LUXONDES

See the electromagnetic waves

Scanphone

User manual

01/2020 - AN

Sommaire

Presentation:

When you want to map or scan the electromagnetic emissions of electronic cards or any environment requires the use of relatively complex mechanical or electronic devices.

These systems may be difficult to transport and not well suited to perform measurements in confined environments.

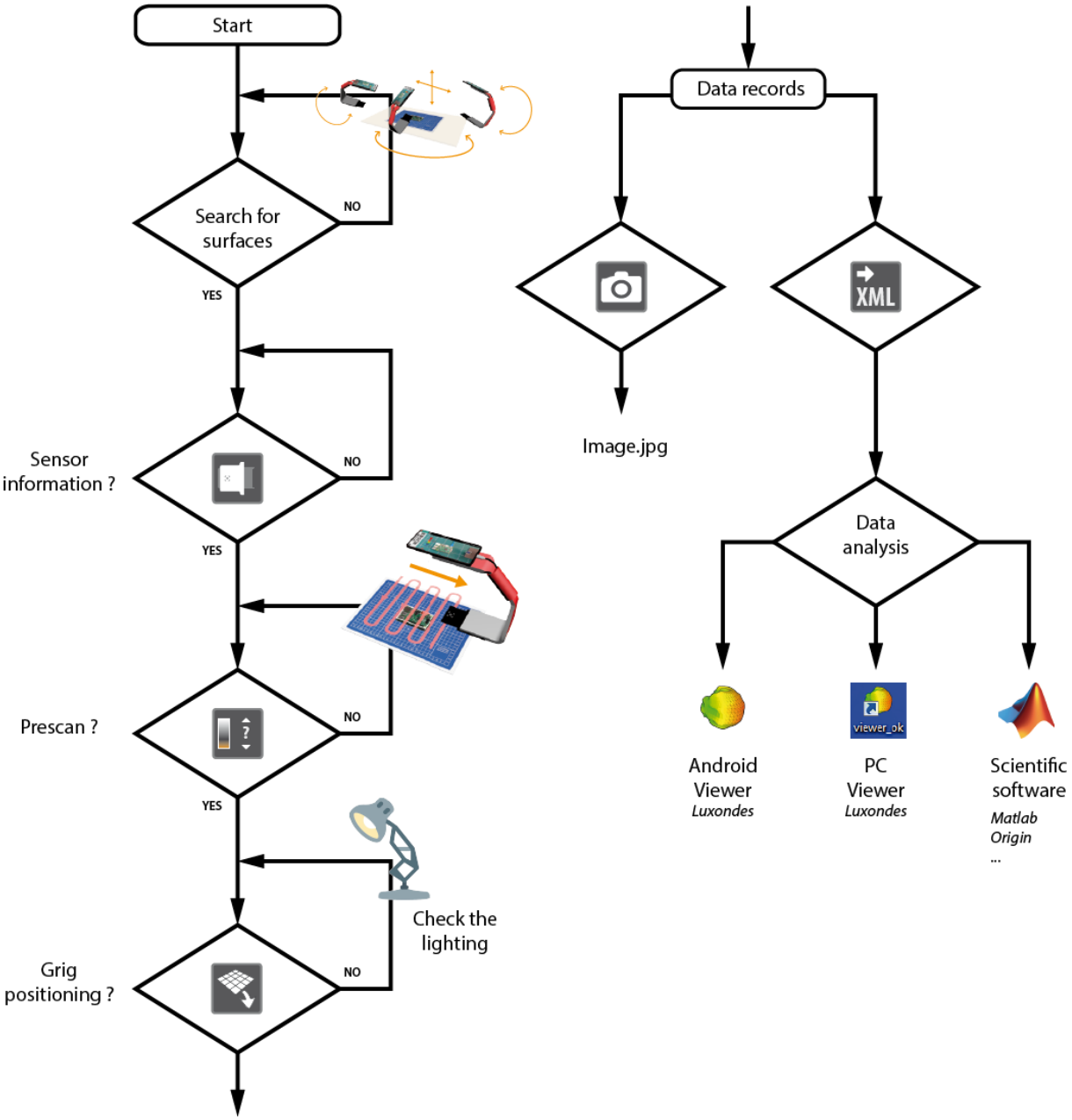
Autonomous, compact and fast, the scanning system proposed aims to overcome these constraints.

It makes it possible to map the electromagnetic environment directly on site or in locations difficult to access, such as inside a vehicle for example.

This scanner is composed of a smartphone coupled to removable EM field sensors to allow covering different configurations.

Using augmented reality technology, it has an interface that allows communication via an USB port between the smartphone and the various sensors.

1. Organizational chart / Use scanphone



2. The smartphone : One Plus 7T PRO

Feature:

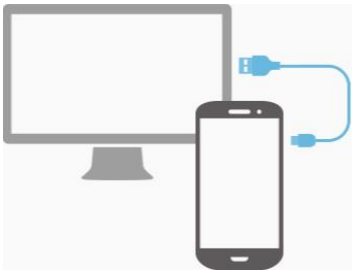
- Snapdragon 855+
- 6.67 ″ Super AMOLED curved screen with “2K +” definition
- 4080 mAh battery with Warp Charge 30T (5V / 6A, 0-50% in 20 min, 0-100 in 65 min)
- Main photo sensor: 48MP + 16MP + 8MP (3x zoom)
- 256 GB of internal storage

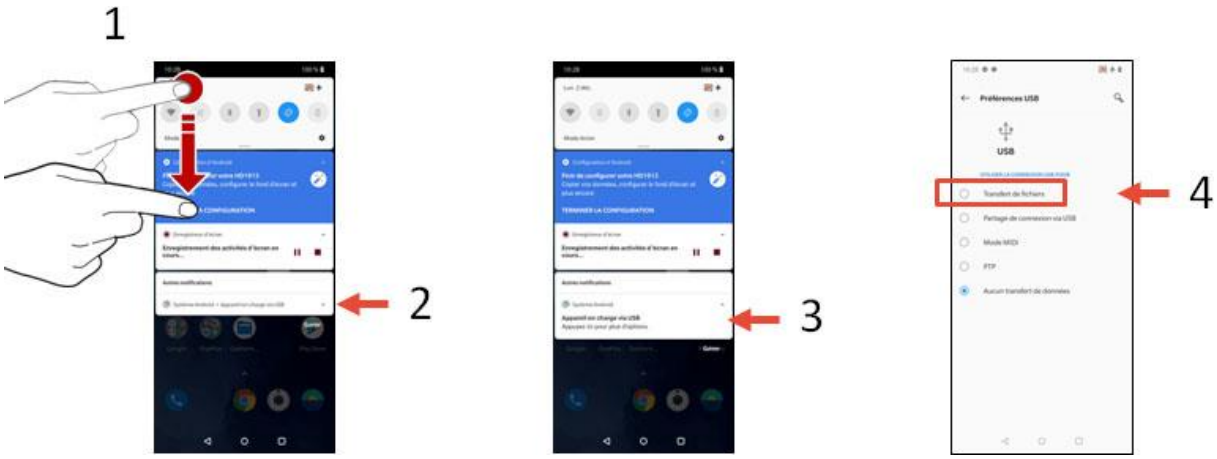
Charge mobile phone:

The One Plus 7T Pro has Warp Charge 30T technology which ensures a full day of use after half an hour of charging.

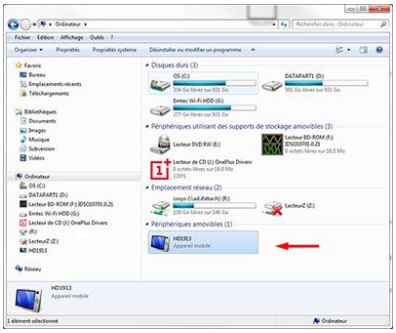
This technology allows the 4085 mAh battery to be recharged to 68% in about 30 minutes.

3. PC connection



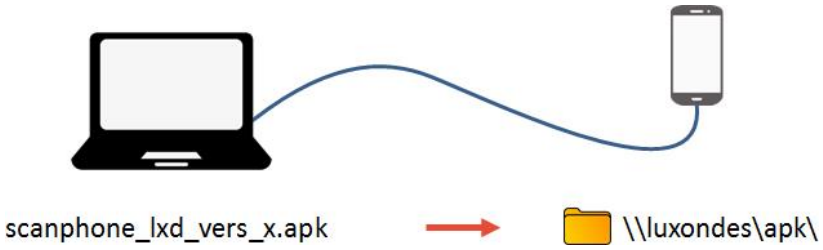


To connect the One Plus 7T Pro to a PC, you must activate the File transfer function, which will then automatically open the communication via USB.

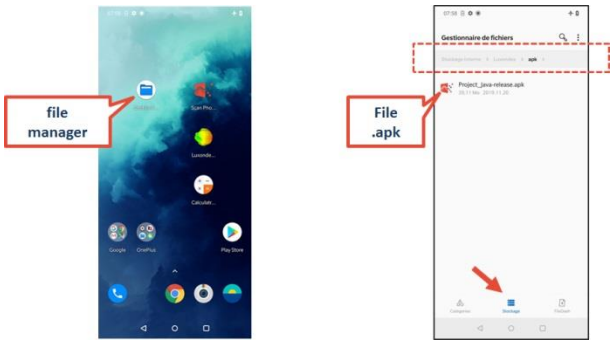


HD1913

4. Application update



Place the new version of the APK in the corresponding folder on the smartphone and start the update.

