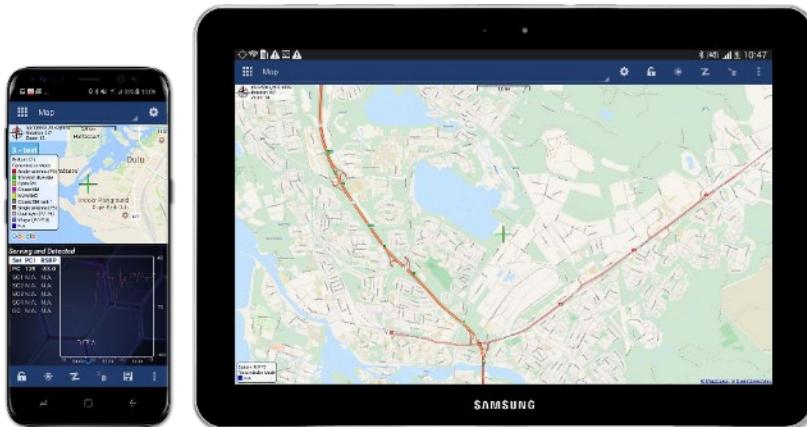


# Keysight Nemo Handy



User Guide



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<b>WARNING</b>	Do not use the Nemo Handy device(s) in a hospital. It may interfere with nearby electronic devices.
<b>WARNING</b>	Observe restrictions on the use of radio equipment in gas stations, fuel depots, chemical plants, or sites where blasting operations are in progress.
<b>NOTE</b>	When using the Nemo Handy devices, the battery operation time is reduced from normal use. The best operation times will be achieved when the batteries are regularly charged and discharged as instructed in the device user manual. See also other instructions and hints from the device user manual regarding the battery use.
<b>NOTE</b>	Note that the local laws and/or regulations may set limitations, restrictions or other obligations on the use of the Nemo Handy and/or the test devices. Observe the laws and regulations of the country (as well as of any other relevant jurisdiction) where the Nemo Handy and/or test device is used. Keysight Technologies Finland, Ltd. assumes no responsibility or liability arising from the failure to comply with the local laws and/or regulations.

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[www.keysight.com/find/softwaremanager](http://www.keysight.com/find/softwaremanager)

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## 1 Quick Guide

This quick guide will explain briefly how to set up the Nemo Handy measurement system and how to start the actual measurements.

### CAUTION

Do not upgrade, root, or reflash your Nemo Handy measurement terminal firmware. Doing so will cause the terminal to permanently lose its measurement capability!

Using Nemo Handy:

1. Select the Nemo Handy button from the Apps view by tapping **Apps** on your Nemo Handy mobile.
2. If you want to use scripts, tap the **Script** button () on the toolbar. If there are no scripts created yet, tap the **New Script** () button or tap the **No script** field and select **New script** from the dialog box. Add script commands by tapping **Add** at the bottom right corner of the touchpad. Otherwise, choose a script from the list and select **Start** from the dialog box. You can also search for a specific script from the list by filtering.
3. To start recording manually, tap the **Start logging** button () on the toolbar. Once the recording has started, the recording icon () appears on the touchpad.
4. You can browse the different views by dragging your finger horizontally across the screen. If a view has several pages, you can move between the pages by dragging your finger vertically across the screen. To activate band lock, system lock, preferred channel lock (UMTS only), or AMR codec, tap the **Menu** button () and select **Forcing**. Please note that unless you deactivate forcing features, they will stay active even if you exit Nemo Handy.
5. While Nemo Handy is logging, you can use the mobile normally for making calls, sending SMS messages, and so on. Tap the **Home** button to switch between different applications or to make a call.
6. Stop the recording by tapping  from the toolbar and selecting **Stop Logging** () from the opening dialog, or pause logging by tapping  from the toolbar and selecting **Pause Logging** () from the opening dialog. After pausing you can continue logging by tapping . You can keep, rename or delete the resulting log file.
7. Export the measurement file for post-processing.

## 2 Introduction

Welcome to the User Guide for Nemo Handy. This user guide explains how to set up and operate the Nemo Handy measurement tool software developed by Keysight Technologies Finland Ltd. Nemo Handy is a portable engineering tool for measuring and monitoring the air interface of digital networks. Nemo Handy supports all mainstream cellular technologies.

Nemo Handy products provide you with the best real-time measurement visualization on the handheld market. In addition to a rich variety of real-time displays, all RF and signaling data is logged to the phone's internal storage. Log files are made available in Nemo file format for easy post-processing with Nemo post-processing tools or third-party post-processing tools.

### 2.1 Important

The test devices (smartphones etc.) tested and sold by Keysight Nemo Wireless Network Solutions are intended for testing purposes only. Software changes in devices may limit their normal use. Keysight Nemo Wireless Network Solutions does its best to provide test devices without any limitations but it is not always possible. Keysight Nemo Wireless Network Solutions assumes no liability if any commercial application or feature is blocked or limited due to software or other device-related modifications.

If the test device is moved to another country or used in the network of another operator than initially ordered, it is possible that the device does not support all network features. Keysight Nemo Wireless Network Solutions assumes no liability in any cases.

The Nemo Handy user must be appropriately trained and should be familiar with the signaling behind wireless technologies.

## 3 Nemo Handy System Overview

The testing environment consists of a Nemo Handy compatible smartphone or tablet. The package also includes the connecting cable and a Bluetooth GPS receiver (optional). For connecting the GPS receiver to the system, please refer to the documentation in the GPS receiver package. The Nemo Handy software is preinstalled in the device so you can start measurements as soon as you receive the product package.

You can use the Nemo Handy device as a regular phone while Nemo Handy is logging in the background: you can make calls, send SMS/MMS messages, make data transfers, and so forth.

### 3.1 Low data throughput with Android applications

New Android-based smartphones with the Android version 6.0 have battery optimization enabled by default. This will stop some CPU and network activity operating in the background for Android apps, thus saving battery. The battery optimization activates when the handset is left idle for a period of time while unplugged and with the screen off. The battery saving mode interrupts background activity for Android applications, and with for example data transfers this manifests as limited data throughput values. The battery saving option is disabled by default in handsets delivered by Keysight Technologies. However, in case low data throughput is experienced, the following settings should be checked and battery optimization should be disabled for all applications. Please note that the settings menu varies depending on the handset vendor and model. General step-by-step instructions are given below.

1. Select the phone's settings.
2. Select **Battery** from the device list and select **Battery optimization** from the menu icon at the top-right of the screen.
3. Select all apps from the drop-down menu in the center of the display. Now you will see all the apps that are Doze-enabled.
4. Select **Don't optimize** for all apps and tap **DONE**.

## 4 Nemo Handy Setup

### 4.1 Installing Nemo Handy using SD card

Nemo Handy mobiles are delivered preinstalled but you may need to update Nemo Handy yourself. Please follow these instructions carefully to install Nemo Handy.

Installing Nemo Handy:

1. Uninstall the old Nemo Handy version by going to **Apps | Settings | More | Application Manager** and tapping **Uninstall**.
  2. Connect the USB cable to the Nemo Handy mobile and to the computer where you have the Nemo Handy installation files.
  3. Select **Disk drive/Media device (MTP)** as the connection type.
  4. Copy Nemo Handy HandyRelease.apk file onto your mobile device under Nemo folder. (When using Samsung Galaxy Note 3 or Samsung galaxy Note 3 T-Mobile see \*)
  5. Disconnect the data cable from the mobile.
  6. Go to **Apps | My Files | All Files | Nemo** and select HandyRelease.apk file from the list.
  7. Select **Install**.
  8. Installation is started and once it is finished, you can start using Nemo Handy.
- \*) When using Samsung Galaxy Note 3 or Samsung Galaxy Note 3 T-Mobile, note that installation of Superuser software is required prior to using Nemo Handy for the first time. Devices have pre-installed Superuser software, so you only need to re-install the software if it has been removed from the device.
- With Note 3 handysuperuser.apk is required
  - With Note 3 T-Mobile superuser.apk is required

#### NOTE

Please note that you need to agree to the Keysight software end-user license agreement (“EULA”) before you can start using Nemo Handy. The EULA will be shown upon first launch of the software: read the agreement and tap *Agree* to continue. If you select the Do not show this screen again option, the EULA will not be displayed again.

### 4.2 Installing Nemo Handy from Keysight Software Manager (KSM)

Nemo Handy mobiles are delivered preinstalled but you may need to update Nemo Handy yourself. Please follow these instructions carefully to install Nemo Handy.

Installing Nemo Handy from KSM:

1. Uninstall the old Nemo Handy version by going to **Apps | Settings | More | Application Manager** and tapping **Uninstall** on your Nemo Handy mobile.
2. Start a browser on your Nemo Handy mobile and log in to KSM. You must have a valid Technical Support Agreement and valid access codes (email address and password).
3. Select **You can get updates** and select the option **Updates** (Updated software and licenses) in the dropdown list under 'View'.
4. Download the version from the Product Family Nemo Handy in Keysight Software Management site.
5. Select **Apps | My Files | All Files | Download** and tap the setup package (.apk) after transfer is completed. (When using Samsung Galaxy Note 3 or Samsung Galaxy Note 3 T-Mobile see \*)
6. Select **Install**.
7. Installation is started and once it is finished, you can start using Nemo Handy.

\*) When using Samsung Galaxy Note 3 or Samsung Galaxy Note 3 T-Mobile, note that installation of Superuser software is required prior to using Handy for the first time. Devices have pre-installed Superuser software, so you only need to re-install the software if it has been removed from the device. If you need the Superuser software, please contact Nemo Technical support.

#### NOTE

Please note that you need to agree to the Keysight software end-user license agreement (“EULA”) before you can start using Nemo Handy. The EULA will be shown upon first launch of the software: read the agreement and tap *Agree* to continue. If you select the Do not show this screen again option, the EULA will not be displayed again.

### 4.3 Nemo Handy OTA (Over-the-air) update

Nemo Handy checks at every startup whether there is a newer version available. Notice that your Technical Support agreement needs to be valid before a newer version will be detected. To disable Nemo Handy from checking for newer version at every startup, deselect **Check at Startup** in the OTA updates settings (**Settings | OTA updates**).

To check for available updates, go to OTA update settings in Nemo Handy and tap **Check for Updates**. If a newer version is detected, you can choose to download and install it. Please note that unit-specific OTA update settings made in Nemo Cloud overrule OTA updates settings made in Nemo Handy, i.e. if in the Nemo Handy unit's OTA Updates settings *Update automatically* is disabled but in Nemo Cloud's **Resources | Units** section OTA updates are enabled for the unit, OTA updates will take place.

To enable silent install, i.e. automatically update the software version when a new software update is released, select **Update automatically**. This is particularly useful with Nemo Autonomous units since the software version in units on the field can be updated remotely.

You can define a version range for Nemo Handy Autonomous units in Nemo Cloud. Version downgrades, i.e. updating Nemo Handy to an older version, can be performed, however this causes all settings to reset. Note that silent install does not work when downgrading. After downgrade, start Nemo Handy manually and accept all usage rights that Nemo Handy asks for. For more information, see Nemo Cloud User Guide.

#### NOTE

Please note that you need to agree to the Keysight software end-user license agreement (“EULA”) before you can start using Nemo Handy. The EULA will be shown upon first launch of the software: read the agreement and tap *Agree* to continue. If you select the Do not show this screen again option, the EULA will not be displayed again.

Under OTA updates you can also check for Nemo Browser updates and install a new Nemo Browser version if there is one available through tapping **Check for Nemo Browser updates**.

### 4.4 Installing Nemo Handy license

Nemo Handy mobiles are delivered preinstalled but you may need to update the Nemo Handy license. Nemo Handy retrieves the license automatically over the air when starting Nemo Handy for the first time without a license. If you do not have the possibility to connect the Nemo Handy mobile to internet via mobile connection or WiFi, please contact Nemo Helpdesk for the license. Please follow these instructions carefully to select the Nemo Handy license.

Selecting Nemo Handy license:

#### NOTE

These instructions are meant to be followed when a license has been updated, for example when a new product version containing new features requiring a license is published or when a customer has purchased a new option for an existing license. A new license is uploaded to the server by Nemo Technical Support and Nemo Handy automatically connects to the server and retrieves the available licenses.

1. In Nemo Handy, go to **Menu | About | License** and tap **Browse licenses**.
2. The License Browser view opens.
3. Tap **Refresh** to refresh the list of available licenses for Nemo Handy.
4. The currently used license is highlighted in green. A network license displays a product variant, options, and expiration date. There is no additional information available for a regular license. If there is a problem regarding the license, an error dialog box appears.
5. Select the correct license from the list by tapping it and selecting **Load**.
6. If you want to release a license, select **Release**.
7. You can now start using Nemo Handy.

Note that if the license expires during Nemo Handy runtime, you will get a notification dialog box warning you that the application will shut down in ten minutes after the notification dialog box is closed. Tap **OK** or the back button of the device to close the dialog box, which starts the timer for application shutdown.

## 4.5 Superuser request

After installing Nemo Handy to a device for the first time, Superuser access will be requested. It is recommended to select **Remember choice forever**.

#### NOTE

Note that when using Note 3 and Note 3 T-Mobile devices, the Superuser software must not be removed or Nemo Handy will not function.

## 4.6 Temporary airplane mode on VoLTE devices

Most VoLTE devices require a radio switch-off-switch-on before Nemo Handy can decrypt IMS messages from packet capture. Therefore, if the airplane mode is not already enabled, Nemo Handy asks to temporarily enable airplane mode at Nemo Handy startup.

If you wish to save your selection, select the **Always use this selection** option.

Tap **Yes** to enable temporary airplane mode.


This function is disabled in automated mode.







## 4.7 Connecting an external GPS

Nemo Handy uses an internal GPS receiver by default. If you want to use an external GPS, you have to pair a Bluetooth GPS with the phone. Turn the Bluetooth GPS on. If you have several devices, switch on only one GPS at a time to avoid an incorrectly paired system. Bluetooth ID is not printed on the Bluetooth GPS case.

Choose **Apps | Settings | Bluetooth** and select the corresponding GPS. When you have a connection to the GPS, the GPS view is visible. If you cannot see the GSP view, check that you have chosen the correct GPS device.


## 5 During Measurements

When Nemo Handy is started, home view with shortcuts is displayed. The home view can be customized by the user to include the most used pages and shortcuts to them. To leave the home view, tap the return button. You can re-enter the home view by tapping  in the action bar. To select pages for the home view, tap and hold on a page slot.


After you start logging with Nemo Handy, tap **Start logging** . You can use the mobile as any regular mobile. Nemo Handy runs in the background recording all measurement data. Tap the **Home** button to switch between different applications or to make a call. Pause logging by tapping  from the toolbar and selecting **Pause Logging**  from the opening dialog. To continue logging after pausing, tap  on the toolbar. Stop logging by tapping  on the toolbar and selecting **Stop Logging**  from the opening dialog.

During measurements, calls and data transfers can be made and/or the phone can be left in an idle state, during which time measurements are carried out. Measurement results are stored into a file *filename.nmf*. You can view the measurement process in various views.

You can browse the various views by swiping the touchpad with your finger or by tapping the page header and selecting from the list of displays in the popup shortcut menu. If a page has several views, you can move between the views by dragging your finger vertically across the screen. Note that the scales in the line graphs will change according to the active parameter in the graph. You can change the active parameter from the parameter menu that pops up when the parameter name is tapped and hold down on the screen. The different views are described in detail in Chapter “Nemo Handy measurement views”.

When logging, you can draw a route on the map by placing markers along the route by tapping  on the toolbar.

You can also add markers, textual markers, predefined markers, and photo markers to the log file to mark points of interest during the measurement. To add marker/textual marker/predefined marker/photo marker, go to **Menu | Add Marker** and select **Add Marker/Add Textual Marker/Add Predefined Marker/Add Photo Marker** from the pop up menu. Selecting **Add Photo Marker** opens the camera preview screen. Tap the shutter icon to capture an image. An image preview is displayed. Tap **OK** at the top of the view to confirm capturing the image or tap **RETRY** to dismiss the image and capture a new one. A dialog prompting you to enter photo name is displayed. Enter photo name and tap **OK**.

When a marker is added, a pop up message displaying the marker sequence number appears on the screen. You are also able to see the marker sequence number later by tapping on the marker. To remove last added marker, tap .


### 5.1 Manual application testing

#### NOTE

When performing manual data testing, select the access point that will be used in the data measurement. Please follow the terminal manual to define access point.

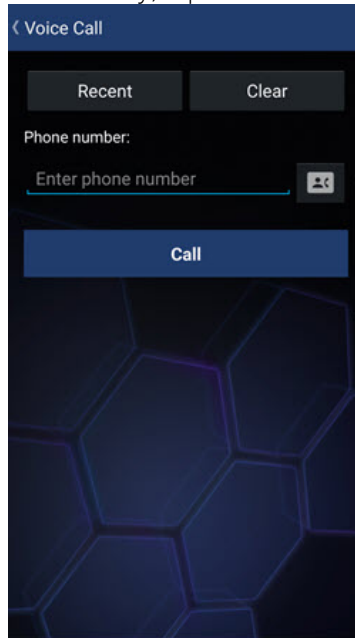
#### 5.1.1 Manual voice call testing



#### NOTE

When testing voice calls manually, always make the calls from Nemo Handy. If you make a call by entering the number using keypad and then tapping , phone events (call attempt, call connected, and so forth) will not be written to log files.

To test voice calls manually, tap the Tools button (  ) on the toolbar and select **Make Voice Call**.

Tap the phone number field and enter the phone number. Alternatively, you can or select an existing contact from the address book by tapping the phone book icon. Tap **Recent** to access a list of previously used phone numbers. Finally, tap **Call**.




When making a call attempt, the call alerting icon (  ) appears on the top left corner on the screen. To end the call, tap the Tools button (  ) and select **Hang up call**. You can adjust the volume by pressing the volume up or volume down key on the upper left-hand side of the phone.


Nemo Handy supports Voice over LTE (VoLTE) and Voice over WiFi (VoWiFi) testing with terminals that support these technologies. Manual video call testing is also supported with terminals that support video calls. The process for video call testing is similar to voice call testing.

With a separate license option, it is possible to measure Video Call Quality using a third-party algorithm.

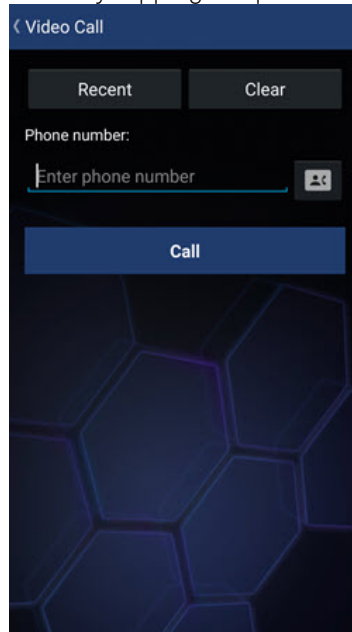
### 5.1.2 Manual video call

#### NOTE

When testing video calls manually, always make the calls from Nemo Handy. If you make a video call by entering the number using keypad and then tapping , phone events (call attempt, call connected, and so forth) will not be written to log files.

To test video calls manually, tap the Tools button (  ) on the toolbar and select **Make Video Call**.

Enter a phone number by tapping the Phone number field. Alternatively, you can or select an existing contact from the address book by tapping the phone book icon. Finally, tap **Call**.



When making a call attempt, the call alerting icon (📞) appears on the top left corner on the screen. To end the call, tap the Tools button (🛠️) and select **Hang up call**. You can adjust the volume by pressing the volume up or volume down key on the upper left-hand side of the phone.

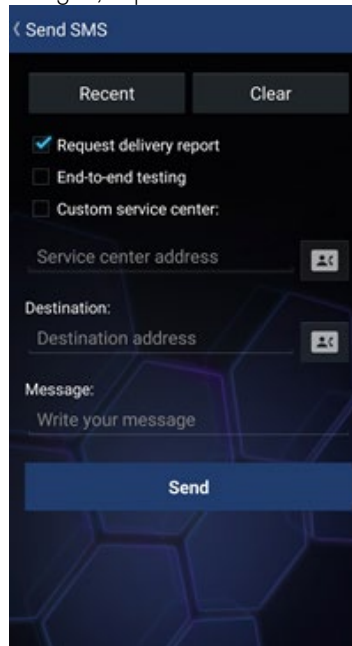
With a separate license option, it is possible to measure Video Call Quality using a third-party algorithm.

### 5.1.3 Manual SMS testing

**NOTE**

Note that this functionality is available only if your Nemo Handy product option supports it.

To manually test sending SMS messages, tap the Tools button (  ) and select **Send SMS**.



Select the *Request delivery report* option to receive a report about the message sending.

Select the *End-to-end testing* option to test end-to-end delivery time. Both terminals must use GPS time (see Chapter “GPS settings”).

*Custom service center* defines a service center, other than the default service center, used to send messages. If you leave this field empty, Nemo Handy will use the default service center.

*Destination* defines the recipient mobile number. Tap the folder icon to select the recipient from address book.

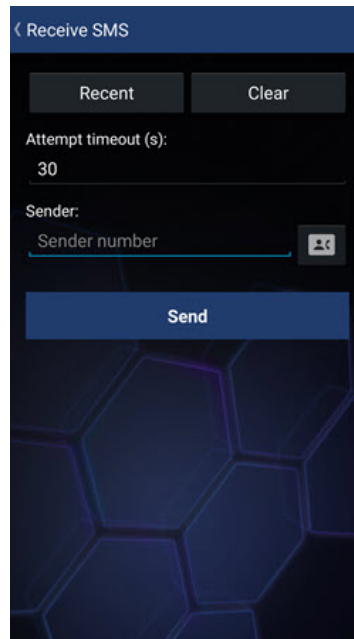
*Message* refers to the test SMS message sent. Type here the test message.


Finally tap **Send** to send the test message.

## 5.1.4 Manual SMS receiving testing

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.



To manually test receiving SMS messages, tap the Tools button (  ) and select **Receive SMS**.

*Attempt timeout* defines the maximum duration (in seconds) of the SMS receive attempt. Enter the sender phone number by tapping the *Sender number* field. Alternatively, you can select an existing contact from the address book by tapping the phone book icon. To view a list of phone numbers from which your Nemo Handy device has previously received SMS messages, tap *Recent*. To clear sender number from the sender number field, tap *Clear*. Finally, tap **Send**. To cancel receiving SMS, select **Menu | Cancel All SMS**.

## 5.1.5 Manual MMS testing

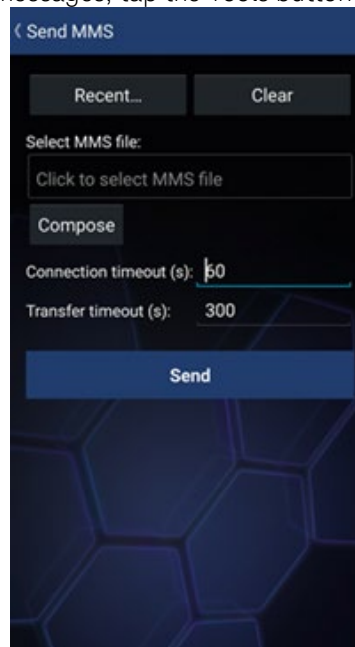
### NOTE

Note that to able to perform MMS testing, the MMS testing features must be selected in General settings.

### NOTE

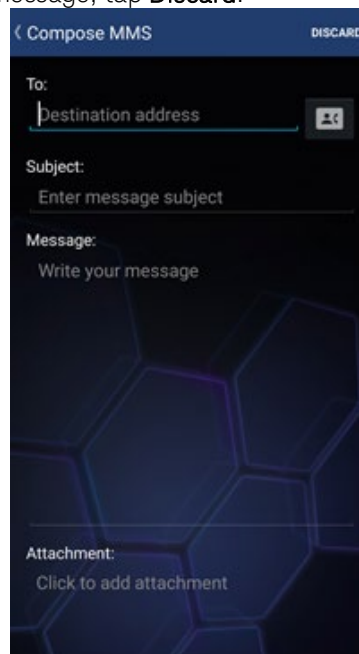
Note that this functionality is available only if your Nemo Handy product option supports it. Note that Android version 4.4 or later is required for performing MMS tests.

To manually test sending MMS messages, tap the Tools button (  ) and select **Send MMS**.



*Select MMS file* defines the MMS file that will be sent.

*Compose* allows composing the message. Enter phone number and subject, write a message and add an attachment. To discard message, tap **Discard**.



*Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt.

*Transfer timeout (s)* defines the maximum duration (in seconds) of the transfer attempt.

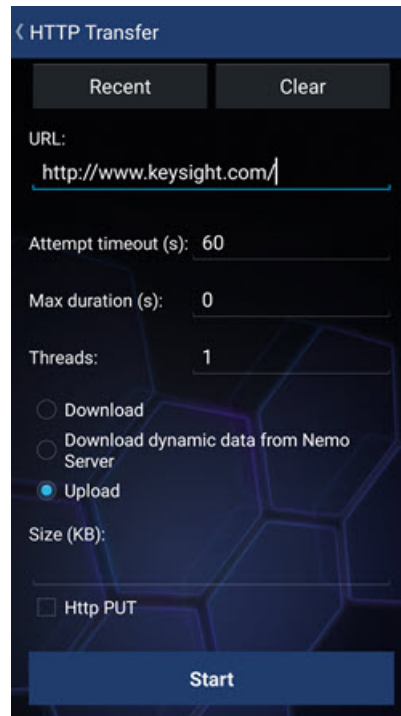
Finally tap **Send** to send the test message.

*Recent...* displays recent MMS messages.

## 5.1.6 Manual HTTP testing

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.



Tap the Tools button (  ) and select **Make HTTP transfer**.

*URL* defines the file that will be downloaded. In upload, only path is defined. You can also specify alternative port number, for example **www.server.com:1234/path/file**, in the URL field.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.

*Max duration (seconds)* defines the maximum duration of the HTTP transfer.

*Threads* enables you to define the number of threads (value can be 1-20) for the HTTP transfer.

For example, if a 10 MB file is transferred with the thread value set to 3, 30 MB is actually transferred.

*Download/Upload* defines the direction of transfer.

Select the *Download dynamic data from Nemo Server* option to download automatically generated test data from Nemo Server.

*Size* (with uplink only) defines the size of the uploaded package in kilobytes

*Http PUT* (Uplink selected) defines that HTTP PUT is used as the file upload method instead of HTTP POST (default).

When multiple threads are used in HTTP download, you can disable multipart transfer by selecting *Disable multipart transfer*. When this option selected, the file is transferred x times (i.e. the amount defined in *Threads*) instead of being split into smaller fragments.

Tap **Recent** to access a list of previously used HTTP transfers. This way you can quickly define HTTP connection settings and the file used in the transfer. If there are no previously used transfer settings, tap **Select host**. Select **HTTPS** or **HTTPS**. On the Select HTTP/S connection page, select one of the predefined HTTP/S connections and tap **Select**. To create a new connection, tap **Create New**.

With scripted HTTP(S) transfers you can select the mode for stopping the transfer. The options are *Stop when completed* and *Force stop*. To define the stop mode, add the command for

HTTP(S) transfer to the script and tap **StopHTTPTransfer** to open the Stop HTTP Transfer dialog box. Select the stop style from the pulldown menu and tap **Save**.

The forced stop is useful with scripts that loop data transfers for a fixed amount of time, or when the data transfer needs to be ended when a call is disconnected.

### 5.1.7 Manual HTML browsing testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

#### NOTE

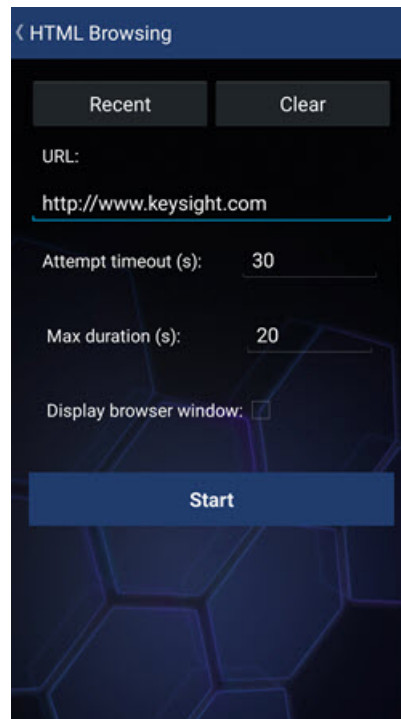
Note that you need to install the Nemo Browser installation package (available in KSM) separately to your Nemo Handy device to perform HTML browsing testing.

To obtain correct results, you should only perform HTML browsing testing on static web pages, such as

#### NOTE

<https://portal.etsi.org/TBSiteMap/STQ/HTLMReferenceWebPage.aspx>

If you test dynamic web pages, DCOMP event parameters (service access time, IP termination time, TCP handshake time, payload access time, processing delay or connection processing delay) might be missing or incorrect.



Tap the Tools button (  ) and select **Make HTML transfer**. After defining the settings, select **Start** to begin the data process.

*URL* defines the URL of the page that will be browsed.

*Attempted timeout (s)* defines the time of the attempt before timeout in seconds.

*Max. duration (s)* defines the maximum duration of the transfer in seconds. Once the maximum duration is met, Nemo Handy stops the transfer and proceeds to the next script command.

*Display browser window*, when selected, displays the browser window while manual HTML browsing testing is being performed.

Tap *Choose previously loaded URL* to select a URL that has been used before.


When the session starts, Nemo Walker Air opens an external Nemo Browser where the inserted URL opens.

The orange line beneath the web address field indicates the browsing progress. When the web page is loaded, the browser opens the Nemo Browser home page to indicate that the session is completed. The Transaction log view displays the transaction results.

## 5.1.8 Manual FTP testing

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Go to Nemo Handy to define the FTP settings. Tap the Tools button () on the toolbar and select **Make FTP transfer**. After defining the settings, tap **Start** to begin the data process.

*Server* defines the IP address for the FTP server, for example, 12.34.56.78.

*Username* and *Password* are required for the FTP server. Tap and hold  to show password.

*Port* defines the port number for the FTP server, for example, 21.

*Passive*, when selected, the passive mode is used. When cleared, the active mode is used.

*Threads* defines how many threads Nemo Handy transfers data with simultaneously (1-20). For example, with one thread Handy creates one FTP session and with five threads it creates five sessions.

Select whether the FTP file is *Downloaded* from the server or *Uploaded* from the phone to the server.

*Folder* (with Uplink only) defines the destination folder for the transferred package. With *Browse* you can browse the server for the destination folder.

*File* defines the name of the downloaded file (with Downlink only).

*Browse* allows browsing through and selecting files to be downloaded once the server address has been set.

*Max duration (seconds)* defines the maximum duration of the FTP transfer.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.


*Transfer timeout (Use default/Define)* defines the time in seconds for how long Nemo Handy waits during a transfer if there is a break in the data flow. If the transfer does not continue within the defined time, transfer will fail. The default value is 30 seconds.

Tap **Recent** to access a list of previously used FTP transfers. This way you can quickly define FTP connection settings and the file used in the transfer. If there are no previously used transfer settings, tap **Select host**. On the Select FTP connection page, select one of the predefined connections and tap **Select**. To create a new connection, see Chapter “Creating New FTP Connections”.

### 5.1.9 Manual SFTP testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Go to Nemo Handy to define the SFTP settings. Tap the Tools button () on the toolbar and select **Make SFTP transfer**. After defining the settings, select **Start** to begin the data process. *Browse* allows browsing through and selecting files to be downloaded once the server address has been set.

*Server* defines the IP address for the SFTP server, for example, 12.34.56.78.

*Port* defines the port number for the SFTP server, for example, 21.

*Username* and *Password* are required for the SFTP server.

Select whether the SFTP file is *Downloaded* from the server or *Uploaded* from the phone to the server.

*Path* (with Uplink only) defines the destination folder for the transferred package.

*Browse* allows browsing through and selecting files to be downloaded once the server address has been set.

*File* defines the name of the downloaded file.

*Max duration (seconds)* defines the maximum duration of the FTP transfer.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.

*Transfer timeout (Use default/Define)* defines the time in seconds for how long Nemo Handy waits during a transfer if there is a break in the data flow. If the transfer does not continue within the defined time, transfer will fail. The default value is 30 seconds.

Tap **Recent** to access a list of previously used SFTP transfers. This way you can quickly define SFTP connection settings and the file used in the transfer.

If there are no previously used transfer settings, tap **Select host**. On the Select SFTP connection page, select one of the predefined connections and tap **Select**. To create a new connection, see Chapter “Defining measurement upload configurations”.

### 5.1.10 Manual IPerf testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Tap the Tools button () and select **Make IPerf Transfer** to define IPerf setting. Tapping **Recent** show transfers initiated from manual transaction.

Select whether you are using TCP or UDP protocols, enter the server address and port, enter the duration of the transfer, select the direction of the transfer (*Download/Upload/Both*), and enter the TCP/UDP window size (KB), and attempt timeout. Finally, select **Start** to begin the transfer.

### 5.1.11 Manual IPerf 3 testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Tap the Tools button () and select **Make IPerf 3 Transfer** to define IPerf 3 setting.

Tapping **Recent** show transfers initiated from manual transaction.

*TCP/UDP* defines whether you are using TCP or UDP protocols.

*Server* is the IP address used in Nemo Server.

*Server port* refers to the port used by Nemo Server. For TCP and UDP protocols, the default port is 5001.

*Duration* defines the length of the data transfer in seconds.

*Download/Upload* defines the direction of the transfer.

*TCP window size (KB)* defines the size of the receive window during TCP/IP transmission. If it is too small, it can decrease the maximum data throughput, and if it is too high it can increase the retransmission round-trip time (RTT). To be able to avoid decrease of data throughput, the window size should be at least the maximum throughput multiplied by RTT. For example, with HSDPA with category 8 the maximum throughput is about 7.3 Mbit/s and RTT is about 100 ms. To avoid reduction of the throughput the TCP window size should be set at least to  $7.3 \text{ Mbit/s} * 0.1 \text{ s} = 730 \text{ kbit} = 91.25 \text{ kB}$ .

*Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt.

*Transfer timeout (s)* defines the maximum duration (in seconds) of the transfer attempt.

*Buffer length:*

-*When using UDP:* Defines the socket buffer length. When not defined, the default socket buffer length of the operating system is used.

-*When using TCP:* Defines the buffer length written or read to and from the stream.

*Tunnel address* defines the local address and network interface used by IPerf 3 binary. When not defined, tunnel address is assigned automatically by the operating system.


*Listen port* defines the local port that IPerf 3 binary uses. When not defined, is assigned by the operating system automatically.

Finally, select **Start** to begin the transfer.

## 5.1.12 Manual ICMP Ping

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Tap the Tools button () on the toolbar and select **ICMP Ping**. After defining the settings, tap **Start** to begin the ICMP ping test.

*Host* defines the ping host address.

*Repeats* defines how many times the ping is repeated.

*Packet size* defines the size of the ping package in bytes.

*Interval* defines the interval in milliseconds between ping repeats.

*Timeout* defines the maximum duration (in seconds) of the ping attempt.

Finally, select Start to begin the transfer.

## 5.1.13 Manual Facebook testing

### NOTE

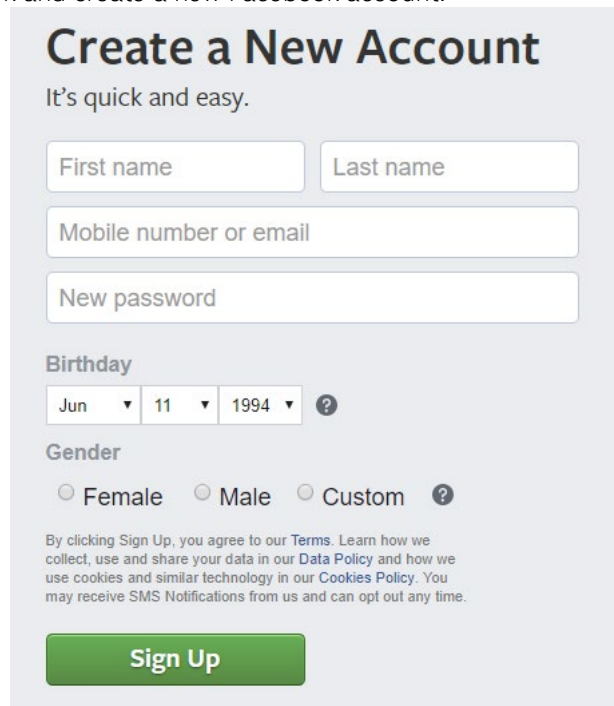
Note that this functionality is available only if your Nemo Handy product option supports it.

In order to be able to test the Facebook application, you will need to set up a Facebook page and create a Facebook app. First, set up a Facebook developer account and create an app.

### 13.5.1.1 Create a Facebook application and a Facebook page

In order to create a new Facebook application, you will need to set up a developer account.

1. Go to Facebook and create a new Facebook account.



**Create a New Account**  
It's quick and easy.

First name  Last name

Mobile number or email

New password

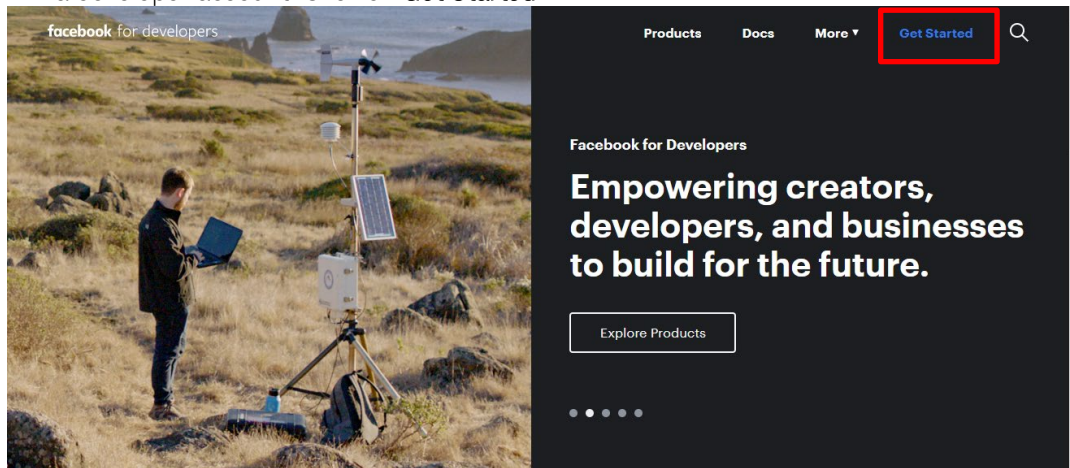
**Birthday**  
Jun ▾ 11 ▾ 1994 ▾ ?

**Gender**  
 Female  Male  Custom ?

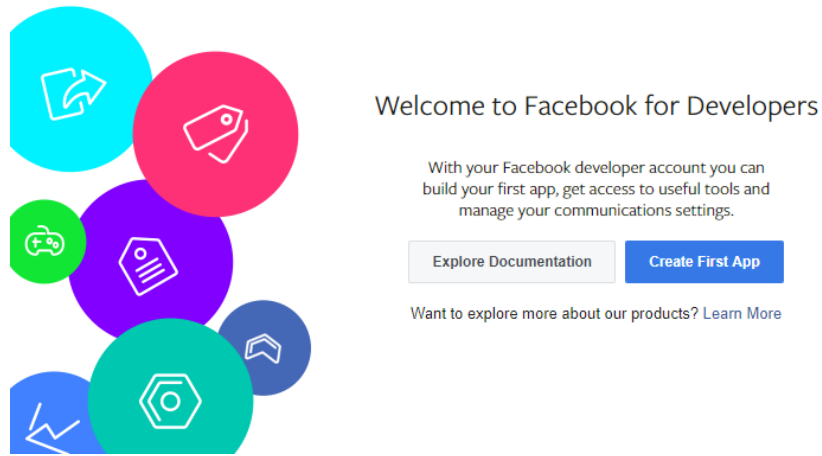
By clicking Sign Up, you agree to our Terms. Learn how we collect, use and share your data in our Data Policy and how we use cookies and similar technology in our Cookies Policy. You may receive SMS Notifications from us and can opt out any time.

**Sign Up**

2. After you have created an account, go to <https://developers.facebook.com/> and create a developer account. Click on **Get Started**.



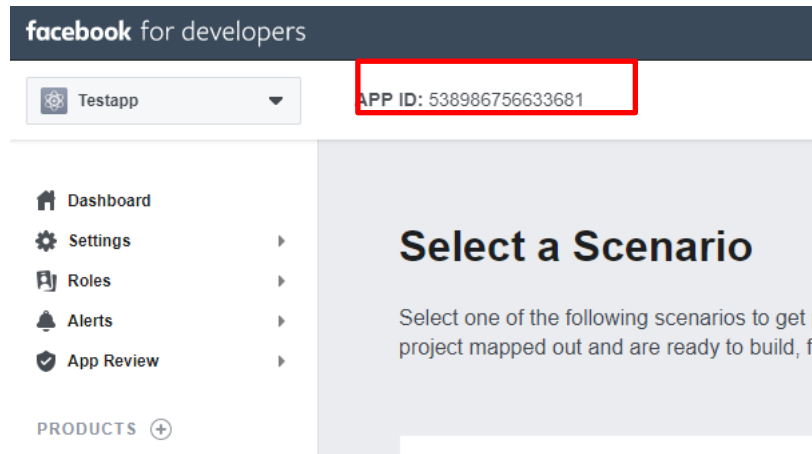
3. After you have created and verified your developer account, click on **Create First App** or **Create App** if you have created apps before.



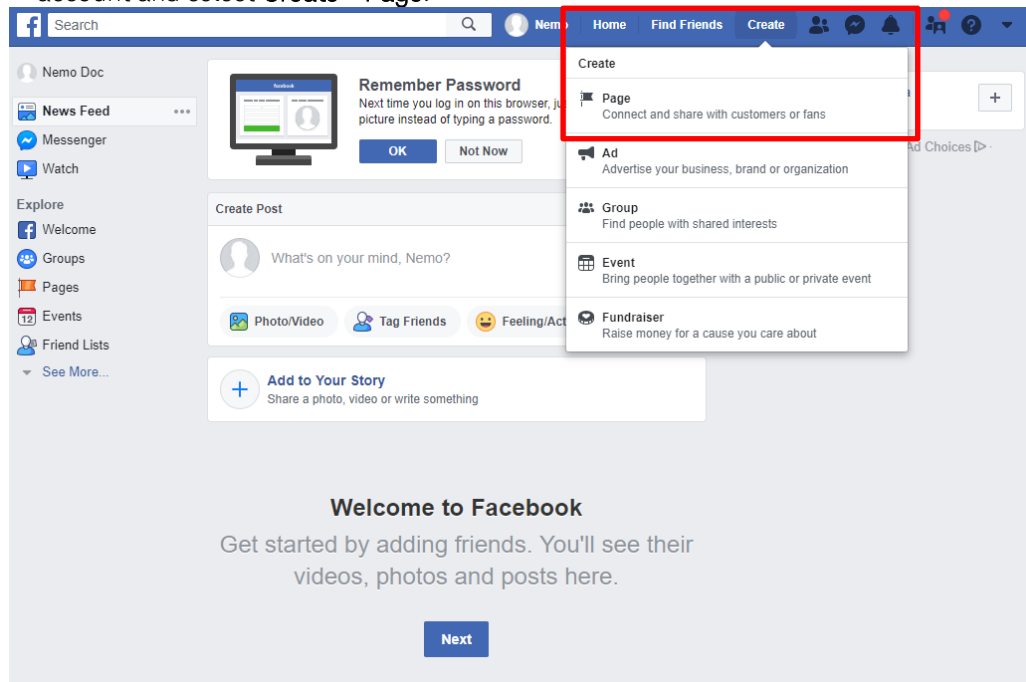
4. In the Create a New App ID dialog, enter a name for your app and click **Create App ID**.

A screenshot of the "Create a New App ID" dialog. The title is "Create a New App ID" with the subtitle "Get started integrating Facebook into your app or website". There are two input fields: "Display Name" with the value "FBtestingapp" and "Contact Email" with the placeholder text "Used for important communication about your app". At the bottom, there is a line of text: "By proceeding, you agree to the Facebook Platform Policies". To the right of this text are two buttons: "Cancel" and "Create App ID".

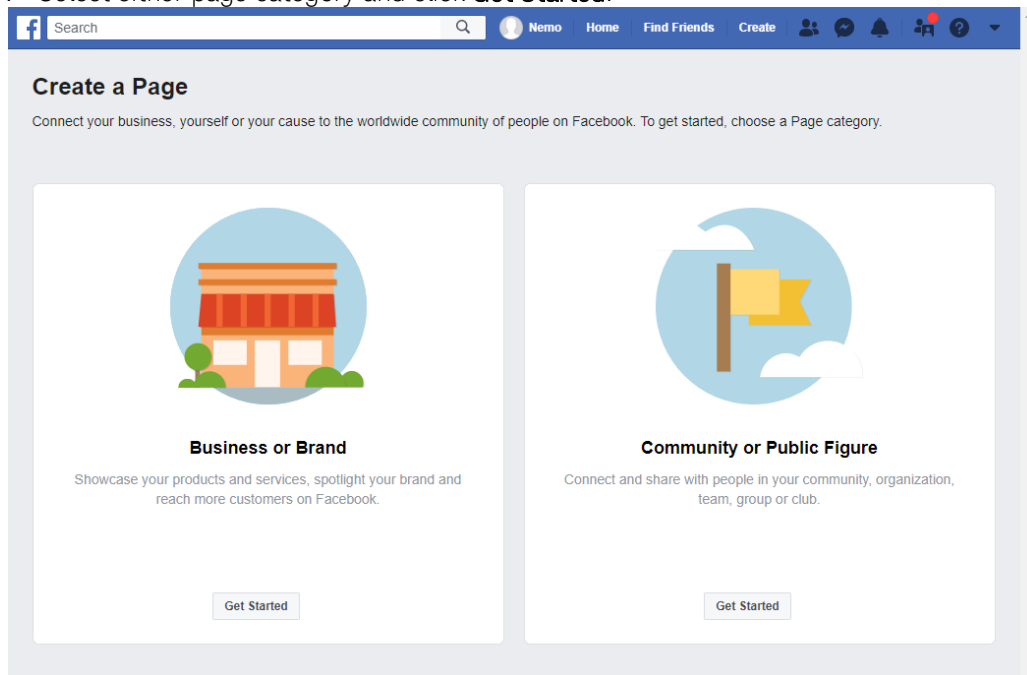
5. After the security check, you will see the **App ID** at the top of the page. Write the App ID down for later use.



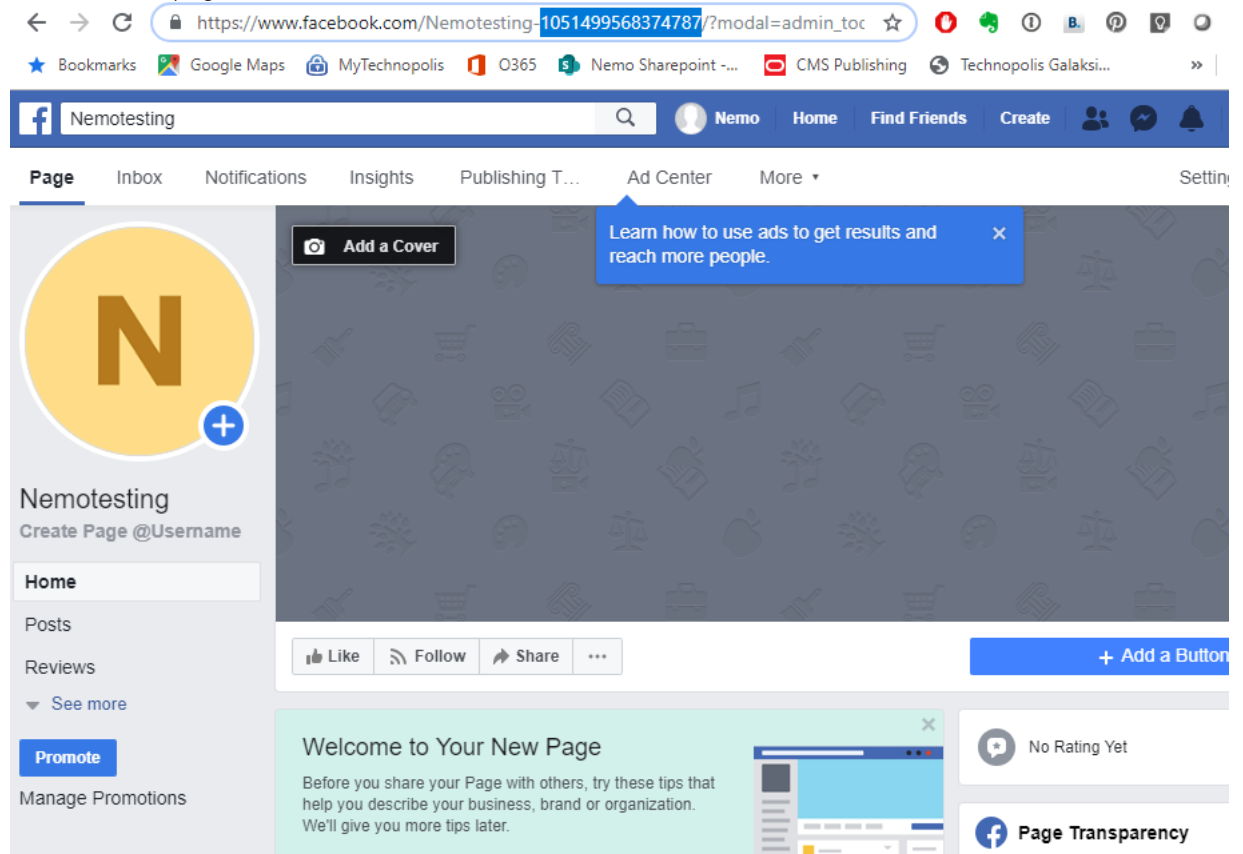
6. Next, you need to create a Facebook page. Log in to Facebook with your regular account and select **Create - Page**.



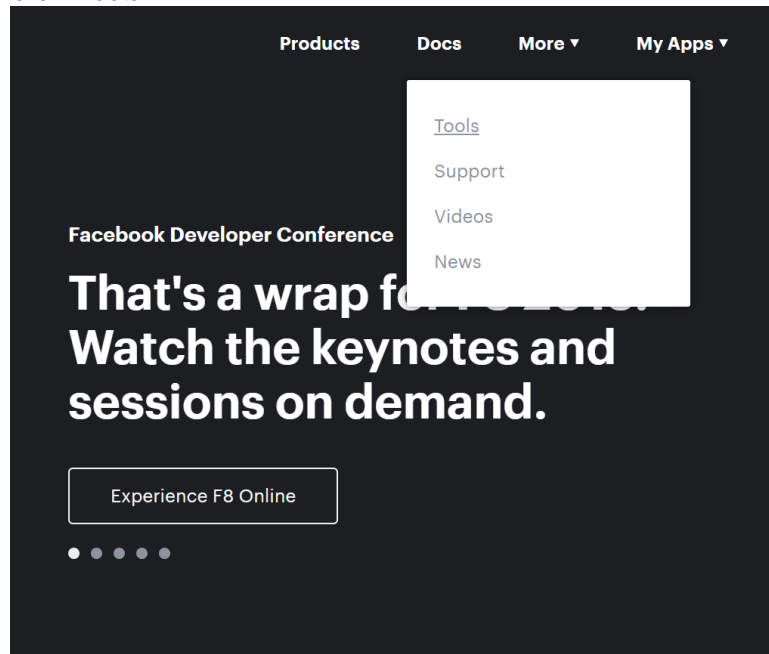
7. Select either page category and click **Get Started**.



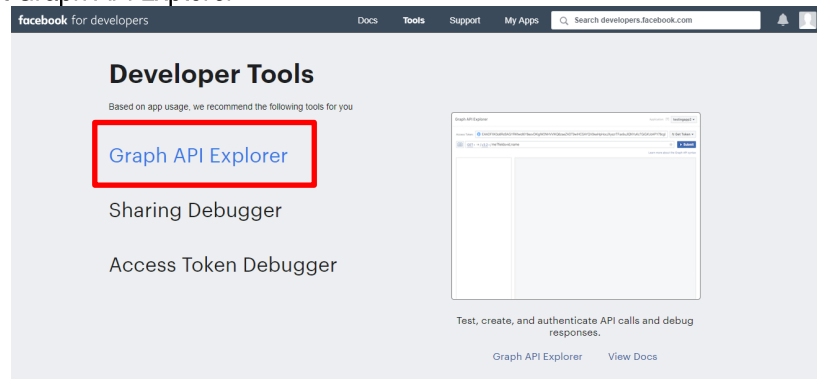
8. Define a name for your page and select a category. Click **Continue**. You can skip the steps of adding a profile and cover photo.
9. Your new page is created.



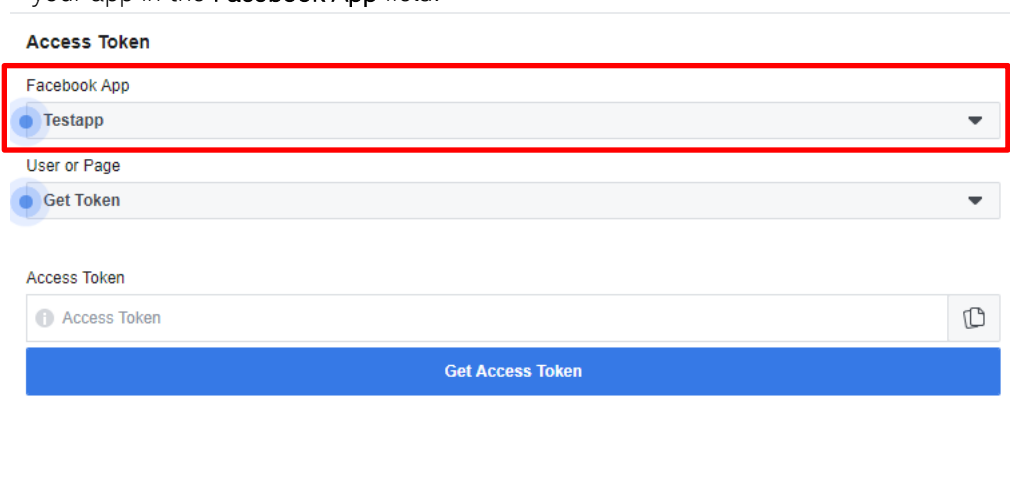
- Return to the Facebook for Developers site (<https://developers.facebook.com/>) and log in with your developer account.
- Select **More – Tools**.



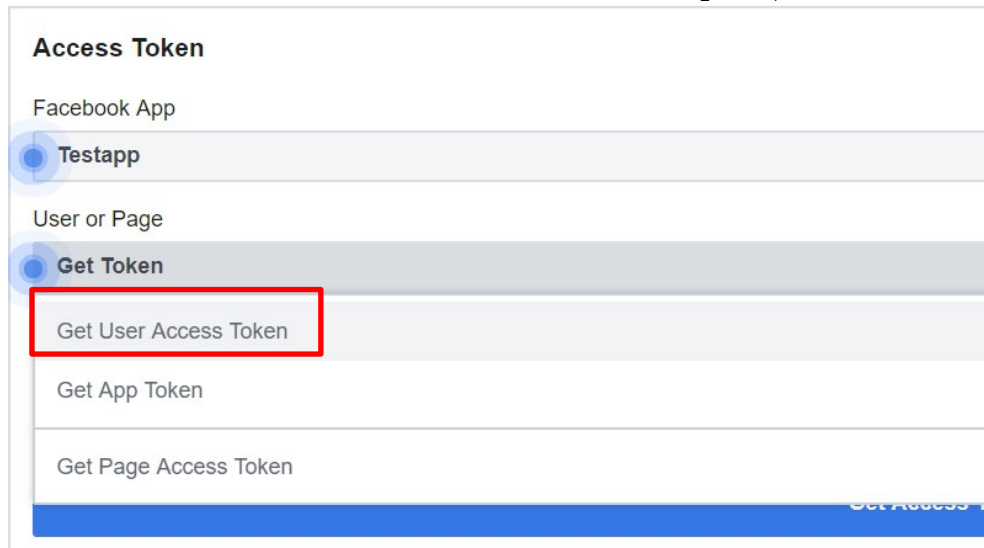
- Select **Graph API Explorer**.



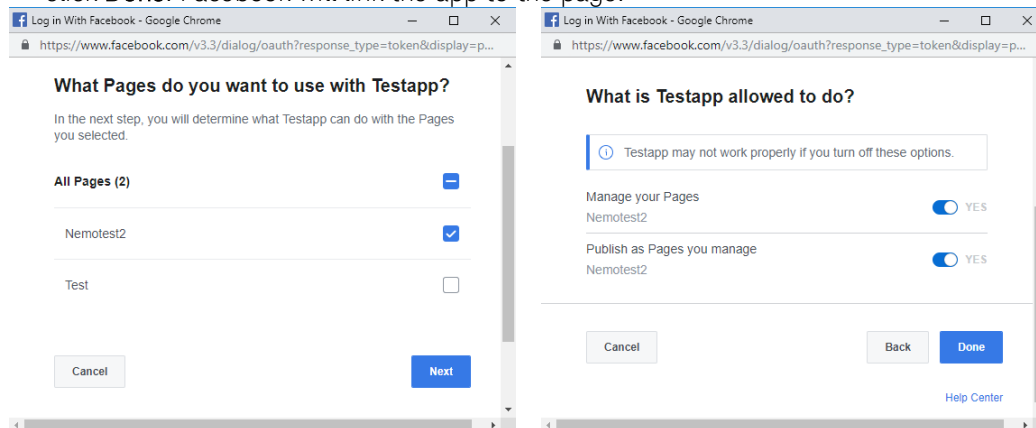
- In the Graph API Explorer, you will see the **Access Token** settings on the right. Select your app in the **Facebook App** field.



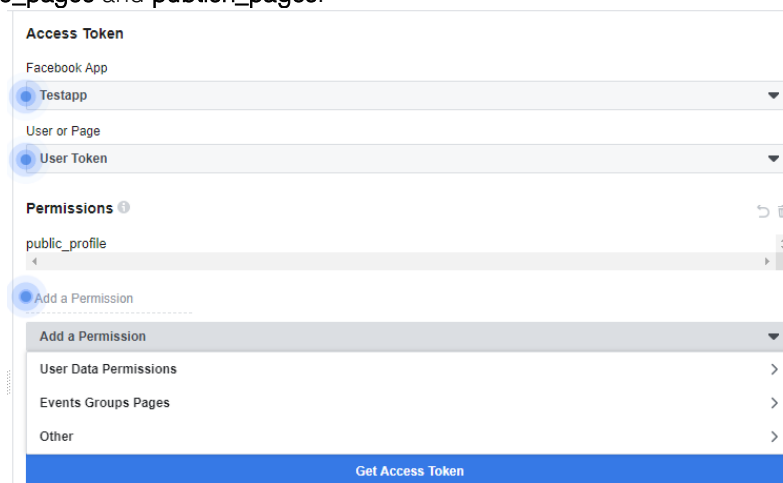
14. Next, select **Get User Access Token** from the **User of Page** drop-down menu.




15. Log in to Facebook and provide access to the page you created for this purpose. Finally click **Done**. Facebook will link the app to the page.

