SAMPLE CORE
IP TESTER

Model TDLV with Android software
Instruction Manual

INSTRUMENTATION GDD

1963 rue Frank-Carrel, suite 203
Québec (QC), Canada, G1N 2E6
Tel.: +1 (418) 478-5469

E-Mail: info@gddinstruments.com
Web site: www.gddinstruments.com

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1   Introduction

The SCIP (**S**ample **C**ore **I.P.**) tester is an efficient, compact, lightweight and low consumption unit designed for resistivity measurements.

The SCIP tester can use any Android device to process data acquisition. The software is free of charge and available on Google Play:
https://play.google.com/store/apps/details?id=com.gddinstrumentation.scip

Characteristics:

- **Related to the GDD Rx 8-32:** The SCIP acts as a 1 dipole receiver relating DDH Cores to the resistivity and IP surveys.

- **Programmable windows:** The SCIP offers twenty fully programmable windows for higher flexibility in defining the IP decay curve.

- **Available Modes:** Arithmetic, logarithmic, semi-logarithmic, Cole-Cole and user defined.

- **IP display:** Chargeability values, Resistivity and IP decay curves are displayed in real time on the screen of Android device.

- **Internal memory**: The memory capacity depends of the Android device that you use with SCIP. Each reading includes the full set of measured parameters with full waveform of the received signal.

- **Transmitting mode**: Can be used as a low voltage transmitter of 3, 6, 9 or 12V or 0.5, 5, 50 or 500uA.

2   SCIP tester accessories

A   1x   SCIP tester model TDLV
B   1x   Set of core holders
C   1x   Handy pocket tape (10'/3m)
D   1x   Allen key
E   1x   70g bottle of Cupric Sulphate with MSDS
F   1x   USB Stick (contains SCIP tester software, Sync software, IP PostProcess software, manuals)
G   1x   SCIP tester Instruction Manual
H   1x   IP PostProcess software Manual
I   1x   Set of red/black cables banana/banana or banana/alligator
J   1x   SCIP tester AC charger with international plug kit (universal voltage)
K   1x   Serial communication cable (RS-232)
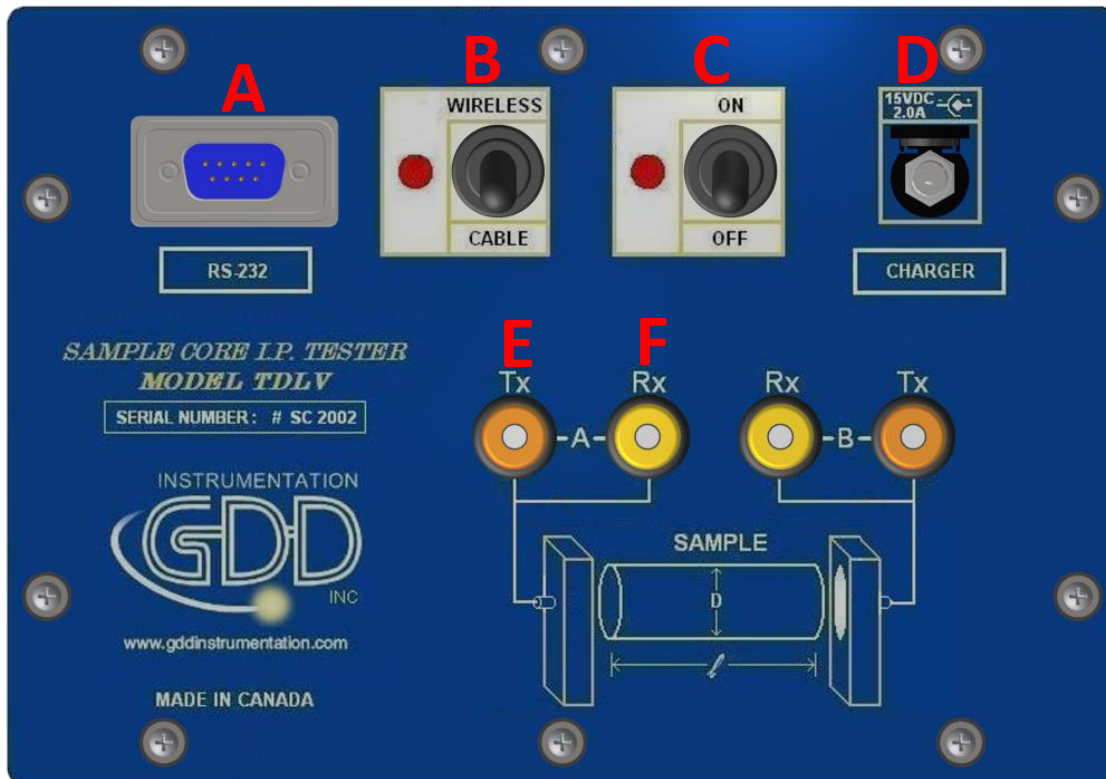L   1x   USB / serial (RS-232) cable adapter

Optional accessories:

- Borehole probe
  (including probe, backpack reels and cable)

The SCIP tester components are described in this section.

A - RS-232 connector - 9 pin serial communication port
This connector is used to connect the RS-232 cable between the Android device and the SCIP tester.

B - CABLE/WIRELESS switch
This switch is used to select CABLE (RS-232) or WIRELESS (Bluetooth) communications with the Android device. The red light indicates the WIRELESS position.

C - ON/OFF switch
This switch is used to turn the SCIP tester ON. The red light indicates that the SCIP tester is ON.

D - CHARGER connector
This connector is used to charge the SCIP tester's battery with the AC charger, and to supply power to the SCIP tester when the battery is discharged.

E - TX terminals
Transmitting connectors.

F - RX terminals
Receiving connectors.

4   Power

GDD's SCIP tester is powered by a rechargeable Li-Ion battery. Here are a few tips for using and storing the SCIP tester.

<u>Usage</u>

- Use the power supply provided by GDD to charge the SCIP tester battery. If you want to use another AC charger, make sure that the specifications are the same as those of the AC charger provided by GDD.
- Do not replace the SCIP internal battery without the authorization and advice of GDD's technicians.
- The total operating time of the SCIP tester depends on environmental conditions. Using the SCIP in very cold weather (-20^0C to –40^0C) decreases the operating time. At normal temperatures (20°C), the operating time is from 10 to 16 hours.
- The power level of the batteries and the charging status appear on the main screen of SCIP software.

- Use the AC charger as a power supply for working with the SCIP tester when the battery level is too low.
- There is a protection circuit in the SCIP tester that prevents charging the battery in cold weather (under 0°C) or in hot weather (over 45°C).
- The SCIP will turn itself off when the battery reaches a critical low level.

<u>Storage</u>

- When storing the SCIP tester for a few days or more, make sure that the battery is fully charged.
- Store the SCIP tester in a cool, dry place.

5   Important tips for getting good results

The SCIP (**S**ample **C**ore **I**nduced **P**olarization) measures geophysical properties of the ore such as apparent resistivity and chargeability. The SCIP simulates an Induced Polarization survey. The waveform is ON+, OFF, ON-, OFF. The current flows through the sample and is then switched off. While the current is flowing through the sample, a resistivity (Rho) is calculated from the ON Time Voltage. When the current is switched off, the voltage across the sample drops and a decay curve is measured. The Chargeability (M) is calculated from this DECAY.

Here are a few tips about preparing and measuring your core samples:

> Note: It is very important to always use the same methodology and keep the samples under the same environmental conditions for all measurements of all samples in order to compare them with each other.

- Soak your core samples in water for a few days before testing them.

> It is recommended to soak the samples in water in order to keep their properties as in the natural environment. The best way to take measurements would be on fresh samples. If it is not possible, two days of soaking should be sufficient. Note however that it is not necessary to leave the samples to soak. The important point is to keep the same measurement conditions for all samples. The values will not necessarily match with field data but the measured values of a sample compared to another one allows defining which ones are less resistive and/or more chargeable. You may then correlate anomalies versus results from the field.

> Note: The use of distilled water by osmosis could dilute the natural salts contained in the samples and falsify the measurement results. In this case, the use of running water seems an acceptable compromise.

- Remove the excess of water on the core sample before beginning the measuring process.

- Use a saturated copper sulphate solution.

> To take a measurement, the sample is fixed between electrodes by using sponges dipped in copper sulphate solution. Make sure that some copper sulphate crystals are not dissolved in water to get a saturated solution.

- Before starting the measurement, make sure that the core sample is completely dry on its surface.

- During the whole measuring process, make sure that the work bench, the core holders and the rod that fix together the core holders are completely dry.

- During the measuring process, wait until the contact resistance becomes stable before taking a reading. This may take a few minutes.

- Select the most appropriate settings.

    Select the most appropriate stack in order to stop the reading when the chargeability and the resistivity responses are stable. Depending on your sample and contact resistance, the number of stacks needed to obtain stable values will vary.

    We suggest using the same timing and windows than your field IP survey. Otherwise, a timing of two (2) seconds and arithmetic windows give good results.

- Use the appropriate mode (constant current or constant voltage).

    There are two modes of measurement, voltage and current. In order to determine which one to use, the contact resistance value (Rs) can be a good indication. For a Rs between 1 kOhm and 24 kOhms both modes are possible. However, we suggest selecting a constant current for an Rs lower than 1 kOhm and a constant voltage when Rs is greater than 1 kOhm. In voltage mode make sure that the Vp (mV) is greater than half of the selected voltage and in current mode make sure that the I (uA) is almost the same value of the selected current. If there is saturation, the reading may not be reliable. In that case, try a lower current or a lower voltage.

Rs = 24 kOhms

Constant current

Constant voltage

Rs = 1 kOhm

Constant current | **Constant voltage**

Rs = 1 kOhm
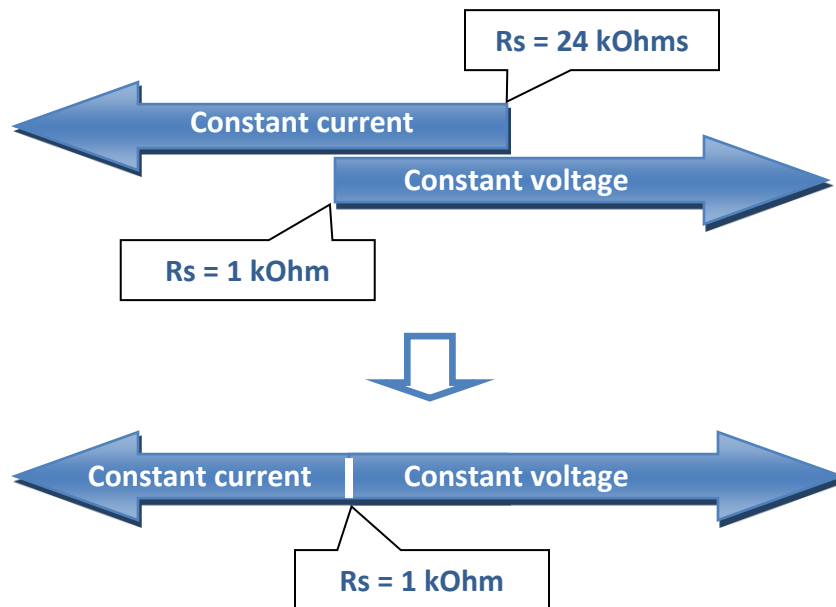
- For better results, take the average of several readings on each core sample.

6 Quick Start Guide

Generally, Android devices don't have any RS-232 port. To use SCIP tester with the serial communication cable, you would need an USB/RS-232 adapter like the one supplied by GDD and shown below. You would need also a USB connector adapted to your Android device.


1. Place the core sample into the core holders (see Section 7 – How to use Core Holders).

2. Turn the SCIP tester ON using the ON/OFF switch on the front panel.

3. Select the communication mode using the CABLE/WIRELESS switch on the SCIP tester's front panel. If Cable mode is selected, connect the serial communication cable between the SCIP (RS-232 connector) and your Android device with help of USB/RS-232 adapter if needed.

4. Turn on your Android device.

5. If this is the first time you use your Android device with the SCIP tester, you need to install the SCIP software from the Google Play store:
   https://play.google.com/store/apps/details?id=com.gddinstrumentation.scip
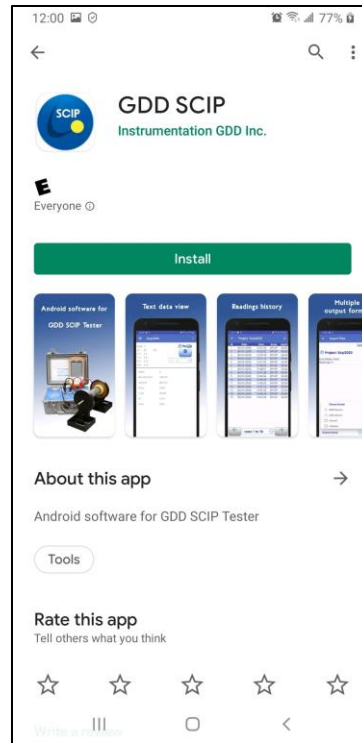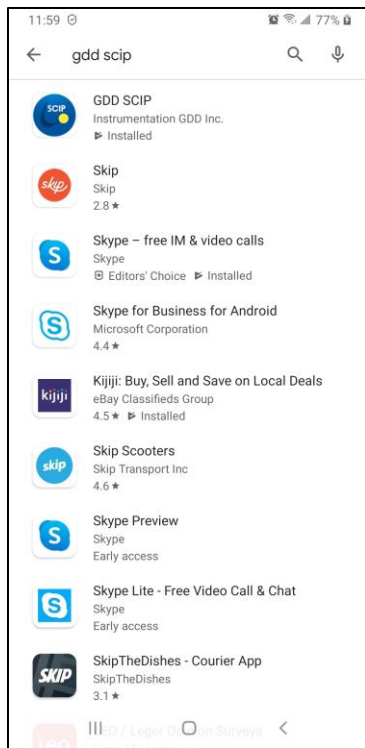
6. If this is the first time you use your Android device with this given SCIP tester and you want to use Bluetooth connection, you need to pair the SCIP tester with your Android device. Use 1234 as PIN to pair any GDD SCIP tester.
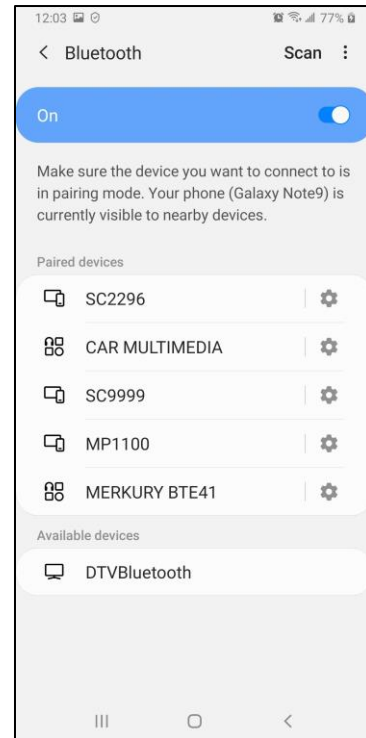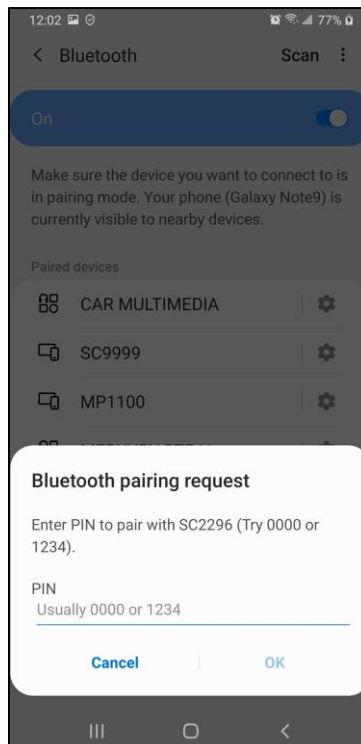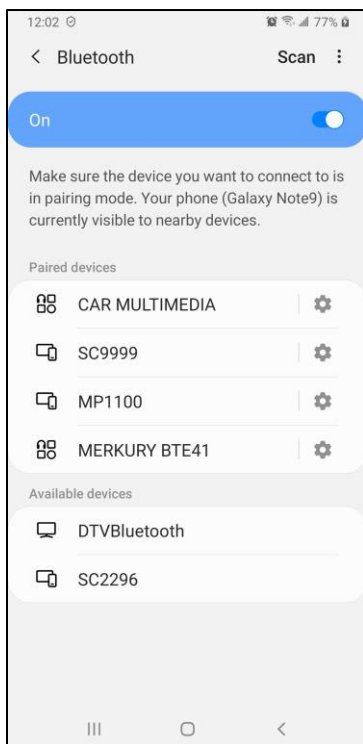
7. Click on GDD SCIP icon.
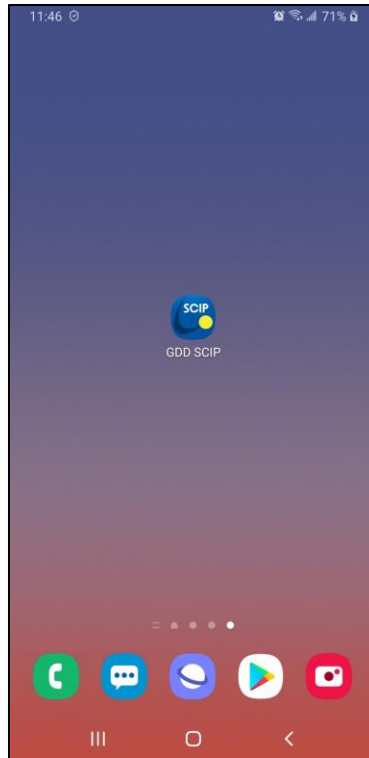
8. If this is the first run of the SCIP software, you need to create a project and choose the appropriate survey mode. Go to the **Function menu**->**New Project**.
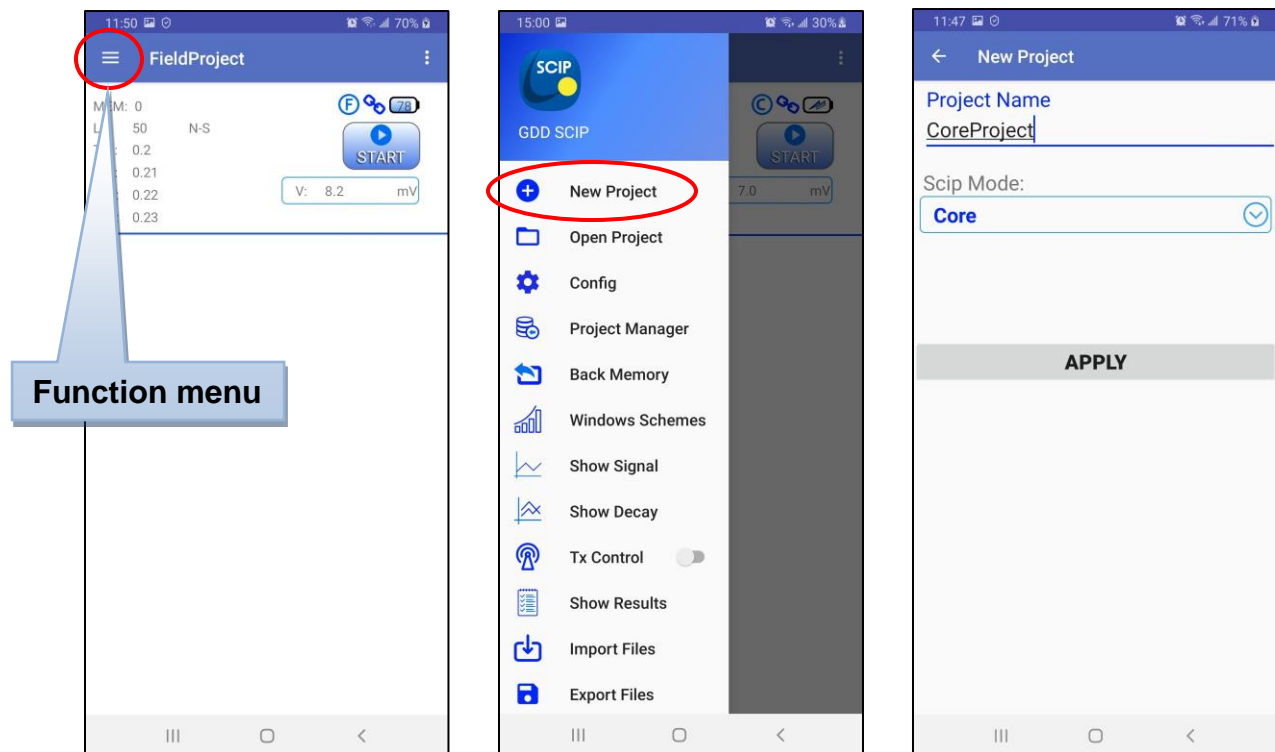
9. Make sure the right communication mode is selected and the right SCIP tester is chosen in case of Bluetooth communication. Go to the **Config menu**->**Settings**->**Connection**.
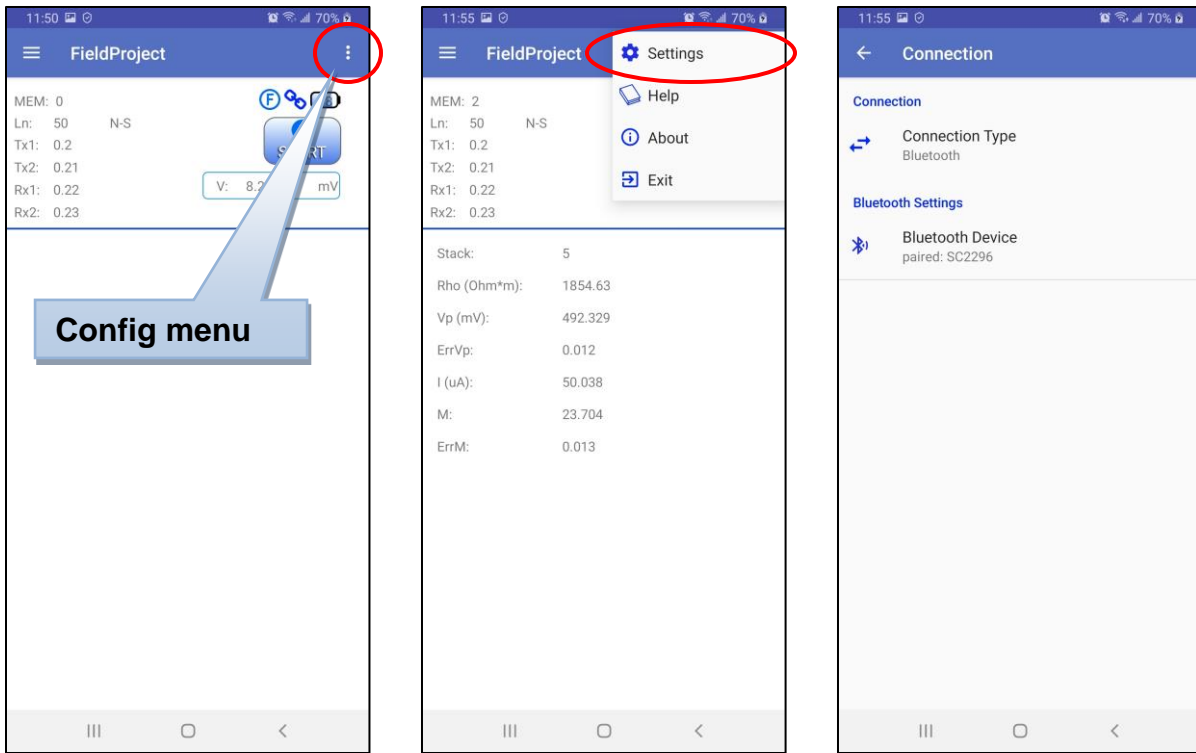
Do **Function menu**->**Reinit** if you change communication mode or you choose another SCIP tester in Bluetooth mode.
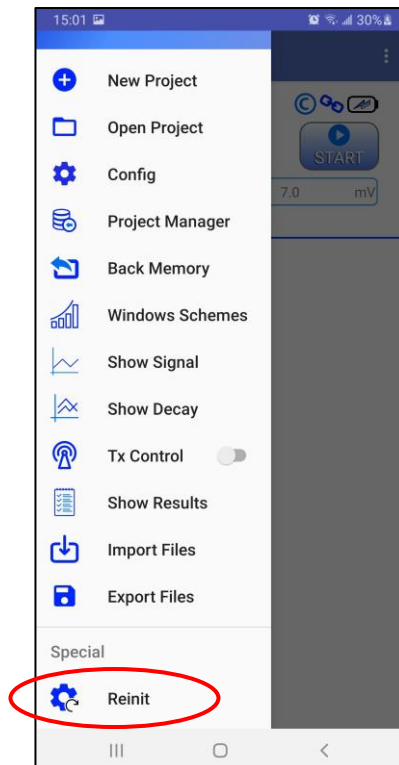
10. The main screen appears with the enabled **START** button. Click **START** to begin the acquisition process.
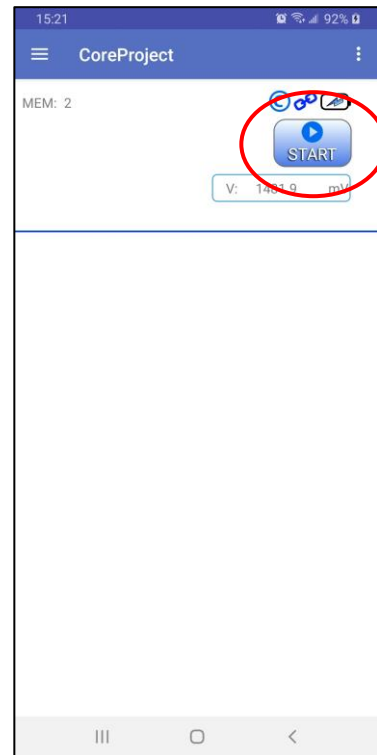
The following example is made for the projects in **Core** SCIP mode.