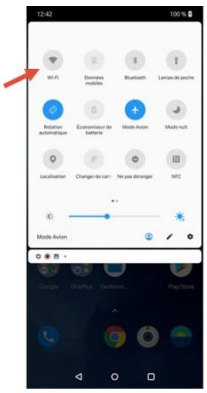


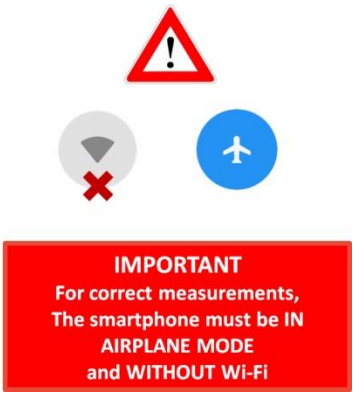
With the file manager, click on the APK file for the update.

5. Airplane mode

When mapping in the “Telecom” frequency band (between 2 GHz and 3 GHz), data exchanges between the smartphone and the outside could disturb the measurements.

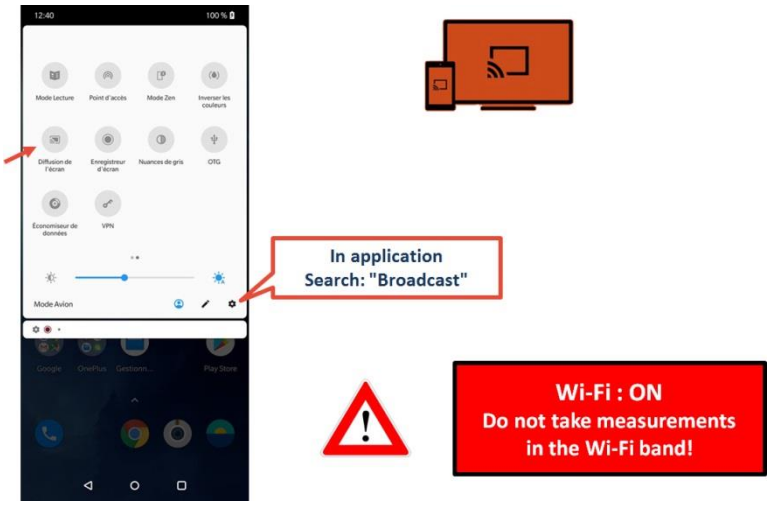
In this case, the smartphone must be placed in airplane mode and without Wi-Fi. This also significantly increases the autonomy of the scanphone.





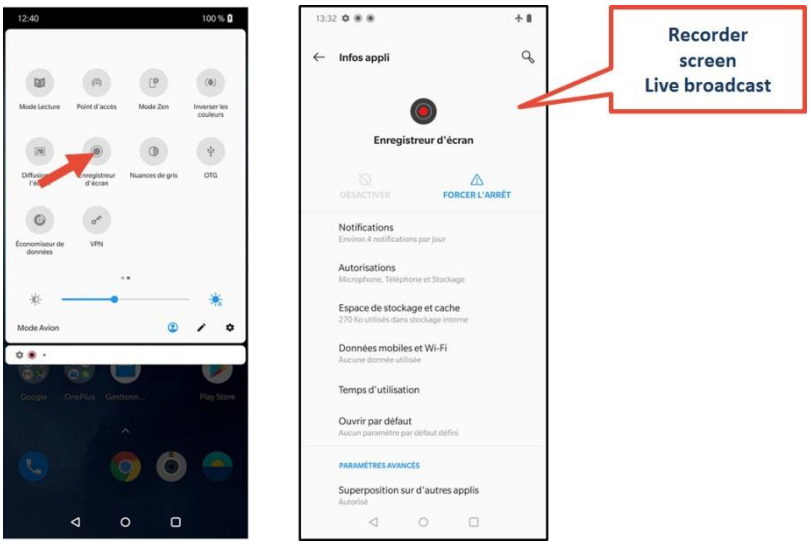
6. Cast screen on TV

Duplicating the screen of the smartphone to a television or video projector allows sharing the experience to a wider audience (restitution of measurements, teaching, congress, demonstration ...)



7. Screen recorder

The OnePlus 7T smartphone has an internal application that can record the screen in full HD video format. This allows you to review a video of an experiment in the laboratory or on site.



8. Scanphone application

When the USB-C cord is plugged in, the smartphone application starts automatically. Otherwise, launch it manually by clicking on the icon on the home window.

9. Menu

Menu display

Export .XML

Screenshot

Menu 1 - 2

Help

Pre-Scan. Threshold détect.

Grid selection

Grig positioning

Grid repositioning

Sensor information

Data simulation

Show the Max

Max Hold function

Color pattern selection

Sensor size selection

Curved display

Grid thickness

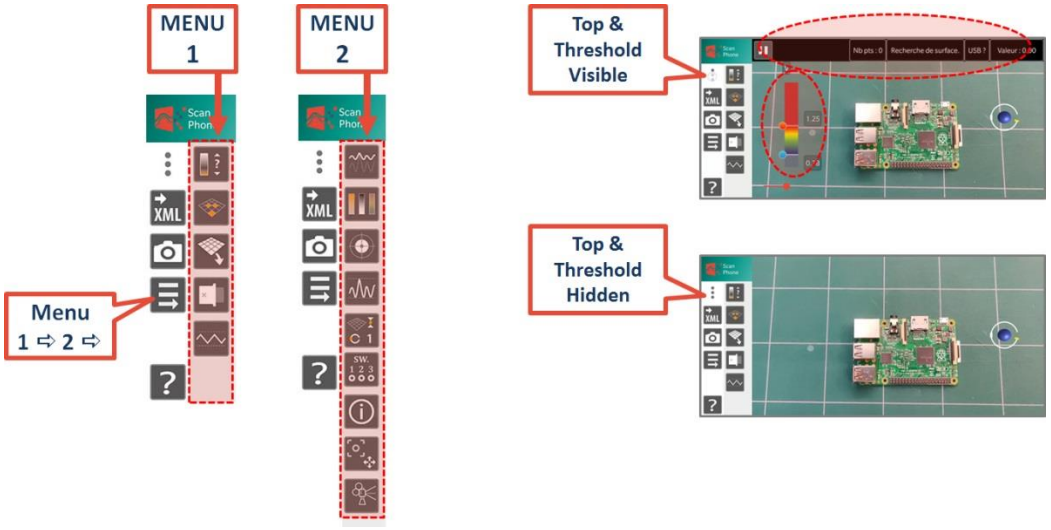
Switch selection

Version information

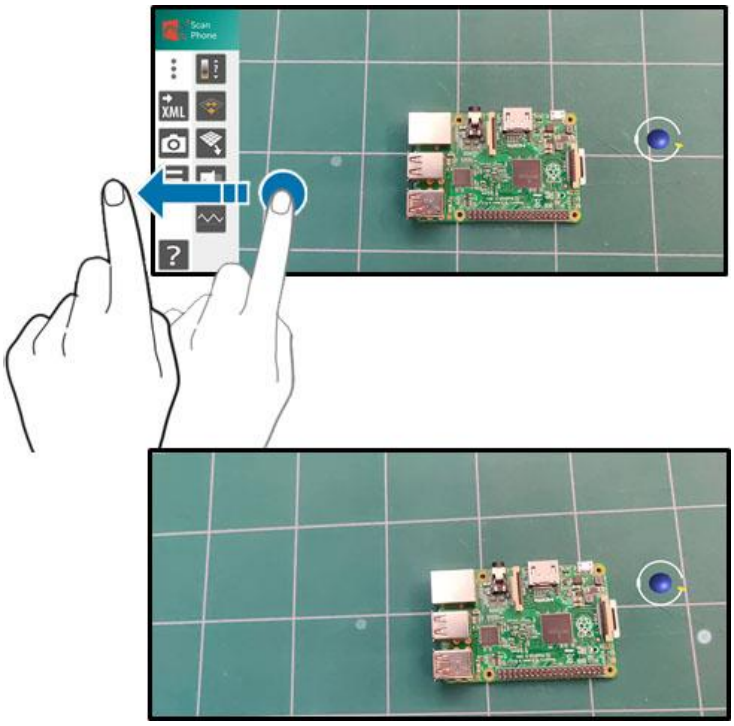
Sensor Parameter

Fixed camera

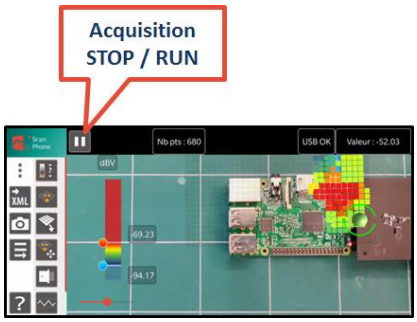
10. Interface: Menu 1-2 / Threshold On / Off