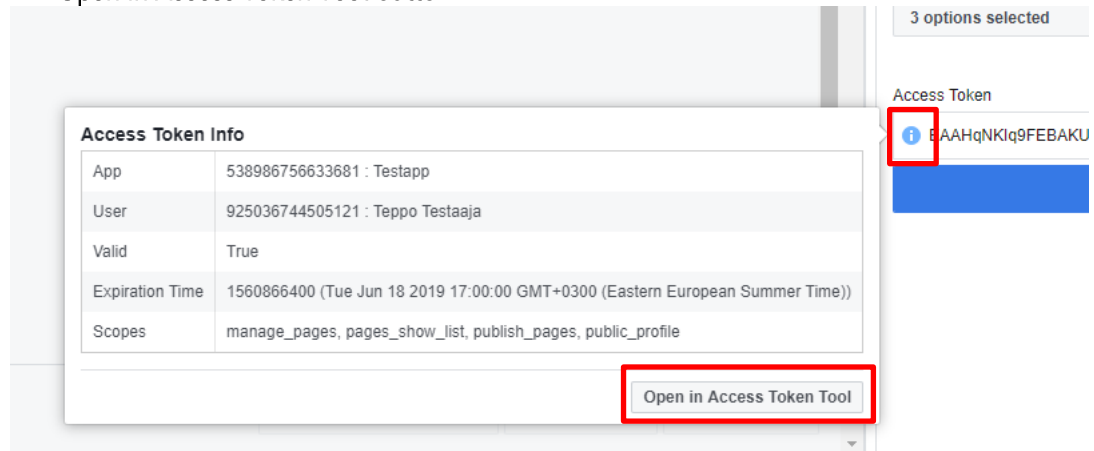


16. In the **Add a Permission** menu, expand the **Events Groups Pages** item and select **manage\_pages** and **publish\_pages**.

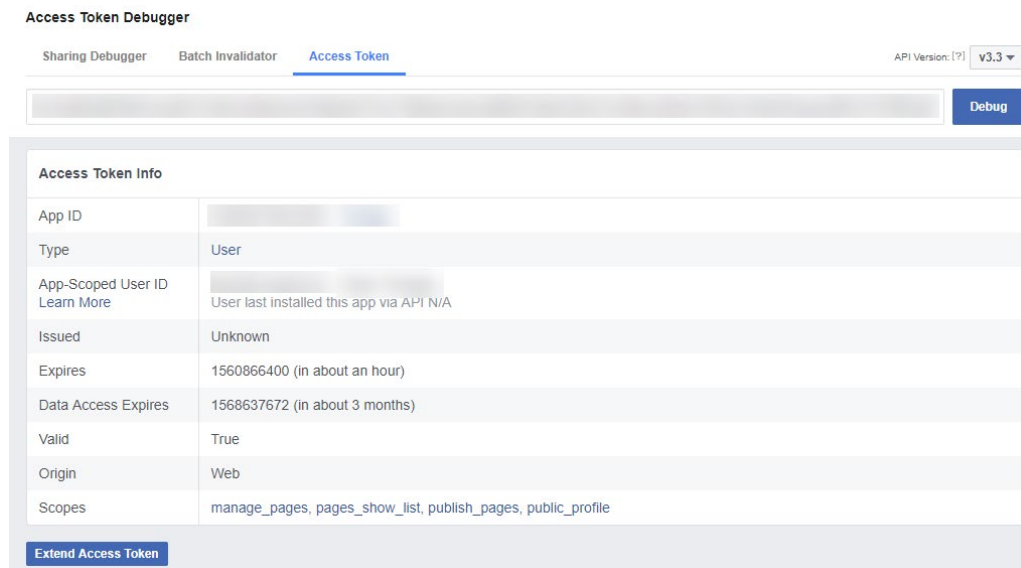


17. Finally click the **Get Access Token** button.

18. Click the  icon in the Access Token field. In the **Access Token Info** dialog, click the **Open in Access Token Tool** button.



19. In the **Access Token Debugger** view, click the **Extend Access Token** button. Enter your FB password if asked.



- The extended token ID appears at the bottom of the view. Copy and paste this in the Nemo Outdoor Facebook Configuration dialog, **Page access token** field. The extended token ID appears at the bottom of the view.

**Access Token Debugger**

Sharing Debugger   Batch Invalidator   **Access Token**   API Version: [?] v3.3

EAAHqNKIq9FEBAKUsoQZC01cMAUuKNqImHuhOk6pQrbzTWJUTYjMhaq7wpq1Qe6RzFCVe0zZC9mo7OwsRwySfveSwW0FazYKmkBxEhUjcaLd05nW3TXFBRUgR   **Debug**

Access Token Info	
App ID	538986756633681 : Testapp
Type	User
App-Scoped User ID <a href="#">Learn More</a>	925036744505121 : Teppo Testaaja User last installed this app via API N/A
Issued	Unknown
Expires	1560866400 (in about an hour)
Data Access Expires	1568637672 (in about 3 months)
Valid	True
Origin	Web
Scopes	manage_pages, pages_show_list, publish_pages, public_profile

**Extend Access Token**

This new long-lived access token will expire on August 17, 2019:

EAAHqNKIq9FEBAR85Ow1kuII4y2BsaJvd1teEd00enYWhDMMzOJcIvNQK5f9bXP5Lca9qdFQGsaIA8PIfVek2B...   **Debug**

- Create a fb\_id.txt file with Notepad and type in it the APP\_ID that you wrote down in step 5 and the extended token in their own separate lines.
- Place fb\_id\_text. file to the Nemo Handy root folder (**nemo/handy**).

Tap the Tools icon () on the toolbar and select **Facebook**.

Begin by selecting the test type. You can post for example a status update to Facebook. Tap **Post Status Update**, enter a message into the opening dialog box, and select **OK**. The status update is displayed in the Facebook view.

The following metrics and events are recorded from Facebook application:

- Facebook Transfer Attempts
  - Data transfer attempt (DAA) event. Trigger point: Checks validity of User Access Token
- Facebook Transfer Success
  - Data transfer connect (DAC) event. Trigger point: User Access Token is valid
- Facebook Transfer Failures
  - Data transfer failure (DAF) event. Trigger point: User Access Token is invalid or expired
- Data Transfer Request
  - DREQ event. Trigger point: JSON call to get user wall feed/friend list/HTTP post
- Data Transfer Completed
  - DCOMP event. Trigger point: Return success if the retrieval is OK or HTTP POST with the image data is successfully uploaded

## 5.1.14 Manual YouTube testing

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

### NOTE

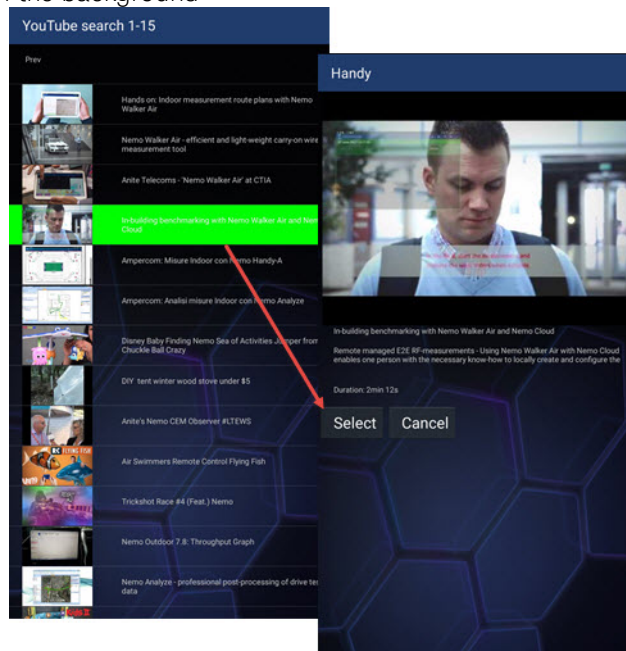
Note that Opticom PEVQ-S is available only if your Nemo Handy product license option supports it.

First, make the YouTube page visible by going to **Settings | Page Settings | YouTube**. Select **Show Page** and tap the Back key of the device.

Tap the Tools button (  ) and select **YouTube**.

Tap **Search** to search for a video from YouTube. Select among the following options: search video, most popular, latest, or most viewed. Select a video from the list and tap **Select** to start playing the video.

*Opticom PEVQ-S* enables the selection of an Opticom PEVQ-S preloaded video for video quality testing. Select **Opticom PEVQ-S**, tap the text field under it and select a previously created YouTube test from the pull-down menu. The measurement initiates automatically, and the Nemo Browser displays it in the background



The video plays in the Nemo Browser view. Video following streaming related parameters are displayed in the YouTube view.

*Init* displays the video initialization time in seconds.

*min s / min s* displays the current point and the duration of the video.

*Width* defines the width of the video view in pixels.

*Height* defines the height of the video view in pixels.

*Format* displays the YouTube media encoding option that defines the size and encoding of the video (for example, MPEG-4, H.264, or VP8). A list of options can be found, for example, in Wikipedia (<http://en.wikipedia.org/wiki/YouTube>).

*Mos* displays the MOS value.

### 5.1.15 Manual Netflix testing

**NOTE**

This feature requires the older Netflix version 4.16.1.

**NOTE**

You need an active Netflix account to test the Netflix application.


**NOTE**

Do not exit from the Netflix application before the video has been run.

**NOTE**

For Netflix testing, turn off the screen lock of your Nemo Handy device from the device settings.

Before you can perform Netflix testing, you need to log in to Netflix separately before you launch the Nemo Handy application. After you have logged in to Netflix, close the Netflix application. Nemo Handy will launch the application when the test begins.

Tap the Tools button () and select **Netflix**. Select the duration of the Netflix test among the options on the list or define the duration yourself with the *User defined* option (with this option you need to insert the video ID and the track ID for the test).

Tap **Start** to start the manual Netflix test.


### 5.1.16 Manual Twitter testing

**NOTE**

Note that this functionality is available only if your Nemo Handy product option supports it.

First, make the Twitter page visible by going to **Settings | Page Settings | Twitter**. Select **Show Page** and tap the Back key of the device.

Select **Settings | Logins**. Turn Login Twitter **On**. A dialog box allowing you to log on to your Twitter account opens.

Tap the Tools button () and select **Twitter**. Select one of the options from the list (*Homepage loading/Profile loading/Following a Twitter feed/Text tweet/Photo tweet*)


### 5.1.17 Manual Instagram testing

**NOTE**

Note that this functionality is available only if your Nemo Handy product option supports it.

First, make the Instagram page visible by going to **Settings | Page Settings | Instagram**. Select **Show page** and tap the Back key of the device.

Select **Settings | Logins**. Turn Login Instagram **On**. A dialog box allowing you to log on to your Instagram account opens.

Tap the Tools button () and select **Instagram**. Tap **Get Self Feed** to load Instagram home feed.


### 5.1.18 Manual LinkedIn testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

First, make the LinkedIn page visible by going to **Settings | Page settings | LinkedIn**. Select **Show page** and tap the Back key of the device.

Select **Settings | Logins**. Turn Login LinkedIn **On**. A dialog box allowing you to log on to your LinkedIn account opens.


Tap the Tools button () and select **LinkedIn**. Tap a testing options from the list to begin testing.

### 5.1.19 Manual Dropbox testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Select **Settings | Logins**. Turn Login Dropbox **On**. A dialog box allowing you to log on to your Dropbox account opens.

Tap the Tools button () and select **Dropbox**. The Dropbox view with Download and Upload options opens.

In Download view you choose which file will be downloaded. Enter the file and path either by tapping **Browse** to select a file or by tapping the text field and typing the path and filename.

If tapping **Browse**, tap on a file from the list and tap **Select**.

*Recent* opens a view displaying recent transfers. Transferred files can be selected or deleted in this view.

*Clear* empties the File field.

In Upload view, enter the folder path by tapping on the text field and typing the path.

Define the file size in KB by tapping on the text field.


*Transfer timeout (Use default/Define)* defines the time in seconds for how long Nemo Handy waits during a transfer if there is a break in the data flow. If the transfer does not continue within the defined time, transfer will fail. The default value is 30 seconds.

Tap **Start** to begin the uploading process.

### 5.1.20 Manual Email testing

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Tap the Tools button () on the toolbar and select **Email**.

In the Test type field you can select whether to send email or to receive email.

#### 20.5.1.1 Send Email

*Test type* defines whether you want to test sending email or receiving it.

*User name* defines the user name of the email account. The form and length of the user name is email account server dependent.

*Password* defines the password of the email account.

When *Gmail* is tapped, Nemo Handy searches the device for previously configured email account settings and inserts the account information automatically.

*SMTP host* defines the SMTP host identification/code. SMTP is a protocol used for sending emails.

*SSL*, when selected, activates the SSL (Secure Socket Layer) encrypted link.

*Port* defines the port used for email testing.

*Attachment* defines whether an attachment is sent with the email. The options are *None* (no attachment is sent); *File* (a file browsed from the device is sent as an attachment); and *Generate* (Nemo Handy generates the attachment of user-definable size).

*From* defines the sending email address of the test email.

*To* defines the recipient email address of the test email.

*Subject* defines the content of the subject field of the test email.

*Message* defines the content text displayed in the text field of the test email.

*Send* sends the test email.

*Clear* clears all inserted data from the Email window.

### 20.5.1.2 Receiving Email

*User name* defines the user name of the email account. The form and length of the user name is email account server dependent.

*Password* defines the password of the email account.

*Receiving protocol* defines the receiving protocol, POP3 or IMAP. POP3 and IMAP protocols are used for receiving emails.

When *Gmail* is tapped, Nemo Handy searches the device for previously configured email account settings and inserts the account information automatically.

*POP3/IMAP host* defines the host for respective protocols.

*SSL*, when selected, activates the SSL (Secure Socket Layer) encrypted link.

*Port* defines the port used for email testing.

*Count* defines the number of latest received messages imported for the receive email testing.


*Receiving* initiates the email testing process.

*Clear* clears all inserted data from the Email window.

## 5.1.21 Manual scanning

### NOTE

Note that this functionality is available only in Broadcom-based terminals

Tap the Tools button () on the toolbar and select **Scanning**. After defining the settings, select **Start** to begin scanning.

To select scanning type, tap **Add New**. Scanning type dialog box opens.

Tap **Scanning type** to select among GERAN band scan, GERAN ARFCN scan, UTRAN band scan, and UTRAN UARFCN scan.

Tap **Band** to select band.

*Max reported cells* allows selecting from 10 to 80 maximum reported cells.


*Basic decoding* allows enabling or disabling the base station identity code.

When a new scan type has been added, tap **Start** to begin scanning. To discard added scan, tap the recycle bin icon. To edit scanning type, tap the wheel icon. To clear the list of added scans, tap **Clear all**.

To view scanning results, go to **Settings | Page Settings** to allow **UMTS Pilot Scan Results** page or **GSM Frequency Scan Results** page, depending on the selected type of scan.

## 5.1.22 Manual external application start

It is possible to launch an external application test manually in Nemo Handy.

Tap the Tools button (  ) on the toolbar and select **Start Application**. Select the application from the pulldown menu and select **Start** to start the application.

*Force stop application after test* forces the application to shut down when the test is over. It is recommended to select this option.

*Start* initiates the application test.


For more detailed instructions, see “Use Case: External application Speedtest as a script command”.

## 5.1.23 Manual mScore testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

mScore testing in Nemo Handy performs a test against the mScore server in *uplink* or *downlink*. The test takes a few seconds and measures the quality of data transfer. Selecting *Score* tests the selected the data traffic, i.e. a test server, sends a data traffic that simulates for example watching video online and calculates the internet connection a MOS score between 1-5. See Nemo File Format documentation for more detailed information on logged parameters.

Tap the **Tools** button (  ) on the toolbar and select **mScore**.

*Connection protocol* enables you to select HTTP or HTTPS.

Enter the server address and the server port number. Select the UID type, i.e. whether the unit IMEI is used, or the unique identifier is defined manually.

*Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt.

*Results max wait time (s)* defines the maximum time in seconds that Nemo Handy waits for the results.

By selecting *Enable pcap logging* you can to enable server side pcap logging.

Select test type (Shooter DL, Shooter UL, or score). If you select Score, select VoIP-VoLTE-VoWiFi, Video Streaming, TV Live, Web, or Network Downlink from the drop-down menu under *Select score test*.

Define the size of the test file and the maximum attempt duration (in seconds) of the test.

Tap **Start test**.

## 5.1.24 Manual Viber testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap “Tap here to fill entire screen” at the bottom of the screen.


**NOTE**

Note that you must have a Viber Messenger downloaded to your Nemo Handy device and a configured Viber account to perform Viber testing.

**NOTE**


Note that when testing Viber VoIP calls, during call connecting the device's display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Nemo Handy cannot detect when the call has been connected.

With Nemo Handy, you can perform chat message and VoIP call testing. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

Tap the **Tools** button () on the toolbar and select **Viber**.

Select the test type and enter contact number. When testing chat message sending, enter a message.

Tap **Recent** to access a list of previously used transfers. This way you can quickly define Viber testing connection settings and used in the transfer.

When testing chat message sending to a selected contact, tap **Send** to start the test. When testing making a VoIP call to a selected contact, tap **Call** to start the test. To hang up ongoing call, tap () and select ja **Hang Up VoIP call**.

### 5.1.25 Manual WhatsApp testing

**NOTE**

Note that this functionality is available only if your Nemo Handy license supports it.

**NOTE**

Note that you must have a WhatsApp Messenger downloaded to your Nemo Handy device and a configured WhatsApp Messenger account to perform BiP testing.

**NOTE**


Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap "Tap here to fill entire screen" at the bottom of the screen.

**NOTE**

Note that when testing Whatsapp VoIP calls, during call connecting the device's display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Nemo Handy cannot detect when the call has been connected.

With Nemo Handy, you can perform chat message, VoIP and video call testing. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

Tap the **Tools** button () on the toolbar and select **WhatsApp**.


When testing chat message sending to a selected contact, tap **Send** to start the test. When testing making a VoIP call to a selected contact, tap **Call** to start the test. To hang up ongoing call, tap () and select ja **Hang Up VoIP call**.

Select the test type and enter contact number.

*Message* (only with chat message) defines the content text.

*Add image* (only with chat message) allows you to add an image to the chat message.

Tap **Browse** to browse for an image in the device memory.

Tap **Recent** to access a list of previously used transfers. This way you can quickly define WhatsApp testing connection settings and used in the transfer.  
When testing chat message sending to a selected contact, tap **Send** to start the test. When testing making a VoIP call to a selected contact, tap **Call** to start the test. To hang up ongoing call, tap  and select ja **Hang up VoIP call**.

## 5.1.26 Manual BiP Messenger testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap “Tap here to fill entire screen” at the bottom of the screen.

### NOTE


Note that you must have a BiP Messenger downloaded to your Nemo Handy device and a configured BiP Messenger account to perform BiP testing.

### NOTE

Note that when testing BiP VoIP calls, during call connecting the device’s display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Nemo Handy cannot detect when the call has been connected.

With Nemo Handy, you can perform chat message, VoIP and video call testing. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

Tap the **Tools** button () on the toolbar and select **BiP Messenger**.


When testing chat message sending to a selected contact, tap **Send** to start the test. When testing making a VoIP call to a selected contact, tap **Call** to start the test. To hang up ongoing call, tap  and select ja **Hang Up VoIP call**.

Select the test type and enter contact number.

*Message* (only with chat message) defines the content text.

Tap **Browse** to browse for an image in the device memory.

Tap **Recent** to access a list of previously used transfers. This way you can quickly define BiP testing connection settings and used in the transfer.

When testing chat message sending to a selected contact, tap **Send** to start the test. When testing making a VoIP call to a selected contact, tap **Call** to start the test. To hang up ongoing call, tap  and select ja **Hang Up VoIP call**.

## 5.1.27 Notifications





Select **Settings | Display & Sound | Notifications** to access the Notifications page. Here you can activate/deactivate, edit existing, and create new notifications. See Chapter “Custom notifications” for more information on editing and creating new notifications.

There are three types of notifications: audio, icon, and popup. Audio notifications will play an audio file when triggered. Notifications with icons will appear as icons on the measurement route on a map and in line graphs. A popup message can be selected for both types of notifications. The popup appears briefly at the bottom of the screen. If you have a smartwatch or other

wearable with an Android operating system, you can select wearable to display notifications on your wearable device.

With the buttons at the top you can select/clear all icons, audio files, popups, and wearable. By tapping each parameter, you can select individual notifications.

Notification	Icon	Audio	Trigger
<user-defined description>		User-defined	User-defined
GPS Fix Lost		yes	
GPS Fix Acquired		yes	
GPS Disconnected		yes	
GPS Connected		yes	
Service received		yes	
Service lost		yes	
LAC Changed		yes	
Cell ID Changed, Channel Changed, System Changed, CDMA System Changed		yes	
Voice Call Attempt			
Voice Call Connected			
Voice Call Failed			
Voice Call Disconnected			
Voice Call Dropped			
C/I L		yes	C/I under 12
UL Power Up High		yes	Percentage of uplink power up commands over 60
TX Power High		yes	TX power over 14
BLER High		yes	Block error rate downlink over 5
DL Power Up High		yes	Percentage of downlink power up commands over 60
Best RSCP Low		yes	Active set received signal code power under -95
RX Quality Bad		yes	RX quality over 4
Best Ec/N0 Low		yes	Active set Ec/N0 under -15
RX Level Low		yes	RX level under -95
FTP Connection Attempt HTTP Connection Attempt			

Notification	Icon	Audio	Trigger
mScore Connection Attempt			
WhatsApp Connection Attempt			
Viber Connection Attempt			
BiP Connection Attempt			
FTP Connection Success			
HTTP Connection Success			
mScore Connection Success			
WhatsApp Connection Success			
Viber Connection Success			
BiP Connection Success			
FTP Connection Failed			
HTTP Connection Failed			
mScore Connection Failed			
WhatsApp Connection Failed			
Viber Connection Failed			
BiP Connection Failed			
FTP Connection Disconnected			
HTTP Connection Disconnected			
mScore Connection Disconnected			
WhatsApp Connection Disconnected			
Viber Connection Disconnected			
BiP Connection Disconnected			
FTP Connection Dropped			
HTTP Connection Dropped			
mScore Connection Dropped			
WhatsApp Connection Dropped			
Viber Connection Dropped			
BiP Connection Dropped			
FTP Transfer Attempt			
HTTP Transfer Attempt			
mScore Transfer Attempt			
WhatsApp Transfer Attempt			
Viber Transfer Attempt			
BiP Transfer Attempt			
FTP Transfer Success			
HTTP Transfer Success			
mScore Transfer Success			
WhatsApp Transfer Success			
Viber Transfer Success			
BiP Transfer Success			
FTP Transfer Failed			
HTTP Transfer Failed			
mScore Transfer Failed			
WhatsApp Transfer Failed			
Viber Transfer Failed			
BiP Transfer Failed			

## 5.2 Scripted application testing

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

It is possible to use script files to run measurements with Nemo Handy. When a script is used, Nemo Handy makes voice calls and data transfers automatically. Scripts can be created and edited with Nemo Handy's integrated Script Editor functionality (see Chapter "Creating scripts"). Script files can be stored on the internal memory (*sdcard/Nemo/Handy/Script*) or an external memory card (this function is disabled in Android version 4.4 and later).

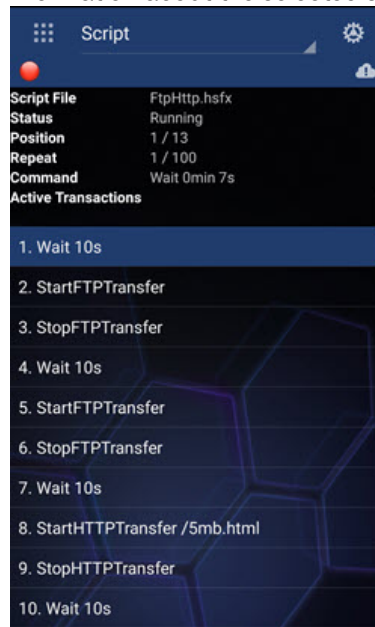
### NOTE

Please use only the folder specified above for storing scripts.

First define your access point. Please follow the terminal manual for further instructions.

To open a script in Nemo Handy, tap the Script button (📄) on the toolbar. If there are no scripts created yet, tap the **New Script** button (📄). Add script commands by tapping **Add** at the bottom right corner of the touchpad. For more information, see Chapter "Creating scripts"). Next, select a script file from the list of available scripts and tap **Load & Run**. The selected script is loaded and started. If the Autologging option is selected, Nemo Handy will start logging when the script is started.

A new Script view appears with information about the selected script.



If you did not start the script directly when it was loaded, that is, selected **Load** instead of **Load & Run**, the loaded script appears under *Current script*. Tap the script name and select **Start** from the dialog box that opens, or tap (📄) on the toolbar to start the script. Nemo Handy starts making the calls/data transfers as defined in the script file. The Script view displays the script status.

The script will finish automatically but to interrupt the script, tap (📄) on the toolbar and select **Yes** in the dialog box prompting whether scripting should be stopped. If the Autologging option is activated, Nemo Handy will stop logging and save the file.

You can follow the script by scrolling down all the way to the end of the script view. The script history view displays the progress of the script from beginning to end.



## 5.2.28 Creating scripts

You can create scripts with Nemo Handy's integrated Script Editor.



### 28.5.2.1 Defining access point

First, define your access point. If you do not select the access point, Nemo Handy will use the default access point. To change access point name, select **Change APN** from the list. Please follow the terminal manual for further instructions on configuring the mobile data connections. To avoid WLAN connections during measurements, user should disable WLAN connections before making measurements.

### 28.5.2.2 Creating scripts

Tap the Script button () on the toolbar. If there are no scripts created yet, tap the **New Script** button (). An empty script is created and opened in the Script Editor main view. Add script commands by tapping **Add** on the toolbar. When you select a command from the Add menu, a page with settings specific to the selected command is opened. Those pages are described in the following chapters.

You can edit the command by double-tapping the active command. You can move, edit, delete and add commands with the buttons at the bottom of the page. Nemo Handy will ask confirmation for deleting the command, tap **Yes** to delete the command. Tap and hold on one of the commands to enter a multi-selection mode, where you can copy and paste a block of commands with the corresponding buttons. The commands will be pasted at the end of the script, and you can relocate them with up and down buttons. Unselect all commands or tap the Back button to disable selecting commands.


Save a script by tapping the **Save** button () on the toolbar, enter filename and tap **OK**. Tap the **Menu** button () at the top right corner of the touchpad and select **Script options** to define *repeats, duration and max duration*.

### 28.5.2.3 Parallel scripting of data transaction

Nemo Handy supports parallel scripting of data transactions. This can be used to simulate real world user scenarios with multiple active data transactions of different type, such as, simultaneous uplink and downlink data transfers. Another application is the maximum throughput testing. To rule out possible effects of the test server, data can be downloaded simultaneously from multiple servers. To perform parallel data transfers in the script, add multiple transactions, such as FTP transfers, into the script. Interleave the start and end lines of the transactions so that the start lines of the transactions appear consecutively in the script transaction list and after that the end lines, respectively.

### 28.5.2.4 Starting a script

To start a script from the script list, select the script and tap **Load & Run** from the dialog box that opens.

To start a script later, select the script and tap **Load** from the dialog box that opens. The Start Logging button () is now visible on the toolbar. Tap the button to open a dialog where you can start the script immediately or start the script later. If you select to start the script later, define the script start time in the opening dialog. After this, the device displays a dialog in which you can cancel the operation while waiting for the script to start.

You can also search for a specific script from the list by filtering. Tap the **Filter** text field and type in the desired filter(s). Tap **Done** to activate the filter.



To create a script that is repeated, select a script from the list, tap **Edit**, and tap on **Repeats**.

Define how many times the script is repeated. In addition, you can set a maximum duration for the script. To define a minimum duration for the script, select the **Duration** option and enter the duration in minutes.

System lock allows locking a script to a specific system. To select system lock, tap **System**.

Select the **Max duration** option and define how many minutes the script will be run. The script will be stopped either after the script has been repeated the defined number of times or the maximum duration is reached. Tap **Save**.

### 28.5.2.5 Verifying and saving a script

Before saving a script, it is advised that the script is verified, that is, Nemo Handy will check that the script is valid and the script commands are in the correct order. Tap the Verify button () on the toolbar. If the script is valid, a *Verified* message is displayed. If there are errors in the script, Nemo Handy will tell you where the problem is. Tap the Save () button to save a script. To save the script, select **Menu | Save As**. Enter a name for the script file and tap **OK**.

## 5.2.29 Scripted voice calls

### NOTE

If you wish to perform scripts with both VoLTE and CSFB calls, you can manually turn on/off the VoLTE capability by tapping the **Tools** button on the toolbar and selecting **Disable/Enable IMS**. This feature is currently only available with Android devices that have IMS.

To add a script command for voice call, select **Add | Voice call** in the Script Editor main view.

*Phone number* defines the recipient phone number.

*Random duration* enables randomizing the call duration of the call(s). When *Random duration* is selected, every time this script is run a new value for call duration is randomized.

*Call duration* defines the duration (in seconds) of the call, unless used with Call End Condition (see below).

*Attempt timeout* defines the maximum duration (in seconds) of the call attempt.

*Call end condition* defines an end condition for the call based on the active system (*Until system is GSM/UMTS/LTE*), that is, the call is terminated when a specific system becomes active.

### NOTE

If a call end condition is defined, call duration countdown will begin only after the call end condition terminates the call. Thus it is recommended that also call duration is defined. This is to ensure that the events after the handover are logged as well.

### NOTE

Call end conditions are supported with voice calls only.

*Proceed to next command (after call is completed/immediately)*: When *after call is completed* is selected, Nemo Handy waits for the voice call to end before moving to next command. When *immediately* is selected, Nemo Handy moves to next command while the voice call is still active. *Voice quality mode* defines the voice quality mode. Always use the same mode between mobile originating and mobile terminating device.

When *On: caller initiated (default)* is selected, the Caller (Mobile Originating device) first sends an audio sample to uplink and the Callee (Mobile Terminating device) waits for sync tone, records sample and then sends its own sync and sample to uplink. This is the default mode except with CDMA calls.

When *On: callee initiated* is selected, Caller (Mobile Originating device) begins listening to the line and when it detects sync tone, it will capture the sample and send its own sample to uplink. This is useful for example in CDMA networks where MO device does not receive information on

when MT device has answered the call and call is truly connected. Select this option with CDMA calls.

*Sample file (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines the voice sample file used in the voice quality testing. There are two types of samples: wideband and narrowband. If the sample filename has a wb postfix, the sample is wideband. Otherwise it is narrowband.

*MOS threshold (visible when Caller initiates voice quality/Caller responds voice quality is selected)* can be used to limit the number of samples saved to the measurement file. For example, only samples with a MOS score below 3 are saved.

*Uplink volume (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines the uplink volume level. When selecting Default, the default volume level is used. Selecting Define enables the user to set the volume level.

*POLQA Version (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines which POLQA version is used (POLQA 1.1/POLQA 2.4).

Scripted video call testing is also supported with terminals that support video calls. The process for video call testing is similar to voice call testing.

### 5.2.30 Scripted video calls

To add a script command for video call, select **Add | Video call** in the Script Editor main view.

*Phone number* defines the recipient phone number.

*Random duration* enables randomizing the call duration of the call(s). When *Random duration* is selected, every time this script is run a new value for call duration is randomized.

*Call duration* defines the duration (in seconds) of the call, unless used with Call End Condition (see below).

*Attempt timeout* defines the maximum duration (in seconds) of the call attempt.

*Call end condition* defines an end condition for the call based on the active system (*Until system is GSM/UMTS/LTE*), that is, the call is terminated when a specific system becomes active.

#### NOTE

If a call end condition is defined, call duration countdown will begin only after the call end condition terminates the call. Thus it is recommended that also call duration is defined. This is to ensure that the events after the handover are logged as well.

#### NOTE

Call end conditions are supported with voice calls only.

*Proceed to next command (after call is completed/immediately)*: When *after call is completed* is selected, Nemo Handy waits for the voice call to end before moving to next command. When *immediately* is selected, Nemo Handy moves to next command while the voice call is still active. *Voice quality mode* defines the voice quality mode. Always use the same mode between mobile originating and mobile terminating device.

When *On: caller initiated (default)* is selected, the Caller (Mobile Originating device) first sends an audio sample to uplink and the Callee (Mobile Terminating device) waits for sync tone, records sample and then sends its own sync and sample to uplink. This is the default mode except with CDMA calls.

When *On: callee initiated* is selected, Caller (Mobile Originating device) begins listening to the line and when it detects sync tone, it will capture the sample and send its own sample to uplink. This is useful for example in CDMA networks where MO device does not receive information on when MT device has answered the call and call is truly connected. Select this option with CDMA calls.

*Sample file (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines the voice sample file used in the voice quality testing. There are two types of samples: wideband and narrowband. If the sample filename has a wb postfix, the sample is wideband. Otherwise it is narrowband.

*MOS threshold (visible when Caller initiates voice quality/Caller responds voice quality is selected)* can be used to limit the number of samples saved to the measurement file. For example, only samples with a MOS score below 3 are saved.

*Uplink volume (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines the uplink volume level. When selecting Default, the default volume level is used. Selecting Define enables the user to set the volume level.

*POLQA Version (visible when Caller initiates voice quality/Caller responds voice quality is selected)* defines which POLQA version is used (POLQA 1.1/POLQA 2.4).

### 5.2.31 Scripted call answer

*Timeout* defines the maximum time in seconds that Nemo Handy waits for an incoming call before moving to next script command.

*Max duration (seconds)* defines the maximum duration of the call (in seconds) before Nemo Handy ends the call. With the default value 0 Nemo Handy does not restrict the duration of the call but waits for the counterparty to end the call.

*Server duration (seconds)* defines the length of a call made by the server.

*Answer delay (milliseconds)* defines the delay in milliseconds before answering an incoming call.

*Proceed to next command (after call is completed/immediately)*: When *after call is completed* is selected, Nemo Handy waits for the voice call to end before moving to the next command. When *immediately* is selected, Nemo Handy moves to the next command while the voice call is still active.

*Voice quality mode* defines the voice quality mode.

When *On: caller initiated (default)* is selected, the Caller (Mobile Originating device) first sends an audio sample to uplink and the Callee (Mobile Terminating device) waits for sync tone, records sample and then sends its own sync and sample to uplink.

When *On: callee initiated* is selected, Caller (Mobile Originating device) begins listening to the line and when it detects sync tone, it will capture the sample and send its own sample to uplink. This is useful for example in CDMA networks where MO device does not receive information on when MT device has answered the call and call is truly connected.

*Sample file* defines the voice sample file used in the voice quality testing. There are two types of samples: wideband and narrowband. If the sample filename has a wb postfix, the sample is wideband. Otherwise it is narrowband.

*MOS threshold* can be used to limit the number of samples saved to the measurement file. For example, only samples with a MOS score below 3 are saved.

*Uplink volume* default value varies depending on the device in use.

*POLQA Version (visible when On: caller initiated/On: callee initiated is selected)* defines which POLQA version is used (POLQA 1.1/POLQA 2.4).

### 5.2.32 Scripted FTP transfer

Add a script command for FTP transfer by selecting **Add | FTP transfer** in the Script Editor main view.

*Host* defines the FTP host address.

*Username* defines the host site logon user name.

*Password* defines the host site logon password.

*Port* defines the host port.

*Passive mode* option defines whether passive mode is used or not.

Browse allows browsing through and selecting files to be downloaded once the server address has been set.

*File* (with Download only) defines the file name of the downloaded file.

*Path* (with Upload only) defines the destination folder for the transferred package.

*Size* (with Upload only) defines the size of the uploaded package in kilobytes.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.

*Transfer timeout (Use default/Define)* defines the time in seconds for how long Nemo Handy waits during a transfer if there is a break in the data flow. If the transfer does not continue within the defined time, transfer will fail. The default value is 30 seconds.

*Max duration (seconds)* defines the maximum duration of the FTP transfer.

*Threads* defines how many threads Nemo Handy transfers data with simultaneously (1-20). For example, with one thread Nemo Handy creates one FTP session and with five threads it creates five sessions.

Tap **Recent** to access a list of previously used FTP transfers. This way you can quickly define FTP connection settings and the file used in the transfer.

If there are no previously used transfer settings, tap **Select host**. On the Select FTP connection page, select one of the predefined connections and tap **Select**. To create a new connection, see Chapter "Creating New FTP Connections".

With scripted FTP transfers you can select the mode for stopping the transfer. The options are *Stop when completed* and *Force stop*. To define the stop mode, add the command for FTP transfer to the script and tap **StopFTPTransfer** to open the Stop FTP Transfer dialog box. Select the stop style from the pulldown menu and tap **Save**.

The forced stop is useful with scripts that loop data transfers for a fixed amount of time, or when the data transfer needs to be ended when a call is disconnected.

### 5.2.33 Scripted SFTP transfer

*Host* defines the SFTP host address.

*Username* defines the host site logon user name

*Password* defines the host site logon password.

*Port* defines the host port.

Browse allows browsing through and selecting files to be downloaded once the server address has been set.

*File* (with Download only) defines the file name of the downloaded file.

*Path* (with Upload only) defines the destination folder for the transferred package.

*Size* (with Upload only) defines the size of the uploaded package in kilobytes.

*Transfer timeout (Use default/Define)* defines the time in seconds for how long Nemo Handy waits during a transfer if there is a break in the data flow. If the transfer does not continue within the defined time, transfer will fail. The default value is 30 seconds.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.

*Max duration (seconds)* defines the maximum duration of the SFTP transfer.

Tap **Select recent transfer** to access a list of previously used SFTP transfers. This way you can quickly define SFTP connection settings and the file used in the transfer.

With scripted SFTP transfers you can select the mode for stopping the transfer. The options are *Stop when completed* and *Force stop*. To define the stop mode, add the command for SFTP transfer to the script and tap **StopSFTPTransfer** to open the Stop SFTP Transfer dialog box. Select the stop style from the pulldown menu and tap **Save**. The forced stop is useful with scripts that loop data transfers for a fixed amount of time, or when the data transfer needs to be ended when a call is disconnected.

## 5.2.34 Scripted HTTP transfer

To add a script command for HTTP transfer, select **Add | HTTP transfer** in the Script Editor main view.

*URL* defines the file that will be downloaded. In upload, only path is defined. You can also specify alternative port number, for example [www.server.com:1234/path/file](http://www.server.com:1234/path/file), in the URL field.

*Attempt timeout* defines the maximum duration (in seconds) of the transfer attempt.

*Max duration (seconds)* defines the maximum duration of the HTTP transfer.

*Threads* enables you to define the number of threads (value can be 1-20) for the HTTP transfer. For example, if a 10 MB file is transferred with the thread value set to 3, 30 MB is actually transferred.

*Download/Upload* defines the direction of transfer.

Select the *Download dynamic data from Nemo Server* option to download automatically generated test data from Nemo Server.

*Size (with uplink only)* defines the size of the uploaded package in kilobytes

*Http PUT (Uplink selected)* defines that HTTP PUT is used as the file upload method instead of HTTP POST (default).

When multiple threads are used in HTTP download, you can disable multipart transfer by selecting *Disable multipart transfer*. When this option selected, the file is transferred x times (i.e. the amount defined in *Threads*) instead of being split into smaller fragments.

Tap **Recent** to access a list of previously used HTTP transfers. This way you can quickly define HTTP connection settings and the file used in the transfer. If there are no previously used transfer settings, tap **Select host**. Select **HTTPS** or **HTTPS**. On the Select HTTP/S connection page, select one of the predefined HTTP/S connections and tap **Select**. To create a new connection, tap **Create New**.

With scripted HTTP(S) transfers you can select the mode for stopping the transfer. The options are *Stop when completed* and *Force stop*. To define the stop mode, add the command for HTTP(S) transfer to the script and tap **StopHTTPTransfer** to open the Stop HTTP Transfer dialog box. Select the stop style from the pulldown menu and tap **Save**.

The forced stop is useful with scripts that loop data transfers for a fixed amount of time, or when the data transfer needs to be ended when a call is disconnected.

## 5.2.35 Scripted HTML browsing

### NOTE

Note that you need to install the Nemo Browser installation package (available in KSM) separately to your Nemo Handy device to perform HTML browsing testing.

To obtain correct results, you should only perform HTML browsing testing on static web pages, such as

<https://portal.etsi.org/TBSiteMap/STQ/HTLMReferenceWebPage.aspx>

### NOTE

If you test dynamic web pages, DCOMP event parameters (service access time, IP termination time, TCP handshake time, payload access time, processing delay or connection processing delay) might be missing or incorrect.

To add a script command for HTML browsing, select **Add | HTML browsing** in the Script Editor main view.

*URL* defines the URL of the page that will be browsed.

*Attempted timeout (s)* defines the time of the attempt before timeout in seconds.

*Max. duration (s)* defines the maximum duration of the transfer in seconds. Once the maximum duration is met, Nemo Handy stops the transfer and proceeds to the next script command. Tap *Choose previously loaded URL* to select a URL that has been used before.

### 5.2.36 Scripted ICMP Ping

To add a script command for ICMP ping, select **Add | ICMP ping** in the Script Editor main view. *Host* defines the ping host address. *Repeats* defines how many times the ping is repeated. *Packet size* defines the size of the ping package in bytes. *Interval* defines the interval in seconds between ping repeats. *Timeout* defines the maximum duration (in seconds) of the PING attempt.

### 5.2.37 Scripted SMS sending

To add a script command for Send SMS, select **Add | Send SMS** in the Script Editor main view. *Destination* defines the receiving phone number. *Service center* defines the service center address. *Attempt timeout* defines the maximum duration (in seconds) of the SMS send attempt. Select the *End-to-end testing* option to test end-to-end delivery time. Both terminals must use GPS time (see Chapter “GPS settings”). In the *Message* field you can type the test message to be sent.

### 5.2.38 Scripted SMS receiving

To add a script command for Receive SMS, select **Add | Receive SMS** in the Script Editor main view. Tap *Recent* to view a list of recently received SMS messages. *Attempt timeout* defines the maximum duration (in seconds) of the SMS receive attempt. Enter the sender phone number by tapping the *Sender number* field. Alternatively, you can select an existing contact from the address book by tapping the phone book icon. Tap **Save**.

### 5.2.39 Scripted MMS send

#### NOTE

Note that to be able to perform MMS testing, the MMS testing features must be turned on in General settings.

#### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it. Note that Android version 4.4 or later is required for performing MMS tests.

To add a script command for Send MMS, select **Add | Send MMS** in the Script Editor main view. *Select MMS file* defines the MMS file that will be sent. *Compose* allows composing the message. Enter phone number and subject, write a message and add an attachment. To discard message tap **Discard**. *Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt. *Transfer timeout (s)* defines the maximum duration (in seconds) of the transfer attempt.

## 5.2.40 Scripted E-mail testing

To add email testing to the script, tap **Add** and select **E-mail** from the popup menu. The E-mail view opens.

In the *Test type* field, select whether to send email or receive email.

### 40.5.2.1 Send E-mail

*User name* defines the user name of the email account. The form and length of the user name is email account server dependent.

*Password* defines the password of the email account.

*SMTP host* defines the SMTP host identification/code. SMTP is a protocol used for sending emails.

*SSL*, when selected, activates the SSL (Secure Socket Layer) encrypted link.

*Port* defines the port used for email testing.

*Attachment* defines whether an attachment is sent with the email. The options are *None* (no attachment is sent); *File* (a file browsed from the device is sent as an attachment) and *Generate* (Nemo Handy generates the attachment of user-definable size).

*From* defines the sending email address of the test email.

*To* defines the recipient email address of the test email.

*Subject* defines the content of the subject field of the test email.

*Message* defines the content text displayed in the text field of the test email.

When *Gmail* is tapped, Nemo Handy searches the device for previously configured email account settings and inserts the account information automatically.

Tap **Save** to save the script.

*Cancel* empties the script.

### 40.5.2.2 Receive E-mail

*User name* defines the user name of the email account. The form and length of the user name is email account server dependent.

*Password* defines the password of the email account.

*Receiving protocol* defines the receiving protocol, POP3 or IMAP. POP3 and IMAP protocols are used for receiving email.

*POP3/IMAP host* defines the host for respective protocols.

*SSL*, when selected, activates the SSL (Secure Socket Layer) encrypted link.

*Port* defines the port used for email testing.

*Count* defines the number of latest received messages imported for the receive email testing.

*Receiving* initiates the email testing process.

*Clear* clears all inserted data from the E-mail window.

When *Gmail* is tapped, Nemo Handy searches the device for previously configured email account settings and inserts the account information automatically.

## 5.2.41 Scripted IPerf TCP/UDP

To add a script command for using IPerf TCP or IPerf UDP, select **Add | IPerf TCP transfer/IPerf UDP transfer** in the Script Editor main view.

*Server* is the IP address used in Nemo Server.

*Server port* refers to the port used by Nemo Server. For TCP and UDP protocols, the default port is 5001.

*Duration* defines the length of the data transfer in seconds.

*Data size* defines the length of the total data transfer in kilobytes; that is, the transfer finishes when the defined amount of data has been transferred.

Define whether you are sending (**Upload**) or receiving (**Download**) data or both.

*TCP window size (KB)* defines the size of the receive window during TCP/IP transmission. If it is too small, it can decrease the maximum data throughput, and if it is too high it can increase the retransmission round-trip time (RTT). To be able to avoid decrease of data throughput, the window size should be at least the maximum throughput multiplied by RTT. For example, with HSDPA with category 8 the maximum throughput is about 7.3 Mbit/s and RTT is about 100 ms. To avoid reduction of the throughput the TCP window size should be set at least to  $7.3 \text{ Mbit/s} * 0.1 \text{ s} = 730 \text{ kbit} = 91.25 \text{ kB}$ .

*UDP datagram size* defines the size of the UDP packet in bytes. It should be smaller than the maximum packet size of the lower layers to be able to avoid packet fragmentation in the lower layers. Packet fragmentation has a huge negative impact to the achieved data throughput and it should be avoided. On the other hand, if too small UDP packet size is used the portion of the UDP and IP header increases which decreases the amount of transmitted user data with the result of smaller data throughput. Normally good maximum value for UDP datagram is a little bit less than maximum Ethernet packet size which is 1,500 bytes. A good default value for the UDP datagram size is 1,460 bytes.

*UDP bandwidth (kbps)* defines how much data is attempted to be transmitted. Since UDP does not guarantee successful data transmission, it is not limited by maximum throughput of the lower layers. If higher bandwidth is used, the packet error rate (PER) increases. For example, if lower layers are capable of transmitting 100kbit/s and UDP bandwidth is configured to 400kbit/s, there should be a 75% packet error rate (only every fourth packet has been transmitted successfully). Naturally UDP bandwidth should not be configured too small since it limits the maximum throughput, which is not usually desired.

*Attempt timeout* defines the time in seconds for how long Nemo Handy waits for the connection to be established. If a connection is not established within the defined time, connection attempt will fail.

## 5.2.42 Scripted IPerf 3 TCP/UDP

To add a script command for using IPerf 3 TCP or IPerf UDP, select **Add | IPerf 3 TCP transfer/IPerf 3 UDP transfer** in the Script Editor main view.

*Server* is the IP address used in Nemo Server.

*Server port* refers to the port used by Nemo Server. For TCP and UDP protocols, the default port is 5001.

*Duration* defines the length of the data transfer in seconds.

*Data size* defines the length of the total data transfer in kilobytes; that is, the transfer finishes when the defined amount of data has been transferred.

Define whether you are sending (**Upload**) or receiving (**Download**) data or both.

*TCP window size (KB)* defines the size of the receive window during TCP/IP transmission. If it is too small, it can decrease the maximum data throughput, and if it is too high it can increase the retransmission round-trip time (RTT). To be able to avoid decrease of data throughput, the window size should be at least the maximum throughput multiplied by RTT. For example, with HSDPA with category 8 the maximum throughput is about 7.3 Mbit/s and RTT is about 100 ms. To avoid reduction of the throughput the TCP window size should be set at least to  $7.3 \text{ Mbit/s} * 0.1 \text{ s} = 730 \text{ kbit} = 91.25 \text{ kB}$ . Note that when TCP Window size is not defined, IPerf 3 uses the default socket buffer size of the operating system.

*UDP datagram size* defines the size of the UDP packet in bytes. It should be smaller than the maximum packet size of the lower layers to be able to avoid packet fragmentation in the lower layers. Packet fragmentation has a huge negative impact to the achieved data throughput and it should be avoided. On the other hand, if too small UDP packet size is used the portion of the UDP and IP header increases which decreases the amount of transmitted user data with the result of smaller data throughput. Normally good maximum value for UDP datagram is a little bit

less than maximum Ethernet packet size which is 1,500 bytes. A good default value for the UDP datagram size is 1,460 bytes.

*UDP bandwidth (kbps)* defines how much data is attempted to be transmitted. Since UDP does not guarantee successful data transmission, it is not limited by maximum throughput of the lower layers. If higher bandwidth is used, the packet error rate (PER) increases. For example, if lower layers are capable of transmitting 100kbit/s and UDP bandwidth is configured to 400kbit/s, there should be a 75% packet error rate (only every fourth packet has been transmitted successfully). Naturally UDP bandwidth should not be configured too small since it limits the maximum throughput, which is not usually desired.

*Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt.

*Transfer timeout (s)* defines the maximum duration (in seconds) of the transfer attempt.

*Parallel streams* defines the amount of parallel data transfers there are in the script.

*Buffer length:*

-*When using UDP:* Defines the socket buffer length. When not defined, the default socket buffer length of the operating system is used.

-*When using TCP:* Defines the buffer length written or read to and from the stream.

*Tunnel address* defines the local address and network interface used by IPerf 3 binary. When not defined, tunnel address is assigned automatically by the operating system.

*Listen port* defines the local port that IPerf 3 binary uses. When not defined, is assigned by the operating system automatically.

### 5.2.43 Scripted Netflix testing

#### NOTE

This feature requires the older Netflix version 4.16.1.

#### NOTE

In order to be able to test the Netflix application, you need an active Netflix account.

Before you can perform Netflix testing, you need to log in to Netflix separately before you launch the Nemo Handy application. After you have logged in to Netflix, close the Netflix application.

Nemo Handy will launch the application when the test begins.

You can add Netflix testing as a part of a script. To add a script command for Netflix testing, select **Add | Netflix** in the Script Editor main view.

Select the duration of the Netflix test among the options on list, or define the duration yourself with the *User defined* option (with this option you need to insert the video ID, the track ID, the duration of the video in seconds, and the timeout for the test attempt in seconds for the test. Once you have made your selection, tap **Save**, and the Netflix testing is added to the script.

#### NOTE

Do not exit from the Netflix application before the video has been run.

#### NOTE

For Netflix testing, turn off the screen lock of your Nemo Handy device from the device settings.

### 5.2.44 Scripted YouTube testing

With Nemo Handy you can stream videos from YouTube.

To add a script command for streaming videos from YouTube, select **Add | YouTube** in the Script Editor main view.

*URL* defines the link to the YouTube video.

*YouTube ID* defines the ID of the selected video.

*Video duration* defines for how long (in seconds) the video is streamed.

*Attempt timeout* defines the time in seconds for how long Nemo Handy waits for the connection to be established. If a connection is not established within the defined time, connection attempt will fail.

Tap **Search** to search for a video from YouTube. Select from the following options: search video, most popular, latest, or most viewed. Select a video from the list and tap the still image to add it to the script. When you run the script, the video will play for the defined duration.

*Opticom PEVQ-S* enables the selection of an Opticom PEVQ-S preloaded video for video quality testing. Select **Opticom PEVQ-S**, tap the text field next to it and tap on a video from the pull-down menu to add it to the script. When you run the script, the video will play for the defined duration.

## 5.2.45 Scripted Facebook testing

In order to be able to test the Facebook application, you will need to set up a Facebook page and create a Facebook app. See “Create a Facebook application and a Facebook page” for more information.

*Test type* defines whether you want to get wall feed, post status update, or to post a photo, a generated photo, or a video.

*Number of items* allows you to enter the number of shown items.

*Time range* allows you to define the time frame from which the results are retrieved, e.g. messages from the last five days.

*Attempt timeout* defines the maximum duration (in seconds) of the attempt.

Please note that image and video files you wish to upload to Facebook must be in your Nemo Handy device’s local memory.

## 5.2.46 Scripted Twitter testing

*Test type* defines whether you are testing homepage loading, profile loading, following a Twitter feed, text tweet, or photo tweet.

*Number of items* allows you to enter the number of shown items.

*Attempt timeout* defines the maximum duration (in seconds) of the attempt.

## 5.2.47 Scripted Instagram testing

*Test type* defines the test type.

*Number of items* allows you to enter the number of shown items.

*Attempt timeout* defines the maximum duration (in seconds) of the attempt.

## 5.2.48 Scripted LinkedIn testing

*Test type* defines whether you are testing profile loading by public URL, share text and URL, or loading my info.

*Attempt timeout* defines the maximum duration (in seconds) of the attempt.

## 5.2.49 Scripted Dropbox testing

Select **Uplink** or **Downlink**.

In the Download view, browse for the folder path by tapping **Browse**.

*Transfer timeout (s)* defines the maximum duration (in seconds) of the transfer attempt.

In the Upload view, insert the folder path by tapping on the text field and typing the path.

*Size (KB)* defines the size of the file.

*Select recent transfer* enables you to choose a file from a list of recently transferred files.

In the Downlink view you choose which file will be downloaded. Insert the file and path either by tapping **Browse** to select a file from a list, or by tapping the text field and typing the path and filename.

*Attempt timeout (s)* defines the maximum duration (in seconds) of the attempt.

*Select recent transfer* enables you to choose a file from a list of recently transferred files.

## 5.2.50 Scripted scanning

### NOTE

Note that this functionality is available only in Broadcom-based terminals.

To select scanning type, tap **Add new**. The Scanning type dialog box opens.

Tap **Scanning type** to select among GERAN band scan, GERAN ARFCN scan, UTRAN band scan, and UTRAN UARFCN scan.

Tap **Band** to select band.

*Max reported cells* allows selecting from 10 to 80 maximum reported cells.

*Bsic decoding* allows enabling or disabling the base station identity code.

When a new scan type has been added, tap **Save** to save scan type. To discard an added scan, tap the recycle bin icon. To edit scanning type, tap the wheel icon. To clear the list of added scans, tap **Clear all**.

To view scanning results, go to **Settings | Page settings** to allow **UMTS Pilot Scan Results** page or **GSM Frequency Scan Results** page, depending on the selected scan type.

## 5.2.51 Wait

To add a wait period in the script, click **Add** and select **Wait** from the popup menu. The Wait Properties view opens.

*Time synchronization point (seconds)*, when selected, enables accurate time synchronization on both A- and B-sides with multiple devices. This option should be used when a certain command must be executed exactly after an elapsed time (t=0) with more than one device. Each time the script runs into a time synchronization point, it checks the elapsed time from the previous time synchronization point and waits until the wait time condition is met. This way the script engine keeps the original reference time point of (t=0) regardless of script iteration in order to prevent time from drifting. For example, the end-to-end voice call script commands below are repeated three times:

1. Make call (duration=30 sec)
2. End call
3. Wait (time synchronization point 60 sec)
4. Receive call (timeout=45 sec)
5. Wait (time synchronization point 90 sec)

Round #1:

Time synchronization point #1: Check if (60) secs have been elapsed since (t=0)

Time synchronization point #2: Check if (60+90) secs have been elapsed since (t=0)

Round #2:

Time synchronization point #1: Check if (60+90+60) secs have been elapsed since (t=0)

Time synchronization point #2: Check if (60+90+60+90) secs have been elapsed since (t=0)

Round #3:

Time synchronization point #1: Check if (60+90+60+90+60) secs have been elapsed since (t=0)

Time synchronization point #2: Check if (60+90+60+90+60+90) secs have been elapsed since (t=0)

*Random wait time* enables randomizing the wait duration. If *Random wait time* is selected, every time this script is run a new value for wait time is randomized.

*Wait time (s)* defines the wait period in seconds.

*But at most value* is the maximum wait time in seconds if the defined notification does not appear.

*Wait Condition* defines a wait condition based on the active system (Until system is GSM/Until system is UMTS/Until system is LTE/Custom condition), i.e. the wait period continues until a specific system becomes active. Select *Custom condition* to use more than one condition by using AND / OR command. For instance, you could wait until the terminal is alerting and trigger the next script command from that call state.

#### NOTE

Note: If both Wait Condition and Wait (s) are defined, the Wait (s) countdown will begin only after the Wait Condition is met.

*Wait from* enables you to select one of the following options:

*Current time* enables you to define a pause between items in the script. For example, you can set a 10 second pause after a voice call is finished and before the next call starts.

The options *Call Attempt*, *Video Call Attempt*, and *Context Activation Attempt* enable you to define a wait period after the selected event notification. For example, you can make the script pause for 60 seconds after a call attempt event. This will prevent the script from continuing before the call attempt has completed.

#### NOTE

If a Wait Condition is defined, it is recommended that also a wait period (Wait) be defined. This is to ensure that logging starts only after handover has successfully occurred.

## 5.2.52 Loop

It is possible to repeat selected script commands within the script by placing those commands within a loop. To add a loop in the script, click **Add** and select **Loop** from the popup menu. The Loop dialog box opens.

*Loop time* defines the duration of the loop (in seconds). Select **Loop time** and set the value (minimum duration 1, maximum duration one week).

*Loop count* defines the number of loops executed. Select **Loop count** and set the value (minimum number of loops 1, maximum number of loops 1000000).

Place the commands you wish to loop between the *LoopStart* and *LoopStop* commands.

## 5.2.53 Airplane mode

Airplane mode can be switched on and off. When the script run is complete, the airplane mode returns to the state it was in before the script was started. Airplane mode can be used to check how the LTE detach and attach to the network is working.

Notice that the Bluetooth connection will also be turned off when this is enabled. This means that for instance the connection to the possible Bluetooth GPS will be disabled.

### 5.2.54 Band lock

To add a band lock to the script, tap **Add** and select **Band lock** from the popup menu. The Band lock view opens.

Tapping on the **Bands** field opens a list of bands. Select the band(s) and tap **Save**.

### 5.2.55 Channel lock

To add a channel lock to the script, tap **Add** and select **Channel lock** from the popup menu. The Channel lock view opens.

*ARFCN* allows you to define the GSM carrier and band where to lock the UE.

*UARFCN* allows you to define the WCDMA carrier and scrambling code where to lock the UE.

*LTE PCI* allows you to define the LTE carrier and physical cell identity (PCI) where to lock the UE.

### 5.2.56 Change APN

To change APN (Access Point Name) in Nemo Handy script, tap **Add** and select **Change APN** from the popup menu. The Change APN view opens.

Tap **Browse** to select the access point name from a list or tap the text field and type the APN name. Tap **Save**.

### 5.2.57 Textual user note (TNOTE)

To add a textual user note (TNOTE) in Nemo Handy script, tap **Add** and select **Textual marker** from the popup menu. The textual marker view opens.

Type text and tap **Save**.

### 5.2.58 AMR lock

To add an AMR lock to the script, tap **Add** and select **AMR lock** from the popup menu. The AMR lock view opens.

*Attempt timeout (s)* defines the maximum duration (in seconds) of the attempt.

Tapping on the *AMR codecs* field opens a list of AMR codecs. Select a codec and tap **Save**.

### 5.2.59 Scripted external application start

You can record the terminal onscreen touch activity to create recordings of touch command sequences. This allows you to control third-party applications from Nemo Handy and run them with scripts. At the same time all RF information is recorded to the measurement file. You must record the touch command sequences and add them to the script. Notice that the touch command sequence is different if you use different devices due to different screen resolution. Also, the touch event recording differs depending on whether you use the device in portrait or landscape mode.

It is possible to add a recording of an external application test as a script command. To add an external application start to the script, tap **Add** and select **Start application** from the popup menu. The Start application dialog box opens.

*Select application* allows you to select the application for the test. Please note that only applications installed by the user are displayed in the pulldown menu.

*Force stop application after testing* forces the application to shut down when the test is over. It is recommended to select this option.

*Record file* displays the file currently recorded.

*Start* initiates the selected application and the recording session.

Tap **Save** to save the script.

*Cancel* empties the script.

### 59.5.2.1 Use Case: External application Speedtest as a script command

This use case presents how to add an external application test as a script command to your Nemo Handy script. In this use case the external application to be used is Ookla Speedtest, but this can be done with other applications as well.

1. Ensure you have the application you wish to use installed in your Nemo Handy device.
2. Tap the Script button (📄) on the toolbar. Create a script or edit an existing one.
3. Tap **Add** and select **Start application**.
4. Tap the *Select application* field and select the application you wish to use.
5. Select the **Force stop application after testing** option. This needs to be selected to make the script repeatable.
6. Tap **Start**.
7. The application you selected and the recording of the external application session starts. In the application, tap on the functions you wish the application to execute.

