WAVERONNE CellScout
4G/5G Smart Network Surveyor

User Manual



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1 Introduction

1.1 About CellScout 5G

Waveronne CellScout is a handheld 4G/5G network surveyor and beam coverage validation tool for installation, optimization, DAS, IBS and field teams. It scans all nearby LTE and 5G NR cells, locks onto the target cell, and shows live RSRP, RSRQ, SINR, RSSI, Speed Test values, RF cell info with GPS position and bearing. Technicians can point the antenna correctly, generate the indoor, outdoor heatmaps and confirm network performance on the spot.

CellScout works on its own, with no phone or laptop needed. It has a 5-inch touchscreen, SIM-based and SIM-less scanning, 31 LTE bands plus the main 5G NR bands, an IP65 metal housing and more than 5 hours of battery life. Results export to CSV.

- check coverage and signal quality on the spot, with pass/fail gauges;
- record drive and walk surveys outdoors, with every sample placed on the map;
- survey indoor coverage on a floor plan, point by point;
- look at nearby cells, scan the air interface and lock the modem to a chosen cell;
- measure download and upload speed over the mobile network;
- export recorded data as CSV files to a phone or laptop over Wi-Fi.

Key features

- 4G and 5G KPIs
- Friendly user interface
- Tower lock and scouting of all nearby cells
- Fast fetching rate
- Outdoor map with GPS and bearing
- Tower list shown on the map
- Directional antenna provided
- Speed test
- APN-Setup
- Support for a wide range of bands
- Built-in compass
- Handheld stand-alone device with IP65 protection
- Data reporting
- Remote access
- Indoor floor map
- SIM-less scanning
- Continuous updates

Applications

- 4G/5G outdoor surveys
- 4G/5G Indoor surveys
- Network troubleshooting.
- Private Networks Validation
- IoT for factories
- 5G slicing validation

CellScout provides instant, real-time KPIs of the serving and neighboring cells for faster decisions in the field: RSSI, RSRP, RSRQ, SINR, signal quality, speed test (latency, jitter and throughput), band, EARFCN, PCI, cell ID, ECGI, NCGI, MCC, MNC, TAC, azimuth, bearing and GPS position (latitude and longitude), with all nearby cells on the map.

1.2 About this manual

This manual starts with the hardware: what is in the package, the SIM card and the connectors. It then follows the screens of the device in the order you meet them: the Home screen, the tabs of the bottom bar (**KPIs**, **Settings**, **Maps**) and the pages behind them, the web portal, troubleshooting, a glossary and the specifications.

1.3 Safety compliance and precautions

1. Use only the original accessories, to prevent damage to the device.
2. Do not touch the antennas during operation.
3. Preferably connect the antennas before you switch the CellScout on.
4. Insert the SIM card before you switch the CellScout on.
5. Do not let water or other liquids get into the device.
6. Keep the device away from explosive items.
7. Do not leave the device to charge in the sun.
8. Do not open the device. Have it serviced only at a company maintenance branch.
9. Before the first use, charge the battery continuously for 2.5 to 3 hours.

2 Getting started

2.1 Check the package

Unpack and inspect the shipping package to make sure that you have received all the parts, without damage. The package contains:

CellScout	
12 V DC power adapter	
Carrying case	
5 × duck antennas	

For any issue with the shipment, call your agent or our nearest service office, or write to `sales@waveronne.com`.

2.2 SIM card placement

1. Switch the device off.
2. Hold the SIM card with the metal contacts facing up and align it with the SIM slot.
3. Slide the card gently straight into the slot until you hear a click: it is then fully seated and locked in place.



Align the card, contacts facing up



Slide it straight in



Clicked into place

Figure 1: SIM card placement

2.3 Interface

All operation is on the touch screen. The power and SIM connections are on one end panel and the antenna ports on the other.



Figure 2: CellScout interface

Part	Use
Touchscreen	Shows the measurements and controls the device.
ON/OFF button	Switches the device on and off. Its blue light is on while the device is on.
Charging socket (DC IN)	Connection for the 12 V DC power adapter.
Charging indicator	Shows that the battery is charging.
SIM card slot	Holds the Micro SIM card (section 2.2).
RF Port 1 to RF Port 4	SMA connectors for the cellular antennas.
GPS port	SMA connector for the GPS antenna.

2.4 Preparations

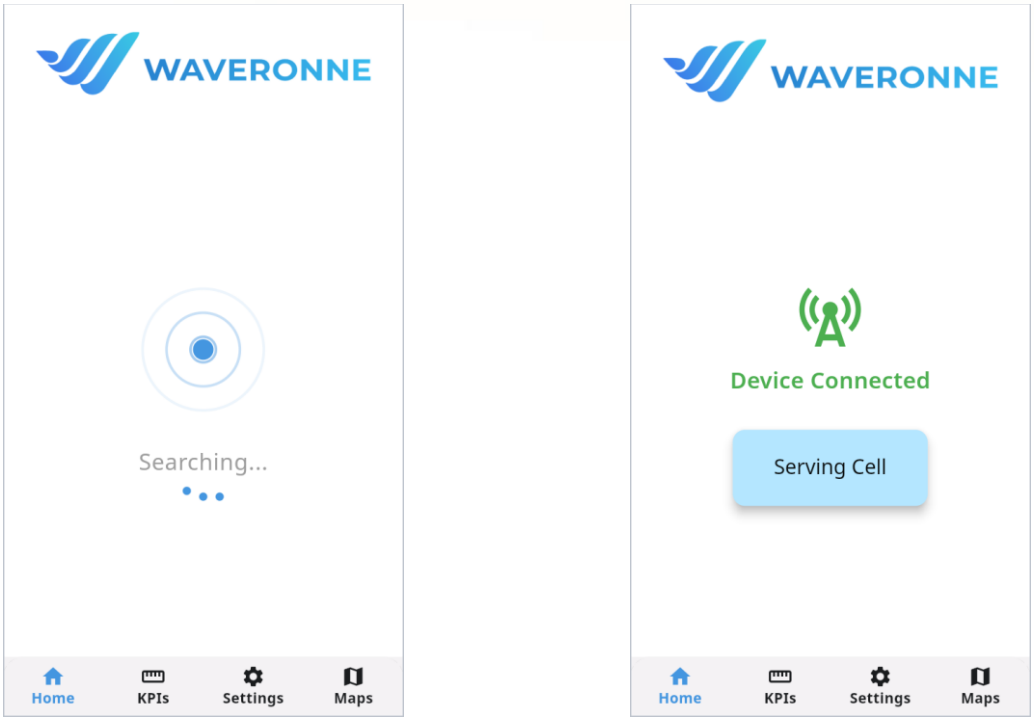
1. Insert the SIM card of the operator you want to measure (section 2.2).

   Note: The device operates also in the SIM-LESS scanning.
2. Connect the power adapter to the charging socket. Before the first use, charge the battery continuously for 2.5 to 3 hours.
3. Connect the antennas to the device.
4. Press the ON/OFF button to switch the device on, and check that its blue light comes on.

The following chapters describe the screens and menus of the CellScout in detail.

2.5 The Home screen

When the device starts, the Home screen shows **Searching…** while the app connects to the cellular modem and waits for the first measurement. As soon as the modem answers and reports a serving cell, the screen changes to **Device Connected** and the **Serving Cell** button appears. Tap it to open the Gauges dashboard (section 3.3).



Starting: searching for the modem *Connected to the modem*

Figure 3: Home screen

2.6 Moving around

The bar at the bottom of every screen has four tabs:

Tab	What you find there
Home	The start screen with the connection status.
KPIs	Live measurements: Instant Values, Gauges, Charts, Candidate Cells and Signal Per Port.
Settings	Display, Wi-Fi, gauge ranges, data reports, remote access, RF board (modem), speed test, compass, date and time, and About.
Maps	The map with outdoor recording, the tower list, tower import and indoor floor plans.

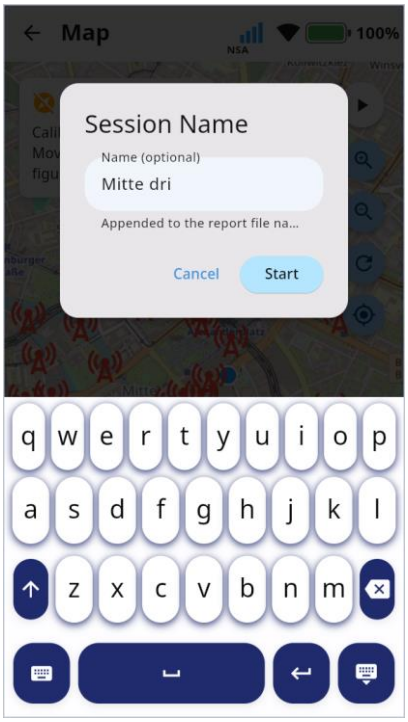
2.7 The status bar

The top right corner of every page shows the state of the device at a glance:

Symbol	Meaning
Signal bars with **LTE**, **NSA** or **SA** below	Signal strength of the serving cell, and the radio technology in use: LTE only, 5G non-standalone (LTE anchor plus 5G) or 5G standalone.
Signal bars with a small padlock	The modem is locked to one cell (section 5.6).
Red circle with "!"	No mobile network: the modem is not registered.
Red recording symbol (two linked circles)	Data is being recorded.
Wi-Fi symbol	The device is connected to a Wi-Fi network.
Battery and percentage	Battery charge.

2.8 Typing text

When a page needs text, for example a session name, an on-screen keyboard opens at the bottom of the screen. The page above it gets shorter and moves the field you are typing in up into view; a window, such as the session name window, moves up so that its buttons stay above the keyboard. Scroll the page to reach the rest of it while the keyboard is open. The arrow key switches between lower and upper case, the key with the cross deletes the last character, and the return key confirms. The keyboard button at the bottom right hides the keyboard.

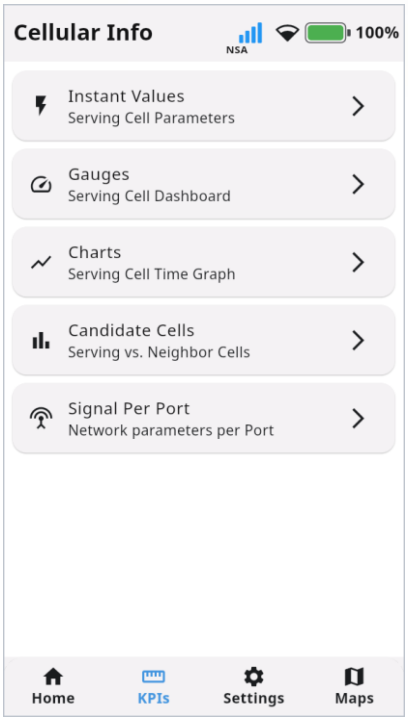


On-screen keyboard

Figure 4: Typing a session name

3 KPIs – live measurements

The **KPIs** tab (titled Cellular Info) lists five pages; with LTE switched off under Network Mode, Candidate Cells is left out, as it needs LTE (section 3.5). They all show the serving cell live and refresh at the RF fetching rate set under Settings → RF Board.



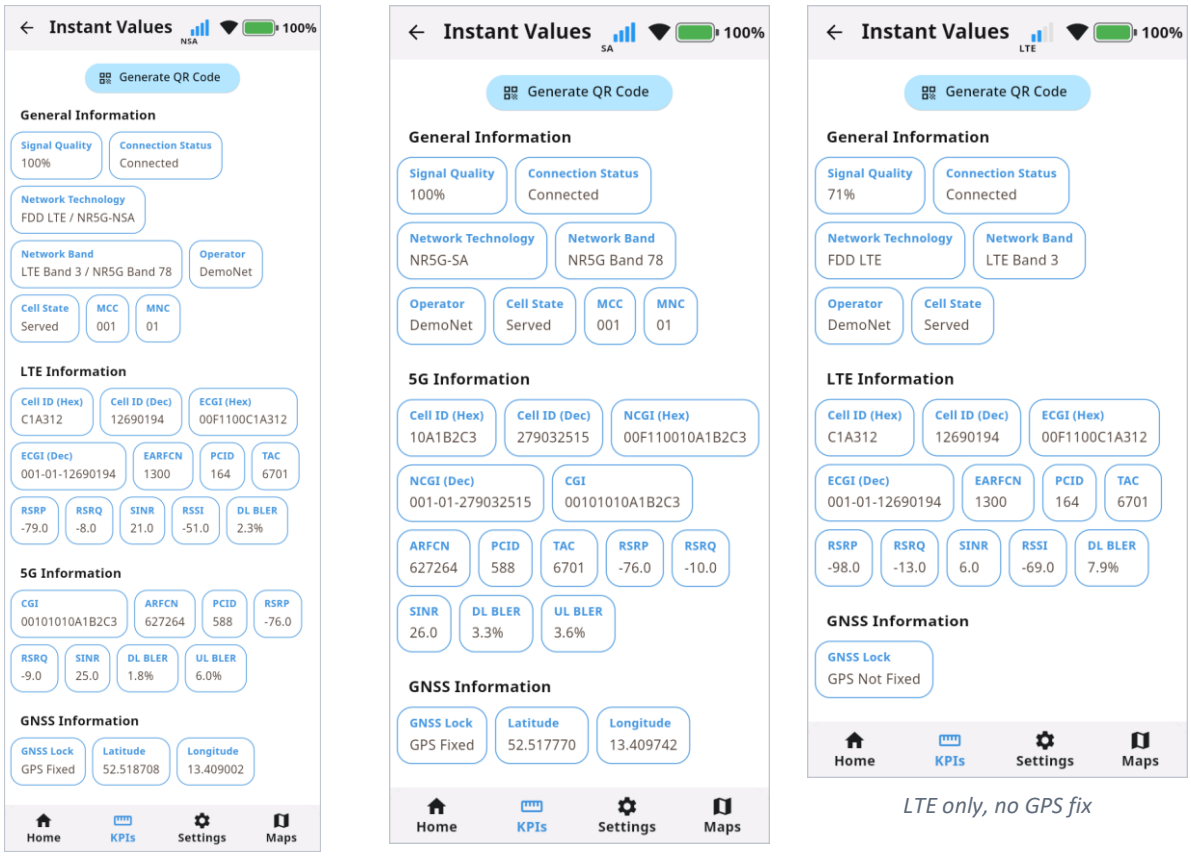
The KPIs tab

Figure 5: Cellular Info

3.1 Instant Values

Instant Values lists every parameter of the serving cell as a set of labelled boxes, grouped by topic. Only the groups that apply are shown.

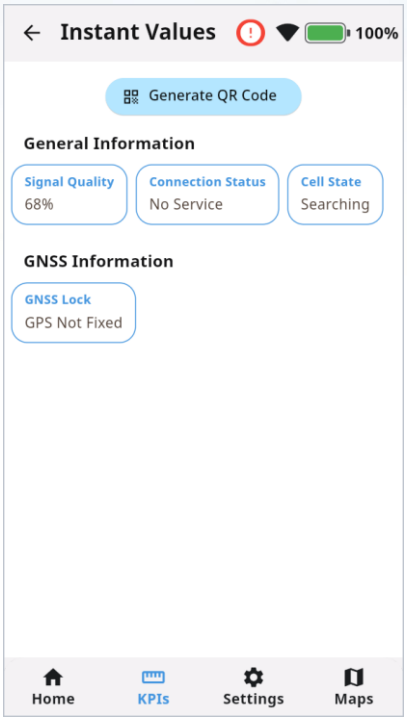
Group	Values
General Information	Signal quality (%), connection status, network technology (for example FDD LTE / NR5G-NSA), network band, operator, cell state, MCC and MNC.
LTE Information	Cell ID (hex and decimal), ECGI (hex and decimal), EARFCN, PCID, TAC, RSRP, RSRQ, SINR, RSSI and the downlink block error rate (DL BLER).
5G Information	CGI or cell ID and NCGI, ARFCN, PCID, TAC (SA), RSRP, RSRQ, SINR, and downlink and uplink block error rates.
GNSS Information	GNSS lock (GPS Fixed / GPS Not Fixed), latitude and longitude.



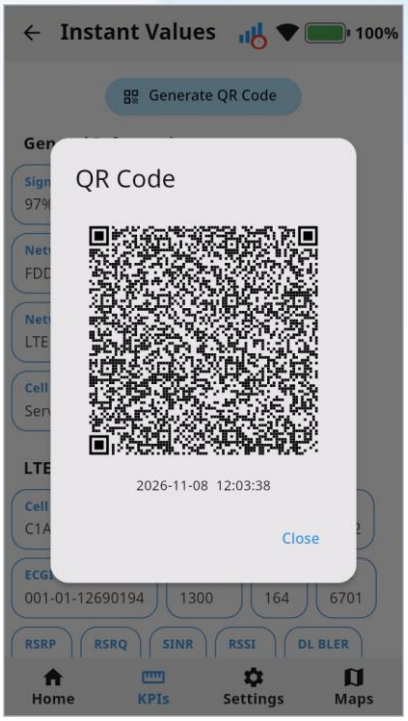
5G NSA (LTE + 5G) *5G SA* *LTE only, no GPS fix*

Figure 6: Instant Values in different network situations

Generate QR Code at the top shows a QR code of the values on screen, stamped with the date and time. Scan it with a phone camera to keep a copy of the reading.