11. The following screen appears. The **Contact** is the value of the core resistance in **kOhm**. Click on **NEXT** to continue.
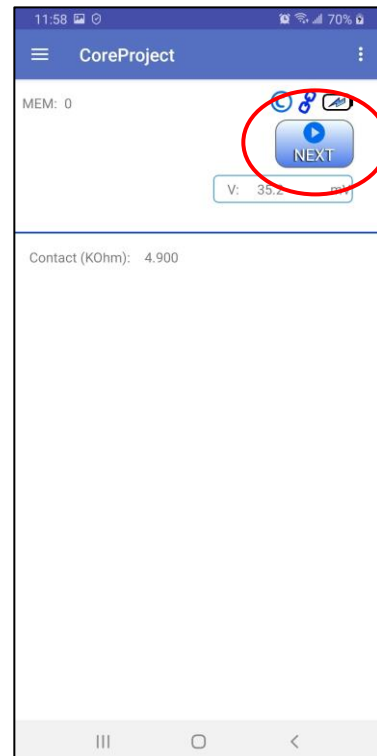
If the value of the core resistance is higher than 50 000 kOhms (50 MOhms), the value of the chargeability could be affected. If this should be the case, the following message should appear. Click on OK to continue or click on NO to stop the measuring process.

⚠ **Attention!**

Contact resistance is above 50 MOhm. Chargeability calculation may be affected. Do you want to continue?

NO   OK
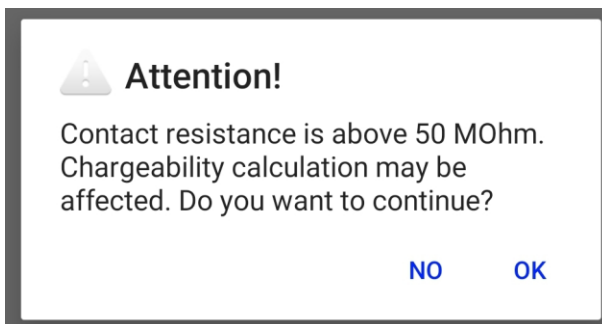
12. Set the parameters of the core sample in the **PARAMETERS** window.
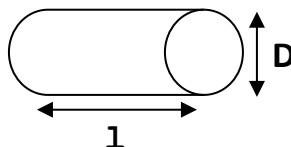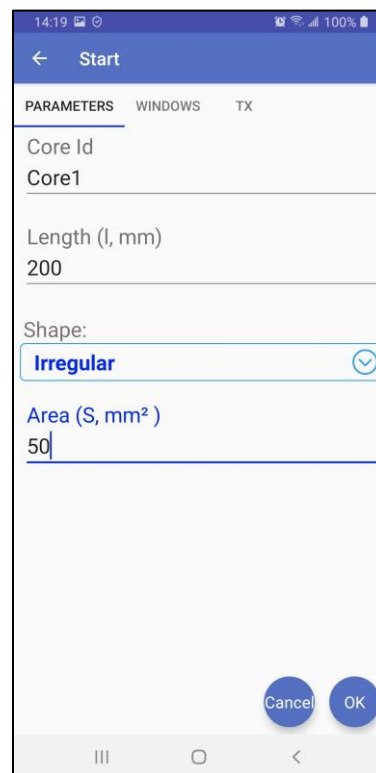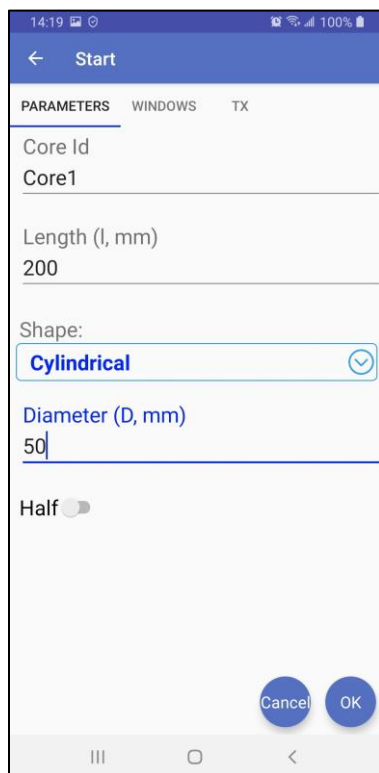
For a core sample, select **Cylindrical** and enter the **Diameter** of the cross section in **mm**.
If you measure a half core (split core) sample, select **Half**.
For any other type of samples, enter the cross-sectional **Area** in **mm²**.

13. In the **WINDOWS** window, select the maximum number of stacks, the signal time and the mode (decay windows definition).
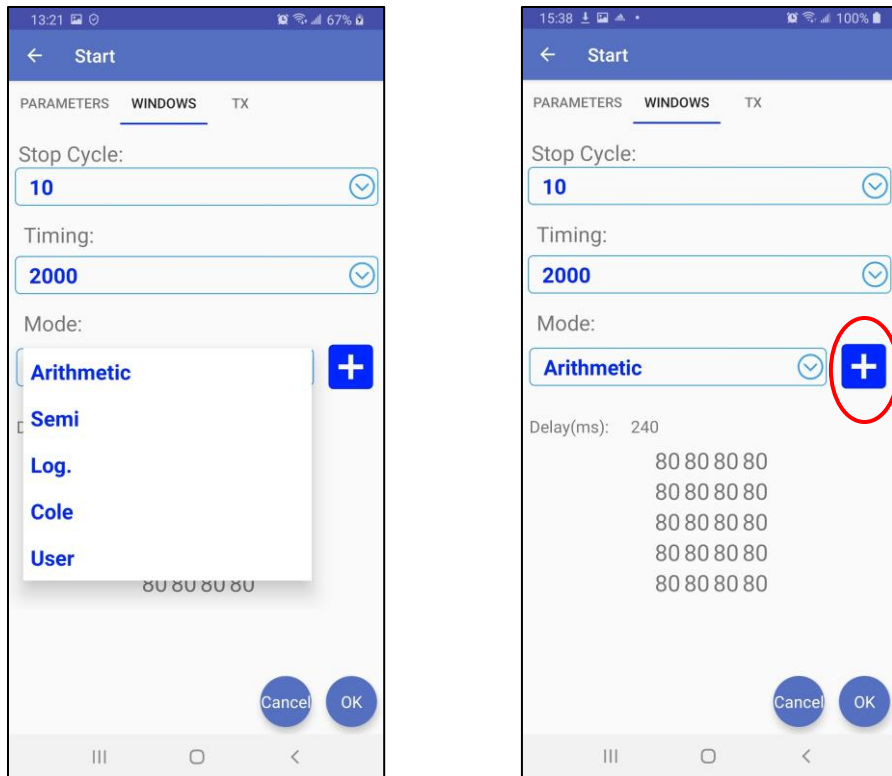
The time to get one reading increases with the number of stacks and the signal timing. It could take up to three (3) hours to get one reading with 50 stacks at a timing of 128 seconds.

You can add your custom windows schemes by clicking on as explained in the **Chapter 9.6**

14. In the **TX** window, select if you want to use a constant voltage or a constant current. You can use a voltage of **3, 6, 9** or **12 V** or a current of **0.5, 5, 50** or **500 uA**.
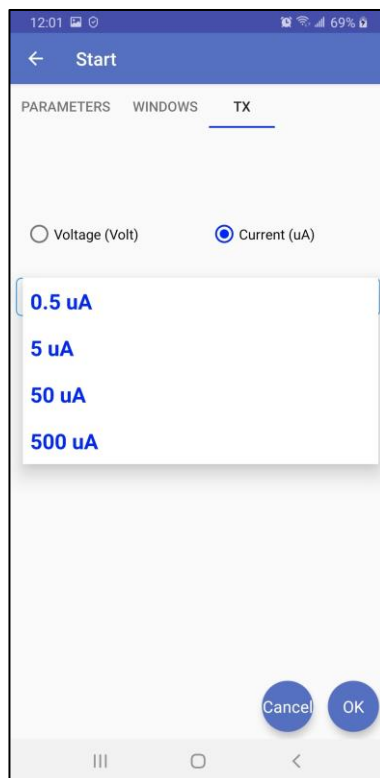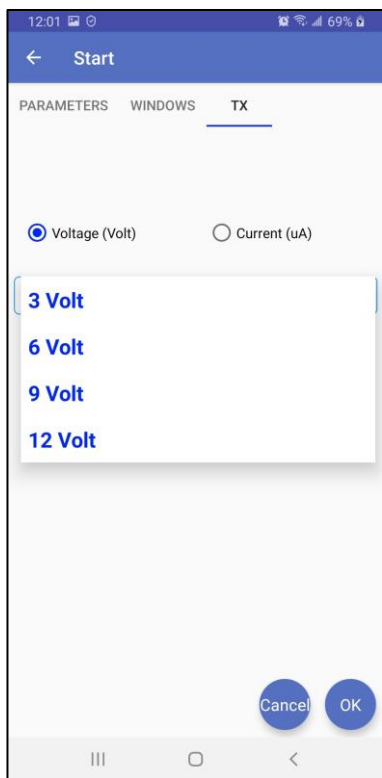

Click **Ok** to close the settings window and continue survey or **Cancel** to stop it.

15. If you continue the survey, the SCIP synchronizes with the transmitted signal and shows the reading. See **Annex 1** for details on the readings.
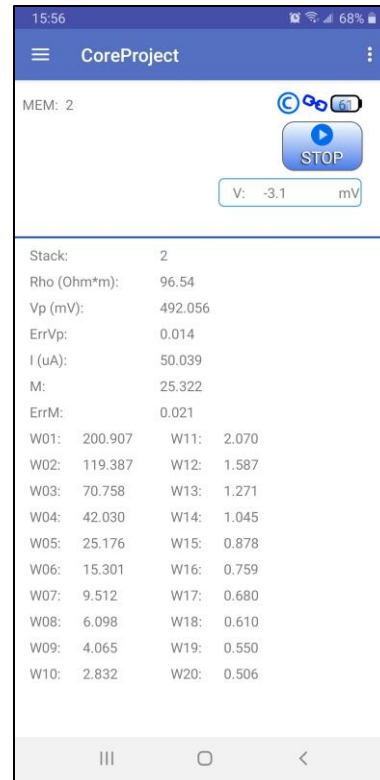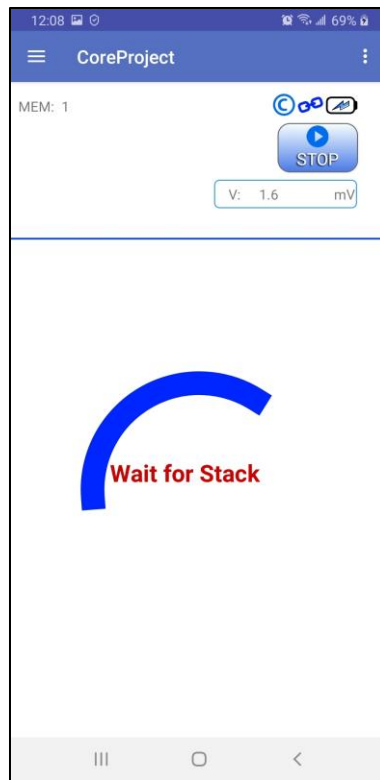