#### NOTE

Tap the buttons inside the external application in a slow pace – Nemo Handy will remember your actions inside the external application but may need a moment to register your actions.

#### CAUTION

Do not change the speed unit inside the Speedtest application. The speed unit must be Mbps, otherwise Nemo Handy will report erroneous data.

8. With Ookla Speedtest you can import the results to Nemo Handy. With importing results, select **Export to CSV and Email**, and select **Handy** as the export destination.
9. Ookla Speedtest will inform you when the import is complete. After this, you need to tap two additional functions in the Ookla Speedtest for the statistics to be displayed correctly in Nemo Handy. Once you have executed everything in the external application, including the two additional taps, tap the Back button of the Nemo Handy device to return to Nemo Handy. The recording of the touch event session is stopped automatically at this point. You can select another application if you wish and tap **Start** to begin a new recording session.
10. Tap **Stop** to indicate that you are finished with the recording of the touch events. The record file name is displayed in the Record file text field. Tapping **Cancel** erases the actions you made after tapping Start in the Start application dialog box.
11. Tap **Save** in the Start application dialog box to save the script command.

#### NOTE

Note that it is recommended to add a Wait period to the script to avoid too tight recurrence.

12. The external application test is now saved as a script command in the script you created/selected, and you can define the recurrence of the script. Every time the script is run, the external application you selected opens and performs the same functions in the same order and within the same timeframe as you tapped them during the recording session.

## 5.2.60 Scripted mScore testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

mScore testing in Nemo Handy performs a test against the mScore server in *uplink* or *downlink*. The test takes a few seconds and measures the quality of data transfer. Selecting *Score* tests the selected the data traffic, i.e. a test server sends data traffic that simulates for example watching video online and calculates the internet connection a MOS score between 1-5. See Nemo File Format documentation for more detailed information on logged parameters.

You can run an mScore test as part of the script. To add a script command for running an mScore test, select **Add | mScore Test** in the Script Editor main view.

*Connection protocol* enables you to select HTTP or HTTPS.

Enter the server address and the server port number. Select whether UID type, i.e. whether the unit IMEI is used, or the unique identifier is defined manually.

*Connection timeout (s)* defines the maximum duration (in seconds) of the connection attempt.

*Results max wait time (s)* defines the maximum time in seconds that Nemo Handy waits for the results.

By selecting *Enable pcap logging* you can to enable server side pcap logging.

Select test type (Shooter DL, Shooter UL, or score). If you select *Score*, select VoIP-VoLTE-VoWiFi, Video Streaming, TV Live, Web, or Network Downlink from the drop-down menu under *Select score test*.

Define the size of the test file and the maximum attempt duration (in seconds) of the test.

Tap **Start test**.

## 5.2.61 Scripted Viber testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Note that you must have a Viber Messenger downloaded to your Nemo Handy device and a configured Viber account to perform Viber testing.

### NOTE

Note that when testing Viber VoIP calls, during call connecting the device's display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Handy cannot detect when the call has been connected.

### NOTE

Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap "Tap here to fill entire screen" at the bottom of the screen.

With Nemo Handy, you can perform chat message and VoIP call testing. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

You can run a Viber test as part of the script. To add a script command, select **Add | Viber** in the Script Editor main view.

Select the test type. When testing chat messages, VoIP calls, enter a contact number.

*Call attempt timeout (s)* (only with VoIP call) defines the maximum duration (in seconds) of the call attempt.

*Call duration* (only with VoIP call) defines the duration of the call in seconds.

*Answer wait time* (only with Answer VoIP call) defines how many seconds Nemo Handy waits for a call answer before hanging up call.

*Message* (only with chat message) defines the content text of the chat message.

*Add image* (only with chat message) allows you to add an image to the chat message. Tap **Browse** to browse for an image in the device memory.

## 5.2.62 Scripted WhatsApp testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Note that you must have a WhatsApp Messenger downloaded to your Nemo Handy device and a configured WhatsApp account to perform WhatsApp testing.

### NOTE

Note that when testing WhatsApp VoIP calls, during call connecting the device's display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Nemo Handy cannot detect when the call has been connected.

### NOTE

Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap "Tap here to fill entire screen" at the bottom of the screen.

With Nemo Handy, you can perform chat message, VoIP call, video call, and VoIP call answer testing with WhatsApp. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

You can run a WhatsApp test as part of the script. To add a script command, select **Add | WhatsApp** in the Script Editor main view.

Select the test type. When testing chat messages, VoIP and video calls, enter a contact number. *Call attempt timeout (s)* (only with VoIP and video call) defines the maximum duration (in seconds) of the call attempt.

*Call duration* (only with VoIP and video call) defines the duration of the call in seconds. *Answer wait time* (only with Answer VoIP call) defines how many seconds Nemo Handy waits for a call answer before hanging up call.

*Message* (only with chat message) defines the content text of the chat message.

*Add image* (only with chat message) allows you to add an image to the chat message. Tap **Browse** to browse for an image in the device memory.

## 5.2.63 WiFi Enable/Disable

*WiFi Enable* enables WiFi connection on the device. Go to the WiFi Spectrum page on Nemo Handy to check available WiFi connections.

*WiFi Disable* disables WiFi connection on the device.

## 5.2.64 Scripted BiP testing

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Note that when performing application testing with devices, such as Samsung Galaxy S9, Samsung Galaxy S8 and Samsung Galaxy S8+, that allow user to hide the navigation bar when using applications, the navigation bar must be set visible always. I.e. you must tap “Tap here to fill entire screen” at the bottom of the screen.

### NOTE

Note that you must have a BiP Messenger downloaded to your Nemo Handy device and a configured BiP Messenger account to perform BiP testing.

### NOTE

Note that when testing BiP VoIP calls, during call connecting the device’s display must be on, therefore do not close the proximity sensor of the device. If the display turns off, Nemo Handy cannot detect when the call has been connected.

With Nemo Handy, you can perform chat message, VoIP call, video call, and call answer testing with BiP. The test measures the quality of data transfer. See Nemo File Format documentation for more detailed information on logged parameters.

You can run a BiP test as part of the script. To add a script command, select **Add | BiP** in the Script Editor main view. Select the test type. When testing chat messages, VoIP and video calls, enter a contact number.

*Call attempt timeout (s)* (only with VoIP and video call) defines the maximum duration (in seconds) of the call attempt.

*Call duration* (only with VoIP and video call) defines the duration of the call in seconds.

*Answer wait time* (only with Answer VoIP call) defines how many seconds Nemo Handy waits for a call answer before hanging up call.

*Message* (only with chat message) defines the content text of the chat message.

## 5.2.65 Nested script

A nested script is a script inside a script. Nested scripts enable you to run automated measurements combining multiple scripts. You can use nested scripts to run several scripts one after another.

You can use nested scripts for example to make 10 voice calls followed by 10 data transfers and repeat that for 1000 times, without having to define 20 transactions in the script. Instead, create a script that makes one voice call with a repeat of 10, and another script with 1 data transfer with repeat of 10, and put them both as nested scripts in the same parent script.

To add a script command for a nested script, select **Add | Nested script** in the Script Editor main view.

### NOTE

Please note that nested scripts can be only added in scripts that do not have other transactions than other nested scripts.

*Script* defines the script file that will be nested. Tap the field and select a script from the list.

*Run condition* defines how long the script will be run. If you select *Until finished*, the script will be run until it is finished. If you select *Max time*, you will need to define in minutes the maximum duration of the script.

*Repeats* defines how many times the script is repeated.

## 5.3 Automated testing

### NOTE

Please note that automated testing requires the automated testing license option.

Nemo Handy offers the automated testing mode, that is, the ability to schedule Nemo Handy to perform measurements automatically using the Automated testing status view. During the automated testing mode, the data views are viewable, but you will not be able to control the measurement or use forcing features. Also, the log files can be automatically sent to an FTP or HTTPS server.

In addition to running standalone automated testing, Nemo Handy can be connected to the Nemo Handy Autonomous system is remotely configured and controlled by Nemo Cloud. For more information on the Nemo Handy Autonomous system, please refer to the Nemo Cloud User Guide.

### 5.3.66 Automated testing settings

Select **Settings | General** and select **Automated Testing** to activate the automated testing mode. Next, select **Settings | Automated Testing** to open the Automated Testing settings page.

*Phone Number* defines the phone number of the Nemo Handy mobile terminal.

*Maintenance Data Protocol* defines the protocol for uploading maintenance data. For more information, see Chapter “Maintenance data protocol” (Not available in Autonomous Probe mode).

*Startup Maintenance* defines whether maintenance is performed automatically when Nemo Handy is starting. During maintenance sessions, Nemo Handy unit uploads reports and measurement files to an FTP/HTTPS server if server is configured.

*Upload Config* enables configuration upload.

*Low Maintenance Priority* defines the priority of a maintenance session, that is, maintenance can be delayed if a new measurement session is set to run immediately after the previous one, or if a measurement is still running when a maintenance session is scheduled to take place.

*Maintenance by WiFi*, when selected, WiFi is used for maintenance. When the setting is selected, WiFi is automatically switched on for maintenance and any available configured network is used.

*Maintenance Interval* defines in minutes how often maintenance is performed if the measurement is in idle mode.

With the Nemo Handy Autonomous license, the phone will be automatically restarted after every 10<sup>th</sup> maintenance session.

### NOTE

Note that Auto start must be switched on for the mobile to restart.

*Unit Name* defines the name of the unit (defined here or in Nemo Cloud). The name is shown in the Automated testing status view and in Nemo Cloud. If the unit name is defined here, it will be updated to Nemo Cloud along with reports.

*Unit Prefix* defines the prefix attached to the measurement file name.

*Status SMS Number* defines the number where SMS reports are sent to. SMS status messages are sent when measurement session is started and stopped, and when doing maintenance.

*Error SMS Number* defines the number where error reports are sent to. Applicable only when Nemo Handy is used with the Nemo Autonomous Probe system. The possible error messages are:

- No Packet Connection: check that APNs are configured correctly
- No Contact FTP: check that IP address is correct and that the server is running
- Cannot Login FTP: check that the server is running
- Invalid Configuration: check measurement configuration
- Configuration Not Found: check that the configuration file is available on the server

*Measurement APN* defines which APN is used for measurements.

*Maintenance APN* defines which APN is used for maintenance.

*Use Session Color*, if selected, displays a colored background on Automated testing views (except when the color displays a status of for work example a work order from Nemo Cloud. If this setting is not selected, the background of the view is white.

*Nemo Autonomous Probe Mode*, if selected, activates the Autonomous Probe mode (reboot required). For more information, see Chapter “Nemo Autonomous Probe mode”.

When *Periodic Restart* is selected, the device is restarted after every 10th maintenance. (Applicable only when Nemo Handy is used with the Nemo Autonomous Probe system)

*Auto Start*, if selected, automatically starts Nemo Handy in phone startup.

### 66.5.3.1 Maintenance data protocol

The protocol for maintenance data upload can be defined in the Maintenance data protocol view. Define the protocol by selecting FTP, HTTPS, Dropbox, or SFTP.

If HTTPS is selected, there might be a need to create a configuration to define settings needed for the file upload. In this case, please see Chapter “Defining measurement upload configurations” for further information.

### 66.5.3.2 Nemo Autonomous Probe mode

When the Nemo Autonomous Probe mode is selected, tethering is turned on automatically when application is started. Maintenance is always performed to local computer on the Nemo Autonomous Probe (Embedded Linux) using the tethered connection. Server addresses in configuration (FTP and SFTP) are not displayed in the Nemo Autonomous Probe mode, configurations are made in the new settings described below. Otherwise operation is similar to normal automated testing. Real-time reporting is switched on automatically when the Nemo Autonomous Probe mode is enabled and the Automated testing view displays the Nemo Autonomous Probe addresses. The reporting interval is fixed to one minute.

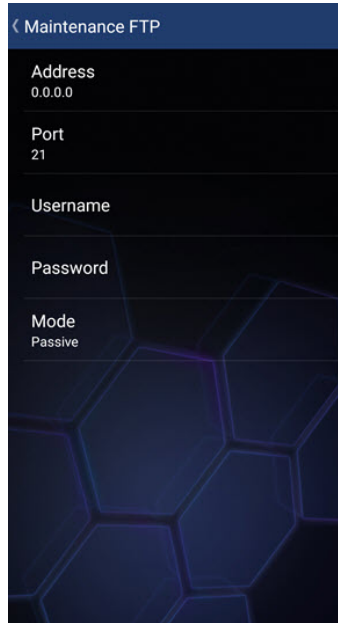
When the Nemo Autonomous Probe mode is enabled, the GPS source is automatically switched to Nemo Autonomous Probe GPS. This can be changed in **Settings | GPS | GPS Source** by tapping the desired GPS source option.

When the Autonomous Probe mode is activated, new settings allowing the user to configure Autonomous Probe remote server address, port, username, and password appear in the Automated testing settings. In addition, when selecting Cloud Data through Autonomous Probe, all data traffic from the device to Nemo Cloud is routed through Nemo Autonomous Probe.

These settings are written to an autoconfig file, and you can select whether to send the settings to local server (Embedded Linux) using FTP connection. Note that if the Autonomous Probe mode is used with Nemo Cloud, these settings are overwritten by the settings configured in Nemo Cloud.

### 5.3.67 Maintenance FTP

The FTP server address needs to be entered manually. Select **Settings | Maintenance FTP** and enter the FTP server information. If no server is set up, the log files will be stored on the Nemo Handy terminal.



< Maintenance FTP	
Address	0.0.0.0
Port	21
Username	
Password	
Mode	Passive


*Address* defines the IP address of the server.


*Port* defines the host port.

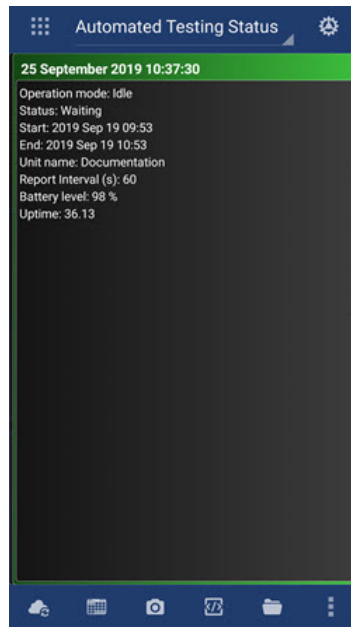
*Username* defines the host site logon user name.

*Password* defines the host site logon password.

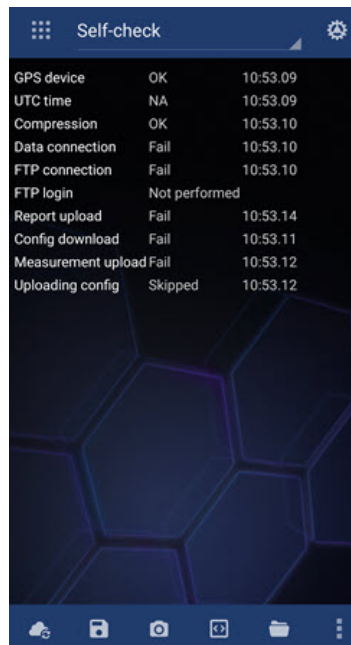
*Mode* defines whether active or passive mode is used in FTP connection.

When this is done, go to the Calendar view and tap  on the toolbar to initiate a maintenance session.

The Automated testing status view should look as the image below. Tap the  button to switch between the different calendar and status views.



If the unit has never been used with the Nemo Server before, the Self-check view will look like in the screen below.



After about ten minutes, the unit has been automatically registered to server and is ready for use. You can now copy new *autoconfig.xml* file to `sdcard\Nemo\Handy` manually.

### 5.3.68 Maintenance SFTP

The SFTP server address needs to be entered manually. Select **Settings | Maintenance SFTP** and enter the SFTP server information. If no server is set up, the log files will be stored on the Nemo Handy terminal.

*Address* defines the IP address of the server.

*Port* defines the host port.

*Username* defines the host site logon user name.

*Password* defines the host site logon password.

### 5.3.69 Scheduling maintenance and measurement sessions manually

Go to the Automated testing status view and tap  to create a new maintenance or measurement session. In the opening dialog box, select the session type and tap **OK**. Selecting the measurement session type opens the Measurement Session settings dialog box:

*Start date*, *Start time*, *End date*, and *End time* define the start and end date and time of the measurement session.

Tap *Session name* to name the measurement session.

Tap *Description* to define description for the measurement session.

*Script file* opens a list of all available scripts, allowing you to select the script you want to run. If there are no scripts in the view, you can browse for them. Select a script by tapping **Select**.

*Select BTS File*

*Map*

*Script repeats* defines how many times the script will be run, defining the length of the measurement session based on repeats rather than a fixed end time. For example, a voice call can be defined to be performed 100 times after a defined start time. After the repeats have been performed, Nemo Handy will upload the measurement file to the server. If script repeat is set to -1, the script is repeated for the duration the measurement session.

*Upload files after nested script* defines whether measurement files are uploaded to the server after nested script.

*Wait after nested script upload (sec)* defines the wait period in seconds after measurement files have been uploaded to the server after nested script.

*Measurement split duration (min)* defines in minutes the splitting of the measurement session into multiple log files. When set to -1, the whole measurement session will be gathered in one log file.

*Immobile limit (minutes)* defines the measurement to be stopped after the probe has been immobile for the defined time. The feature is disabled if the limit is set to 0 or if the GPS does not have a fix.

*No GPS fix limit (minutes)* defines the measurement to be stopped after the GPS fix has been lost for the defined number of minutes.

*Logging*

*Answer incoming calls* option allows Nemo Handy to answer incoming calls in automated mode. Needed in mobile to mobile call testing.

*Packet capture (Off/Enabled)* When packet capture is enabled, Nemo Handy can utilize the packet capture interface for getting certain specific KPIs without actually storing the PCAP log.

*Use packet capture filter* defines whether the packet capture filter is used

*Packet capture filter* – packet capture filtering is based on the Wireshark filters. For more information, please refer, for example, to <https://wiki.wireshark.org/CaptureFilters>.

*Session prefix* defines the prefix of the measurement file created during the new measurement session.

*Capture* When packet capture is in capture mode, a pcap log will be written together with the measurement file

*Session start SMS info*, when set to **Yes**, defines an SMS to be sent to Nemo Cloud when the measurement session has begun/ended. Applicable only when Nemo Handy is used with the Nemo Autonomous Probe system.

*Everyday session* defines whether the measurement session is to be repeated every day (until a different measurement configuration is received).

*Manual mode* allows you to define the measurement as a manual measurement session. In manual mode, the measurement is started when an SMS command is sent to the terminal, or **Start** is tapped on the calendar status view.

*Send report to server* defines whether a status report is to be uploaded to the server during the maintenance session.

*Send measurements to server* defines whether measurement files are to be sent to the server after the measurement session.

*Load next config from server* defines whether a configuration file is to be downloaded from the server during the maintenance session.

*Allow script connection* defines when the phone is allowed to make voice calls and data transfer attempts.

*Always* – The phone will make voice calls and data transfer attempts always, also in roaming situation.

*In service* – The phone will make voice calls and data transfer attempts only when it finds a network.

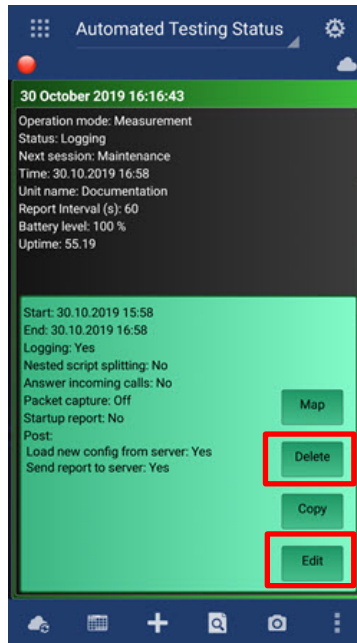
*In home network* – The phone will make voice calls and data transfer attempts only when it is in the home network.



After the session settings have been defined, tap the Back button on your mobile device. A dialog box prompting whether you want the changes saved to the server during the next maintenance is displayed. Select **Yes**.

Selecting *Maintenance session* type opens the Maintenance Session settings dialog box.

*Start date*, *Start time*, *End date*, and *End time* define the start and end date and time of the maintenance session.

The maintenance or measurement session is now displayed in the Session properties view within the Automated testing status view. To edit an existing maintenance or measurement session, tap **Edit** in the Session properties view. To delete a session, select **Delete** in the Session properties view.




The session is also displayed in the monthly and weekly view within the Automated testing status view as a time scale, ranging from the start time to the end time. Tap  to switch between views. To initiate a maintenance session manually, select  from the calendar view toolbar.

### 5.3.70 Manual start and stop

To enable manually-triggered measurements, set Manual mode to **Yes** in the Session settings in Nemo Handy.

Tap **Start** in the session dialog box on the Calendar view to start the measurement and **Stop** to stop the measurement and automatically perform maintenance.

When Nemo Handy is in automated testing mode, you are also able to start and stop measurements remotely via SMS. Set Nemo Handy to automated testing mode by selecting **Settings | General** and selecting the Automated testing option. After this, schedule a measurement session from Session Settings by going to the Calendar view and tapping . Set manual mode to **Yes** and select the script you wish to run. SMS commands are sent to the phone number of the addressed field unit. The message text defines the command. Available commands are listed below:

- Start measurement SMS:
  - !SM prefix

#### NOTE

Prefix defines the prefix added to the file name. Prefix can also be left blank, in which case no prefix is added to the file name.

- Stop measurement SMS:
  - !EM

### 5.3.71 Access point for maintenance and scripted connections

To change the Internet Access Point used for data connections during maintenance (measurement file transfer and configuration file retrieval), please follow the terminal manual. A valid Internet access point on the phone is required for Nemo Handy operations. If your service contract does not include an access point, you will need to contact your service provider. By default, Nemo Handy will use the phone's default access point.

### 5.3.72 Nemo Cloud work orders

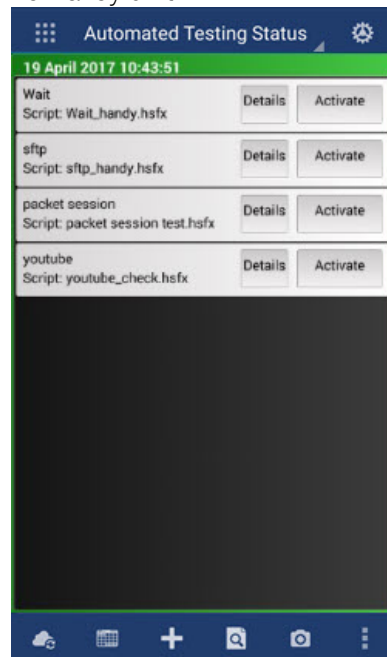
Nemo Cloud work order projects are similar automatic projects: you create the project and configure the work orders (preconfigured measurements sessions) in Nemo Cloud. The difference between automatic projects and work order projects is that instead of fixed measurement sessions, in a work order project the end-user of the measurement device can select which work order to perform at a chosen time, which gives more flexibility within the measurement project. You can view and select work orders set in Nemo Cloud in the Automated testing status view. Note that you must log into Nemo Cloud with the Nemo Handy terminal.

#### NOTE

Note that you need to perform the maintenance session manually in Nemo Handy before you can view measurement sessions or work orders from Nemo Cloud.

To perform maintenance, go to the Status view in the Nemo Handy device and tap the maintenance button (🔧).


To view work orders from Nemo Cloud, go to the Automated testing status view. This view displays the work orders assigned to this Nemo Handy unit. In the example below, there are four work orders assigned to the Nemo Handy unit.



Tapping **Details** displays information regarding the work order (configured in Nemo Cloud).

Tapping **Map** takes you to the map view in Nemo Handy.

You can move between all the work order detail views with the up and down arrows on the top right corner.

Return back to the view displaying the work orders by tapping  twice (tapping this button once displays the automated testing status).

Tap **Activate** to activate a work order. You can manually deactivate the work order by tapping **Complete** after tapping Activate to select another work order. Note that tapping **Complete** changes the work order state to *Measurement done*, and only after the measurement files are sent to Nemo Cloud the work order state becomes *Completed*. Nemo Handy displays the work orders activated once or more times in yellow.

The process flow with work orders starts with activating the work order. After activating the work order, perform the measurements needed. After the measurement is done, the state of the work order changes to Measurement done (displayed in yellow), and the measurement files are uploaded to Nemo Cloud during a maintenance session. When the file upload is successfully finished, the status of the work order changes to Completed (displayed in grey). Work order statuses can be seen in Nemo Cloud as well. A completed work order can be activated again if needed.

## 5.4 Voice quality testing

### NOTE

Please note that voice quality testing requires the voice quality license option.

Nemo Handy supports voice quality measurements based on POLQA (ITU-T Rec. P.863) and PESQ (ITU-T P.862.1) algorithms both in uplink and downlink directions. SWB (Super Wideband) and NB (Narrowband) POLQA measurement modes are supported. Results are reported on MOS (Mean Opinion Score) scale. The POLQA MOS scores are calculated in real-time in Nemo Handy and displayed on the screen. The PESQ MOS scores are calculated in the post-processing with Nemo File Manager based on the audio samples that are saved in the measurement files. Please note that the *Use dialer for calls* option in **Settings | General** must be enabled with voice quality measuring.

Go to **Settings | Voice quality**. Define the voice quality mode and select the sample file (see Chapter “Voice quality settings”). Voice quality testing can also be performed using scripts. With scripted voice quality testing, please ensure that the sample file used in the script is available. If it is not available, the voice quality script command is skipped. To turn voice quality testing off, select **Off** in the Voice quality mode field.

### 5.4.73 POLQA NB/SWB mode selection

POLQA measurements can be performed in Super Wideband (SWB) or in Narrowband (NB) mode. The mode is selected automatically based on the sample used, that is, if a wb sample is selected, SWB POLQA measurement mode will be used. Respectively, if NB sample file is selected, NB POLQA measurement mode will be used.

### NOTE

Note that SWB POLQA measurement mode should only be used with voice calls where WB AMR codecs are used. WB AMR is used only in mobile-to-mobile voice calls where in both ends the mobile is WB AMR capable and the WB AMR codec is enabled in the network. Also, AMR WB codec must be activated from the AMR codecs selection in forcing menu.

### 5.4.74 Voice quality testing in uplink+downlink mode

If you select the *Uplink+downlink* voice quality mode, you will need two terminals or one terminal and a Nemo Server. *Make sure you have the same settings (mode and sample) in both ends.*

Also, activate the auto-answer mode in the terminals (**Settings | General | Answer incoming calls**).

Make a voice call from one unit to the other. The units will be sending and receiving the sample in turns until the voice call ends.

#### 5.4.75 PESQ voice quality testing

PESQ score cannot be calculated in the phone in real time. Instead, it is calculated in the post-processing in Nemo File Manager. In the File Manager the saved audio samples are contained in a .zip file. The .nmf file will thus contain both PESQ and POLQA scores, which are calculated for every audio sample, embedded in the .zip file. When the PESQ dongle is installed and a POLQA measurement file with embedded audio samples is processed, also the PESQ score is calculated.

##### NOTE

Note that copy protection dongle with PESQ option is required in the Nemo File Manager PC to perform the PESQ calculation.

##### NOTE

Note that Voice Quality settings in the File Manager do not affect whether the audio samples are saved or not.

MOS threshold defines the limit for saved audio samples (**Settings | Voice quality | MOS threshold**). All audio samples with POLQA MOS score that is below the defined limit will be saved with the logfile. This makes it possible to playback the actual audio samples in the post-processing.

##### NOTE

Note that the threshold must be set to 5 (all samples are saved) when measuring also PESQ. This is because PESQ calculation is done in the Nemo File Manager in post-processing.

#### 5.4.76 PEVQ-S video quality testing

##### NOTE

Please note that PEVQ-S video quality testing requires the PEVQ-S video quality testing license option.

PEVQ-S is an advanced framework algorithm developed by OPTICOM for full-reference video quality analysis in adaptive streaming environments. It combines FR high accuracy video quality measurements with real-time measurements.

Video quality measurement models can be classified into three categories:

- Full Reference (FR): Original uncompressed source (reference) is available to the model
- Reduced Reference (RR): Only partial information about the reference is available to the model
- No Reference (NR): No reference information is available to the mode.

In Nemo Handy PEVQ-S measurements can be performed within YouTube testing either manually or in scripted testing.

Once the PEVQ-S testing is enabled, you can select among three preloaded video files placed in phone\Nemo\Handy\Pevqs and run the measurement.

## 5.4.77 Nemo Server remote configuration

Nemo Handy can optionally communicate with Nemo Server to perform synchronized voice quality testing. Communication is done over packet data connection using Nemo Server API interface (HTTP API).

To perform communication with Nemo Server, go to **Settings | Nemo Server config** and enable Nemo server configuration. For more Nemo server config settings, see Chapter “Nemo Server Config Settings”.

In scripts, the Make Voice Call command sends Nemo Server a ServerWaitCall command that includes the Nemo Server configuration settings, call duration, and an automatically generated unique Call ID.

The Receive Voice Call command sends Nemo Server a ServerMakeCall command that includes the Nemo Server configuration settings, call duration, and an automatically generated unique Call ID.

## 5.5 Forcing features

Nemo Handy supports band locking, cell locking, system locking, channel locking, scrambling code (SC) locking, physical cell identity (PCI), and AMR codec activation. Support for the locks is terminal-specific, so please refer to the Nemo Handy data sheet to see which locks are supported by your test device. Please note that unless you deactivate forcing features, they will stay active even if you exit Nemo Handy.

### NOTE

Note that the forcing function settings differ slightly when the terminal's ICD version is 5.11 or newer. You can check the ICD version of your terminal under **Device information in Menu | About | Version**.

Tap the Menu button (  ) and select **Forcing**.

The Forcing page opens with fields for system lock, band lock, channel lock, GSM channel lock, scrambling code lock, and AMR codec activation.

### NOTE

Note that some of these functionalities are available only if your Nemo Handy device supports them.

The Status view displays the status for the different locks.

## 5.5.78 System lock

To activate the system lock, tap the **System** field. Next, select a system from the pop-up menu. Tap **Activate** to lock the device to the selected system(s).

### NOTE

Note that GSM WCDMA and GSM WCDMA Auto both do the same thing. There is no difference between how they function.

## 5.5.79 Band lock

To activate the band lock, tap the **Bands** field. Select a band and/or system from the Select bands dialog box.

All supported bands from the systems supported by the terminal are displayed. However, the terminal does not necessarily support all the listed bands. If you are trying to lock the phone to a

band that the phone does not support, the phone will revert back to default. Band lock overrides the system lock when used simultaneously. For example, if you lock to the WCDMA 2100 band, you cannot choose the GSM system lock. Tap **Activate** to confirm the selection.

**NOTE**

Please note that the lock is not released by rebooting the device or by exiting Nemo Handy. The lock can only be released with Nemo Handy. If the device requires a reboot, a notification is displayed automatically.

### 5.5.80 GERAN/GSM carrier lock

Phone locks to a GSM carrier based on the selected carrier and band. To activate the carrier lock, tap the **ARFCN** field.

In the GERAN carrier lock dialog box you can select the GSM carrier and the band.

If your serving system is currently GSM, tapping **Pick** opens a dialog box in which you can select the target cell where to lock the UE.

### 5.5.81 UTRAN/WCDMA carrier lock

Phone locks to a WCDMA carrier and scrambling code. To activate the carrier lock, tap the **UARFCN** field. In the UTRAN carrier lock dialog box you can select the WCDMA carrier and the scrambling code where to lock the UE.

If your serving system is currently WCDMA, tapping **Pick** opens a dialog box in which you can select the target cell where to lock the UE.

### 5.5.82 EUTRAN/LTE carrier lock, LTE cell lock

Phone locks to LTE cell based on selected Channel and PCI (Physical Cell ID). To activate cell lock, tap **LTE PCI** field. In LTE PCI lock dialog box you can define values for EARFCN and PCI.

If your serving system is currently LTE, tapping **Pick** opens a dialog box in which you can select the target cell where to lock the UE.

**NOTE**

Please note that system lock to *LTE only* must be activated prior to activating LTE PCI lock.

**NOTE**

Please note that LTE cell lock works with selected terminals, such as Samsung Galaxy S4 4G+, Samsung Galaxy Note 3, Samsung Galaxy Note 3 (T-Mobile) and Note 10.1 2014 Edition.

**NOTE**

Please note that both channel and PCI must be selected. Only cell lock is supported, not LTE channel/ carrier lock.

### 5.5.83 AMR codec activation

To activate the AMR codec, tap the **AMR codecs** field.

Select AMR codec from the **Select AMR codecs** dialog box and tap the return button.

**NOTE**

Please note that some device models need to be powered off and on to activate the AMR Codec. If the device requires a reboot, a notification is displayed automatically.


## 5.6 Supported chipsets

Nemo Handy supports Qualcomm and Samsung Shannon chipsets. The Samsung proprietary chipset (Shannon) is supported by Samsung Galaxy Note 5 SM-N9208 and Samsung Galaxy S6 Edge+, and Qualcomm by all other supported devices. The locking features (see \*) differ between the two chipsets:

Qualcomm	Samsung Shannon
System lock (RAT)	System lock (RAT)
Band lock	Band lock
ARFCN	ARFCN/ GSM carrier
UARFCN + scrambling code	UARFCN + scrambling code/ UMTS carrier
EARFCN + PCI	EARFCN + PCI/ LTE carrier
AMR codec	

\*The forcing/locking features are device-specific.

## 5.7 Forcing features of Samsung Shannon chipset

Tap the Menu button (  ) and select **Forcing**. Select the system, band, and other forcing features if desired, and tap **Activate**. System lock is used the same way as with Qualcomm. For more info, see Chapter “System lock”.

### NOTE

Please note that your locking settings may take some time to load.

Select the system you wish to lock. The options are: GSM WCDMA, GSM Only, WCDMA, GSM WCDMA Auto, LTE GSM WCDMA, and LTE Only. In band lock it is possible to select only one band at a time.

### 5.7.84 GSM channel lock (ARFCN)

With GSM Channel Lock Nemo Handy can be locked on a GSM channel. Select **Options | Forcing | ARFCN**. Tap the **Not Locked** field to activate GSM channel lock.

The Geran carrier lock dialog box opens. Enter the number of the channel that you want to lock to and tap **OK**. To select a GSM band, tap the **Band** field.

### NOTE

Note that System must be switched to GSM Only for ARFCN lock to show as an option. For channel lock the device must be in idle mode.

### 5.7.85 WCDMA carrier lock (UARFCN)

With the WCDMA Carrier Lock the mobile can be locked on a UMTS carrier and a scrambling code. Select **Options | Forcing | UARFCN/SCR**. Tap the **Not Locked** field to activate the WCDMA carrier lock. Scrambling code may get an undefined value: the device changes scrambling code freely, while being locked to a specific carrier.

The Utran carrier lock dialog box opens. Enter the number of the carrier (UARFCN) and the scrambling code that you want to lock to, and tap **Lock**. Tap **Pick** to pick a cell.

**NOTE**

Note that System must be switched to WCDMA for UARFCN/SCR lock to show as an option. For WCDMA carrier lock the device must be in idle or connected mode.

## 5.7.86 LTE carrier lock (EARFCN/PCI)

**NOTE**

Device reboot required.

With the LTE carrier Lock the mobile can be locked to a carrier. Select **Options | Forcing | EARFCN**. Select **Options | Forcing | EARFCN**. Tap the **Not Locked** field to activate the carrier lock. PCI may get an undefined value: the device changes PCI freely, while being locked to a specific carrier.

The Eutran carrier lock dialog box opens. Enter the number of the carrier (EARFCN) and the PCI that you want to lock to, and tap **Lock**. Tap **Pick** to pick a cell.

**NOTE**

Note that System must be switched to LTE for EARFCN lock to show as an option. For carrier lock the device must be in idle or connected mode.

## 5.7.87 Forcing features with Samsung Shannon chipset-based devices with ICD 5.11 or newer

In Samsung Shannon chipset terminals with ICD version 5.11 or newer, the forcing functions need to be configured slightly differently.

Once you select the system, Nemo Handy automatically displays all the system-specific bands supported by the terminal in question.

**NOTE**

Note that only one lock can be active at a time, if you set another lock the previous one will be released when the new lock becomes active.

You can define either the channel number or the cell number, it is not possible to define both at the same time.

## 5.8 IP capture

**NOTE**

Note that this functionality is available only if your Nemo Handy license supports it.

Application-level data can be captured with Nemo Handy. The data is collected in a separate log file in .pcap format. Pcap files can be processed with Nemo Outdoor, Nemo Analyze, or Wireshark. By default, full IP capture, including IP and all above layers are captured. Pcap log files can be very large if no filtering is applied. Therefore, it is practical in most cases to apply filtering to capture only the protocol layers of interest. Capture filter rules are read from a text file. Rules must be defined in the standard Wireshark filter format.

*IP capture* enables/disables IP packet capturing.

When packet capture is enabled, Nemo Handy can utilize the packet capture interface for getting certain specific KPIs without actually storing the PCAP log.

When packet capture is in capture mode, a pcap log will be written together with the measurement file.

*IP capture interfaces* enables selecting which interface to use for IP capture. Note that if WLAN is selected and the device's WLAN is then turned off, the selected interface's mode changes to default mode "any".

*IP capture max packet size* defines how many bytes to capture from each packet.

*IP capture filter* defines whether captured packets are filtered.

*IP capture filter rules* allows you to define IP capture filter rules. The rules must be placed in the root directory (/Nemo/Handy/) as a text file with .txt ending.

IP capture is started whenever you start logging with Nemo Handy and stopped when logging is stopped. You can upload IP capture files to a server by selecting **Upload packet capture files** in the Log file name dialog box that appears when you stop logging.

## 5.9 Indoor measurements

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

You can view indoor maps in Nemo Handy and plot the measurement route on the map with markers or use GPS if available.

### 5.9.88 Importing maps and defining map settings

If this is the first time you are performing indoor measurements with Nemo Handy, you will need to import an indoor map (that is, a floorplan) to Nemo Handy as an image file. The supported formats are .jpg, .jpeg, .gif, and .png. Transfer the image file (for example Floorplan.jpg) to the *phone/Nemo/Handy/Maps* folder on the internal memory card of your Nemo Handy terminal by using for example a Bluetooth connection, a cable connection, or a memory card reader (this functionality is disabled in Android version 4.4 and later).

You can also take a photo, for example, of an emergency exit plan with the Nemo Handy mobile phone camera and use that as an indoor map.

In Nemo Handy, select **Settings | Indoor | Floorplans** and tap **Add** to choose or import a map or take a picture to be used as floorplan. A dialog box prompting whether you want to copy floor position from another floorplan is displayed. Select **No/Yes**. When selecting **Yes**, a list of previously imported floorplans is opened and you can choose the floorplan from which the floor position is copied to the new floorplan. When selecting **No**, the dialog box closes and the new floorplan is imported without added floor position information. If this is the first time you are performing indoor measurements, Nemo Handy will generate a MapInfo file (.tab) based on the image file. Next time you make measurements and use the same map, Nemo Handy will use the .tab file automatically. A MapInfo map always consists of two files: a MapInfo .tab file and an image file.

The resulting floorplan (.tab) will be listed on the Floorplans page. You can have several floorplans loaded at the same time. For example, you can have a floorplan from each of the floors of a building. Select a file and tap **Up** and **Down** to rearrange to order of the floors on the map.

When **Use map name as floor name** option is selected, added floors are automatically named after the floorplan file. If the option is not selected, the floors are named in the following manner: "Floor 1", "Floor 2", etc.

If there is already added floors with different names that do not match with the map file name and **Use map name as floor name** is selected, a dialog prompting whether the user wants to change the floor names to match the map file names appears. By clicking **Yes**, all added floor names will be renamed.

Select a floorplan and tap **Edit**. On the Tab file settings page you can define the dimensions of the floorplan and select a route plan.

*Layer name* defines the floorplan name. The name can be edited.

Select the *Display route plan* option to display a route plan on the indoor map.

*Route plan* defines the route plan file (.rpf) displayed on the indoor map.

*File type* defines whether the floorplan dimensions are defined in meters (width/height) or in geodetic coordinates.

*Width* defines the floorplan width in meters. Nemo Handy enters a default value (number of pixels in the image divided by ten) for the field, but you should enter the correct value.

*Height* defines the floorplan height in meters. Nemo Handy enters a default value (number of pixels in the image divided by ten) for the field, but you should enter the correct value.

*Longitude* defines the geodetic coordinates of the left and right sides of the map. Enter coordinates in decimal degrees (for example, 25.4714).

*Latitude* defines the geodetic coordinates of the top and bottom sides of the map. Enter coordinates in decimal degrees (for example, 25.4714).

Next, define indoor settings from the Indoor settings view (see Chapter “Indoor settings”). After defining indoor settings, you are ready to begin measurements.

## 5.9.89 Importing iBwave maps

iBwave is a third-party indoor planning tool. iBwave has a proprietary indoor map format (.ibwc) with floorplans for every floor of a building, indoor coverage overlay, and antenna array/cabling visualization.

If this is the first time you are performing indoor measurements with iBwave maps, you will need to import iBwave map files (.ibwc) to Nemo Handy. Please refer to iBwave documentation on how to create iBwave maps that can be imported to Nemo Handy. Transfer the files to the *phone/Nemo/Handy/Maps* folder on the internal memory card of your Nemo Handy terminal by using for example a Bluetooth connection, a cable connection, or a memory card reader (this functionality is disabled in Android version 4.4 and later).

In Nemo Handy, select **Settings | Indoor**, tap **Import iBwave maps** and select from which storage local or Cloud, you wish to import an .ibwc file. If the map file contains several building, choose one of them.

The floorplans (.tab) are listed on the Floorplans page. Select a floorplan and tap **Up** and **Down** to rearrange to order of the floors on the map.

Select a floor/tab file and tap **Edit**.

On the Tab file settings page you can select a route plan to be displayed on the map. You can also select the file type between metric and geodetic, and define the width and the height of the indoor map.


Next, define indoor settings from the Indoor settings view (see Chapter “Indoor settings”). After defining indoor settings, you are ready to begin measurements.


## 5.9.90 Georeferenced indoor map

When adding new indoor maps (that is, floorplans) in Indoor settings, you can define a georeferenced indoor map position on the world map. When using georeferenced indoor maps, indoor map and Google Map or OpenStreet Map are displayed one upon another on the Map page.


In Nemo Handy, select **Settings | Indoor** and tap **Floorplans**. Select an indoor map from the list, or add a new one by tapping **Add**. Once an indoor map has been selected, tap **Edit** on the toolbar.

The tab file settings view opens. Select **Geodetic** as File type, if not defined yet. Scroll down and tap **Georegister**. New map view activity opens with selected indoor map.

Tap the *Lock map* (  ) button to lock the OpenStreetMap map in its position while maintaining the possibility to scroll, rotate and zoom. This enables scaling, rotating, and moving the indoor map on top without accidentally moving the OpenStreetMap. Tap the lock icon again to lock the entire floorplan to disable zooming, and rotating. While the map is locked, *Go to GPS location*, *Go to building location* and *Go to address location* menu items are disabled. Tap **Unlock map** to unlock the map and to enable the menu items. Tap the *Lock map* button for the third time to unlock the map and to enable the menu items.

*Go to GPS location* (  ) jumps to current building location, if there is no GPS fix shown.

*Go to building location* icon (  ) jumps to current building location.

*Go to address location* (  ) opens a dialog box in which you can define address location (address, postal code, city, county, state, and country).

When tapping the *Save* (  ) icon, a dialog box prompting whether you want to overwrite the last position appears. Select **No/Yes**.

You can rotate the map and zoom in and out by “pinching” the screen by using two fingers (for example, thumb and index finger).

Tap and hold the floorplan on the map to move its position, rotate, and resize the floorplan.

To scale indoor map in x- and y-axes, tap and drag one of indoor map's edges with a finger. Alternatively, set the longitude and latitude in the tab file settings.

Select a map location by tapping and holding your finger on top of a map to move the floorplan to the new location.

To display the floorplan on a satellite map, go to **Settings | Map** and select **Satellite** as the *Google Map type*. Next, go to **Settings | Indoor**, tap **Floorplans**, select a floorplan from the list and tap **Edit**. Set file type as geodetic and tap **Georegister**.

Tap the **Save** icon and select **Yes** to accept the new position to be written in the Tab file. If there are one or more floors added, a dialog box is shown prompting the user whether they want to copy current floor position to all existing floor. To discard new position, tap the Back button of the device and select **Yes** in the possible following dialog box. The dialog box opens when information of the floorplan's location or size has been changed without saving the changes. If there have been no changes or the changes made have already been saved, tapping the Back button of the device leads straight to Tab file settings.

You can modify existing geocoded floorplans if needed by tapping **Edit** again.

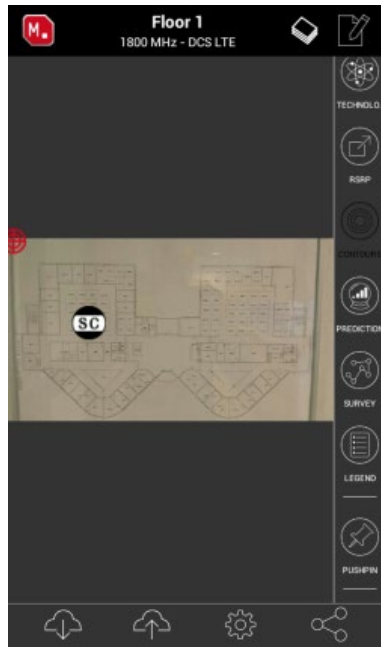
## 5.9.91 iBwave Planner


Nemo Handy enables exchanging project information directly between iBwave Planner and Nemo Handy. iBwave Planner and Nemo Handy both run on the same device, using the IBWC file as a common medium. This enables the user to create a floor plan in iBwave Planner, switch to Nemo Handy for the measurements and then switch back to iBwave Planner to create preliminary design.

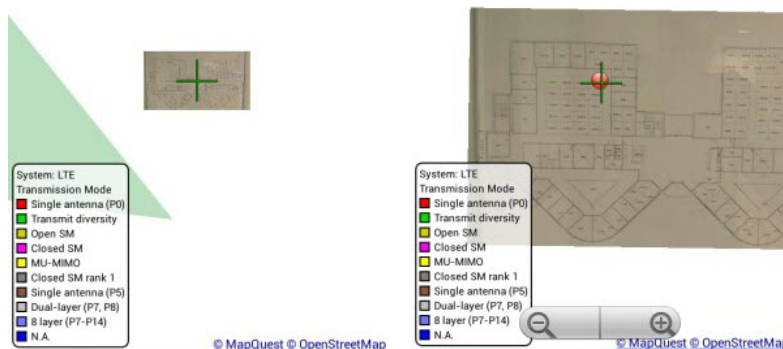
### NOTE



Please note that iBwave Planner should be installed on a terminal that has Nemo Handy installed on it.

1. Start iBwave Planner (Nemo Handy can run on the background) to make your indoor design planning.

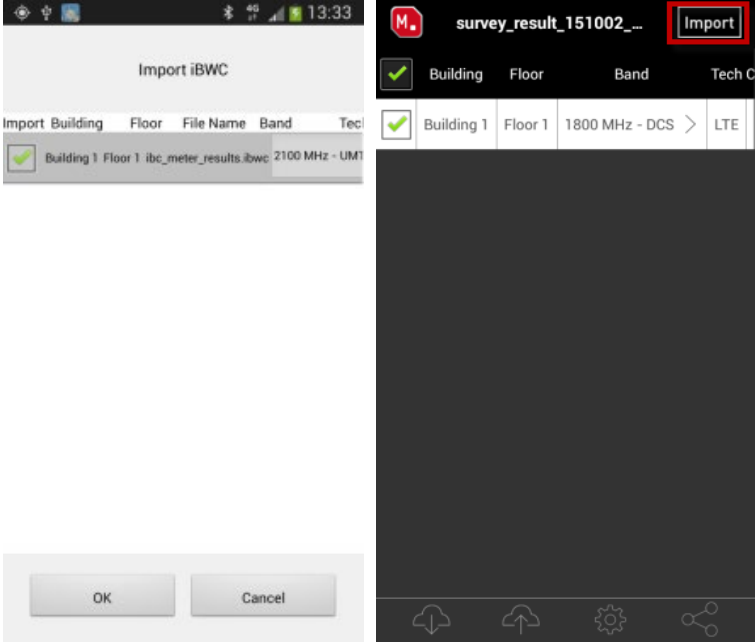


2. In iBwave Planner, tap on the survey button on bottom right corner to launch Nemo Handy. In Nemo Handy, select the correct building from your project file (you can have several buildings in your iBwave project file).
3. The Floorplan view opens. This view enables you to change the order of the floors or remove entire floors if the building has several. The Map page displays the floor that is highest on the list. If you wish to select another floor to be displayed on the Map page, tap and hold a button displaying the name of the floor, for example Floor 1, on the upper left corner of the Map page.
4. Tap **OK** to confirm your selection. The page that was previously viewed is automatically opened in Nemo Handy. In Nemo Handy, start logging by tapping **Menu | Start logging**.
5. Go to the Map page and place a marker by tapping and holding on top of the desired location. Alternatively, tap  on the toolbar to place a marker. All current information is collected to the survey whenever a marker is added to the map.

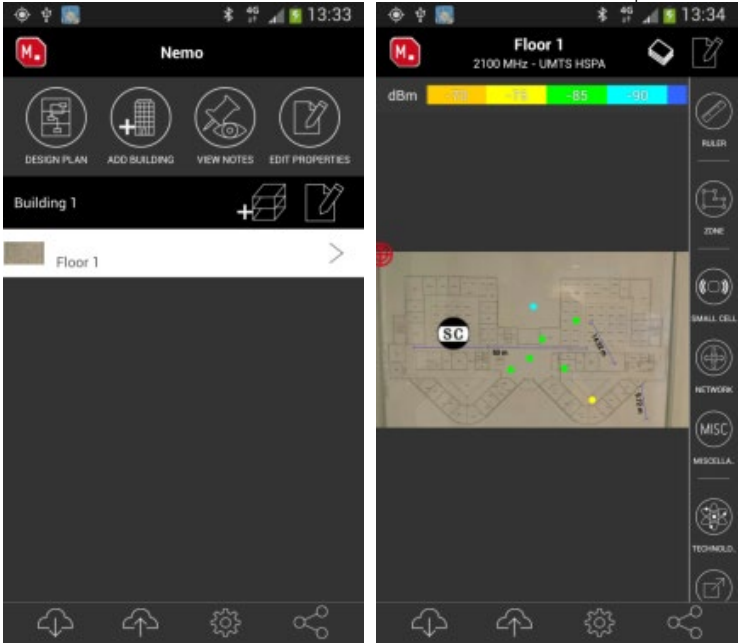


6. Stop logging by tapping  from the toolbar and selecting **Stop Logging**  from the opening dialog. A dialog box prompting what to do with the log file is displayed.

7. Select **Export iBwave survey** and tap **Export** to export the measurements to iBwave Planner. iBwave Planner opens. After exporting measurements from Nemo Handy, you can perform a new test in another location.
8. In the iBwave Planner, you can choose what information you want to import to your project. Tap **Import** on the top right corner of the page to import selected measurements to iBwave Planner.



9. You can view your results by going to the correct building and floor in the planner tool. The results can be viewed as measurements on the map.

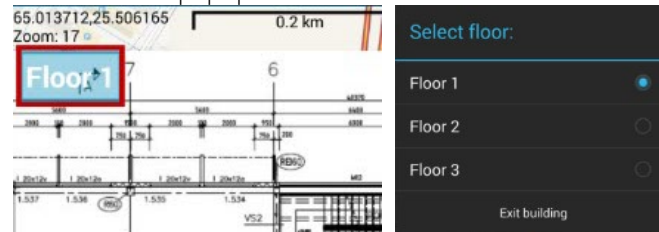


## 5.9.92 Performing indoor measurements

You can view indoor maps (floorplans) in Nemo Handy and plot a measurement route on the map with markers.

First, make the map page visible by going to **Settings | Page Settings | Map**. Select **Show Page** and tap the Back key of the device. Load the floorplan on top of the map in **Settings | Indoor | Floorplan**.

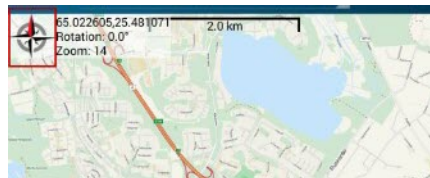
To change, edit, or delete the floorplan, tap and hold **Floor** on the upper left-hand corner of the map view to open the Select floor popup menu.



Tap the option you wish to select. Tapping **Exit building** removes the floorplan from the map but leaves the floorplan area marked in red. To reopen the floorplan, tap and hold the red area.

Tapping **Floor** locates the floorplan on the map. If the floorplan is not visible, zoom in on the map. The zoom level may have to be over 17 for the floorplan to be displayed.

It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the screen indicates the cardinal directions, and tapping on the compass once turns the map back into upright position.



Nemo Handy automatically rotates the map based on the phone compass heading. Autorotation is enabled when the compass in the upper left-hand corner of the UI is tapped twice (once if the map is already in upright position) and the compass circle turns green.






Note that the compass may need calibration, in which case Nemo Handy asks you to calibrate the compass by rotating the Nemo Handy device around its three axes.


The Follow button (📍) centralizes the view on the location of the floorplan. To disable autorotation, tap on the compass on the upper left-hand corner again. This enables you to roll the map with your fingers to match your own orientation inside the building, and then when you walk in the building, the map should stay in the same position with the device.




To pan the map through the screen, lock the map in its position by tapping  on the toolbar.






When the map is locked, the icon changes into the following icon:  and the map can be panned without changing the page by accident.

Tap the lock icon () to enable zooming. When zooming is enabled, the icon changes into the following icon: . You can zoom in and out by “pinching” the screen using two fingers (for example, thumb and index finger).

You can select whether GPS or inserted markers are used in marking the measurement route on the map: when the  icon is displayed, Nemo Handy uses GPS for route marking

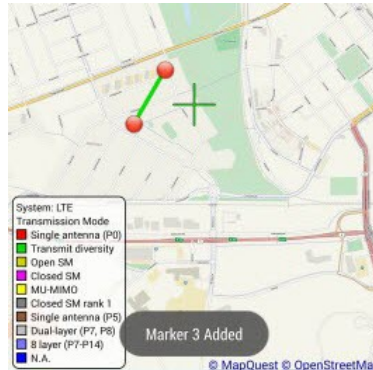
(recommended for outdoor measurements). When the  icon is displayed, Nemo Handy uses inserted markers to mark the measurement route (recommended for indoor measurements). Tapping the displayed icon changes the mode into the other.

To start logging, tap start logging button ().

Stop logging by tapping  on the toolbar and selecting **Stop Logging** () from the opening dialog. Pause logging by tapping  from the toolbar and selecting **Pause Logging** () from the opening dialog. After pausing you can resume logging by tapping  on the toolbar.

When logging, you can draw a route on the map by placing markers along the route by pressing and holding your finger on top of the map in the desired location or by positioning the green cross on top of the location you wish to add the marker and tapping **Menu | Add marker**. You can also add markers, textual markers, predefined markers, and photo markers to the log file to mark points of interest during the measurement. A good practice in indoor measurement is to add a marker when starting walking and when stopping walking, and, when starting walking again, adding a new marker in the same location. To add a marker to the log file, go to **Menu | Add marker** and select **Add marker/Add textual marker/Add predefined marker/Add photo marker** from the pop up menu. Selecting **Add Photo Marker** opens the camera preview screen. Tap the shutter icon to capture an image. An image preview is displayed. Tap **OK** at the top of

the view to confirm capturing the image or tap **RETRY** to dismiss the image and capture a new one. A dialog prompting you to enter photo name is displayed. Enter photo name and tap **OK**. When a marker is added, a pop up message displaying the marker sequence number appears on the screen.



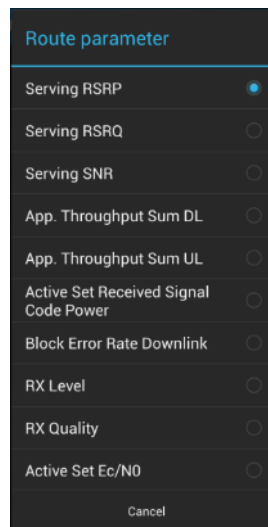
You are also able to see the marker sequence number later on by tapping on the marker. To remove last added marker, select **Menu | Delete marker**.

If the **Draw route** setting is selected in the Map settings, the markers will be connected to form a route. Note also that Nemo Handy must be logging for you to be able to place markers on the route.

You can view the measured route with color-coded parameter values in real-time on indoor maps. You can also observe the values of user-configurable network parameters from the route coloring on the map and define which color refers to which parameter value.

**NOTE**



Note that if the Parameter item is not visible in the indoor map menu, go to **Settings | Map** and select **ON** for Indicate parameter, define the route color, and select a route parameter.



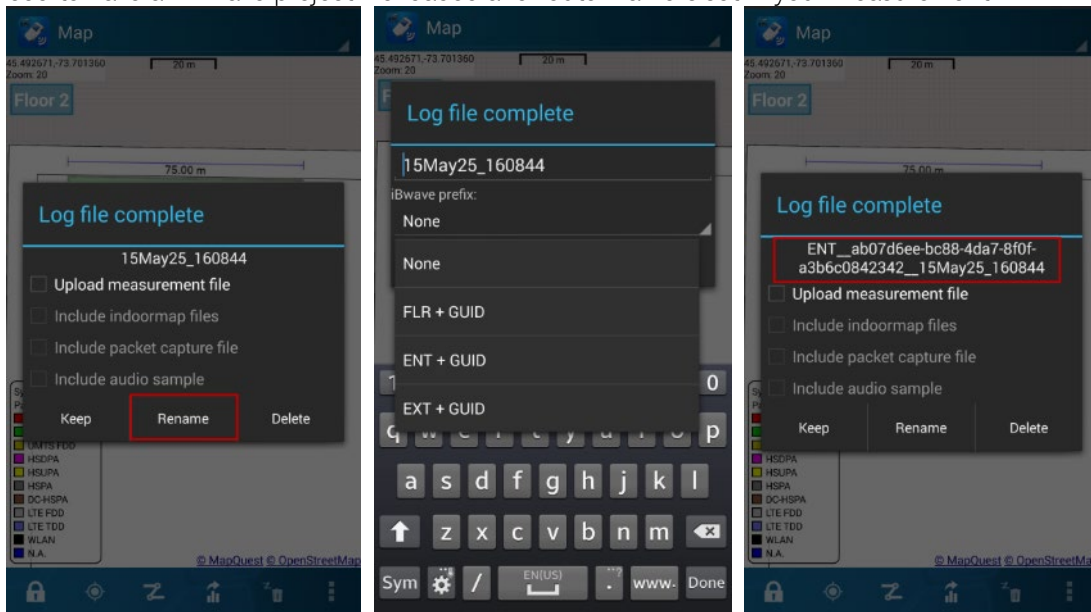
Select a parameter and the route will be colored accordingly.

The **Draw zones** (on/off) setting can be enabled in Indoor settings. The zones are used in iBwave project files as one layer that will be drawn on top of the indoor floorplan. The zone layer information is stored in the iBwave project file. Zones are used for example for drawing areas for DAS antenna groups to graphically show where a certain cell is transmitting.



After the measurements have been performed, stop the measurement by tapping  from the toolbar and selecting **Stop Logging** () from the opening dialog.

It is possible to use the iBwave floorplan information as part of the measurement file name. The file names indicate the used map GUID, and to indicate a floor, entrance, or exit you can choose FLR (floor), ENT (entrance), or EXT (exit) prefix from the pulldown menu by tapping **Rename**. Tap the **iBwave prefix** field to open the pulldown menu. Notice that before this feature is shown, you need to have an iBwave project file loaded and route markers set in your measurement.