No service: the modem is searching



QR code of the current values

Figure 7: No service, and sharing values by QR code

3.2 Signal quality

CellScout colours values the same way everywhere: **green** is good, **yellow** and **orange** are moderate, **red** is poor. The limits for each colour are set per measurement under Settings → Gauge Ranges (section 5.3). The main measurements are:

Value	Unit	What it tells you
RSRP	dBm	Received power of the cell's reference signal.
RSRQ	dB	Reference signal quality.
SINR	dB	Signal to interference plus noise ratio.
RSSI	dBm	Total received power in the channel, including interference and noise.

3.3 Gauges

The Gauges dashboard shows the serving cell as dials, readable from a distance. The header shows:

- a **Pass** or **Fail** badge: Fail as soon as a measurement falls into its red range; that value is then marked with a red "!";
- the **operator** name;
- the **LTE** cell (EARFCN, PCID, cell ID in hex and decimal, FDD or TDD mode) and the **5G** cell (ARFCN, PCID, cell ID, mode).

Below are dials for **SINR**, **RSRP** and **RSRQ**, and a compass. Each dial has two needles, **blue for LTE** and **purple for 5G**, with the current values printed underneath. The small dots on the rim mark the lowest and highest value seen since the last reset. The coloured outer ring shows the ranges set in Gauge Ranges.



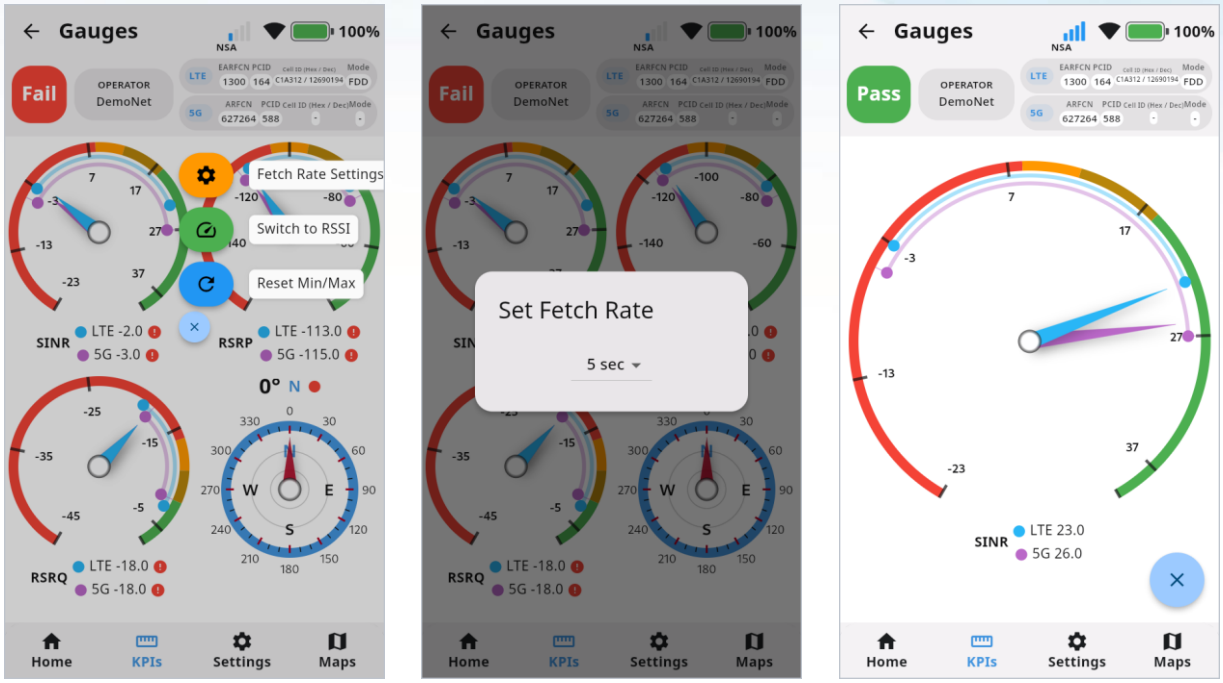
Good signal: Pass *Weak signal: Fail* *Dark mode*

Figure 8: Gauges dashboard

Tap the round menu button in the middle of the screen for three actions:

- **Fetch Rate Settings**: how often the modem is read;
- **Switch to RSSI** / **Switch to Compass**: replace the compass by an RSSI dial, or back;
- **Reset Min/Max**: clear the lowest and highest value markers.

Tap any dial to show it full screen; tap the × button to return.



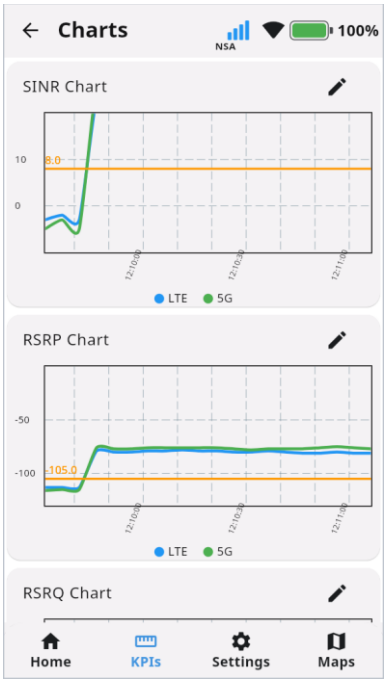
Menu *Fetch rate* *One dial full screen*

Figure 9: Gauge menu and full-screen dial

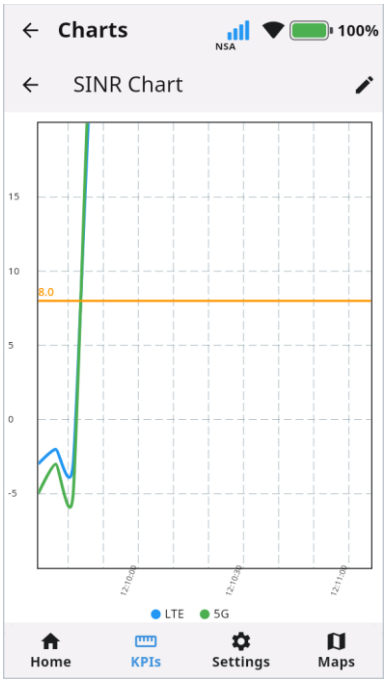
3.4 Charts

Charts plots RF KPIs over time, LTE in blue and 5G in green. The orange line is the threshold for that measurement, with its value on the left. New samples enter on the right and older ones scroll out to the left.

- Tap a chart to show it full screen.
- Tap the pencil to set the chart's vertical range and its threshold. **Save** keeps the change, **Reset** returns to the default.



Charts page



One chart full screen



Range and threshold

Figure 10: Charts

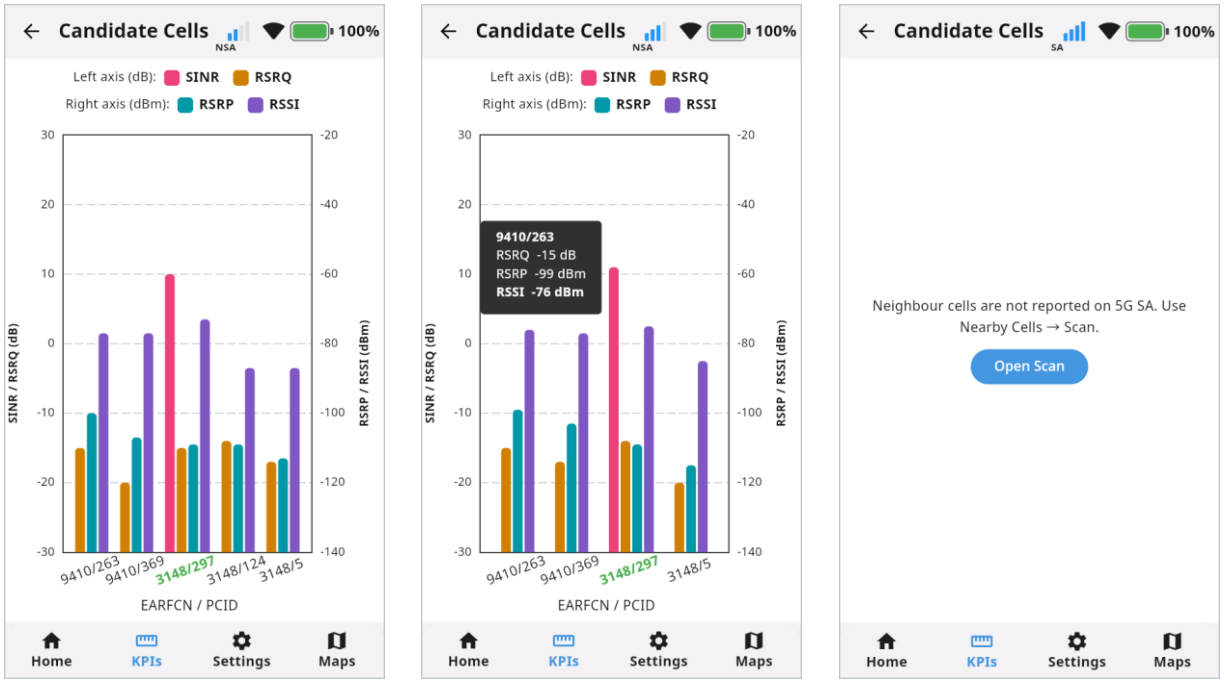
3.5 Candidate Cells

Candidate Cells compares the serving cell with the neighbouring cells the modem reports: up to five cells, strongest RSRP first. Each group of bars is one cell, labelled with its EARFCN and PCI; the serving cell's label is green. Use it to see which neighbour would be the next best server.

The chart has two scales, so the small dB values and the large dBm values can be read side by side. The legend at the top is grouped the same way:

- **Left axis (dB)**: **SINR** and **RSRQ**, in warm colours (pink and orange), from −30 to 30 dB;
- **Right axis (dBm)**: **RSRP** and **RSSI**, in cool colours (teal and purple), from −140 to −20 dBm.

Note: Candidate Cells works on LTE and 5G NSA. On 5G SA the modem reports no neighbours: the page says **Neighbour cells are not reported on 5G SA. Use Nearby Cells → Scan.** and **Open Scan** takes you to Settings → RF Board → Nearby Cells → **Scan** (section 5.6).



Candidate Cells *Touched bar: exact values* *On 5G SA: Open Scan*

Figure 11: Candidate Cells

3.6 Signal Per Port & MIMO

Signal Per Port shows the connection type and MIMO mode (for example 5G NSA with 4×4 MIMO) and a table of SINR, RSRP and RSRQ for the combined signal and for each receive antenna. A port that is much weaker than the others usually means a loose or damaged antenna.

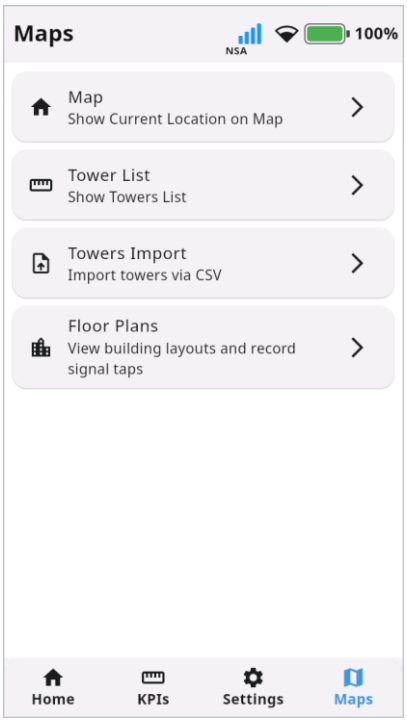


Signal Per Port

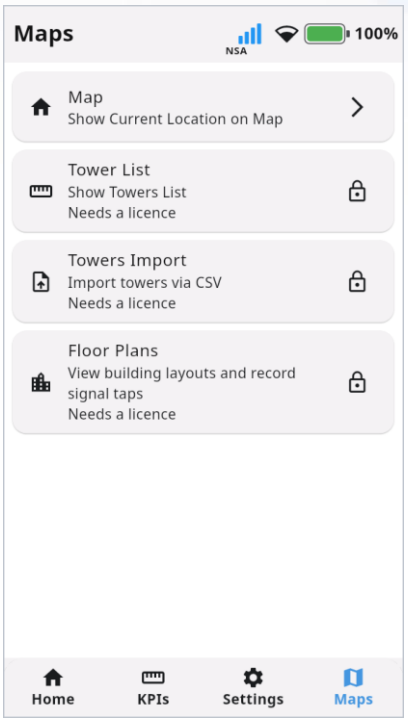
Figure 12: Antenna ports

4 Maps

The **Maps** tab has four entries. Map, Tower List, Towers Import and Floor Plans.



Licensed unit



Without licences

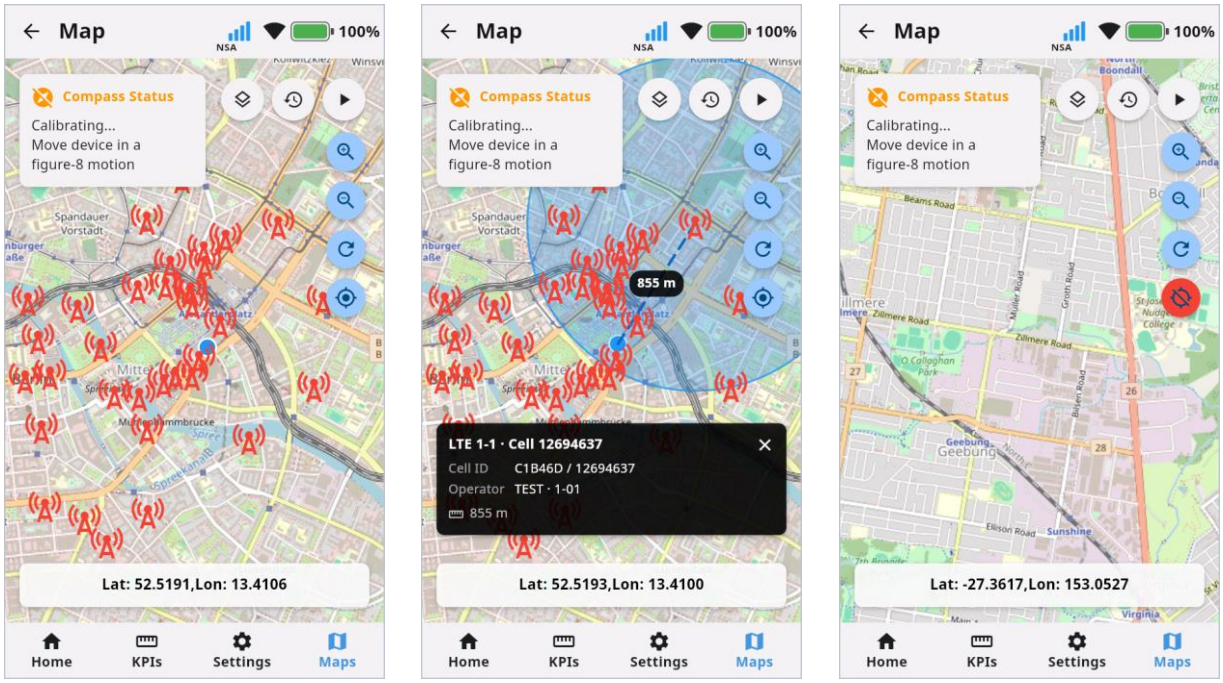
Figure 13: The Maps tab

4.1 The map

The map shows street maps, your position as a blue dot with a light-blue cone pointing where the device faces, and the cell towers from the tower list as red mast symbols. The coordinates of your position are shown at the bottom. Drag to move the map and pinch to zoom.

Button	Action
Layers	Show or hide the survey tools: several sessions at once, the KPI bar, paths, heatmap, filters, speed tests while recording and export (section 4.4).
Clock with arrow	Open a recorded session (section 4.3).
▶ (play)	Open the live session panel to record a survey (section 4.2).
Magnifier + / −	Zoom in / out.
Circular arrow	Return to the default zoom level.
Target	Centre the map on your position. The button is red with a crossed-out target while there is no GPS fix.

Tap a tower to select it: a blue circle shows its range, a dashed line and label show the distance from you, and a card at the bottom describes the tower: its radio and network, the name and site you gave it (if any), the Cell ID in hex and in decimal, the operator with its network code, and the distance. Without a GPS fix the card says **GPS Not Fixed** instead of a distance. Tap the tower again, or the × on the card, to clear the selection.