11. Interface : Menu On / Off



12. Acquisition STOP / RUN

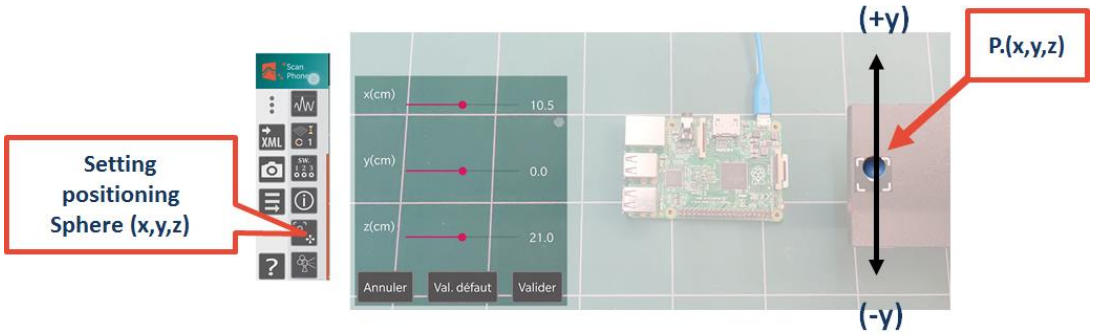


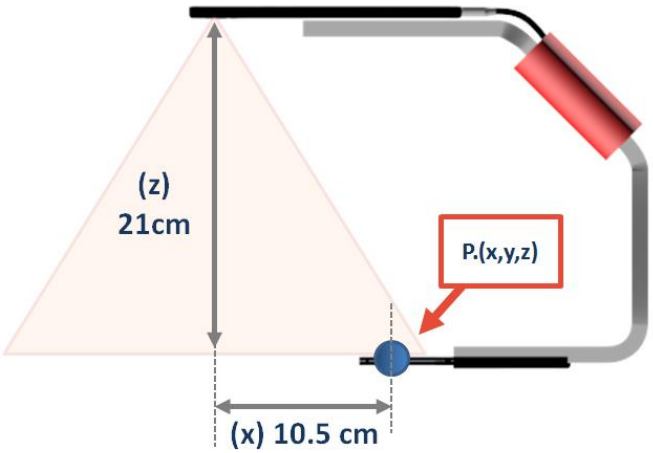
If you are using the 3D grid, it is important to stop the acquisition so that you can step back to display the matrix.

13. Parameter: position of the sphere

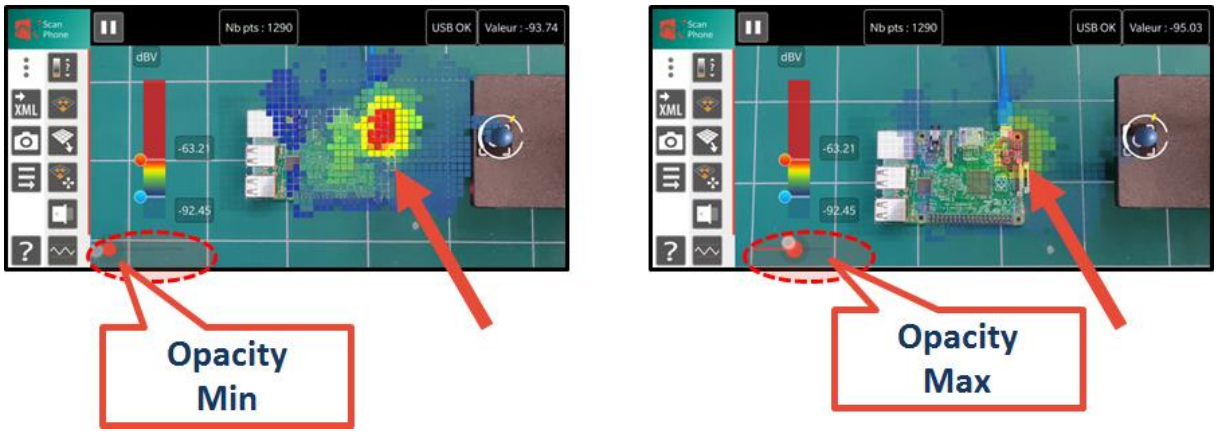
The sphere physically represents the sensor in the augmented reality environment. Compared to the smartphone camera, it has a fixed position. (see diagram below).

If another probe is used (by replacing the internal sensor of the scanphone with an external spectrum analyzer) it is possible to modify the position of the sphere in the 3 dimensions x, y, and z.

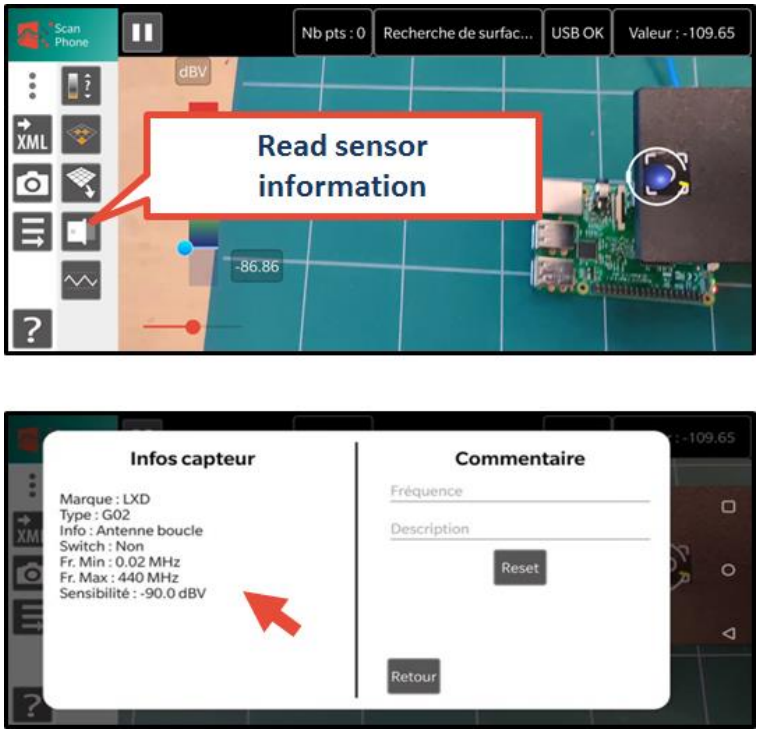




14. Interface: Grid opacity

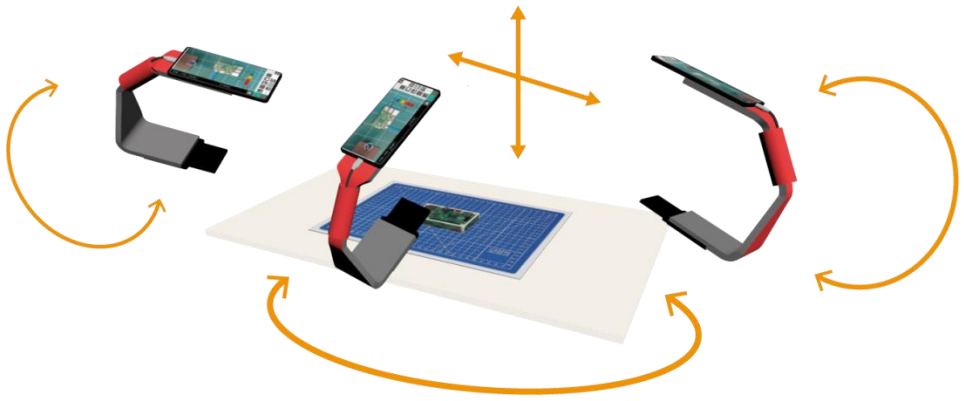


15. Read sensor information



Reading the characteristic information of the sensor automatically configures the measured values and the corresponding unit.

16. Environmental recognition



Sweep slowly

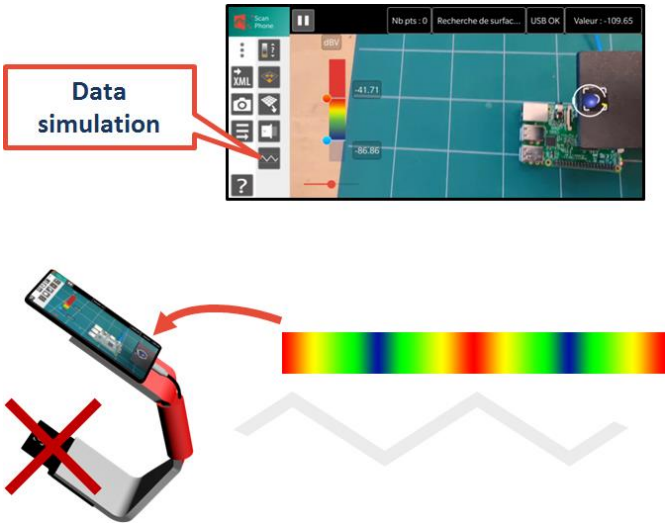
the scene to be mapped

In order to be able to build its augmented reality environment, the smartphone must initially have sufficient information linked to the visual cues constituting the object under test and its immediate environment (visual landmarks). It is therefore necessary to carry out a learning phase which consists in slowly sweeping the surface around the object with the smartphone over the surface to be mapped so that the application learns the necessary environmental cues.