In constant current mode, if a little red circle appears in the window that means that the signal is saturated. Stop the measuring process, select a lower current and start the readings over. These instructions appear in a pop-up window when you click on the red circle.
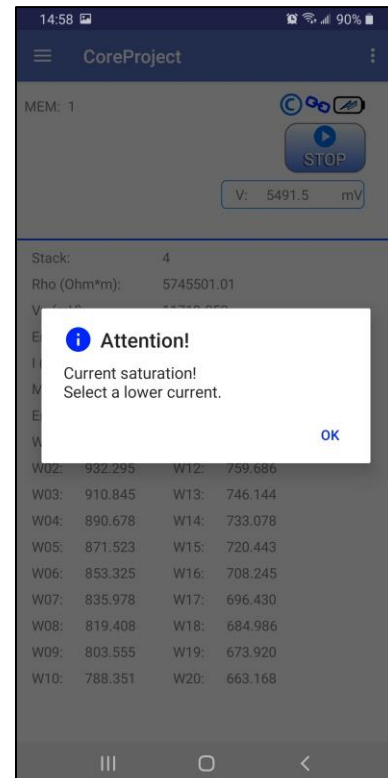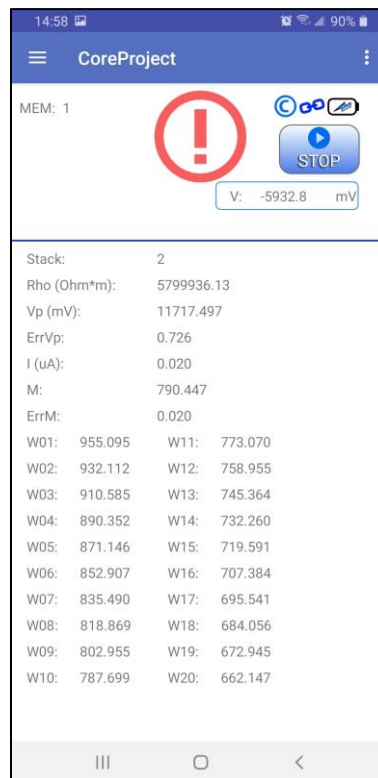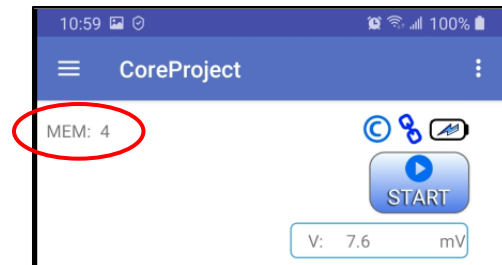
16. To stop the reading and save the data, click on STOP, or wait until the SCIP has finished acquiring data.
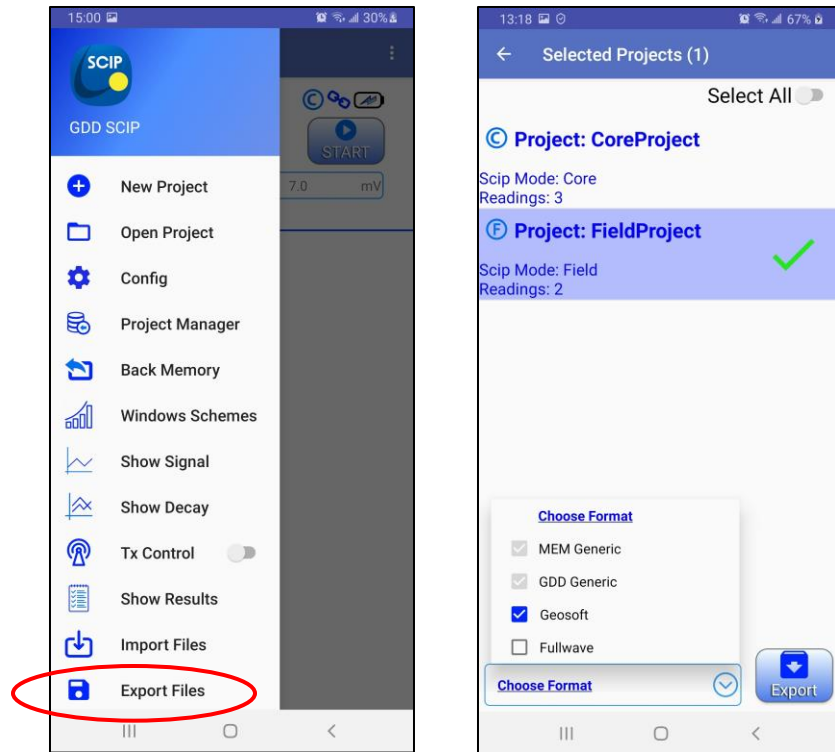

17. Confirm if you want or not to stop the reading and if you want or not to save the reading.
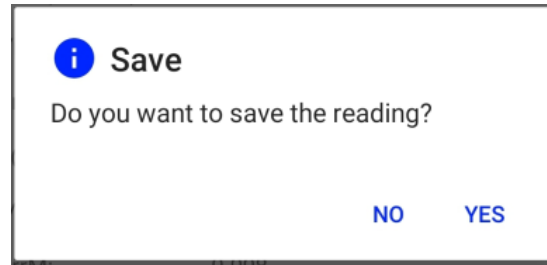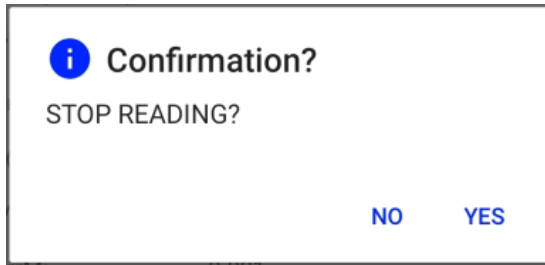
The **MEM:** number increases by one after saving. You can save many readings in many projects before exporting data files.

18. To get output data files go to the **Function menu**->**Export Files**. Select the projects to output and the desired output formats.

The **MEM Generic** and the **GDD Generic** formats are always selected. The **GDD Generic** is a text format while the **MEM Generic** is a binary format providing access to all information including full waveform data. The **MEM Generic** format files can be used in **GDD IP PostProcess** software to view the data, analyse the data and recalculate the data from the original full waveform signal if needed. The **Geosoft** option can be chosen to create a specific file to be imported in **Geosoft** software. Take note that in the **Geosoft** file (*.dat* file), some information as core ID, length and diameter is missing. The **Fullwave** option can be selected to create a file that contains the full waveform sampled data in text format.
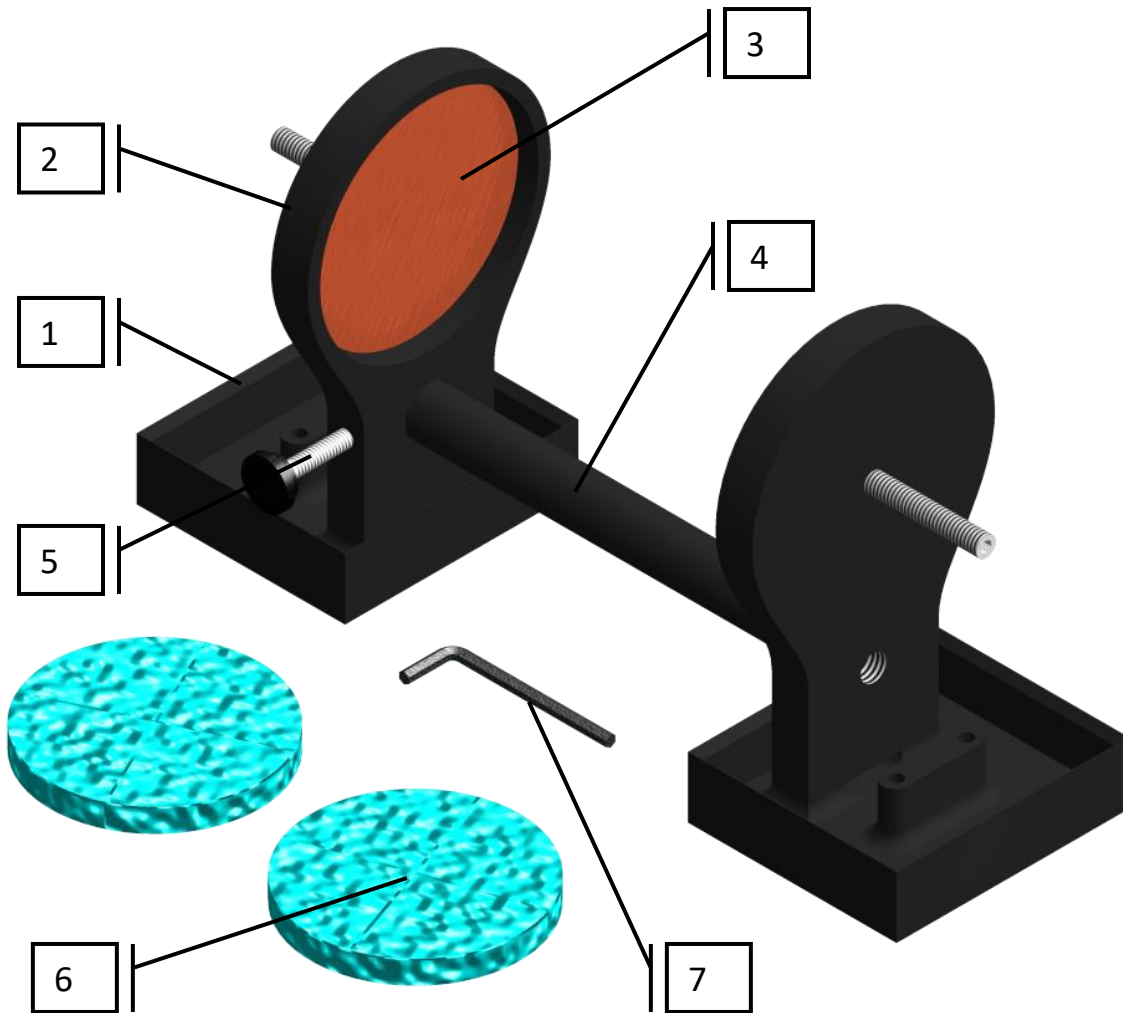
19. Click on **Export** to create the output files. They will have the same names as projects and will appear in the **\Documents\GDDSCIP** folder in the main memory of your Android device.
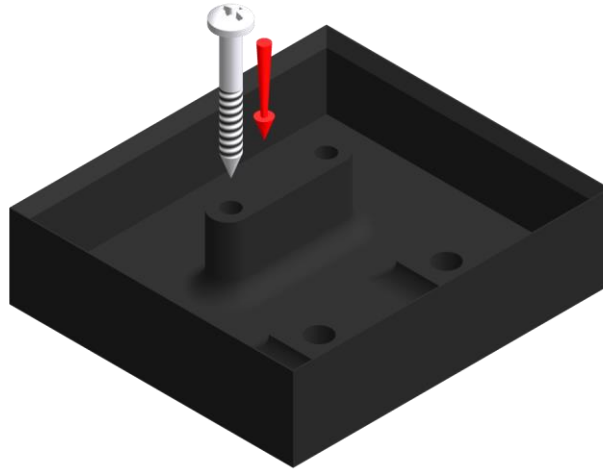Wait until the following message.
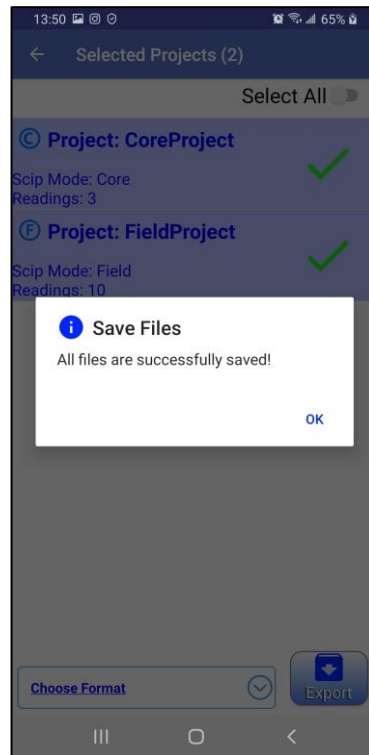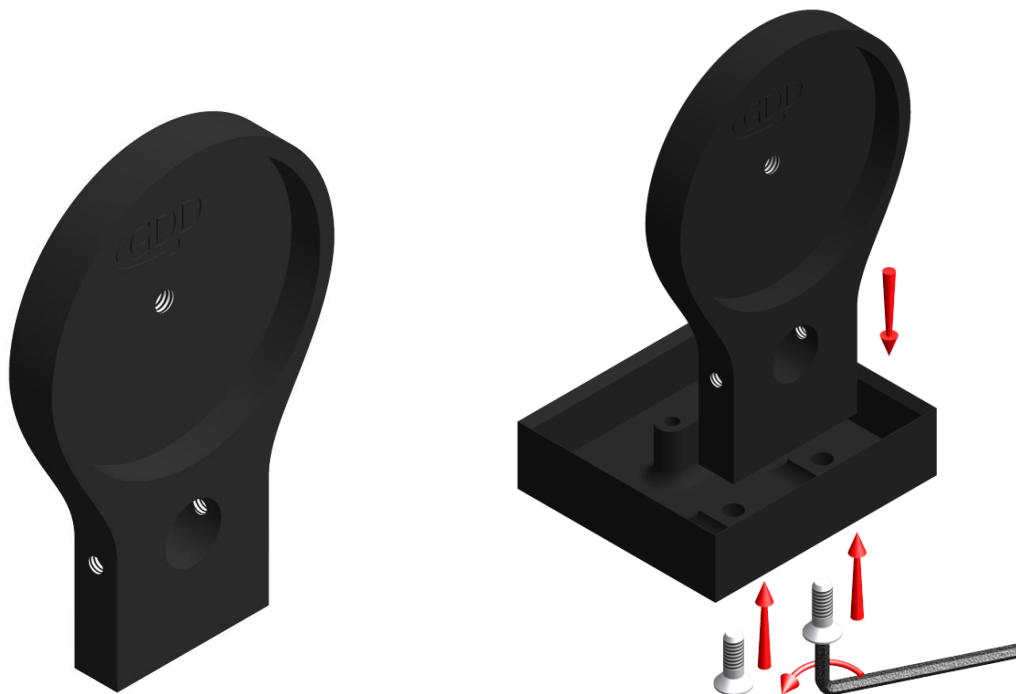
7.1 Core Holders - components

1. Receptacle (2x)

The two receptacles must be used to keep the surface between the two core holders dry. The receptacles keep all the liquid (water, copper sulphate) in them. It is possible to screw the receptacles onto a table using the two base holes.

2. Holder (2x)

The two holders keep the core sample in place. Fix the holders to the receptacles with two bolts using the Allen key provided with the Core Holder.
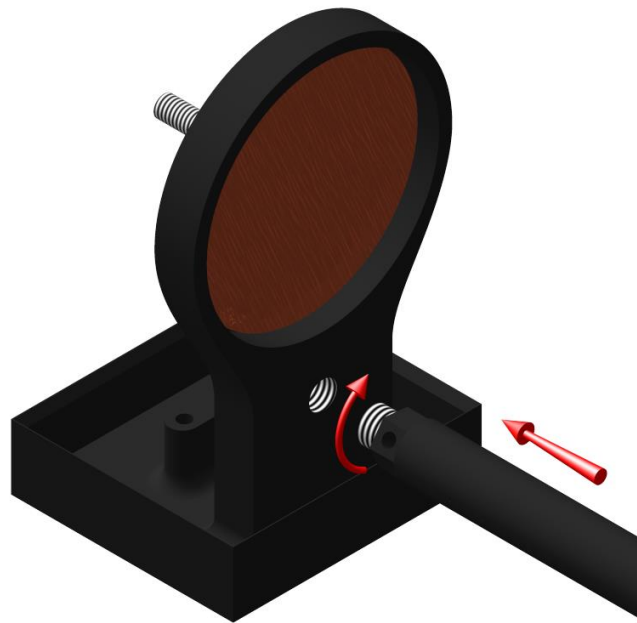
3. Electrode (2x)

The electrode consists of a copper disc with a stainless-steel bolt. The banana connector can be inserted into the bolt for better contact. It is possible to adjust the distance between the electrode and the holder by screwing or unscrewing the electrode using the Allen key.
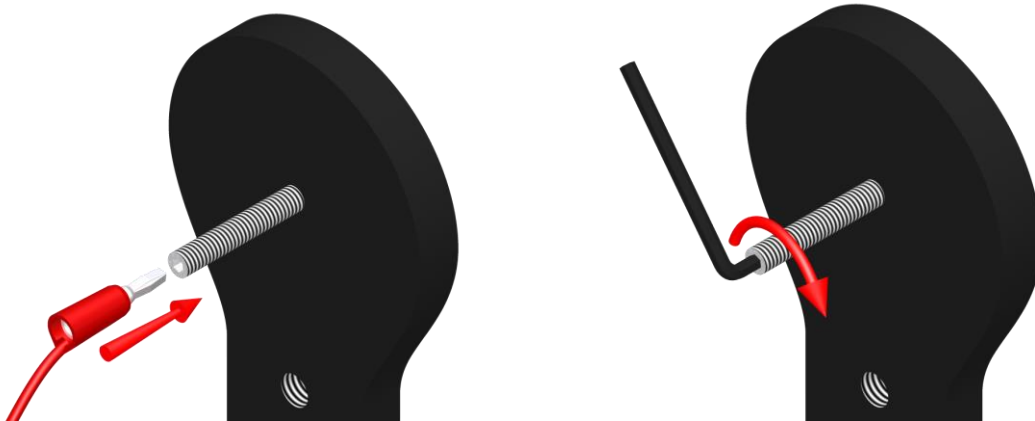
4. Rod (2x)