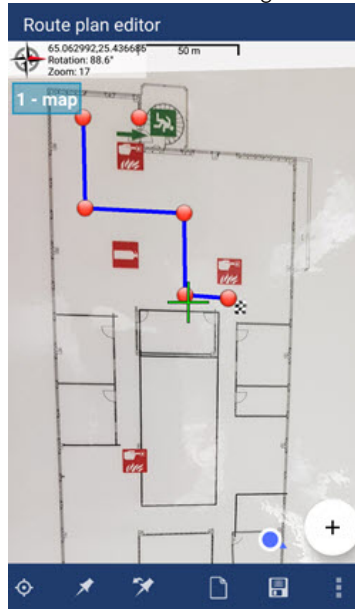
### 92.5.9.1 Route Plan Editor


**NOTE**

Route Plan Editor view is available only with the additional Advanced Indoor Analysis license option.

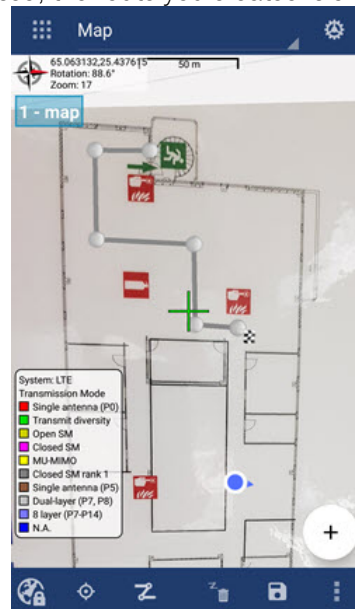
You can create a predetermined route before indoor measurements. This is done with the Route Plan Editor. Once you have selected the floorplan you need, on the map view, tap **Menu | Route Plan Editor**.

The route plan editor opens. Insert the markers to indicate the route to be measured. The latest added marker is identified with the black-and-white flag to indicate the direction of the route.





Once you have created the route, save the route either by tapping on the save icon or through **Menu | Save**. Name the route file and tap **Save**. You can create a new route by tapping the  icon. Once you have created and saved all the routes you wish to create, tap **Menu | Close route plan editor**. To edit existing route plans, open the route plan editor, tap **Menu | Import file** and select the file you wish to edit. The route is opened on the route plan editor and you can edit the route.

Note that you need to select **Draw route** in the Indoor map settings to be able to view the route. Once the route plan editor is closed, the route you created is displayed on the floorplan in grey.



Start the measurement by tapping the start logging button on the toolbar. The first marker of the route is displayed in red. Once you have moved to the location of the second marker, tap the

marker icon . The second marker is now displayed in red. By each marker, tap the marker icon to move to the next marker on the map. You can skip over a marker by tapping on the Skip marker icon (  ), in which case Nemo Handy will disregard the next marker and connect the previous and the next marker.

Once the measurement is stopped, name and save the file as usual. You can view the results on the route.

If you want to close the route plan, clear **Display route plan** in **Settings | Settings | Indoor | Floorplans | [floorplan] | Edit | Display route plan**.


### 5.9.93 Distributed antenna systems (DAS)

Testing and verifying DAS antennas is possible with the DAS Anomalies feature which enables you to view indoor small cell antennas and transmitters on the indoor map in real time by using either iBwave indoor plans or our BTS file. While marking your route during walking measurements you are able to verify whether different antennas are transmitting or not. A visual notification (red/green) is displayed in the indoor map indicating whether the current DAS antenna is transmitting.

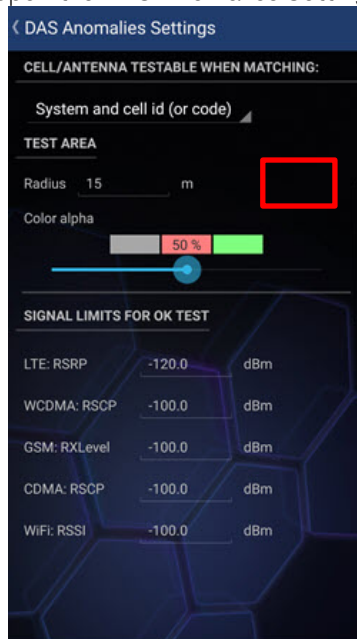
**NOTE**

Note that this functionality requires an additional licensing option (Advanced Indoor Analysis).

First, make the map page visible by going to **Settings | Page settings | Map**. Select **Show page** and tap the Back key of the device. Load a floorplan on top of the map in **Settings | Indoor | Floorplan**.

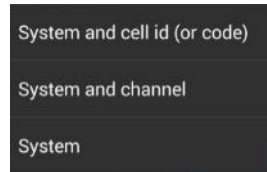
Activate the DAS Anomalies feature by going to **Menu (  ) | Settings | Indoor** and selecting **DAS Anomalies**.

Tap **DAS Anomalies Settings** to open the DAS Anomalies Settings view.



With **CELL/ANTENNA TESTABLE WHEN MATCHING** can select which method is used for activating a cell or and antenna for testing. Antenna is available for testing when the chosen parameters are valid. For example, if you select **System and channel**, you must have that

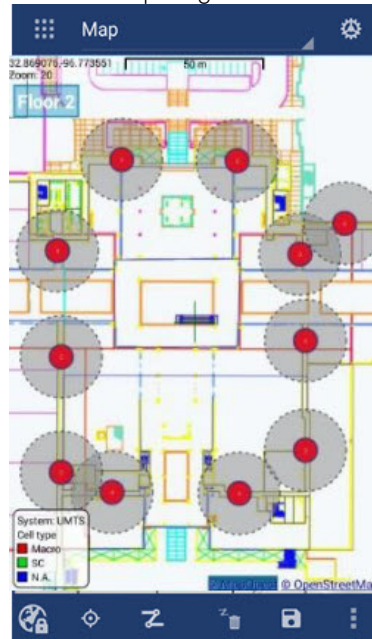
information either in your base station (BTS) or iBwave file. The pulldown menu contains the following options:



To define the radius of the test area, tap on the **Radius** field and insert a value.

To define the hue of the circle marking the test area, move the blue dot along the blue line under **Color alpha**.

To set the signal limits for acceptable test values, tap on the respective fields and insert a value. The test results are shown on the indoor map as green and red circles according to your settings.



## 5.9.94 BTS Editor view

### NOTE

BTS Editor view is available only with the additional Advanced Indoor Analysis license option.

BTS Editor enables users to create BTS files in an easy manner directly in Nemo Handy. This feature enables adding base stations and antennas to indoor maps and is useful to users who are building indoor coverage network to for example different buildings, malls, and so forth.

Creating BTS files in Nemo Handy:

1. Go to Map page when the device is not logging or playback. Select **Menu** (☰) | **Switch to BTS editor**.
2. Load a floorplan to the BTS Editor by selecting **Settings | Indoor** and tap **Floorplans**. Select an indoor map from the list or add a new one by tapping **Add** (+). Once an indoor map has been selected, add geodetic coordinates to the floorplan if needed by tapping **Edit**. The tab file settings view opens.
3. Select **Geodetic** as File type. After this, return to the Map page. you are able to rotate and scale the floorplan on top of the OSM.

- When you want to add a new DAS antenna, Small Cell antenna or a Macro Cell, and so forth, move the map cursor on top of the desired location and tap **Add** (+). The Cell Properties dialog box appears.

Mandatory parameters		
System	UMTS(16-bit CID)	
Type	NORMAL	
Site name	Cell name	Channel
Site 1	Cell 1	10837
Latitude	Longitude	Direction
65.01358	25.50887	0
Cell ID	PSC	RNC ID
57507	7	9

Optional parameters		
Beam	Range	LAC

Pick from:

Serving Neighbors Existing

Cancel OK

- Tapping **OK** in the Cell properties dialog box adds a BTS Cell or an indoor marker on top of the location where the cursor is. When location is added, a popup of the serving cell should be shown by default.
- Check that the pre-filled serving cell parameter values are correct. In cell properties dialog box you are able to pick cell properties from current serving cells, neighbor cells, or existing cells in BTS DB. If some mandatory parameters are invalid, you are able to select cell values using Serving, Neighbors, or Existing buttons. The values can also be added by hand.
- You can move already existing BTS markers by pressing and holding and dragging them (*move cell to the new location* text is shown when marker can be moved). Tapping a BTS marker opens a list containing other editing tools: **Edit**, **Create DAS**, and **Delete**.
  - When tapping Edit, the same Cell properties dialog box is opened that has previously been filled for the selected BTS cell properties.
  - Create DAS creates DAS antenna in the same cell properties as the selected cell, except location and cell type is DAS. DAS is created on top of the location where cursor is at that time.
  - Delete deletes the selected cell.
- Tap the New (📄) button to remove all existing BTS cells on the map and BTS database. Tap **Yes** to confirm your selection,
- Tap the Save (💾) button and enter filename to save current BTS database information in an .nbf file. Also already created .nbf files can be edited by load then in Settings.
- To close BTS editor and return to normal Nemo Handy state, select **Menu** (☰) | **Close BTS editor**.



## 5.9.95 Automated location mapping

Automated location mapping automatically displays the actual test route and location when performing indoor measurement.



1. Install the Neon Command setup and start the application. Sign in with the username and password.
2. In Neon Command, upload and geocode your floorplan. For more information, see Neon Command documentation.
3. Download NeonLocationServiceStandalone .apk file and install it on your handset. Accept possible updates, power the external TRX Neon tracking module and pair the devices from the handset's Bluetooth settings.
4. Start Nemo Handy, go to **Settings | GPS** and make sure that *Internal GPS* is selected as GPS Source.
5. For a first-time login to NeonLocationServiceStandalone, select **Settings | Indoor | Neon floorplan**. Log in with your Neon Command username and password. Tap **Neon settings** and select the TRX tracking device in Neon floorplan settings.
6. In Neon Floorplans view, click **Add**. A dialog box prompting whether to download Neon Floorplan by Address or Current location opens. Select your method of download. This will download the floorplan (i.e. a .tab file and a .pdf file created by Neoncommander.exe) to Nemo Handy.
7. Name the file in the dialog box that opens.
8. Make sure the tracking module is attached to a belt, or the top of your pants. The tracking module does not work as well when you place it in a pocket because it can move around and affect the step detection. Neon tracks you best when the tracking module is mounted to the front of your body where you would wear a pager, or in the center of the back.
9. Start the measurement by selecting **Menu | Start logging**. After starting measurements indoors, manually pinpoint your initial location on the map by tapping the pin icon. After this,

define the heading by walking 10 meters and pinpoint your location again by tapping the pin icon.

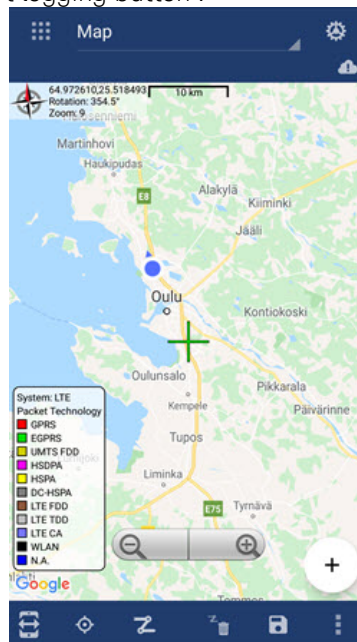
10. Once the starting point is set, start walking through the route. Stop logging by tapping  on the toolbar and selecting **Stop Logging** () from the opening dialog. Once the logging is stopped, you can choose whether to keep, rename, or delete the resulting log file. The saved log files along with captured screenshots and indoor marker files are saved to File explorer (see Chapter “File explorer” for more information).

## 5.10 Outdoor measurements

First, make the map page visible by going to **Settings | Page Settings | Map**. Select **Show Page** and tap the Back key of the device.


Define map settings by going to the Map settings view by selecting **Settings | Map** (see Chapter “Map settings”).

Start logging by tapping the start logging button .





You can view the maps in Nemo Handy and plot a measurement route on the map with markers. You can select whether GPS or inserted markers are used in marking the measurement route on


the map: when the  icon is displayed, Nemo Handy uses GPS for route marking

(recommended for outdoor measurements). When the  icon is displayed, Nemo Handy uses inserted markers to mark the measurement route (recommended for indoor measurements).

Tapping the displayed icon changes the mode into the other.



To pan the map through the touchpad, lock the map in its position by tapping  on the



toolbar. When the map is locked, the icon changes into  and the map can be panned without changing the page by accident.

You can zoom in and out by “pinching” the screen using two fingers (for example, thumb and index finger) to zoom in or zoom out when viewing a map. Tap  to focus on your current location.


Zoom level of the map can be adjusted also by using the zoom slider on the bottom of the screen.

It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the screen indicates the cardinal directions, and tapping on the compass turns the map back into upright position.

With the Clear route tool (  ) you can remove the measurement route from the map. You can see the measured route with color-coded parameter values in real-time on live map. To quickly switch between different parameters, tap  on the toolbar. See Chapter “Defining route parameters” for defining custom route parameters and color sets.

Stop logging by tapping  on the toolbar and selecting **Stop Logging** (  ) from the opening dialog. Once the logging is stopped, you can choose whether to **Keep**, **Rename**, or **Delete** the resulting log file. The saved log files along with captured screenshots and indoor marker files are saved to File explorer (see Chapter “File explorer” for more information).

### 5.10.96BTS information on a map

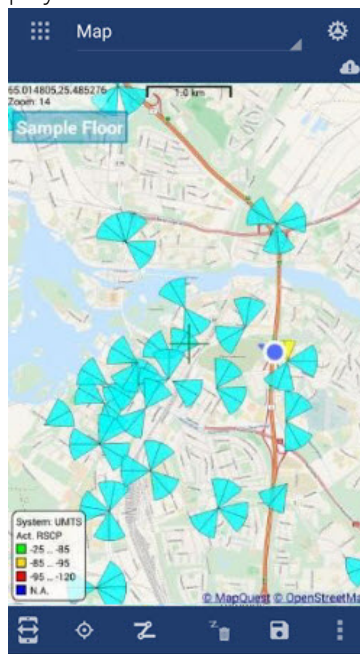
With Nemo Handy you can view BTS icons on a map. Open a map and go to **Menu** (  ) | **Settings** | **BTS**. Select **Show BTS** and define the color for active system BTS icons, other BTS icons, and active cell.


Select a BTS file and select **Use BTS file**. If you wish to see detailed information about the individual cells, tap the **Cell info** item and select the information to be displayed.

A map with the BTS site icons is displayed. During measurement, the BTS that the measurement device is connected to is highlighted with the color that you selected for Active cell in the Outdoor settings page.

**NOTE**

The terminal needs to have a GPS fix and the zoom factor needs to be at least 8 before the BTS icons are displayed.

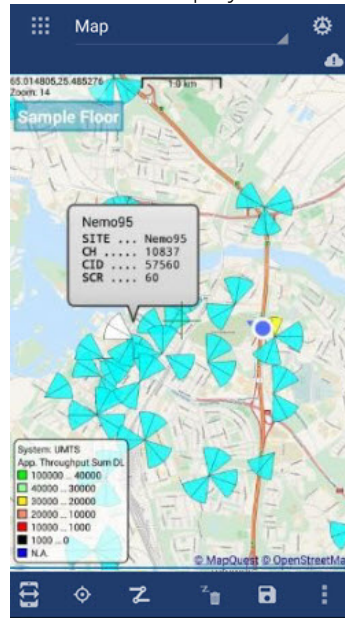


To display BTS focus button  in the map, **Show BTS** in Map Settings must be selected. Tapping the BTS focus button adjusts zoom level automatically to 13, which best displays BTS icons on the map, and focuses map to the location of BTS icons.

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To view information on individual cells, tap a BTS icon, and from the Select sector dialog box, select a sector.

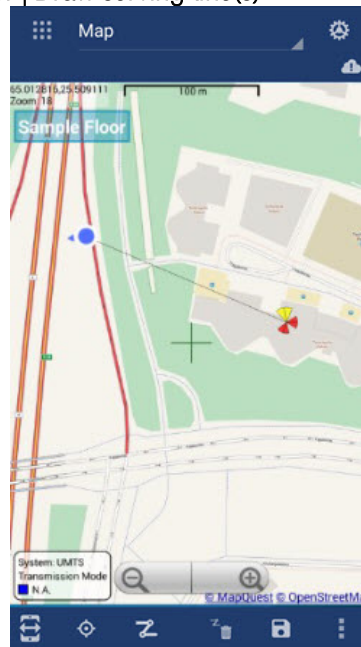
Cell information for the selected sector will be displayed on the map.



Select **Menu** | **Show BTS data** to view a list of all BTS sites in the current BTS file.

### 5.10.97 Line drawing on the map for serving cell

Nemo Handy supports line drawing to the serving cell BTS icon on the map. Line drawing can be activated from **Settings** | **Outdoor** | **Draw serving line(s)**.



## 5.10.98 Use case 1 – A map with route, BTS, and notification icons

This use case describes how to play back a measurement file on a map and to view BTS icons and notification icons on the map.

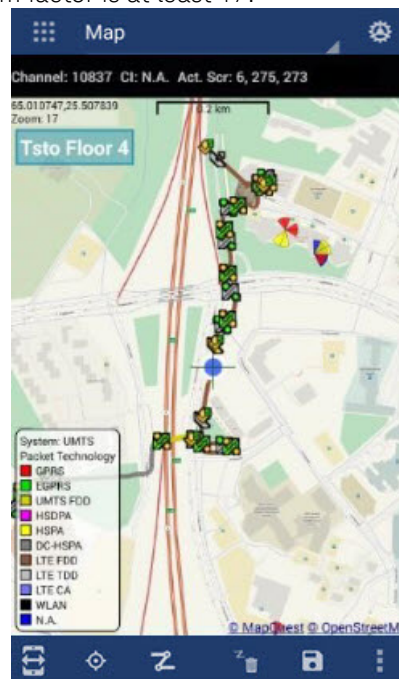
Select **Settings** | **Page settings** and make the map page visible. Go to **Settings** | **Map**, select **On** for the Show notification icons on map option and **Always** for the Draw route option.

Make sure that you have a GPS connected to the system or use the terminal's internal GPS.

Select **Settings** and go to the GPS page. Select a GPS in the **GPS source** field.

Next, select the BTS file. Select **Settings** and go to the BTS page. Select a BTS file, and select the **Use BTS file** option. Make sure that the BTS file matches the SIM card you are using in the Nemo Handy terminal. They must from the same operator. Also, note that the BTS file needs to be from the same area where you made the measurement.

Close the Settings dialog box and go the map view. Select **Menu** | **File explorer**. Select a measurement file and select **Menu** | **Play**. Once the file has been loaded, the route and notification icons will appear on the map. If the BTS files are not visible, check that your terminal has a GPS fix and that the zoom factor is at least 17.




## 5.10.99 KML files displayed on a map


KML is an XML formatted language used by Google Earth, Google Maps, and other programs to allow geo-spatial data to be rendered. With KML, you can highlight routes, areas, such as network cells, clusters, etc. with shading coloring.

To create a .kml file from your data, visit

[https://developers.google.com/kml/documentation/kml\\_tut](https://developers.google.com/kml/documentation/kml_tut) for more information. You may also download a .kml file directly to your Nemo Handy device. Next, go to the Map view and tap the

Add layer icon (  ) located at the right-hand bottom corner of the map. The Add Layers page opens. Tap **KML** and Nemo Handy will automatically find every .kml file in the device and display them in a dialog box. Select a file from the list and the selected file will be drawn on top a map and zoomed to the correct location based on the coordinates defined in the .kml file.



Tap the Locate button (  ) to open the Locate layer dialog. To locate a kml layer, select a layer by tapping on the layer name, you can also remove a layer from the map by tapping the trash can icon in the Locate layer dialog. The locate layer button is useful when you have drawn many kml layers.

### 5.10.100 Site verification testing

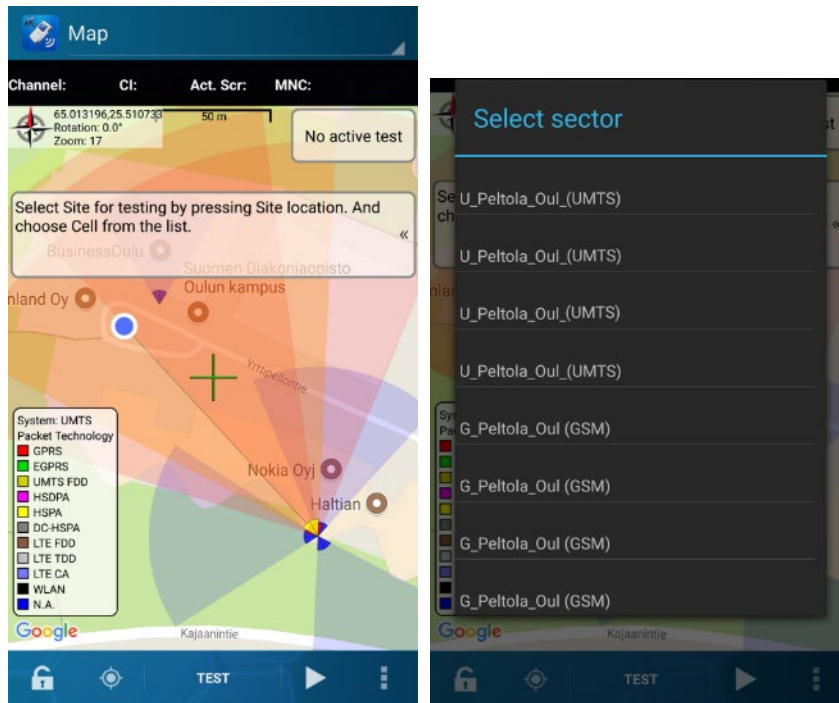
**NOTE**

Site verification testing is available only with the site verification license option.

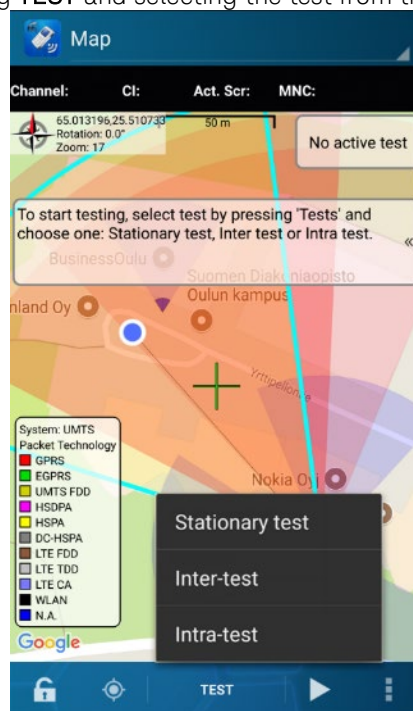
Site verification can be used for antenna health checks.

First, make sure you have a BTS file with range information included available in your Nemo Handy device. Next, in Nemo Handy, navigate to the Site Verification page and enable site verification test.

Navigate to the map view and select the site and sector for testing by tapping on the cell on the map. The map view displays instructions on the process.

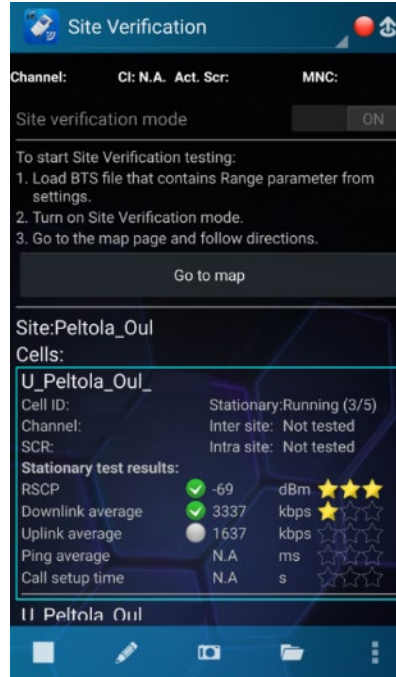


When the site is selected, the site cells filled on the list on Site verification page. The list contains all cells from the site and the system selected. Tap **Mark cross feeder** to mark current selected cell to cross feeder problem. Tap **Unmark cross feeder** to unmark current selected cross feeder problem cell. The marked cross feeder cells are shown on the Site verification page in red. Select the test type by tapping **TEST** and selecting the test from the popup menu.



Follow the instructions on the screen to perform the test. There are three main tests: stationary, inter-site, and intra-site.

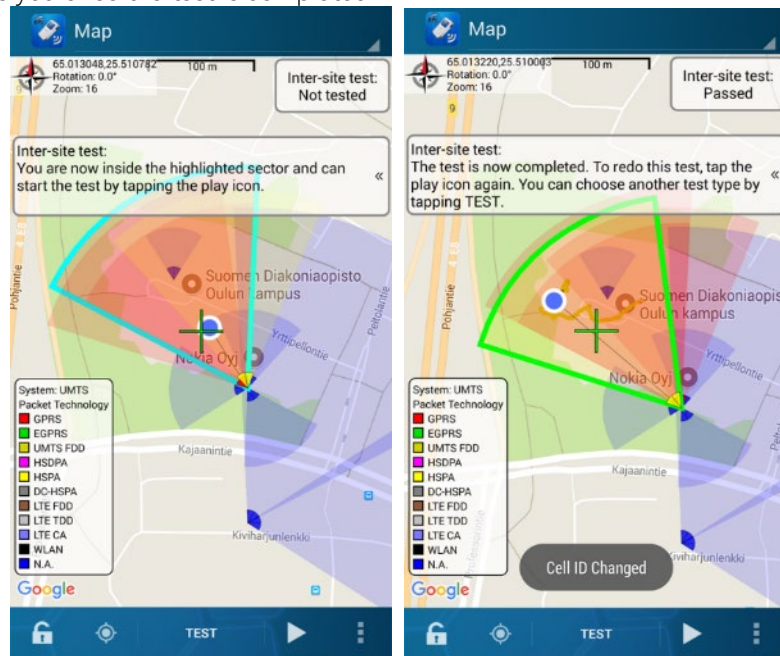
Stationary test is performed to one BTS cell on that specific location. Stationary test includes signal strength, signal noise ratio (LTE only), transfer test (both for uplink and downlink), ping, and call test. The test succeeds when all the separate test types (call test, data transfer test, and ping test) activated in **Settings | Site verification** are tested successfully without even one of the selected test types failing. The progress of the stationary test can be monitored on the Site verification page.



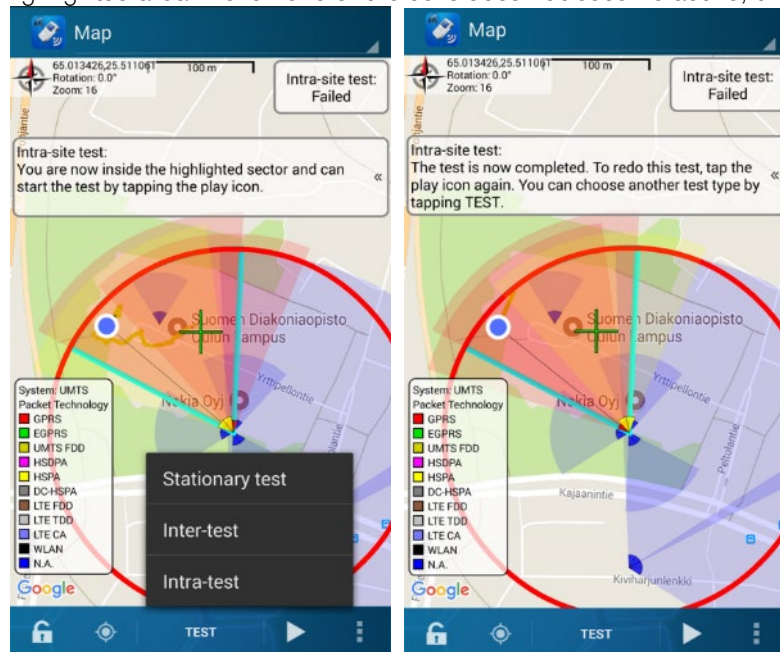
To perform the stationary test, select the cell, and physically go to the area highlighted on the map. Once you are inside the highlighted area, Nemo Handy instructs you to start the test. You need to stay inside the marked area for the duration of the test. Nemo Handy informs you once the test is completed.



Inter-test is for testing cell handovers between two cells by using a voice call test. When performing inter tests, follow the instructions on the map view. To perform inter-test, select the cell, and physically go to the area highlighted on the map. Once you are inside the highlighted area, Nemo Handy instructs you to start the test and on how to proceed with the test. Nemo Handy informs you once the test is completed.



Intra-test tests every cell displayed on the map. To perform the intra-test, select the cell, and physically go to the area highlighted on the map. Once you are inside the highlighted area, Nemo Handy instructs you to start the test. Start the test and follow the instructions displayed on the Nemo Handy user interface. The test is passed if all the cells change to active state when you enter the highlighted area. If even one of the cells does not become active, the test fails.



Backup files are created for all main test results for each site cell, and these files are saved until the PDF report is created. These backup files are in the Nemo/Handy/SiteVerification folder in

the phone's external storage. The backup files are overwritten only when the corresponding tests are redone and only the latest test results are saved. This means that the Site Verification test does not need to be done in one go.

The tests can be aborted by tapping the stop icon.

When the tests are finished, you can create a PDF report of the test results by tapping **Menu | Create report**. The PDF report is saved in the Results folder. If you need to abort the report creation, do not remove the backup files from Nemo Handy before you have successfully created the report another time.

### 5.10.101 Navigation Assistant

The Navigation Assistant feature in Nemo Handy provides turn-by-turn navigation for drive testing. The feature requires a TomTom Bridge device and Nemo Cloud for creating measurement routes. This section introduces this functionality on the Nemo Handy and Navigation Assistant side. For instructions on how to create routes in Nemo Cloud and assign them to Nemo Handy, see the Nemo Cloud User Guide.

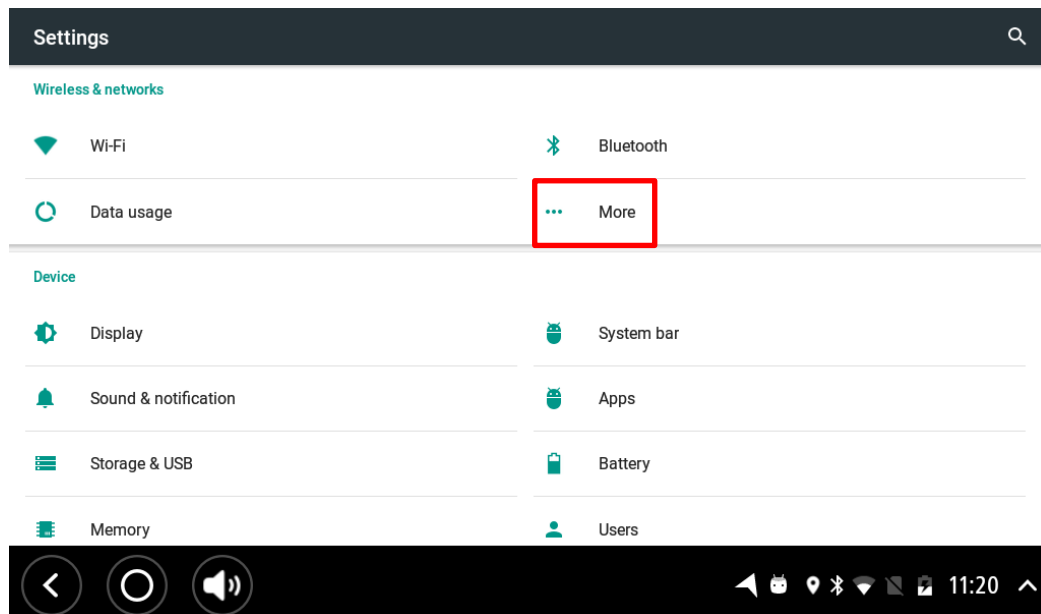
#### NOTE

You must enable Automated testing from general settings (**Settings | General**) when using Navigation Assistant.

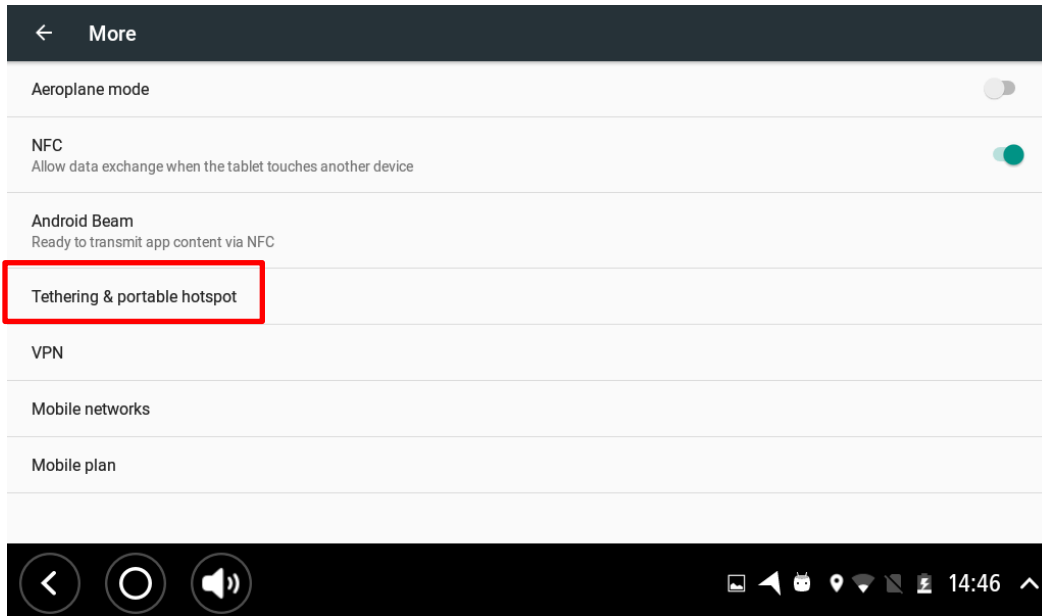
#### WARNING

Do not configure the navigation device or Navigation Assistant while you are driving for traffic safety reasons.

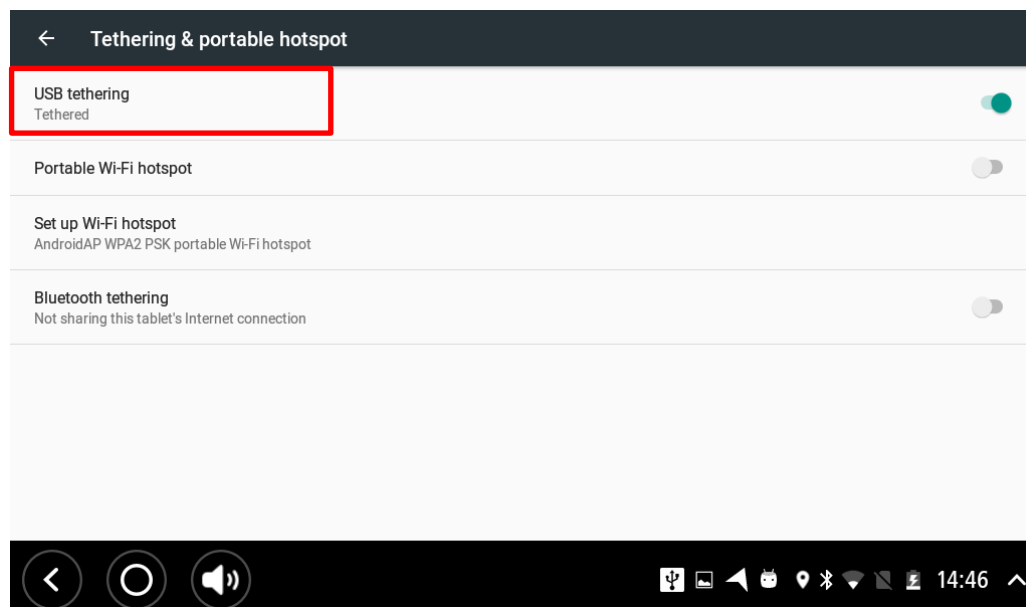
1. Install the latest version of Navigation Assistant to your TomTom Bridge device (refer to chapter "Updating Navigation Assistant software").
2. On the TomTom Bridge device, enable USB Tethering. Select **Settings - Wireless & networks, More**.



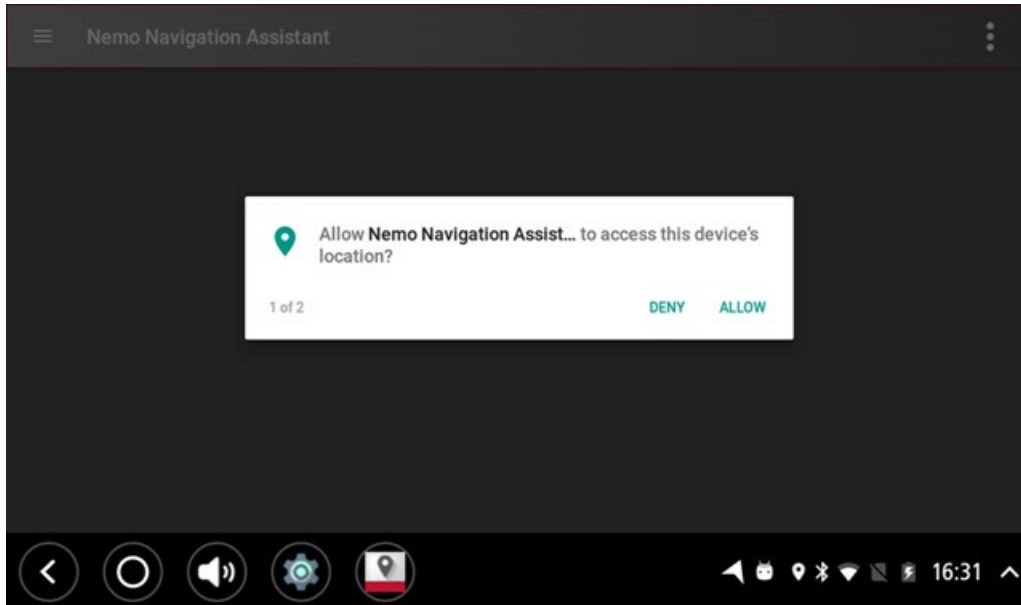
3. Select **Tethering & portable hotspot**.



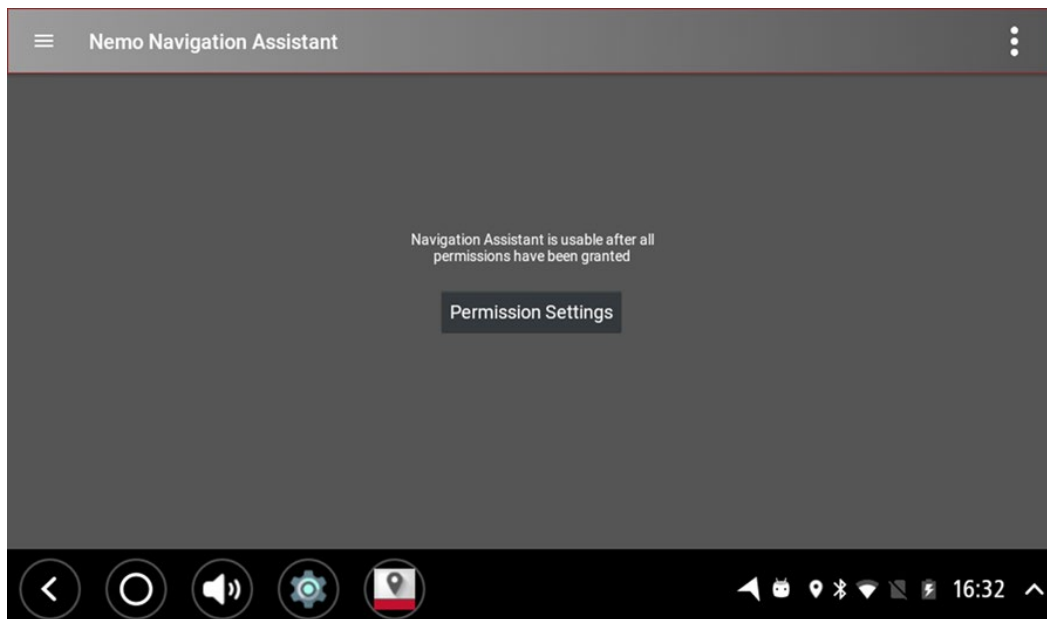
4. Select **USB tethering**.



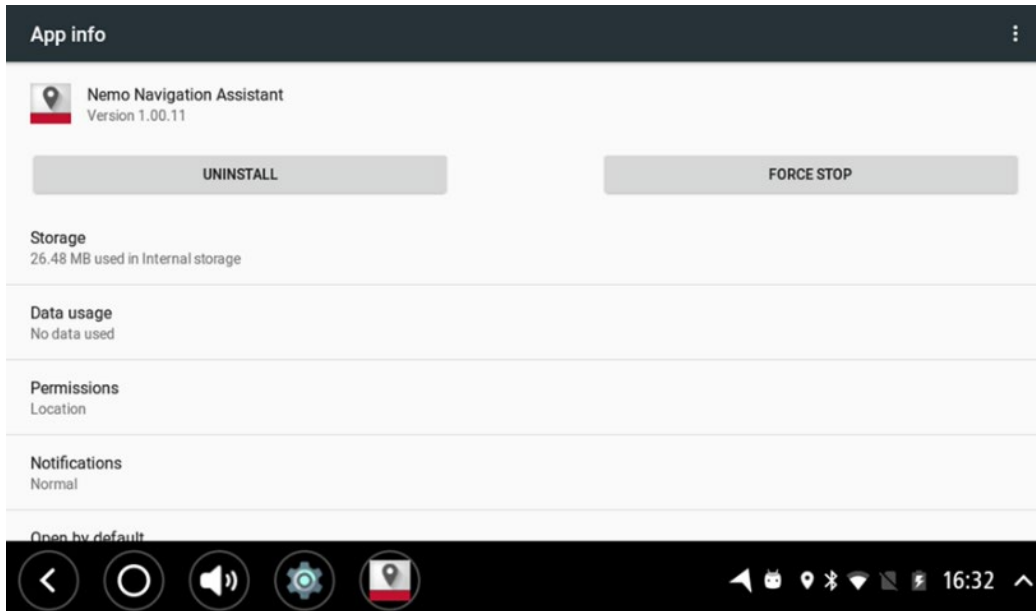
5. Once USB tethering is enabled, connect the TomTom device with a USB cable to the Nemo Outdoor laptop.
6. Start the Nemo Navigation Assistant on the TomTom Bridge device.
7. When the Navigation Assistant is started for the first time, the device will ask for permission to access the device's location and files. You will need to allow all access to the Navigation Assistant. Otherwise the feature will not work. Tap **Allow** and **Allow**.



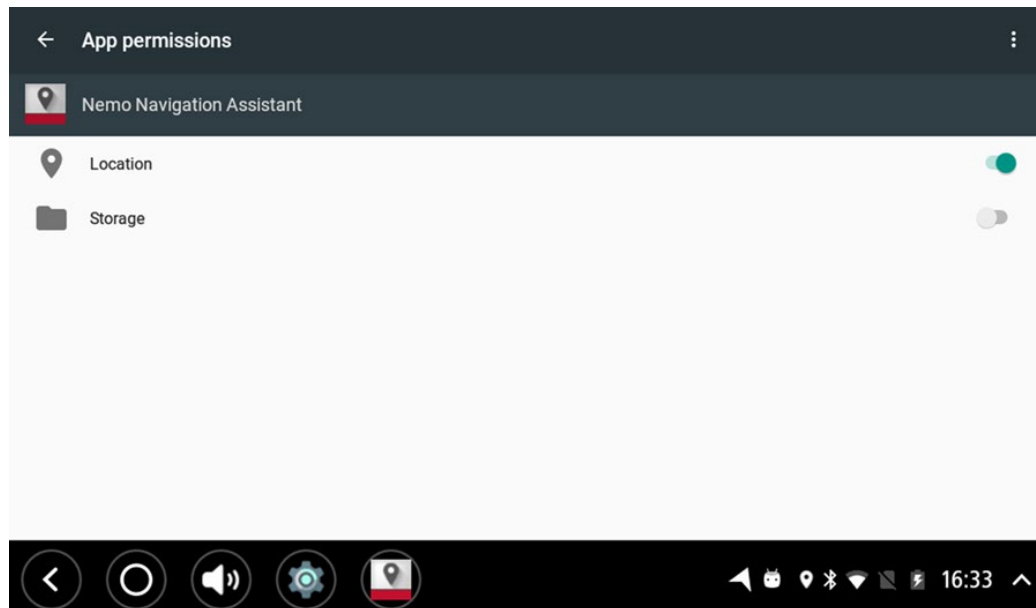
8. Tap **Permission Settings**.



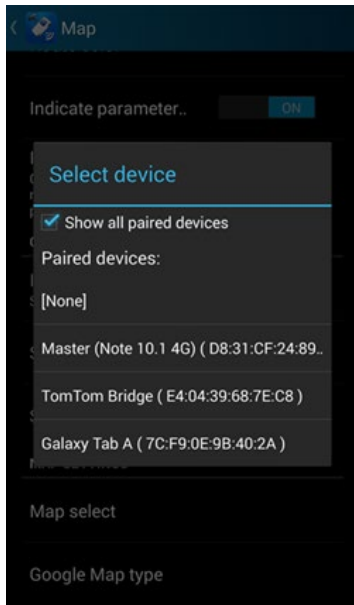
9. Tap **Permissions**.



10. Allow access to location and storage.




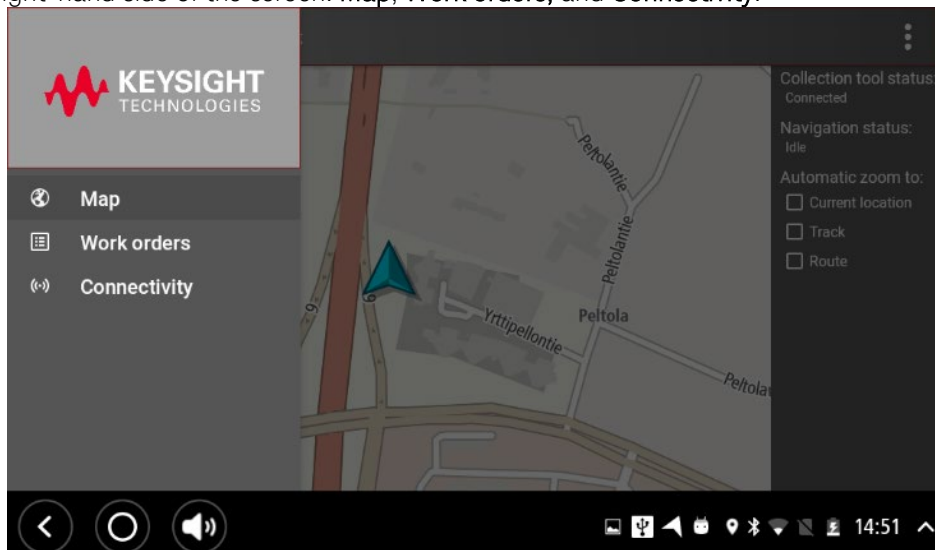
11. Once the navigation assistant starts, tap the button in the upper left corner and select **Connectivity**. Check that *Connection type* is **WiFi**. *Connection status* should display *Waiting for WiFi connection*.
12. Pair Nemo Handy and the navigation device via Bluetooth.
13. In Nemo Handy, go to **Settings | Map | Select Nemo Navigation Assistant**, and select the navigation device you paired with the Nemo Handy device. If the device you have paired does not appear in the list, tap **Show all paired devices**. The device you selected is displayed in Map settings under *Select Nemo Navigation Assistant*.




14. Make sure you are logged into Nemo Cloud through the Nemo Cloud Settings (**Settings | Nemo Cloud**). If you have assigned the Nemo Handy unit to a project in Nemo Cloud, the route is transferred to the Navigation Assistant on the navigation device automatically from the Nemo Handy device. See for example Chapter “Nemo Cloud work orders” for more information).
15. Go to the map view of the TomTom Bridge device and select **Start Measurement**. Nemo Handy starts measuring.
16. When the test drive is finished, select **Stop Measurement**.

#### 101.5.10.1 Using Navigation Assistant


The Navigation Assistant view has three pages that can be accessed by tapping  on the upper right-hand side of the screen: **Map**, **Work orders**, and **Connectivity**.

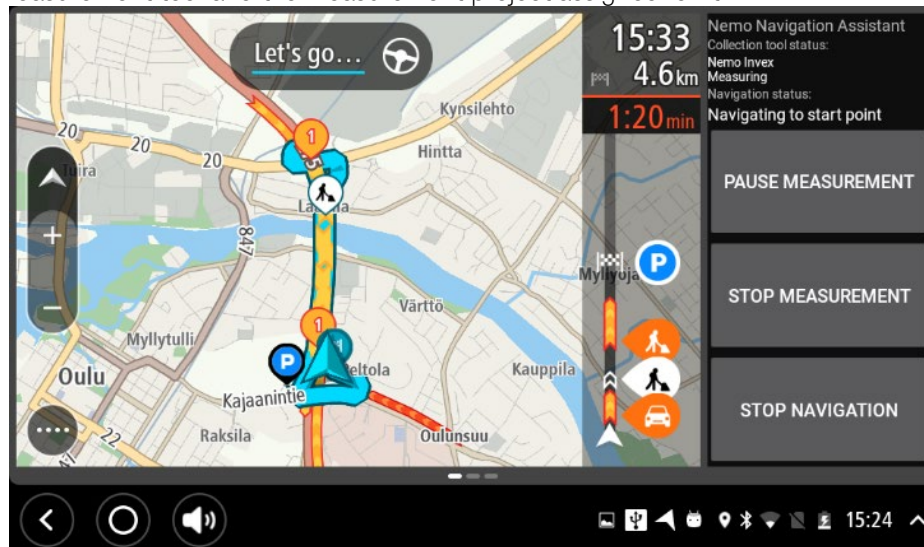


*Map* page displays a map from the navigation device’s navigation system and the measurement route. On the right, you can see the Navigation Assistant widget that displays information about, for example, if the Nemo Handy unit is connected to the navigation device.

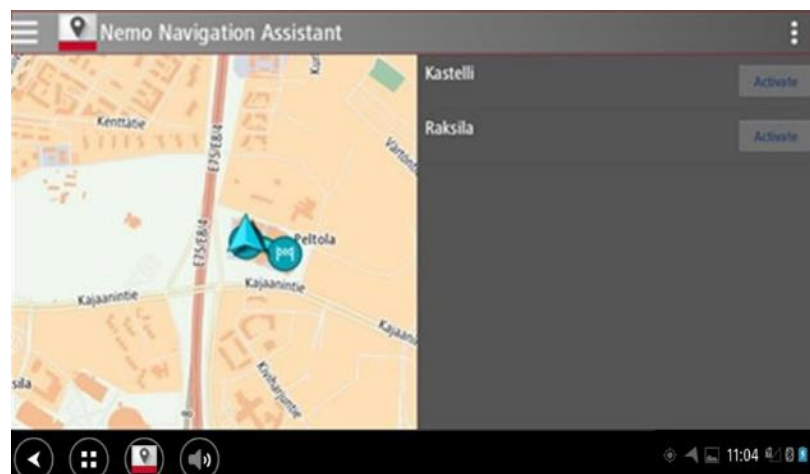
With the jump-to-route button , visible in the selection bar, you can start the measurement route from a location that is not the starting point of the route. Tap the button to display a slider that you can use to select the starting point. This functionality is particularly useful when a measurement route cannot be driven through, for example, because of a roadblock.


*Work orders* page displays the work orders sent from Nemo Handy or Nemo Cloud. *Connectivity* page displays the connection status and type of the navigation device.

Tap the Navigation button  on the selection bar to display the Navigation view. The assigned route is shown on the map and the Nemo Navigation widget displays information regarding the paired measurement tool and the measurement project assigned for it.



Project information is displayed in the Nemo Navigation Assistant view in the navigation device. You can start measurements straight from this view. In the example below, the Nemo tool has been assigned with two work orders, *Kastelli* and *Raksila*, from Nemo Cloud, and these two work orders are displayed on the Nemo Navigation Assistant application.



You can select which work order to activate by tapping the Activate button visible on the right side of the view. Once you have activated the work order, the route configured to that work order is displayed on the map. Tapping the jump-to-route icon  in the selection bar takes you back to the navigation view in the navigation device.

Alternatively, go to Nemo Handy and select a work order by clicking **Activate**.

If you are not in the location where the measurement route is set to begin, the navigation device will first guide you to the start point of the measurement route. Tapping **Enable Auto-Start** will automatically start the measurement once you have reached the starting point of the measurement route. You can also start the measurement manually by tapping **Start Measurement** on the Nemo Navigation Assistant widget.

Follow the directions of the navigation device through the route. The start of the route is indicated with a round icon and end of the route with a flag. When you are at the end-point of the measurement route, the navigation device informs you that you have reached the end of the route, and navigation is stopped. The navigation status changes to idle and a button that you can download the route again is shown. You can stop the measurements by tapping **Stop Measurement** on the Nemo Navigation Assistant widget.

When measurements are ready, the field units send the log files for post processing. The collected data can be directly analyzed with Keysight's Nemo post-processing tools.

#### 101.5.10.2 Updating Navigation Assistant software

1. First, you need to change the security settings of the TomTom Bridge to allow it to accept applications from an unknown source. Go to Settings -> Security -> Unknown sources. Make sure the checkbox next to this is selected.
2. Connect the TomTom Bridge to your computer using the USB cable supplied with your device, then switch your device on.

#### NOTE

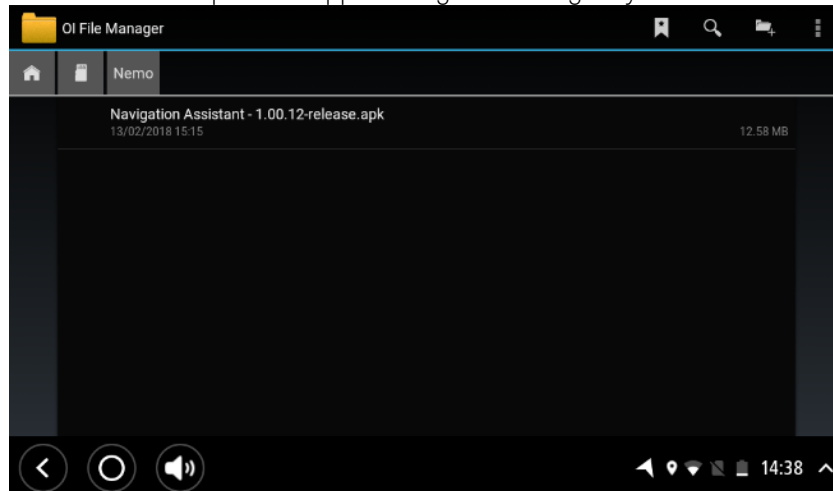
Use ONLY the USB cable supplied with your device. Other USB cables may not work. Also, plug the USB cable directly into a USB port on your computer and not into a USB hub or USB port on a keyboard or monitor.

#### NOTE

Do not use the mount to connect your device to your computer.

3. On your computer, open a file manager program.
4. Your device appears in your computer's files system as TomTom Bridge.
5. Copy Nemo Navigation Assistant APK File from your computer to a folder on your TomTom device.
6. If your TomTom device does not have a file manager app, go to the Bridge Store and install an app (e.g. OI File Manager). Go to All Apps and start the OI File Manager app.

- Find the APK file and tap it. The app will begin installing on your device.




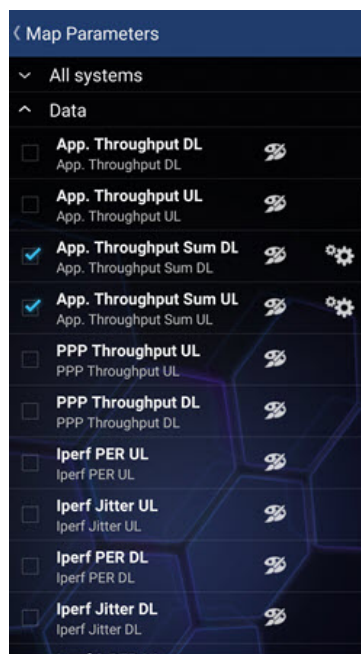
- Disconnect the device from your computer.

## 5.11 Defining route parameters

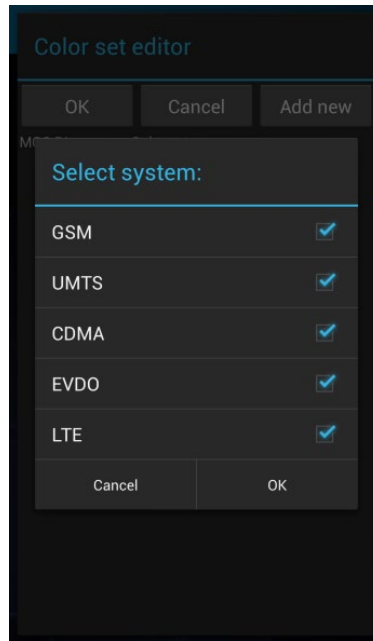
You can create custom color sets for various network parameters. These parameters can be viewed on a map.

Select **Settings** | **Map** and select **Map parameters**.

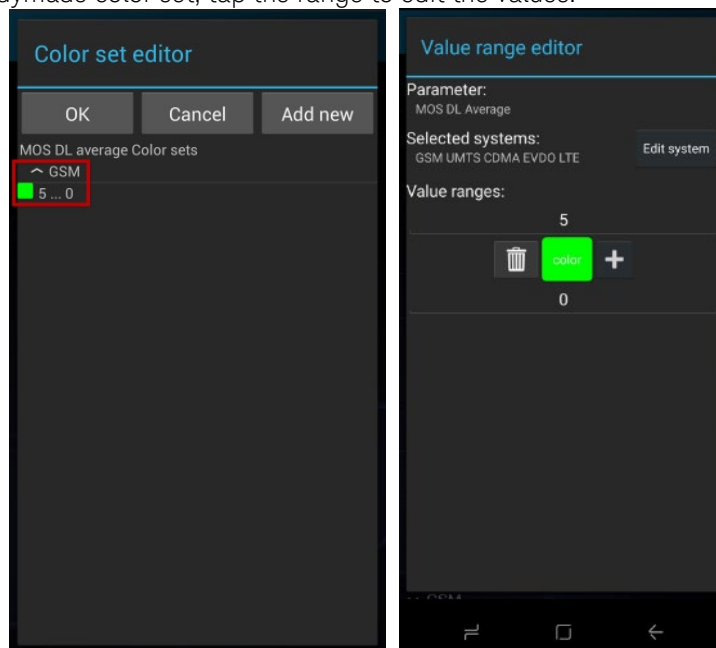
You will see a list of available technologies. Tap on a technology and a second-level list of parameters opens. Select a parameter by tapping the checkbox next to it. Next, tap the color set icon (  ).



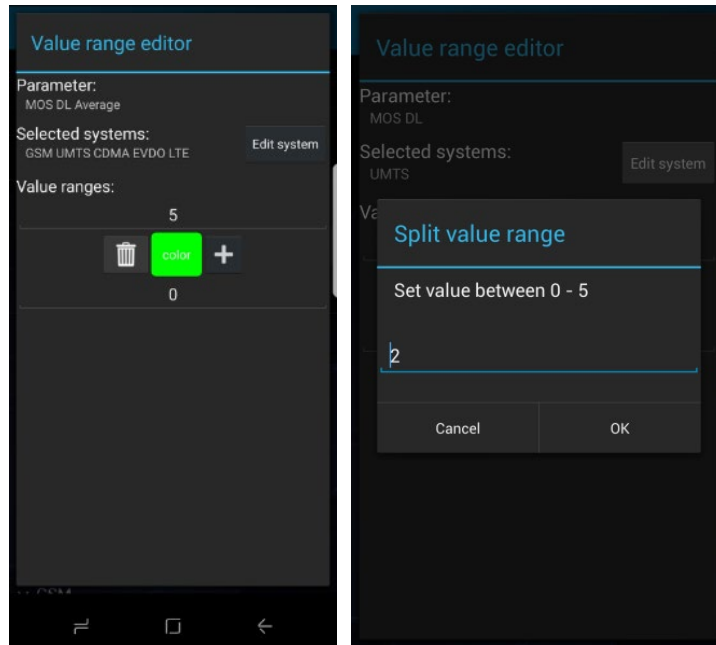
First, select the technology for which the parameter should be displayed by tapping **Add new** in the Color set editor. Note that all parameters are not available for all technologies.