Ensure that the area to be mapped

be well lit

17. Data Simulation

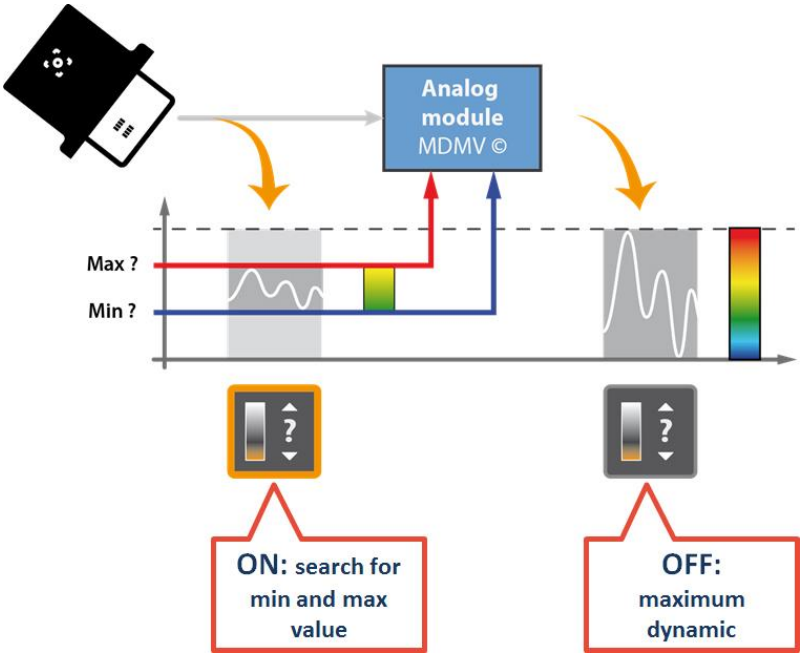


With the data simulation option, it is possible to test the use of the scanphone without the sensor.

18. Curve display

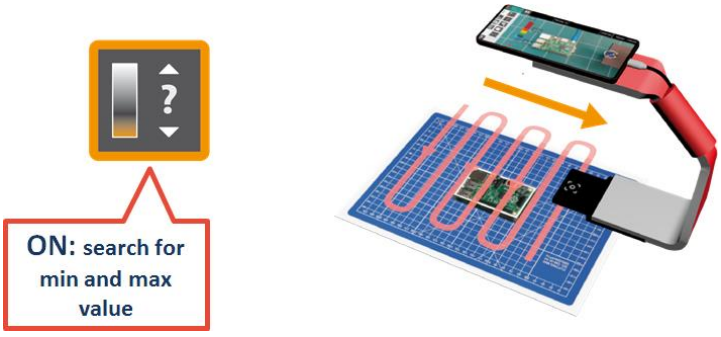
With the curve display menu, a graph allows you to continuously view the variation of the measurement.

19. Pre-scan function



The Pre-scan function automatically detects the Min and Max values measured above the surface to be scanned. For this, the operator slowly scans the entire surface to be mapped. During this sweep, the Min and Max values are automatically read in flight by the apparatus. Once this operation has been carried out, the operator activates the MDMV module.

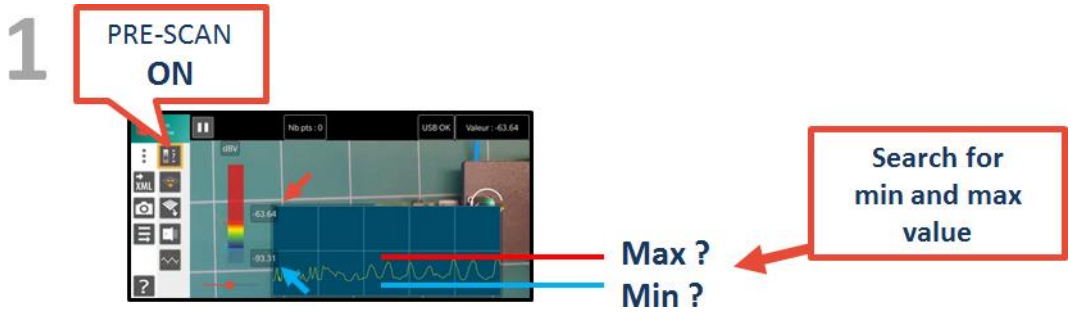
This module uses these Min and Max values to define the appropriate measurement scale allowing to exploit a maximum measurement dynamic.



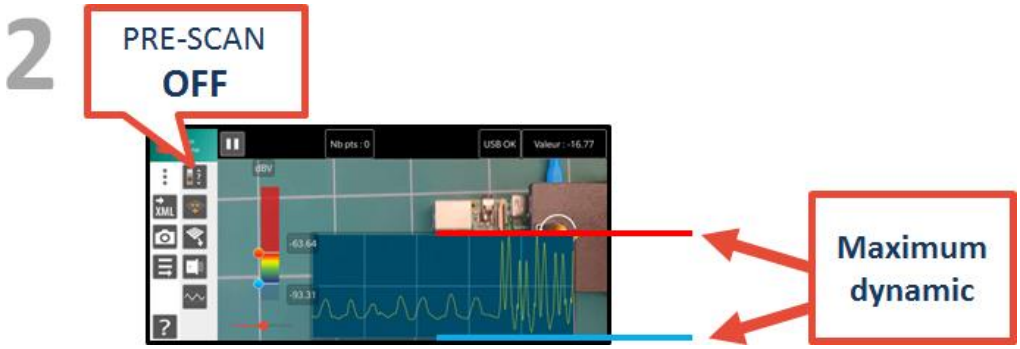
Find min and max values

moving slowly

on the surface to be mapped.



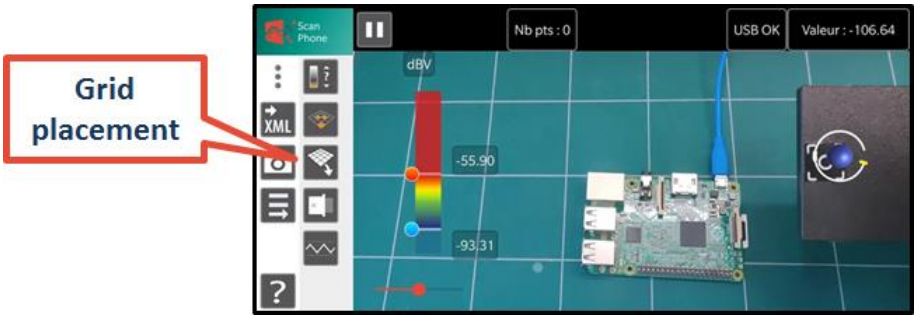
Scan with the scanphone over the area to be mapped, detection of the Min and Max measurement values.



Manual a posteriori modification of thresholds and associated measurement dynamics.

After carrying out the Pre-scan (Pre-scan on) then, automatically defined with the MDMV module the corresponding maximum measurement dynamic, it is possible, at this stage, (Pre-scan off) to manually refine these Min and Max thresholds and this measurement dynamic according to the specific requirements of the measure or operator..

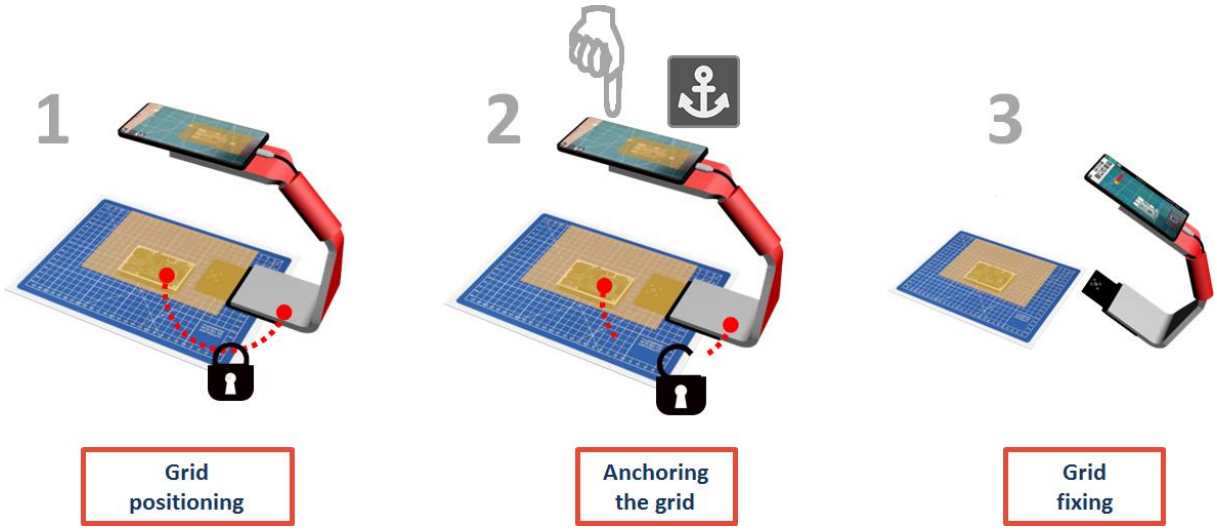
20. Grid positioning



The grid is virtually attached to the sensor, which allows it to be positioned in the desired location and fixed using the anchor.

The grid is linked to the sensor.