Map with towers *Selected tower, 855 m away* *No GPS fix: red target button*

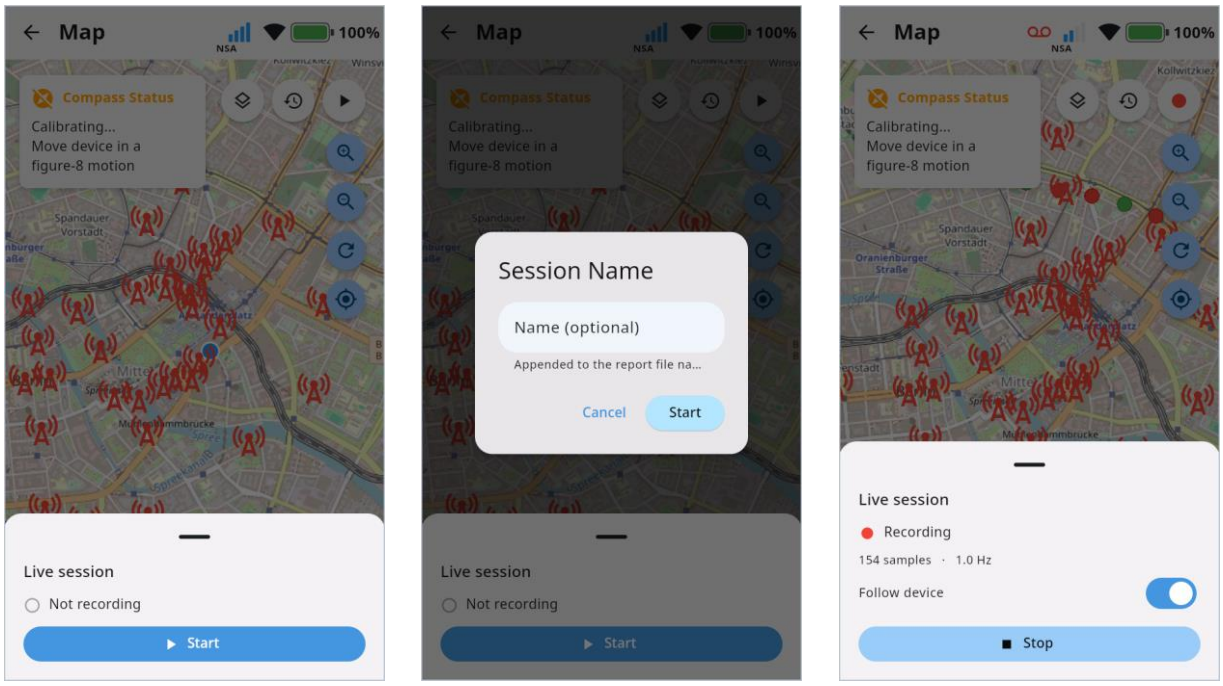
Figure 14: The map

> **Tip:** The **Compass Status** card appears when the compass needs calibrating. Move the device slowly in a figure-8 until the card disappears.

4.2 Recording a drive or walk survey

A live session records a measurement every second together with your GPS position, and draws the route on the map as coloured dots.

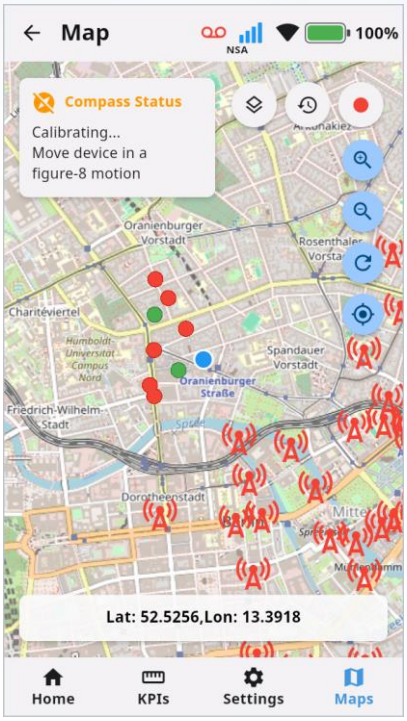
1. Wait for a GPS fix: the target button on the map is blue, not red.
2. Tap ▶ at the top right of the map. The Live session panel opens and says Not recording.
3. Tap **Start**. Type a session name if you like (it is added to the report file name) and tap **Start** again.
4. Walk or drive your route. The panel shows the number of samples and the sample rate; the status bar shows the recording symbol.
5. Leave **Follow device** on to keep the map centred on you, or switch it off to look around.
6. Tap **Stop** when you are done. The session is saved.



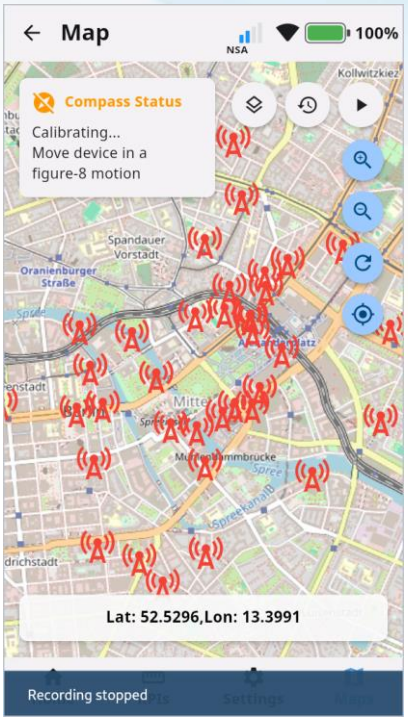
Live session panel *Session name* *Recording, 1 sample per second*

Figure 15: Starting a live session

Each dot on the route is one sample, coloured by signal quality: green is good, orange moderate and red poor. The route stays on the map while you record, so you can see weak spots as you go. When you tap **Stop**, a message says **Recording stopped** and the route is cleared from the map; open the session from the clock button to see it again (section 4.3).



Route coloured by signal quality

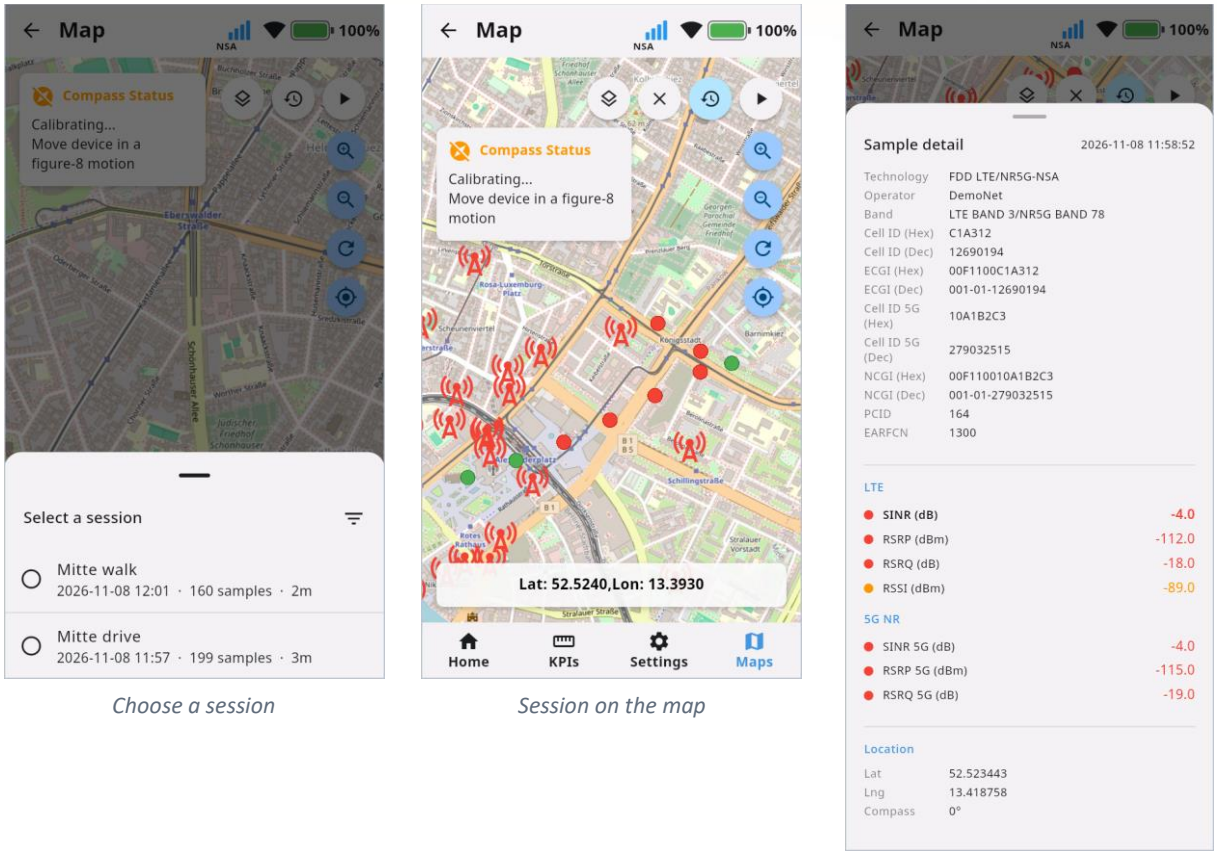


After Stop: route cleared

Figure 16: The recorded route

4.3 Reviewing a recorded session

Tap the clock button on the map to list recorded sessions, newest first, with their start time, number of samples and duration. Pick one to draw it on the map. Tap any dot to open the **Sample detail** panel: time, technology, operator, band, cell identities, the LTE and 5G measurements (coloured like the dot) and the position and compass heading of that sample.



Choose a session *Session on the map* *Details of one sample*

Figure 17: Reviewing a session

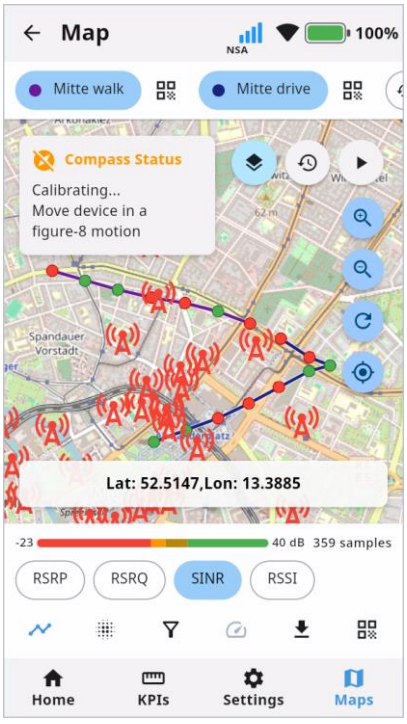
Sessions are also listed under Settings → Data Reports → Reports, where you can export them as CSV files (section 5.4).

While a session is shown, an **×** button appears next to the layers button. Tap it to go back to the live map.

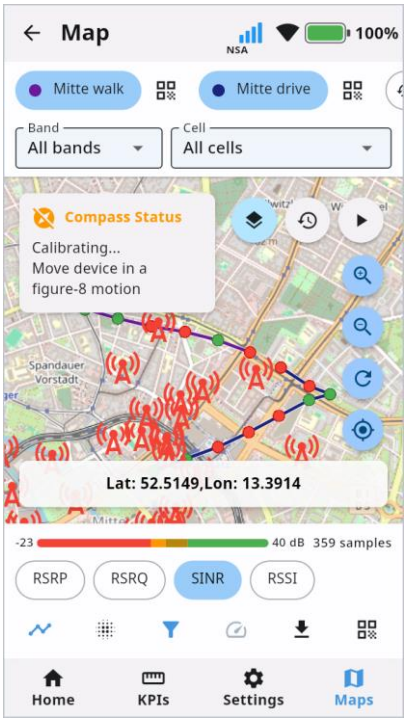
4.4 Survey tools

The survey tools compare several drives or walks on one map. Tap the **layers** button at the top of the map to show them, and tap it again to hide them. The tools add a row of session chips above the map and a survey bar below it. The survey tools are a licensed feature (**Outdoor survey**, section 1.3).

- **Session chips.** While you record, the first chip says **Live · N**, where N is the number of samples so far. Then come the sessions you picked, each in the colour of its route and with a QR button to download that session alone on a phone, followed by the most recent other sessions. Tap a chip to add that session to the map or take it off. **All sessions** at the end of the row lists every session, with check boxes and a filter.
- Up to **6 sessions** can be on the map at once, with at most **60,000 samples** between them. Past this the device says why it did not add the session.
- **Survey bar.** The top row shows the colour scale of the chosen measurement and how many samples are shown. Below it, choose the measurement: **RSRP**, **RSRQ**, **SINR** or **RSSI**. The bottom row shows or hides the **paths** between the samples, switches the **heatmap** on or off, opens the **band and cell filter**, opens **speed tests while recording**, exports the selected sessions to one CSV file, and shows a QR code for downloading them on a phone.
- **Filter.** The **Band** and **Cell** lists above the map show only the samples measured on one band or one serving cell. The sample count then reads, for example, “120 of 359 samples”.
- Tap a sample on any route to open its **Sample detail** panel (section 4.3).



Two sessions, coloured by SINR



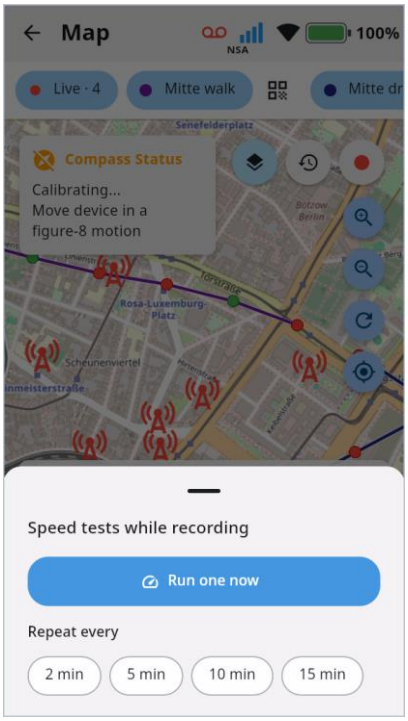
Band and cell filter open

Figure 18: Survey tools on the map

Speed tests while recording

The speed button in the survey bar opens **Speed tests while recording**. It needs a recording in progress: without one it says **Start a recording to run speed tests**.

- **Run one now** runs a single speed test at your current position.
- **Repeat every** 2, 5, 10 or 15 min runs a test now and then at that interval until the recording stops. The device first asks you to confirm: each test takes about 30 to 60 seconds and uses mobile data, and on 5G one test can use several hundred MB. **Stop repeating** ends the series.
- The panel shows the last result (download, upload and ping) and the time of the next test. The result is saved with the sample where the test ran, and that sample is drawn with a ring on the route.
- If you stop the recording before a test has finished, its result is not saved, and repeating tests stop with the recording.



Speed tests while recording

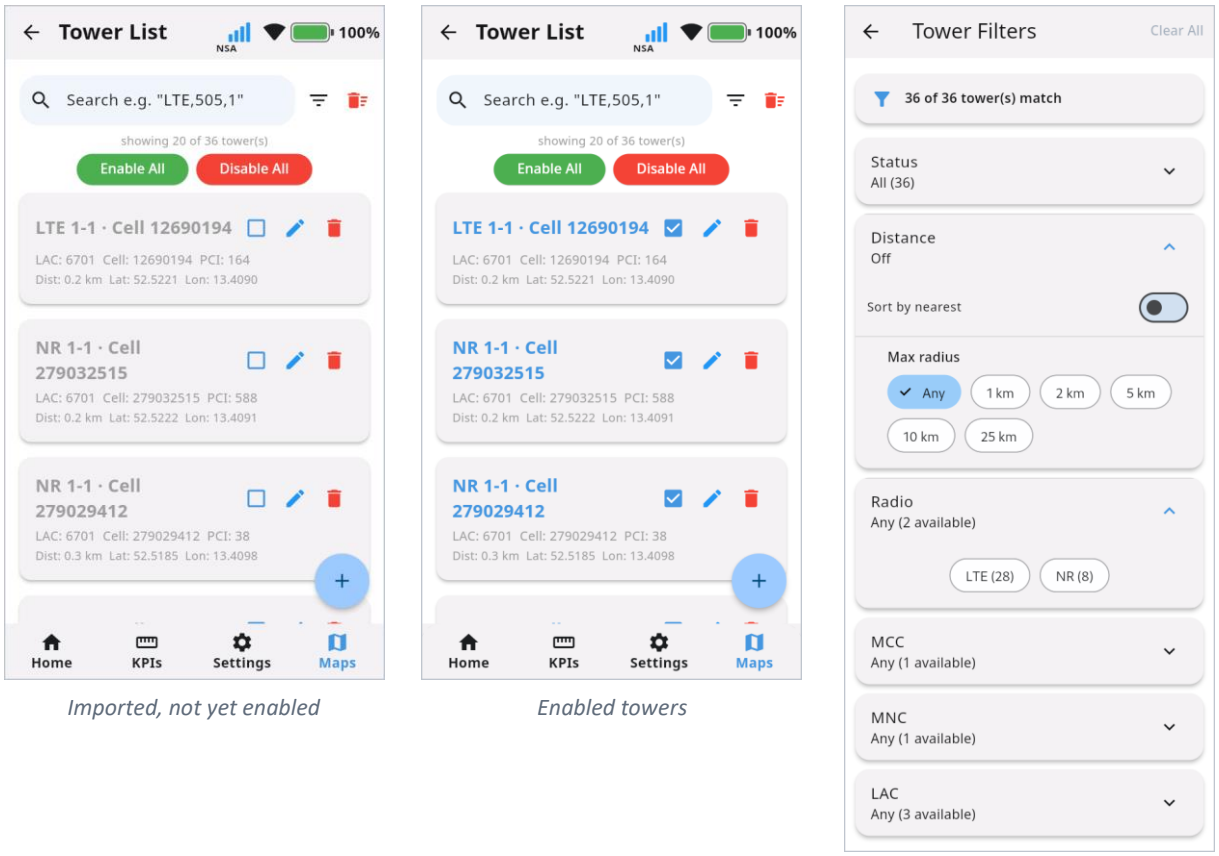
Figure 19: Speed tests on a drive

Speed tests while recording also need the **Speed Test** licence (section 1.3).