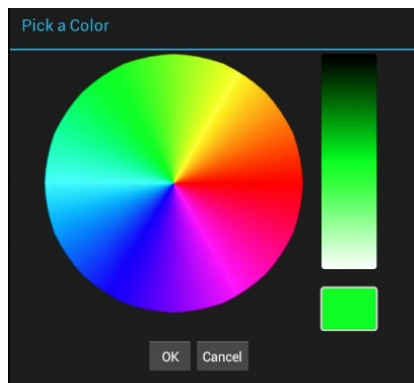
If there is no readymade color set, tap the range to edit the values.



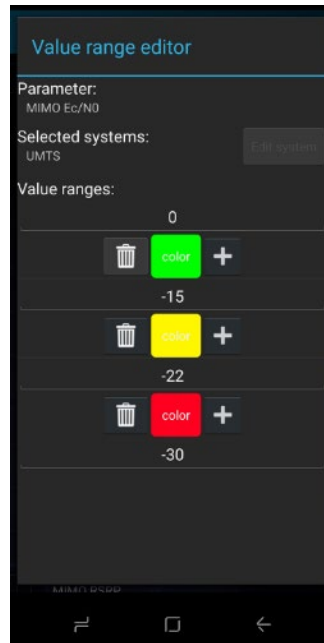
The *Value range editor* displays the minimum and maximum values of the selected parameter. These values cannot be edited. Add a parameter value by tapping the + button. The value can be anything between the min and max value. Just tap the value field and type in a new value. Tap **OK** and the value is added in the Value range editor.



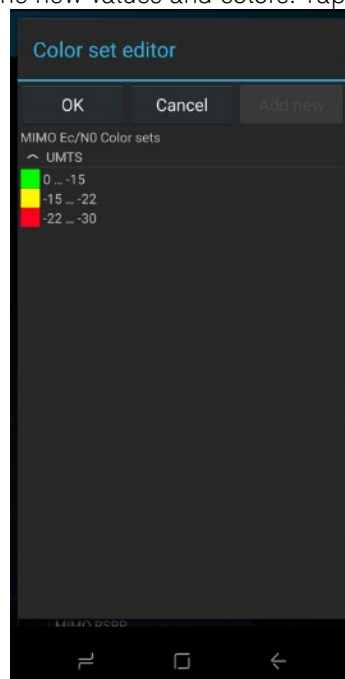
Define a color for the value by tapping the color field below the value. Pick a color from the circle and tap OK.




In the example below, values 0- -15 are colored green, values -15- -22 orange, and -22- -30 red.  
After you have defined all values and colors, tap the Back button.




The Color set editor will display the new values and colors. Tap **Ok** and **Save**.





To see the available color sets, switch between parameters by tapping  on the toolbar.

## 5.12 File explorer

Log files, captured screenshots, and indoor map markers are saved to File Explorer that can be found by selecting **Menu | File Explorer** or by tapping the file explorer button .

File explorer displays a list of various Nemo Handy-related files. The contents can be filtered by selecting/deselecting the configs, maps, results, and scripts items at the top of the screen. You can also tap the search icon and tap the filter button, type a filter text and the list will display items that match the filter. The list can be organized by selecting **Menu | By Name/Size/Date**. An

icon in front of the logfile details shows whether the logfile was saved on internal  or external  SD card.

- *Cloud* lists files copied to Nemo Cloud
- *Configs* lists Nemo Handy configuration files (.xml)
- *Maps* lists map image files (.bmp, .jpg), MapInfo tab files (.tab), and route plans (.rpf)
- *Results* lists log files (.nmf), screenshots (.png, .jpg), and marker files (.mrk). Tap **Logs only** to display only the .nmf files. Tap **Scrshot only** to display screenshots only.
- *Scripts* lists Nemo Handy script files (.nsf)

To delete files from the File Explorer, select files by selecting a file and tapping **Menu | Remove**. To remove all files at once, select **Menu | Select all** and then **Menu | Remove**.


To play back measurement files, select a file from the list and select **Menu | Play**. For more information on playback, see Chapter “Playback”.

To rename measurement files, select a file from the list and select **Menu | Rename**.

To copy measurement files, select files by tapping on the checkbox next to the file and select **Menu | Copy**.

You can also upload measurement files through the File Explorer on an FTP server. Select a file and select **Menu | Upload**. For more information on uploading measurements on an FTP server, see Chapter “Uploading log files on server”.


## 5.13 Playback

To play back measurement files, open the File Explorer by tapping the File Explorer button () on the toolbar. Select a file from the list by tapping the checkbox next to it and select **Menu | Play**.

Nemo Handy will load the file and start the playback. The playback controls will appear at the bottom of the view. You can hide and display them by tapping the Playback icon in the toolbar. With the **+** and **-** controls you can adjust the playback speed. You can also **Pause** and **Resume** the playback. With the slider in the middle you can scroll to a specific point in the measurement. The Notification History view can also be used to jump to a specific point in the measurement. Tap a notification and select **Jump to notification time**. The playback will jump to the point where the notification occurred.

To end the playback, tap the **Close playback** icon () .

## 5.14 Copying files

To copy measurement files, open the File explorer by tapping the File Explorer button () on the toolbar. Select a file from the list by tapping the checkbox next to it and select **Menu | Copy**. Enter filename in the opening dialog and tap **OK**.

If your Nemo Handy device is logged to Nemo Cloud, you can to select whether the files are copied locally or into Nemo Cloud.

*Local* enables you to copy files locally in your Nemo Handy device. With local copies, you can select the destination for the copied selected file(s) from a list of options.

Select the destination for the copies by tapping on your selection. The file(s) you selected are copied in the destination folder.

If you select to copy the selected files to Nemo Cloud, tap **Cloud** and you can select the destination folder in Nemo Cloud.

Select the destination for the copies by tapping on your selection. The file(s) you selected are copied in the destination folder.

You can view files copied to Nemo Cloud through the **Cloud** button in the File explorer view.

## 6 Nemo Handy measurement views

Below are presented the various measurement views available in Nemo Handy. Subset of the available pages is visible by default. Full list of Views, and ability to hide/show individual pages is available at **Settings | Page settings**.

To create a new page, select **Settings | Page settings**, tap **New page** at the bottom of the dialog box and select a page from the existing pages list. Name the page and add or create splits if you wish. Tap the menu icon at the top-right of the screen to select how pages are sorted (All visible/A-Z/Non-alphabetical/Reset to default).

The scales in the bar and line graphs will change according to the selected parameter. Selected parameter can be changed from the Parameter menu that opens by tapping and holding on the value of a parameter on chart legend. You can also add and hide default parameters from existing graphs to existing views. Select **Settings | Page settings, select a page to open**

You can browse through the different pages by dragging your finger horizontally across the screen. If a page has several views, you can move between the views by dragging your finger vertically across the screen.

To jump to a specific page, tap the title bar of a page (top of the page) to open the Jump to page dialog box. From the list, tap a page to move the view to that page. Scroll up and down by dragging your finger vertically across the dialog box.

It is also possible to split screens by selecting **Settings | Page settings** and selecting from the list the page you want to split. A dialog box of the view opens. Tap **Add split** and select a page from the Select pages list. You are also able to select a smaller split if you wish by selecting the **Small splits** option, with which the split is about a third of the screen whereas a normal split is half of the screen. To remove split, tap the trash can button.

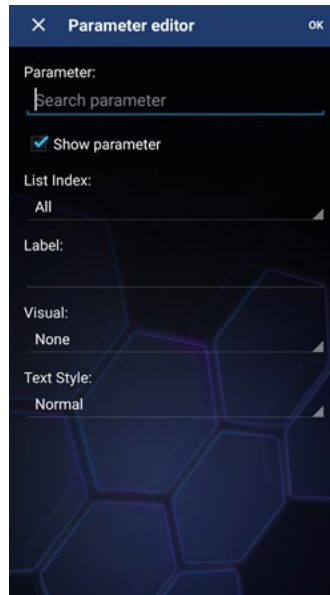
From the same dialog box, you are able to hide and make visible pages by selecting/clearing **Show page**.

From the Page settings menu it is also possible to add new pages, make all pages visible, or reset pages to default state.

To jump to a specific page, tap the title bar of a page (top of the page) to open the Jump to page dialog box. From the list tap a page to move the view to that page. Scroll up and down by dragging your finger vertically across the dialog box.

### 6.1 Parameter menu

Through the Parameter menu you can edit the appearance of data views. Parameter menu is accessed by tapping and holding on the parameter value. and selecting **Parameter settings** from the dialog box. Select the parameter you wish to edit a from a list of available parameters to open the Parameter editor. Please note that the content of the menu depends on the view type (line, text, and so forth).



### 6.1.1 Set scale

Select **None**, **Left**, or **Right** to set the selected parameter active and to define whether the scale displaying the values for the selected parameter is displayed on the left of or on the right side of the display. Select **None** to hide an individual parameter. Tap **Save** to save the changes in the configuration file.

### 6.1.2 Auto scale

#### NOTE

Note that you can define the scaling individually for each parameter in the line graph.

Select **None** and the scales return to normal.

Select **High** and Nemo Handy changes the scales and zooms in on the view so that the line is at the top of the graph and the minimum value is at the bottom of the scale. The symbol changes to ↑.

Select **Low**, and Nemo Handy changes the scales and zooms in on the view so that the line is at the bottom of the graph and the maximum value is at the top of the scales. The symbol changes to ↓.

Select **Both** and Nemo Handy checks the minimum and maximum values for the graph from the visible area and zooms in on the view so that the line is in the middle. The ↑↓ symbol appears next to the parameter name at the top of the view.

Tap **Save** to save the changes in the configuration file.

### 6.1.3 Number format

Select the number format (decimal, hexadecimal, or octal).

Tap **Save** to save the changes in the configuration file.

## 6.2 Status view



*Logging status* displays the current recording status.

*Log file size* displays the size of the measurement file in bytes.

*Log file name* displays the measurement file name.

*Log file path* displays the location where the measurement files are stored on the memory card.

*Free storage* displays the available storage in the internal memory.

*Free memory* displays the current amount of free RAM.

*Heap size* displays the amount of memory that Nemo Handy currently occupies in the operating system.

*Battery temp* displays the battery temperature.

*Script status* displays the current status of the script.

*Script file* displays the name of the script file.

*GPS status* displays the status of the GPS receiver.

*IMEI* displays the International Mobile Equipment Identity (IMEI) number of the mobile terminal.

The IMEI number is used by the GSM network to identify valid devices.

*IMSI* (International Mobile Subscriber Identity) displays a unique number associated with all GSM and UMTS network mobile phone users. It is sent by the phone to the network.

*System lock* displays the system lock status.

*Band lock* displays the band lock status.

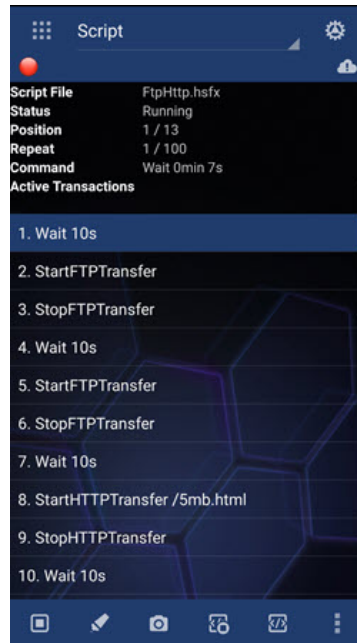
*GSM BCCH Lock* displays the GSM BCCH lock status.

*WCDMA Cell Lock* displays the WCDMA cell lock status.

*LTE Cell Lock* displays the LTE cell lock status.

*APN, PDP Type, Interface, Address, Gateway, DNS, NSAPI* display information about the current access point.

## 6.3 Script view



*Script file* displays the name of the script file.

*Status* displays the current status of the script.

*Position* shows the current position in the script

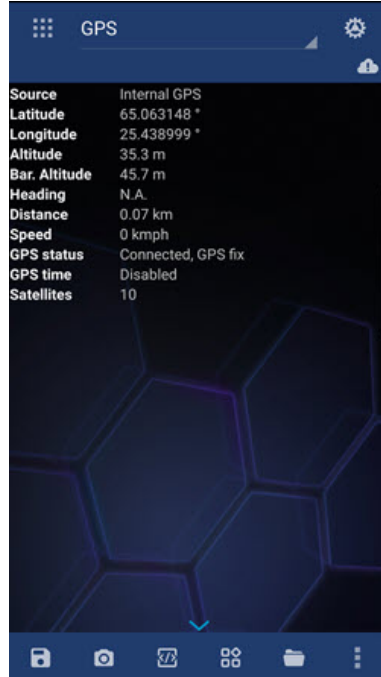
*Repeat* displays how many times the script is repeated and the ordinal number of the current repeat.

*Command* displays which script command is currently running.

*Active transactions* displays the active transactions taking place.

*Script commands* displays the script commands of the script file.

## 6.4 GPS view



The GPS view is available only if the license supports a GPS.

To display GPS view, go to **Settings | Page settings | GPS**, select **Show page** and tap the Back key of the device.

*Source* defines the GPS source.

*Latitude/Longitude* displays the latitude/longitude coordinates.

*Altitude* displays the current elevation in meters.

*Bar. Altitude* displays the current barometric altitude in meters. Long press the value to open a menu. In the menu, tap **Reset** to reset the measurement and set a new point A. When moving up and down e.g. in stairs, the barometric altitude measures the relation between the point A and point B.

*Heading* displays the direction in which a person or vehicle is moving.

*Distance* displays the distance travelled from the starting point.

*Speed* displays the current velocity of the test unit in kilometres per hour.

*GPS status* displays the current status of the GPS, that is, if there is a fix.

*GPS time* displays the time from the GPS. This feature can be enabled and disabled by selecting **Settings | GPS | Use GPS time**.

*Satellites* displays the number of satellites currently visible.

*GPS status* displays the current status of the GPS, that is, if there is a fix.


*Speed* displays the current speed in km/h.

*Distance* displays the distance travelled from the starting point.

## 6.5 Notification history view

The notification history view displays a list of notifications and their timestamps.


To display the Notification history view, go to **Settings | Page Settings | Notification History**, select **Show Page** and tap the Back key of the device. To hide a notification, select it from the notification list by tapping, then select **Hide** from the opening dialog. Tap **OK** to confirm the selection. Clear notification list by tapping the **Clear Notification** button that appears when tapping and holding a notification.


You can use filters in the Notification view. Tap the **Filter** icon () to display a search bar and type in the desired filter(s). To use more than one filter at the same time, insert a space and select OR or AND and type in another filter. The new filter activates automatically, and new notifications are displayed in the view accordingly. If you erase the filter from the **Filter** text field, all signal messages are displayed on the view.

## 6.6 Map view

To display the Map view, go to **Settings | Page settings | Map**, select **Show page**, and tap the Back key of the device.


Select between Google Map and OpenStreetMap in **Settings | Map | Map select**. Both maps support the same functions.


Tap the *Lock map* () button to lock the map in its position while maintaining the possibility to scroll, rotate and zoom. This enables scaling, rotating, and moving the indoor map on top without accidentally moving the map. Tap the Lock map button again to lock the entire floorplan to disable zooming, and rotating. While the map is locked, *Go to GPS location*, *Go to building location* and *Go to address location* menu items are disabled. Tap the *Lock map* button for the third time to unlock the map and to enable the menu items.


You can zoom in and out by “pinching” the screen using two fingers (for example, thumb and index finger) to zoom in or zoom out when viewing a map. Tap  to focus on your current location.

Zoom level of the map can be also adjusted by using the zoom slider on the top of the screen. It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the screen indicates the cardinal directions, and tapping on the compass turns the map back into upright position.

Select a map location by tapping and holding your finger on top of a map to move the floorplan to the new location.

You can view the measured route with color-coded parameter values in real-time on live map. To observe different parameters, tap  or the text field displaying the parameters on the map.

The parameters and the related color sets are user-configurable. You can select whether GPS or inserted markers are used in marking the measurement route on the map: when the  icon is displayed, Nemo Handy uses GPS for route marking (recommended for outdoor measurements).

When the  icon is displayed, Nemo Handy uses inserted markers to mark the measurement route (recommended for indoor measurements). Tapping the displayed icon changes the mode into the other.

The Clear route icon () removes route markings from the map.

To display KML files on top of the Google maps, see “KML files displayed on a map”.

Indoor maps (floorplans) are viewed as layers on top of the map. To view floorplans, go to **Settings | Indoor**, where you can select between floorplans and iBwave maps to be uploaded as layers on top of the map.

The floorplan layers can be viewed one at a time on the map view by tapping and holding **Floor** on the upper left-hand corner of the map view.

Tap and hold the button to open the Select floor popup window and select a floor.

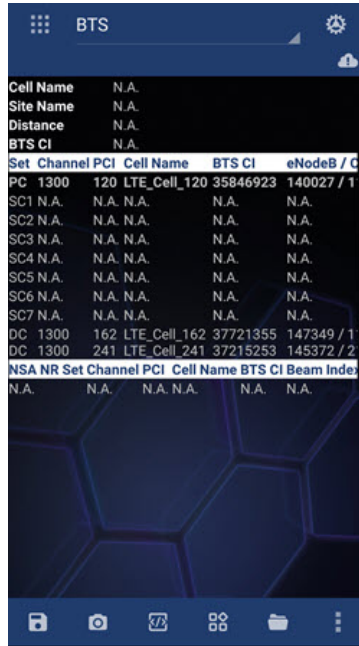
The floor you select is displayed on the map. To change the floorplan viewed, tap and hold the same button, now indicating the name of the current floorplan layer, and select another floorplan. See Chapter “Indoor measurements” for further details on indoor measurements.

It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the

screen indicates the cardinal directions, and tapping on the compass turns the map back into upright position.

To delete the indoor map layer(s) from the map view, go to **Settings | Indoor | Floorplan**, select the floor(s) to be deleted and tap **Delete**.

## 6.7 BTS view



Cell Name	N.A.
Site Name	N.A.
Distance	N.A.
BTS CI	N.A.

Set	Channel PCI	Cell Name	BTS CI	eNodeB / C
PC	1300	120 LTE_Cell_120	35846923	140027 / 1
SC1	N.A.	N.A. N.A.	N.A.	N.A.
SC2	N.A.	N.A. N.A.	N.A.	N.A.
SC3	N.A.	N.A. N.A.	N.A.	N.A.
SC4	N.A.	N.A. N.A.	N.A.	N.A.
SC5	N.A.	N.A. N.A.	N.A.	N.A.
SC6	N.A.	N.A. N.A.	N.A.	N.A.
SC7	N.A.	N.A. N.A.	N.A.	N.A.
DC	1300	162 LTE_Cell_162	37721355	147349 / 1
DC	1300	241 LTE_Cell_241	37215253	145372 / 2

NSA NR Set	Channel PCI	Cell Name	BTS CI	Beam Index
N.A.	N.A.	N.A. N.A.	N.A.	N.A.

To display the BTS view, go to **Settings | Page Settings | BTS**, select **Show Page**, and tap the Back key of the device.

*Cell name* displays the name of the active cell.

*Site name* displays the name of the active base station.

*Distance* displays the distance in kilometers to the active base station.

*BTS CI* displays the cell identity of the active base station.

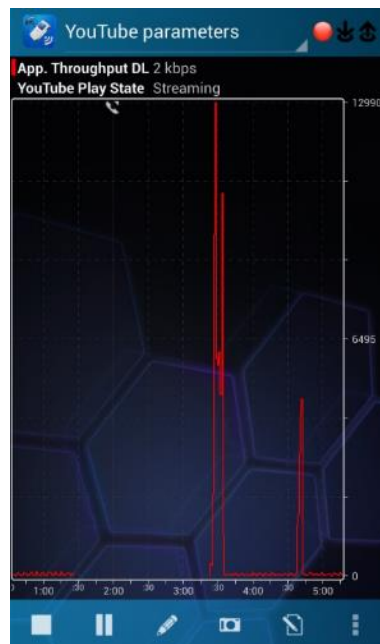
In LTE BTS view, the LTE Secondary Cells are also displayed alongside active and neighbor cells. The Cell IDs are taken from the BTS file.

## 6.8 YouTube view



In the YouTube view you can select to stream YouTube videos. See Chapter “Manual YouTube testing” for more information on YouTube testing.  
To display the YouTube view, go to **Settings | Page settings | YouTube**, select **Show page**, and tap the Back key of the device.

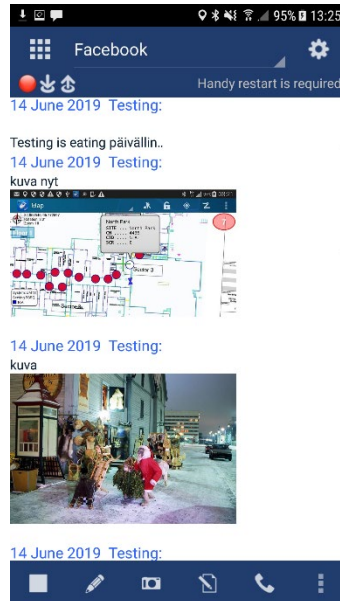
## 6.9 YouTube parameters view



To display the YouTube parameters view, go to **Settings | Page settings | YouTube parameters**, select **Show page**, and tap the Back key of the device.  
*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

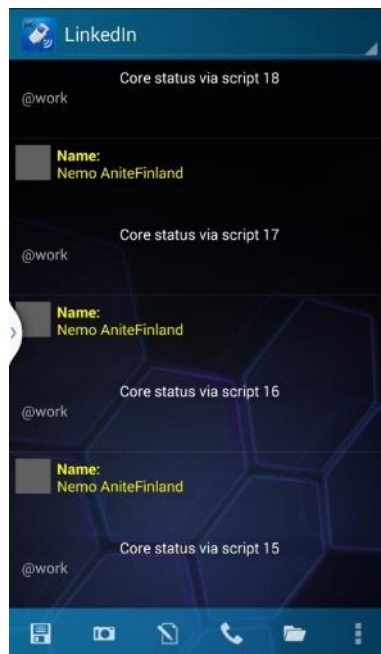
*YouTube Play State* displays the current state of the video streaming.

## 6.10 Facebook view



In the Facebook view you can view wall feed, posted status updates, photos, generated photos, and videos. See Chapter “Manual Facebook Testing” for more information on Facebook testing. To display the Facebook view, go to **Settings | Page settings | Facebook**, select **Show page**, and tap the Back key of the device.

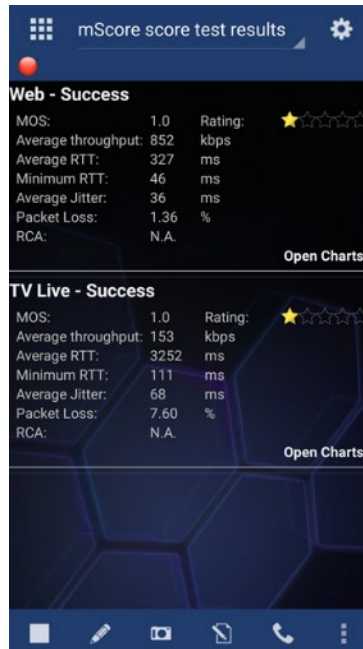
## 6.11 LinkedIn view



In the LinkedIn view you can view self feeds, loaded profiles, shared texts and URLs as well as loaded info. See Chapter “Manual LinkedIn Testing” for more information on LinkedIn testing.

To display the LinkedIn view, go to **Settings** | **Page settings** | **LinkedIn**, select **Show page**, and tap the Back key of the device.

## 6.12 mScore score test results view



mScore score test results view displays the following values: MOS (value also shown in five star rating bar), average throughput (DL), average RTT, minimum RTT, average jitter, packet loss percentage and Root cause Analyze (RCA). RCA can be "N.A.", "Device", "Congestion", "Core/Backhaul", "Server" or "Multiple Root Causes". The view also displays whether the selected test succeeded or failed, e.g. "TV Live – Success". Tap **Open Charts** to view the results of the performed test in graphs. Note that only score test results are displayed in this view.

See Chapter "Manual mScore testing" for more information on mScore testing.

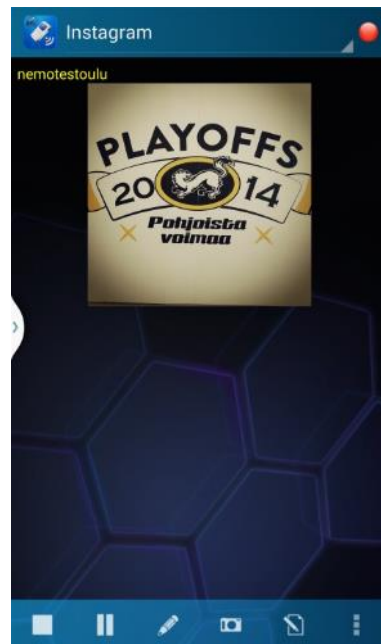
To display the mScore score test results view, go to **Settings** | **Page settings** | **mScore score test results**, select **Show page**, and tap the Back key of the device.

## 6.13 Twitter view



In the Twitter view you can view loaded homepages, profiles, followed tweets, texted tweets, and photo tweets. See Chapter “Manual Twitter Testing” for more information on Twitter testing. To display the Twitter view, go to **Settings | Page settings | YouTube**, select **Show page**, and tap the Back key of the device.

## 6.14 Instagram view



In the Instagram view you can view loaded home feeds and tag searches. See Chapter “Manual Instagram Testing” for more information on Instagram testing.

To display the Instagram view, go to **Settings | Page settings | Instagram**, select **Show page**, and tap the Back key of the device.

## 6.15 Statistics views

The statistics views display statistics for various measurement events. The statistics views display voice and video call related and application testing related statistics. To reset the statistics view, select **Menu | Reset statistics**. To save the current statistics to a .csv file, select **Menu | Save statistics**. The saved statistics can be found in Result folder. The file name format is Statistic\_date\_time.csv.

Statistics views include:

- Statistics (success rate statistics)
- Voice call statistics
  - Voice call
  - CSFB
  - SRVCC
- Video call statistics
- FTP statistics
- SFTP statistics
- HTTP statistics
- Dropbox statistics
- Browsing statistics
- Ping statistics
- SMS statistics
- MMS statistics
- IPerf statistics
- IPerf 3 statistics
- Facebook statistics
- Netflix statistics
- YouTube statistics
- Twitter statistics
- Instagram statistics
- LinkedIn statistics
- Speedtest statistics
- E-mail statistics
- mScore statistics
- WhatsApp statistics
- Viber statistics
- Handover statistics
- Signal level and quality statistics

## 6.16 Netflix parameters view

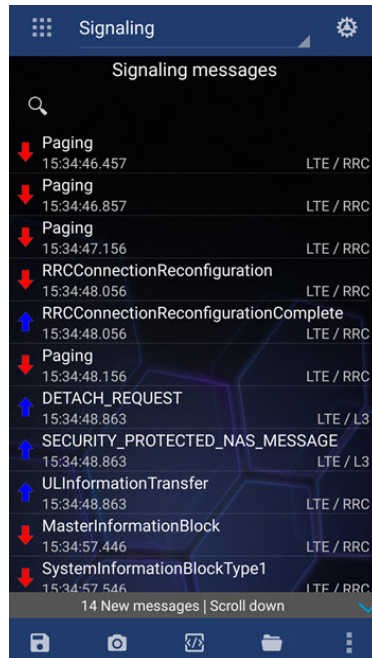
To display the Netflix parameters view, go to **Settings | Page settings | Netflix**, select **Show page**, and tap the Back key of the device.




*PEVQ-S MOS* displays the PEVQ-S MOS score.

*App. Throughput DL* displays the application throughput in downlink direction in kb per second.


## 6.17 Signaling view



Signaling messages view displays a list of signaling messages. Tap an individual message to view the timestamp for that message or L3 messages in decoded form. To return to the signaling main

view, tap  on the upper right corner of the message details view or anywhere on the touchpad.

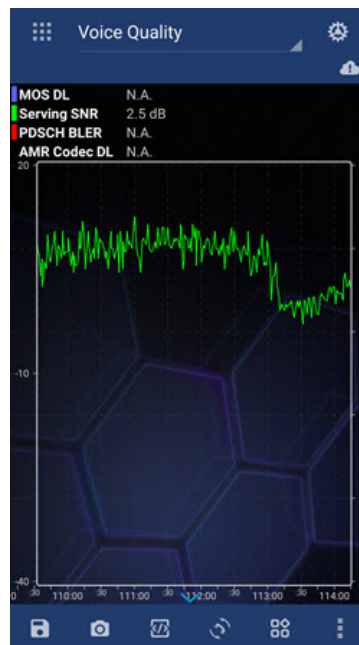
To hide a signalling message, select it from the signalling messages list by tapping and holding, then select **Hide** from the opening dialog. Tap **OK** to confirm the selection.

You can use filters in the Signaling view. Tap the **Filter** icon () to display a search bar and type in the desired filter(s). To use more than one filter at the same time, insert a space and select **OR** or **AND** and type in another filter. The new filter activates automatically, and new messages are displayed in the view accordingly. If you erase the filter from the **Filter** text field, all signal messages are displayed on the view.

## 6.18 Voice quality view

The Voice Quality view is available only if the license supports VQ measurements.

To display the Voice Quality view, go to **Settings | Page Settings | Voice Quality** and select **Show page**.

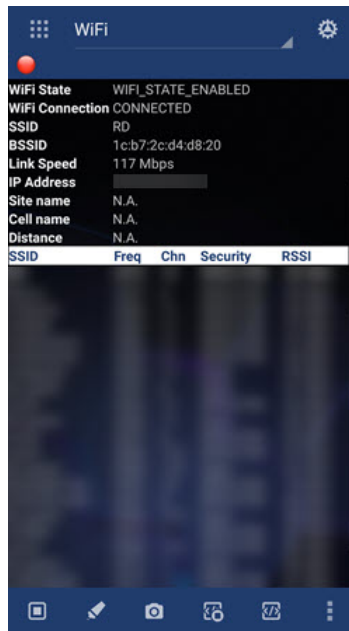


The voice quality view 1/2 displays the *downlink MOS score*, *Serving SNR*, *PDSCH block error rate*, and the *AMR mode in downlink direction*. Alternatives are 4.75, 5.15, 5.9, 6.7, 7.4, 7.95, 10.2, and 12.2.



The voice quality view 2/2 displays the MOS value distribution.

## 6.19 WiFi view



The WiFi view is available only if the license supports WiFi measurements. Activate WiFi scanning by selecting **Active WiFi Scanning** option (**Settings | General**) and select **Menu | Enable WiFi**.

*WiFi State* defines the current state of the WiFi network. The possible states are:

- WIFI\_STATE\_DISABLING
- WIFI\_STATE\_DISABLED
- WIFI\_STATE\_ENABLING
- WIFI\_STATE\_ENABLED
- WIFI\_STATE\_UNKNOWN

*WiFi Connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

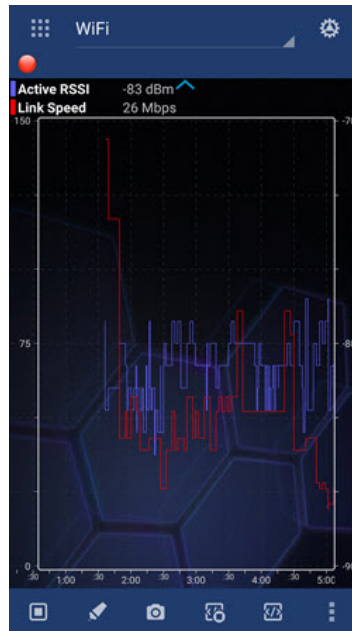
*SSID* displays the WLAN service set identifier.

*BSSID* displays the basic service set identifier, also known as WLAN MAC address.

*Link Speed* displays the maximum transfer rate in Mbit/s.

*IP Address* displays the current IP address.

The view also displays a list of available WiFi networks and the frequency, channel, security mode, and RSSI per network.



*Active RSSI* displays the RSSI value in dBm for the current WLAN network.

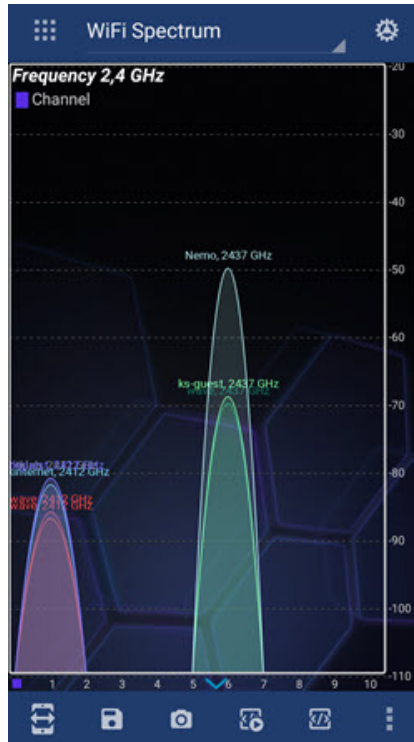
*Link Speed* displays the maximum transfer rate in Mbit/s.

**NOTE**

Note: When WiFi scanning is enabled, throughput will be limited due to scanning. Other processes, such as speedtest, may also be affected.

## 6.20 WiFi Spectrum view

The WiFi Spectrum view can be used to observe possibly overlapping channels and frequencies. To display the WiFi Spectrum view, go to **Settings | Page Settings | WiFi Spectrum** and select **Show Page**. The view consists of two pages, the first page for 2400 MHz and the second for 5000 MHz. Swipe down on the view to access the second page. Lock the view to scroll the page horizontally.

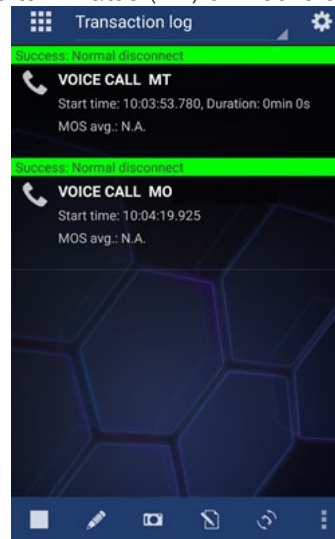


Channels are located on the x-axle.  
Signal strength is displayed on the y-axle.  
SSID is displayed over each line curve.

## 6.21 Transaction log view

To display the Transaction log view, go to **Settings | Page settings | Transaction log** and select **Show page**.

All transactions that can be made with Nemo Handy are shown in a log window, row per transaction, with key information, such as status (success/failure), average data throughput, and whether the voice call was mobile terminated (MT) or mobile originated (MO).





To clear the transaction list, select **Menu | Clear transactions**.

## 6.22 Nemo Cloud view

To display the Nemo Cloud view, go to **Settings | Page settings | Nemo Cloud** and select **Show page**. If you haven't logged into Nemo Cloud yet, you must do so by tapping Login Cloud in Nemo Cloud settings.

When logged in to Nemo Cloud, the Nemo Cloud view displays the username of the Nemo Cloud account, server address, the active project or work order (if received), and/or the unit name defined by the user in Nemo Cloud and or the unit ID (the IMEI of the Nemo Handy device), time of the last synchronization, and most recent activity.

Stop sync button (  ) manually stops file syncing to Nemo Cloud.

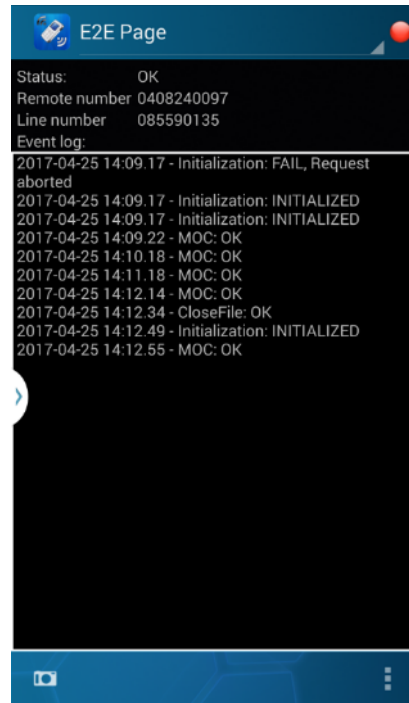
Event log button (  ) opens the Nemo Cloud Event Log view that displays the event history.

Logout button (  ) logs Nemo Handy out from Nemo Cloud.

When logged out from Nemo Cloud, the Nemo Cloud view displays the login settings. When logging in to Nemo Cloud, you can configure your Nemo Handy unit's Cloud settings either directly in the Nemo Cloud view, or through **Settings | Nemo Cloud**.

## 6.23 E2E view

To display the E2E view, go to **Settings | Page settings | E2E Page** and select **Show page**.



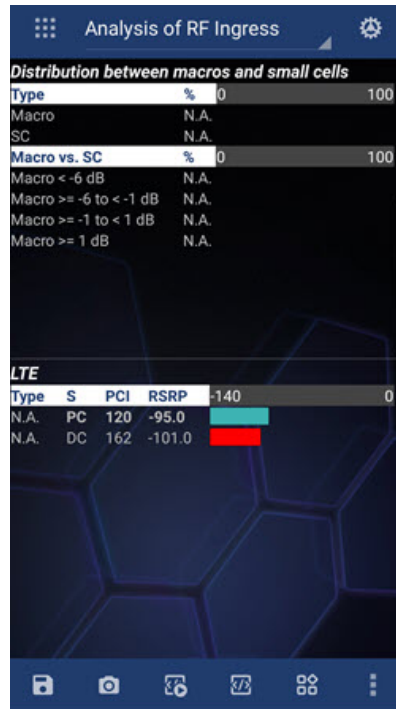
*Status* displays the status of E2E connection (NA, OK, INITIALIZED, or FAIL).  
*Remote number* displays the number of the measurement device.  
*Line number* displays the set number for the E2E server.  
*Event log* displays the event log for E2E calls.

## 6.24 Analysis of RF ingress view

### NOTE

The Analysis of RF ingress view is available only with the additional Advanced Indoor Analysis license option.

To view the Analysis of RF ingress page, go to **Settings | Page settings | Analysis of RF ingress** and select **Show page**.



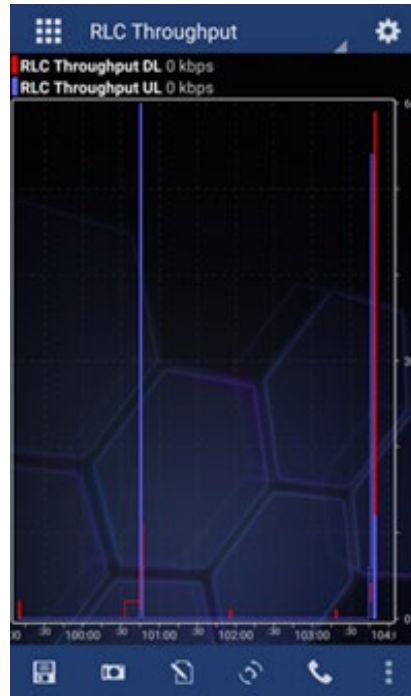
*Type* indicates the percentage distribution between Macro (outdoor cells) and Small Cells (indoor cells). All cells not in the BTS file are considered as macro cells. Cells defined as small\_cell or DAS are included in the Small Cell value.

*Macro vs. SC* indicates the RF ingress amount coming outside during indoor measurements.

*LTE* displays the type of serving cells and neighbour. The type is either MACRO or SC. A cell is not defined in the BTS file is considered as a macro cell. Note that this split displays technology-related information. For further information on different technology views, see respective technology views.

## 6.25 RLC Throughput view

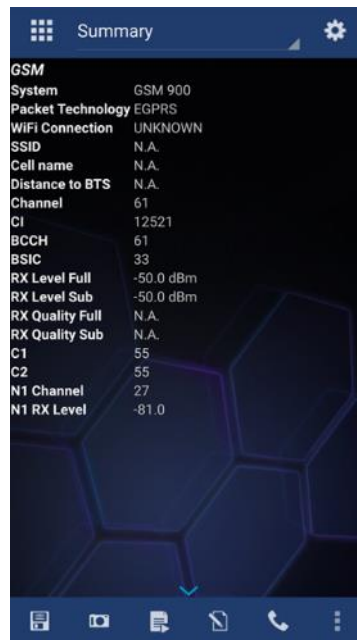
To view the RLC Throughput page, go to **Settings | Page settings | RLC Throughput** and select **Show page**.



*RLC Throughput DL* displays the downlink  
*RLC Throughput UL* displays the uplink

## 6.26 GSM views

### 6.26.4 Summary views for GSM



*System* displays the current cellular system, for example, GSM 1800.

*Packet technology* displays the current packet technology.

*WiFi Connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

*SSID* displays the WLAN service set identifier.

*Cell name* displays the name of the active cell.

*Distance to BTS* displays the distance in kilometers to the active base station.

*Channel* displays the current channel number.

*CI* displays the 16-bit cell identification code.

*BCCH* displays the broadcast control channel number.

*BSIC* displays the base station identity code.

*RX Level Full* displays the received signal level of all TDMA frames (Range: -120 – -10, Unit: dBm)

*RX Level Sub* displays the received signal level of the subset of the TDMA frames (Range: -120 – -10, Unit: dBm)

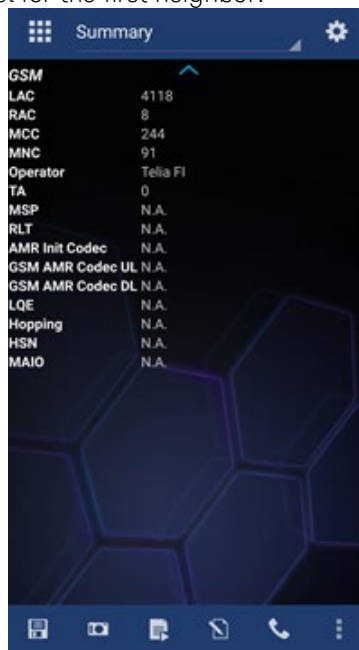
*RX Quality Full* displays the RX quality full value. Values range from 0 to 7.

*RX Quality Sub* displays the RX quality sub value. Values range from 0 to 7.

*C1 & C2* display the C1 and C2 values.

*N1 Channel* displays the channel number for the first neighbor.

*N1 RX Level* displays the RX level for the first neighbor.



*LAC* displays the location area code.

*MCC* displays the mobile country code.

*MNC* displays the mobile network code.

*Operator* displays the mobile operator name.

*TA* displays the timing advance value. Values range from 0 to 63.

*MSP* displays the mobile station Tx power. Values range from 0 to 32.

*RLT* displays the radio link timeout.

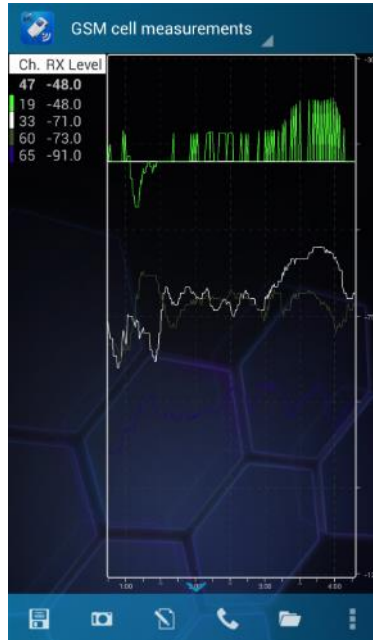
*AMR Init Codec* displays the AMR initial codec mode. Alternatives are 4.75, 5.15, 5.9, 6.7, 7.4, 7.95, 10.2, and 12.2.

*GSM AMR Codec UL/DL* displays the currently used AMR codec for sending and receiving.

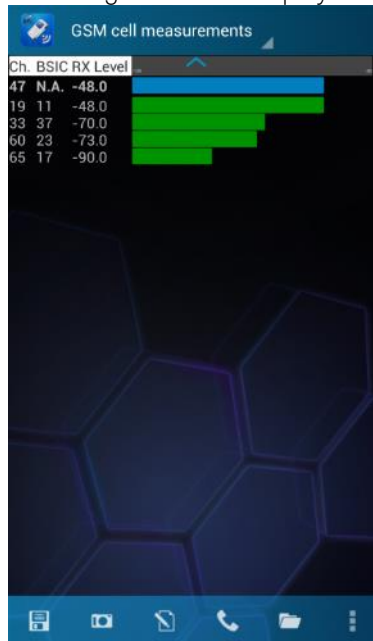
*LQE* displays the link quality estimate. Values range from 0 to 32.

*Hopping* displays hopping status (On/Off).  
*HSN* displays hopping sequence number.  
*MAIO* displays mobile allocation index offset.

### 6.26.5 Cell measurements view for GSM



The Cell measurements 1/2 view (neighbor line view) for GSM displays the *channel number* and *RX level* for the serving and neighbor channels. The serving channel is displayed first on the list (in black). The RX level line for the serving channel is displayed in bold.



The Cell measurements 2/2 view (neighbor bar view) for GSM displays the *channel number*, *BSIC*, and *RX level* for the serving and neighbor channels. The serving channel is displayed first on the list (in black).

The serving channel bar is color coded.

*RX level*: If the value goes below -95, the bar color changes from blue to red.

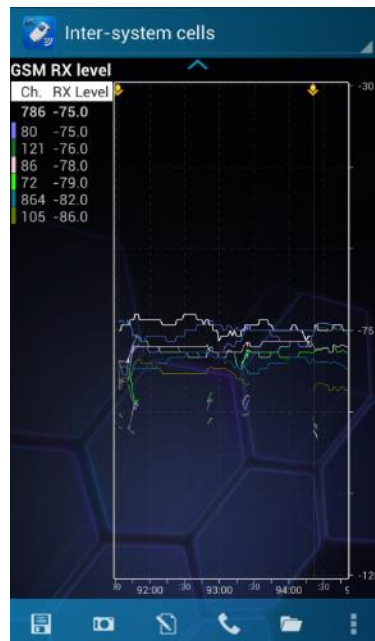
### 6.26.6 GSM cell table / GSM hopping channels



The GSM Cell Table view displays the *channel number*, *CI (cell identity)*, *BSIC*, *C1*, *C2*, *RX level*, and *LAC (location area code)* for the serving (first on list) and neighbor channels.

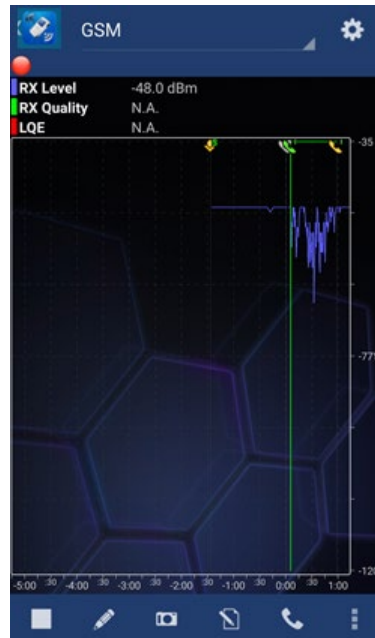
The hopping channels view displays a list of hopping channels and the channel number, C/I, and RX level per hopping channel.

### 6.26.7 GSM inter-system cells



The Cell measurement inter-system line view displays for GSM the *channel number*, and *RX level* for the serving and best neighbors.

### 6.26.8 GSM view



*RX Level* displays the RX level full value when the mobile is in idle mode and the RX level sub value when a call is connected. Values range from -120 to -10 dBm.

*RX Quality*, when DTX in ON, displays the RX quality full value and when DTX is OFF displays RX quality sub value.

*LQE* displays the link quality estimate. Values range from 0 to 32.

## 6.26.9 Throughput view for GSM



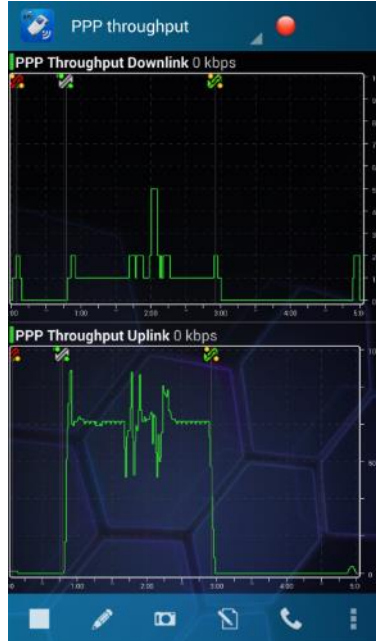
The data throughput line views display the application data throughput in kilobits per second for UL and DL directions. The value is also displayed as a line.

### NOTE

Note that you need to have a data transfer on to see data in these views.

The gauge view displays the *application throughput* in downlink and in uplink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

## 6.26.10 PPP throughput view for GSM



*PPP Throughput* view displays the downlink and uplink throughput values in kbps. The value is calculated based on the SDUs (service data units) that are successfully transferred through the PPP layer. Missing and erroneous PPP packets are excluded from the throughput calculation. To display the PPP Throughput view, go to **Settings | Page settings | PPP Throughput**, select **Show page**, and tap the Back key of the device.

## 6.26.11 IPerf for GSM



To display the IPerf view, go to **Settings | Page settings | IPerf**, select **Show page**, and tap the Back key of the device.

*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

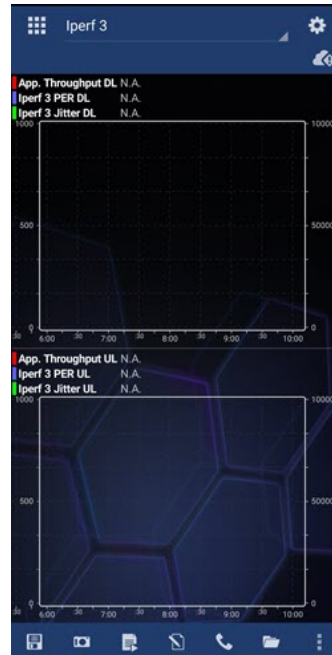
*IPerf Jitter DL* displays the packet jitter downlink in ms.

*App. Throughput UL* displays the application throughput in uplink direction in kb per second.

*IPerf PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter UL* displays the packet jitter uplink in ms.

## 6.26.12 IPerf 3 for GSM



To display the IPerf 3 view, go to **Settings | Page settings | IPerf 3** select **Show page**, and tap the Back key of the device.

*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf 3 PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

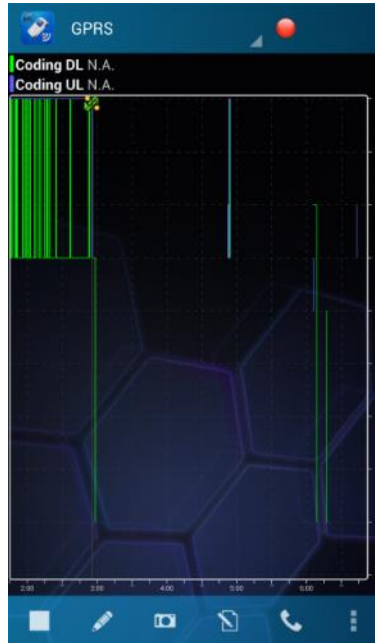
*IPerf 3 Jitter DL* displays the packet jitter downlink in ms.

*App. Throughput UL* displays the application throughput in uplink direction in kb per second.

*IPerf 3 PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter UL* displays the packet jitter uplink in ms.

### 6.26.13 GPRS view for GSM



*Coding DL/UL* displays the CS data channel coding for downlink/uplink directions. Alternatives are 9.6 and 14.4.

### 6.27 WCDMA views

#### 6.27.14 Summary view for WCDMA



*System* displays the current cellular system, for example, UMTS FDD.  
*Packet technology* displays the current packet technology.

*WiFi Connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

*SSID* displays the WLAN service set identifier.

*Cell name* displays the name of the active cell.

*Distance to BTS* displays the distance in kilometers to the active base station.

*Cell ID (16-bit)* displays the 16-bit cell identification code.

*RNC* displays the radio network controller ID.

*LAC* displays the location area code.

*RAC* displays the routing area code.

*MCC* displays the mobile country code.

*MNC* displays the mobile network code.

*Operator* displays the mobile operator name.

*UARFCN* displays the radio frequency channel number in use.

*RRC State* displays the RRC state. Alternatives are Idle, URA PCH, Cell PCH, Cell FACH, and Cell DCH.

*Active Ec/No* displays the active Ec/No value.

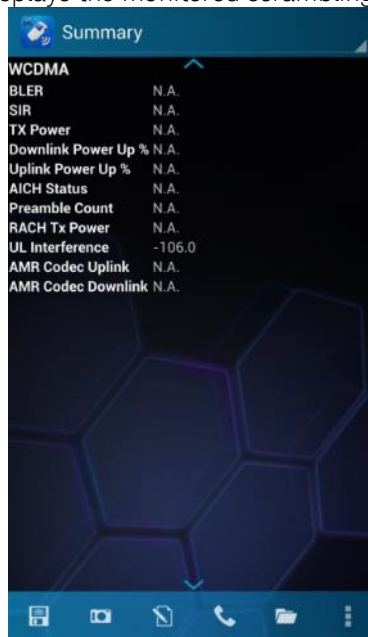
*Active RSCP* displays the active RSCP value.

*Active Scrambling Codes* displays the active scrambling code.

*Monitored Ec/No* displays the monitored Ec/No value.

*Monitored RSCP* displays the monitored RSCP value.

*Monitored Scrambling Codes* displays the monitored scrambling code values.



*BLER* displays block error rate.

*SIR* displays the signal-to-interference ratio. Values range from -50 to 50.

*TX Power* displays the TX power level in dBm. Values range from 30 to -120.

*Downlink/Uplink Power Up %* displays the percentages of downlink (DL) and uplink (UL) power up commands.

*AICH Status* displays the RACH message transmission result.

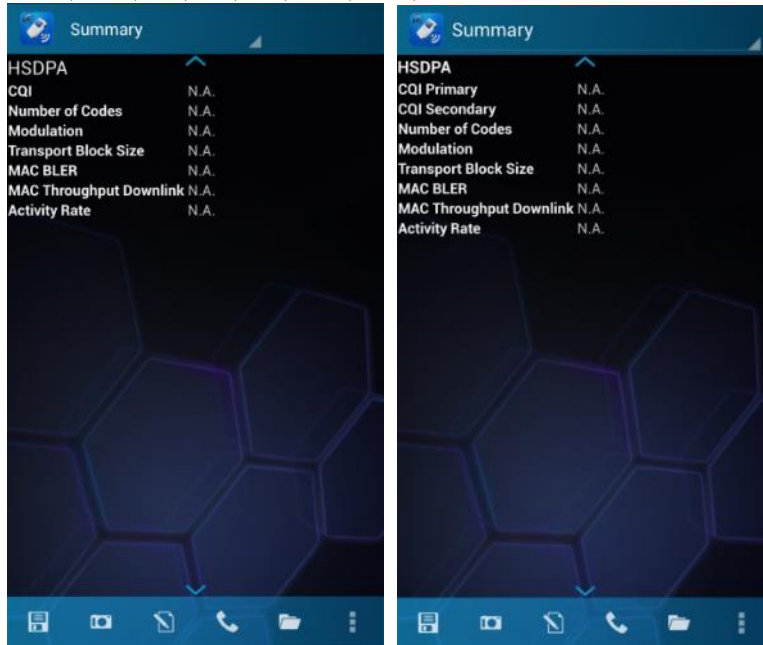
*Preamble Count* displays the transmitted preamble count. Values range from 1 to 65.

*RACH TX Power* displays the RACH message power in dB.

*UL Interference* displays uplink interference in dB.

*AMR Codec UL/DL* displays the AMR mode in uplink (UL) and downlink (DL) directions.

Alternatives are 4.75, 5.15, 5.9, 6.7, 7.4, 7.95, 10.2, and 12.2.



*CQI Primary* displays the Channel Quality Indicator for primary carrier in DC (dual carrier) mode.

*CQI Secondary* displays the Channel Quality Indicator for secondary carrier in DC mode.

*Number of codes* displays the number of HS-PDSCH channelization codes.

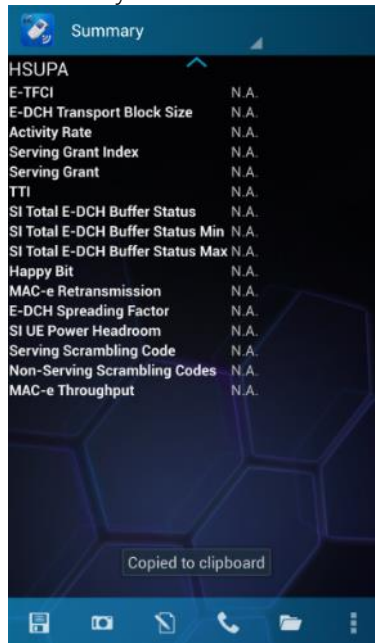
*Modulation* displays the ratio of QPSK/16QAM activity.

*Transport Block Size* displays the Transport Block Size Indicator.

*MAC BLER* displays MAC block error rate.

*MAC Throughput Downlink* displays the MAC downlink data transfer rate in kilobits per second.

*Activity Rate* displays the downlink Activity rate.



*E-TFCI* displays information about the transport block set size.

*E-DCH Transport Block Size* displays the average of transport block size used during the previous reporting period.

*Activity Rate* displays the downlink activity rate.

*Serving Grant Index* defines how much power is given for the uplink data transmission. The network controls current serving grant using absolute and relative grants.

*Serving grant* defines the power ratio of E-DPDCH and DPCCH.

*TTI* defines the transmission time interval.

*SI Total E-DCH Buffer Status* identifies the total amount of data available across all logical channels for which reporting has been requested by the RRC, and indicates the amount of data in a number of bytes that is available for transmission and retransmission in the RLC layer.

*Happy bit* - the happy bit status is periodically reported to the network to indicate when the mobile has enough power to transmit current data buffers in a predefined time period.

*MAC-e Retransmission* displays the ratio of retransmitted PDUs and all transmitted PDUs in the MAC-e layer.

*E-DCH Spreading Factor* displays the enhanced dedicated channel spreading factor.

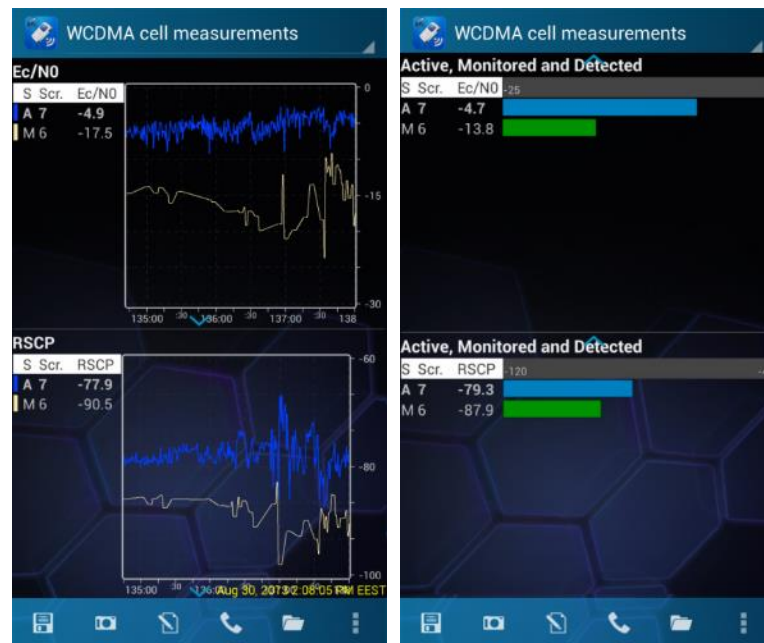
*SI UE Power Headroom* defines the difference between the maximum possible power and currently used power.

*Serving Scrambling Code* displays the serving scrambling code.

*Non-Serving Scrambling Codes* displays the non-serving scrambling codes.