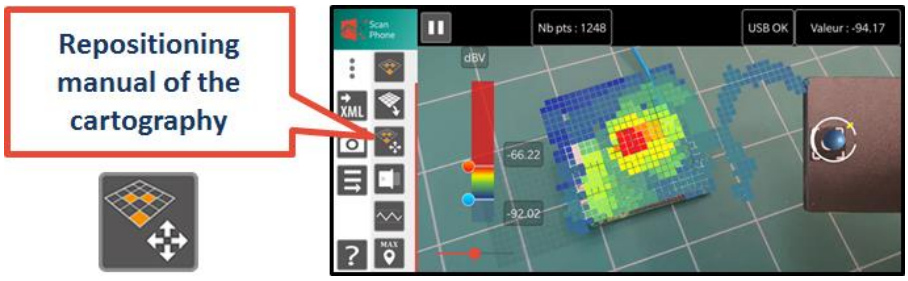
21. Anchoring the virtual grid



When you have positioned the grid in the desired location to carry out the mapping, click on the anchor to fix it and be able to start filling it.

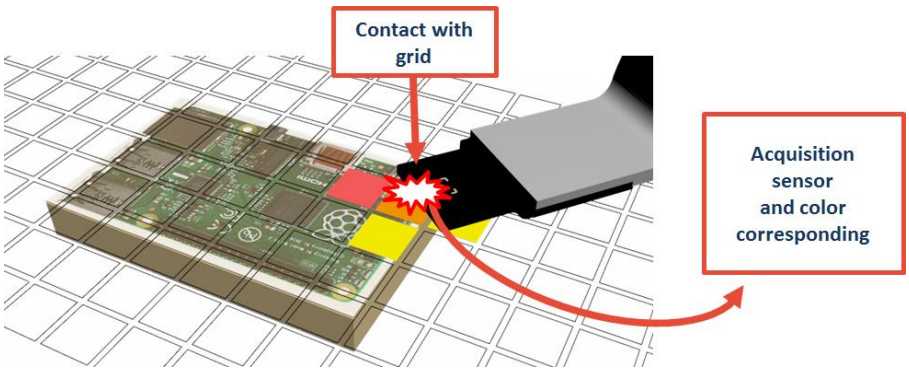
22. Repositioning of the grid

In augmented reality, a lack of light or positioning information can cause the grid to move unintentionally.
To avoid redoing a scan, it is possible to manually reposition the grid with the button: grid positioning.

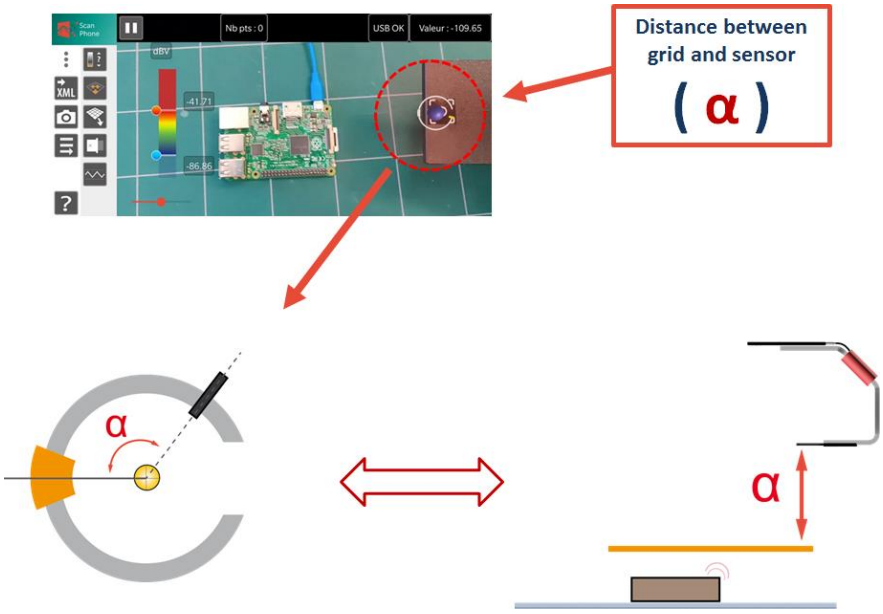


23. Grid filling

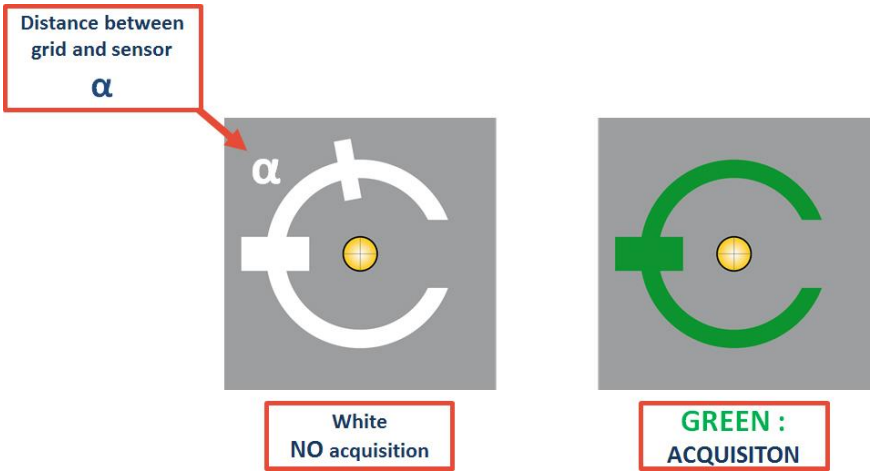
When the application detects that the sensor touches an element of the virtual grid, an acquisition trigger occurs automatically and the pixel is filled with the color corresponding to the amplitude of the measurement, according to the measurement dynamics. Previously stopped (Pre-scan). These acquisitions are then linked automatically for each position of the grid element identified during the manual scanning of the scanphone over the measurement surface by the operator. The acquisition process is very fast and the operator follows in real time the construction of the measurement result from the scan.



24. Distance between grid and sensor

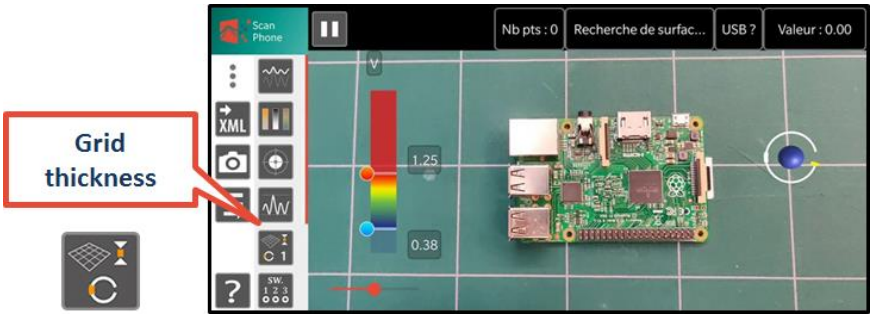


On the screen, the distance between the grid and the sensor is represented by the movement of a cursor on the arc of a circle.

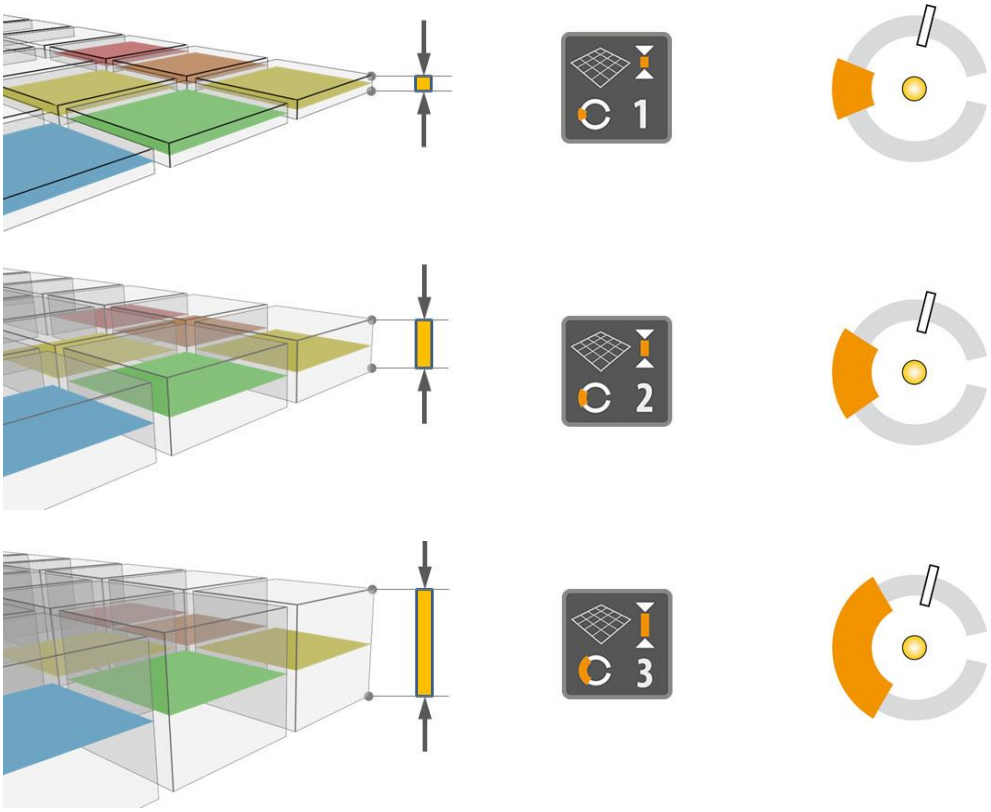


When the sensor and grid are correctly positioned relative to each other**, the arc of a circle turns green.**