The rod fixes the two holders together. Move one of the holders along the rod to keep the core sample in place. It is possible to connect two or three rods together if the core sample is too long for one rod. To affix the rod, insert and screw. To remove the rod from the holder, unscrew the rod. If it becomes hard to unscrew the rod, use a 5/8'' wrench or the Allen key provided with the Core Holder.
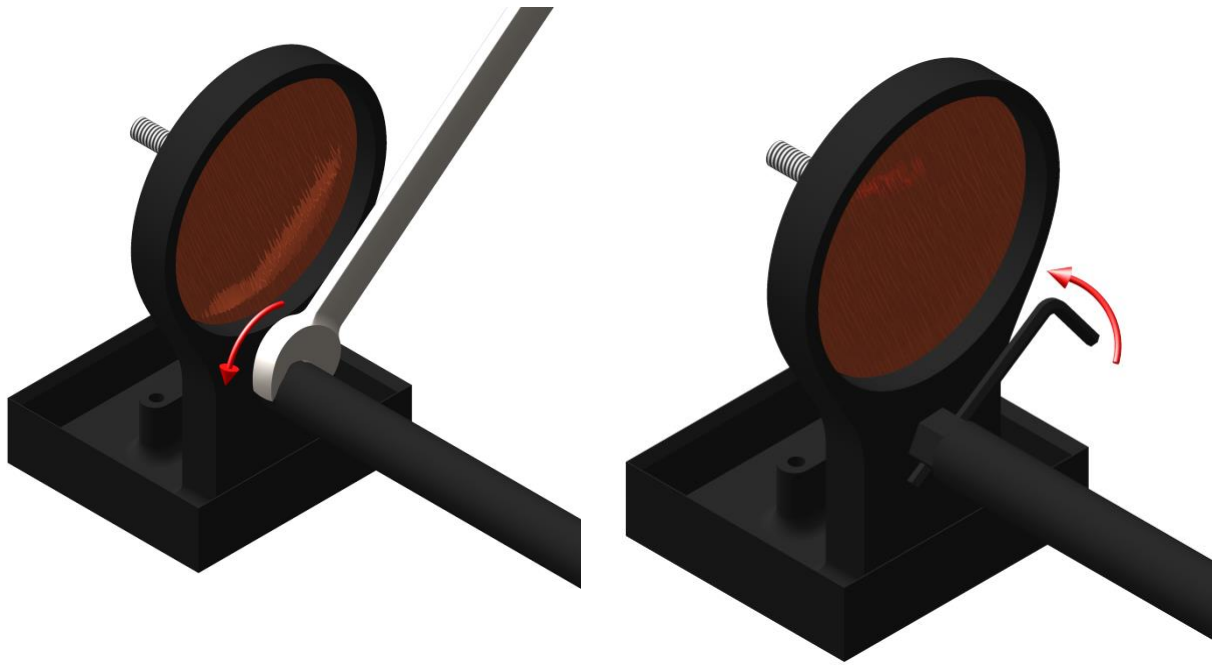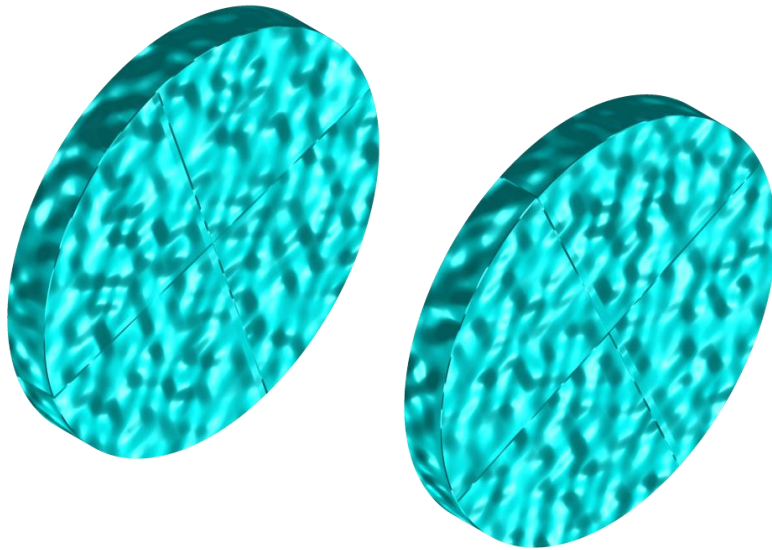
5. Fixing screw
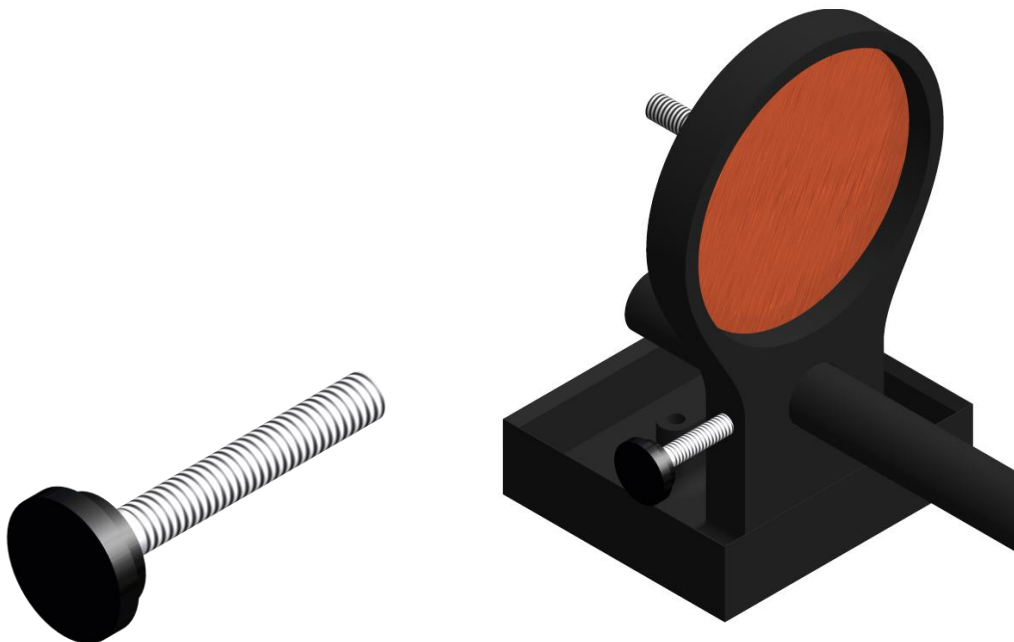
The fixing screw holds the holder in place along the rod.

6. Cellulose sponges (soaked in a solution of copper sulphate*)

Using copper sulphate**** soaked sponges increases the contact between the core sample and the electrodes. Cellulose sponges give better results than other kind of sponges.

 *Copper sulphate might be harmful if inhaled or ingested; or being in contact with the skin or the eye. We highly recommend wearing nitrile gloves, safety glasses and a safety mask when using copper sulphate.

7. Allen key

See points 2, 3 and 4 to know how to use the Allen key with the Core Holder.

7.2 How to use it

1. It is important to place each core holder into its receptacle to keep the surface between the two core holders dry.

Holder

Receptacle

2. Soak the cellulose sponges into a solution of copper sulphate*****. Make sure that both sponges are totally soaked.

Cellulose sponges

Copper sulphate solution

Copper sulphate solution: Add copper sulphate to the water until it gets saturated. This can be seen when there is some copper sulphate that do not dissolve and you can see some residual of it at the bottom of the solution.

* Copper sulphate might be harmful if inhaled or ingested; or being in contact with the skin or the eye. We highly recommend wearing nitrile gloves, safety glasses and a safety mask when using copper sulphate.
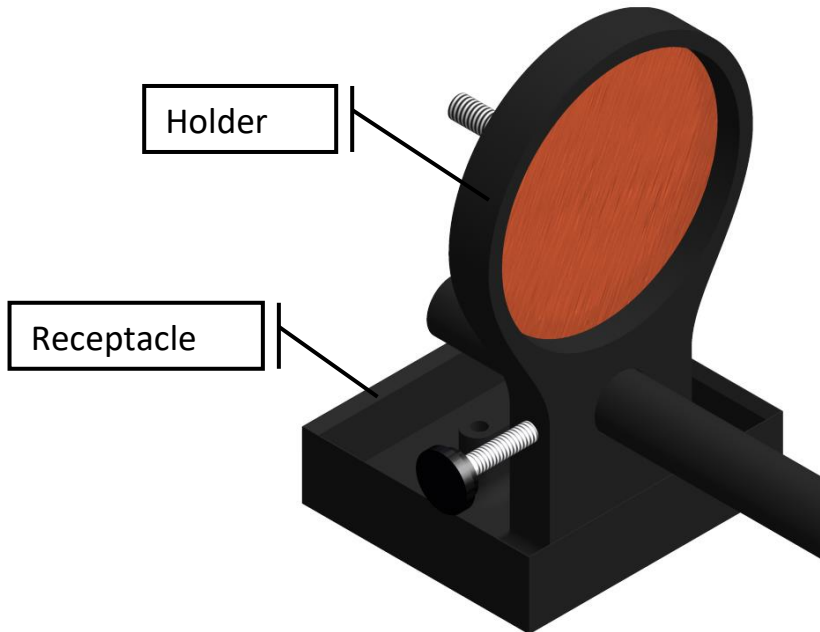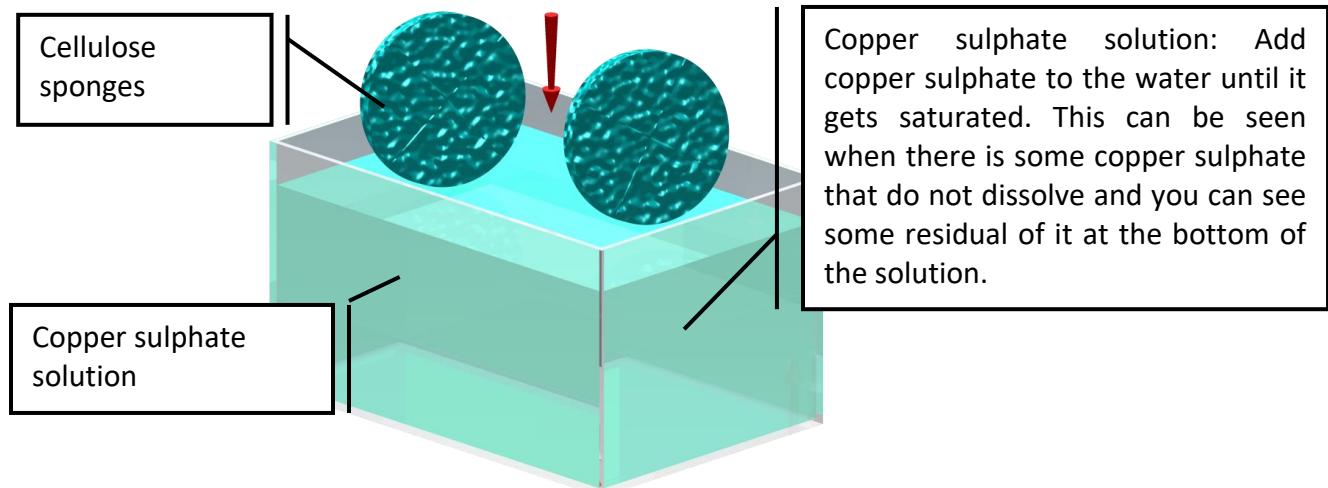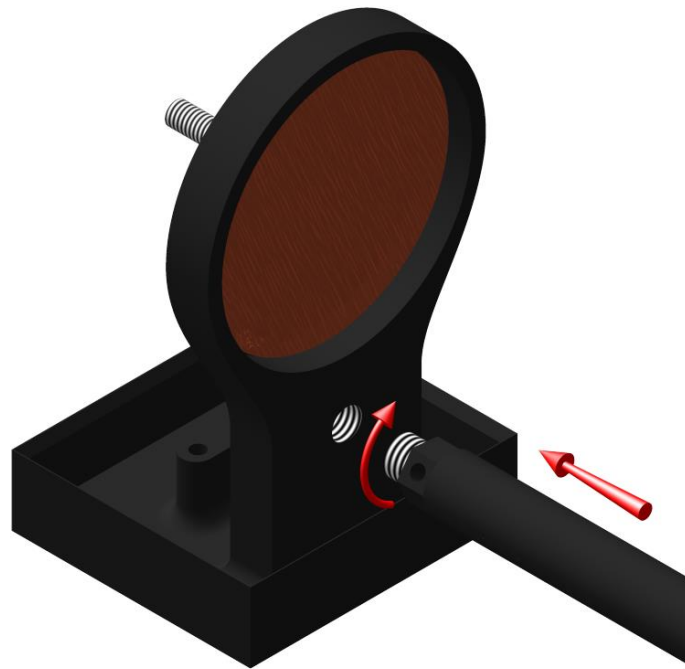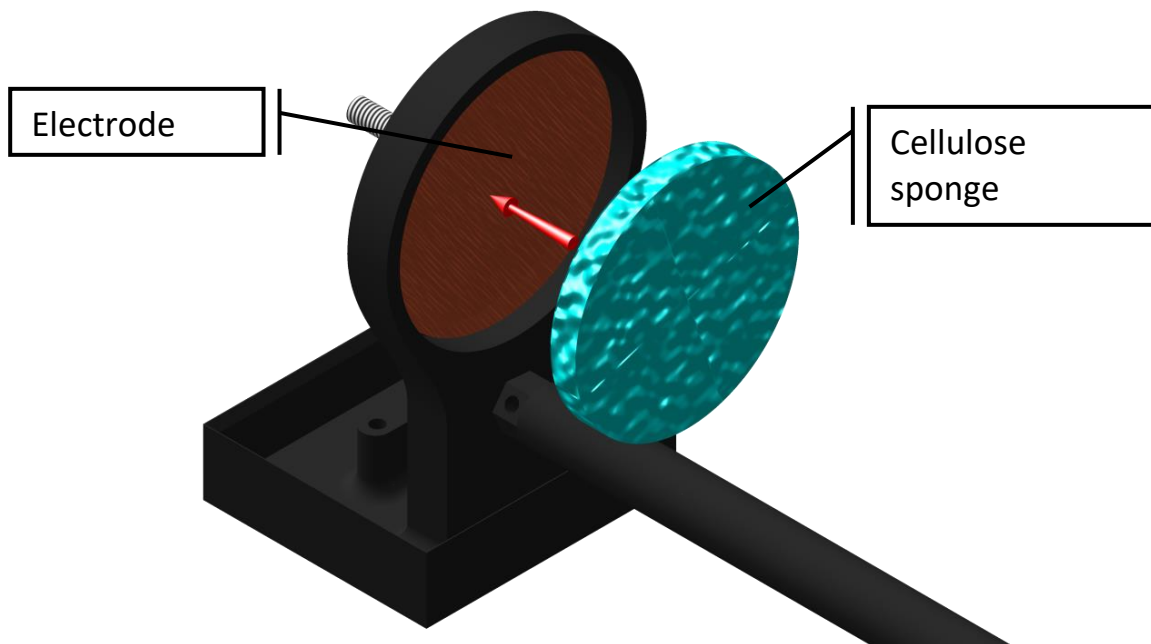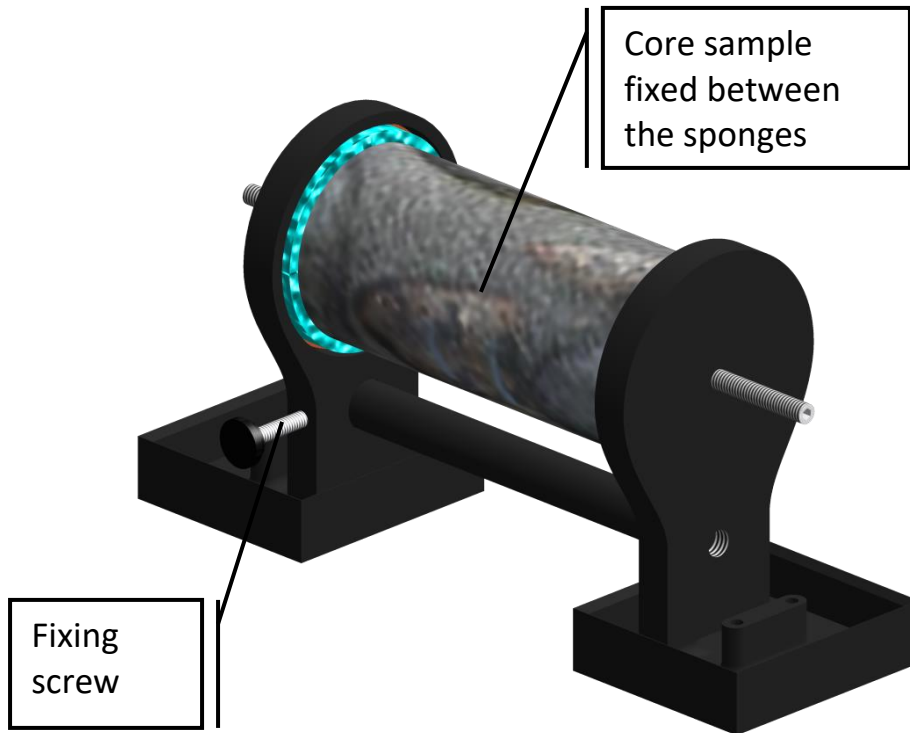
3. Place one, two or three graduated rods between the core holders depending on the size of the core sample.

4. Make sure that the sponges touch the electrodes.

Electrode

Cellulose sponge

5. Place the core sample between the sponges and affix the core holders by using the fixing screw.

Core sample
fixed between
the sponges

Fixing
screw

6. On the SCIP tester, connect Tx-A with Rx-A and Tx-B with Rx-B.

Tx-A / Rx-A   Tx-B / Rx-B
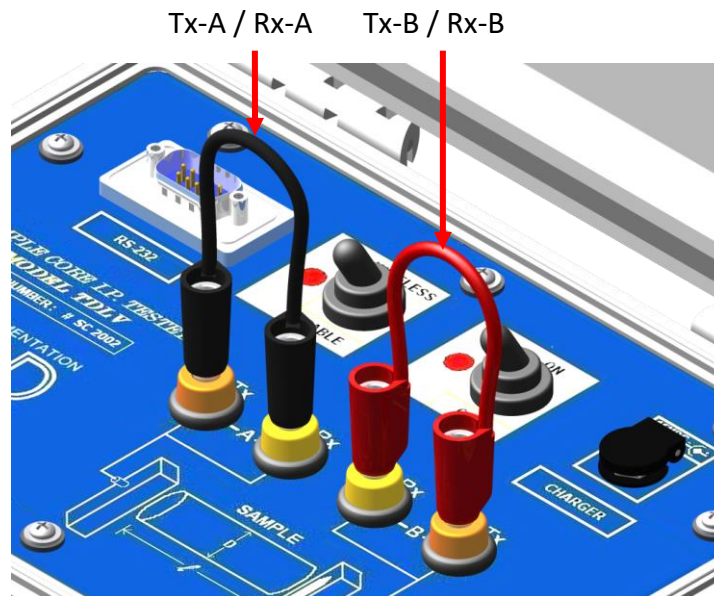
7. Connect electrodes A and B to the Core Holders.
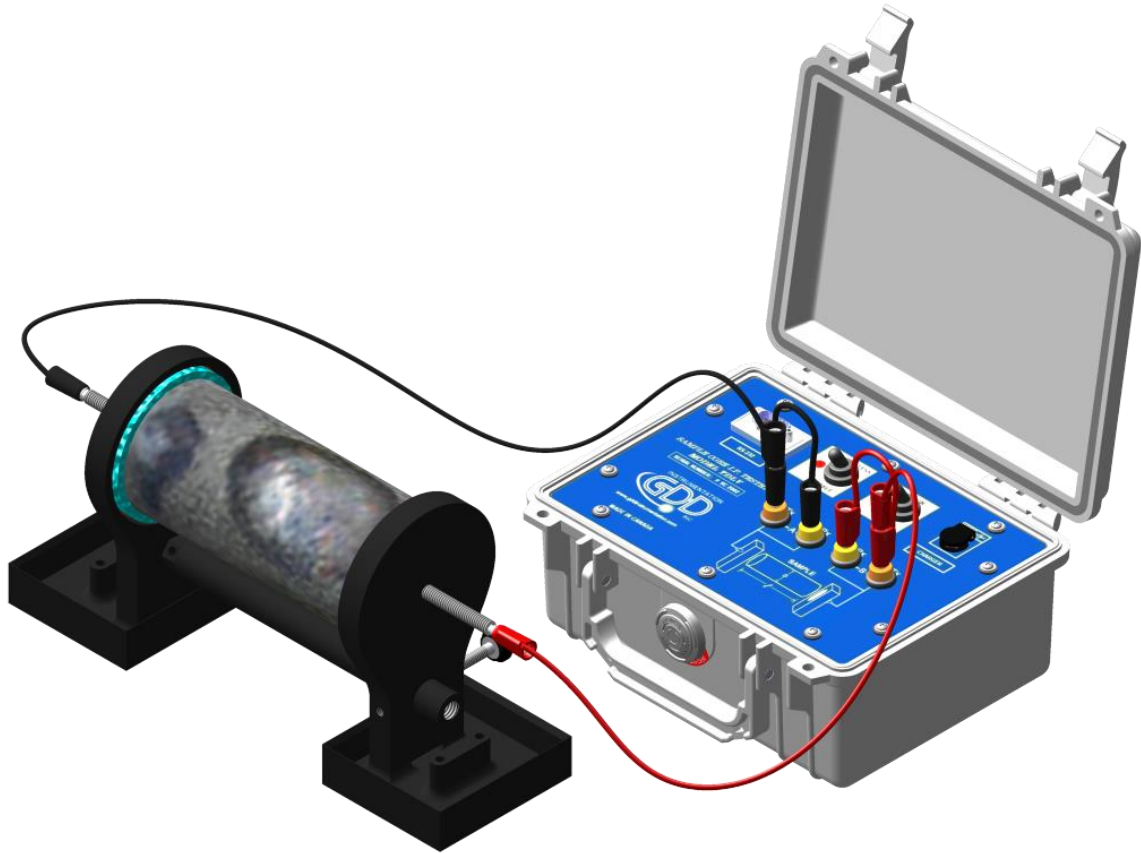
8. During the whole measurement process, **the surface between the core holders should always be completely dry**.