4.5 Tower List

The tower list holds the cell sites you imported (section 4.6) or added by hand. Each card shows the radio type and network (for example LTE 1-1, that is MCC 1, MNC 1), the cell ID, LAC or TAC, PCI, the distance from you, the coordinates and the signal. A tower you added yourself also shows the name you gave it, under that title. The line above the buttons says how many towers match and how many are shown.

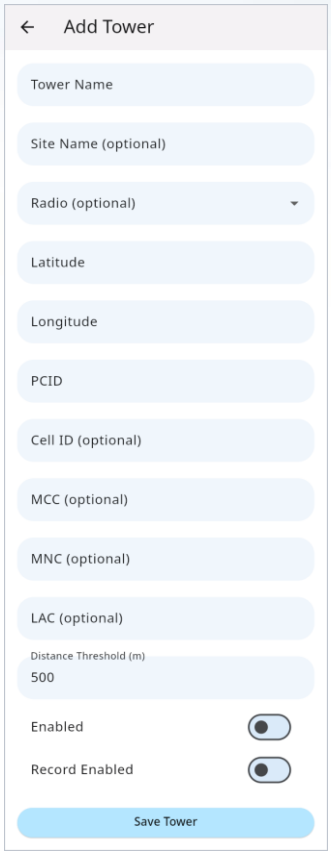
- **Search** with free text, or with comma-separated values such as `LTE,505,1`. Each value is looked for in the radio, MCC, MNC, LAC and cell ID, and in the name and site name you gave the tower.
- The **filter** button opens Tower Filters: status (enabled or disabled), distance (sort by nearest, maximum radius), radio, MCC, MNC and LAC. **Clear All** removes every filter.
- The **tick box** on a card enables the tower. Only enabled towers are drawn on the map. **Enable All** and **Disable All** act on the whole list.
- The **pencil** edits a tower, the **bin** deletes it. The red bin at the top deletes all towers.
- The **+** button adds a tower by hand.



Imported, not yet enabled *Enabled towers* *Tower Filters*

Figure 20: Tower List

Add Tower asks for a name, an optional **Site Name** (for example the site ID), the radio type, latitude and longitude, and the **PCID**, the **Cell ID** (in decimal) or both; MCC, MNC and LAC are optional. **Enabled** shows the tower on the map. **Distance Threshold** and **Record Enabled** are extra per-tower options that can be left at their defaults. Tap **Save Tower** to add it.



Add Tower

Figure 21: Adding a tower by hand

You can also add a tower from the map: press and hold the spot where it stands. The same **Add Tower** form opens without latitude, longitude and LAC, since the position is the spot you held. Choose its **Radio**, **LTE** or **5G (NR)**; the form does not save without one. With the radio set, the tower list shows the tower by its radio, network and cell ID (or its PCI, when no cell ID was given) straight away, with its name below. With **Enabled** on, as the form starts, the tower is enabled at once.

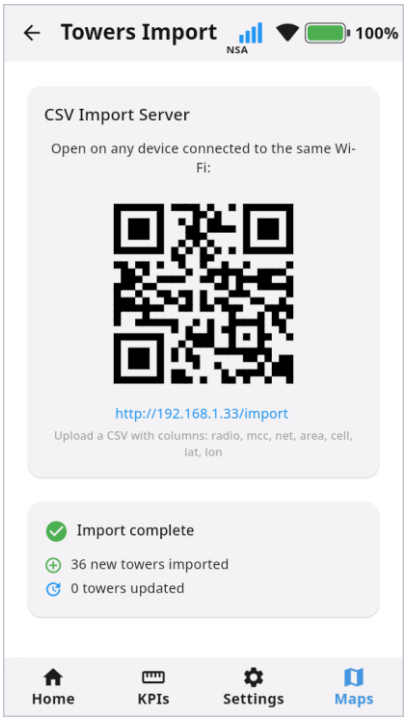
4.6 Importing towers

Towers are imported from a CSV file in OpenCelliD format, using a phone or laptop on the same Wi-Fi network as the device (or connected to its hotspot).

1. On the device, open **Maps → Towers Import**. The page shows a QR code and an address such as `http://192.168.1.33/import`.
2. Scan the QR code with a phone, or type the address in a laptop browser.
3. Drop the CSV file on the page, or click it to pick the file. The file needs at least the columns `radio`, `mcc`, `net`, `area`, `cell`, `lat` and `lon`; the page lists every column it understands.
4. The towers are imported at once. The web page and the device both confirm how many towers were added and updated.
5. Open the Tower List and enable the towers you want on the map.

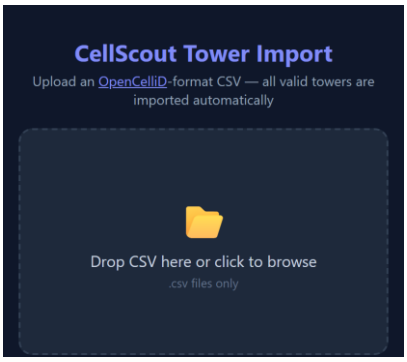


Import page on the device

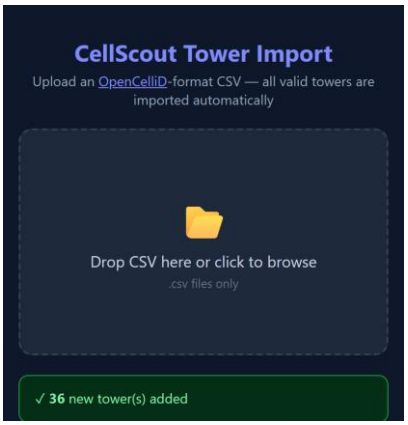


Import complete

Figure 22: Towers Import on the device



Upload page in a browser



After the upload

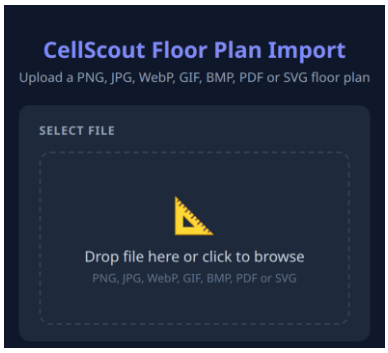
Figure 23: Tower import from a phone or laptop

4.7 Indoor surveys on floor plans

Floor Plans lets you measure coverage inside a building. You import a floor plan once, then walk through the building and tap your position on the plan; at every tap the device stores the current measurements at that point.

Importing a floor plan

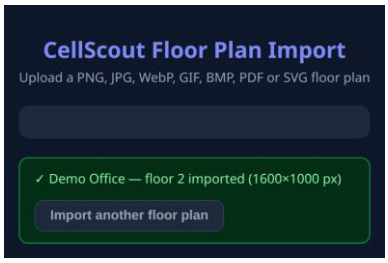
1. Open **Maps → Floor Plans** and tap **Import**. The device shows a QR code and an address such as `http://192.168.1.33:80/floorplans`.
2. Open the address on a phone or laptop on the same Wi-Fi and choose the plan: PNG, JPG, WebP, GIF or BMP, and PDF or SVG once the device has its converters. The page and the device list the formats this device accepts. A device that cannot convert PDF or SVG yet says so as soon as you choose such a file; upload the plan as a PNG or JPG instead.
3. Enter the site or building name, the floor number or label, and the real-world scale: either metres per pixel (0.05 is the recommended value), or two reference points on the plan with the distance between them.
4. Click **Import**. The bar shows the upload as it goes (step 1 of 2). Then the page says the device is processing the file (step 2 of 2); a large plan can take a minute or two. The page then confirms the import and the device lists the new plan.



Choose the file



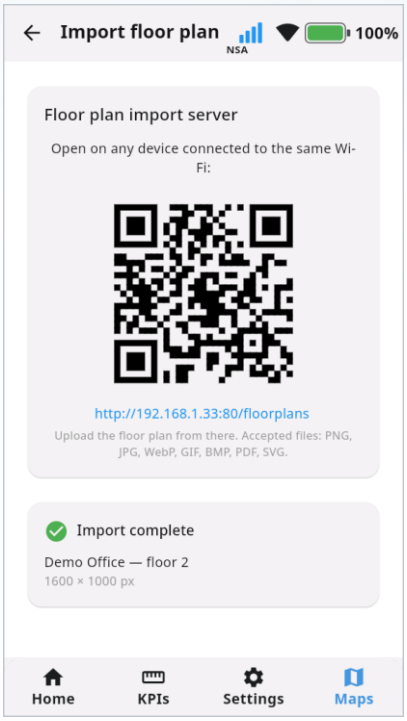
Name, floor and scale



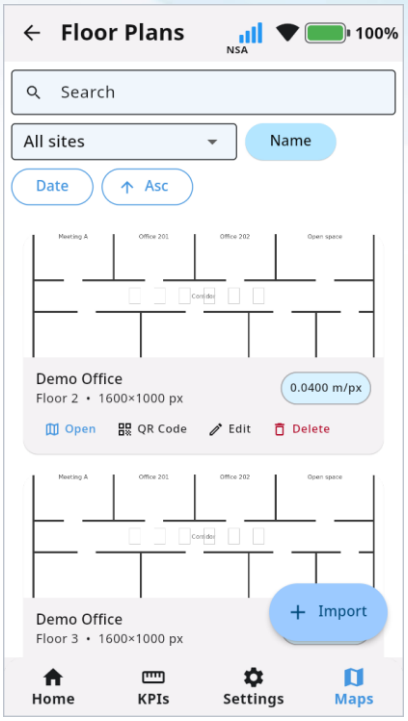
Imported

Figure 24: Floor plan import in a browser

Each plan in the list shows a preview, its name, floor, size and scale, with the actions **Open**, **QR Code**, **Edit** and **Delete**. Once there are more than three plans, a bar above the list helps you find one: **Search** by site name or floor, choose a site from the site list (**All sites** shows every plan), and sort by **Name** or **Date**, ascending or descending. When the search or site filter hides plans, a line says how many are shown, for example “Showing 2 of 4”.



Import page on the device



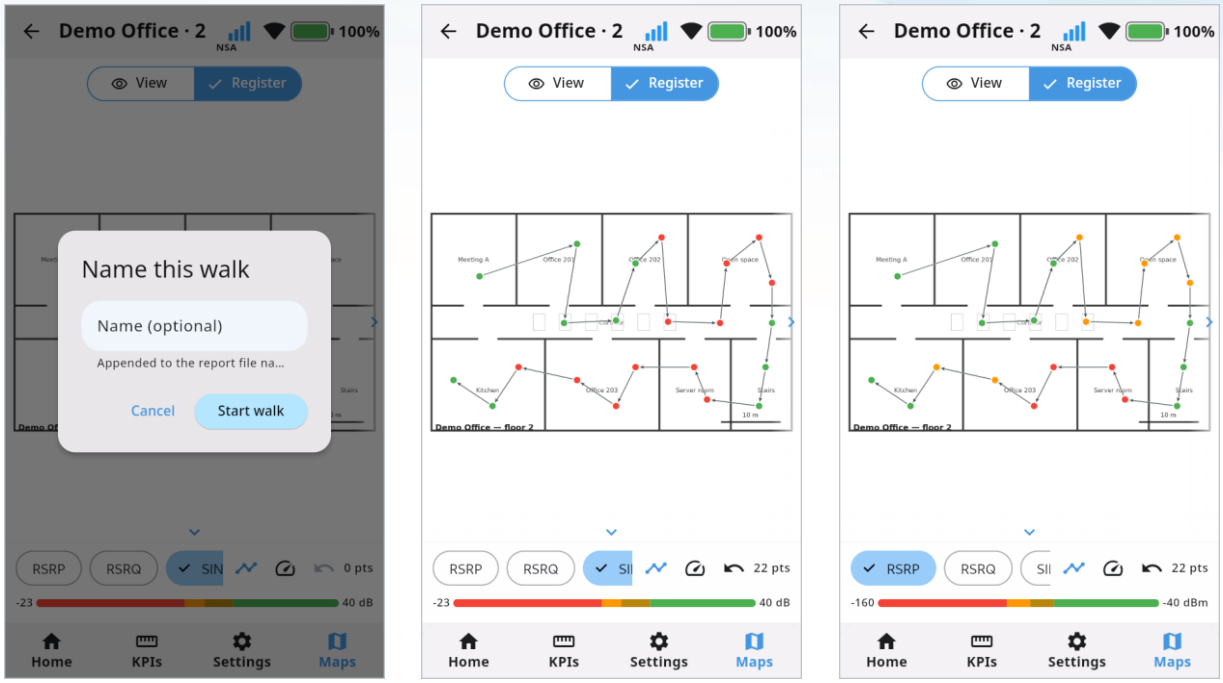
Floor Plans list

Figure 25: Floor plans on the device

Registering measurement points

1. Open the plan and switch from **View** to **Register**.
2. Give the walk a name if you like and tap **Start walk**.
3. Stand still at a spot and tap that spot on the plan. A dot appears, coloured by the measurement you chose at the bottom .
4. Move on and repeat. Dots are joined in the order you registered them, and the counter shows the number of points.
5. Tap the undo arrow to remove the last point.

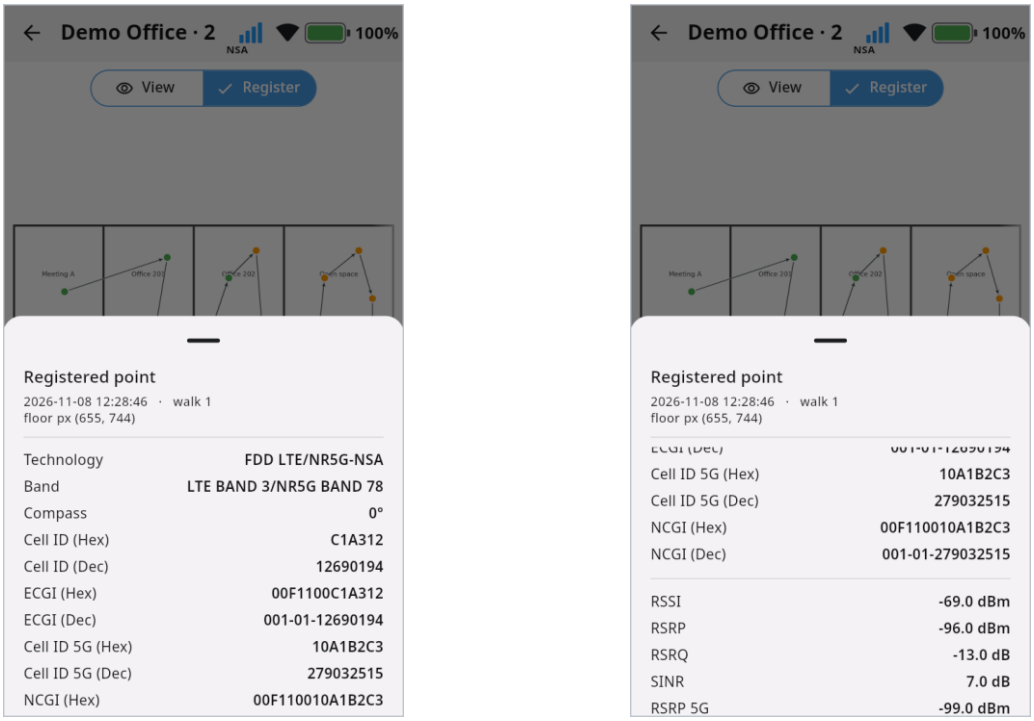
The gauge button in the bottom bar adds a speed test to the points: off, **next point only**, or **every point**. A speed test takes about 30 seconds per point and uses mobile data, so stay at the point until it has finished. When a test gives no result, the point is still saved with its measurements, and a message a few seconds later says why, in the same words as the Speed test page (section 5.7).



Name the walk *Points coloured by SINR* *Same walk by RSRP*

Figure 26: Registering points on a floor plan

Tap a point to see everything recorded there: time, walk, position on the plan, technology, band, compass heading, cell identities and all LTE and 5G measurements.