*MAC-e Throughput* displays the MAC throughput.

## 6.27.15 WCDMA cell measurements



The WCDMA cell measurements views (the neighbor views) 1/2 and 2/2 display the Set, Ec/NO and RSCP values for the serving and neighbor channels.

A refers to active set, D to detected set and M to monitored set.

## 6.27.16 WCDMA cell table

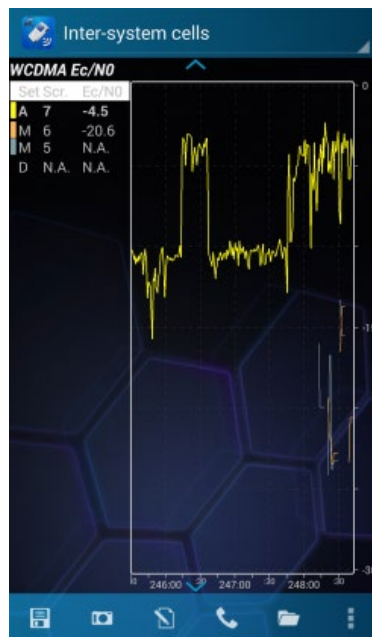


S	Channel	Scrambling Code	Ec/NO	RSCP
A	10837	7	-3.4	-80.3
M	10837	5	-16.5	-93.4
M	10837	6	-17.1	-92.7

The WCDMA Cell Table view displays the *Set*, *Channel number*, *Scrambling Code*, *Ec/NO*, and *RSCP* for the serving (first on list) and neighbor channels.

To display the WCDMA Cell Table view, go to **Settings | Page settings | WCDMA cell table**, select **Show page**, and tap the Back key of the device.

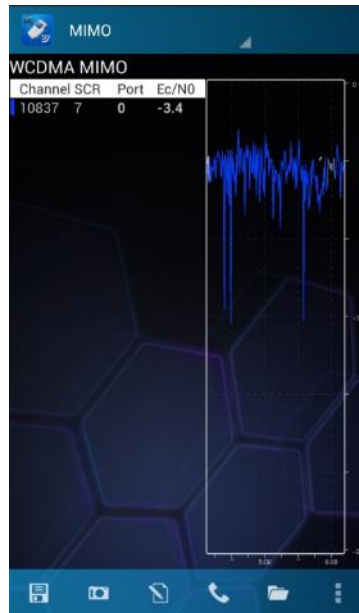
## 6.27.17 WCDMA inter-system cells



The Cell measurement inter-system line view displays for WCDMA the *Set*, *scrambling code*, and *Ec/NO* for the active set and for best pilots in monitored set.

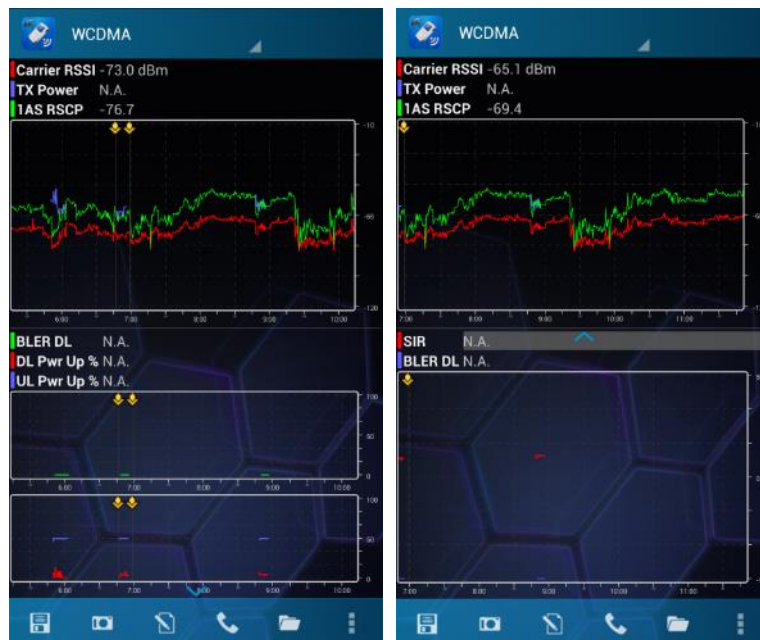
A refers to active set, D to detected set and M to monitored set.

## 6.27.18 WCDMA MIMO



The WCDMA MIMO view displays the *Channel number*, *Scrambling Code*, *Port*, and *Ec/NO*. To display the MIMO view, go to **Settings | Page settings | MIMO**, select **Show page**, and tap the Back key of the device.

## 6.27.19 WCDMA/WCMA power control view



The WCDMA and WCDMA power control views display the *carrier RSSI* value, *TX power* level, and *1AS RSCP* (the best RSCP in the active set), *block error rate* value in downlink direction, *percentages of downlink (DL) and uplink (UL) power up commands*, and *signal-to-interference ratio*.

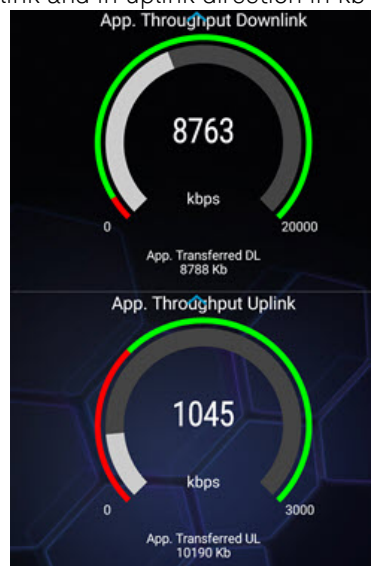
## 6.27.20 Throughput view for WCDMA

**NOTE**

Note that you need to have a data transfer on to see data in these views.



The data throughput line views display the *block error rate* value in downlink direction and the *application throughput* in downlink and in uplink direction in kb per second.



The gauge views display the *application throughput* in downlink and in uplink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

### 6.27.21 PPP throughput for WCDMA



*PPP Throughput* views display the downlink and uplink throughput values in kbps. The value is calculated based on the SDUs (service data units) that are successfully transferred through the PPP layer. Missing and erroneous PPP packets are excluded from the throughput calculation. To display the PPP Throughput view, go to **Settings** | **Page settings** | **PPP Throughput**, select **Show page**, and tap the Back key of the device.

### 6.27.22 IPerf for WCDMA



To display the IPerf view, go to **Settings | Page settings | IPerf**, select **Show page**, and tap the Back key of the device.

*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

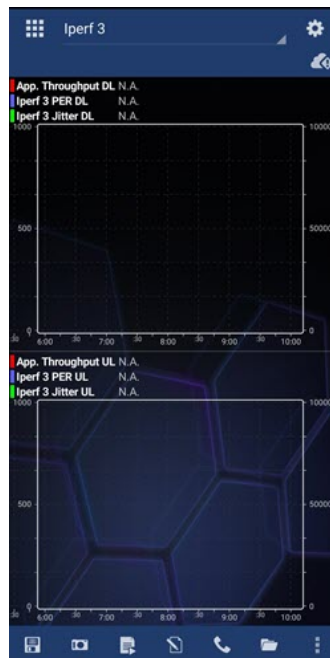
*IPerf Jitter DL* displays the packet jitter downlink in ms.

*App. Throughput UL* displays the application throughput in uplink direction in kb per second.

*IPerf PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter UL* displays the packet jitter uplink in ms.

## 6.27.23 IPerf 3 for WCDMA



To display the IPerf 3 view, go to **Settings | Page settings | IPerf 3**, select **Show page**, and tap the Back key of the device.

*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf 3 PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter DL* displays the packet jitter downlink in ms.

*App. Throughput UL* displays the application throughput in uplink direction in kb per second.

*IPerf 3 PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter UL* displays the packet jitter uplink in ms.

## 6.27.24 HSDPA view for WCDMA



*MAC Throughput* displays MAC throughput.

*MAC BLER* displays MAC block error rate.

*Number of Codes* displays the number of HS-PDSCH channelization codes.

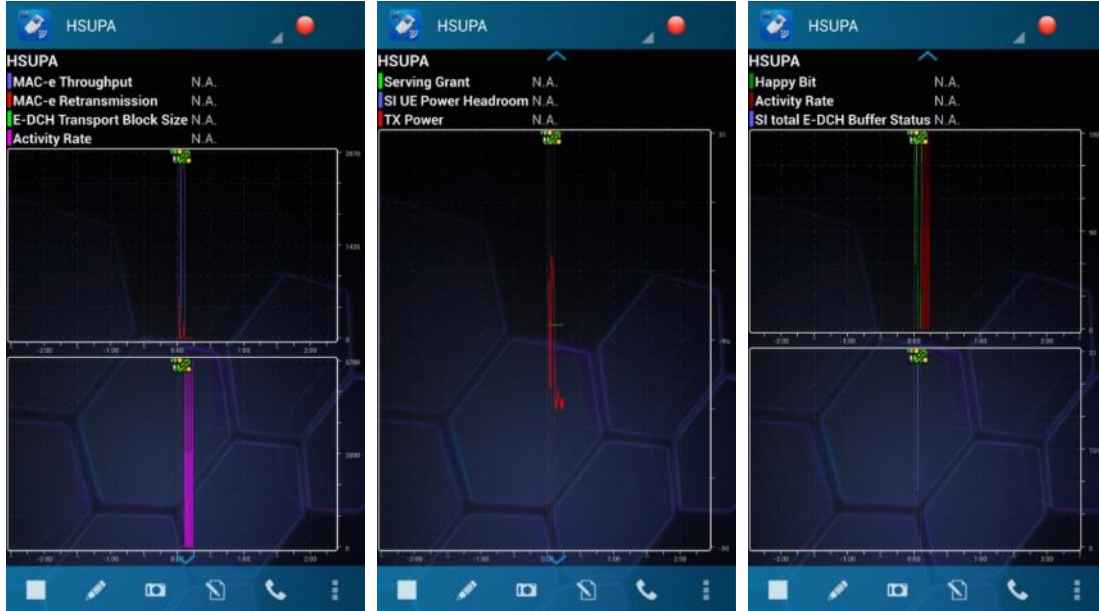
*CQI Primary* displays the Channel Quality Indicator for primary carrier in DC (dual carrier) mode.

*CQI Secondary* displays the Channel Quality Indicator for secondary carrier in DC mode.

Table 1. displays the relative ratio of QSPK, 16QAM and 64QAM modulation activity for the current data session.

Table 2. displays the relative ratio of QSPK, 16QAM and 64QAM modulation activity for the entire measurement.

## 6.27.25 WCDMA HSUPA views



*MAC-e Throughput* displays the MAC throughput.

*MAC-e retransmission* displays the ratio of retransmitted PDUs and all transmitted PDUs in the MAC-e layer.

*E-DCH Transport Block Size* displays the average of transport block size used during the previous reporting period.

*Activity Rate* displays the downlink Activity rate

*Serving grant* defines the power ratio of E-DPDCH and DPCCH.

*SI UE Power Headroom* defines the difference between the maximum possible power and currently used power.

*TX Power* displays the TX power level in dBm. Values range from 30 to -120.

The *Happy Bit* status is periodically reported to the network to indicate when the mobile has enough power to transmit current data buffers in a predefined time period.

*SI Total E-DCH Buffer Status* identifies the total amount of data available across all logical channels for which reporting has been requested by the RRC, and indicates the amount of data in a number of bytes that is available for transmission and retransmission in the RLC layer.

## 6.28 LTE views

### 6.28.26 Summary view for LTE



*System* displays the current cellular system.

*Packet technology* displays the current packet technology.

*WiFi Connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

*SSID* displays the WLAN service set identifier.

*Cell name* displays the name of the active cell.

*Distance to BTS* displays the distance in km to the active base station.

*Cell ID* displays the E-UTRAN cell global ID (ECGI).

*eNodeB/CID* displays the eNodeB ID and cell ID.

*RNC/CID* displays radio network controller ID and cell ID.

*TAC* displays the tracking area code.

*MCC* displays the mobile country code.

*MNC* displays the mobile network code.

*Operator* displays the mobile operator name.

*MME* identifies Mobility Management Entities (MME) within the MME pool areas.

*EARFCN* displays the radio frequency channel number in use.

*Serving Carrier RSSI* displays the carrier RSSI value. Values range from -120 to -10.

*Serving SNR* displays the SNR (signal to noise ratio) for the serving channel in dB.

*Serving RSRQ* displays the reference signal received quality for the serving channel in dB.

*Serving RSRP* displays the reference signal received power for the serving channel in dBm.

*Serving PCI* displays the physical channel identifier number for the serving channel.

*Detected RSRQ* displays the detected reference signal received quality.

*Detected RSRP* displays the detected reference signal received power.

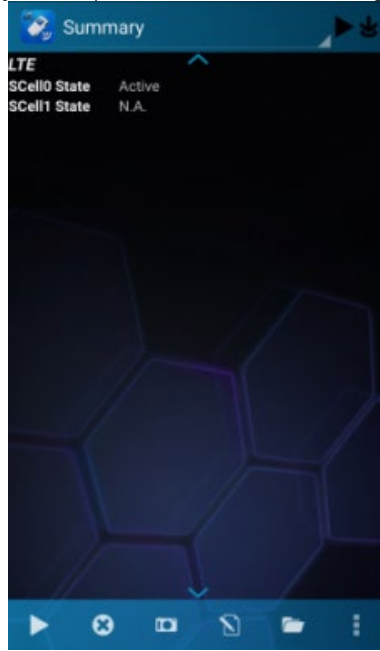
*Detected PCI* displays the detected physical channel identifier numbers.

*EMM State* displays the LTE EPS Mobility Management state.

*EMM Substate* displays the LTE EPS Mobility Management substate.

*Transmission Mode* displays the current MIMO configuration set for the terminal.

*TDD UL DL configuration* displays the uplink and downlink configuration for LTE TDD.



*SCCell0 State* displays whether the first secondary serving cell is active.

*SCCell1 State* displays whether the second secondary serving cell is active.



*PDSCH BLER* displays the block error rate for the PDSCH (physical downlink shared channel) in percentage.

*PDSCH Throughput* displays the downlink data throughput for the PDSCH in bps.

*PDSCH Rank 2 Percentage* displays the percentage of TTIs (transmission time intervals, 1ms) during the reporting period where Rank 2 (MIMO 2x2) has been used in PDSCH channel.

*PDSCH Modulation Codeword 0* displays the PDSCH modulation for codeword 0. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

The available values are

- 1 = QPSK
- 2 = 16QAM
- 3 = 64QAM

*PDSCH Modulation Codeword 1* displays the PDSCH modulation for codeword 1. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

*PDSCH MCS Codeword 0* displays the PDSCH MCS index for codeword 0. The value defines the modulation and the amount of coding used. See 3GPP TS 36.213 subclause 7.1.7. Values range from 0 to 31.

*PDSCH MCS Codeword 1* displays the PDSCH MCS index for codeword 1. The value defines the modulation and the amount of coding used. See 3GPP TS 36.213 subclause 7.1.7. Values range from 0 to 31.

*PDSCH PRB Allocation* displays the number of allocated physical resource blocks for the PDSCH. *DL Bandwidth* indicates the DL bandwidth of the active carrier in MHz.



*TX Power PUSCH* displays the TX power level for the PUSCH (physical uplink shared channel) in dBm. Values range from 30 to -120.

*TX Power PUCCH* displays the TX power level for the PUCCH (physical uplink control channel) in dBm. Values range from 30 to -120.

*PUSCH Throughput* displays the uplink data throughput for the PUSCH in bps.

*PUSCH Modulation* displays the PUSCH modulation for codeword 0. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

*PUSCH Rank* defines how many data streams are used for the data transmission. The value of the parameter is zero when data is not transmitted. Possible values are 0 and 1.

*PUSCH MCS Modulation* displays the PUSCH MCS index for codeword 0. The value defines the modulation and the amount of coding used. See 3GPP TS 36.213 subclause 7.1.7. Values range from 0 to 31.

*Timing Advance* displays the timing advance value for the serving channel. Timing advance is used to adjust uplink transmission timing in a way that allows node B to receive transmissions from all UEs simultaneously. Values range from 0 to 1282.

*Cyclic Prefix* defines the type of signal the terminal is set to measure. With Autodetect selected, the terminal will automatically detect the appropriate signal type.

*RRC State* displays the state of RRC connection.

*RACH Type* displays the RACH (random-access channel) message type. The possible values are contention based and non-contention based.

*RACH Result* displays the RACH message result. The possible values are succeeded, aborted, and failed.

*RACH Maximum Allowed Preambles* displays the maximum allowed number of RACH preambles. See 3GPP 136.133 subclause 6.3.2 and 3GPP 136.321 subclause 5.1. Values range from 3 to 200.

*RACH Number of Trans. Preambles* displays the number of preambles that were sent during the RACH procedure.

*RACH Initial TX Power* displays the initial TX power level for the RACH.

*RACH Succ. Preamble Power Level* displays the power level for a successful RACH preamble.

*RACH PUSCH Power* displays the power level for simultaneous RACH and PUSCH procedures.



The screenshot shows a 'Summary' screen for VoLTE. The background is dark blue with a faint cellular network pattern. The text is white and lists various performance metrics.

VoLTE	
HO Packet Loss	N.A.
HO U-plane Interruption	N.A.
IMS Server State	Connected
IMS Registration Setup Time	1298 ms
IMS Registration Failure Ratio	4.0 %
SIP Handshake Time	248 ms
VoLTE Codec	N.A.
AMR Codec Uplink	23.85WB
AMR Codec Downlink	23.85WB

*HO Packet Loss* displays the HO packet loss.

*HO U-plane Interruption* defines the time from the last packet in the old cell to the first packet in the new cell (minimum value: 0, unit: ms).

*IMS Server State* displays the current IMS server state.

*IMS Registration Setup Time* displays the IMS registration setup time.

*IMS Registration Failure Ratio* displays the IMS registration failure ratio.

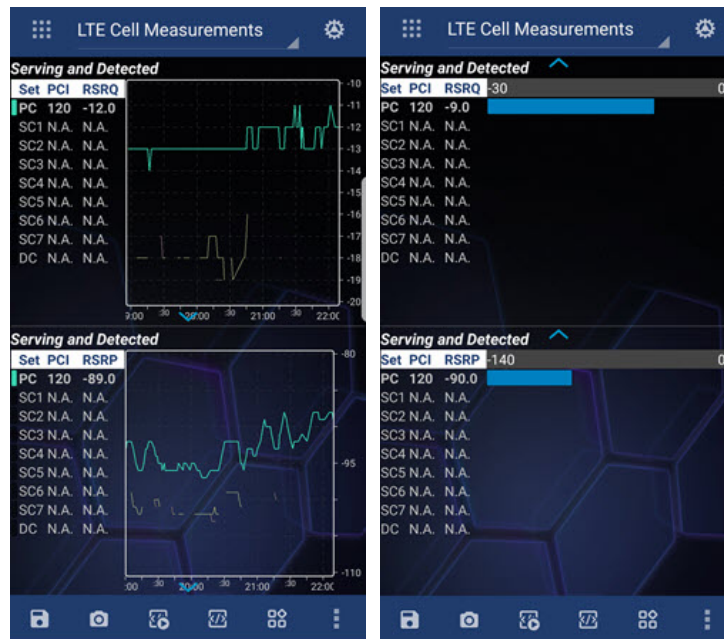
*SIP Handshake Time* defines the time from SIP invite to 100 Trying message (minimum value: 0, unit: ms).

*VoLTE Codec* displays the currently used VoIP codec that can change during the VoIP call.

*AMR Codec Uplink* displays the current active AMR codec for uplink.

*AMR Codec Downlink* displays the current active AMR codec for downlink.

### 6.28.27 LTE Cell Measurements view



The LTE Cell Measurements views (the neighbor views) display the Set, PCI (Physical Channel Identifier) and RSRQ (Reference Signal Received Quality) and RSRP (Reference Signal Received Power) for the serving and neighbor channels. A refers to active set, D to detected set and M to monitored set.

### 6.28.28 LTE cell table

The screenshot shows the 'LTE cell table' view with a table of cell measurements. The table has six columns: Set, Band, Channel, PCI, RSRQ, and RSRP. The serving cell (Set PC) is listed first with RSRQ -6.1 and RSRP -87.0. Other cells are listed as DC or N.A. with their respective RSRQ and RSRP values.

Set	Band	Channel	PCI	RSRQ	RSRP
PC	FDD 1800	1598	161	-6.1	-87.0
DC	FDD 1800	1598	20	-19.4	-102.8
DC	FDD 1800	1598	159	-27.4	-107.8
DC	FDD 1800	1598	45	-28.1	-111.2
N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

The LTE Cell Table view displays the Set, Band, Channel number, PCI (physical channel identifier), RSRQ (reference signal received quality), and RSRP (reference signal received power) for the serving (first on list) and neighbor channels.

To display the LTE Cell Table view, go to **Settings | Page settings | LTE Cell Table**, select **Show page**, and tap the Back key of the device.

### 6.28.29 LTE inter-system cells



The Cell measurement inter-system line view displays for LTE the *PCI* (physical channel identifier) and *RSRP* (reference signal received power) for the serving and neighbor channels. A refers to active set, D to detected set and M to monitored set.

### 6.28.30 LTE MIMO SNR/P



The LTE MIMO SNR/P view displays the *Cell type*, *SNR/P* and *Port*. The calculation method for this parameter is device specific and can change between the devices.

To display the LTE MIMO SNR/P page, go to **Settings | Page settings | LTE MIMO SNR/P**, select **Show page**, and tap the Back key of the device.

## 6.28.31 LTE MIMO



The LTE MIMO 1 and LTE MIMO 2 views display the *Channel number*, *PCI* (physical channel identifier), *RSRQ* (reference signal received quality), *RSRP* (reference signal received power), and *RSSI* (Received signal strength indication)/*Antenna port* for each MIMO antenna port. Scells 1 to 4 are displayed on their own views.

To display the MIMO view, go to **Settings | Page settings | MIMO**, select **Show page**, and tap the Back key of the device.

## 6.28.32 Application throughput view for LTE

### NOTE

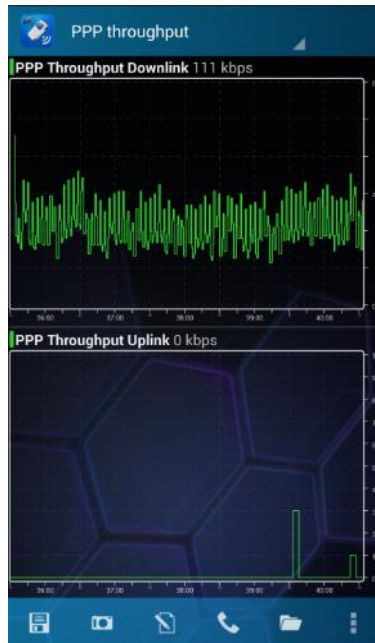
Note that you need to have a data transfer on to see data in these views.



*App. Throughput Downlink* displays the data throughput rate in downlink direction. The gauge view displays the *application throughput* in downlink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

*App. Throughput Uplink* displays the data throughput rate in uplink direction. The gauge view displays the *application throughput* in uplink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

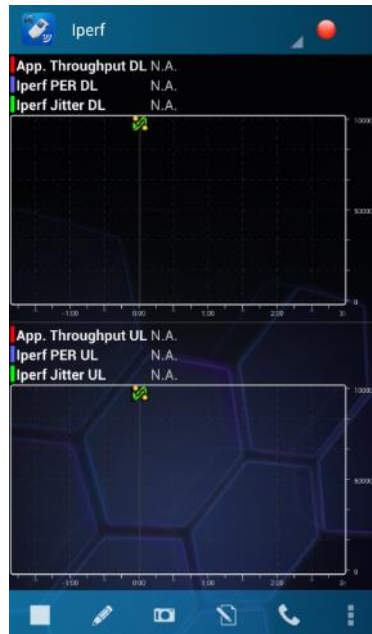
### 6.28.33 PPP throughput view for LTE



The PPP Throughput view displays the downlink and uplink throughput values in kbps. The value is calculated based on the SDUs (service data units) that are successfully transferred through the PPP layer. Missing and erroneous PPP packets are excluded from the throughput calculation.

To display the PPP Throughput view, go to **Settings | Page settings | PPP Throughput**, select **Show page**, and tap the Back key of the device.

## 6.28.34 IPerf view for LTE



*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter DL* displays the packet jitter downlink in ms.

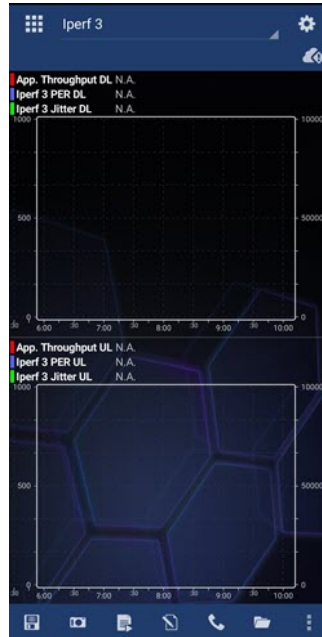
*App. Throughput UL* displays the *application throughput* in uplink direction in kb per second.

*IPerf PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter UL* displays the packet jitter uplink in ms.

To display the IPerf view, go to **Settings | Page settings | IPerf**, select **Show page**, and tap the Back key of the device.

## 6.28.35 IPerf 3 view for LTE



*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf 3 PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter DL* displays the packet jitter downlink in ms.

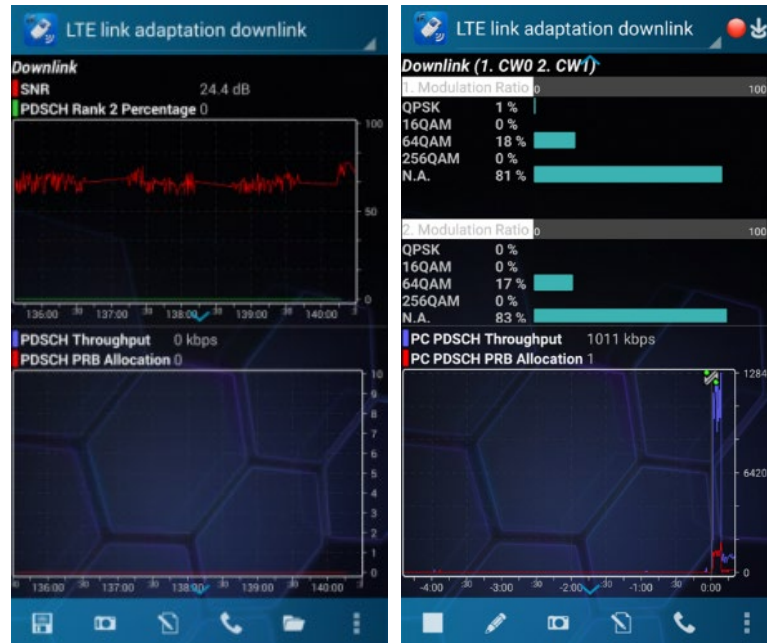
*App. Throughput UL* displays the *application throughput* in uplink direction in kb per second.

*IPerf 3 PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter UL* displays the packet jitter uplink in ms.

To display the IPerf 3 view, go to **Settings | Page settings | IPerf 3**, select **Show page**, and tap the Back key of the device.

## 6.28.36 LTE link adaptation downlink



*SNR* displays the SNR (signal to noise ratio) for the channel in dB.

*PDSCH PRB Allocation* displays the number of allocated physical resource blocks for the PDSCH. Table 1. displays the relative ratio of downlink QSPK, 16QAM, 64QAM, and 256QAM modulation activity for codeword 0.

Table 2. displays the relative ratio of downlink QSPK, 16QAM, 64QAM, and 256QAM modulation activity for codeword 1.

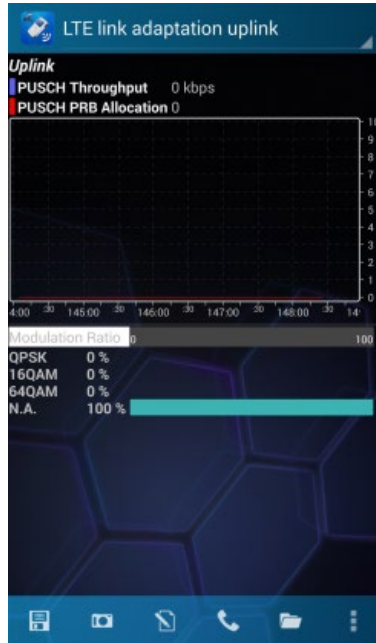
*PDSCH Throughput* displays the downlink data throughput for the PDSCH in bps.

*PDSCH PRB Allocation* displays the number of allocated physical resource blocks for the PDSCH. The downlink modulation ratio displays the relative ratio of uplink QSPK, 16QAM and 64QAM modulation activity for codeword 0 and codeword 1.

*CQI Wideband Codeword 0* displays the wideband channel quality indicator value for codeword 0. This is the average wideband CQI calculated over the reporting period. See 3GPP TS 36.213 subclause 7.2. Values range from 0 to 15.

*CQI Wideband Codeword 1* displays the wideband channel quality indicator value for codeword 1. This is the average wideband CQI calculated over the reporting period. See 3GPP TS 36.213 subclause 7.2. Values range from 0 to 15.

### 6.28.37 LTE link adaption uplink



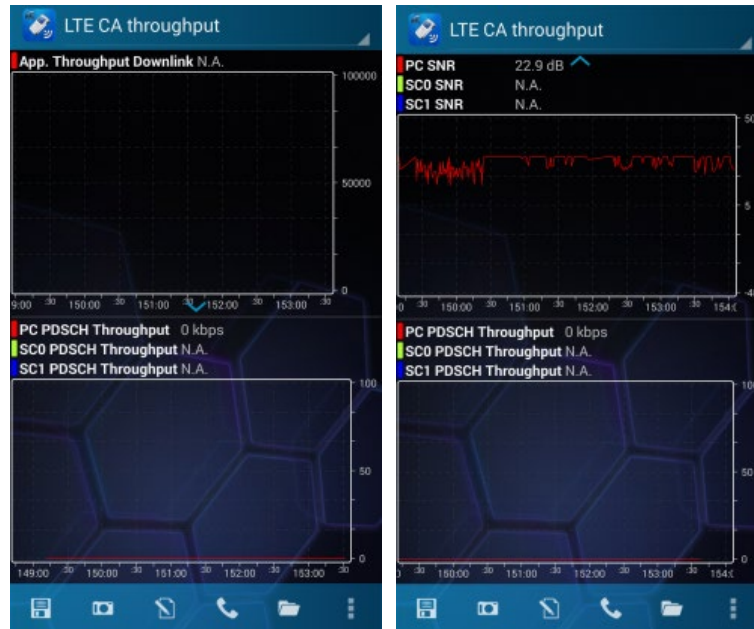
*PUSCH Throughput* displays the uplink data throughput for the PUSCH in bps.  
*PUSCH PRB Allocation* displays the number of allocated physical resource blocks for the PUSCH.  
 The uplink modulation ratio displays the relative ratio of uplink QSPK, 16QAM and 64QAM modulation activity for codeword 0.

### 6.28.38 LTE CA cells



*LTE RSRP* displays LTE reference signal received power in dBm.  
*LTE SNR* displays LTE signal to noise ratio dB.

## 6.28.39 LTE CA throughput



*Application Throughput Downlink* displays the application throughput in downlink.  
*PC PDSCH Throughput* displays primary cell PDSCH throughput in kbps.  
*SC0 PDSCH Throughput* displays first secondary serving cell PDSCH throughput in kbps.  
*SC1 PDSCH Throughput* displays third serving cell PDSCH throughput in kbps.  
*PC SNR* displays primary cell signal to noise ratio in dB.  
*SC0 SNR* displays first secondary serving cell signal to noise ratio in dB.  
*SC1 SNR* displays third serving cell signal to noise ratio in dB.

## 6.28.40 ROHC view

To view the ROHC (Robust Header Compression) page, go to **Settings | Page settings | ROHC** and select **Show page**.



*Profile* displays the ROHC profile identifier.

*Compression Rate UL* displays the percentage of uplink robust header compression.

*Compression Rate DL* displays the percentage of downlink robust header compression.

## 6.29 CDMA/EVDO views

### 6.29.41 Summary view for CDMA/EVDO

CDMA	EVDO
System	System
Packet Technology	Packet Technology
WiFi Connection	RX Power Antenna 0
SSID	RX Power Antenna 1
MCC	Active Pilot Number
Operator	Active Ec/I0
Channel Type	Active RSCP
System ID	TX Power
Network ID	DRC Index
Active Pilot Number	Active SINR
Active Ec/I0	Channel Type
Active RSCP	Sector ID
Channel Number	Hybrid Mode
RX Power 0	Session State
RX Power 1	ALMP State
TX Power	Init State
Frame Error Rate	Idle State
Downlink Power Up %	Connected State
Uplink Power Up %	Route Update State
RLP Downlink Throughput	Overhead Msg State
RLP Uplink Throughput	Subnet Mask
	Color Code
	RLP Downlink Throughput
	RLP Uplink Throughput
	RRI Channel to Pilot Ratio

*System* displays the current cellular system, for example, CDMA2000 1900.

*Packet technology* displays the current packet technology, for example, 1xEVDO REV B.

*WiFi connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

*SSID* displays the WLAN service set identifier.

*MCC* displays the mobile country code.

*Operator* displays the mobile operator name.

*Channel type* displays the current channel type.

*System ID* displays the system ID.

*Network ID* displays the network ID.

*Active pilot number* displays the active pilot number(s).

*Active Ec/I0* displays the Ec/I0 value for the active pilot(s).

*Active RSCP* displays the RSCP value for the active pilot(s).

*Channel number* displays the current channel number.

*RX power 0/1* displays the RX power for antennas 0 and 1. The values range from -120 to 30 dBm.

*TX power* displays the TX power. Values range from -99 to 99 dBm.

*Frame error rate* displays the frame error rate in percentage.

*Downlink/uplink power up %* displays the percentage of *DL/UL power up* commands out of all commands. If this value is 100%, all commands request to increase power.

*RLP downlink/uplink throughput* displays the DL/UL user throughput in radio link protocol layer.

*RRI channel to pilot ratio* displays RRI channel to pilot ratio in dB (Rev A).

EVDO parameters per carrier	
Channel Number	925
Channel ID	0
RX Power	-79.8
RX Power antenna 0	-91.3
RX Power antenna 1	-80.1
TX Power Limited	no
TX Pilot Power	-1.9
TX Adjust	-15.0
TX Power	-0.2
Power Amplifier On/Off	on
Physical Layer Throughput UL	N.A.
Physical Layer Throughput DL	N.A.
Instantaneous PER	N.A.
Short PER	N.A.
Long PER	N.A.
DRC Index	N.A.
T2P	N.A.

EVDO parameters per carrier:

*Channel Number* displays the current channel number.

*Channel ID* displays the channel ID.

*RX Power* displays RX power in dBm.

*RX Power antenna 0* displays the RX power in dBm for antenna 0.

*RX Power antenna 1* displays the RX power in dBm for antenna 1.

*TX Power Limited* displays TX power limited in dBm.

*TX Pilot Power* displays displays TX pilot power in dBm.

*TX Adjust* displays TX adjust in dBm.

*TX Power* displays TX power in dBm.

*Power Amplifier On/Off* displays the status of power amplifier.

*Physical layer throughput UL* displays physical layer throughput UL in bit/s.

*Physical layer throughput DL* displays physical layer throughput DL in bit/s.

*Instantaneous PER* displays instantaneous PER in %.

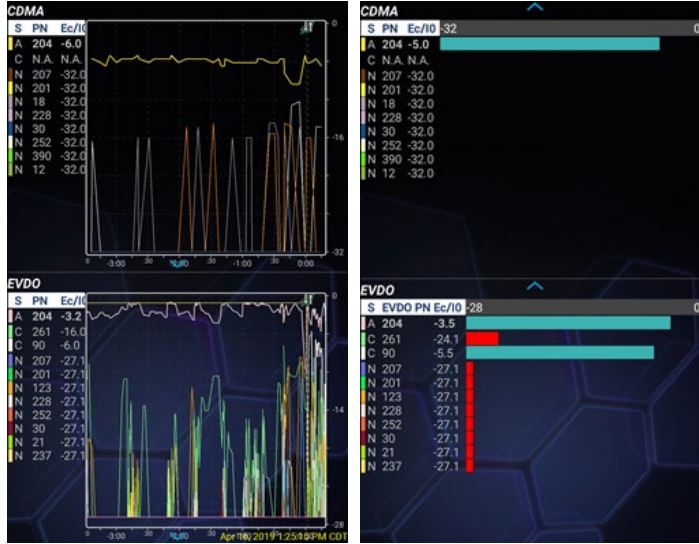
*Short PER* displays short PER in %.

*Long PER* displays long PER in %.

*DRC index* displays DRC index.

*TX T2P* displays TX T2P in dB.

### 6.29.42 Cell measurements view for CDMA/EVDO



The Cell measurements view displays the pilot number and Ec/I0 for the serving (first on list) and neighbor pilots.

CDMA Active, Candidate and Neighbor				
Set	Channel	PN	Ec/I0	RSCP
A	950	204	-6.0	-94.3
C	N.A.	N.A.	N.A.	N.A.
N	950	207	-32.0	-121.3
N	950	201	-32.0	-121.3
N	950	18	-32.0	-121.3
N	950	228	-32.0	-121.3
N	950	30	-32.0	-121.3
N	950	252	-32.0	-121.3
N	950	390	-32.0	-121.3
N	950	12	-32.0	-121.3
N	950	258	-32.0	-121.3

EVDO Active, Candidate and Neighbor				
Set	Channel	PN	Ec/I0	RSCP
A	925	204	-3.2	-83.7
C	925	90	-5.5	-86.1
N	925	207	-27.1	-107.5
N	925	201	-27.1	-107.5
N	925	123	-27.1	-107.5
N	925	228	-27.1	-107.5
N	925	252	-27.1	-107.5
N	925	30	-27.1	-107.5
N	925	21	-27.1	-107.5
N	925	237	-27.1	-107.5
N	925	231	-27.1	-107.5

The Cell measurements view displays the Channel number, PN, Ec/I0, and RSCP for the serving (first on list) and neighbor channels.

### 6.29.43 IPerf view for CDMA/EVDO



*App. Throughput DL* displays the application throughput in downlink direction in kb per second.  
*IPerf PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter DL* displays the packet jitter downlink in ms.

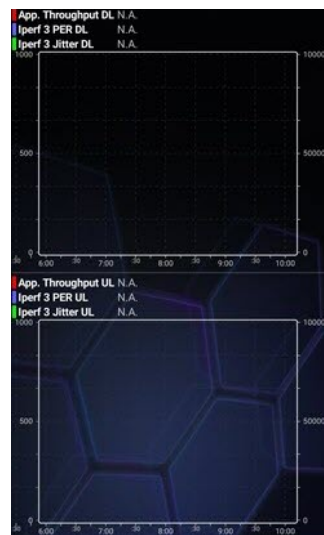
*App. Throughput UL* displays the *application throughput* in uplink direction in kb per second.

*IPerf PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf Jitter UL* displays the packet jitter uplink in ms.

To display the IPerf view, go to **Settings | Page settings | IPerf**, select **Show page**, and tap the Back key of the device.

### 6.29.44 IPerf 3 view for CDMA/EVDO



*App. Throughput DL* displays the application throughput in downlink direction in kb per second.

*IPerf 3 PER DL* displays the downlink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter DL* displays the packet jitter downlink in ms.

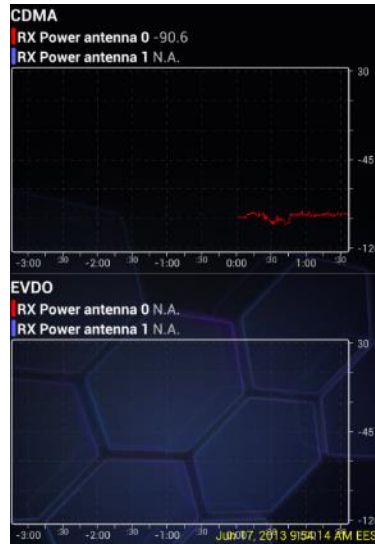
*App. Throughput UL* displays the *application throughput* in uplink direction in kb per second.

*IPerf 3 PER UL* displays the uplink packet error rate, that is, the percentage of erroneously transferred packets from the total number of transferred packets.

*IPerf 3 Jitter UL* displays the packet jitter uplink in ms.

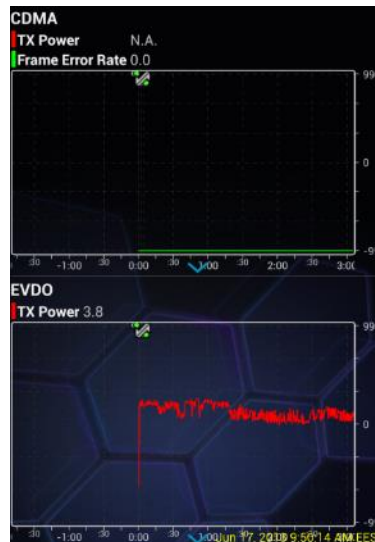
To display the IPerf 3 view, go to **Settings | Page settings | IPerf 3**, select **Show page**, and tap the Back key of the device.

## 6.29.45RX power view for CDMA/EVDO

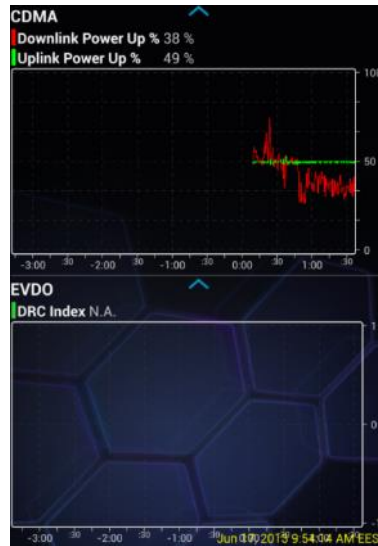


The RX power line view displays the RX power for antennas 0 and 1. The values range from -120 to 30 dBm.

## 6.29.46Power control view for CDMA/EVDO



The Power control line view displays the TX power and FER (for CDMA) and RRI channel to pilot ratio.



*Downlink/uplink power up %* displays the percentage of DL/UL power up commands out of all commands. If this value is 100%, all commands request to increase power.  
*DRC Index* displays the digital rate control index.

## 6.29.47 Application throughput view for CDMA/EVDO

### NOTE

Note that you need to have a data transfer on to see data in these views.



*App. Throughput Downlink* displays the data throughput rate in downlink direction.

The gauge view displays the application throughput in downlink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

*App. Throughput Uplink* displays the data throughput rate in uplink direction.

The gauge view displays the application throughput in uplink direction in kb per second and the amount of data transferred in downlink and in uplink direction in bytes.

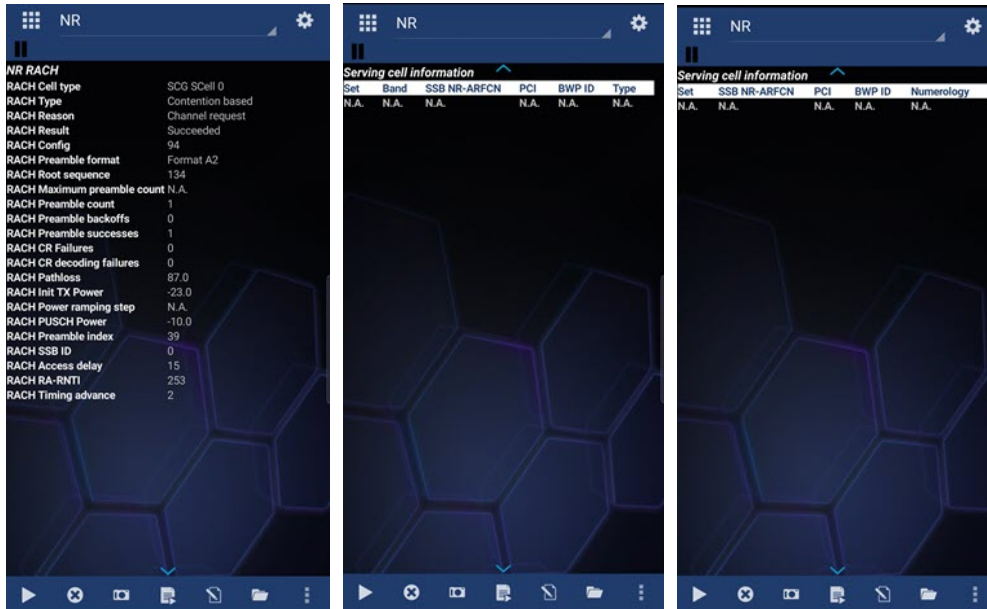
## 6.29.48 PPP throughput view for CDMA/EVDO

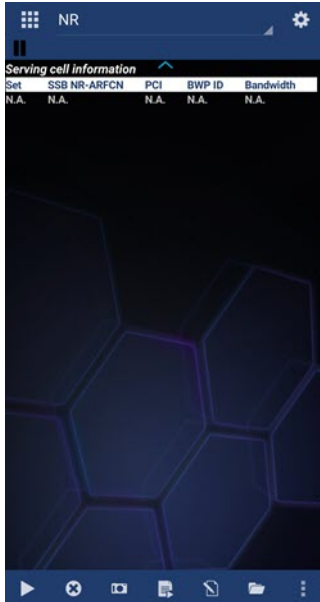


PPP Throughput views display the downlink and uplink throughput values in kbps. The value is calculated based on the SDUs (service data units) that are successfully transferred through the PPP layer. Missing and erroneous PPP packets are excluded from the throughput calculation. To display the PPP Throughput view, go to **Settings | Page settings | PPP Throughput**, select **Show page**, and tap the Back key of the device.

## 6.30 NR views

### 6.30.49 NR view





*RACH Cell type* displays the serving cell type.

*RACH Type* displays the RACH (random-access channel) message type. The possible values are contention based and non-contention based.

*RACH Reason* displays the reason for the RACH procedure 1 = Channel request, 2 = Radio link timeout, 3 = UL data, 4 = No PUCCH (Recorded when scheduling request is not possible because there are no PUCCH resources available), 5 = Max SR (Recorded when maximum number of scheduling requests has been sent to the network without uplink resources), 6 = Handover (RACH procedure after handover), 7 = DL data (This type is used when UE is not synchronized and downlink data is received).

*RACH Result* displays the RACH message result. The possible values are succeeded, aborted, and failed.

*RACH Config* displays RACH config.

*RACH Preamble format* displays the RACH preamble format.

*RACH Root sequence* displays RACH logical root sequence index.

*RACH Maximum Allowed Preambles* displays the maximum allowed number of RACH preambles. See 3GPP 136.133 subclause 6.3.2 and 3GPP 136.321 subclause 5.1. Values range from 3 to 200.

*RACH Preamble count* defines the number of preambles that were sent during the RACH procedure.

*RACH Preamble backoffs* displays RACH preamble responses with backoff time.

*RACH Preamble successes* displays RACH preamble responses with PUSCH resource.

*RACH CR Failures* displays the total number of RACH contention resolution failures.

*RACH CR decoding failures* displays RACH contention resolution failures. This is the total number of contention resolution failures including timer expiries and msg4 decoding failures.

*RACH Pathloss* displays an estimate of the radio condition and what is used to calculate initial

*RACH Initial TX Power* displays the initial TX power level for the RACH.

*RACH Power ramping step* displays the RACH preamble step.

*RACH PUSCH Power* displays the power level for simultaneous RACH and PUSCH procedures.

*RACH Preamble index* displays the preamble index of the last successfully transmitted preamble. This is only valid for successful RACH procedures.

*RACH SSB ID* displays RACH SSB ID. Range: 0 – 63.

*RACH access delay* displays the time from initial MSG1 to MSG2 for non-contention based RACH procedures and time from initial MSG1 to MSG4 for contention based RACH procedures. Valid only for successful.

*RACH RA\_RNTI* displays the RNTI that is used on the PDCCH or NPDCCH when random access responses are transmitted.

*RACH Timing advance* displays the timing advance command received in random access response (MSG2)

SSB NR-ARFCN displays the SSB NR-ARDCN.

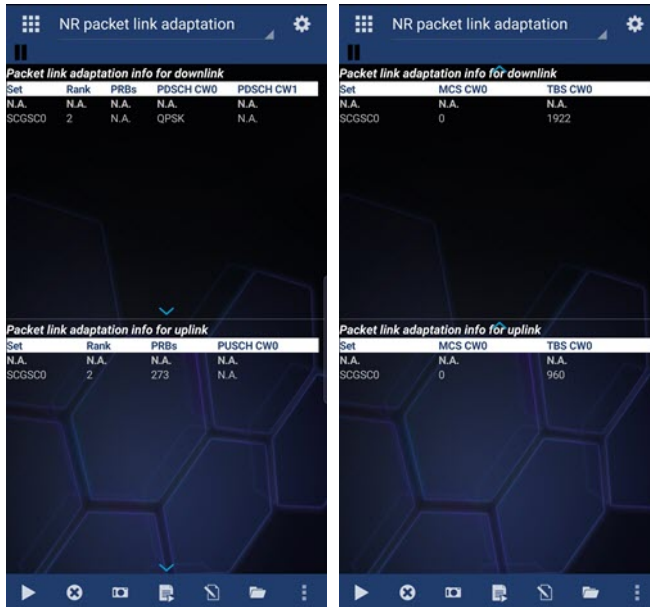
PCI displays physical cell identity.

BWP ID displays BWP ID.

*Numerology* displays numerology.

*Bandwidth* indicates the bandwidth of the active carrier in MHz.

### 6.30.50NR packet link adaptation



*Rank* displays how many data streams are used for the data transmission. When spatial multiplexing transmission scheme is used, the rank is the same as the number of used layers. The value of the parameter is zero when data is not received.

*PRBs* displays PRBs.

*PDSCH CW0* displays Physical Downlink Shared Channel (PDSCH) for codeword 0.

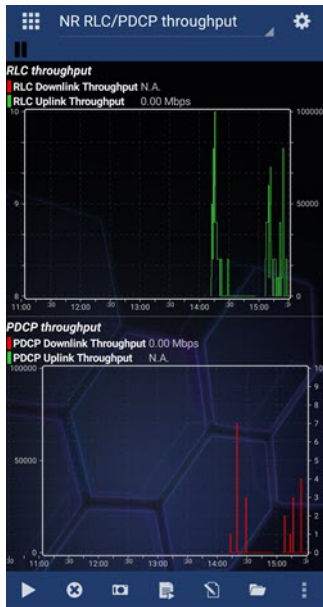
*PDSCH CW1* displays Physical Downlink Shared Channel (PDSCH) for codeword 1.

*PUSCH CW0* displays physical uplink shared channel for codeword 1.

*MCS CW0* for displays PDSCH MCS for codeword 0.

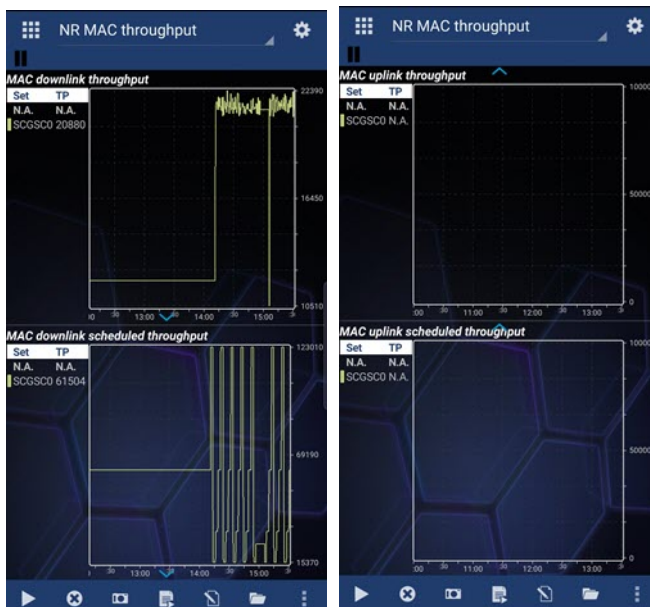
*TBS CW0* displays transport block size for codeword 0.

### 6.30.51 NR RLC/PDCP throughput



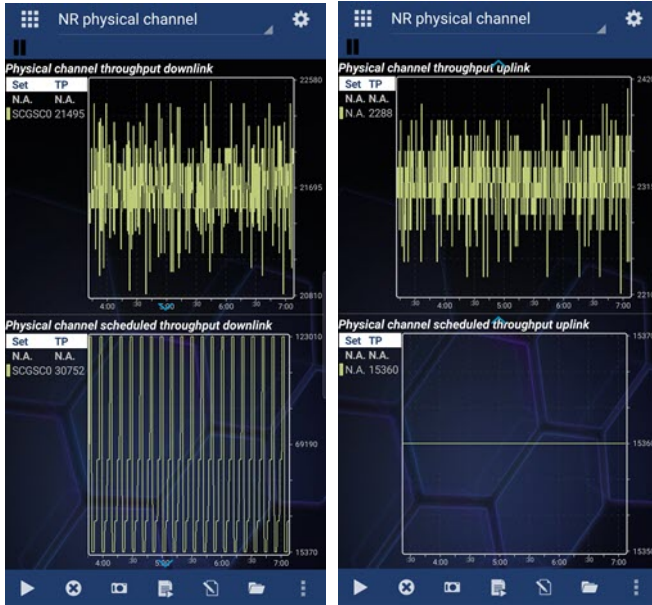
*RLC Downlink Throughput* displays RLC throughput in downlink direction.  
*RLC Uplink Throughput* displays RLC throughput in uplink direction.  
*PDCP Downlink Throughput* displays PDCP throughput in uplink direction.  
*PDCP Uplink Throughput* displays PDCP throughput in uplink direction.

### 6.30.52 NR MAC throughput



*MAC downlink throughput* displays MAC throughput in downlink direction.  
*MAC downlink scheduled throughput* displays MAC scheduled throughput in downlink direction.

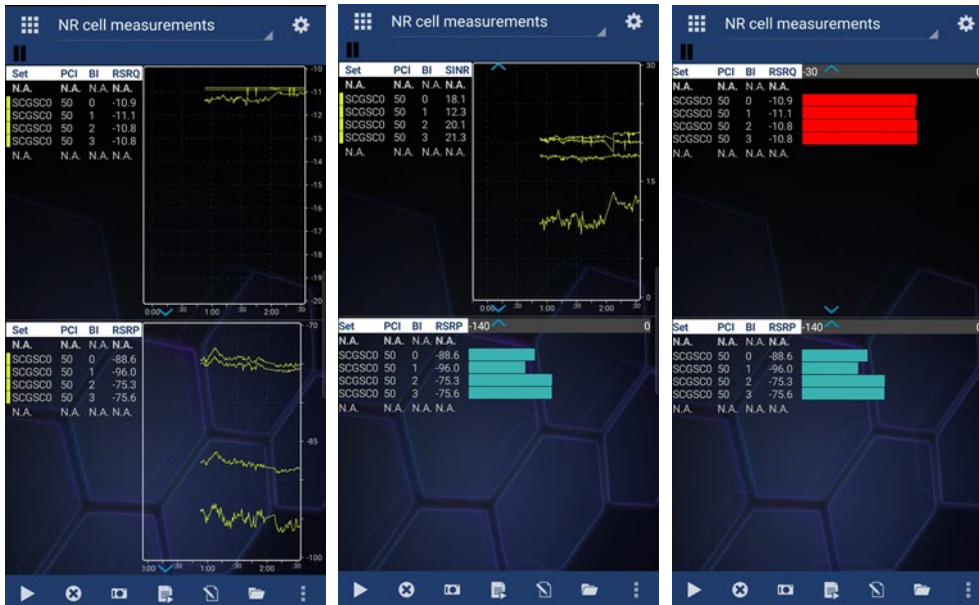
### 6.30.53 NR physical channel throughput

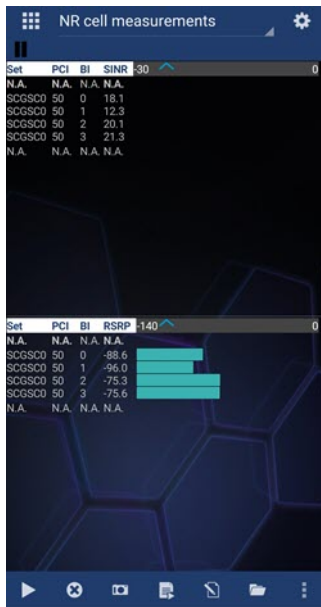


*Physical channel throughput downlink* displays physical channel throughput in downlink direction.

*Physical channel scheduled throughput downlink* displays physical channel scheduled throughput in downlink direction.

### 6.30.54 NR cell measurements





*PCI* displays physical cell identity.

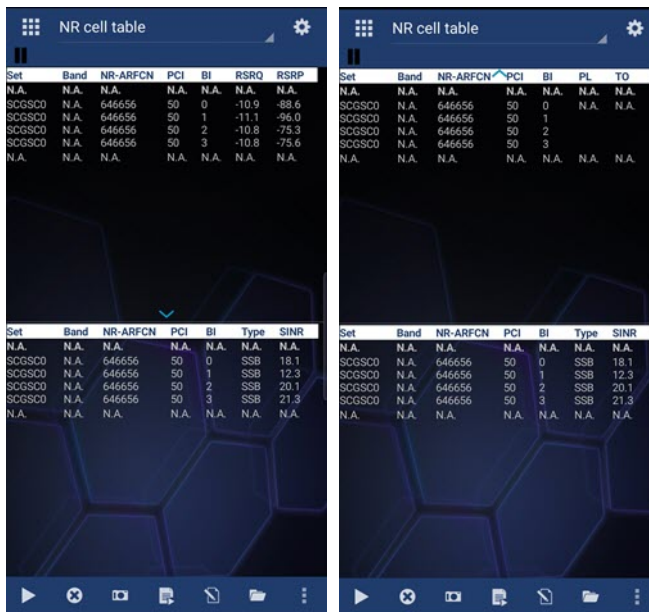
*BI* displays beam index. Note that the beam index is only available with Qualcomm chipset-based devices.

*RSRQ* displays reference signal received quality.

*RSRP* displays the reference signal received power.

*SINR* displays the ratio of the secondary synchronization signal power to noise and interference power.