Dry area
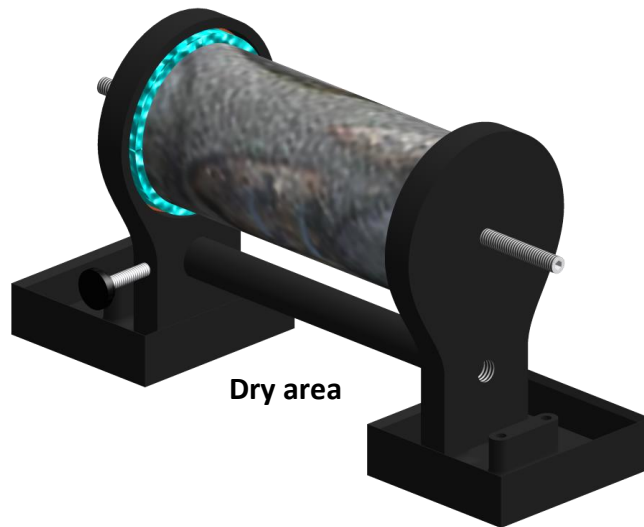
If you need four electrodes to be able to use your own core holders with the GDD SCIP tester, or to use the SCIP as a field IP Tester (see Section 8.2), use the two Tx connectors on the SCIP tester for transmitting and the two Rx connectors for receiving.
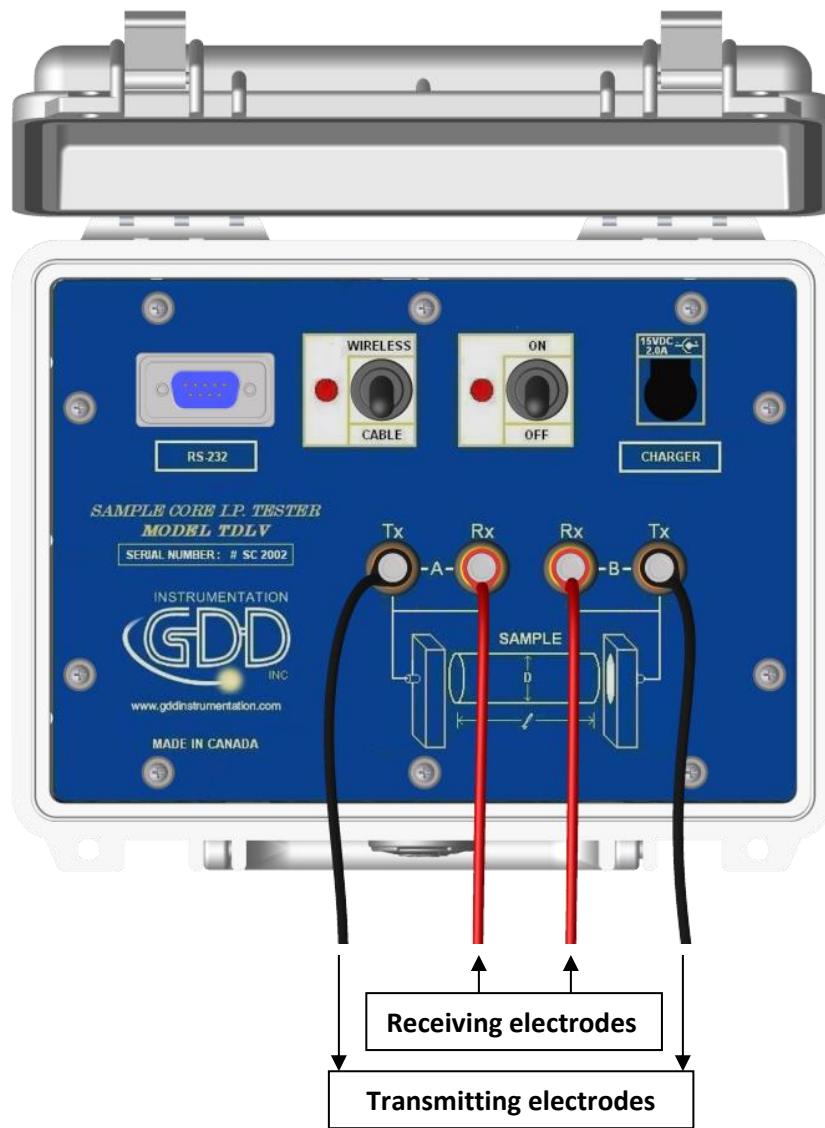
It is important to clean the Core_Holder after each use to prolong its lifespan.

Config menu contains the following commands:

Config menu
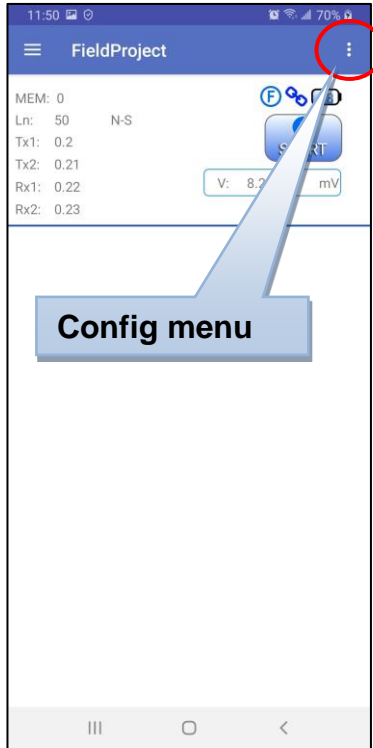
8.1 Settings

The page **General** allows to switch OFF all sound notifications in the software.
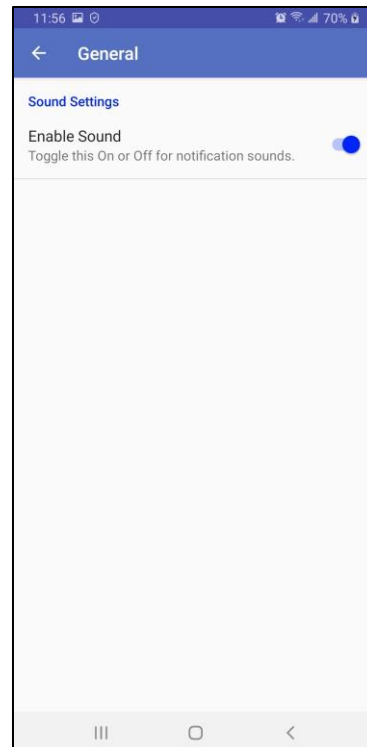
The page **Connection** allows to choose the communication mode between Serial (RS-232) and Bluetooth (Wireless). In Bluetooth mode, you can select a SCIP tester from the list of paired devices.
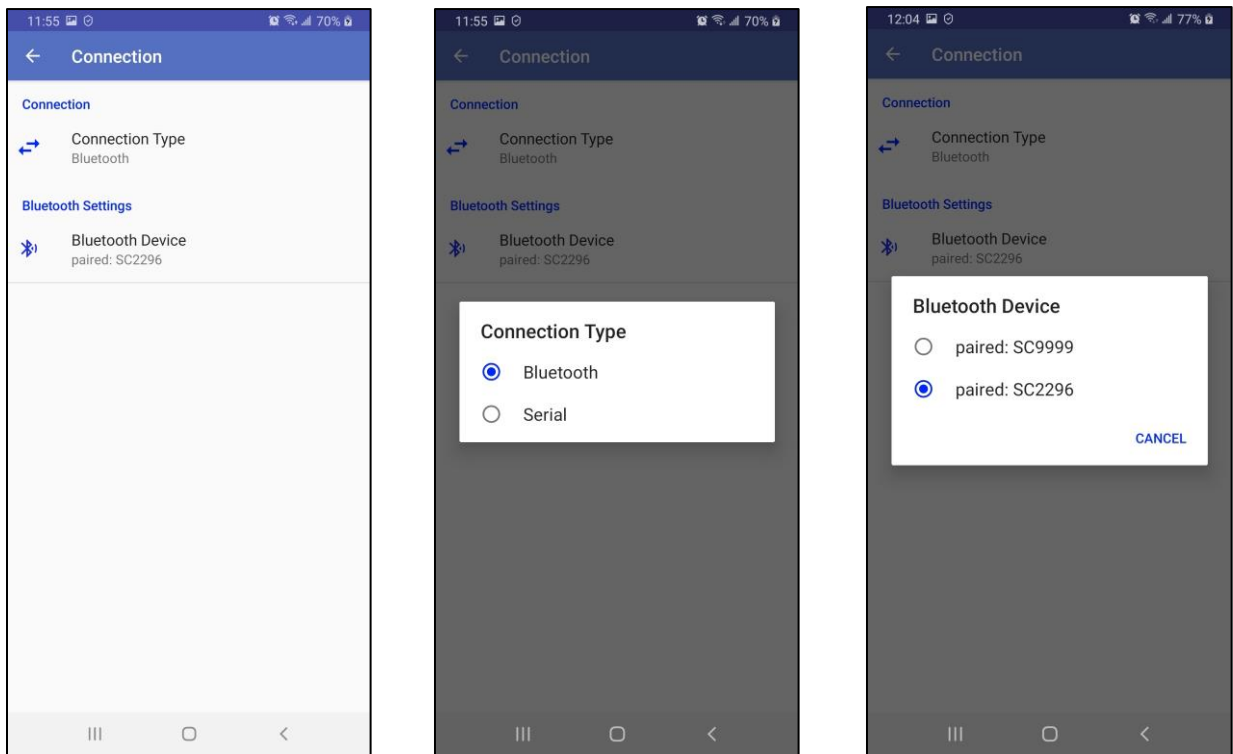
Do **Function menu**->**Reinit** if you change communication mode or you choose another SCIP tester in Bluetooth mode.

8.2 Help

This page shows you the choice of available user manuals in different languages which will be downloaded from the GDD Web site.
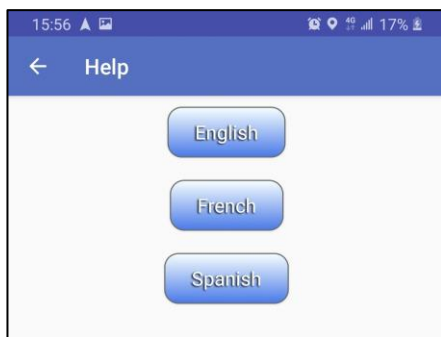
8.3 About

Here you can see the Android software version, the SCIP tester firmware version and the SCIP tester serial number.

8.4 Exit

Always use this command to exit from the software to prevent the software from staying in background memory.

Function menu contains the following commands:
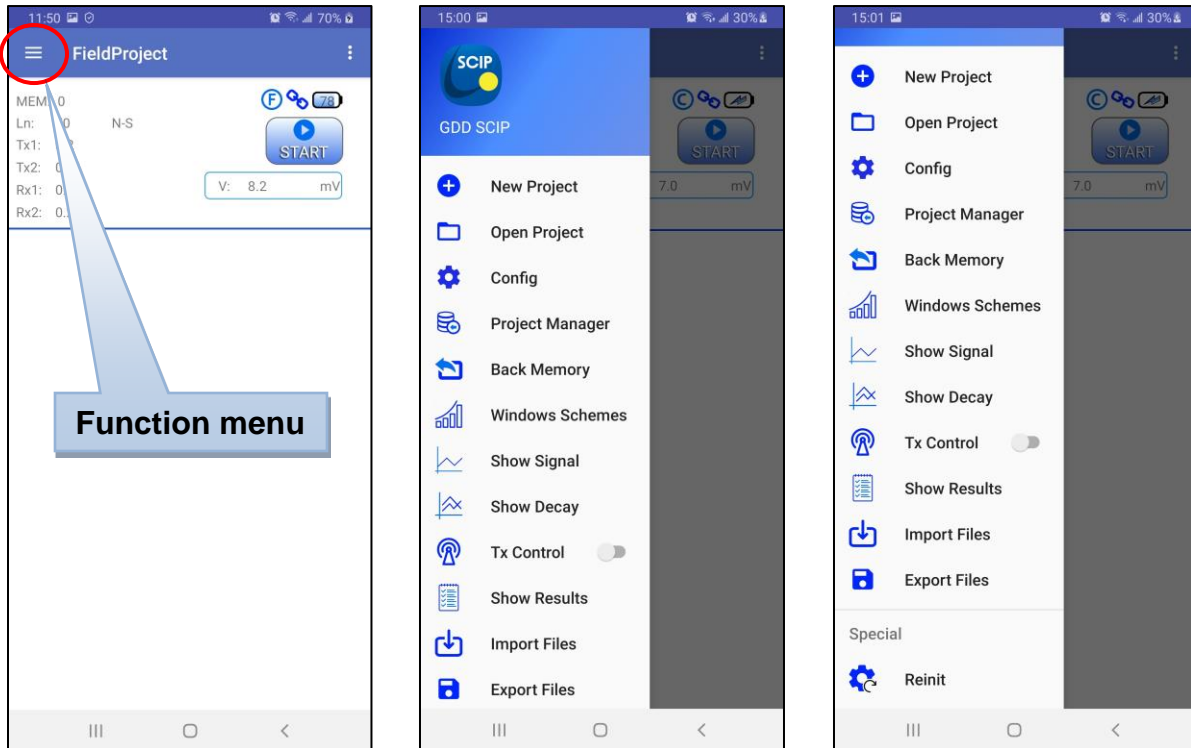
9.1 New Project

Use this command to create a new project. You have to name the project and choose the SCIP tester mode between **Core** and **Field**. The **Core** mode is used for single samples and operates with sample parameters such Diameter and Length. The **Field** mode is used for continuous readings similar to IP surveys in the field or in the borehole. You cannot mix the both modes in the same project.
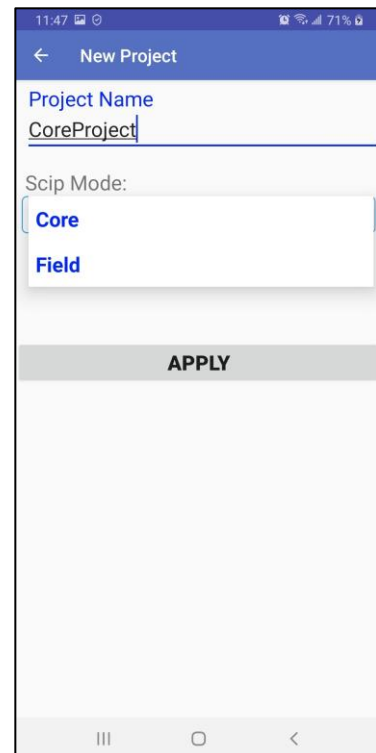
9.2 Open Project

Use this command to select a project to open. You will see all saved projects in your Android system memory. You will see also the SCIP tester mode selected for each project and the number of readings in each project. Click on desired project to open it.

9.3 Config

This command is used to configure the current reading. The *Config* window is divided on 3 tabs.

1. The **PARAMETERS** tab is different for the different SCIP tester modes (**Core** and **Field**).

   In the **Field** mode you configure the positions of your electrodes like in real IP survey in the field.

   You can use ⬅ DEC and ➡ INC buttons to move backward or forward all electrodes together with the defined **Increment**.
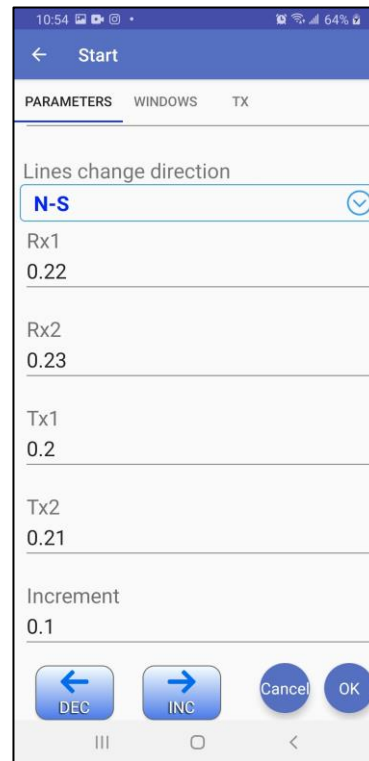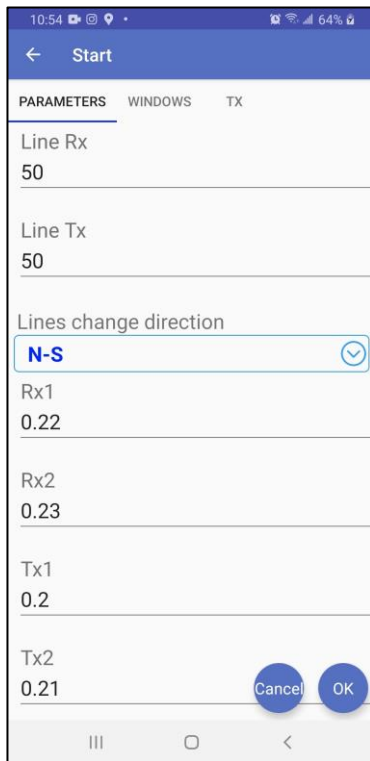
In **Core** mode you define the **Core Id**, the **Length** and the **Shape**. If your sample is **Irregular**, you have to define his **Area**, it means the average cross-sectional area. If your sample is **Cylindrical** (core sample), you have to define his **Diameter** and if the sample is **Half** (split sample) or not (full).

2. The **WINDOWS** tab is used to define the following parameters.
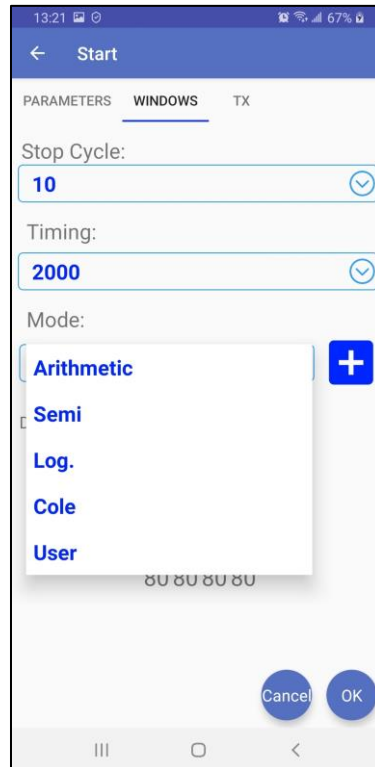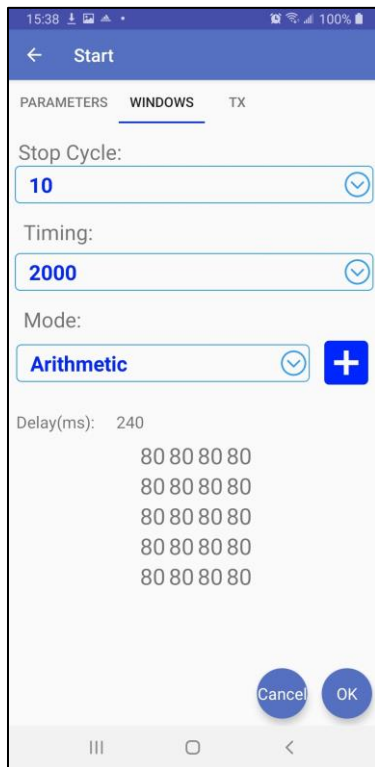
Stop Cycle - the number of cycles to run the reading automatically before the reading stops. You can stop the reading manually any time before the **Stop Cycle** is reached.