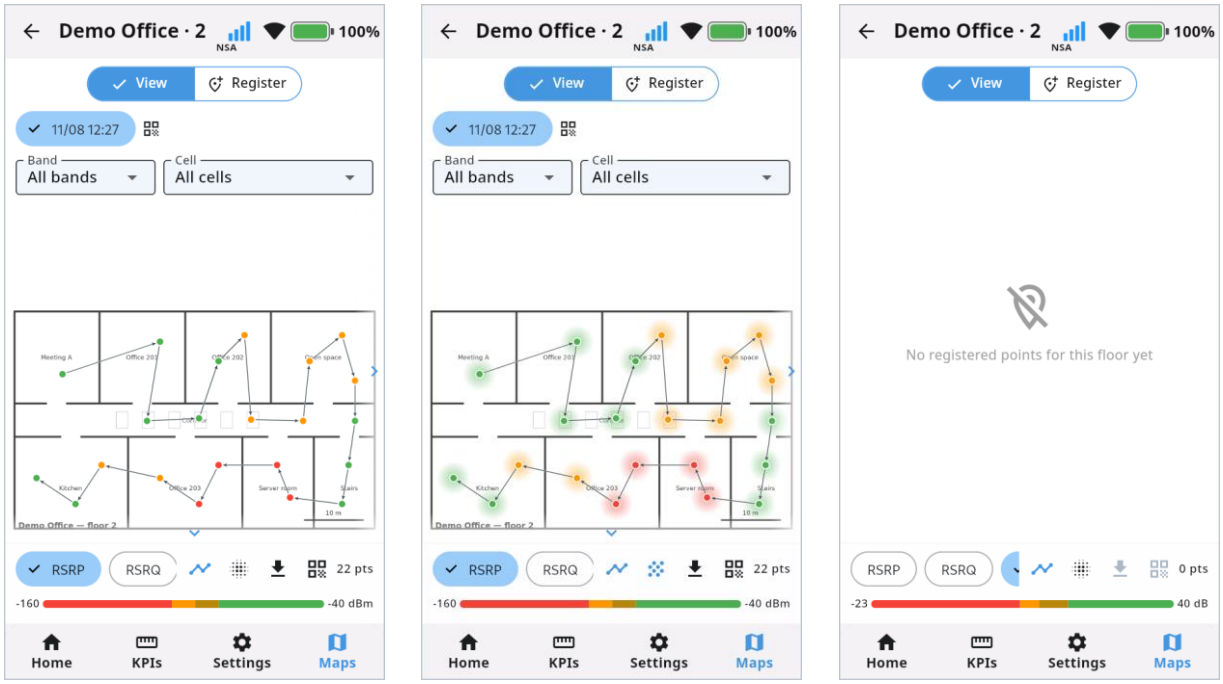


Registered point *More values (scrolled)*

Figure 27: Details of a registered point

Viewing the results

In **View** mode the plan shows all registered points. Use the walk chips to choose which walks to show; when there are more walks than fit across the screen, a scrollbar shows under the chips and an arrow at the side where more are hidden, so drag the row sideways to reach them. Pinch to zoom into the plan and drag to move it; an arrow at an edge of the plan shows that part of it lies beyond that edge. Use the **Band** and **Cell** lists to show only points measured on one band or one serving cell. The bottom bar selects the measurement, shows or hides the path, switches the **heatmap** on or off, exports the points (download button) and shows a QR code for downloading them on a phone. The colour bar below gives the scale.

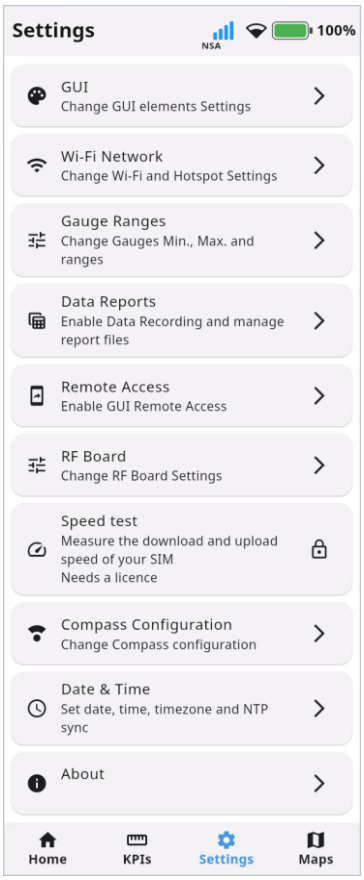


View mode with path *Heatmap switched on* *A plan without points*

Figure 28: Viewing an indoor survey

5 Settings

The **Settings** tab lists all configuration pages. Scroll down to see the whole list.

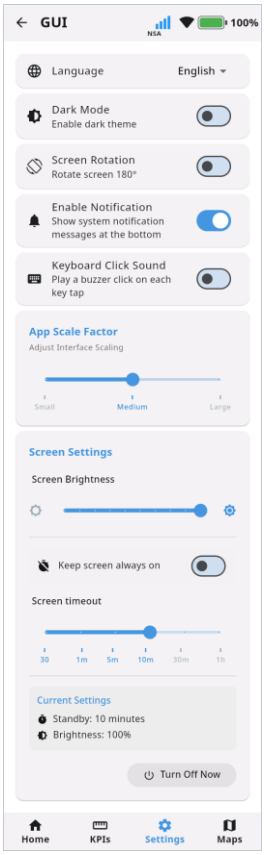


Settings (Speed test shown without licence)

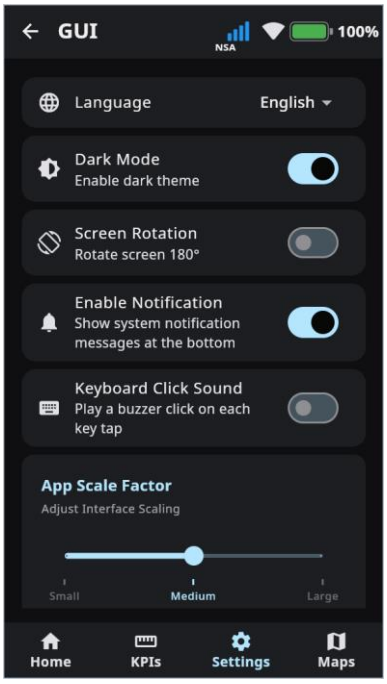
Figure 29: The Settings tab

5.1 GUI

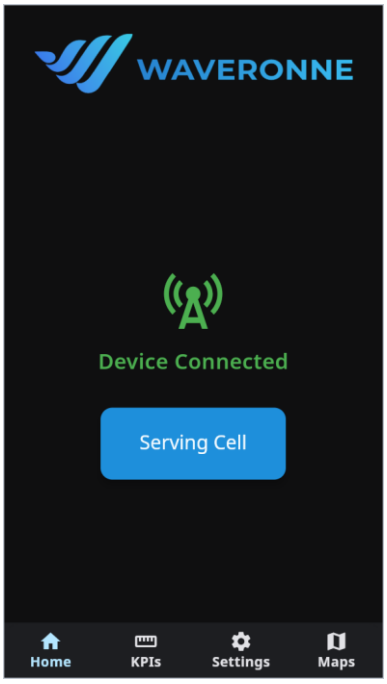
Setting	What it does
Language	Display language.
Dark Mode	Light text on a dark background, for use at night.
Screen Rotation	Turn the picture upside down (180°), for mounting the device the other way up.
Enable Notification	Show system messages at the bottom of the screen.
Keyboard Click Sound	A buzzer click on every key tap.
App Scale Factor	Size of text and controls: Small, Medium or Large.
Screen Brightness	Backlight level.
Keep screen always on	Never switch the screen off automatically.
Screen timeout	Switch the screen off after 30 seconds up to 1 hour without use.
Turn Off Now	Switch the screen off at once. Touch the screen to wake it.



GUI settings



Dark mode on



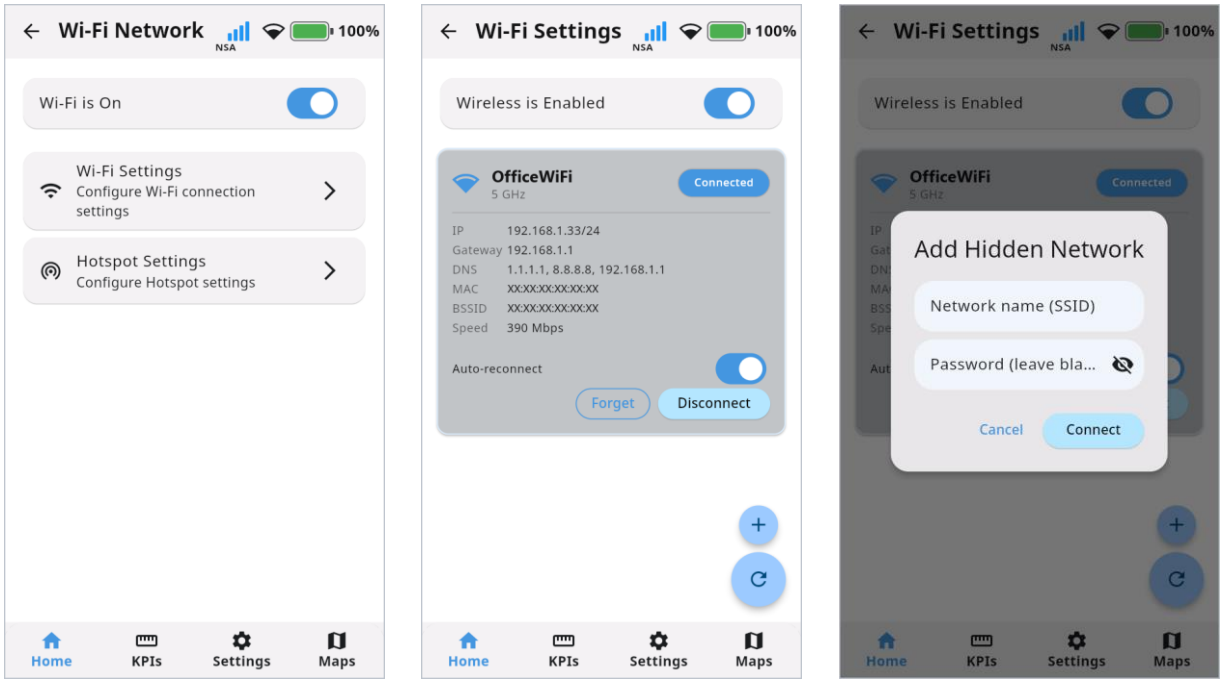
Home screen in dark mode

Figure 30: GUI settings

5.2 Wi-Fi Network

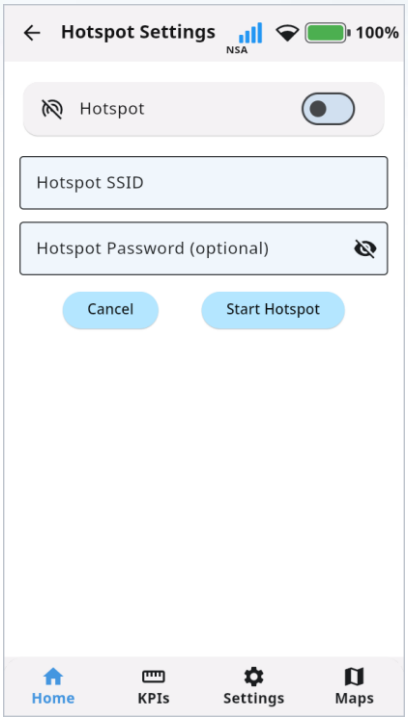
The Wi-Fi page switches Wi-Fi on or off and leads to **Wi-Fi Settings** and **Hotspot Settings**. The device uses Wi-Fi only for your phone or laptop to reach it (reports, imports, licences, remote access); measurements always use the mobile network.

- **Wi-Fi Settings** lists networks. The connected network shows its IP address, gateway, DNS, MAC address, access point (BSSID) and link speed, with **Auto-reconnect**, **Forget** and **Disconnect**. The circular arrow searches for networks again; **+** joins a hidden network by name and password.
- **Hotspot Settings** turns the device into a Wi-Fi access point. Enter a network name (SSID) and, optionally, a password, then tap **Start Hotspot**. Phones and laptops can then connect directly to the device.



Wi-Fi Network *Connected network* *Add a hidden network*

Figure 31: Wi-Fi



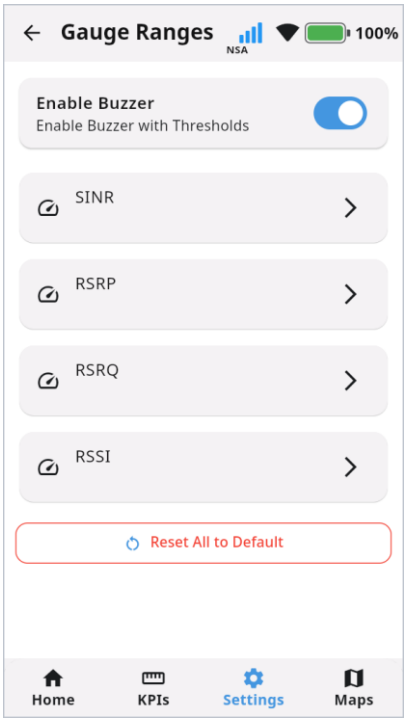
Hotspot Settings

Figure 32: Hotspot

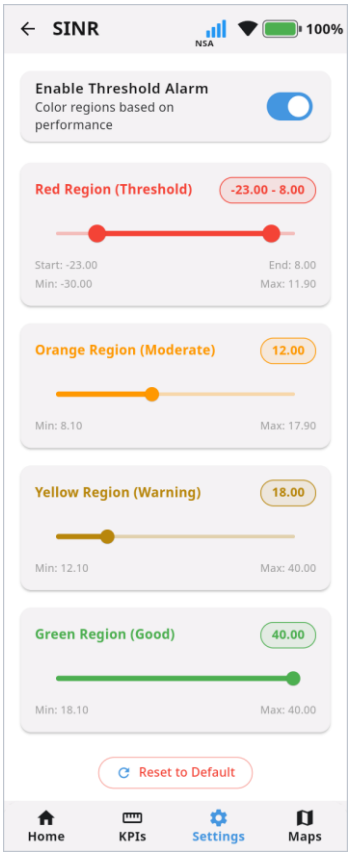
5.3 Gauge Ranges

Gauge Ranges sets the colour limits used by the gauges, the pass/fail badge, charts and maps, separately for SINR, RSRP, RSRQ and RSSI. **Enable Buzzer** sounds the buzzer when a value falls into its red range.

Open a measurement to edit its ranges. The red range is set with a start and an end handle; the orange, yellow and green ranges each end at the value shown in their badge, and every range starts where the one before ends. **Enable Threshold Alarm** switches colour regions on or off for that measurement, and **Reset to Default** restores the factory values. **Reset All to Default** on the first page restores all four.



Gauge Ranges



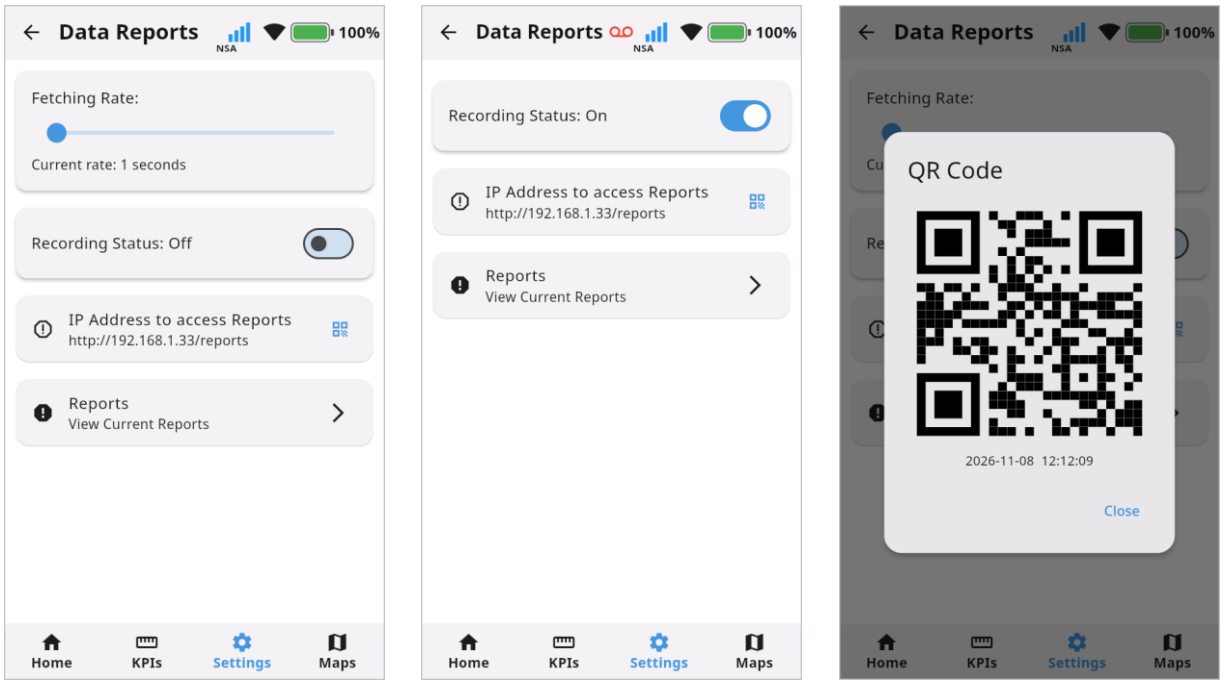
SINR ranges

Figure 33: Setting colour ranges

5.4 Data Reports

Data Reports controls recording and gives access to the recorded data.

- **Fetching Rate** sets how often a sample is taken while recording.
- **Recording Status** switches recording on or off. When you switch it on, the device asks for a session name, as for a live session (section 4.2). While it is on, the page title and the status bar show the recording symbol.
- **IP Address to access Reports** shows the address of the reports page for a phone or laptop on the same network; the QR button shows it as a QR code.
- **Reports** opens the list of recorded data.