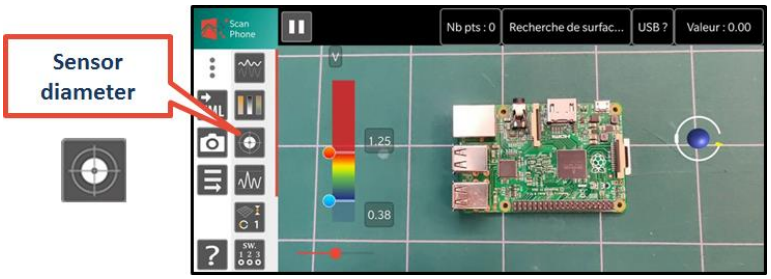
25. Grid thickness

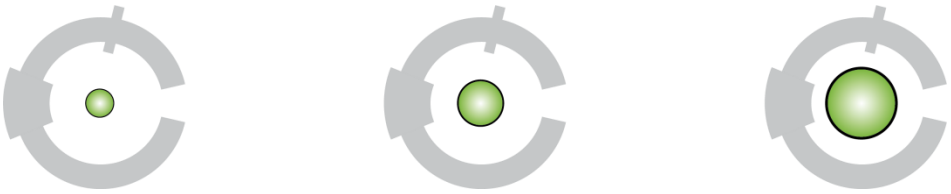


In menu 2, it is possible to change the usable thickness of the grid for acquisitions. This allows you to extend the height of the desired acquisition area.



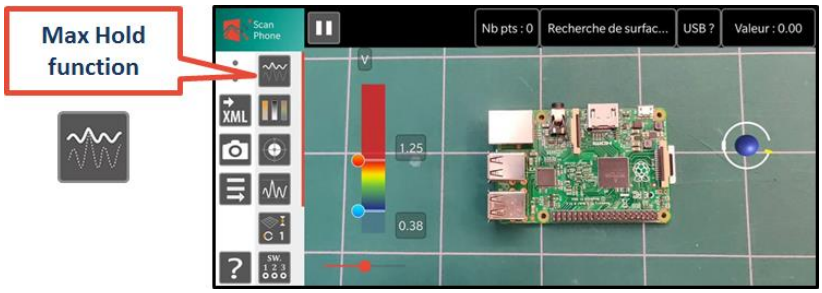
26. Sensor diameter



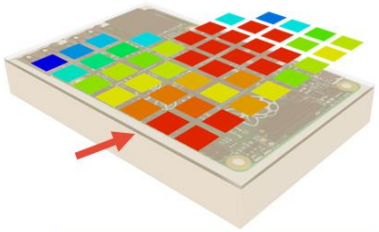


Depending on the type of mapping that you want to perform, it is possible to change the size of the (virtual) sensor to reach a higher or lower resolution. Three sizes are available.

27. MAX Hold function

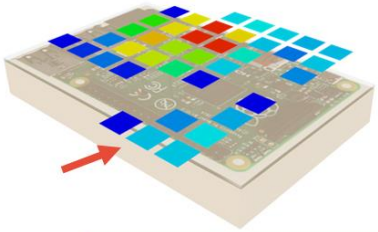


Max Hold: **ON**



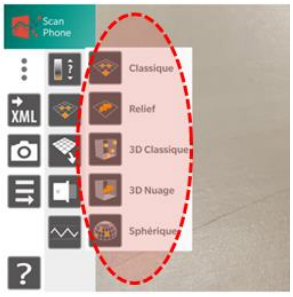
For each passage at the same place on the grid, comparison and display of the Max value

Max Hold: **OFF**



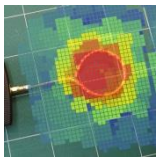
For each passage at the same place on the grid, last value display

28. Selection of grid type

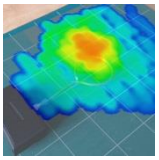


After scanning the environment (around the place to be mapped) it is possible to choose the type of grid that is displayed. By default, the standard grid is displayed (Classic).

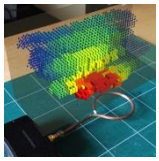
Classic (default)



Landforms

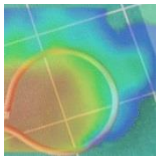


Standard 3D



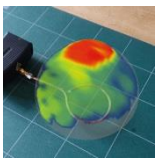
(*)

Cloud 3D



(*)

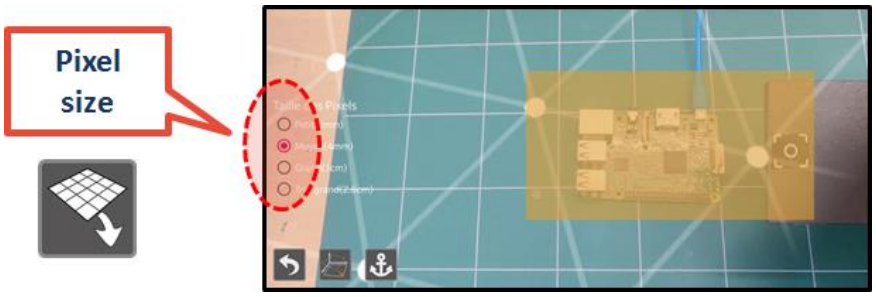
Hemisphere



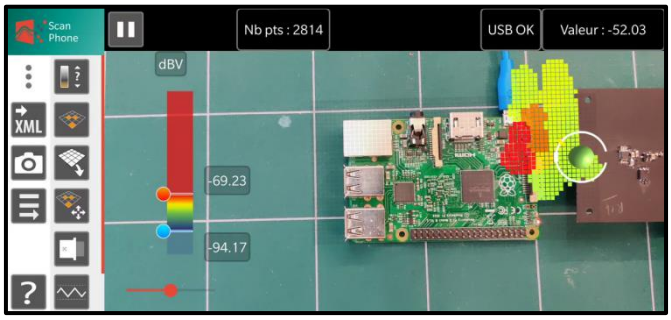
(*) The luxondes viewer is not compatible with 3D modes

29. Pixel size

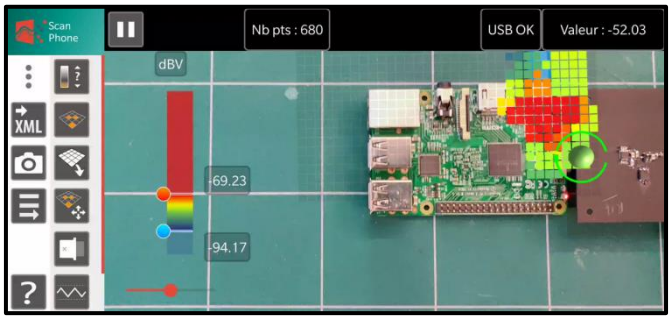
In the Grid Placement interface, it is possible to change the size of the grid pixels according to the desired definition.