Timing – the time base in milliseconds of the transmitted signal. The time base is the time of each ON cycle and each OFF cycle.

Mode – the windows scheme used to calculate the Decay. You can use one of standard windows schemes (Arithmetic, Semi, Log., Cole) or any number of custom windows schemes.

Click ![+] button to add a custom windows scheme, see the **Chapter 9.6** for more details.

3. The **TX** tab is used to choose the transmitter mode between **Voltage** mode and **Current** mode. See **Chapter 5** to better understand how to choose the appropriate mode.
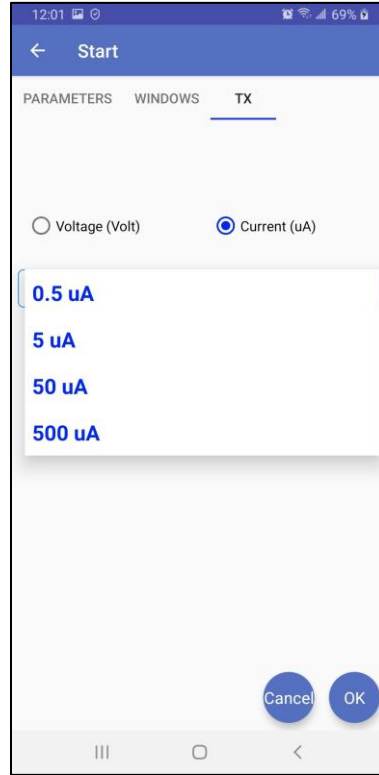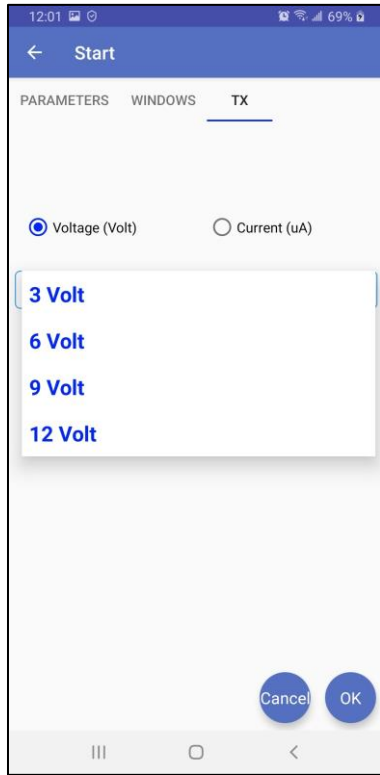
9.4 Project Manager

The **Project Manager** window allows to delete or rename existing projects.

To rename a project, press and hold your finger on the project until the following window opens.
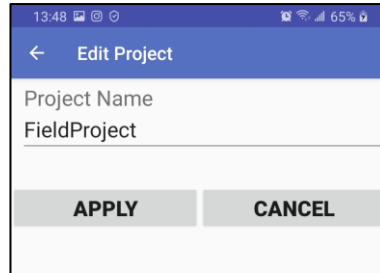
Change the name of the project and click **APPLY**.

To delete one or more projects, click on projects to select and click . You can use **Select All** button to select or deselect all projects together if you have many.
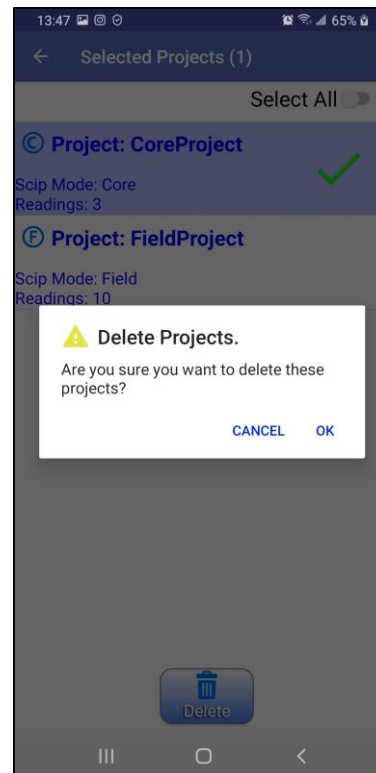
9.5 Back Memory

This command deletes the last reading in the current project.

9.6 Windows Schemes

This command opens the window which allows you to view, edit, create, delete, import and export Windows Schemes. A Windows Scheme describes the Decay curve with up to 20 windows of defined **Width (ms)** started with **Delay (ms)** from the beginning of the OFF-time. The **Time Base (s)** is the duration in seconds of each ON and each OFF cycle.

Save the current Windows Scheme if it has been modified

Import Windows Schemes from a file

Windows Scheme manager

Create a new Windows Scheme

Edit the current Windows Scheme

Make the same Decay Windows for all Time Bases

Decay Windows

You can scroll the windows in this area with your finger or stylus
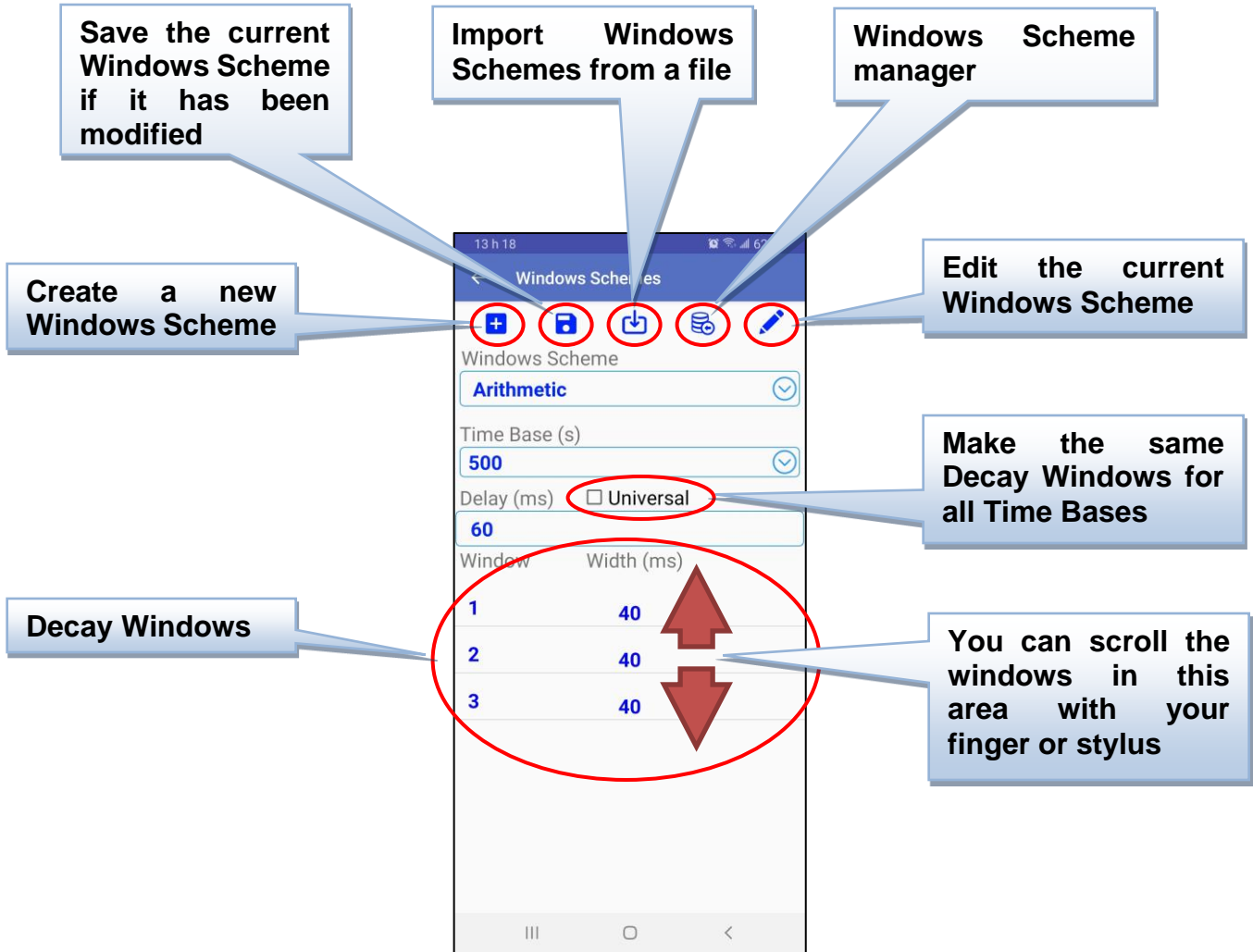
There are 4 standard Windows Schemes: **Arithmetic**, **Semi**, **Log.** and **Cole**. They are read-only. If you change a setting in these schemes, when you try to save it, you will be asked to rename the scheme to obtain a custom one (user defined scheme).

If you select **Universal** option, the Windows settings become the same for all Time Bases. The system chose the Windows settings in order to fit all Time Bases. This option is only available for user defined Windows Schemes, if you select it for one of standard Windows Schemes, you will be asked to rename the scheme for saving.

Create a new Windows Scheme button will ask you to enter a name for the new Windows Scheme, then you can edit the new created scheme to configure Windows settings.

Save the current Windows Scheme button will save the currently selected Windows Scheme if their settings have been changed. You can confirm the name to replace the settings in the existing scheme or rename the scheme to get a new custom one. You cannot save one of standard Windows Schemes, unless you rename it to get a new custom one.

Import Windows Schemes button allows to import one or more Windows Schemes from a **.wnd** file in the memory of your Android device. This way, you can exchange custom (user defined) Windows Schemes between your Android devices.

Windows Scheme manager button calls the window when you can select one or more Windows Schemes to delete or export in a **.wnd** file. The created **.wnd** file will be placed in the **\Documents\GDDSCIP** folder in the main memory of your Android device and will have the current date as name of file.
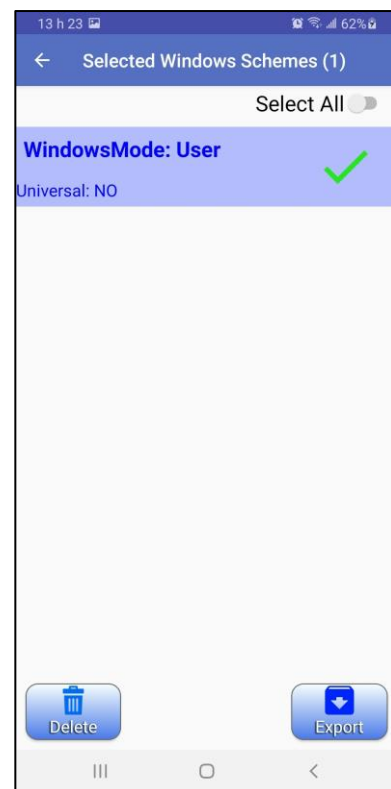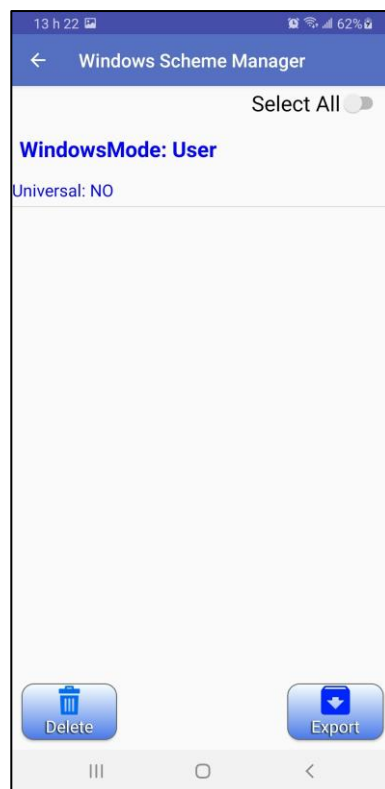
Edit the current Windows Scheme button calls the window which allows to setup Delay and Decay Windows for the selected Windows Scheme and Time Base.

Tap on Delay to change the Delay value in milliseconds.

Tap on Window line to change the Width value in milliseconds for this decay window.

Click on ADD NEW ROW button to add a decay window.

Click on 🗑 button to delete this decay window.
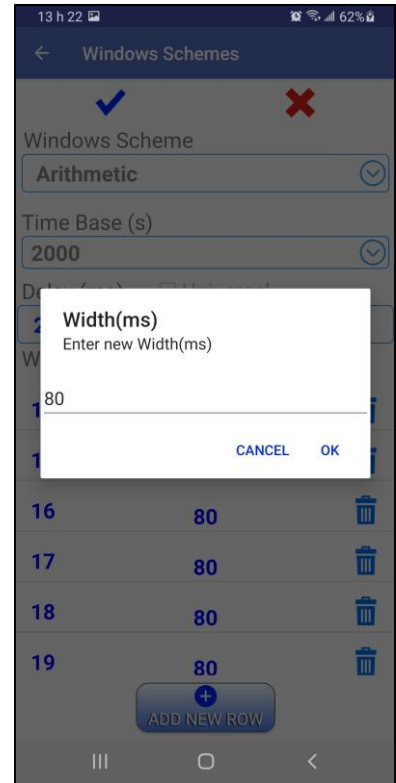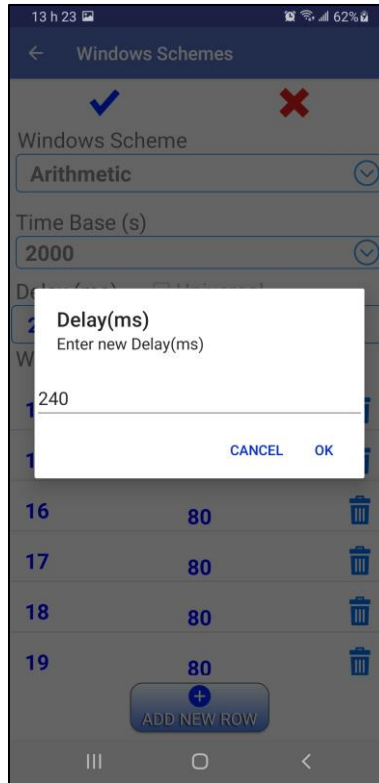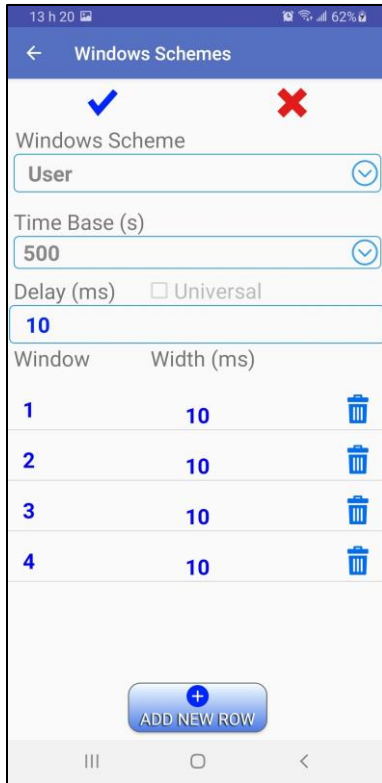
9.7 Show Signal

This command shows you the graph with the real time full waveform of the signal received by your SCIP tester.
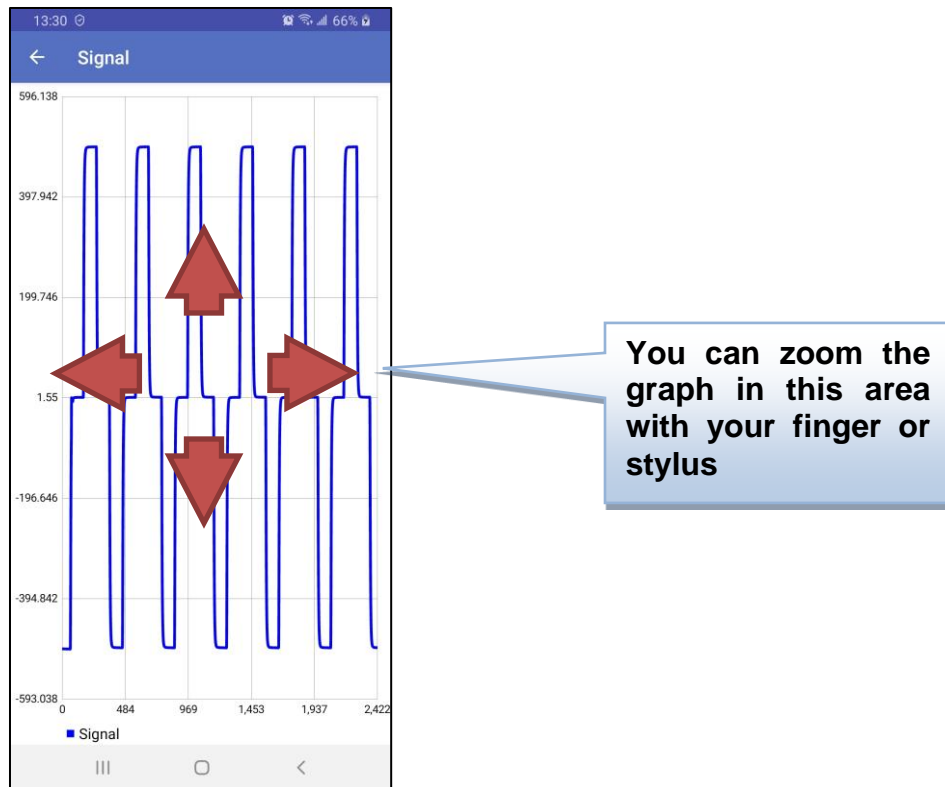
You can zoom the graph with your finger or stylus and tap on it for pausing and running the signal movement.

9.8 Show Decay

This command shows you the graph with **Decay** of the last reading or the actually measured reading. If the reading is not completed yet, the **Decay** can change from one stack to another.

Click on **All Stations** button ⊞ to view the superposed **Decay** graphs for all readings in the project which have the same configuration. That means the same windows mode, transmitter mode, same positions for **Field** mode and same name and geometry for **Core** mode. This function allows to compare the **Decay** of the actual reading with all previous readings in the same place or for the same core in order to see better any possible issues with the reading.
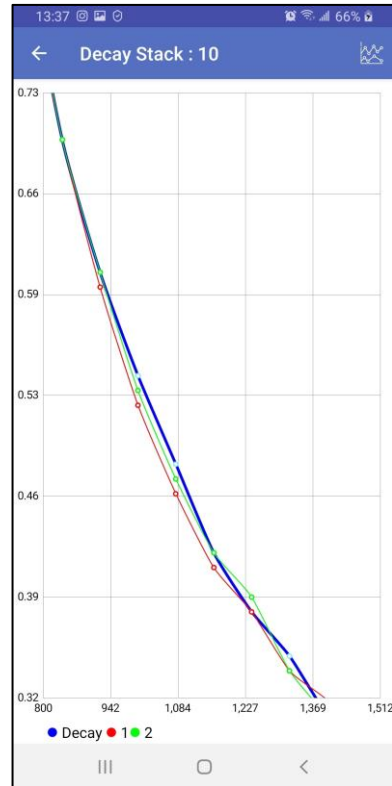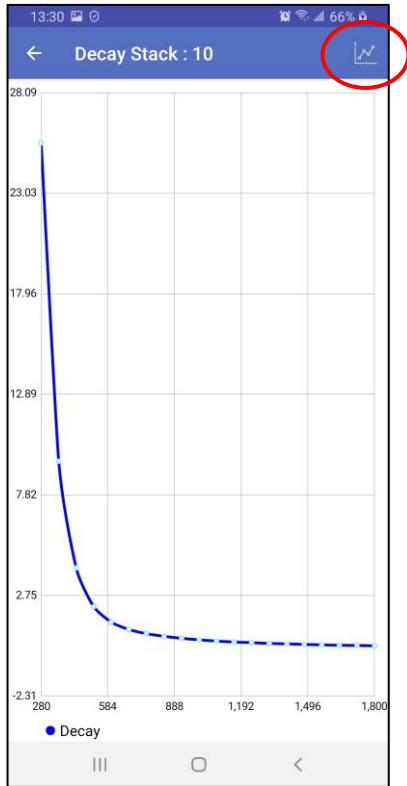
9.9 Tx Control

This command allows to use the SCIP tester as current transmitter only. You may want to use another receiver for your survey, so you can use only the transmitting function of the SCIP tester.