Recording off *Recording on* *Address as a QR code*

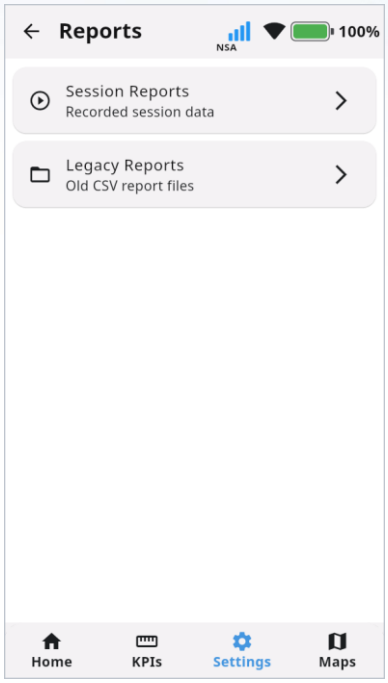
Figure 34: Data Reports

Reports has two lists. **Session Reports** holds recorded sessions; **Legacy Reports** holds CSV files from earlier software versions. Both can be searched, sorted by PCID or date (ascending or descending) and limited to a date range.

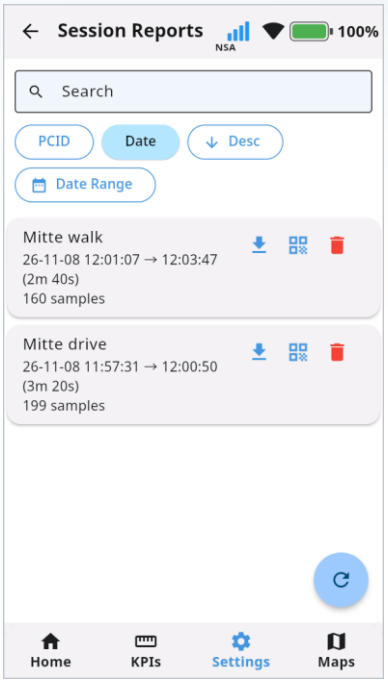
Each session shows its name, start and end time, duration and number of samples, with three buttons:

- **Download** exports the session as a CSV file on the device; a message shows the file name;
- **QR code** shows a code to scan with a phone to download the CSV file;
- **Bin** deletes the session.

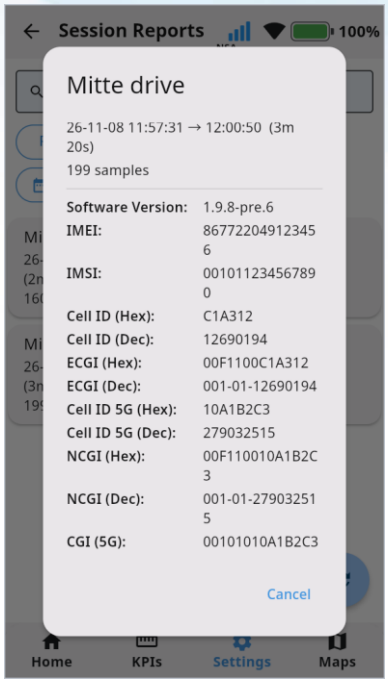
Tap a session to see its details: software version, IMEI and IMSI, and the cell identities it was recorded on.



Reports

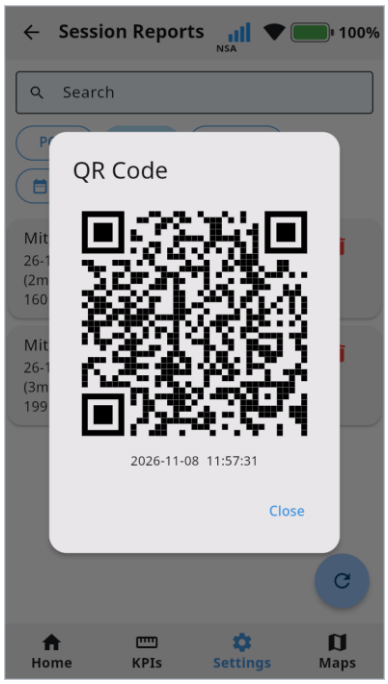


Session Reports

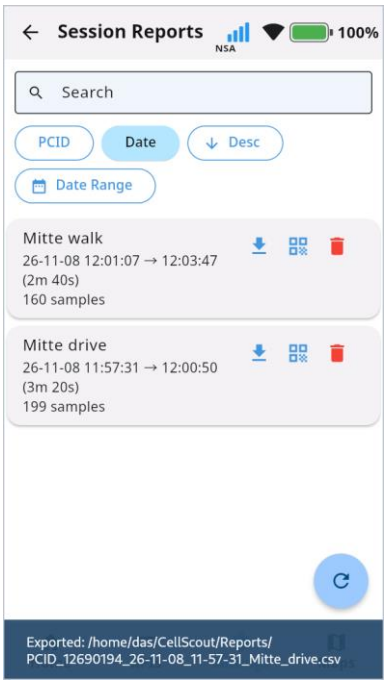


Session details

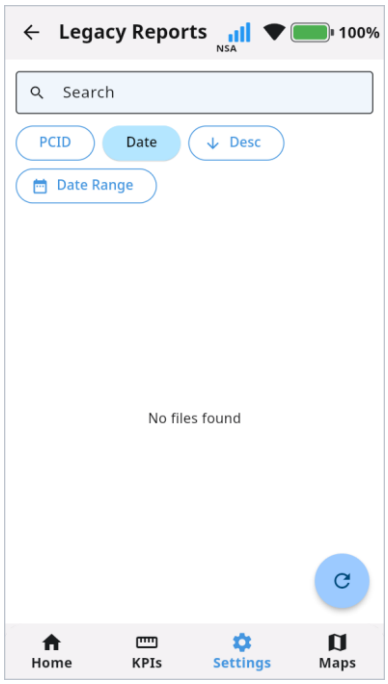
Figure 35: Recorded sessions



Download by QR code



Exported to CSV



Legacy Reports

Figure 36: Exporting reports

On a phone or laptop, the reports page lists the same sessions and legacy files, each with a **Download CSV** link.

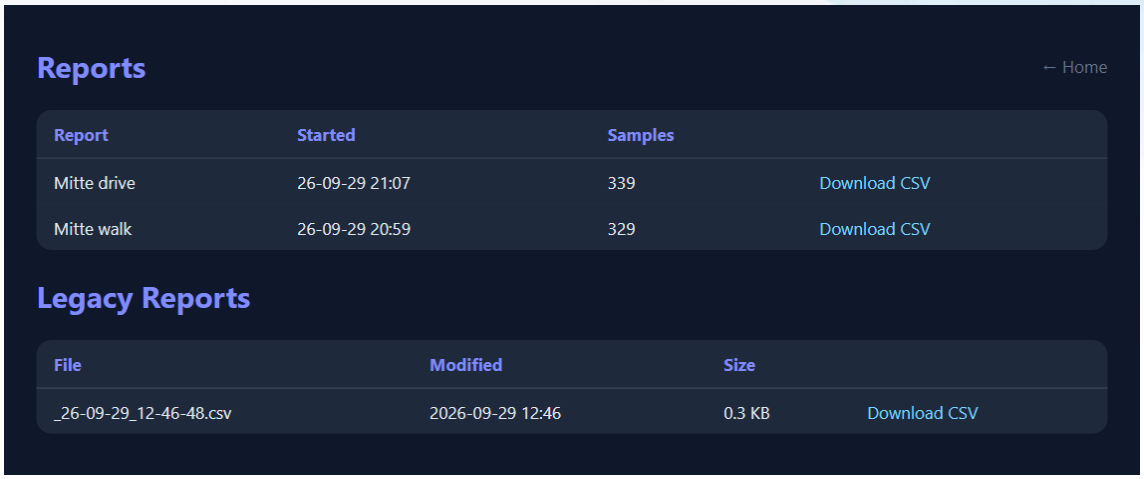


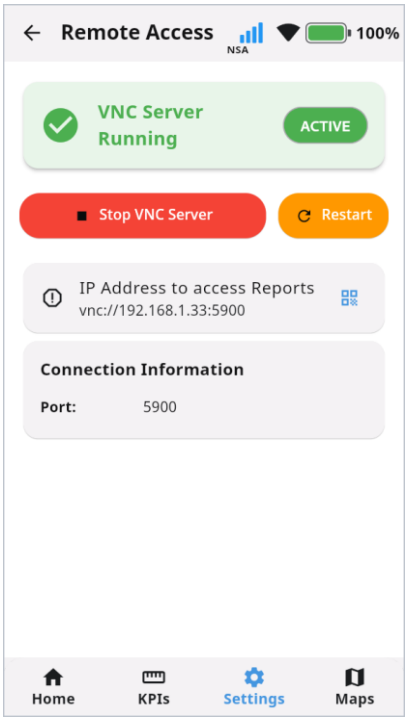
Figure 37: Reports page in a laptop browser

5.5 Remote Access

Remote Access runs a VNC server, so that the screen can be viewed and operated from a computer with any VNC viewer, for example by a support engineer. The page shows whether the server is running, with **Stop VNC Server** and **Restart** buttons, and the address to connect to (such as `vnc://192.168.1.33:5900`) with a QR code.

To reach the device from a computer or phone:

1. Tap **Start VNC Server** if the server is stopped.
2. On a computer or phone connected to the same network as the CellScout, open a VNC viewer.
3. Enter the address shown on the Remote Access page, or scan its QR code.

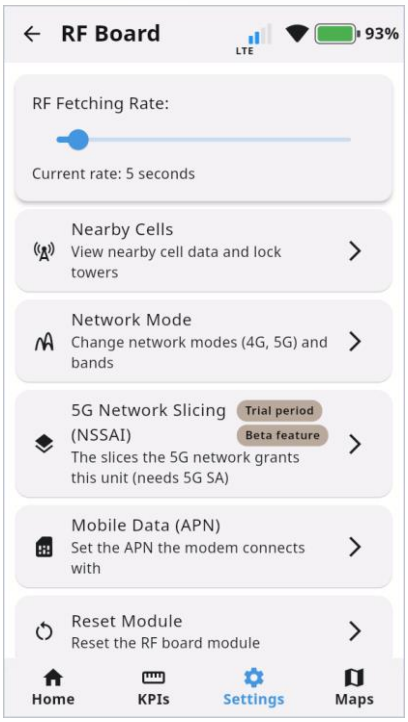


Remote Access

Figure 38: Remote Access

5.6 RF Board

RF Board holds the settings of the cellular modem. **RF Fetching Rate** sets how often measurements are read from the modem; 1 second gives the fastest updates.



RF Board

Figure 39: RF Board

Nearby Cells

Nearby Cells has two tabs: Neighbors and Scan. If LTE is off in Network Mode, it opens straight on Scan.

Neighbors lists the neighbouring cells the modem reports on your SIM's network, as intra-frequency (same EARFCN as the serving cell) or inter-frequency, with EARFCN, PCID and measurements. Sort by PCID or EARFCN, in either direction. On 5G SA the modem reports no neighbours, so tap Open Scan.

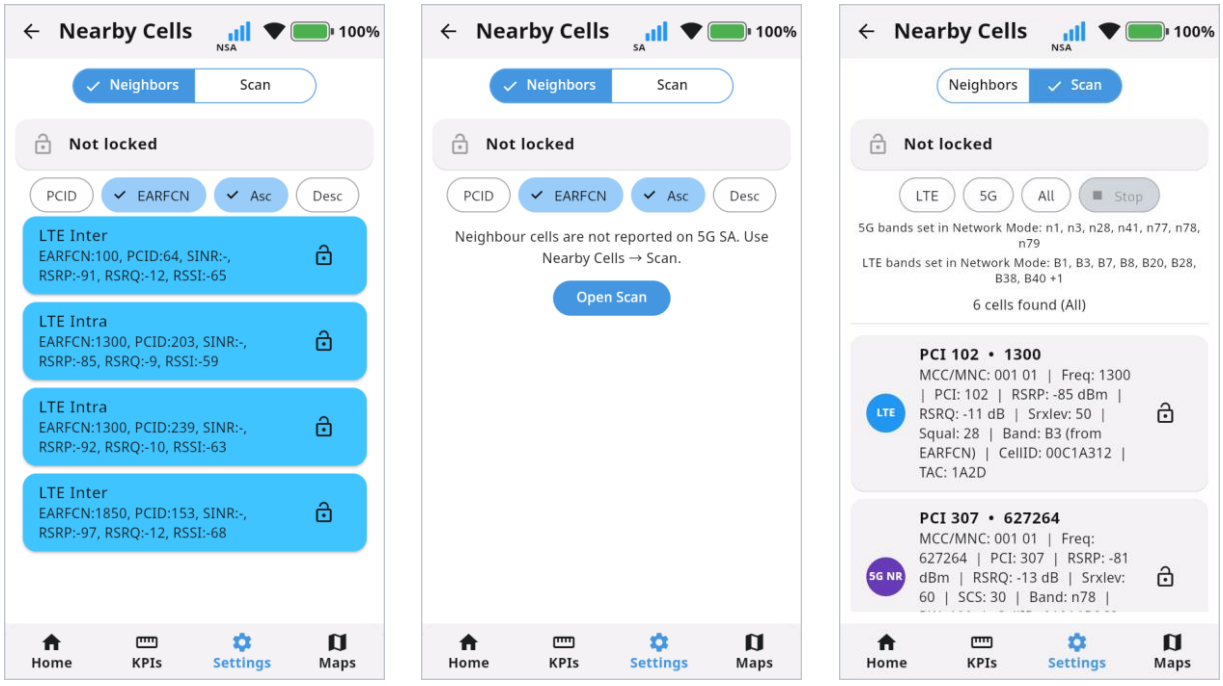
Scan finds every cell the modem can hear, including other operators'. Tap LTE, 5G or All (only the options Network Mode allows are shown), and tap Stop to end it. Each cell shows its technology, PCI, frequency, band, MCC/MNC, RSRP, RSRQ, cell ID and TAC. 5G cells also show subcarrier spacing and bandwidth.

If a scan finds nothing, it retries once after 5 seconds, and Stop cancels the retry. If the retry also finds nothing, you'll see, for example, *0 cells found (All)*. If it ended within seconds, it may have been cut short, so run it again.

On 5G SA only, or when a 5G scan comes back empty within 15 seconds, 5G runs a full All scan and shows only the 5G cells. That makes it take as long as All.

Results show only cells on the bands and technologies set in Network Mode. The lines above the results name those bands, and the result line counts the hidden cells, for example *2 on other bands hidden*. To see them, enable those bands or technologies and scan again.

LTE bands are worked out from the EARFCN, for example *B1 (from EARFCN)*. 5G bands are worked out from the ARFCN when the modem doesn't report one, for example *n77/n78 (from ARFCN)*. Bands that share spectrum, like B2 and B25, count as each other. Cells on unknown channels are always shown.



Neighbors *Neighbors on 5G SA* *Scan result*

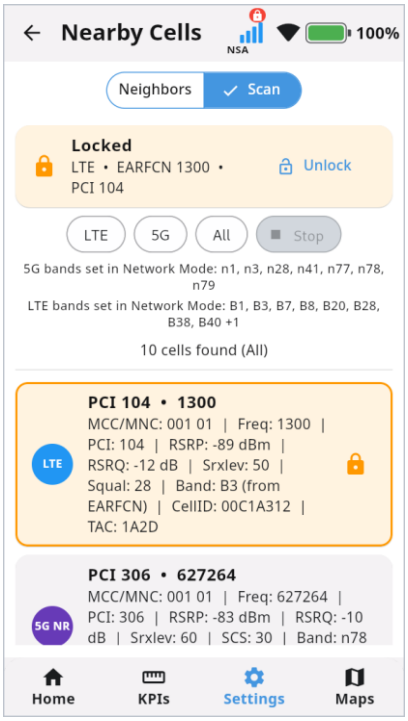
Figure 40: Nearby Cells

Cell lock

Tap the padlock on a cell to lock the modem to it. The modem then stays on that cell even when a better one is available, which is useful for testing a specific cell. The card at the top shows the lock and has an Unlock button, and a small padlock appears on the signal symbol in the status bar.

You can also lock to another operator's cell found by Scan. Its measurements then appear on the Gauges page, where the EARFCN and PCID confirm which cell it is.

If the modem refuses the lock, a message shows its error code, for example *The modem refused the cell lock (CME ERROR 902).*, and the card stays Not locked. If the modem doesn't answer, you'll see *The modem did not answer the cell lock.* Try again.



Locked to one cell

Figure 41: Cell lock

> **Important:** Unlock the cell when you have finished. A locked modem does not move to other cells.

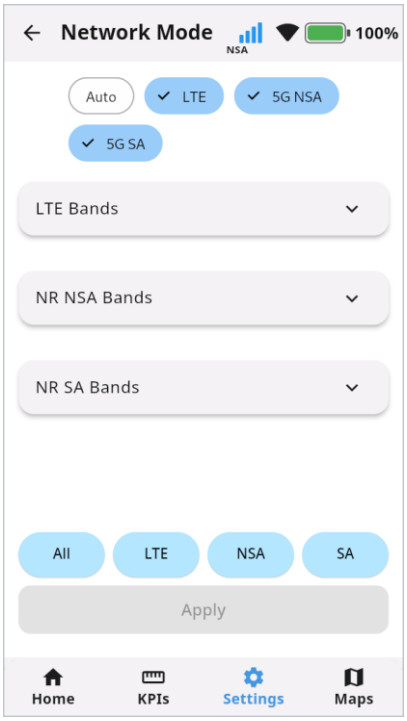
Network Mode

Choose which technologies the modem may use: Auto, or any combination of LTE, 5G NSA and 5G SA. Tap a chip to turn it on or off.