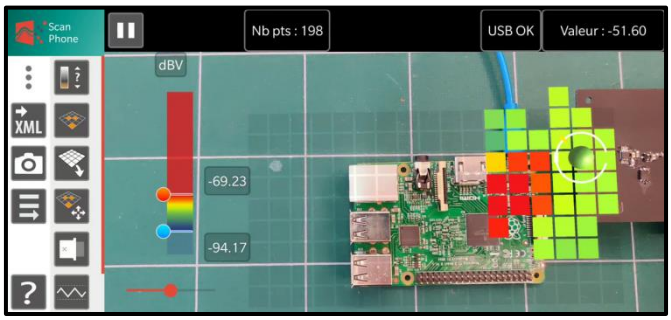
Pixel : 2.5 mm



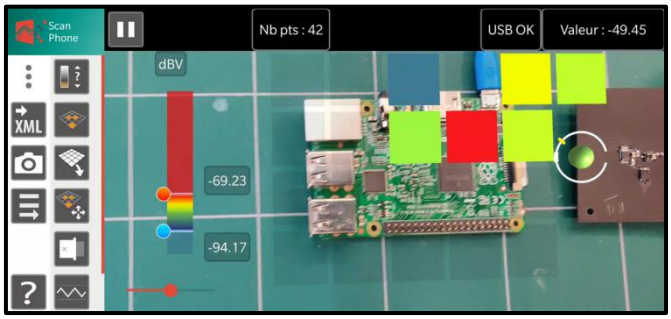
Pixel : 4mm



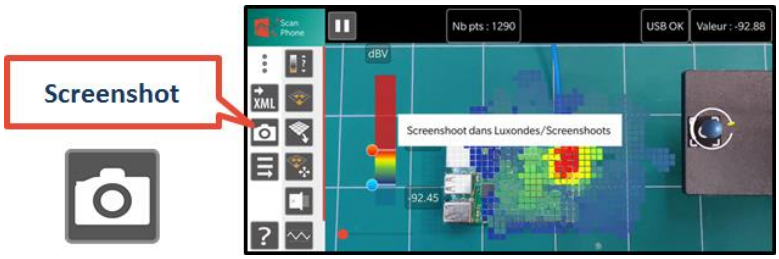
Pixel : 10 mm



Pixel : 2.5 cm

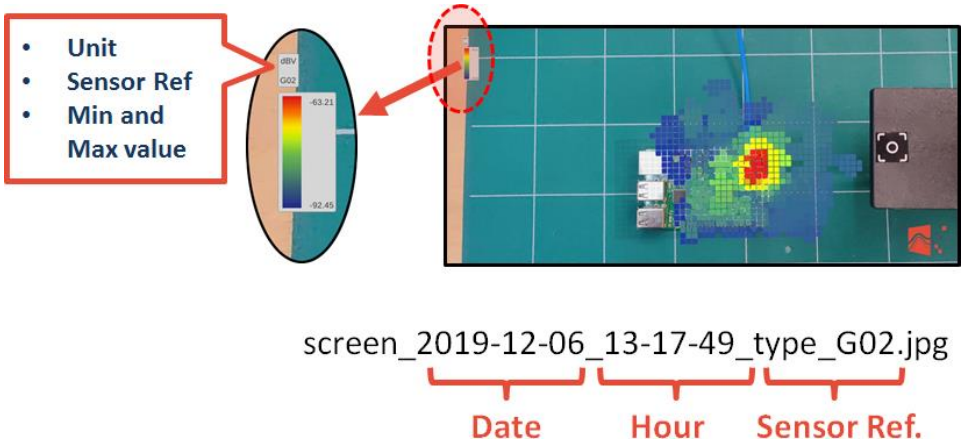


30. Data export / Screenshot



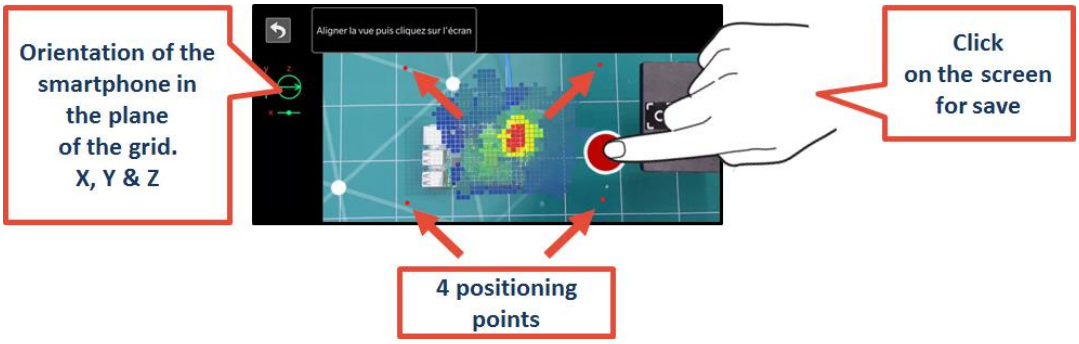
Location of the Screenshot folder in the smartphone

`This PC\HD1913\\Luxondes\Screenshot`



In the luxondes\screenshots folder of the smartphone is the screenshot photo with the test pattern and the min and max values as well as the unit of measurement and the name of the sensor used.

31. Data export / XML



In the XML export window, the 3 arrows on the left allow you to find the correct orientation of the smartphone in the grid plane. The 4 red positioning points must be visible in the window.

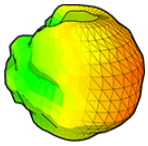
Click on the screen to confirm

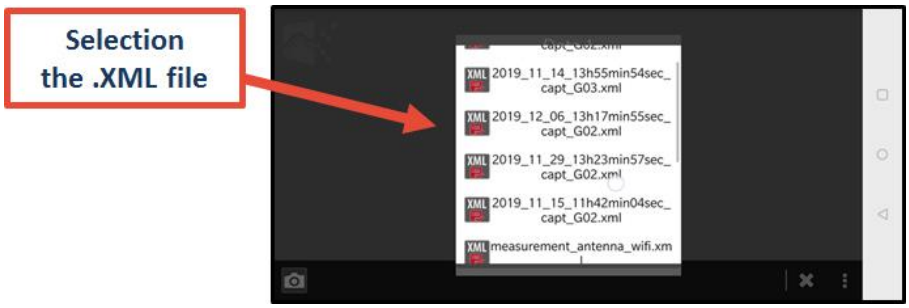
The cartography files (XML) are saved in the following location:

`PC\HD1913\\Luxondes\Data_XML`

```
\2019_12_07_22h21min36sec_capt_G02.xml      XML: Description of the measure
\2019_12_07_22h21min36sec_capt_G02.dat      DAT: Data
\2019_12_07_22h21min36sec_capt_G02.jpg      JPG: Picture
```

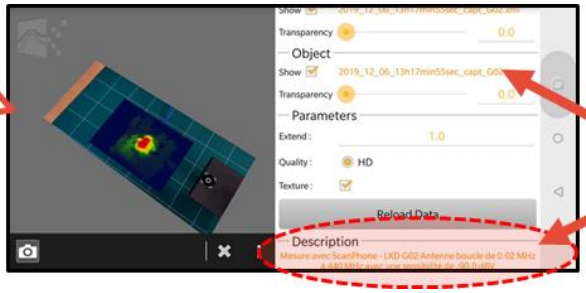
32. Android Viewer



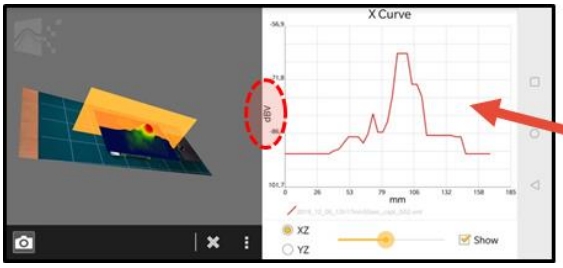


Selecting the file to analyse.

Analysis of data with the viewer Graphic Etc ...

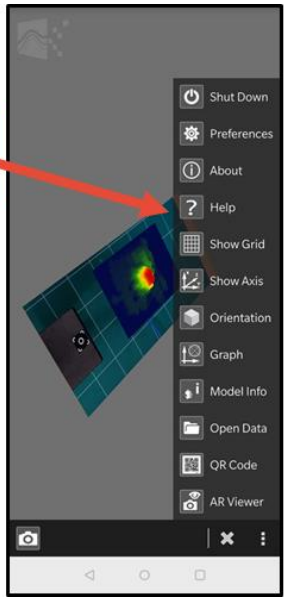


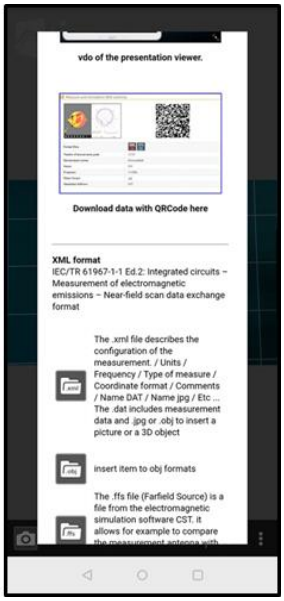
Description Transparency HD.



Curve Value in X or Y

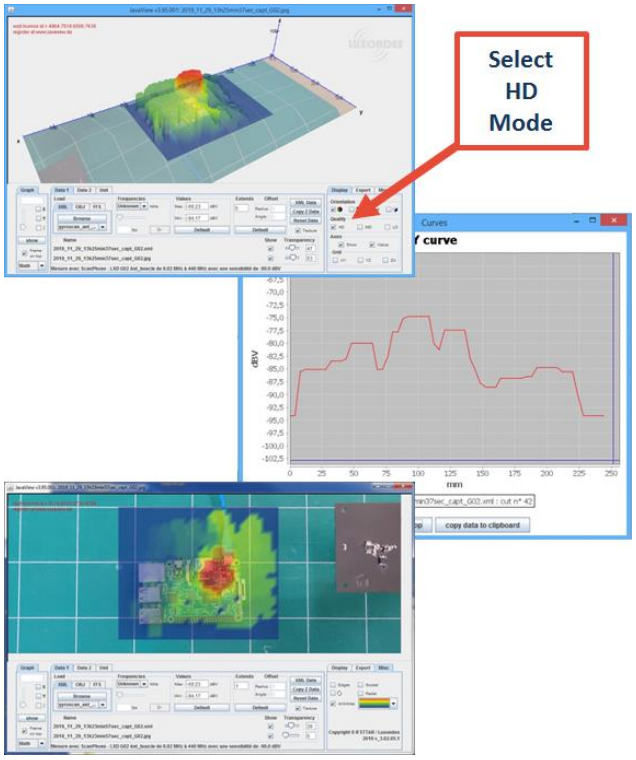
Use of the viewer





33. PC Viewer

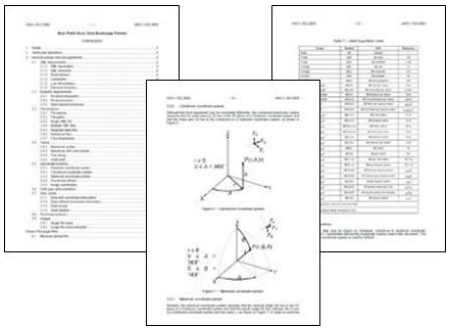
A JAVA / PC viewer allows you to analyse the data