To call the transmitter control window click the button [ ] next to **Function menu**->**Tx Control**. When the transmitter control window is active, all main functions in the menu are disabled in order to avoid disturbing the transmitter.
If the communication with your SCIP tester is not established, this menu will be disabled.
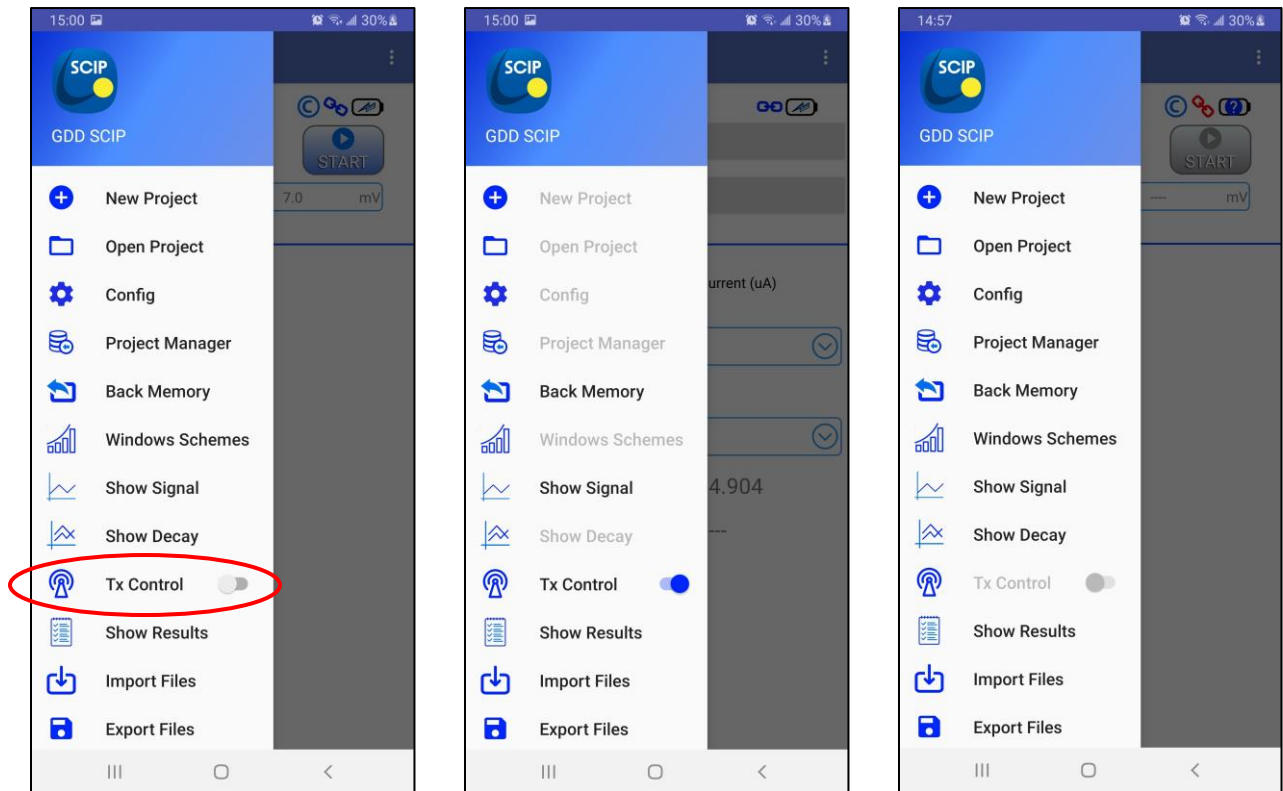
The transmitter control window has **ON/OFF** button to start and stop the transmission cycle and **CLOSE** button to close the window and get back to the main window of the software. You can also close the transmitter control window by clicking again the button [ ] next to **Function menu**->**Tx Control**.

While the transmitter is stopped, the contact resistance (**R Contact (kOhm)**) is continuously measured and shown.

Before starting the transmitter, chose the mode you want to use (**Voltage** or **Current**), voltage or current level and **Timing**, then click **ON** button.

The transmission cycle polarity will be indicated with help of **C+1**, **C0**, **C-1** points and transmitted current (**Current (uA)**) is continuously measured and shown.

The contact resistance measurement is not possible while transmitting.
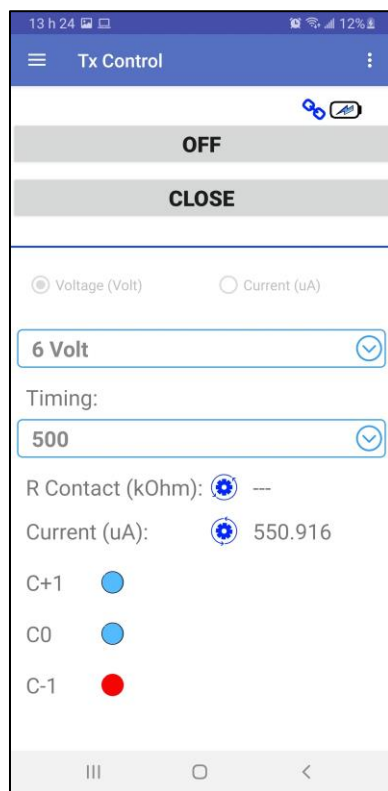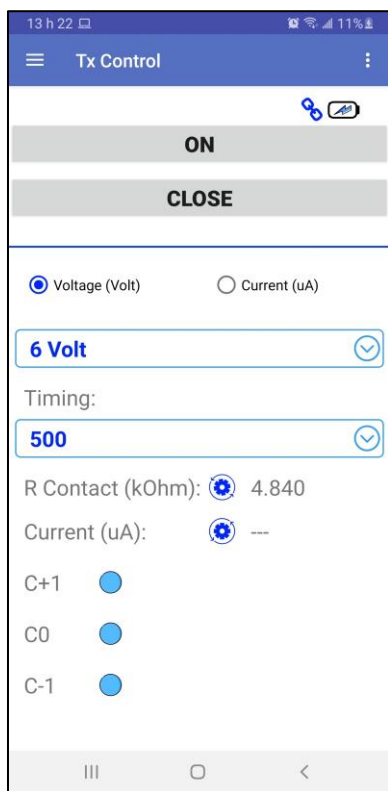
9.10 Show Results

This command is used to view all readings in the current project.

The number of rows by page is configured in the menu that can be shown and hidden by clicking ↓ button. You can also zoom the text size in this menu.
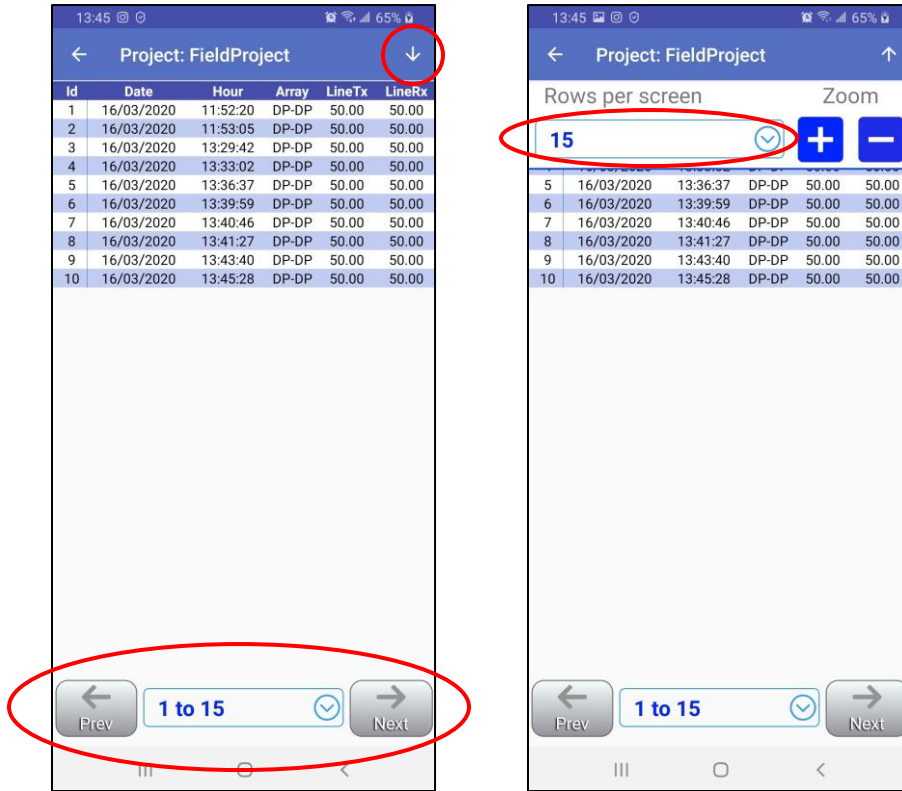
You navigate between the pages with the controls at the bottom of the screen.

To see all the text just slide the screen with your finger or stylus. The landscape screen orientation may be more appropriate to consult the readings.

You can slide the text in this area with your finger or stylus

9.11 Import Files

This command allows to migrate the memory with readings between Android devices.

When you create output data files for the selected projects (see Section 9.12) you always get **.mem** files which contain raw data with all settings associated with the readings.

Copy these **.mem** files into the target Android device, launch the SCIP software, go to the menu **Function menu**->**Import Files**, select the **.mem** files you want to import and confirm that you want to proceed or not when you see the following alert. All projects with all readings will be added into the application database.
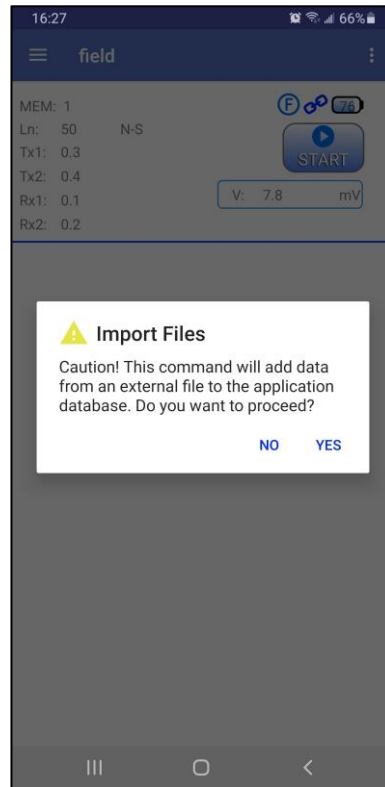
9.12 Export Files

This command is used to get output data files.
Select the projects to output and the desired output formats.

The **MEM Generic** and the **GDD Generic** formats are always selected. The **GDD Generic** is a text format while the **MEM Generic** is a binary format providing access to all information including full waveform data. The **MEM Generic** format files can be used in **GDD IP PostProcess** software to view the data, analyse the data and recalculate the data from the original full waveform signal if needed. The **Geosoft** option can be chosen to create a specific file to be imported in **Geosoft** software. Take note that in the **Geosoft** file (*.dat* file), some information as core ID, length and diameter is missing. The **Fullwave** option can be selected to create a file that contains the full waveform sampled data in text format.

Click on **Export** to create the output files. They will have the same names as projects and will appear in the **\Documents\GDDSCIP** folder in the main memory of your Android device.
Wait until the following message.
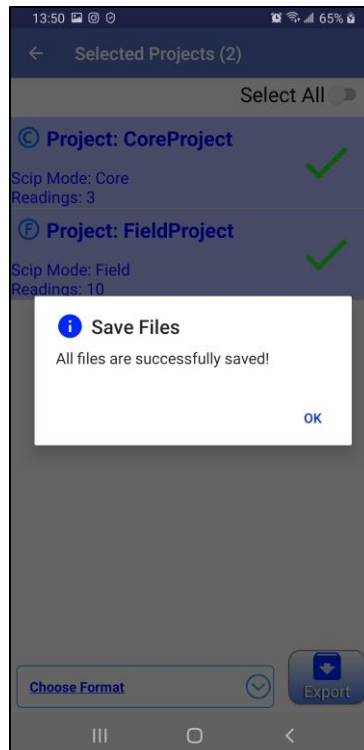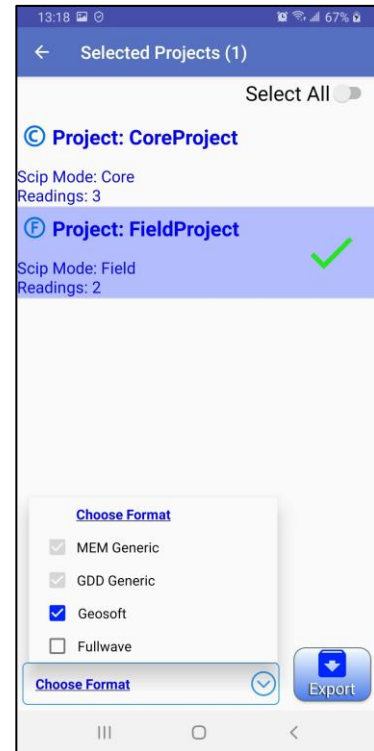
9.13 Reinit

Use this command to reinitialize the communication if you change communication mode or you choose another SCIP tester in Bluetooth mode.

10 Troubleshooting

This section explains some problems that could occur while using the SCIP tester as well as some proposed solutions.

➢ Problem :

The SCIP tester does not turn on when the On-Off switch is at 'On'.

✓ Solution :

- If the SCIP tester's battery power rating is below the critical threshold, the SCIP tester will not come on line. (See the Power section for more details.)

➢ Problem :

The message "Battery Error" appears on the main screen of the Android SCIP program.

✓ Solution :

- A problem has occurred while charging the SCIP battery: over voltage, charging under 0°C or over 45°C, the charging time was too long, the battery is defective, etc.
- Try to disconnect and re-connect the AC charger.

➢ Problem :

Android software cannot connect to the SCIP tester.

✓ Solution :

- Verify that the WIRELESS/CABLE switch of the SCIP tester correspond to the communication mode selected in the Android software.
- In Bluetooth mode, verify that the serial number of the SCIP tester chosen in the software correspond to the one you are using.

- ➢ Problem:

  Once connected to the PC with a USB cable, the Android device's memory doesn't appear as a folder.

- ✓ Solutions:

- • The solution may depend on the firmware of your Android device. Here is an example for the **Cat S42** smartphone:

  - • The smartphone Cat S42 is connected to the PC with a standard micro-USB cable.
  - • Once connected, you should see the Cat S42's memory folder in "**This PC**" folder of your computer.
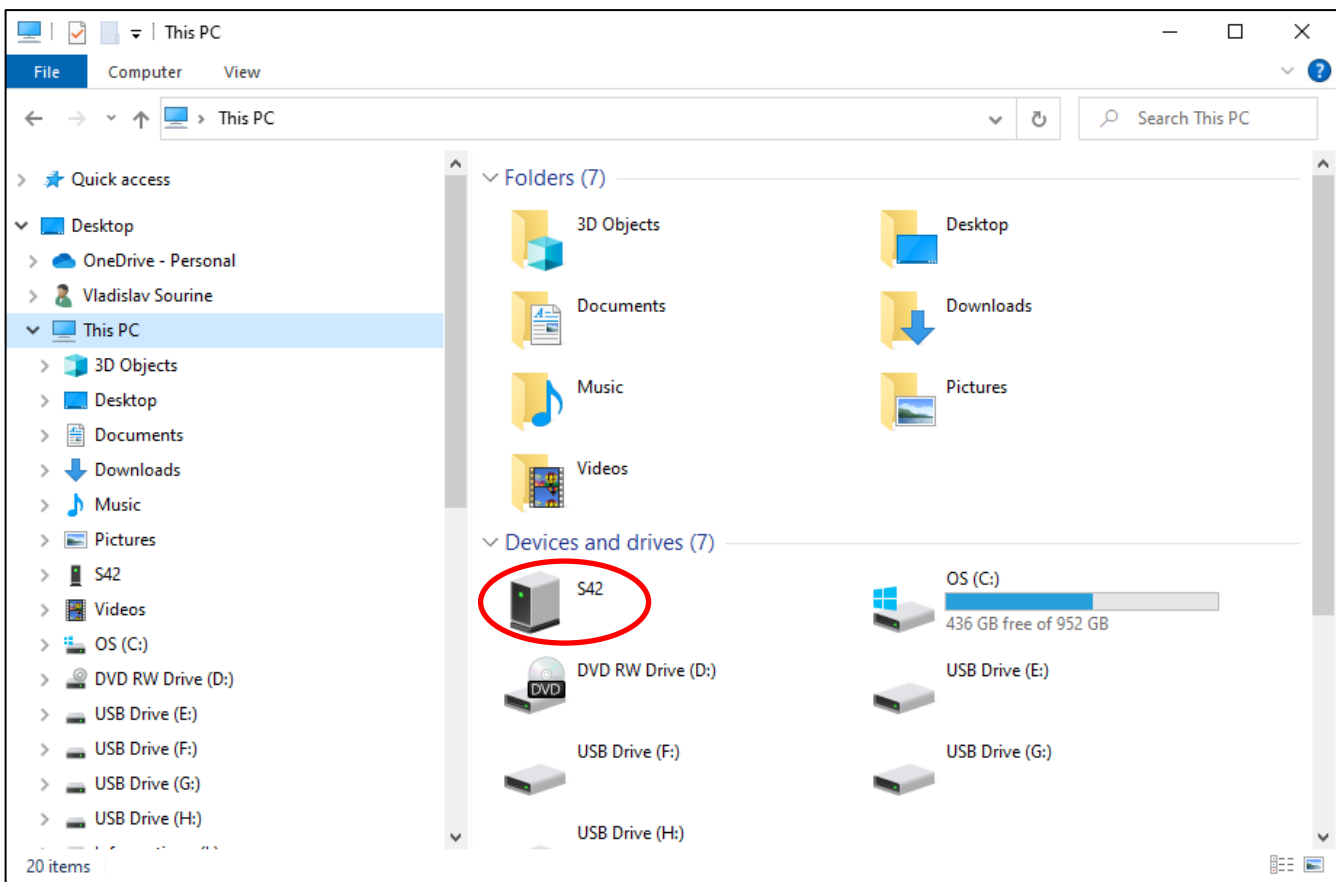
- • If the Cat S42's memory folder doesn't appear automatically, you need to follow the steps below.