### 6.30.55NR cell table



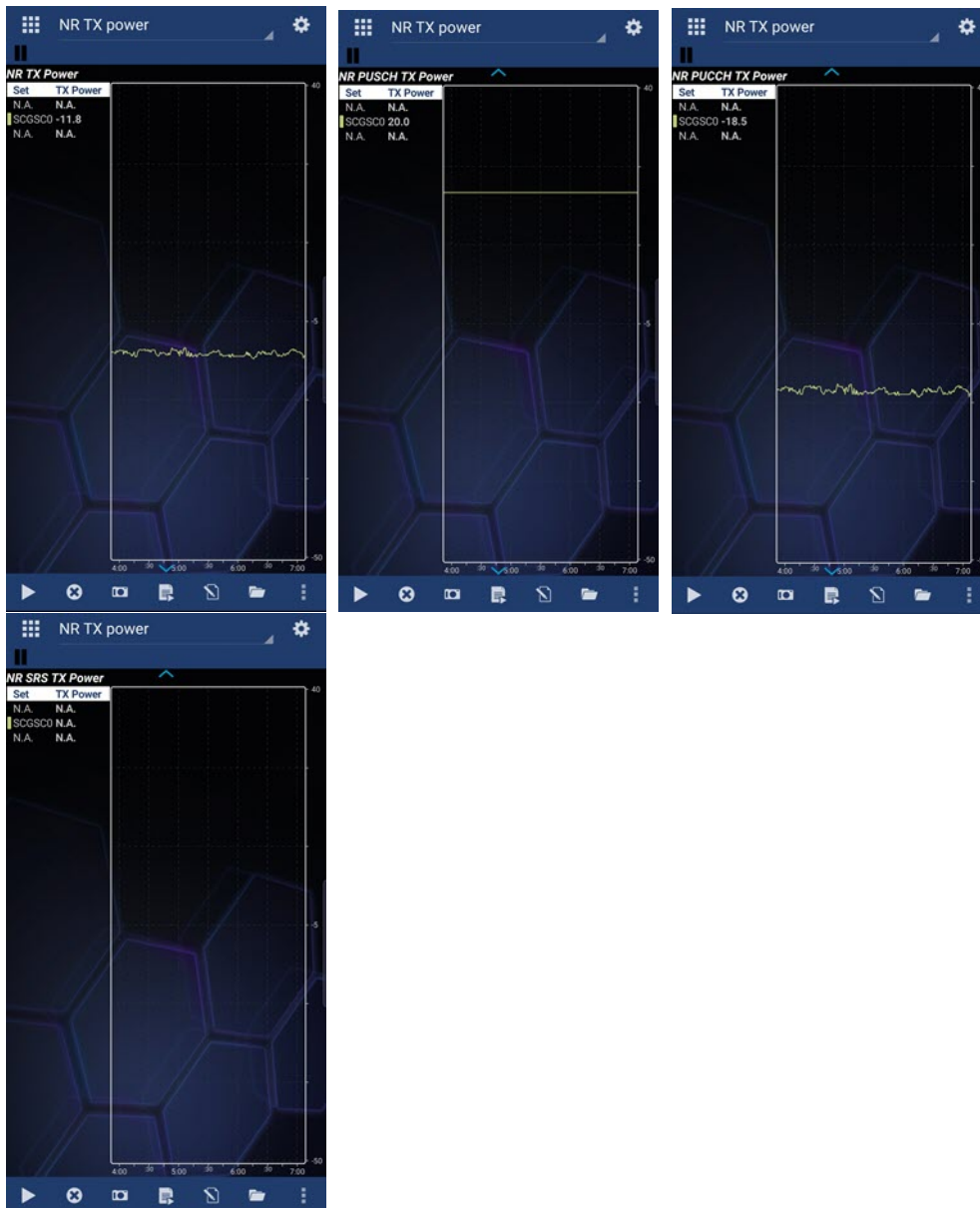
*NR-ARFCN* displays NR-ARFCN.

*PCI* displays physical cell identity.

*BI* displays beam index.

*RSRQ* displays reference signal received quality.  
*RSRP* displays the reference signal received power.  
*SINR* displays the ratio of the secondary synchronization signal power to noise and interference power.  
*PL* displays pathloss.  
*TO* displays timing offset.

### 6.30.56NR TX power



TX Power displays the TX power level in dBm. Values range from 30 to -120.


### 6.31 Custom view

With Nemo Handy's custom view you can tailor a view to your own needs.

You can create a new custom view by selecting **Settings | Page settings** and selecting **New Page | [Empty]**.

Give a name for the page and tap **Create split** (split can also be used as standalone view/page). The page(s) you create will be visible in the page settings.

Alternatively, create a Custom view by tapping **Settings | Page settings** and selecting **Create split**.

To add, edit and remove parameters from pages, go to **Settings | Page settings** and select from the list the page you wish to edit. Tap  to open a preview of the edited page.

Tap the settings icon on the top right corner of the screen and select **Add | Parameter**. The Parameter editor view is displayed. Search for parameter by typing the parameter name on the search parameter field. Select list index, visual, text style and define label (for more information, see Adding a parameter). If the page contains graphs, parameters can also be added to the graphs. You must define Visual: Graph 1 (or Graph 2) and Graph Type must be set to Line Graph. Tap **OK** and then tap **Save** to save the configuration if previous configuration has not been saved. The parameter is now visible on the page and you may exit the Parameter editor.

There are three optional way to hide default parameters:

- 1) By selecting **Settings | Edit | Visibilities** you can select the visible parameters. Tap **Save**.
  - 2) By selecting **Settings | Edit | Parameter**, you can select whether a parameter is shown on a page by selecting a parameter from the list and select the *Show parameter* checkbox and tap **OK**.
  - 3) By selecting **Settings | Remove | Parameter**, you may remove parameters or hide default parameters
- By selecting **Settings | Reset to default**, you can select to reset a display or a page.

## 6.31.57 Create split

The Custom display view opens.

*Add...* enables you to add a page or a parameter.

*Edit...* enables you to edit the display or page configurations.

### 57.6.31.1 Adding a page

Selecting **Add... | Page** enables you to add a new page in the view. Tap **Page** and an editor view opens.

*Name* defines the name of the page and is displayed on the top of the view.

*System* defines the system used. Tap the system field to open the list of systems. This will define when the page is visible. For example, if you choose LTE, the page is only visible when the UE is connected to LTE network.

*Layout* defines the layout of the view, for example the position of a graph. Tap on the layout field to open the list of layout choices.

*None/Bar Graph*: no graph displayed in the view if Visual is set to **None** or to either of the two line graph options in parameter settings; a bar graph is displayed in the view if Visual is set to **Bar Graph** in parameter settings. *Note that the option None/Bar Graph selected here overrides the Line Graph option in parameter settings.*

*Bottom Line Graph*: the graph is displayed on the bottom of the view.

*Right Line Graph*: the graph is displayed in the right side of the view.

*Text size (1-30)* defines the size of the text displayed in the view.

### 57.6.31.2 Adding a parameter

Selecting **Add... Parameter** enables you to add a parameter in the view. Tap **Parameter** and an editor view opens. Please note that the contents of the dialog vary slightly depending on selections made.

*Parameter* defines the parameter used. Insert the parameter by tapping on the text field and typing in the parameter. A list of parameters opens once letters are inserted in the field.

*List Index* defines the parameters shown in the graph. The best value of a parameter with multiple values is 0, the second best is 1, and so forth. For example, List Index 1 used for parameter *Monitored Set Ec/NO* displays the second best Monitored Ec/NO value.

*Label* defines the parameter name displayed in the view. If no label is inserted, the parameter shown in the Parameter field will be displayed as the label.

*Visual* defines whether a graph is displayed in the view. Tap on the **Visual** field to open a list of choices.

*None*: no graph is displayed in the view.

*Graph 1*: one graph is displayed in the view.

*Graph 2*: two graphs are displayed in the view.

*Graph Type* defines the graph type: the options are bar graph and line graph.

*Min Value* defines the minimum value for the parameter, set automatically according to the parameter.

*Max Value* defines the maximum value for the parameter, set automatically according to the parameter.

*Limit Value* defines the threshold value for the parameter, must be set manually.

*Good Color* defines the color for the good values in the graph. Select a color by tapping **Select**, tap on a desired color in the circle, and then tap **OK**.

*Bad Color* defines the color for the bad values in the graph. Select a color by tapping **Select**, tap on a desired color in the circle, and then tap **OK**.

*Line Size* defines the size of the line shown in the graph.

*Text Style* defines the style of the text. Tap the field to select a style: normal, bold, or cursive.

### 57.6.31.3 Editing the display

Selecting **Edit... Display** enables you to edit the display title. Tap **Display** and an editor view opens.

*Title* defines the title of the display. Tap on the text field and type a title.

### 57.6.31.4 Editing a page

Selecting **Edit... Page** enables you to edit the page settings. Tap **Page** and an editor view similar to that introduced in Chapter “Adding a page” opens.

### 57.6.31.5 Custom display live view

Once the Custom display is in live view, it is possible to activate parameters, scale parameters, or save configurations. Tap and hold a parameter. A Parameter dialog box opens. Select **Parameter settings** from the dialog box and select the parameter you wish to edit from a list of available parameters to open the Parameter editor.

*Set scale* activates the selected parameter. This means that the scales will display values for that parameter. Define whether the scale displaying the values for the selected parameter is displayed on the left or on the right side of the display. Select **None** to hide an individual parameter.

*Auto scale* defines the scale for the parameter. Tap **Auto scale** to open a list of choices.

Select **None**, and the scales return to normal.

Select **High**, and Nemo Handy changes the scales and zooms in on the view so that the line is at the top of the graph and the minimum value is at the bottom of the scale. The symbol changes to ↑.

Select **Low**, and Nemo Handy changes the scales and zooms in on the view so that the line is at the bottom of the graph and the maximum value is at the top of the scales. The symbol changes to ↓.

Select **Both**, and Nemo Handy checks the minimum and maximum values for the graph from the visible area and zooms in on the view so that the line is in the middle. The ↑↓ symbol appears next to the parameter name at the top of the view.

*Save configuration* enables saving the configuration.

## 6.31.58 Custom display example

Here is an example of how to create a new page with custom display.

1. Tap **Settings | Page settings** and **New page**.
2. The Select page dialog box opens. Select **[Empty]**.
3. Type a name for the page (this is the name visible on the display field in live view) and select **Show page**. Tap **Create split**.
4. The Custom display view opens. Tap **Edit... Page**.
5. The editor view opens. Insert the information and tap **OK**.  
The name inserted in *Name* field is the name visible on the page.
6. The new page opens. To add a parameter, tap **Add... Parameter**.
7. The editor view opens. Insert the information and tap **OK**.
8. The Custom display editor view opens. In this view it is possible to add new pages or parameters, and to edit or remove the existing display, page(s), or parameter(s).



To add a page tap **Add... Page** and insert the information for the page.

To add a parameter tap **Add... Parameter** and insert the information for the parameter.

To edit the display, tap **Edit... Display**.

To edit the parameter(s), tap **Edit... Parameter** and tap on the parameter you wish to edit.

To edit the page(s), tap **Edit... Page** and tap on the page you wish to edit.

9. To save the Custom display, tap **Save**.
10. Tap the back button of the device to exit the Custom display editor view.
11. The New page view opens. In this view you can edit () or delete () the Custom display view, or create a new split by tapping **Create split**. Tap the back button of the device to exit the Custom display.
12. The Test case page created in Custom display can now be viewed in the live view.  
The page is displayed on the Page settings.  
The page can be edited by tapping **Settings | Page settings**, or by tapping on the page name on **Settings | Page settings**.
13. To scale a desired parameter in the graph, tap and hold on the parameter. Select **Parameter settings** from the dialog box to open the Parameter editor. Select **Left** or **Right** under Set scale or select **None** to hide the parameter. Finally, tap **Save**.

## 7 Settings

The chapters below describe the Settings pages.

### 7.1 Page settings

In Nemo Handy, select **Settings | Page Settings** to define page settings and create custom views. For more information, see “Custom view”

### 7.2 General settings

In Nemo Handy, select **Settings | General** to define general settings.

*Backlight* option defines the brightness of the backlight.

*Answer Incoming Calls* option activates/deactivates the auto answer mode. When Nemo Handy is in auto answer mode, it answers all incoming voice calls. Note that this applies only when doing manual testing. When using scripts, please add the script command for answering incoming calls.

*Call Answer Delay* option allows you to define the delay in milliseconds before answering an incoming call.

*Answer Known Numbers* option activates/deactivates the answer known numbers mode. When in this mode, Nemo Handy only answers incoming calls from phone numbers that appear in the phone application’s outgoing call list. Incoming calls from numbers that do not appear in the phone application’s outgoing call list are not answered and Nemo Handy hangs up the call. In this case, call events are not written into the measurement file.

When *Answer Allowed Numbers* option is selected, Nemo Handy only answers incoming calls from phone numbers that have been added to Allowed Phone Numbers list. Incoming calls from numbers that do not appear in the list are not answered and Nemo Handy hangs up the call. In this case, call events are not written into the measurement file.

*Allowed Numbers* enables adding new phone numbers to the Allowed Phone Numbers list. Enter the phone number without country code and select **Save**. Note that you are able to add several new numbers from the same dialog.

*Active WiFi Scanning* activates/deactivates WiFi scanning.

*Forcing Reset* option allows you to define whether the forcing lock settings return to default when the Nemo Handy application is closed. Forcing reset is on by default.

*Airplane Mode at Startup* option enables you to define whether Nemo Handy turns the Airplane mode on for a few second at application startup. The options are **Ask always** (default), **Enabled**, and **Disabled**. Tap on the text field to open the option selection.

*Enable MMS Testing* option enables MMS testing. Note that Android version 4.4 or later is required for performing MMS tests. When MMS testing is enabled, the Android default MMS application is Nemo Handy. Note that if Nemo Handy is the default MMS application, all received MMS messages are routed to Nemo Handy and not visible in the UI. To use the standard MMS feature in the terminal, you need to turn off the MMS testing feature from Nemo Handy settings.

*Send Crash Reports*, if selected, Nemo Handy will send crash reports.

*Send Analytics Reports*, when selected, allows Nemo Handy to send user statistics to improve Nemo Handy user experience.

*Write Debuglog* defines whether debug log is written.

*Device Label* allows naming the device.

*Phone Number* defines the phone number of the Nemo Handy terminal. This information can be used in post-processing to make statistics between MO and MT calls.

*Custom Operator Names* defines the operator names displayed in the Summary views. Tap **Add new** in the dialog that opens. Define MCC (mobile country code) and MNC (mobile network code) and enter operator name. Tap **Save**.

*Import/Export Settings* option enables importing and exporting settings. With this feature you can share settings with other users and device models from your Nemo Handy terminal.

*Keep Backup*, when selected, keeps a backup of measurement files in the measurement unit's backup folder (located at /backup folder). This way, if the files disappear from Nemo Cloud, they can be recovered from the measurement unit.

*Screenshot Resolution* enables you to define the resolution of screenshots (original, medium, or small) you take from the Nemo Handy user interface.

*Screenshot Format* defines in which format (.png or .jpg) the captured screenshot will be saved.

*Screenshot Timestamp*, if selected, leaves a timestamp on the captured screenshot.

*Screenshot All Views*, if selected, captures a screenshot of all views. Ask, when selected, prompts Nemo Handy to ask whether to take screenshot of all views whenever the user is taking a screenshot.

*Enable MMS Testing*, if selected, enables you to perform MMS testing.

*MMS APN* defines which APN is used for MMS testing.

*Automated Testing* option activates/deactivates the automated testing feature. See Chapter "Automated testing" for more information.

In addition to the manual exporting of settings, it is also done automatically when closing Nemo Handy. When starting newly installed Nemo Handy for the first time previously exported settings are checked and loaded.

## 7.3 Logins

In Nemo Handy, select **Settings | Logins** to define the login settings.

*Login Twitter*, if selected, allows you to log into Twitter. Logging in is mandatory when performing Twitter testing.

*Login Instagram*, if selected, allows you to log into Instagram. Logging in is mandatory when performing Instagram testing.

*Login LinkedIn*, if selected, allows you to log into LinkedIn. Logging in is mandatory when performing LinkedIn testing.

*Login Dropbox*, if selected, allows you to log into Dropbox. Logging in is mandatory when performing Dropbox testing.

## 7.4 Display & Sound settings

In Nemo Handy, select **Settings | Display & Sound** to define the display settings.

*Display config file* defines which views are displayed. Selecting **Default** uses the default configuration, while **Select configuration file** enables you to open a customized configuration file.

*Units* defines the measurement units used when defining the Nemo Handy maps (Metric/Imperial).

*Throughput prefix* defines in which unit throughput units are shown (Kilo/Mega/Giga)

*Show serving info* displays/hides the serving channel information on every page.

*Serving info parameters* allows you to select parameters to be displayed in the serving info bar that can be displayed at the top of the screen.

*Notification volume* sets the volume level for voice notifications.





















*Notifications* enables you to select which notification icons and/or notification audio files are in use. See Chapter "Notifications" for more information on notifications.












## 7.4.1 Notifications

Select **Settings | Display & Sound | Notifications** to access the Notifications page. Here you can activate/deactivate, edit existing, and create new notifications. See Chapter “Custom notifications” for more information on editing and creating new notifications.

There are three types of notifications: audio, icon, and popup. Audio notifications will play an audio file when triggered. Notifications with icons will appear as icons on the measurement route on a map and in line graphs. A popup message can be selected for both types of notifications. The popup appears briefly at the bottom of the screen. If you have a smartwatch or other wearable with an Android operating system, you can select wearable to display notifications on your wearable device.

With the buttons at the top you can select/clear all icons, audio files, popups, and wearable. By tapping each parameter, you can select individual notifications.

Notification	Icon	Audio	Trigger
<user-defined description>		User-defined	User-defined
GPS Fix Lost		yes	
GPS Fix Acquired		yes	
GPS Disconnected		yes	
GPS Connected		yes	
Service received		yes	
Service lost		yes	
LAC Changed		yes	
Cell ID Changed, Channel Changed, System Changed, CDMA System Changed		yes	
Voice Call Attempt			
Voice Call Connected			
Voice Call Failed			
Voice Call Disconnected			
Voice Call Dropped			
C/I L		yes	C/I under 12
UL Power Up High		yes	Percentage of uplink power up commands over 60
TX Power High		yes	TX power over 14
BLER High		yes	Block error rate downlink over 5
DL Power Up High		yes	Percentage of downlink power up commands over 60
Best RSCP Low		yes	Active set received signal code power under -95

Notification	Icon	Audio	Trigger
RX Quality Bad		yes	RX quality over 4
Best Ec/N0 Low		yes	Active set Ec/N0 under -15
RX Level Low		yes	RX level under -95
FTP Connection Attempt HTTP Connection Attempt mScore Connection Attempt WhatsApp Connection Attempt BiP Connection Attempt			
FTP Connection Success HTTP Connection Success mScore Connection Success WhatsApp Connection Success BiP Connection Success			
FTP Connection Failed HTTP Connection Failed mScore Connection Failed WhatsApp Connection Failed BiP Connection Failed			
FTP Connection Disconnected HTTP Connection Disconnected mScore Connection Disconnected WhatsApp Connection BiP Connection Disconnected			
FTP Connection Dropped HTTP Connection Dropped mScore Connection Dropped WhatsApp Connection Dropped BiP Connection Dropped			
FTP Transfer Attempt HTTP Transfer Attempt mScore Transfer Attempt WhatsApp Transfer Attempt BiP Transfer Attempt			
FTP Transfer Success HTTP Transfer Success mScore Transfer Success WhatsApp Transfer Success BiP Transfer Success			
FTP Transfer Failed HTTP Transfer Failed mScore Transfer Failed WhatsApp Transfer Failed BiP Transfer Failed			

### 1.7.4.1 Custom notifications

It is possible to edit existing notifications and create new notifications.

To edit a notification, tap the arrow icon next to a notification.

*Label* defines the name of the notification.

*Parameter name* defines the parameter or measurement event for which the notification is created.

*Unit* defines in which unit the parameter value is shown.

*Trigger* defines the condition for the notification. The options are *Change*, *Equals threshold*, *Over threshold*, and *Under threshold*.

*Threshold* defines the value that triggers the notification. This setting is hidden when the *Change* trigger option is selected.

*Hysteresis* defines a tolerance value for triggering the notification. Value 0 means hysteresis is not used. This setting is hidden when the *Change* trigger option is selected.

*Speak* defines the audio (text to speech) used with the notification. Type in the text and it will be played when the notification is triggered. By tapping the speaker icon, you can preview the audio file.

*Icon* displays the notification icon.

*Default action* defines how you will be notified. The options are audio, icon, popup or wearable. You can also select all four.

To create a new notification, tap **Add New** at the top right corner of the Notification settings page.

*Label* defines the name of the notification.

*Parameter name* defines the parameter or measurement event for which the notification is created.

*Trigger* defines the condition for the notification. The options are *Change*, *Equals threshold*, *Over threshold*, and *Under threshold*.

*Speak* defines the audio (text to speech) used with the notification. Type in the text and it will be played when the notification is triggered. By tapping the speaker icon, you can preview the audio file.

*Icon* defines the appearance of the notification icon (circle, square, triangle). Select the color as well.

*Default action* defines how you will be notified. The options are audio, icon, popup, or wearable. You can also select all four.

After defining all the settings, tap **Save** and the new/edited notification is added to the list.

## 7.5 Logging settings

In Nemo Handy, select **Settings | Logging** to define the logging settings.

*Log file prefix* allows you to define your own prefix for log file name.

*Measurement File Format* defines the file format used in measurements. The file format options are Measurement file (.nmf, default) and Debuglog (.nbl).

### NOTE

Note that if the Debuglog (.nbl) option is selected you cannot access or use the .nbl logging file as such. It is recommended not to select the Debuglog option unless prompted by Keysight Technologies.

If the *Autologging* option is selected, Nemo Handy will start logging when a script is started and stop logging when the script is finished. It is also possible to switch autologging off in the middle of a script if you would like to continue logging even after the script is finished.

*Log file splitting* option allows you to split the log files into manageable sized files instead of having one large file. See Chapter “Log file splitting” below for more information.

*Measurement upload* allows you to save connection settings into configurations that can be used when uploading files on a server. See Chapter “Defining measurement upload configurations” for more information.

*Questionnaire* allows defining when a questionnaire is displayed. You can choose to show it when a measurement is started, paused, resumed, or stopped. A summary of answers is shown when all questions have been answered.

When a questionnaire has been created, it can be used by engineers in the field. The idea is to collect information from measurement environment to a measurement file. Using questionnaire reduces errors by the user (for example, typing city or location wrong). Questionnaire results are stored to QNOTE file format event as specified in Nemo File Format.

*Background logging (OFF/ON)*, when activated, enables idle logging with Nemo Handy. In idle logging mode measurements files are still logged into Nemo Handy memory while Nemo Handy is idle and not logging.

*Background log length* defines the length of the idle log in minutes. In idle logging mode Nemo Handy saves data for the length of time defined here. Tap **Background log length** to define the idle log length.

*IP capture* option activates/deactivates IP packet capturing. See Chapter “IP capture” for more information on IP capturing.

*IP capture interfaces* enables selecting which interface to use for IP capture. Note that if WLAN is selected and the device’s WLAN is then turned off, the selected interface’s mode changes to default mode “any”.

*IP capture max packet size* defines how many bytes to capture from each packet.

*IP capture filter* option defines whether captured packets are filtered.

*IP capture filter rules* allows you to define IP capture filter rules.

*Initial marker*, when selected, a dialog will be displayed when logging begins, in which the user can define a measurement description.

*Predefined marker* allows user to define the marker before starting logging.

Step-by-step Use Case Description:

- Connect the UE to a PC and open the XML to a text editor.
- Add / modify XML to match your need.
- Distribute the used XML which is located in /Nemo/Config folder to all users (users need to put their XML to each measurement system).
- After the XML has been moved to /Nemo/Config folder, go to Nemo Handy settings. Enable Questionnaire and when it will be shown.
- When Nemo Handy is configured and a measurement started, the questionnaire is displayed for the first time (depending on the settings).
- If a measurement is paused, actual file writing will not stop until the user has answered the Questionnaire (depending on the setting).
- Same thing happens when stopping the measurement (depending on the setting).

*Create Report after* enables you to create a Nemo Instant Report.

*Select template* enables you to select a default template used for the instant report.

*Customize report* enables you to customize a template for the instant report.

## 7.5.2 Background logging

### NOTE

Note that this functionality is available only if your Nemo Handy product option supports it.

Background logging enables the recording of for example potential issues outside active measurements. When **Background Logging** is activated in Logging settings, and Nemo Handy is in normal use or in idle mode in the background, Nemo Handy records all detected problems or issues even if there is no actual measurement running at the time. To save these detected issues in a measurement file, go to **Menu | Save background logging data**. You can keep, rename, or delete the file.

Note that in background logging mode Nemo Handy stores data only for the length of time defined in **Logging | Background log length**. The default length is set to five minutes, which means that the last five minutes are stored in Nemo Handy memory. If this five-minute limit is exceeded, Nemo Handy erases the data from the start of the idle logging session onwards, keeping the total time of the log within the set limit. Any detected issues can be saved only within the set time limit.

## 7.5.3 Log file splitting

Log file splitting allows you to split the log files into manageable sized files instead of having one large file. The files can be split based on file size or file length. Log file splitting is available only when running scripts. You can access the Log file splitting dialog box through **Settings | Logging | Log File Splitting**.

If you select the *Flexible file size limit* option, you can define a file size in MB. When that file size is reached, the file will be saved and a new file created. With the *Flexible* option, the ongoing script will not be interrupted when the limit is reached. Instead, logging will continue until the current script round (repeat) is finished, and a new file is created when the next script round is started.

If you select the *Fixed size limit* option, you can define a file size in MB. When that file size is reached, the file will be saved and a new file created. With the *Fixed* option, the ongoing script round (repeat) is interrupted when the limit is reached, a new file is created, and the ongoing script round is started from the beginning.

### NOTE

Please note that if you define a very small file size and select the fixed file size limit option, there is a possibility that the script will loop indefinitely. In such a case, adjust the file size limit big enough for the script to finish.

If you select the *Flexible file length limit* option, you can define a file length in minutes. When that length is reached, the file will be saved and a new file created. With the *Flexible* option, the ongoing script will not be interrupted when the limit is reached. Instead, logging will continue until the current script round (repeat) is finished, and a new file is created when the next script round is started.

If you select the *Fixed file length limit* option, you can define the file length in minutes. When that length is reached, the file will be saved and a new file created. With the *Fixed* option, the ongoing script round (repeat) is interrupted when the limit is reached, a new file is created, and the ongoing script round is started from the beginning.

### NOTE

Please note that if you define a very short file length and select the fixed file length limit option, there is a possibility that the script will loop indefinitely. In such a case, adjust the file length limit long enough for the script to finish.

If you select the *Nested script* option, Nemo Handy creates a new log file for each nested script execution.

## 7.5.4 Defining measurement upload configurations

A measurement upload configuration contains settings for the connection used to upload the files and information about how the files are named and where they are uploaded.

Select one of the existing configurations or create a new one by tapping **Create New**.

First select the protocol used for the transfer.

On the *Connection configuration* page, define settings needed for the file upload. Once you have defined all settings, tap **Save**. The configuration will appear on the *Select Configuration* page.

Note that the contents vary slightly depending on the selected protocol.

*Target folder path* defines the target location for the uploaded files when FTP protocol is used.

Type in the path, tap **Verify Path**, and the target folder path will be checked. If you want to create a new target folder on the FTP server, type in the name in the *Target folder path* field (for example /handy) and tap **Create and Verify**. If the path is correct, a *Path verification successful* message is displayed.

*URL* defines the target path for the uploaded files when HTTP or HTTPS protocol is used. Type in the address, tap **Verify URL**, and the target path will be checked. If the path is correct, a *Verification successful* message is displayed.

*Prefix type* defines a prefix that will be added at the beginning of the file name. Select *None* and no prefix will be added and IMEI will add the terminal's IMEI code. You can also type in a custom prefix.

*Selected HTTP(S)/(S)FTP connection* defines the connection used for the file upload. To select a premade connection, tap **Select**, select a connection from the list, and tap **Select**. To create a new connection, tap **Select** on the Create configuration page and then tap **Create New**.

### 4.7.5.1 FTP connection settings

On the Create FTP connection page, define the FTP connection settings.

*Host* defines the FTP host address.

*Port* defines the host port.

*Passive mode* option defines whether passive mode is used or not.

*Username* defines the host site logon user name

*Password* defines the host site logon password.

After defining all settings, tap **Verify Connection** to check that the settings are correct. You should see the Verification successful message. After the connection has been verified, tap **Save** to save the connection for future use. The saved connection will be added on the Select FTP connection page. You can access the Select FTP connection page also through the script editor when defining FTP logon settings and when defining settings for manual FTP transfers

### 4.7.5.2 HTTP(S) connection settings

On the Create HTTP/HTTPS connection page, define the connection settings for HTTP and HTTPS protocols.

*Host* defines the host IP address.

*Username* defines the host site logon user name

*Password* defines the host site logon password.

Select the **Authenticate server** option (for HTTPS) to authenticate the HTTPS server.

After defining all settings, tap **Verify Connection** to check that the settings are correct. You should see the Verification successful message. After the connection has been verified, tap **Save** to save the connection for future use.

### 4.7.5.3 Dropbox connection settings

On the Create configuration page, define the connection settings for the Dropbox protocol. *Target folder path* defines the target location for the uploaded files when Dropbox is used. Type in the path, tap **Verify Path**, and the target folder path will be checked. If you want to create a new target folder on the Dropbox server, type in the name in the *Target folder path* field (for example /handy) and tap **Create and Verify**. If the path is correct, a Path verification successful message is displayed.

*Prefix type* defines a prefix that will be added at the beginning of the file name. Select **None** and no prefix will be added, and IMEI will add the terminal's IMEI code. You can also type in a custom prefix.

After defining the settings, tap **Save** to save the connection for future use.

## 7.6 Real-time reporting

Real-time reporting can be used together with Nemo Cloud (or any supporting third-party tool) to send status reports with defined interval. Reports include information like signal strength, coordinates and statistics. This information can be utilized in real-time when monitoring measurement units with Nemo Cloud.

To define real-time reporting settings, go to **Settings | Real-time reporting**.

*Reporting* enables/disables real-time reporting.

*Report interval* defines the reporting interval in seconds.

*Network settings* opens the Selected configuration dialog box. For more information, see Chapter "Uploading log files on server".

## 7.7 GPS settings

When the *Use GPS time* option is activated, the system clock is synchronized with GPS time at the beginning of a measurement. Logging is not started before there is a GPS fix and the clock can be synchronized. If logging is started and there is no GPS fix, Nemo Handy will go into "Waiting state" during which Nemo Handy cannot be used.

*GPS source* defines the GPS source. When using Nemo Handy in Nemo Autonomous Probe mode, you can use USB GPS over tethered connection by selecting **Autonomous Probe GPS** as GPS source.

*Bluetooth devices* displays the enabled devices.

When automated testing is selected in **Settings | General**, the following options are displayed.

When *GPS required* option is activated, GPS is required.

When the *Use fixed location* option is activated, Nemo Handy does not log GPS data with measurements, but will instead write the same coordinates into all measurement files and reports.

Tapping *Location* allows you to define the location for the coordinates written into all measurement files and reports.

### NOTE

Please note that this option affects the system clock in Nemo Handy. Not the clock in the Android terminal.

## 7.8 Map settings

*Draw route* defines when the measurement route is drawn on the map. The alternatives are always, when logging, and never.

*Show notifications on map (Yes/No)* defines whether notifications appear on the map.

*Route width* defines the width of the route line on the scale from 1-20.

*Route color* defines the color displaying the route on the map.

*Idle route*, (on/off) when activated, allows Nemo Handy to continue drawing the route and collecting the route data also when the measurement is in idle mode or paused.

*Indicate parameter on route color*, when set to **Yes**, enables you to observe the values of certain network parameters from the route coloring on the map. The colors referring to each parameter are predefined.

*Map parameters* allows you to select parameters to be displayed on a map. You can also define a color set for the parameters.

*Import GPX route* enables you import a GPX file. Tap **Import GPX route** and select a .gpx file from the list. Note that you need to ensure that you have copied the GPX file to your Nemo Handy device before you can import the file.

*Show GPX route*, when selected, displays the GPX route on top of the map.

*Select Nemo Navigation Assistant* enables you to select a GPS navigation device to be used alongside Nemo Handy. Tapping **Select Nemo Navigation Assistant** opens the Select device dialog which shows paired devices. Select the correct device from the list. If the device you wish to select is not displayed, select **Show all paired devices**.

*Map select* enables you to select between Google Map and OpenStreetMap (Google Map selected as default).

*Google Map type* defines whether normal or satellite map is used.

*HTTP map loading* (with Open Street Map selected) defines when Nemo Handy is allowed to load a map (*Always/When not logging/Never*).

## 7.8.5 Google Map

Using Google Map may require updating the Google Play services. In this case, when Google Map is selected as the map type Nemo Handy asks you to update the Google Play services. Tap **Update**.

You will need to sign in to a Google Account to update Google Play services.

If you already have a Google Account, tap **Existing** and enter your account details. If you need to create a new account, tap **New** and insert your information details. Follow the instructions on the view for the updating process.

Signing in and updating the services may take a few minutes. After the update is done, restart the Nemo Handy application.

With Google Map you can select between the normal view and the satellite view. To define the Google Map type, go to **Settings | Map | Google Map type** and select **Normal** or **Satellite**.

## 7.9 Indoor settings

*Floorplans* displays a list of .tab files that have been loaded in Nemo Handy. See Chapter "Importing maps and defining map settings".

*Import iBwave maps* allows you to import iBwave map files (see Chapter "Importing iBwave maps" for more information).

*DAS Anomalies*, (on/off) when activated, allows you to test and verify in-building DAS (Distributed Antenna Systems) antennas and view the antennas on the indoor map.

*DAS Anomalies Settings* allows you to define the DAS test area radius, intensity of the colors indicating the results, and the signal limits for acceptable test results.

*Draw zones* (on/off), when activated, draws zones on the indoor map after the loading of iBwave map files.

## 7.10 BTS settings

*BTS file* defines the BTS file displayed on the map.

To select a BTS file, the files (which are \*.nbf or \*.csv format) must first be loaded from a PC into the phone's BTS folder (phone/ Nemo/ Handy/ BTS), from where they are listed in the BTS settings. If no BTS files have been loaded, the listing will be empty. Select a BTS file from the list of files shown on the popup window.

*Encrypt BTS files* enables you to encrypt the BTS files. After encrypting a BTS file a password is required to open the file. The encrypted .nab file can be transferred to a PC via USB cable or Bluetooth without a password. A message is displayed if there are no BTS files to encrypt. Switch on the **Use BTS file** option to view the BTS icons on the map and to define BTS cells settings.

*Show BTS file cells* defines whether BTS icons are displayed on the map. Also, select a BTS file on the BTS settings page.

*BTS cells settings* defines the size and the color of BTS cells. You can define in pixels the size of active cell, active system, and other system BTS icons.

*Use cell range*, if selected, shows actual cell ranges on the map.

*Range transparency* defines the transparency of the cell range showed on the map.

*Draw serving lines* (ON/OFF), when activated, draws line(s) from the current location to the active cell(s).

*Active cell size* defines the size of the active serving cell when a BTS file is used.

*Active cell color* defines the color for the serving cell when a BTS file is used.

*Active system cells cell size* defines the size for the serving system base stations when a BTS file is used.

*Active system color* defines the color for serving system base stations when a BTS file is used.

For example, if the device is connected to a WCDMA network, all WCDMA base stations are colored with the selected color.

*Show other system cells*, when selected, shows cells from non-serving system base stations when a BTS file is used.

*Other system color* defines the color for the non-serving system base stations when a BTS file is used. For example, if the device is connected to a WCDMA network, all other base stations are colored with the selected color.

To adjust the cell colors, tap on the color icon.

*Cell info* allows you to display selected cell information on a map. First select a BTS file and then switch on the **Use BTS file** option. Select the information you would like to view on a map. See Chapter "BTS information on a map" for more information.

### 7.10.6 Serving info parameters

When you tap **Serving info parameters** in the Display & Sound settings, the Serving info parameters dialog box appears. Here you will find a list of parameters to choose from.

#### NOTE

Please note that only parameters supported by the current system will be displayed in the serving info bar. For example, if you select parameters from the GSM group and the device is connected to a WCDMA network, the parameters will not be displayed.

Tap on a technology from the list. A second-level list opens. Select a parameter from the second-level list by tapping on the check box. If you wish to edit the properties of the parameter,

tap the  button.

You can edit the appearance of the parameter in the serving info bar and define for which technologies the parameter is displayed. Finally tap **Save**.

*Label* refers to the parameter name displayed in the serving info bar.

*Format* defines the format in which the value is displayed. The options are decimal, hexadecimal, and octadecimal.

*Show unit* defines whether the parameter value unit is displayed in the serving info bar.

*System* defines for which network technologies the parameter is displayed.


#### NOTE


Note that the width of the serving info bar is limited, so all selected parameters may not fit in the bar. Turning the terminal horizontally will make the serving info bar wider and more parameters will fit in.

### 7.10.7 Serving info bar

You can select parameters to be displayed in the serving info bar that is displayed at the top of the screen (select **Settings** | **Display & Sound** | **Show serving info**).

To edit the parameter info bar, tap and hold on the parameter info bar to open the settings popup.

The settings icon () opens the Serving info parameter window, where you can select more parameters to be displayed on the serving info bar.

The paintbrush icon () opens a popup window in which you can define the color of the text displayed on serving info bar.

The minus icon – allows you to decrease the font size of the text displayed on the serving info bar.

The plus icon + allows you to increase the font size of the text displayed in the serving info bar.

Note that you can scroll the serving info text horizontally.

### 7.11 Voice quality settings

#### NOTE

Please note that this page appears only if your license includes the voice quality option.

Through the Voice Quality page you can define voice quality testing settings. See Chapter “Voice quality testing” for more information on performing voice quality tests.

*Voice quality mode* defines the voice quality mode. The options are off and uplink+downlink.

- *Uplink+downlink*: Sample is sent and received in turns. The downlink voice quality is measured by the Nemo Handy terminal and uplink quality by Nemo Server or another Nemo Handy terminal.

*Sample file* defines the voice sample file used in the voice quality testing. There are two types of samples: wideband and narrowband. If the sample filename has a “wb” postfix, the sample is wideband. Otherwise it is narrowband.

POLQA measurements can be done in Super Wideband (SWB) or in Narrowband (NB) mode. The mode is selected automatically based on the sample, that is, if a wb sample is selected, SWB POLQA measurement mode will be used. Respectively, if NB sample file is selected, NB POLQA measurement mode will be used.

#### NOTE

Note that SWB POLQA measurement mode should be only used with voice calls where WB AMR codecs are used. WB AMR is only used in mobile-to-mobile voice calls where in both ends the mobile is WB AMR capable, and the WB AMR codec is enabled in the network.

**NOTE**

Note that SWB POLQA cannot be used when testing against a fixed line, for example, between Nemo Handy and Nemo Server.

*MOS threshold* can be used to limit the number of samples saved to the measurement file. For example, only samples with a MOS score below 3 are saved.

*Uplink volume* sets the uplink volume level. Please note that in most cases the default value is recommended.

*Local audio output* defines the audio output of voice quality calls. The output is handset by default. You can also select loudspeaker or Bluetooth-headset. To pair a Bluetooth-headset with the phone go to **Apps | Settings | Bluetooth**.

*Use POLQA 2.4*, when selected, uses POLQA version 2.4 in voice quality measurements. When this selection is cleared, POLQA 1.1 version is used.

## 7.12 Nemo Server config settings

**NOTE**

Note that Nemo Server config settings are hidden if call sequencer is activated.

Tap *Nemo Server settings* to define the Nemo Server URL, username, password, remote number i.e. the channel on which commands and options are set, line number i.e the server number to which calls are made, and prefix of the Nemo Server.

*Use configuration* allows enabling/disabling Nemo server configuration.

When *Time sync* is enabled, latency and UTC time information is sent to Nemo Server with every command.

When *Mandatory* is enabled, configuring the server successfully is mandatory for the execution of the script, that is, if the server request fails Nemo Handy proceeds to next command, if there is any, without making the call. When disabled, the call is made even if the server request fails.

When *Initial connection* is selected, the script is not started until the HTTP commands go through from the Nemo Handy device to the server at least once.

*Save sample* defines whether samples falling below MOS threshold are saved or not.

*MOS threshold* can be used to limit the number of samples saved to the server. For example, only samples with a MOS score below 3 are saved.

*Enable PESQ* defines whether MOS values are calculated using PESQ.

*Enable POLQA* defines whether MOS values are calculated using POLQA.


**NOTE**

Note that both PESQ and POLQA can be selected.


## 7.13 Call sequencer settings

**NOTE**

Note that Call Sequencer is automatically disabled when automated testing mode is enabled in **Settings | General** but Nemo Handy unit is not assigned to a manual project via Nemo Cloud.

*Activate call sequencer*, when selected, activates call sequencer. The call sequencer icon  is now displayed on the toolbar. Tapping the icon opens the Call Sequences settings. Enter a phone number and select an existing sequence file from a list under *Select Sequence File*. The selected sequence file is also displayed under *Call Sequence file*. To change the call sequence file, select another sequence file from the list under *Select sequence file*, tap and hold the file name and tap **Load** from the opening dialog. You are also able to edit, delete, and rename the

file in the same dialog. To edit or unload a file under Call sequence settings, tap and hold the file name.

To create a new sequence tap  in the upper right corner of the screen. Enter a name for the new call sequence file in the opening dialog and click **OK**. The Call Sequence Editor is opened, allowing creating, removing, editing and selecting sequences.

*Startup delay (s)* defines how many seconds Nemo Handy waits before starting a call. The default time is 30 seconds.

*Originating calls* defines how many originating calls are made per sequence.

*Terminating calls* defines how many terminating calls are made per sequence.

*Repeats* defines how many times the sequence is repeated.

*Call duration* defines the duration of the call in seconds, unless used with Call End Condition (see below).

*Wait time (s)* defines the wait period in seconds.

*Voice quality mode* defines the voice quality mode:

When *On: caller initiated (default)* is selected, the Caller (Mobile Originating device) first sends an audio sample to uplink and the Callee (Mobile Terminating device) waits for a sync tone, records a sample and then sends its own sync and sample to uplink. This is the default mode except with CDMA calls.

When *On: callee initiated* is selected, Caller (Mobile Originating device) begins listening to the line and when it detects a sync tone, it will capture the sample and send its own sample to uplink. This is useful for example in CDMA networks where MO device does not receive information on when MT device has answered the call and call is truly connected. Select this option with CDMA calls. After selecting a sample file, you can save the sample to Nemo Server if needed by selecting the **Save sample** checkbox.

*VQMon: sample play*, when selected, the Caller sends an audio sample without a sync tone.

*Sample file* (visible when *On: caller initiated (default)/On: callee initiated/VQMon: sample play* is selected) defines the voice sample file used in the voice quality testing. There are two types of samples: wideband and narrowband. If the sample filename has *wb* as postfix, the sample is wideband. Otherwise the sample is narrowband.

*MOS threshold* (visible when *On: caller initiated (default)/On: callee initiated/VQMon: sample play* is selected) can be used to limit the number of samples saved to the measurement file. For example, only samples with a MOS score below 3 are saved. After selecting a sample file, you can save the sample to Nemo Server if necessary by selecting the **Save sample** option.

In the *Prefix for the received sample files* field you can enter a prefix for the received sample.

*Uplink volume* (visible when *On: caller initiated (default)/On: callee initiated/VQMon: sample play* is selected) defines the uplink volume level. When selecting Default, the default volume level is used. Selecting Define enables the user to set the volume level.

*POLQA Version* (visible when *Caller initiates voice quality/Caller responds voice quality* is selected) defines which POLQA version is used (POLQA 1.1/POLQA 2.4).

POLQA measurements can be done in Super Wideband (SWB) or in Narrowband (NB) mode. The mode is selected automatically based on the sample, that is, if a *wb* sample is selected, SWB POLQA measurement mode will be used. Respectively, if *NB* sample file is selected, NB POLQA measurement mode will be used.

Note that PESQ measurements can only be performed in narrow band mode.

*Address* defines the server address.

*Password* defines the server password.

## 7.14 Nemo Cloud settings

### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.

### NOTE

Nemo Cloud with Nemo Handy can be purchased as Basic (with file synchronization) or Premium (with file synchronization and automation). Please note that if you do not purchase one of these two options purchased you cannot use Nemo Cloud.

*Storage* defines which files Nemo Handy uses when files are uploaded, that is, from which file the file content is displayed when uploading files, and the location where new created files are saved. The options of the storage preference are **Ask always**, when Nemo Handy asks the storage location every time files are uploaded or saved; **Local**, when files are uploaded and saved locally; and **Nemo Cloud**, when files are uploaded and saved in Nemo Cloud. The preference can be changed later in Nemo Cloud settings in Nemo Handy. The Storage button is disabled when no active project is received from the server.

When *Sync only in WiFi (ON/OFF)* is selected, file syncing takes place only when Nemo Handy is connected to WiFi. If the WiFi connection drops, the file synchronization stops and resumes when Nemo Handy reconnects to WiFi.

When *Sync when logging (ON/OFF)* is selected, Nemo Handy synchronizes files by default. When disabled, Nemo Handy stops the file synchronization during measurements and synchronizes the files automatically when the measurement ends

To log in to Nemo Cloud, first tap the **Login** button. Next, define the following:

*Service address* is the address to your Nemo Cloud server. If you want to change to a different Nemo Cloud instance, change the address to the desired one.

*Username* is the user name for Nemo Cloud created in the Nemo Cloud user interface.

*Password* is the password for Nemo Cloud created in the Nemo Cloud user interface.

Next, tap **Login**. The summary displayed below *Login/Logout* is the latest message sent from Nemo Cloud. Please note that possible error messages sent from Nemo Cloud are displayed in this summary.

## 7.15 Scanner settings

*Scanner devices* enables you to select a scanner in a dialog box.

*Scanner enabled (ON/OFF)* enables the scanner.

## 7.16 Site verification settings

These settings are for site acceptance and antenna verification testing.

*Enable of disable test (call test)* activates or deactivates the site verification call test.

*Phone number* defines the phone number for the call test. Tap the text field and type in the number.

*Enable of disable test (data transfer test)* activates or deactivates the site verification data transfer test.

*Data transfer test configuration* enables you to configure the settings for site verification data transfer test. Tap text field and configure the data transfer settings for the test.

*Enable of disable test (ping test)* activates or deactivates the site verification ping test.

*Ping test address* defines the ping address for the site verification ping test.

*Limit values configurations* enables you to define the limit values for the site verification test configurations.

## 8 Feedback

Tap **Give Feedback** from the home screen to open a feedback form. Enter your name (optional) and feedback and tap **SUBMIT**. Please note that you will not receive a reply to your feedback. If you have feedback that requires response, please contact Nemo Technical Support.

## 9 DRT4311B Scanner

Nemo Handy supports measurements with DRT4311B test receiver. For details regarding hardware, setting up, and mounting the DRT4311B, DRT4311B software, battery charging and troubleshooting, please refer to DRT4311B Miniature Test Receiver Hardware Manual, supplied with the product.

### 9.1 Installing Mps Scanner Service and license

#### 9.1.1 Installing Mps Scanner Service Air using SD card

Nemo Handy devices are delivered preinstalled but you may need to update DRT Mps Scanner Service yourself. Please follow these instructions carefully to install Mps Scanner Service.

#### 9.1.2 Installing Mps scanner service

1. Uninstall the old Mps Scanner Service version by going to **Apps\Settings\More\Application Manager** and tapping **Uninstall**.
2. Connect the USB cable to the Nemo Handy device and to the computer where you have the Mps Scanner Service installation files.
3. Select **Disk drive/Media device (MTP)** as the connection type.
4. Copy MpsScannerService.apk file onto your device under Nemo folder.
5. Disconnect the data cable from the device.
6. Go to **Apps\My Files\All Files\Nemo** and select Mps Scanner Service.apk file from the list.
7. If you already have Mps Scanner Service installed on the device, the installer program will ask to replace the old version. Select **Install**.
8. Repeat all steps for each device.
9. Installation is started and once it is finished, you can start using Mps Scanner Service.

#### 9.1.3 Installing Mps Scanner Service from KSM

Nemo Handy devices are delivered preinstalled but you may need to update Mps Scanner Service yourself. Please follow these instructions carefully to install Mps Scanner Service.

1. Uninstall the old Mps Scanner Service version by going to **App\Setting\More\Application Manager** and tapping **Uninstall** on your Mps Scanner Service.
2. Start a browser on your Nemo Handy mobile and log in to KSM. You must have a valid Technical Support Agreement and valid access codes (email address and password).
3. Select **You can get updates** and select the option **Updates** (Updated software and licenses) in the dropdown list under 'View'.
4. Go to the latest Mps Scanner Service release and select the setup file (for example, Mps SCANNER SERVICE\_1.10.42\_Setup) from Product Family | Nemo Handy.
5. Select **Apps | My Files | All Files | Download** and tap the setup package (.apk) after transfer is completed.
6. If you already have Mps Scanner Service installed on the device, the installer program will ask to replace the old version. Select **Install**.
7. Installation is started and once it is finished, you can start using Mps Scanner Service.
8. Repeat all steps for each device.

## 9.1.4 Installing Mps Scanner Service license

Nemo Handy devices are delivered preinstalled but you may need to update the Mps Scanner Service license. Mps Scanner Service retrieves the license automatically over the air when starting it for the first time without a license. If you do not have the possibility to connect the Nemo Handy device to internet via mobile connection or WiFi, please contact Nemo Helpdesk for the license.

Please follow these instructions carefully to select the Mps Scanner Service.  
Selecting Mps Scanner Service license:

### NOTE

These instructions are meant to be followed when a license has been updated, for example, when a new product version containing new features requiring a license is published or when a customer has purchased a new option for an existing license. A new license is uploaded to the server by Nemo Technical Support and Nemo Handy automatically connects to the server and retrieves the available licenses.

1. In Nemo Handy, go to **Menu | About** and tap **Browse licenses**.
2. The License Browser view opens.
3. Tap **Refresh** to refresh the list of available licenses for Mps Scanner Service.
4. The currently used license is highlighted in green. A network license displays a product variant, options and expiration date. There is no additional information available for a regular license.
5. Select the correct license from the list by tapping it and selecting **Load**.
6. Repeat all steps for each device.

## 9.2 Bluetooth pairing

Before beginning the measurements, pairing the devices through a Bluetooth connection is required. This can be done through the devices' own settings: **Settings | Network connections | Bluetooth | My device**. When the Bluetooth connections are enabled on the devices, the available device must be chosen for pairing. Once the devices have been selected there are two minutes to pair the devices. The devices only need to be paired once, after the first pairing the connection will be saved in the devices.

In Nemo Handy, go to **Settings | Scanner | Scanner devices**.

The Select device dialog box opens. Select the correct scanner and tap **OK**.

### NOTE

Note that DRT4311B scanner's default pin number is 1234.

The page for DRT4311 is shown as a default. However, if you wish to hide the page, select **Settings | Page settings | DRT 4311B**, clear **Show page**, and tap the Back key of the device.

On the DRT4311B page you can connect or disconnect the scanner. To configure scanner, tap **Configure**. Scan configuration page opens.

Scan configuration page shows you the configuration that is being currently used. You can also select a type of scan you want to configure. To save or load configurations, tap **Menu | Save/ Save as/ Load**. If you do not have any earlier configurations to load, you must make a new configuration and save it. To create new items, tap **Add New** on the toolbar. The Select scan type dialog box opens. Select scan type.

If you do not define a name for a configuration, it will be automatically saved as ScannerConfigFile.xml.

## 9.3 Scan types

### 9.3.5 GSM Frequency Scan


On the GSM frequency scan page you can select the band, measurement mode and edit selected channels.

Tap **Band** to select the band from the drop-down list.

By tapping **Measurement mode**, you can select among normal, enhanced, and survey operation modes.

Tapping **Edit** opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.6 UMTS pilot scan

On the UMTS pilot scan page you can select the band, top n values, measurement mode and channels.


Tap **Band** to select the band from the drop-down list.

By tapping **Top n values** you can define how many top values are shown.

By tapping **Measurement mode**, you can select among normal, enhanced, and survey operation modes.

Tapping **Edit** opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.7 LTE OFDM scan

On the LTE OFDM scan page you can select the band, channel, bandwidth, cyclic prefix, top n values, duplexing, measurement mode and number, or Tx port detect.

Tap **Band** to select the band from a drop-down list. Some of the LTE OFDM scan configurations are set on AutoDetect as a default.

To change bandwidth, tap **AutoDetect**. Select among AutoDetect, Normal, and Extended.

To change cyclic prefix, tap **AutoDetect**. Select among AutoDetect, Normal, and Extended.

By tapping **Top n values** you can define how many top values are shown.


To change duplexing, tap **AutoDetect**. Select among AutoDetect, FDD, and TDD.

By tapping **Measurement mode**, you can select among normal, enhanced and survey.

Tap **Num Tx port detect** to change the number of TX port detect. Select among AutoDetect, 1, 2, and 4.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.8 CDMA pilot scan

On the CDMA pilot scan page you can select the band, top n values, and measurement mode and channel.


Tap **Band** to select the band from a drop-down list.

By tapping **Top n values** you can define how many top values are shown.

**Measurement mode** allows you to define measurement mode: normal, enhanced, or survey.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.9 EVDO pilot scan

On the EVDO pilot scan page you can select the band, top n values, and measurement mode, and channel.


Tap **Band** to select the band from the drop-down list.

By tapping **Top n values** you can define how many top values are shown.

**Measurement mode** allows you to define measurement mode: normal, enhanced, or survey.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.10 CW (continuous wave) RSSI scan

On the CW RSSI scan page you can select the system, band, bandwidth, measurement mode, and channel.


Tap **System** to select the system.

Tap **Band** to select the band, and **Bandwidth** to select the bandwidth.

Measurement mode allows you to define the measurement mode. The options for the mode are Maximum, Minimum, Average, and All. Tap on the Operation mode field and select the mode.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 9.3.11 Blind scan

In scan configurations you can select **Blind scan**. You can add any number of blind scans to the scan configuration. Unlike the other scan types, blind scan is a one-shot scan. If the scanning configurations include only blind scans, when all the configured blind scans are performed, the scanner goes to Configured state and stops scanning. If blind scan is mixed with other scan types, for example frequency scan, the scanning is stopped when the user stops the scan. GSM blind scans generate **FREQSCAN** events, UMTS/CDMA/EVDO blind scans generate **PILOTSCAN** GSM events, and LTE blind scans generate **OFDMSCAN** events. Results for blind scans are displayed on the Blind Scan Results page. Results for each supported system (GSM, WCDMA, LTE, CDMA, EVDO) are displayed on a designated separate page.

Tap **System** to select the system for the scan from the pulldown menu.  
Tap **Band** to select the band for the scan.

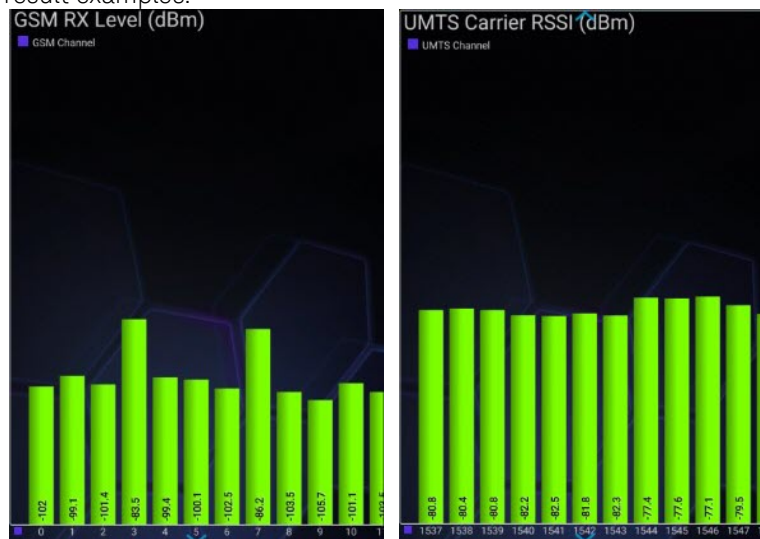
### 9.3.12 Scanning results

#### NOTE

Note that if you run a script with Airplane mode, the scanning results may be incomplete

To show scanning results, go to **Settings | Page settings**, and select **LTE OFDM Scan Results/UMTS Pilot Scan Results/GSM Freq Results/CW RSSI Scan Results**. Select **Show page** and tap the Back key of the device.

CW RSSI scan result examples:



If you view the results in bar graphs, you can adjust the view if the view is locked. Locking the view also displays the values on graphs. While on the view, lock the view, and tap and hold on the view to open the Menu dialog box. In the dialog box you can select among Zoom, Sort by, Threshold, and Parameter.

*Zoom* enables you to set the zoom level with a slider.

*Sort by* enables you to sort the results by channel or signal strength (**Channel, Weak first, Strong first**).

With *Threshold* you can set the threshold (maximum value and minimum value) for results that will be displayed.

*Parameter* enables you to view the results according to the parameter.  
Define any or all of the above in their individual dialog boxes and tap **OK**.

## 10 PCTEL IBflex & PCTEL HBflex Scanners

Nemo Handy supports measurements with PCTEL IBflex and HBflex test receiver. For details regarding hardware, setting up, and mounting the IBflex/HBflex, IBflex/HBflex software, battery charging and troubleshooting, please refer to the product documentation supplied with the IBflex/HBflex product.

### 10.1 Installing Mps Scanner Service

#### 10.1.1 Installing PCTEL Scanner Service using SD card

Nemo Handy devices are delivered preinstalled but you may need to update PCTEL Scanner Service yourself. Please follow these instructions carefully to install the scanner service application.

#### 10.1.2 Installing Scanner Service

1. Uninstall the old Scanner Service version by going to **Apps\Settings\More\Application Manager** and tapping **Uninstall**.
2. Connect the USB cable to the Nemo Handy device and to the computer where you have the Scanner Service installation files.
3. Select **Disk drive/Media device (MTP)** as the connection type.
4. Copy *SeeGullConnect\_1.X.X.X.apk* file onto your device under Nemo folder.
5. Disconnect the data cable from the device.
6. Go to **Apps\My Files\All Files\Nemo** and select *SeeGullConnect\_X.X.X.X.apk* file from the list.
7. If you already have *SeeGullConnect\_1.X.X.X.apk* installed on the device, the installer program will ask to replace the old version. Select **Install**.
8. Repeat all steps for each device.
9. Installation is started and once it is finished, you can start using Scanner Service.

#### 10.1.3 Installing Scanner Service from KSM

Nemo Handy devices are delivered preinstalled but you may need to update PCTEL Scanner Service yourself. Please follow these instructions carefully to install Scanner Service.

1. Uninstall the old Mps Scanner Service version by going to **Apps\Settings\More\Application Manager** and tapping **Uninstall** on your Scanner Service.
2. Start a browser on your Nemo Handy mobile and log in to KSM. You must have a valid Technical Support Agreement and valid access codes (email address and password).
3. Select **You can get updates** and select the option **Updates** (Updated software and licenses) in the dropdown list under 'View'.
4. Download the latest PCTEL Scanner Service release and select the setup file (for example *SeeGullConnect\_1.X.X.X.apk\_Setup*) from Product Family | Nemo Handy.
5. Select **Apps | My Files | All Files | Download** and tap the setup package (.apk) after transfer is completed.
6. If you already have Scanner Service installed on the device, the installer program will ask to replace the old version. Select **Install**.
7. Installation is started and once it is finished, you can start using Scanner Service.
8. Repeat all steps for each device.

## 10.2 Bluetooth pairing

Before beginning the measurements, pairing the devices through a Bluetooth connection is required. This can be done through the devices' own settings: **Settings | Network connections | Bluetooth | My device**. When the Bluetooth connections are enabled on the devices, the available device must be chosen for pairing. Once the devices have been selected there are two minutes to pair the devices. The devices only need to be paired once, after the first pairing the connection will be saved in the devices.

In Nemo Handy, go to **Settings | Scanner | Scanner devices**.

The Select device dialog box opens. Select the correct scanner and tap **OK**.

Scan configuration page shows you the configuration that is being currently used. You can also select a type of scan you want to configure. To save or load configurations, tap **Menu | Save/ Save as/ Load**. If you do not have any earlier configurations to load, you must make a new configuration and save it. To create new items, tap **Add New** on the toolbar. The Select scan type dialog box opens.

### NOTE

Note that previous scanner configuration is loaded automatically when Nemo Handy starts.


## 10.3 Scan types

### 10.3.4 Frequency scan

On the Frequency scan page you can select the band, bandwidth (only with LTE), C/I, channel and whether SIB signalling is enabled.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under "Select channels from the channel range".

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 10.3.5 Pilot scan

On the Pilot scan page you can select the band, number of pilots, pilot mode, channel, and whether SIB signaling is enabled

When pilot scan is performed, Nemo Handy also writes cell scan events by using SIB signaling to obtain data to perform cell scan. Enable SIB signaling to activate this functionality.


Tap **Band** to select the band.

Tap the **Number of pilots** field and insert a value to define the number of pilots.

*Pilot mode* allows you to define the pilot mode: autodetect, normal, or extended.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under "Select channels from the channel range".

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 10.3.6 LTE OFDM scan

On the LTE OFDM scan page you can select the band, bandwidth, number of signals, MIMO scan.