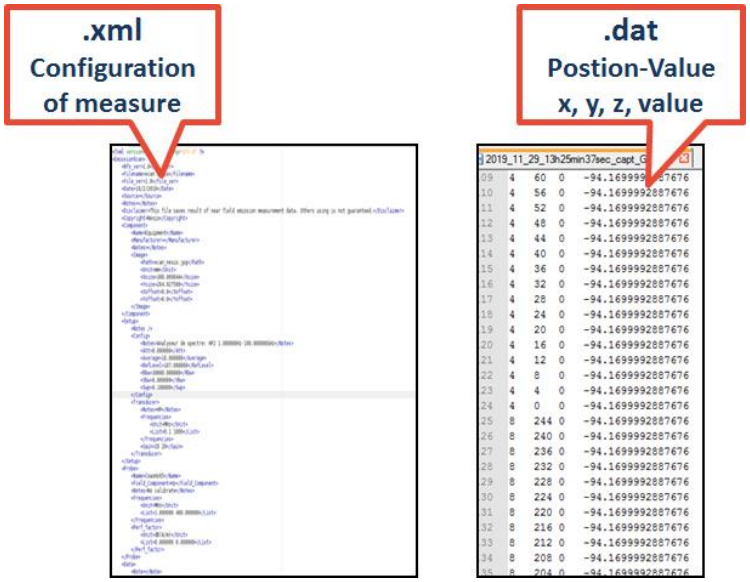
34. The XML format

Near-Field Scan Data Exchange Format

(Norme IEC 61967-1-1)



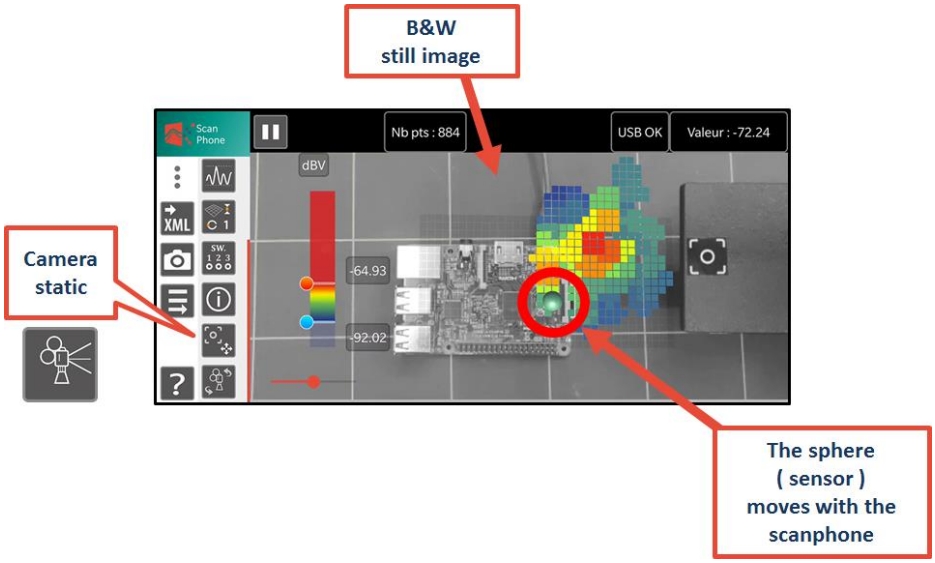
The XML / NFC (Normalization Form Canonical Composition) data format is intended to facilitate the exchange of data between industry, academia, vendors and end customers. It is based on the widely used XML- (eXtensible Markup Language) format, which is readable by both machine and human. Its structure allows data to be exploited on any operating system.



XML data can also be used with scientific analysis software such as MatLab™.

35. Miscellaneous

Fixed camera mode:



This mode allows you to view the scan by fixing the image of the environment. This allows you to make educational videos of experiments.

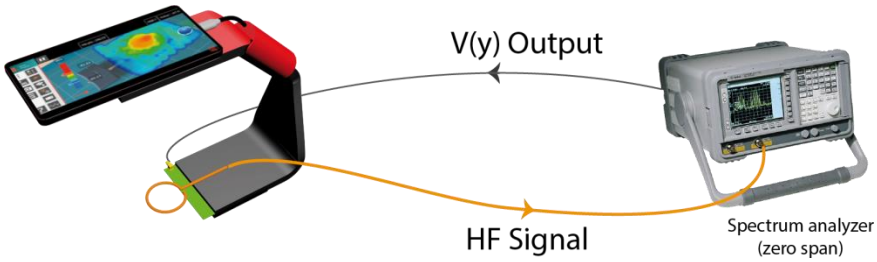
36. Measurement configuration with spectrum analyser

Example with an Agilent 7402A spectrum analyzer and the A4J option.

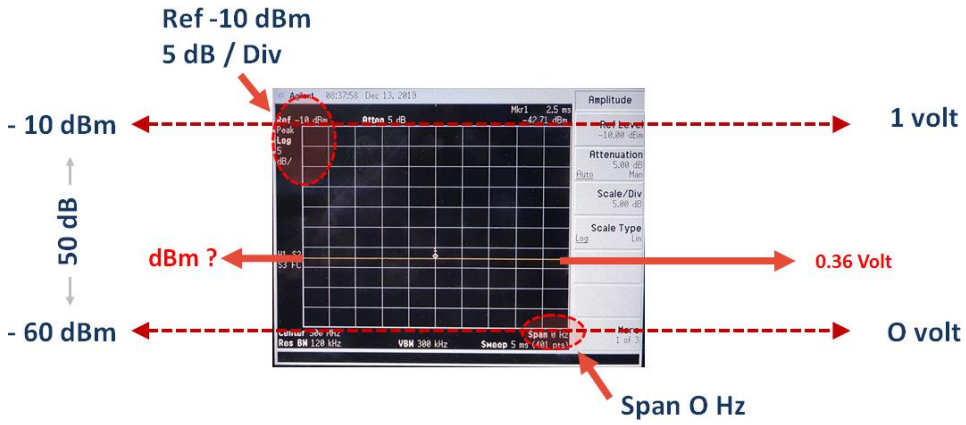
	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

For this operating mode we will use the spectrum analyzer as a precision detector. In Zero Span mode, the voltage V (out) is proportional to the variation Y of the signal on the screen.

Beforehand (before zero span) the classic settings will be made (ATT; Ref Level; RBW / VBW; Sweep; Average; Detector; etc…).



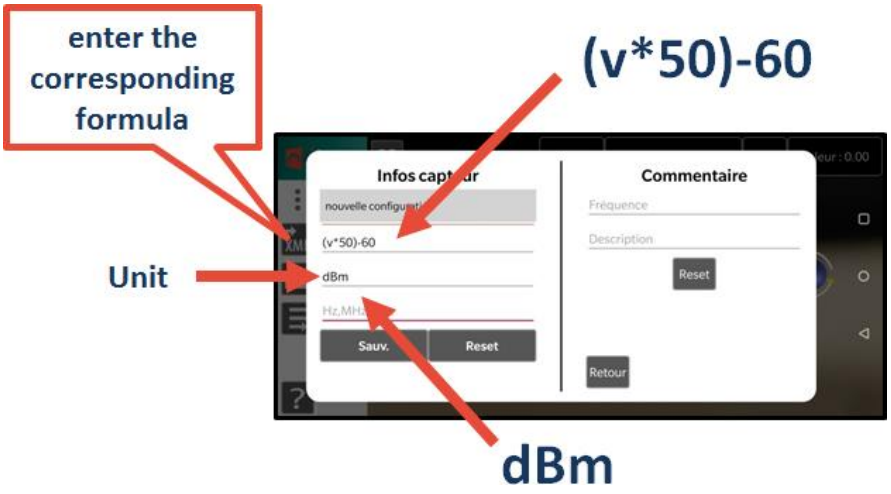
Equation between dBm and V (y) Output (Example with a 7402A spectrum analyzer)



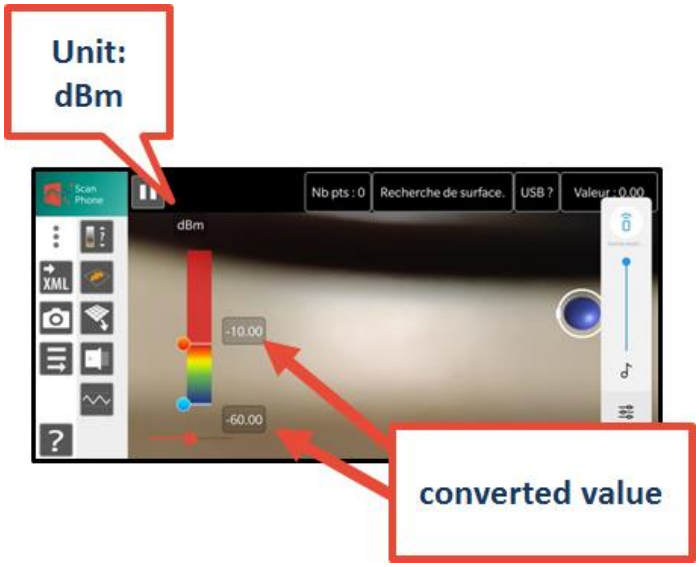
$$dBm = (Volt * 50) - 60$$

0.36V = -42 dBm

In the example above, we have 50 dB of dynamic range corresponding to a voltage range between 0 and 1Volt. In the sensor menu of the scanphone it is possible to configure the measurements with the appropriate formula.



Customization of the formula in the info sensor menu.



the measurement value is displayed with the corresponding unit.