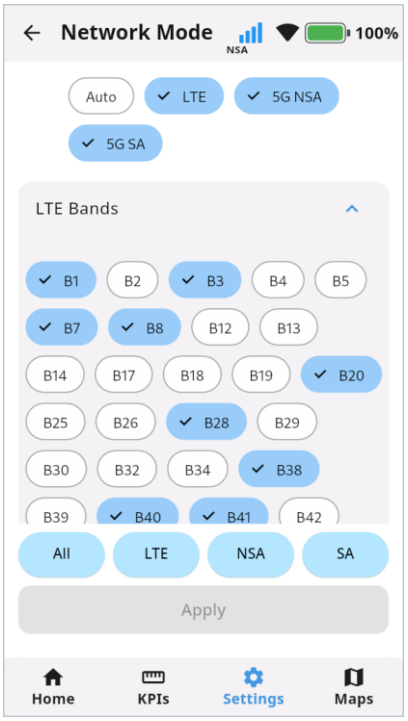
Auto allows all technologies. Tapping a technology while Auto is on turns Auto off and switches off that technology only. Tapping Auto itself turns it off but keeps LTE, 5G NSA and 5G SA on. 5G NSA needs LTE, and at least one technology always stays on.

To allow or block individual bands, open LTE Bands, NR NSA Bands or NR SA Bands. The All, LTE, NSA and SA buttons select common sets.

Tap Apply to send the changes. It takes a second or two and the modem doesn't restart, but service may drop for a few seconds. If the modem refuses a change, a message tells you, and the page shows what the modem kept.



Network Mode



LTE band selection

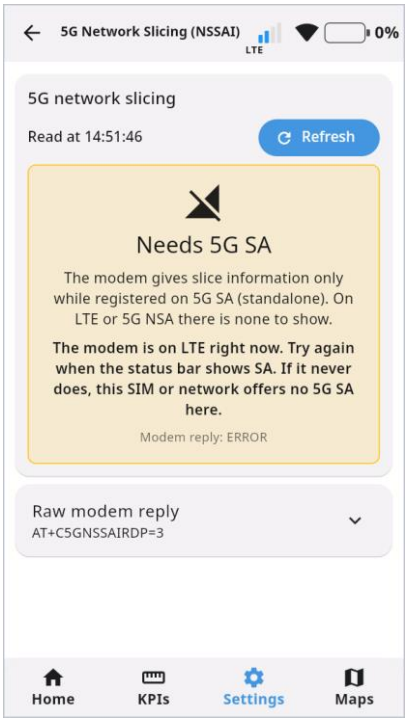
Figure 42: Network Mode

Important: With LTE, 5G NSA and 5G SA all on, 5G SA takes priority: the KPIs show SA first, then LTE and 5G NSA.

5G Network Slicing (NSSAI)

5G Network Slicing shows the network slices of the 5G network the device is registered on: the **Allowed NSSAI** (the slices the network granted at the last registration), the **Configured NSSAI** (the slices each network has provisioned on the modem), the **Rejected NSSAI** with the reason for each, and the **Default configured NSSAI** stored on the device. Each slice shows its service type, such as SST 1 (eMBB), and its differentiator (SD) if it has one. Tap **Refresh** to read them again.

> **Note:** The modem reports slices only while it is registered on 5G SA (standalone); the status bar then shows SA. On LTE or 5G NSA the page shows **Needs 5G SA** and the reason, for example that Network Mode is LTE only or that 5G SA is switched off. Some SIM cards and networks offer no 5G SA.



On LTE: Needs 5G SA

Figure 43: 5G Network Slicing

Mobile Data (APN)

It shows the data connection: its state and IP address, and the APN in use. If no custom APN is set, the modem uses the APN from the SIM card's carrier settings.

To set an APN, enter the **APN Name**, choose the **APN Type** (IPv4, IPv6 or dual stack) and the **Authentication** (with user name and password if your operator requires them), and tap **Apply**.

Once a custom APN is set, the button under **Apply** goes back to the original one: **Restore** followed by its name, or **Restore blank (network default)** when the SIM leaves the APN to the network. The modem restarts, and the **APN Name** field then shows the APN in use, empty for a blank one.

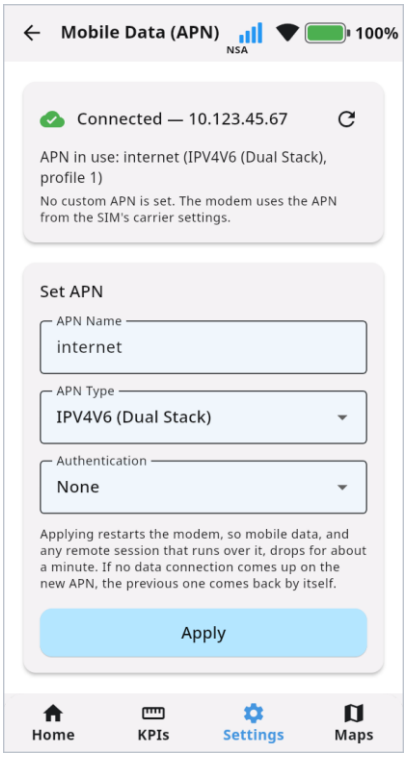
If no data connection comes up on the new APN, a **No data connection** window counts down 60 seconds: tap **Keep** (with the APN name) to stay on the new APN, or **Restore now** to go back at once; when the time runs out, the previous APN comes back by itself. If the SIM's carrier settings put their own APN back after the restart, the device asks whether to **Force** yours by turning off the modem's carrier profiles. Carrier-

specific settings such as VoLTE then stop loading, for this SIM and any other, until you restore the original APN; the modem restarts twice.

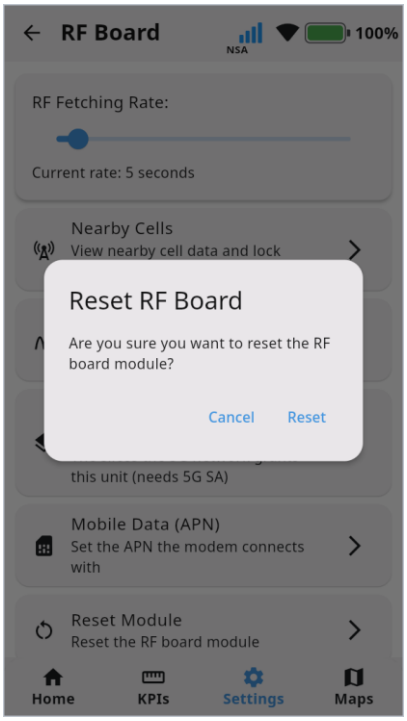
whether your custom APN is in use. It is put back on the modem every time the app starts, but only with SIM cards of the same network; with a SIM of another network the card says the custom APN is not used. When the device does not know the original APN, the button under **Apply** reads **Stop using the custom APN**: the app then stops putting it back, the modem keeps the APN it has until you set another, and nothing restarts.

Reset Module

Reset Module restarts the cellular modem after a confirmation. Use it if measurements stop updating or the device stays without service where there should be coverage. It takes about a minute for the modem to come back. A reset also makes new data appear sooner after you insert another SIM card, lock to a different cell or change the bands.



Mobile Data (APN)



Reset confirmation

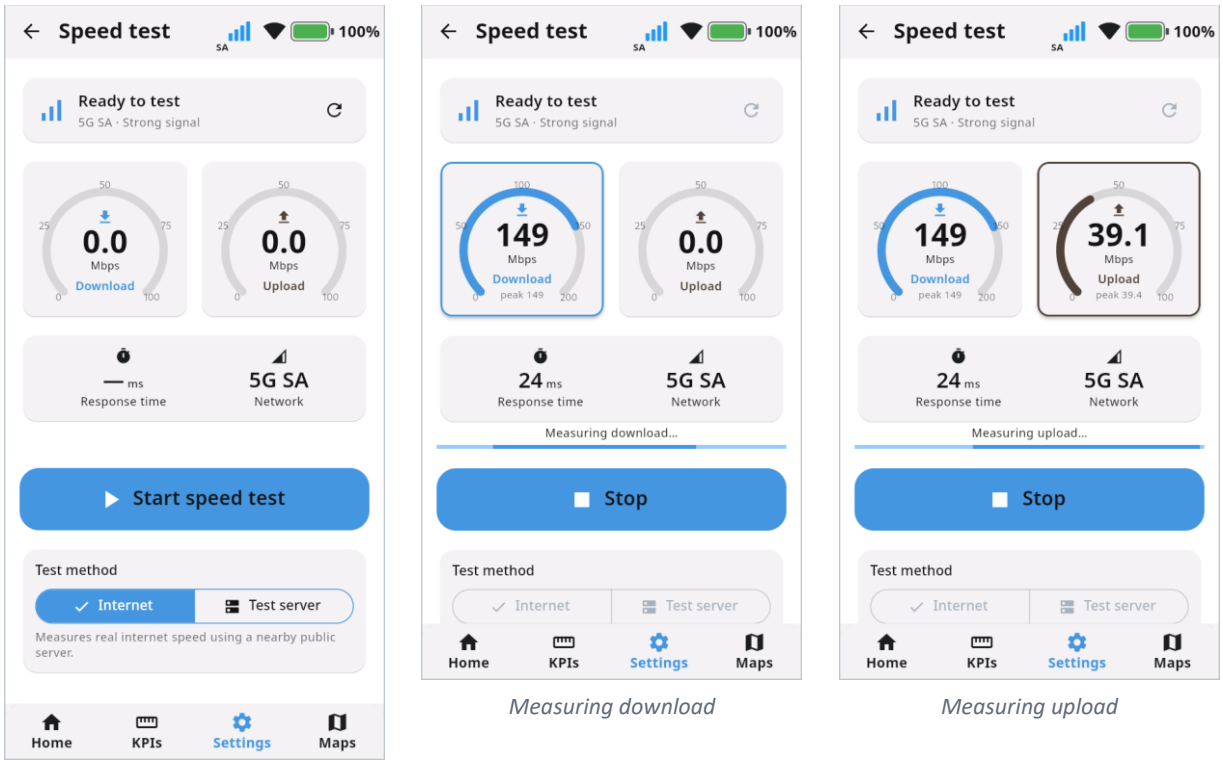
Figure 44: APN and module reset

5.7 Speed test

Speed test measures download and upload throughput and response time over the mobile network. It is a licensed feature. The top card says whether the device is ready: it needs a registered mobile network with a data connection.

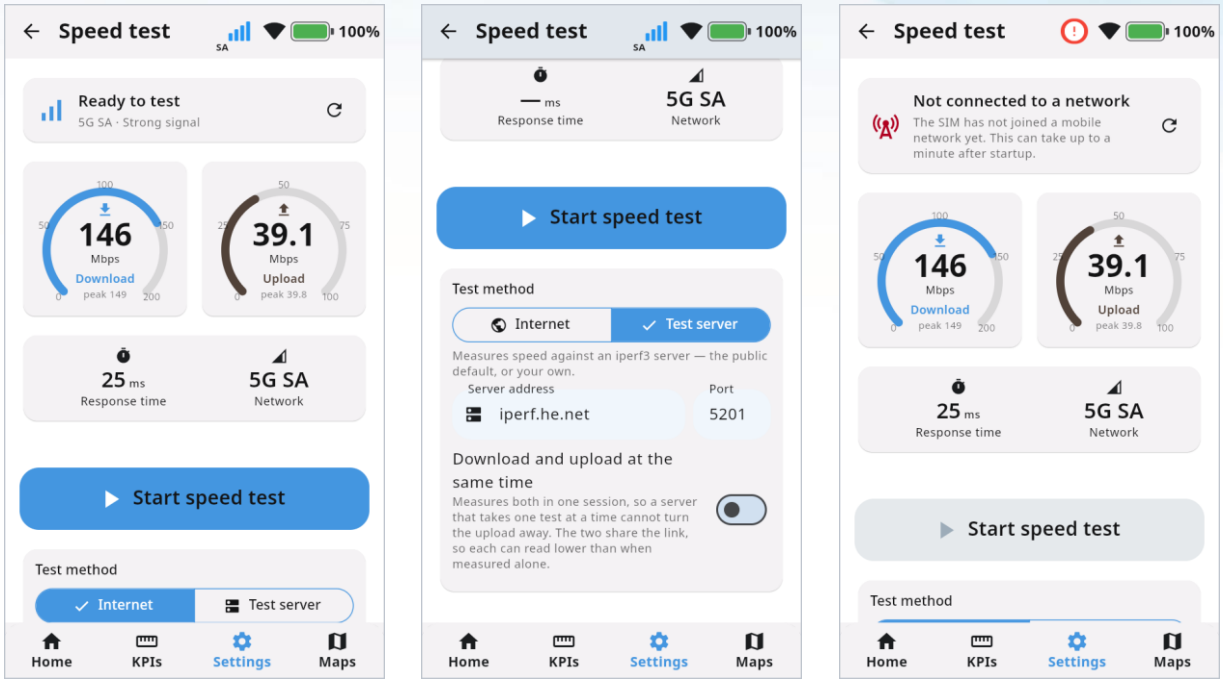
1. Check that the top card says **Ready to test**, with the technology and signal level. The signal word matches the signal bars at the top of the screen.
2. Choose the **Test method**: **Internet** measures against a nearby public server; **Test server** measures against an iperf3 server whose address and port you enter; once you have tested against a server, the clock button in the address field lists the most recent ones, newest first, and tapping one fills in its address and port. With **Test server**, **Download and upload at the same time** measures both directions together in one session. Turn it on when the server turns the upload away: public servers take one test at a time and often refuse the second. The two directions then share the connection, so each can read lower than when measured alone.
3. Tap **Start speed test**. The response time is measured first, then download, then upload. The progress bar and the highlighted dial show the current step; **Stop** cancels.
4. The result stays on screen: download and upload in Mbit/s with the peak values, the response time, and the network used.

A running test carries on if you leave the Speed test page. Open the page again to follow it; the result is still there when you come back.



Ready to test *Measuring download* *Measuring upload*

Figure 45: Running a speed test



Result *Test server method* *Not connected to a network*

Figure 46: Speed test result and other states

If a recording is running while you test, the result (ping, jitter, download and upload) is saved with the session and appears in its CSV file.

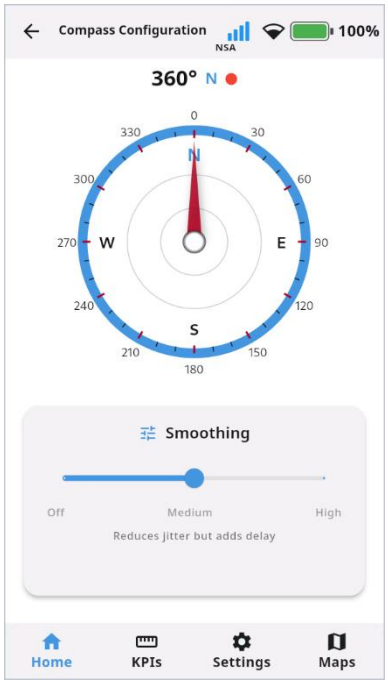
When a test gives no result, the device checks the SIM's internet over the mobile connection before it says why, and a red **The test could not run** card names the cause and what to do: the SIM has no data left, no internet gets through the SIM, the speed test service is slow to answer, or the test server is busy or turned the test away. When only the download was measured, the card is titled **Only part of the test ran**. **Details** shows the technical output for support; drag it up to read the rest, as the scrollbar on its right shows. See chapter "**Troubleshooting"**.

Speed tests run from the map while recording, and on indoor points, always use the speed test service. When one gives no result, its message names the same causes, after the same check of the SIM; when the service is slow to answer, it says to try again in a minute, as there is no test server to switch to there. On the map, the **Speed tests while recording** panel also shows the reason in place of the last result.

> **Note:** A speed test uses mobile data: one test can transfer several hundred megabytes on a fast 5G connection.
>
> **Note:** Changing the APN, change the server access and the speed test results.

5.8 Compass Configuration

If the heading looks wrong, move the device in a figure-8 to calibrate it.

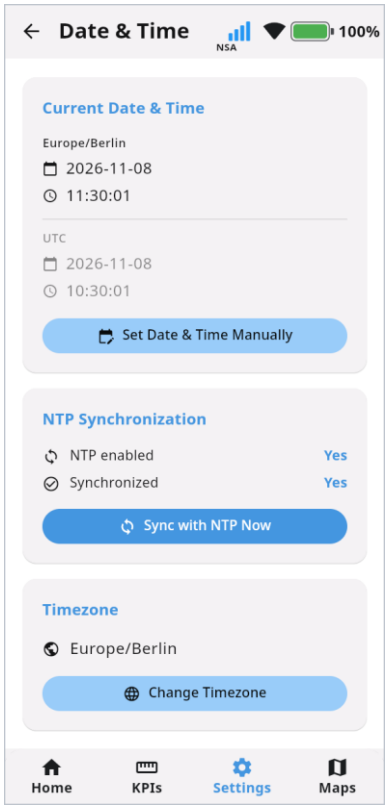


Compass Configuration

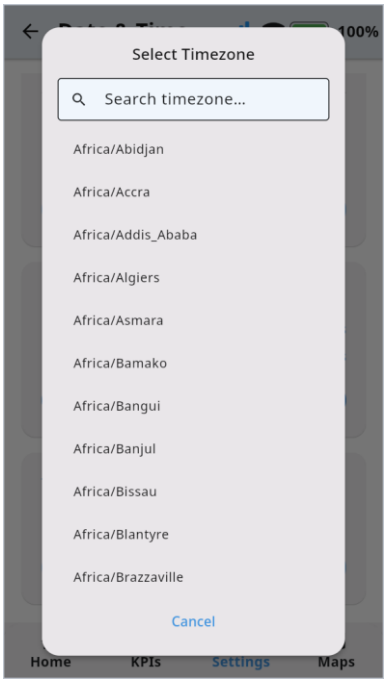
5.9 Date & Time

The device normally sets its clock from the internet (NTP), which needs an internet connection, for example mobile data on the SIM card. The page shows local time and UTC, whether NTP is enabled and synchronised, and the time zone.