When frequency scan is performed, Nemo Handy also writes cell scan events by using SIB signaling to obtain data to perform cell scan. Enable SIB signaling to activate this functionality. Please note that with scanner firmware version 2.0.2.0 and newer you can use channel bandwidth auto-detection (LTE\_BANDWIDTH\_AUTO) for LTE signals 1.4, 3, 5, 10, 15, and 20 MHz.


Tap **Band** to select a band and **Bandwidth** to select a bandwidth.

Tap the **Number of signals** field and insert a value to define the number of signals.

*Mimo scan* enables MIMO scanning.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.


### 10.3.7 CW (continuous wave) RSSI scan

On the CW RSSI scan page you can select the band and the channel.

Tap **Band** to select the band, and **Bandwidth** to select the bandwidth.

Tapping **Edit** next to SELECTED CHANNELS opens the Channel range editor dialog box.

In the dialog box you can define the channel range either by defining the start channel and the end channel and tapping **Add** or by selecting channels by tapping the channel range button under “Select channels from the channel range”.

Selected channels are displayed under SELECTED CHANNELS. By tapping  you can edit and delete range items.

### 10.3.8 Blind scan

On the scan configuration you can select **Blind scan**. You can add any number of blind scans to the scan configuration, but please note that Blind scan needs to be kept separate from other scan types. PCTEL IBflex does not support mixing of blind scan with other scan types.

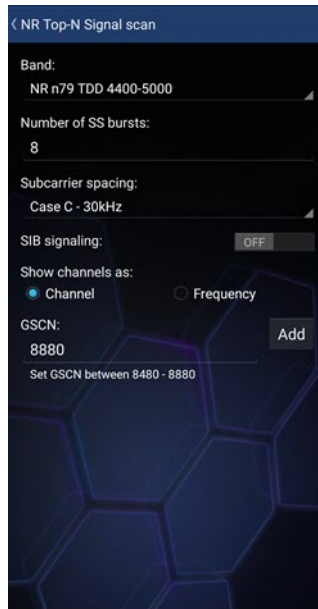
Unlike the other scan types, blind scan is a one-shot scan. When all the configured blind scans are performed, the scanner goes to Configured state and stops scanning. GSM blind scans generate FREQSCAN events, UMTS/CDMA/EVDO blind scans generate PILOTSCAN events, and LTE and NR blind scans generate OFDMSCAN events. Results for blind scans are displayed on the Blind Scan Results page. Results for each supported system (GSM, WCDMA, LTE, CDMA, EVDO, and NR) are displayed on a designated separate page.

Tap **Band** to select the band. Select the number of IDs (max 16), i.e. the number of cells to be scanned. For WCDMA/CDMA/EVDO this is the number of pilots, for LTE/TD-LTE the number of cell IDs. With GSM this value must be 1. Finally, select Subcarrier spacing.

### 10.3.9 NR Top-N signal scan

#### NOTE

Note that this functionality is available only if your Nemo Handy license supports it.



On the NR Top-N scan page you can select the band, define the number of SS burst, and select subcarrier spacing.

When frequency scan is performed, Nemo Handy also writes cell scan events by using SIB signaling to obtain data to perform cell scan. Enable SIB signaling to activate this functionality. Please note that with scanner firmware version 2.0.2.0 and newer you can use channel bandwidth auto-detection (LTE\_BANDWIDTH\_AUTO) for LTE signals 1.4, 3, 5, 10, 15, and 20 MHz.

Select *Show channels as* Channel or Frequency to define channel number or frequency. When defining Channel, tap **Add** to add the GSCN (Global synchronization channel number). When defining Frequency, tap the field under frequency and enter the frequency number.

### 10.3.10 Scanning results

#### NOTE

Note that if you run a script with Airplane mode, the scanning results may be incomplete

To show scanning results, go to **Settings | Page Settings**, and select **LTE OFDM Scan Results/UMTS Pilot Scan Results/GSM Freq Results/CW RSSI Scan Results/Blind Scan Results/NR PS/SS Scan Results/NR DM/SSB Scan Results**. Select **Show Page** and tap the Back key of the device.

To show cell scan scanning results with Nemo Handy, a new page must be created by selecting **Settings | Page Settings | New Page | Cellscan Results**.

LTE OFDM scan result examples

Band	EARFCN	PCI	MCC	MNC	TAC	Cell ID	BTS	RSRP
LTE FDD 1800 (Band 3)	1300	123	N.A.	N.A.	N.A.	N.A.	N.A.	-95.3
LTE FDD 1800 (Band 3)	1300	124	N.A.	N.A.	N.A.	N.A.	N.A.	-91.1
LTE FDD 1800 (Band 3)	1300	125	244	91	4090	35857183	N.A.	-80.4

GSM frequency result examples

Band	ARFCN	BSIC	MCC	MNC	LAC	Cell ID	BTS	RX Level
GSM 900 R	3	3	244	12	800	8185	N.A.	-69.3
GSM 900 R	7	3	244	12	800	8186	N.A.	-70.2
GSM 900 R	19	9	244	91	1434	14701	N.A.	-47.6
GSM 900 R	31	16	244	91	1434	12531	N.A.	-91.3
GSM 900 R	33	31	244	91	1434	12699	N.A.	-63.7
GSM 900 R	47	26	244	91	1434	14702	N.A.	-37.6
GSM 900 R	51	7	244	91	1434	14202	N.A.	-74.7
GSM 900 R	65	15	244	91	1434	12678	N.A.	-71.6
GSM 900 R	80	46	244	5	2000	42177	N.A.	-70.5
GSM 900 R	83	63	244	5	2000	40719	N.A.	-83.6
GSM 900 R	93	25	244	5	2000	41497	N.A.	-92.6
GSM 900 R	103	61	244	5	2000	9807	N.A.	-92.7

UMTS pilot scan result examples

Band	EARFCN	PCI	MCC	MNC	LAC	Cell ID	BTS	RSRP
WCDMA 2100	10837	5	N.A.	N.A.	N.A.	N.A.	N.A.	-85.4
WCDMA 2100	10837	7	244	91	5009	647331	N.A.	-70.2

LTE blind scan result examples

Band	EARFCN	PCI	RSRP	RSRQ	CINR
LTE FDD 1800 (Band 3)	1300	124	-97.4	-19.5	-7.5
LTE FDD 1800 (Band 3)	1300	125	-87.3	-9.4	11.9
LTE FDD 1800 (Band 3)	1598	161	-91.7	-6.5	26.1
LTE FDD 1800 (Band 3)	1825	194	-92.0	-8.8	13.6

NR PS/SS scan results/NR DM/SSB result examples



If you view the results in bar graphs, you can adjust the view if the view is locked. Locking the view also displays the values on graphs. While on the view, lock the view, and tap and hold on the view to open the Menu dialog box. In the dialog box you can select among Zoom, Sort by, Threshold, and Parameter.

*Zoom* enables you to set the zoom level with a slider.

*Sort by* enables you to sort the results by channel or signal strength (Channel, Weak first, Strong first).



With *Threshold* you can set the threshold (maximum value and minimum value) for results that will be displayed.

*Parameter* enables you to view the results according to the parameter.

Define any or all of the above in their individual dialog boxes and tap **OK**.

## 11 Ending Measurements

To end the measurements:

1. Stop all calls and data connections.
2. Tap  on the toolbar and select **Stop Logging** () from the opening dialog. Nemo Handy will stop the recording. You can keep, rename, or delete the resulting log file. If you wish to upload the measurement file, indoor map file, a packet capture file, audio sample, or BTS file on a server, select the respective options and tap **Send**. See Chapter “Uploading log files on server” for more information on the connection settings.
3. If you wish to exit Nemo Handy, select **Menu | Exit**.

## 12 Nemo Instant Report

The Nemo Instant Report feature greatly enhances the possibility to create a report instantly after your measurements have been conducted.

The users on the field can quickly produce the report after the measurement and choose to send it via email if needed. The report will also be uploaded to any remote server together with the measurement files.

There are four report types available. Full Report includes everything and the other report types are subsets. The following reports are included:

- Full Report
  - Includes, for example, RF averages, indoor maps, screenshots (if taken), and statistics
- LTE Report
  - Statistical information related to GSM and UMTS removed
- LTE and UMTS Summary
  - Detailed statistics removed
- Summary Report
  - As above, but includes GSM as well

You can define the thresholds for certain parameters, for instance, the acceptable call success rate or minimum data throughput. Values below the thresholds are also displayed in the report. You can add your own company logo in the reports.

### 12.1 Creating Nemo Instant Report

#### NOTE

Note that this feature requires a separate license option.

1. Go to **Settings | Logging** and select **Create Report After Measurement**.
2. To select a default template, tap **Select template**.
3. The Select Template dialog box opens. Select a template by tapping on the template name. Add filters if needed.
4. You are also able to customize the thresholds for the parameters on the reports. For example, it is possible to define the acceptable level for RSRP or average call setup time. These values are used in the report as the threshold. If you want to create a customized report, tap **Customize Report** on the Logging view. Fill in the thresholds and tap **Save**. When the set threshold is triggered, the information is shown in red on the report.
5. Once you end the measurement session, the report is created according to your settings.

### 12.2 Generating a Nemo Instant Report

The report is generated after you have done your measurements. All the information that was collected during the measurements will be shown on the reports.

1. When the measurement session is ended, the Log file complete dialog box opens. Select **Create Report**.
2. Tap **Keep** or **Rename** to generate the report. The screen changes to landscape mode for screenshots for the report.
3. The Create report dialog box opens. In this dialog box you are able to change the template (**Select Template**), open the report in your Nemo Handy device (**Show Report**), send the report as an email (**E-mail Report**), or close the dialog box

4. Nemo Handy generates the report based on your settings. The template can be saved and other reports generated. It is possible to generate different reports from the same measurement file(s).


## 12.3 Custom logo for Nemo Instant Report

You can customize the logo displayed on the cover page of the report. The logo image file is located in the Nemo / Handy / Config folder. The name of the file is YourLogo.png. The image size needs to be 350x350 pixels, and the format is PNG. Transparency can be used to hide background information of the logo. You can replace the YourLogo.png file with your own image file. Nemo Handy will read the file when the report is generated. If the image dimensions do not match the size of 350x350 pixels, the image might not fit into the designated place in the report.

## 13 Exporting and Converting Files

Measurement files need to be exported from Nemo Handy by uploading them on an FTP server.

### 13.1 Uploading log files on server


You can upload measurement log files directly from Nemo Handy after stopping a measurement or through the File Explorer. Tap the **File Explorer** button (). Select the log file(s) and tap **Menu | Upload**.

On the Selected configuration page, use the previously defined settings (configuration) and tap **Send** or load another configuration by tapping **Select Configuration**.

Select one of the existing configurations and tap **Select**. For more information on creating new configurations, see Chapter “Defining measurement upload configurations”.

After the files have been uploaded, Nemo Handy will ask if you would like to send a notification of the uploaded files. You can send an email or an SMS. To send an email, you need to have an email account set up on your mobile. The notification contains a link to the server from where the files can be downloaded. Tap **Delete Sent Files** to delete the uploaded files from the Nemo Handy terminal.

### 13.2 Uploading log files to Nemo Xynergy

You can upload measurement log files directly from Nemo Handy to Nemo Xynergy after stopping a measurement or through the File Explorer. Tap the **File Explorer** button (). Select the log file(s) and tap **Menu | Upload**.

On the Selected configuration page, tap **Xynergy** to open the Nemo Xynergy Options dialog box.

In the Nemo Xynergy Options dialog box, fill the *Host*, *Username*, *Password* (if not set beforehand) fields. Tap **Refresh** and wait for the data to be fetched from the server, and make further selections, that is, (project) type, region, market or cell type, using the drop-down menus. You are also able to create a cluster and a project by tapping the plus icon next to the Cluster and Project fields. Define name for the cluster/project and tap **OK**.

When selecting **InBuilding** (that is, indoor measurements) as project type, and active indoor map has been selected, a prefilled form will open, allowing you to add a new venue/building/floor combination to Nemo Xynergy server.

*Advanced Options* allows you to refine your configuration. You can define the binning type and size, and select the type of report you wish Nemo Xynergy to create from the data. Select the binning type and define the binning size. The *Reports* field displays the reports you can select. In the *Processing Parameters* field you are able to define the source devices for the data used in the reports, and select the processing parameters you wish to be included in the report. Tap **Save** to save your selection.

In the Nemo Xynergy Options view, tap **OK**. Nemo Handy opens the Selected configuration page with the selected FTP settings obtained from Nemo Xynergy. Tap **Send** to send the file/files using these settings to the server.

After the files have been uploaded, Nemo Handy will ask if you would like to send a notification of the uploaded files. You can send an email or an SMS. To send an email, you need to have an email account set up on your mobile. The notification contains a link to the server from where the files can be downloaded. Tap **Delete Sent Files** to delete the uploaded files from the Nemo Handy terminal.

### 13.3 Exporting files manually

Connect the data cable to the mobile and to a USB port on a PC. Windows will automatically detect the USB device. Select **Disk drive\Media device (MTP)** as the mode on your Nemo Handy mobile. The measurement files (.nmf) will be on the internal memory card in folder *sdcard\Nemo\Handy\Results*. Copy and save the files on the PC where you have installed Nemo File Manager.

## 14 Tips and Hints

This section gives some tips and hints for using Nemo Handy.

### 14.1 Starting measurements

Before you start logging with Nemo Handy, please check that the mobile is in idle mode, that is, there are no data connections or calls ongoing. If there is a call on when you start logging, it will affect the measurement events logged and you will not have the signaling at the beginning of the log file.

### 14.2 File locations

The various files associated with Nemo Handy have specific file locations. When adding files to Nemo Handy, you should *only use these specified folder locations for the files*.

Measurement data files are saved to **sdcard\Nemo\Handy\Results** folder on the internal memory card of your Nemo Handy terminal by using for example a Bluetooth connection or a cable connection.

The following are the file locations where Nemo Handy related files should be saved.

Measurement data (.nmf)

- sdcard\Nemo\Handy\Results

Display configurations (.xml)

- Display configurations are installed to the "\sdcard\Nemo\Handy\Config" directory.


### 14.3 Using the GPS receiver







If you move too far away from the external Bluetooth GPS receiver or the receiver battery goes flat, the GPS state in the Nemo Handy GPS view switches to *Not connected*. In such a case, you do not need to restart Nemo Handy, just check that you have chosen the correct GPS port in settings.

If you want to change to another Bluetooth GPS receiver, you need to delete the pairing between the existing GPS receiver and Nemo Handy first.

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### 15.1 During Measurements

When Nemo Handy IoT is started, home view with shortcuts is displayed. The home view can be customized by the user to include the most used pages and shortcuts to them. To leave the home view, tap the return button. You can re-enter the home view by tapping  in the action bar. To select pages for the home view, tap and hold on a page slot.

After you start logging with Nemo Handy IoT, tap the start logging button (). You can use the mobile as any regular mobile. Nemo Handy IoT runs in the background recording all measurement data. Tap the **Home** button to switch between different applications or to make a call. Pause logging by tapping  from the toolbar and selecting **Pause Logging** () from the opening dialog. To continue logging after pausing, tap  on the toolbar. To stop logging, tap  on the toolbar and select **Stop Logging** () from the opening dialog.

During measurements, calls and data transfers can be made and/or the phone can be left in an idle state, during which time measurements are carried out. Measurement results are stored into a file *filename.nmf*. You can view the measurement process in a number of views.

You can browse the various views by swiping the touchpad with your finger or by tapping the page header and selecting from the list of displays in the popup shortcut menu. If a page has several views, you can move between the views by dragging your finger vertically across the screen. Note that the scales in the line graphs will change according to the active parameter in the graph. You can change the active parameter from the parameter menu that pops up when the parameter name is tapped and hold down on the screen.

When logging, you are able to draw a route on the map by placing markers along the route by tapping  on the toolbar. To remove last added marker, tap .

### 15.2 Custom view

With Nemo Handy IoT's custom view you can tailor a view to your own needs.

You can create a new custom view by selecting **Settings | Page settings** and selecting **New Page | [Empty]**.

Give a name for the page and tap **Create split** (split can also be used as standalone view/page). The page(s) you create will be visible in the page settings.

Alternatively, create a Custom view by tapping **Settings | Page settings** and selecting **Create split**.

#### 15.2.1 Create split

The Custom display view opens.

*Add...* enables you to add a page or a parameter.

*Edit...* enables you to edit the display or page configurations.

##### 1.15.2.1 Adding a page

Selecting **Add... | Page** enables you to add a new page in the view. Tap **Page** and an editor view opens.

*Name* defines the name of the page and is displayed on the top of the view.

*System* defines the system used. Tap the system field to open the list of systems. This will define when the page is visible. For example, if you choose LTE, the page is only visible when the UE is connected to LTE network.

*Layout* defines the layout of the view, for example the position of a graph. Tap on the layout field to open the list of layout choices.

*None/Bar Graph*: no graph displayed in the view if **Visual** is set to **None** or to either of the two line graph options in parameter settings; a bar graph is displayed in the view if **Visual** is set to **Bar Graph** in parameter settings. *Note that the option None/Bar Graph selected here overrides the Line Graph option in parameter settings.*

*Bottom Line Graph*: the graph is displayed on the bottom of the view.

*Right Line Graph*: the graph is displayed in the right side of the view.

*Text size (1-30)* defines the size of the text displayed in the view.

### 1.15.2.2 Adding a parameter

Selecting **Add... Parameter** enables you to add a parameter in the view. Tap **Parameter** and an editor view opens. Please note that the contents of the dialog vary slightly depending on selections made.

*Parameter* defines the parameter used. Insert the parameter by tapping on the text field and typing in the parameter. A list of parameters opens once letters are inserted in the field.

*List Index* defines the parameters shown in the graph. The best value of a parameter with multiple values is 0, the second best is 1, and so forth. For example, List Index 1 used for parameter *Monitored Set Ec/NO* displays the second best Monitored Ec/NO value.

*Label* defines the parameter name displayed in the view. If no label is inserted, the parameter shown in the Parameter field will be displayed as the label.

*Visual* defines whether a graph is displayed in the view. Tap on the **Visual** field to open a list of choices.

*None*: no graph is displayed in the view.

*Graph 1*: one graph is displayed in the view.

*Graph 2*: two graphs are displayed in the view.

*Graph Type* defines the graph type: the options are bar graph and line graph.

*Min Value* defines the minimum value for the parameter, set automatically according to the parameter.

*Max Value* defines the maximum value for the parameter, set automatically according to the parameter.

*Limit Value* defines the threshold value for the parameter, must be set manually.

*Good Color* defines the color for the good values in the graph. Select a color by tapping **Select**, tap on a desired color in the circle, and then tap **OK**.

*Bad Color* defines the color for the bad values in the graph. Select a color by tapping **Select**, tap on a desired color in the circle, and then tap **OK**.

*Line Size* defines the size of the line shown in the graph.

*Text Style* defines the style of the text. Tap the field to select a style: normal, bold, or cursive.

### 1.15.2.3 Editing the display

Selecting **Edit... Display** enables you to edit the display title. Tap **Display** and an editor view opens.

*Title* defines the title of the display. Tap on the text field and type a title.

### 1.15.2.4 Editing a page

Selecting **Edit... Page** enables you to edit the page settings. Tap **Page** and an editor view similar to that introduced in Chapter “Adding a page” opens.

### 1.15.2.5 Custom display live view

Once the Custom display is in live view, it is possible to activate parameters, scale parameters, or save configurations. Tap and hold a parameter. A Parameter dialog box opens. Select **Parameter**

**settings** from the dialog box and select the parameter you wish to edit from a list of available parameters to open the Parameter editor.

*Set scale* activates the selected parameter. This means that the scales will display values for that parameter. Define whether the scale displaying the values for the selected parameter is displayed on the left or on the right side of the display. Select **None** to hide an individual parameter.

*Auto scale* defines the scale for the parameter

Select **None**, and the scales return to normal.

Select **High**, and Nemo Handy IoT changes the scales and zooms in on the view so that the line is at the top of the graph and the minimum value is at the bottom of the scale. The symbol changes to ↑.

Select **Low**, and Nemo Handy IoT changes the scales and zooms in on the view so that the line is at the bottom of the graph and the maximum value is at the top of the scales. The symbol changes to ↓.

Select **Both**, and Nemo Handy IoT checks the minimum and maximum values for the graph from the visible area and zooms in on the view so that the line is in the middle. The ↑ symbol appears next to the parameter name at the top of the view.

Tap **Save** to save the changes in the configuration file.

## 15.2.2 Custom display example

Here is an example of how to create a new page with custom display.

1. Tap **Settings | Page settings** and **New page**.
2. The Select page dialog box opens. Select **[Empty]**.
3. Type a name for the page (this is the name visible on the display field in live view) and select **Show page**. Tap **Create split**.
4. The Custom display view opens. Tap **Edit... Page**.
5. The editor view opens. Insert the information and tap **OK**.  
The name inserted in *Name* field is the name visible on the page.
6. The new page opens. To add a parameter, tap **Add... Parameter**.
7. The editor view opens. Insert the information and tap **OK**.
8. The Custom display editor view opens. In this view it is possible to add new pages or parameters, and to edit or remove the existing display, page(s), or parameter(s).



To add a page tap **Add... Page** and insert the information for the page.

To add a parameter tap **Add... Parameter** and insert the information for the parameter.

To edit the display, tap **Edit... Display**.

To edit the parameter(s), tap **Edit... Parameter** and tap on the parameter you wish to edit.

To edit the page(s), tap **Edit... Page** and tap on the page you wish to edit.

9. To save the Custom display, tap **Save**.
10. Tap the back button of the device to exit the Custom display editor view.
11. The New page view opens. In this view you can edit () or delete () the Custom display view, or create a new split by tapping **Create split**. Tap the back button of the device to exit the Custom display.
12. The Test case page created in Custom display can now be viewed in the live view.  
The page is displayed on the Page settings.  
The page can be edited by tapping **Settings | Page settings**, or by tapping on the page name on **Settings | Page settings**.

13. To scale a desired parameter in the graph, tap and hold on the parameter. Select **Parameter settings** from the dialog box to open the Parameter editor. Select **Left** or **Right** under Set scale or select **None** to hide the parameter. Finally, tap **Save**.

## 15.3 Settings

### 15.3.3 Page settings

Select **Settings | Page** settings to define page settings and create custom views.

#### 3.15.3.1 General Settings

Select **Settings | General** to define general settings.

*Backlight* option defines the brightness of the backlight.

*Send crash reports*, if selected, Nemo Handy IoT will send crash reports.

*Write debuglog* defines whether debug log is written.

*Device Label* allows naming the device.

*Import/export settings* option enables importing and exporting settings. With this feature you can share settings with other users and device models from your Nemo Handy IoT terminal.

*Keep backup*, when selected, keeps a backup of measurement files in the measurement unit's backup folder (located at /backup folder). This way, if the files disappear from Nemo Cloud, they can be recovered from the measurement unit.

*Screenshot resolution* enables you to define the resolution of screenshots (original, medium, or small) you take from the Nemo Handy IoT user interface.

*Screenshot format* defines in which format (.png or .jpg) the captured screenshot will be saved.

*Screenshot timestamp*, if selected, leaves a timestamp on the captured screenshot.

*Screenshot all views*, if selected, captures a screenshot of all views. *Ask*, when selected, prompts Nemo Handy IoT to ask whether to take screenshot of all views whenever the user is taking a screenshot.

### 15.3.4 Logins

Select **Settings | Logins** to define the login settings.

*Login Dropbox*, if selected, allows you to log into Dropbox. Logging in is mandatory when performing Dropbox testing.

### 15.3.5 Display & Sound settings

In Nemo Handy IoT, select **Settings | Display & Sound** to define the display settings.

*Display config file* defines which views are displayed. Selecting **Default** uses the default configuration, while **Select Configuration File** enables you to open a customized configuration file.

*Units* defines the measurement units used when defining the Nemo Handy IoT maps (Metric/Imperial).

*Throughput prefix* defines in which unit throughput units are shown (Kilo/Mega/Giga)

*Notification volume* sets the volume level for voice notifications.

*Notifications* enables you to select which notification icons and/or notification audio files are in use. See Chapter "Notifications" for more information on notifications.

## 15.3.6 Notifications

Select **Settings** | **Display & Sound** | **Notifications** to access the Notifications page. Here you can activate/deactivate, edit existing, and create new notifications. See Chapter “Custom notifications” for more information on editing and creating new notifications.

There are four types of notifications: audio, icon, popup, and wearable. Audio notifications will play an audio file when triggered. Notifications with icons will appear as icons on the measurement route on a map and in line graphs. A popup message can be selected for both types of notifications. The popup appears briefly at the bottom of the screen. If you have a smartwatch or other wearable with an Android operating system, you can select wearable to display notifications on your wearable device.

With the buttons at the top you can select/clear all icons, audio files, popups, and wearable. By tapping each parameter, you can select individual notifications.

### 6.15.3.1 Custom notifications

It is possible to edit existing notifications and create new notifications.

To edit a notification, tap the arrow icon next to a notification.

*Label* defines the name of the notification.

*Parameter name* defines the parameter or measurement event for which the notification is created.

*Unit* defines in which unit the parameter value is shown.

*Trigger* defines the condition for the notification. The options are *Change*, *Equals threshold*, *Over threshold*, and *Under threshold*.

*Threshold* defines the value that triggers the notification. This setting is hidden when the Change trigger option is selected.

*Hysteresis* defines a tolerance value for triggering the notification. Value 0 means hysteresis is not used. This setting is hidden when the Change trigger option is selected.

*Speak* defines the audio (text to speech) used with the notification. Type in the text and it will be played when the notification is triggered. By tapping the speaker icon, you can preview the audio file.

*Icon* displays the notification icon.

*Default action* defines how you will be notified. The options are audio, icon, popup or wearable. You can also select all four.

To create a new notification, tap **Add New** at the top right corner of the Notification settings page.

*Label* defines the name of the notification.

*Parameter name* defines the parameter or measurement event for which the notification is created.

*Trigger* defines the condition for the notification. The options are *Change*, *Equals threshold*, *Over threshold*, and *Under threshold*.

*Speak* defines the audio (text to speech) used with the notification. Type in the text and it will be played when the notification is triggered. By tapping the speaker icon, you can preview the audio file.

*Icon* defines the appearance of the notification icon (circle, square, triangle). Select the color as well.

*Default action* defines how you will be notified. The options are audio, icon, popup, or wearable. You can also select all four.

After defining all the settings, tap **Save** and the new/edited notification is added to the list.

## 15.4 Logging Settings

In Nemo Handy IoT, select **Settings | Logging** to define the logging settings.

*Log file prefix* allows you to define your own prefix for log file name.

*Measurement File Format* defines the file format used in measurements. The file format options are Measurement file (.nmf, default) and Debuglog (.nbl).

### NOTE

Note that if the Debuglog (.nbl) option is selected you cannot access or use the .nbl logging file as such. It is recommended not to select the Debuglog option unless prompted by Keysight Technologies.

If the *Autologging* option is selected, Nemo Handy IoT will start logging when a script is started and stop logging when the script is finished. It is also possible to switch autologging off in the middle of a script if you would like to continue logging even after the script is finished.

*Measurement upload* allows you to save connection settings into configurations that can be used when uploading files on a server. See Chapter “Defining measurement upload configurations” for more information.

*Questionnaire* allows defining when a questionnaire is displayed. You can choose to show it when a measurement is started, paused, resumed, or stopped. A summary of answers is shown when all questions have been answered.

When a questionnaire has been created, it can be used by engineers in the field. The idea is to collect information from measurement environment to a measurement file. Using questionnaire reduces errors by the user (for example, typing city or location wrong). Questionnaire results are stored to QNOTE file format event as specified in Nemo File Format.

*Background log length* defines the length of the idle log in minutes. In idle logging mode Nemo Handy IoT saves data for the length of time defined here. Tap **Background Log Length** to define the idle log length.

*IP capture* option activates/deactivates IP packet capturing. See Chapter “IP capture” for more information on IP capturing.

*IP capture interfaces* enables selecting which interface to use for IP capture. Note that if WLAN is selected and the device’s WLAN is then turned off, the selected interface’s mode changes to default mode “any”.

*IP capture max packet size* defines how many bytes to capture from each packet.

*IP capture filter* option defines whether captured packets are filtered.

*IP capture filter rules* allows you to define IP capture filter rules.

*Initial marker*, when selected, a dialog will be displayed when logging begins, in which the user can define a measurement description.

*Predefined marker* allows user to define the marker before starting logging.

Step-by-step Use Case Description:

- Connect the UE to a PC and open the XML to a text editor.
- Add / modify XML to match your need.
- Distribute the used XML which is located in /Nemo/Config folder to all users (users need to put their XML to each measurement system).
- After the XML has been moved to /Nemo/Config folder, go to Nemo Handy settings. Enable Questionnaire and when it will be shown.
- When Nemo Handy IoT is configured and a measurement started, the questionnaire is displayed for the first time (depending on the settings).
- If a measurement is paused, actual file writing will not stop until the user has answered the Questionnaire (depending on the setting).
- Same thing happens when stopping the measurement (depending on the setting).

*Create Report after* enables you to create a Nemo Instant Report.

*Select template* enables you to select a default template used for the instant report.

*Customize report* enables you to customize a template for the instant report.

## 15.4.7 Defining measurement upload configurations

A measurement upload configuration contains settings for the connection used to upload the files and information about how the files are named and where they are uploaded.

Select one of the existing configurations or create a new one by tapping **Create New**.

First select the protocol used for the transfer.

On the *Connection configuration* page, define settings needed for the file upload. Once you have defined all settings, tap **Save**. The configuration will appear on the *Select Configuration* page.

Note that the contents vary slightly depending on the selected protocol.

*Target folder path* defines the target location for the uploaded files when FTP protocol is used.

Type in the path, tap **Verify Path**, and the target folder path will be checked. If you want to create a new target folder on the FTP server, type in the name in the *Target folder path* field (for example /handy) and tap **Create and Verify**. If the path is correct, a *Path verification successful* message is displayed.

*Remote address* defines the target path for the uploaded files when HTTP or HTTPS protocol is used. Type in the address, tap **Verify Remote Address**, and the target path will be checked. If the path is correct, a *Verification successful* message is displayed.

*Prefix type* defines a prefix that will be added at the beginning of the file name. Select *None* and no prefix will be added and IMEI will add the terminal's IMEI code. You can also type in a custom prefix.

*Selected HTTP(S)/(S)FTP connection* defines the connection used for the file upload. To select a premade connection, tap **Select**, select a connection from the list, and tap **Select**. To create a new connection, tap **Select** on the Create configuration page and then tap **Create New**.

### 7.15.4.1 (S)FTP Connection Settings

On the Create FTP connection page, define the FTP connection settings.

*Host* defines the FTP host address.

*Port* defines the host port.

*Passive mode* option defines whether passive mode is used or not.

*Username* defines the host site logon user name

*Password* defines the host site logon password.

After defining all settings, tap **Verify Connection** to check that the settings are correct. You should see the Verification successful message. After the connection has been verified, tap **Save** to save the connection for future use. The saved connection will be added on the Select FTP connection page. You can access the Select FTP connection page also through the script editor when defining FTP logon settings and when defining settings for manual FTP transfers

### 7.15.4.2 HTTP(S) Connection Settings

On the Create HTTP/HTTPS connection page, define the connection settings for HTTP and HTTPS protocols.

*Host* defines the host IP address.

*Username* defines the host site logon user name

*Password* defines the host site logon password.

Select the **Authenticate Server** option (for HTTPS) to authenticate the HTTPS server.

After defining all settings, tap **Verify Connection** to check that the settings are correct. You should see the Verification successful message. After the connection has been verified, tap **Save** to save the connection for future use.

### 7.15.4.3 Dropbox Connection Settings

On the Create configuration page, define the connection settings for the Dropbox protocol.

*Target folder path* defines the target location for the uploaded files when Dropbox is used. Type in the path, tap **Verify Path**, and the target folder path will be checked. If you want to create a new target folder on the Dropbox server, type in the name in the *Target folder path* field (for

example /handy) and tap **Create and Verify**. If the path is correct, a Path verification successful message is displayed.

*Prefix type* defines a prefix that will be added at the beginning of the file name. Select **None** and no prefix will be added, and IMEI will add the terminal's IMEI code. You can also type in a custom prefix.

After defining the settings, tap **Save** to save the connection for future use.

## 15.4.8 GPS settings

When the *Use GPS time* option is activated, the system clock is synchronized with GPS time at the beginning of a measurement. Logging is not started before there is a GPS fix and the clock can be synchronized. If logging is started and there is no GPS fix, Nemo Handy IoT will go into "Waiting state" during which Nemo Handy IoT cannot be used.

*GPS source* defines the GPS source.

*Bluetooth devices* displays the enabled devices.

### NOTE

Please note that this option affects the system clock in Nemo Handy IoT. Not the clock in the Android terminal.

## 15.4.9 Map settings

*Draw route* defines when the measurement route is drawn on the map. The alternatives are always, when logging, and never.

*Show notifications on map (Yes/No)* defines whether notifications appear on the map.

*Route width* defines the width of the route line on the scale from 1-20.

*Route color* defines the color displaying the route on the map.

*Idle route*, (on/off) when activated, allows Nemo Handy to continue drawing the route and collecting the route data also when the measurement is in idle mode or paused.

*Import GPX route* enables you import a GPX file. Tap **Import GPX Route** and select a .gpx file from the list. Note that you need to ensure that you have copied the GPX file to your Nemo Handy device before you can import the file.

*Show GPX route*, when selected, displays the GPX route on top of the map.

*Select Nemo Navigation Assistant* enables you to select a GPS navigation device to be used alongside Nemo Handy IoT. Tapping **Select Nemo Navigation Assistant** opens the Select device dialog which shows paired devices. Select the correct device from the list. If the device you wish to select is not displayed, select **Show all paired devices**.

*Map select* enables you to select between Google Map and OpenStreetMap (Google Map selected as default).

*Google Map type* defines whether normal or satellite map is used. Using Google Map may require updating the Google Play services. In this case, when Google Map is selected as the map type Nemo Handy asks you to update the Google Play services. Tap **Update**.

You will need to sign in to a Google Account to update Google Play services.

If you already have a Google Account, tap **Existing** and enter your account details. If you need to create a new account, tap **New** and insert your information details. Follow the instructions on the view for the updating process.

Signing in and updating the services may take a few minutes. After the update is done, restart the Nemo Handy application.

*HTTP map loading* (with Open Street Map selected) defines when Nemo Handy IoT is allowed to load a map (*Always/When not logging/Never*).

## 15.4.10 BTS settings

*BTS file* defines the BTS file displayed on the map.

To select a BTS file, the files (which are \*.nbf or \*.csv format) must first be loaded from a PC into the phone's BTS folder (phone/ Nemo/ Handy/ BTS), from where they are listed in the BTS settings. If no BTS files have been loaded, the listing will be empty. Select a BTS file from the list of files shown on the popup window.

*Encrypt BTS files* enables you to encrypt the BTS files. After encrypting a BTS file a password is required to open the file. The encrypted .nab file can be transferred to a PC via USB cable or Bluetooth without a password. A message is displayed if there are no BTS files to encrypt. Switch on the **Use BTS File** option to view the BTS icons on the map and to define BTS cells settings.

*Show BTS file cells* defines whether BTS icons are displayed on the map. Also, select a BTS file on the BTS settings page.

*BTS cells settings* defines the size and the color of BTS cells. You can define in pixels the size of active cell, active system, and other system BTS icons.

*Cell info* allows you to display selected cell information on a map. First select a BTS file and then switch on the **Use BTS** option. Select the information you would like to view on a map. See Chapter "BTS information on a map" for more information.

## 15.5 Nemo Handy IoT OTA (Over-the-air) updates settings

Nemo Handy IoT checks at every startup whether there is a newer version available. Notice that your Technical Support agreement needs to be valid before a newer version will be detected. To disable Nemo Handy from checking for newer version at every startup, deselect **Check at Startup** in the OTA updates settings (**Settings | OTA Updates**).

To check for available updates, go to OTA update settings in Nemo Handy IoT and tap **Check for Updates**. If a newer version is detected, you can choose to download and install it. Please note that unit-specific OTA update settings made in Nemo Cloud overrule OTA updates settings made in Nemo Handy IoT, i.e. if in the Nemo Handy IoT unit's OTA Updates settings *Update automatically* is disabled but in Nemo Cloud's **Resources | Units** section OTA updates are enabled for the unit, OTA updates will take place.

To enable silent install, i.e. automatically update the software version when a new software update is released, select **Update Automatically**.

Version downgrades, i.e. updating Nemo Handy IoT to an older version, can be performed in Nemo Cloud, however this causes all settings to reset. Note that silent install does not work when downgrading. After downgrade, start Nemo Handy IoT manually and accept all usage rights that Nemo Handy IoT asks for. For more information, see Nemo Cloud User Guide.

## 15.5.11 IoT settings

**IoT Devices** enables selecting which IoT dongle you are using.

**Operation Modes** enables selecting which operation mode is used, e.g. LTE-M1/LTE-NB1/NB-IOT.

### 11.15.5.1 Forcing features

Nemo Handy IoT supports band locking when using Know You modem. Support for the lock is terminal-specific, so please refer to the Nemo Handy data sheet to see which locks are

supported by your test device. Please note that unless you deactivate forcing features, they will stay active even if you exit Nemo Handy IoT.  
Select Settings IoT Forcing to open the Forcing page opens with field band lock.

**NOTE**

Note that some of these functionalities are available only if your Nemo Handy device supports them.

15.5.11.1.1 *Band lock*

Select a band and/or system from the Band lock dialog box.

All supported bands from the systems supported by the terminal are displayed. However, the terminal does not necessarily support all the listed bands. If you are trying to lock the phone to a band that the phone does not support, the phone will revert back to default. Band lock overrides the system lock when used simultaneously. For example, if you lock to the WCDMA 2100 band, you cannot choose the GSM system lock.

Tap **Save** to confirm the selection.

After adding band lock, you must exit Nemo Handy IoT, disconnect and reconnect the IoT modem and finally restart Nemo Handy IoT. After this, continue using Nemo Handy IoT as usual.

**NOTE**

Please note that the lock is not released by rebooting the device or by exiting Nemo Handy IoT. The lock can only be released with Nemo Handy IoT. If the device requires a reboot, a notification is displayed automatically.

## 15.5.12 Nemo Cloud settings

**NOTE**

Note that this functionality is available only if your Nemo Handy license supports it.

**NOTE**

Nemo Cloud with Nemo Handy can be purchased as Basic (with file synchronization) or Premium (with file synchronization and automation). Please note that if you do not purchase one of these two options purchased you cannot use Nemo Cloud.

*Storage* defines which files Nemo Handy uses when files are uploaded, that is, from which file the file content is displayed when uploading files, and the location where new created files are saved. The options of the storage preference are **Ask always**, when Nemo Handy asks the storage location every time files are uploaded or saved; **Local**, when files are uploaded and saved locally; and **Cloud**, when files are uploaded and saved in Nemo Cloud. The preference can be changed later in Cloud settings in Nemo Handy. The Storage button is disabled when no active project is received from the server.

When *Sync only in WiFi (ON/OFF)* is selected, file synching takes place only when Nemo Handy is connected to WiFi. If the WiFi connection drops, the file synchronization stops and resumes when Nemo Handy reconnects to WiFi.

When *Sync when logging (ON/OFF)* is selected, Nemo Handy synchronizes files by default. When disabled, Nemo Handy stops the file synchronization during measurements and synchronizes the files automatically when the measurement ends

To log in to Nemo Cloud, first tap the **Login** button. Next, define the following:

*Service address* is the address to your Nemo Cloud server. If you want to change to a different Nemo Cloud instance, change the address to the desired one.

*Username* is the user name for Nemo Cloud created in the Nemo Cloud user interface.

*Password* is the password for Nemo Cloud created in the Nemo Cloud user interface.

Next, tap **Login**. The summary displayed below *Login/Logout* is the latest message sent from Nemo Cloud. Please note that possible error messages sent from Nemo Cloud are displayed in this summary.

## 15.6 Nemo Handy IoT Views

### 15.6.13 Status View

*System time* displays the ongoing time of the day in the device.

*Logging status* displays the current recording status.

*Log file size* displays the size of the measurement file in bytes.

*Log file name* displays the measurement file name.

*Log file path* displays the location where the measurement files are stored on the memory card.

*Free storage* displays the available storage in the internal memory.

*Free memory* displays the current amount of free RAM.

*Heap size* displays the amount of memory that Nemo Handy currently occupies in the operating system.

*Battery temp* displays the battery temperature.

*Script status* displays the current status of the script.

*Script file* displays the name of the script file. *GPS status* displays the status of the GPS receiver.

*IMEI* displays the International Mobile Equipment Identity (IMEI) number of the mobile terminal.

The IMEI number is used by the GSM network to identify valid devices.

*IMSI* (International Mobile Subscriber Identity) displays a unique number associated with all GSM and UMTS network mobile phone users. It is sent by the phone to the network.

*Band lock* displays the band lock status.

*GSM BCCH Lock* displays the GSM BCCH lock status.

*WCDMA Cell Lock* displays the WCDMA cell lock status.

*LTE Cell Lock* displays the LTE cell lock status.

*APN, PDP Type, Interface, Address, Gateway, DNS, NSAPI* display information about the current access point.

### 15.6.14 GPS View

*Source* defines the GPS source.

*Latitude/Longitude* displays the latitude/longitude coordinates.

*Altitude* displays the current elevation in meters.

*Heading* displays the direction in which a person or vehicle is moving.

*Distance* displays the distance travelled from the starting point.

*Speed* displays the current velocity of the test unit in kilometres per hour.

*GPS status* displays the current status of the GPS, that is, if there is a fix.

*GSP time* displays the time from the GPS. This feature can be enabled and disabled by selecting

**Settings | GPS | Use GPS Time.**

*Satellites* displays the number of satellites currently visible.

*GPS status* displays the current status of the GPS, that is, if there is a fix.

*Speed* displays the current speed in km/h.

*Distance* displays the distance travelled from the starting point.

### 15.6.15 Notification History View

The notification history view displays a list of notifications and their timestamps.

To display the Notification history view, go to **Settings | Page Settings | Notification History**, select **Show Page** and tap the Back key of the device. To hide a notification, select it from the notification list by tapping, then select **Hide** from the opening dialog. Tap **OK** to confirm the

selection. Clear notification list by tapping the **Clear Notification** button that appears when tapping and holding a notification.

You can use filters in the Notification view. Tap the **Filter** icon (🔍) to display a search bar and type in the desired filter(s). To use more than one filter at the same time, insert a space and select OR or AND and type in another filter. The new filter activates automatically, and new notifications are displayed in the view accordingly. If you erase the filter from the **Filter** text field, all signal messages are displayed on the view.

### 15.6.16 Signaling View

Signaling messages view displays a list of signaling messages. Tap an individual message to view the timestamp for that message or L3 messages in decoded form. To return to the signaling main view, tap ✕ on the upper right corner of the message details view or anywhere on the touchpad.

To hide a signalling message, select it from the signalling messages list by tapping and holding, then select **Hide** from the opening dialog. Tap **OK** to confirm the selection.

You can use filters in the Signaling view. Tap the **Filter** icon (🔍) to display a search bar and type in the desired filter(s). To use more than one filter at the same time, insert a space and select OR or AND and type in another filter. The new filter activates automatically, and new messages are displayed in the view accordingly. If you erase the filter from the **Filter** text field, all signal messages are displayed on the view.

### 15.6.17 Summary View for IoT

*System* displays the current cellular system, for example, GSM 1800.

*Packet technology* displays the current packet technology.

*WiFi Connection* displays the current status of the WiFi connection. The possible states are:

- CONNECTING
- CONNECTED
- SUSPENDED
- DISCONNECTING
- DISCONNECTED
- UNKNOWN

*SSID* displays the WLAN service set identifier.

*Cell name* displays the name of the active cell.

*Distance to BTS* displays the distance in kilometers to the active base station.

*Cell ID* displays the E-UTRAN cell global ID (ECGI).

*eNodeB/CID* displays the eNodeB ID and cell ID.

*RNC/CID* displays radio network controller ID and cell ID.

*TAC* displays the tracking area code.

*MCC* displays the mobile country code.

*MNC* displays the mobile network code.

*EARFCN* displays the radio frequency channel number in use.

*Carrier RSSI* displays the carrier RSSI value. Values range from -120 to -10.

*Serving SNR* displays the SNR (signal to noise ratio) for the serving channel in dB.

*Serving RSRQ* displays the reference signal received quality for the serving channel in dB.

*Serving RSRP* displays the reference signal received power for the serving channel in dBm.

*Serving PCI* displays the physical channel identifier number for the serving channel.

*Detected RSRQ* displays the detected reference signal received quality.

*Detected RSRP* displays the detected reference signal received power.

*Detected PCI* displays the detected physical channel identifier numbers.

*EMM State* displays the LTE EPS Mobility Management state.

*EMM Substate* displays the LTE EPS Mobility Management substate.

*Transmission Mode* displays the current MIMO configuration set for the terminal.

*PDSCH BLER* displays the block error rate for the PDSCH (physical downlink shared channel) in percentage.

*PDSCH Throughput* displays the downlink data throughput for the PDSCH in bps.

*PDSCH Rank 2 Percentage* displays the percentage of TTIs (transmission time intervals, 1ms) during the reporting period where Rank 2 (MIMO 2x2) has been used in PDSCH channel.

*PDSCH Modulation Codeword 0* displays the PDSCH modulation for codeword 0. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

The available values are

- 1 = QPSK
- 2 = 16QAM
- 3 = 64QAM

*PDSCH Modulation Codeword 1* displays the PDSCH modulation for codeword 1. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

*CQI Wideband Codeword 0* displays the wideband channel quality indicator value for codeword 0. This is the average wideband CQI calculated over the reporting period. See 3GPP TS 36.213 subclause 7.2. Values range from 0 to 15.

*CQI Wideband Codeword 1* displays the wideband channel quality indicator value for codeword 1. This is the average wideband CQI calculated over the reporting period. See 3GPP TS 36.213 subclause 7.2. Values range from 0 to 15.

*PDSCH PRB Allocation* displays the number of allocated physical resource blocks for the PDSCH. The downlink modulation ratio displays the relative ratio of uplink QSPK, 16QAM and 64QAM modulation activity for codeword 0 and codeword 1.

*PDSCH Rank* displays the percentage of TTIs (transmission time intervals, 1ms) during the reporting period where Rank has been used in PDSCH channel.

*Bandwidth* indicates the DL bandwidth of the active carrier in MHz.

*TX Power PUSCH* displays the TX power level for the PUSCH (physical uplink shared channel) in dBm. Values range from 30 to -120.

*TX Power PUCCH* displays the TX power level for the PUCCH (physical uplink control channel) in dBm. Values range from 30 to -120.

*PUSCH Throughput* displays the uplink data throughput for the PUSCH in bps.

*PUSCH Modulation* displays the PUSCH modulation for codeword 0. This is the modulation order as defined by 3GPP TS 36.213 subclause 7.1.7.

*PUSCH Rank* defines how many data streams are used for the data transmission. The value of the parameter is zero when data is not transmitted. Possible values are 0 and 1.

*PUSCH MCS Modulation* displays the PUSCH MCS index for codeword 0. The value defines the modulation and the amount of coding used. See 3GPP TS 36.213 subclause 7.1.7. Values range from 0 to 31.

*Timing Advance* displays the timing advance value for the serving channel. Timing advance is used to adjust uplink transmission timing in a way that allows node B to receive transmissions from all UEs simultaneously. Values range from 0 to 1282.

*Cyclic Prefix* defines the type of signal the terminal is set to measure. With Autodetect selected, the terminal will automatically detect the appropriate signal type.

*RRC State* displays the state of RRC connection.

*RACH Type* displays the RACH (random-access channel) message type. The possible values are contention based and non-contention based.

*RACH Result* displays the RACH message result. The possible values are succeeded, aborted, and failed.

*RACH Maximum Allowed Preambles* displays the maximum allowed number of RACH preambles. See 3GPP 136.133 subclause 6.3.2 and 3GPP 136.321 subclause 5.1. Values range from 3 to 200.

*RACH Number of Trans. Preambles* displays the number of preambles that were sent during the RACH procedure.

*RACH Initial TX Power* displays the initial TX power level for the RACH.

*RACH Succ. Preamble Power Level* displays the power level for a successful RACH preamble.

*RACH PUSCH Power* displays the power level for simultaneous RACH and PUSCH procedures.

## 15.6.18 Statistics Views

The statistics views display statistics for various measurement events. The statistics views display voice and video call related and application testing related statistics. To reset the statistics view, select **Menu | Reset Statistics**. To save the current statistics to a .csv file, select **Menu | Save Statistics**. The saved statistics can be found in Result folder. The file name format is Statistic\_date\_time.csv.

Statistics views in Nemo Handy IoT are:

- HTTP statistics (with Exelonix modem)
- UDP echo statistics ( )
- Ping statistics (with Know You modem)

## 15.6.19 IoT Parameters View

### 19.15.6.1 Ping Testing (when using Know You Modem)

Test round defines which test round (repeat), e.g. 1/10, is taking place.

Last Ping RTT displays the latest Ping round-trip time (Minimum value: 0 Unit: ms)

Last UDP RTT displays the latest UDP round-trip time (Minimum value: 0 Unit: ms)

Operation Mode defines the operation mode (100 = Inband same PCI 101 = Inband different PCI 102 = Guardband 103 = Standalone)

Power Save Mode displays the power save mode.

DCI Repetitions displays the DCI repetitions (Range: 1 – 2048)

DCI Count displays the DCI count (Minimum value: 0)

DCI Format displays the DCI format (2000 = N0 2010 = N1)

RACH Preamble Repetitions displays the number of times the preamble is repeated to improve coverage. When multiple CE levels were used during the RACH procedure this is the last used repetitions (Range: 1 – 128).

RACH CE Level displays the last used coverage enhancement level. CE level defines the parameter set that is used for preamble sending (Range: 0 – 3).

RSRP (Reference signal received power) displays the linear average of the power contributions of the resource elements that carry cell-specific reference signals within the considered measurement frequency (Range: -160 – 0 Unit: dBm)

### 19.15.6.2 UDP Echo Testing

Test round defines which test round (repeat), e.g. 1/10, is taking place.

Last Ping RTT displays the latest Ping round-trip time (Minimum value: 0 Unit: ms)

Last UDP RTT displays the latest UDP round-trip time (Minimum value: 0 Unit: ms) Operation Mode defines the operation mode (100 = Inband same PCI 101 = Inband different PCI 102 = Guardband 103 = Standalone)

DCI Repetitions displays the DCI repetitions (Range: 1 – 2048)

DCI Count displays the DCI count (Minimum value: 0)

DCI Format displays the DCI format (2000 = N0 2010 = N1)

RACH Preamble Repetitions displays the number of times the preamble is repeated to improve coverage. When multiple CE levels were used during the RACH procedure this is the last used repetitions (Range: 1 – 128).

RACH CE Level displays the last used coverage enhancement level. CE level defines the parameter set that is used for preamble sending (Range: 0 – 3).

RSRP (Reference signal received power) displays the linear average of the power contributions of the resource elements that carry cell-specific reference signals within the considered measurement frequency (Range: –160 – 0 Unit: dBm)

## 15.6.20 IoT Measurements View

### 20.15.6.1 When using Know You modem

RSRP (Reference signal received power) displays the linear average of the power contributions of the resource elements that carry cell-specific reference signals within the considered measurement frequency (Range: –160 – 0 Unit: dBm).

Serving SNR displays the signal-to-noise ratio for the serving cell.

Ping RTT displays the Ping round trip time (Minimum value: 0 Unit: ms).

RACH Preamble Repetitions displays the number of times the preamble is repeated to improve coverage (Range: 1 – 128).

### 20.15.6.2 When using Exelonix modem

RSRP (Reference signal received power) displays the linear average of the power contributions of the resource elements that carry cell-specific reference signals within the considered measurement frequency (Range: –160 – 0 Unit: dBm).

Serving SNR displays the signal-to-noise ratio for the serving cell.

UDP echo RTT (available with Exelonix modem) displays the UDP echo round trip time RACH

## 15.6.21 IoT Config View

### 21.15.6.1 When using Know You modem

When using Know You modem, you can perform UDP echo testing and PING testing.

To test UDP echo, select test type (UDP echo/HTTP GET/HTTP PUT).

With UDP echo, define server address, port, repeat count, data count, timeout, interval and access point.

With HTTP GET define remote address i.e. file path, repeat counts, timeout (ms), interval (ms), and access point.

With HTTP PUT define remote address, port, repeat count, data count, timeout, interval, and access point.

Tap **Start**.

To test Ping, define the Ping address, the amount to repeats, delay from reply to request and Access point (Please follow the terminal manual to define access point) and tap **Start**.

### 21.15.6.2 When using Exelonix modem

When using Exelonix modem, you can perform UDP echo testing and HTTP data transfer testing.

Select test type (UDP echo/HTTP GET/HTTP PUT).

With UDP echo, define server address, port, repeat count, data count, timeout, interval and access point.

With HTTP GET define remote address, repeat counts, timeout (ms), interval (ms), and access point.

With HTTP PUT define remote address, port, repeat count, data count, timeout, interval, and access point.

Tap **Start**.

### 15.6.22 IoT AT Messages View

To display the IoT AT Messages view, go to **Settings | Page Settings | IoT AT Messages** and select **Show Page**.


Enter a command in the AT command field at the bottom of the view and tap **Send**.


Results are shown in the same view. Blue arrow indicates a user-sent AT command, while a red arrow indicates AT responses from the IoT dongle.

### 15.6.23 Map View

To display the Map view, go to **Settings | Page Settings | Map**, select **Show Page**, and tap the Back key of the device.


Select between Google Map and OpenStreetMap in **Settings | Map | Map Select**. Both maps support the same functions.



Tap the *Lock map* (  ) button to lock the map in its position while maintaining the possibility to scroll, rotate and zoom. This enables scaling, rotating, and moving the indoor map on top without accidentally moving the map. Tap the Lock map button again to lock the entire floorplan to disable zooming and rotating. While the map is locked, *Go to GPS location*, *Go to building location* and *Go to address location* menu items are disabled. Tap the *Lock map* button for the third time to unlock the map and to enable the menu items.


You can zoom in and out by “pinching” the screen using two fingers (for example, thumb and index finger) to zoom in or zoom out when viewing a map. Tap  to focus on your current location.

Zoom level of the map can be also adjusted by using the zoom slider on the top of the screen. It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the screen indicates the cardinal directions and tapping on the compass turns the map back into upright position.

Select a map location by tapping and holding your finger on top of a map to move the floorplan to the new location.

You can view the measured route with color-coded parameter values in real-time on live map. To observe different parameters, tap  or the text field displaying the parameters on the map. The parameters and the related color sets are user-configurable. You can select whether GPS or

inserted markers are used in marking the measurement route on the map: when the  icon is displayed, Nemo Handy uses GPS for route marking (recommended for outdoor measurements). When the  icon is displayed, Nemo Handy uses inserted markers to mark the measurement route (recommended for indoor measurements). Tapping the displayed icon changes the mode into the other.

The Clear route icon (  ) removes route markings from the map. To display KML files on top of the Google maps, see “KML files displayed on a map”. Indoor maps (floorplans) are viewed as layers on top of the map. To view floorplans, go to **Settings | Indoor**, where you can select between floorplans and iBwave maps to be uploaded as layers on top of the map. The floorplan layers can be viewed one at a time on the map view by tapping and holding **Floor** on the upper left-hand corner of the map view. Tap and hold the button to open the Select floor popup window and select a floor. The floor you select is displayed on the map. To change the floorplan viewed, tap and hold the same button, now indicating the name of the current floorplan layer, and select another floorplan. See Chapter “Indoor measurements” for further details on indoor measurements. It is possible to rotate the map/floorplan by placing two fingers on the screen and turning the fingers in a circular movement on the screen. The compass on the upper left-hand side of the screen indicates the cardinal directions and tapping on the compass turns the map back into upright position. To delete the indoor map layer(s) from the map view, go to **Settings | Indoor | Floorplan**, select the floor(s) to be deleted and tap **Delete**.

#### 15.6.24BTS View

To display the BTS view, go to **Settings | Page Settings | BTS**, select **Show Page**, and tap the Back key of the device.  
*Cell name* displays the name of the active cell.  
*Site name* displays the name of the active base station.  
*Distance* displays the distance in kilometers to the active base station.  
*BTS CI* displays the cell identity of the active base station.

The Secondary Cells are also displayed alongside active and neighbor cells. The Cell IDs are taken from the BTS file.

#### 15.6.25Transaction Log View


To display the Transaction log view, go to **Settings | Page Settings | Transaction Log** and select **Show Page**. All transactions that can be made with Nemo Handy are shown in a log window, row per transaction, with key information, such as status (success/failure), average data throughput, and whether the voice call was mobile terminated (MT) or mobile originated (MO). To clear the transaction list, select **Menu | Clear transactions**.


#### 15.6.26Nemo Cloud View

To display the Nemo Cloud view, go to **Settings | Page Settings | Nemo Cloud** and select **Show Page**. If you haven't logged into Nemo Cloud yet, you must do so by tapping Login Cloud in Nemo Cloud settings. Logging into Nemo Cloud activates automated testing mode. Note that

when creating a project in Nemo Cloud, Nemo Handy IoT device must be assigned to a manual project for IoT measurement files to correctly sync to Nemo Cloud.

When logged in to Nemo Cloud, the Nemo Cloud view displays the username of the Nemo Cloud account, server address, the active project or work order (if received), and/or the unit name defined by the user in Nemo Cloud and or the unit ID (the IMEI of the Nemo Handy IoT device), time of the last synchronization, and most recent activity.

Stop sync button (  ) manually stops file syncing to Nemo Cloud.

Event log button (  ) opens the Nemo Cloud Event Log view that displays the event history.

Logout button (  ) logs Nemo Handy out from Nemo Cloud.

When logged out from Nemo Cloud, the Nemo Cloud view displays the login settings. When logging in to Nemo Cloud, you can configure your Nemo Handy IoT unit's Cloud settings either directly in the Nemo Cloud view, or through **Settings | Nemo Cloud**.

## 16 Technical support

If you have questions on or beyond this documentation about Nemo tools, please contact our technical support service through Nemo Support Portal at <http://nemo.support.keysight.com>, call us (local phone numbers can be found in chapter Phone and email support) or send us an email at [nemo.support@keysight.com](mailto:nemo.support@keysight.com). Note that for full support you need to have the Maintenance Agreement.

### 16.1 Nemo Support Portal

Nemo Support Portal is a web interface for technical support, product-related questions, and RMA requests. It offers a fast and convenient way to reach our technical support team and submit repair, warranty repair, and calibration requests. Customers can open a support ticket, follow the status of existing tickets, and request technical support 24/7/365. Furthermore, the Nemo Support Portal includes a Knowledge Base for the most frequent and latest topics on Nemo Products. Submitting a ticket via Nemo Support Portal ensures that our technical specialists have all the necessary information available to solve your support case, resulting in faster response times.

Please go to <http://nemo.support.keysight.com> to access the portal and click **Request access** to obtain a password to the system.

### 16.2 Phone and email support

During the warranty period, *the phone support related to potential software errors* is free of additional charge. Registered users with a valid Maintenance Agreement are entitled to *full support*. Nemo Support Portal is the preferred channel for technical support requests, but you can also send us an email. When emailing, please let us know the number of your Software Maintenance and Support Agreement.

Please contact us at the following locations (global email address [nemo.support@keysight.com](mailto:nemo.support@keysight.com)):

<b>Global</b>	
Tel.	+358 50 395 7800
<b>Americas</b>	
Tel.	+1 469 951 9105
<b>Apac</b>	
Tel.	+65 9746 2431
<b>P.R. China</b>	
Tel.	+86 10 6567 8528
<b>India</b>	
Tel.	+91 982 0016372

## 16.3 Locations for Keysight Technologies

Online assistance: <http://www.keysight.com/find/assist>

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

Should the Declaration of Conformity be required, please contact a Keysight Sales Representative, or the closest Keysight Sales Office. Alternately, contact Keysight at: [www.keysight.com](http://www.keysight.com).