- **Set Date & Time Manually** sets the clock by hand, for use without internet access.
- **Sync with NTP Now** turns NTP on and asks the time server at once. A card counts the seconds while the device waits, up to two minutes, then says **Synchronized with the time server** or why not: no internet connection, the time server's address cannot be looked up, or no time server answered. Some networks block time requests; the device keeps trying in the background, and the page updates when it succeeds. Use this button after setting the time by hand to go back to internet time.
- **Change Timezone** opens a searchable list of time zones.



Date & Time



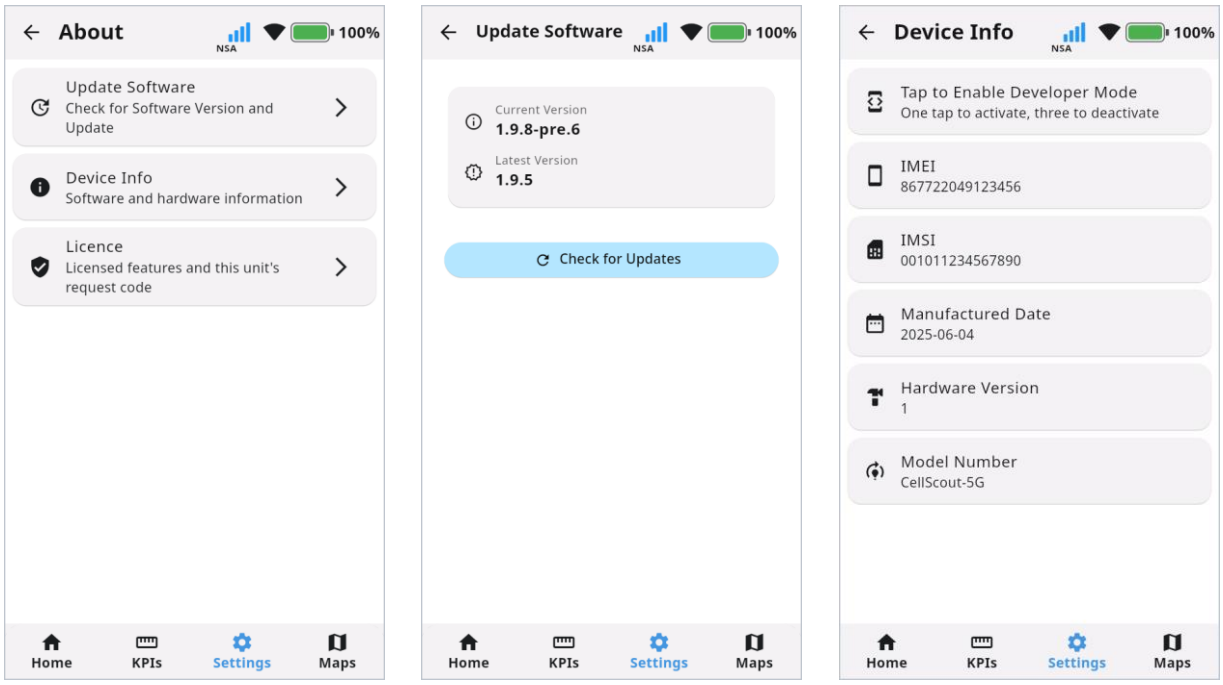
Choose a time zone

Figure 47: Compass, date and time

5.10 About

About has three entries:

- **Update Software** shows the installed and the latest available version. **Check for Updates** looks for a new version; if there is one, the page offers to download and install it. While it downloads, **Cancel download** stops it; a download that receives nothing for 60 seconds stops by itself, so check the connection and try again. During the install the screen shows each step (unpacking, checking the unit, installing, restarting), and the app restarts on the new version by itself, usually within 2 to 5 minutes. If the install cannot finish, the screen says why (for example another update is running, the download is damaged, or software the update needs could not be installed) and whether anything was changed; **Details** shows the installer's log for support, and **Close** returns to the page. If there is no result after 20 minutes, the screen says so and offers **Close**; the update may still finish by itself. Connect the charger before you install an update, and do not switch the device off until it has finished.
- **Device Info** shows the modem IMEI, the SIM IMSI, the manufacturing date, hardware version and model number.



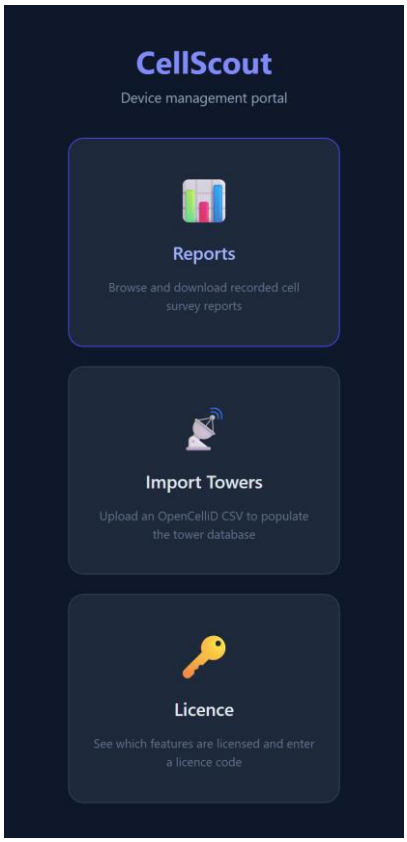
About *Update Software* *Device Info*

Figure 48: About

6 The web portal

A phone or laptop on the same network as the device can open the device's web portal in any browser, at `http://` followed by the device's IP address, for example `http://192.168.1.33/`. The address is shown on several pages of the device, for example Settings → Data Reports and the Licence page, often with a QR code to scan. When the device runs its own hotspot, connect to the hotspot first; the device is then normally reached at `http://10.42.0.1/`.

Page	Address	Use
Portal	`/`	Start page with links to Reports, Import Towers and Licence. Floor plans has no link there: use the QR code or the address on the device's floor plan import page.
Reports	`/reports`	Download recorded sessions and legacy reports as CSV (section 5.4).
Import Towers	`/import`	Upload an OpenCelliD CSV of cell towers (section 4.6).
Floor plans	`/floorplans`	Upload a floor plan (section 4.7).



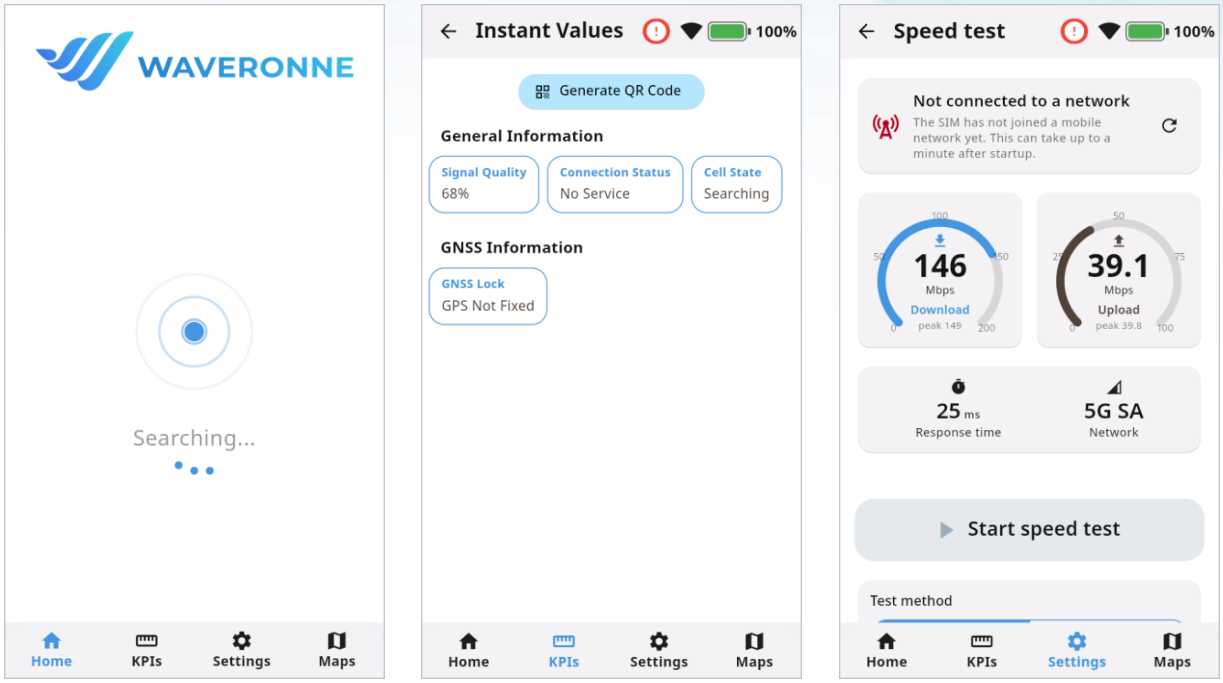
The portal start page

Figure 49: Web portal

7 Troubleshooting

What you see	Likely cause	What to do
Home screen stays on **Searching…**	The modem is still starting, there is no SIM card, or no network can be found.	Wait two minutes after power-on. Check that a SIM card is inserted and the antennas are connected. If nothing changes, restart the device; if it happens again, contact support (chapter 11).
Red "!" in the status bar; Instant Values shows **No Service**	The modem is not registered on a mobile network.	Check that a SIM card is inserted and active and that the antennas are connected. Check Settings → RF Board → Network Mode (try Auto). Move to a place with coverage. Try Reset Module.
Gauges show **Fail**	At least one measurement is in its red range.	This is a measurement result, not a fault. Adjust the ranges in Settings → Gauge Ranges if your limits differ.
GNSS shows **GPS Not Fixed**; the map's target button is red	No satellite fix yet.	Go outdoors with a clear view of the sky and wait a few minutes. Start outdoor recordings only once the target button is blue.
Compass Status: Poor accuracy on the map	The compass needs calibrating.	Move the device slowly in a figure-8 until the message disappears.
One antenna port much weaker than the others	Antenna cable loose or damaged.	Check the antenna connections, then look at KPIs → Signal Per Port again.
Speed test says **Not connected to a network**	No registration or no data connection.	Wait for service, check the APN (Settings → RF Board → Mobile Data), then tap the refresh button on the Speed test page.
Speed test says the operator is blocking internet access	The SIM has no data left, or its data bundle has expired. The operator shows its own page in place of every website.	Recharge or renew the SIM's data plan with the operator, then run the test again.
Speed test says no internet gets through the SIM	The SIM is connected but passes no data: no data balance, data blocked by the operator, or very poor signal.	Check the SIM's data balance with the operator, or move to better signal and try again.
Speed test says the speed test service did not answer in time	The SIM reaches the internet, but the connection is very slow or congested.	Try again in a minute, or switch the Test method to **Test server**.
Speed test says the test server is busy	The iperf3 server is running another test; it takes one at a time.	Wait a minute and try again, or enter a different server.
Imported towers do not appear on the map	Towers are imported disabled.	Open Maps → Tower List and tap **Enable All**, or enable single towers.

What you see	Likely cause	What to do
The floor plan page says the device cannot convert PDF or SVG files yet	The converters for PDF and SVG plans are not installed on this device yet. A software update installs them when the device has internet.	Export the plan as a PNG or JPG and upload that. After the next update installed with internet access, PDF and SVG work too.
The web portal does not open	Phone or laptop on a different network.	Connect it to the same Wi-Fi as the device, or to the device's hotspot, and use the address shown on the device.
Signal suddenly looks worse everywhere	The modem is still locked to one cell (padlock on the signal symbol).	Settings → RF Board → Nearby Cells → **Unlock**.
No mobile data after changing the APN	The modem restarts to apply the APN.	Wait about a minute; if the new APN does not work, the previous one comes back by itself.
Update Software says **The update was not installed**	The installer stopped before it finished; the message says why.	Follow the message: wait and try again if another update is running, download again if the file is damaged, check the internet connection if software could not be installed. **Details** shows the log for support.
Update Software says **The update is taking too long**	The installer has not finished after 20 minutes.	Wait a few more minutes; the app restarts by itself if it finishes. If nothing changes, restart the device and check the version on the Update Software page.
Date & Time says **Not synchronized** after **Sync with NTP Now**	No internet connection, or the network blocks time requests.	Check that Wi-Fi or mobile data works, then tap **Sync with NTP Now** again. If the network blocks time requests, set the time by hand.



Searching *No service* *Speed test not ready*

Figure 50: Screens that point to a problem

8 Glossary

Term	Meaning
4×4 MIMO	Multiple-input multiple-output with four receive antennas.
APN	Access Point Name: the name of the operator's data network the modem connects to.
ARFCN / EARFCN	Channel number of the carrier frequency, for 5G NR (ARFCN) and LTE (EARFCN).
Band	Frequency band, for example LTE Band 3 (1800 MHz) or NR band n78 (3.5 GHz).
BLER	Block error rate: share of data blocks received with errors (DL) or sent again (UL).
Cell ID, ECGI, NCGI, CGI	Identities of a cell. The ECGI (LTE) and NCGI (5G) combine MCC, MNC and cell ID into a worldwide unique identity.
CSV	Comma-separated values: a text table that opens in spreadsheet programs.
FDD / TDD	Frequency or time division duplex: whether uplink and downlink use separate frequencies or take turns on one.
GNSS / GPS	Satellite positioning.
IP65	Ingress protection rating: dust-tight and protected against water jets.
iperf3	A tool for measuring throughput against a server you control.
KPI	Key performance indicator: here, a measured value of the network, such as RSRP or SINR.
LTE	4G mobile network technology.
MCC / MNC	Mobile country code and mobile network code: together they identify the operator (PLMN).
NR	New Radio: the 5G radio technology.
NSA	5G non-standalone: 5G carried alongside an LTE anchor cell.
NTP	Network Time Protocol: sets the clock from the internet.
OpenCelliD	A public database of cell towers; also the CSV format CellScout imports.
PCI / PCID	Physical cell identity: a short number that tells neighbouring cells apart on the same frequency.
RSRP, RSRQ, SINR, RSSI	Signal measurements; see section 3.2.
SA	5G standalone: 5G without an LTE anchor.
SCS	Subcarrier spacing of a 5G carrier, in kHz.
SMA	The screw-on coaxial connector of the antenna ports.
TAC / LAC	Tracking or location area code: the area a cell belongs to.
VNC	Virtual Network Computing: remote view and control of the screen.

9 Specifications

Item	Specification
Technology	4G (LTE) and 5G NR (SA and NSA)
Main measurands	RSSI, SINR, RSRP, RSRQ & Speed Test Values
Info acquisition	Frequency band, PCI / cell ID, EARFCN, GPS and bearing
Accuracy	± 2 dB
GPS receiver	Built-in
User control	The device's touch screen
Display	5-inch DSI capacitive touch display, 720 × 1280, IPS, optically bonded toughened glass panel, 5-point touch
Refresh rate	≥ 1 second
Result representation	Serving cell: rotary gauges, instant values, maps and time chart. Top N available cells: bar charts
Additional user settings	Legend for measurands (Excellent / Good / Fair / Poor)
User aids	Pass/Fail indicator, and audio alert on failing the thresholds
SIM card dependency	SIM-based and SIM-less scanning
Locking	Cell locking or band locking
User inputs	Text fields via the touchscreen keypad (for example site ID, address, technician ID, antenna gain compensation or offsets, and target tower coordinates)
Battery	7.4 V, 3400 mAh, lithium battery
Battery operation	> 5 hours of continuous operation
Charger output	12 V, 3 A
Mains input	AC 100–240 V, 50/60 Hz
LED or screen indicators	Charging, power and scanning
MIMO capability	Optional (2×2) and (4×4)
GPS antenna	Attachable
Data access	Wi-Fi
Export format	CSV
Interfaces	5 × RF ports, DC input
RF connector	SMA female
Standard antennas	5 × duck antenna (700–3800 MHz)
Enclosure	Heavy-duty metal
Ingress protection	IP65
SIM card holder	Easy-access external SIM card holder
Operating temperature	−20 to 50 °C
Relative humidity	< 80 % at 0 to 35 °C and < 70 % at 36 to 50 °C, non-condensing
Dimensions	230 × 125 × 50 mm
Weight	922 g (< 1 kg with antennas)
Antenna dimensions	Height 200 mm, base diameter < 16 mm
Standard package	Basic instrument, AC/DC charger, 5 × duck antennas and user guide

10 Further help

For any further inquiries, please contact support@waveronne.com

For questions about a shipment or an order, call your agent or our nearest service office, or write to sales@waveronne.com