- Slide the main screen of your Cat S42 from Upper edge Down.
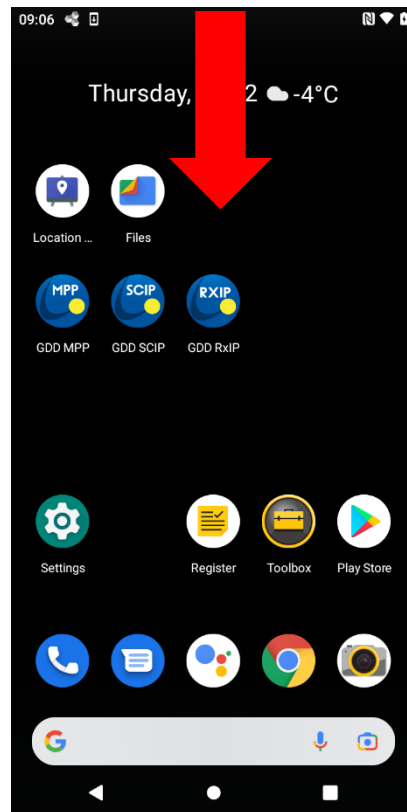
- Click on the USB connection settings then chose the **File Transfer** mode.
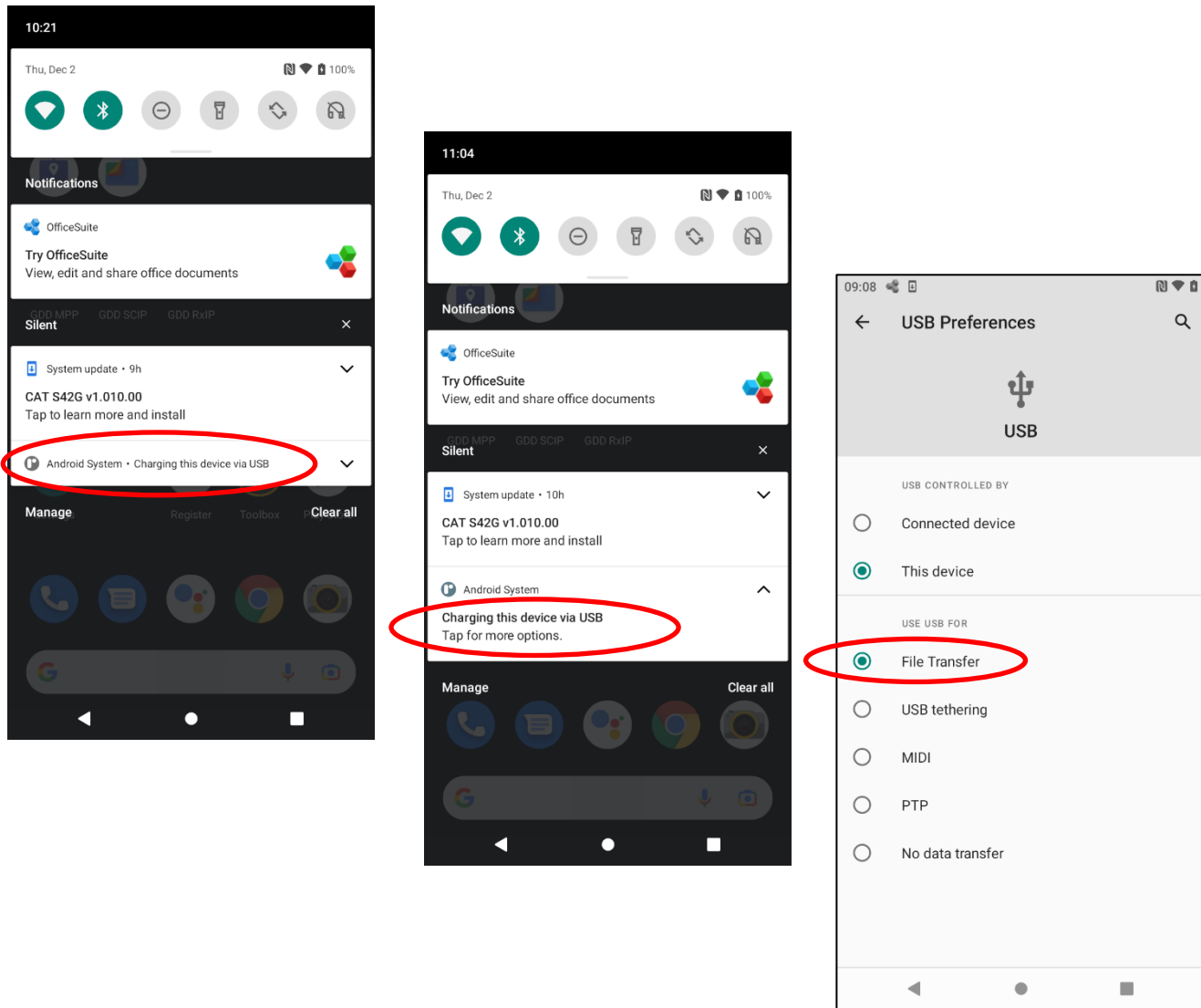
- The Cat S42's memory folder should now appear.

If you encounter a problem not described in this manual, do not hesitate to contact **Instrumentation GDD** for help at:

Tel.:   (418) 478-5469

Toll free line: 1 877 977-4249
e-mail: info@gddinstruments.com

Emergency out of business hours:

:   Home phone: (418) 657-5870
                                     Cell phone: (418) 261-5552

Any GDD SCIP tester that breaks down while under warranty or service will be replaced free of charge upon request for the duration of repairs, except for shipping fees. This service is subject to instrument availability but we have been able to honour this commitment up to now.

The output data file format is different for **Core** SCIP tester mode and **Field** SCIP tester mode.

Core mode:

	Mem	CoreID	S(mm2)	D(mm)	I(mm)	Half	Date	Hour	Contact	Rho	Vp	ErrVp	M	ErrM	I(uA)	Time	Stack	TxMode	M01	M02
	1	100k-1u	------	10	100	No	08/03/2019	13:15:12	38.8	77.79	2977.013	0.034	11.157	0.019	30.056	2000	5	3V	98.653	51.812
	2	100k-1u	------	10	100	No	08/03/2019	13:15:13	37.3	77.79	5950.866	0.022	14.592	0.013	60.085	2000	5	6V	118.61	67.509
	3	100k-1u	------	10	100	No	08/03/2019	13:15:14	37.1	77.8	8917.195	0.022	16.046	0.011	90.024	2000	5	9V	123.81	73.554
	4	100k-1u	------	10	100	No	08/03/2019	13:15:15	37.4	77.77	11884.28	0.068	16.115	0.012	120.014	2000	5	12V	120.3	73.197
	5	100k-1u	------	10	100	No	08/03/2019	13:15:16	37.4	77.88	49.437	0.002	6.121	0.047	0.499	2000	5	0,5uA	57.939	26.368
	6	100k-1u	------	10	100	No	08/03/2019	13:15:17	38.1	78.1	495.31	0.047	7.185	0.006	4.981	2000	5	5uA	68.571	32.283
	7	100k-1u	------	10	100	No	08/03/2019	13:15:18	38	77.74	4946.918	0.449	13.508	0.019	49.977	2000	5	50uA	112.77	62.662
	8	100k-1u	------	10	100	No	08/03/2019	13:15:19	37.2	77.78	12036.084	0.127	16.026	0.011	121.543	2000	5	500uA	119.58	72.771
	9	10k-10u	------	10	100	No	08/03/2019	13:15:20	3.5	7.84	2733.82	0.007	10.469	0.003	273.801	2000	5	3V	98.132	49.862
	10	10k-10u	------	10	100	No	08/03/2019	13:15:21	3.5	7.84	5464.376	0.047	12.46	0.003	547.156	2000	5	6V	111.48	59.561

Project: Quality Test
Windows: 20 Setting: Arithmetic Delay (ms): 240 Timing (ms): 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80,
Version PPC: 1.7.2.0 Version SCIP: 0.2.4.1 SCIP SN: 2297

Field mode:

	Mem	Date	Hour	Array	LineTx	LineRx	Dir	n	Tx1	Tx2	Rx1	Rx2	Contact	Rho	Sp	SpMin	SpMax	Vp	ErrVp	Sym(%)	M	ErrM	I(uA)	Time	Stack	TxMode	M01	M02
	1	08/03/2019	13:15:12	DP-DP	0	0	N-S	1	1	2	3	4	38.8	77.79	-1.6	-1.6	0.3	2977.013	0.034	100	11.157	0.019	30.056	2000	5	3V	98.653	51.812
	2	08/03/2019	13:15:13	DP-DP	0	0	N-S	2	1	2	4	5	37.3	77.79	-1.5	-1.6	0.2	5950.866	0.022	100	14.592	0.013	60.085	2000	5	6V	118.61	67.509
	3	08/03/2019	13:15:14	DP-DP	0	0	N-S	3	1	2	5	6	37.1	77.8	-1.5	-1.5	0.2	8917.195	0.022	100	16.046	0.011	90.024	2000	5	9V	123.81	73.554
	4	08/03/2019	13:15:15	DP-DP	0	0	N-S	4	1	2	6	7	37.4	77.77	-1.6	-1.6	0.2	11884.28	0.068	100	16.115	0.012	120.014	2000	5	12V	120.3	73.197
	5	08/03/2019	13:15:16	DP-DP	0	0	N-S	5	1	2	7	8	37.4	77.88	-1.5	-1.6	0.3	49.437	0.002	100	6.121	0.047	0.499	2000	5	0,5uA	57.939	26.368
	6	08/03/2019	13:15:17	DP-DP	0	0	N-S	6	1	2	8	9	38.1	78.1	-1.4	-1.6	0.4	495.31	0.047	100	7.185	0.006	4.981	2000	5	5uA	68.571	32.283
	7	08/03/2019	13:15:18	DP-DP	0	0	N-S	7	1	2	9	10	38	77.74	-1.4	-1.5	0.2	4946.918	0.449	100	13.508	0.019	49.977	2000	5	50uA	112.77	62.662
	8	08/03/2019	13:15:19	DP-DP	0	0	N-S	8	1	2	10	11	37.2	77.78	-1.5	-1.6	0.2	12036.084	0.127	100	16.026	0.011	121.543	2000	5	500uA	119.58	72.771
	9	08/03/2019	13:15:20	DP-DP	0	0	N-S	9	1	2	11	12	3.5	7.84	-1.5	-1.5	0.2	2733.82	0.007	100	10.469	0.003	273.801	2000	5	3V	98.132	49.862
	10	08/03/2019	13:15:21	DP-DP	0	0	N-S	10	1	2	12	13	3.5	7.84	-1.6	-1.6	0.2	5464.376	0.047	100	12.46	0.003	547.156	2000	5	6V	111.48	59.561

Project: Quality Test
Windows: 20 Setting: Arithmetic Delay (ms): 240 Timing (ms): 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80
Version PPC: 1.7.2.0 Version SCIP: 0.2.4.1 SCIP SN: 2297

Header:

Project:	Name of your project

Windows:	Number of windows (depending on the selected mode)
Settings:	Selected mode
Delay:	Delay in ms before the first window (depending on the selected mode)
Timing:	Timing of each window (depending on the selected mode)

Version PPC:	Version of the SCIP program on the PDA
Version SCIP:	Version of the SCIP tester software
SN:	Serial number of the SCIP tester

Readings:

|	
Mem:	Memory number
Core ID:	Sample name or number
S(mm²):	Cross-sectional area of the none core sample in **mm²**
D(mm):	Diameter of the core sample in **mm**
l(mm):	Length of the sample in **mm**
Half:	Half or full core sample
Date:	Date when the reading was taken
Hour:	Hour when the reading was taken
Array:	Electrical array (Pole-Pole, Dipole-Dipole, etc.)
LineTx:	Position of the transmitter line in **m**
LineRx:	Position of the receiver line in **m**
Dir:	Transmitter and receiver lines direction (North-South, East-West)
n:	Number of Rank of dipole
Tx1:	Position of the first transmitter electrode in **m**
Tx2:	Position of the second transmitter electrode in **m**
Rx1:	Position of the first receiver electrode in **m**
Rx2:	Position of the second receiver electrode in **m**
Contact:	Sample resistance in **kOhm**
Rho:	Resistivity of the sample in **Ohm*m**
Sp:	Average self potential during the reading in **mV**
SpMin:	Minimum self potential during the reading in **mV**
SpMax:	Maximum self potential during the reading in **mV**
Vp:	Voltage at the edges of the sample in **mV** (must be under 13V)
ErrVp:	Standard deviation of the Vp
Sym(%):	Symmetry of the signal in **%**
M:	Chargeability of the sample in **mV/V**
ErrM:	Standard deviation of M
I(uA):	Current sent by SCIP in **uA**
Time:	Transmitter timing in **ms**
Stack:	Number of stacks
TxMode:	Transmitter mode (voltage – 3V, 6V, 9V, 12V or current – 0.5uA, 5uA, 50uA, 500uA)
M01 – M20:	Windows of chargeability

Data from SCIP
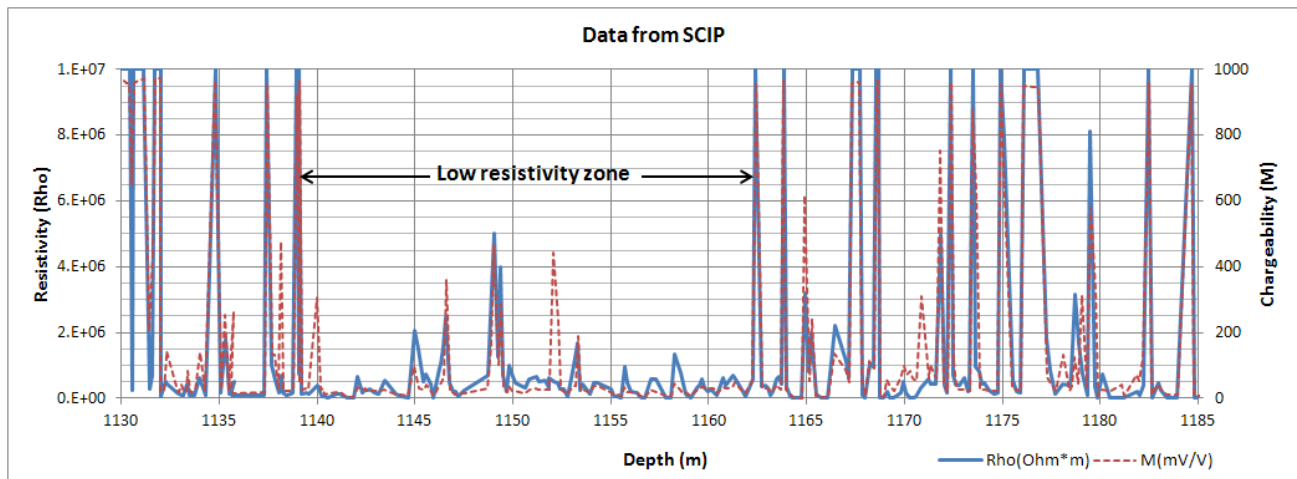
We can note that when the resistivity increases the chargeability increases also. In certain conditions it is useful to calculate a normalized chargeability. This normalization is the metal factor, MF. The MF parameter is the ratio between the chargeability and the resistivity. For a high chargeability with a low resistivity the ratio increases allowing a better discrimination to define metallic mineralization (graphite). However, metallic minerals (sulfides) are often disseminated with a high chargeability corresponding to a high apparent resistivity, in which case the MF parameter is less useful. The metal factor generally used is MF = M *1000 / Rho.

Annex 3 – Using SCIP Tester with a borehole probe

Get apparent resistivity and chargeability (IP) measurements by using SCIP with a borehole probe. It's easy to use, compact, and fast with low power consumption. SCIP is rugged, portable and can be used under any field conditions. Plus, it provides real-time feedback of your ore physical properties.

The GDD SCIP probe has four electrodes which allow sending current (Ix) and reading voltage (Vp). Since the probe is foldable, the length can be reduced from 1.67 meters to 0.68 meter to facilitate transport. You can build your own or use the GDD SCIP probe.
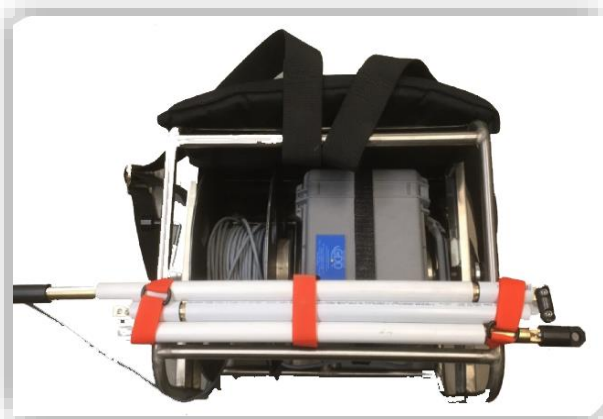
The borehole SCIP probe is very useful for detail IP surveys in drill holes. The probe can be used in Dipole-Dipole or Wenner configuration according to the electrode connections.
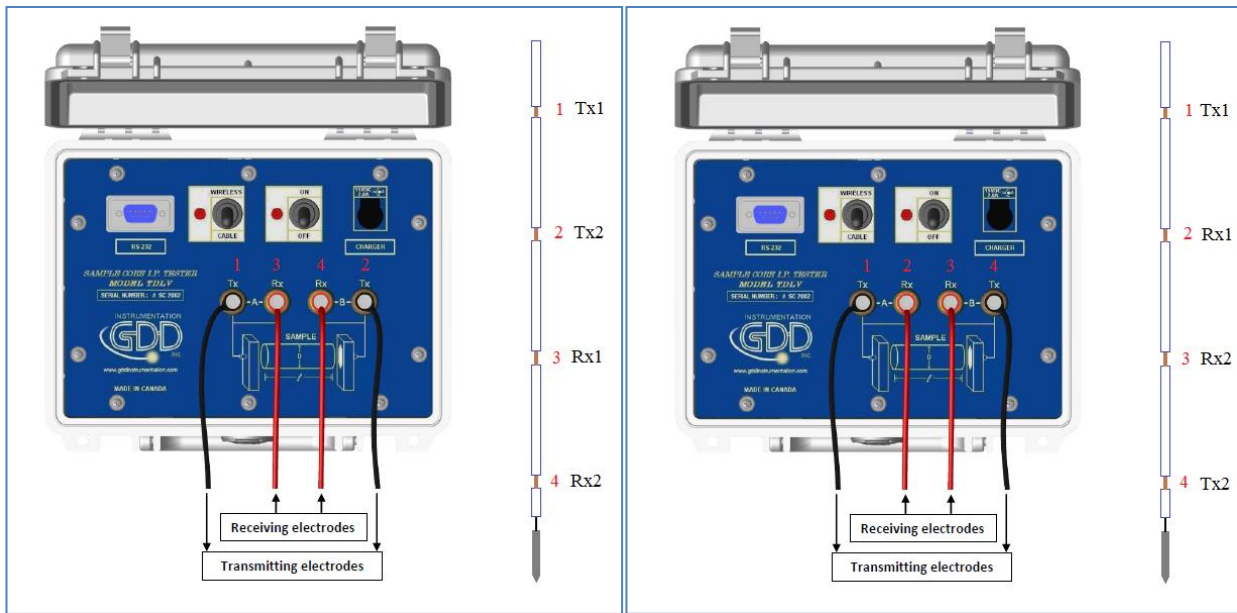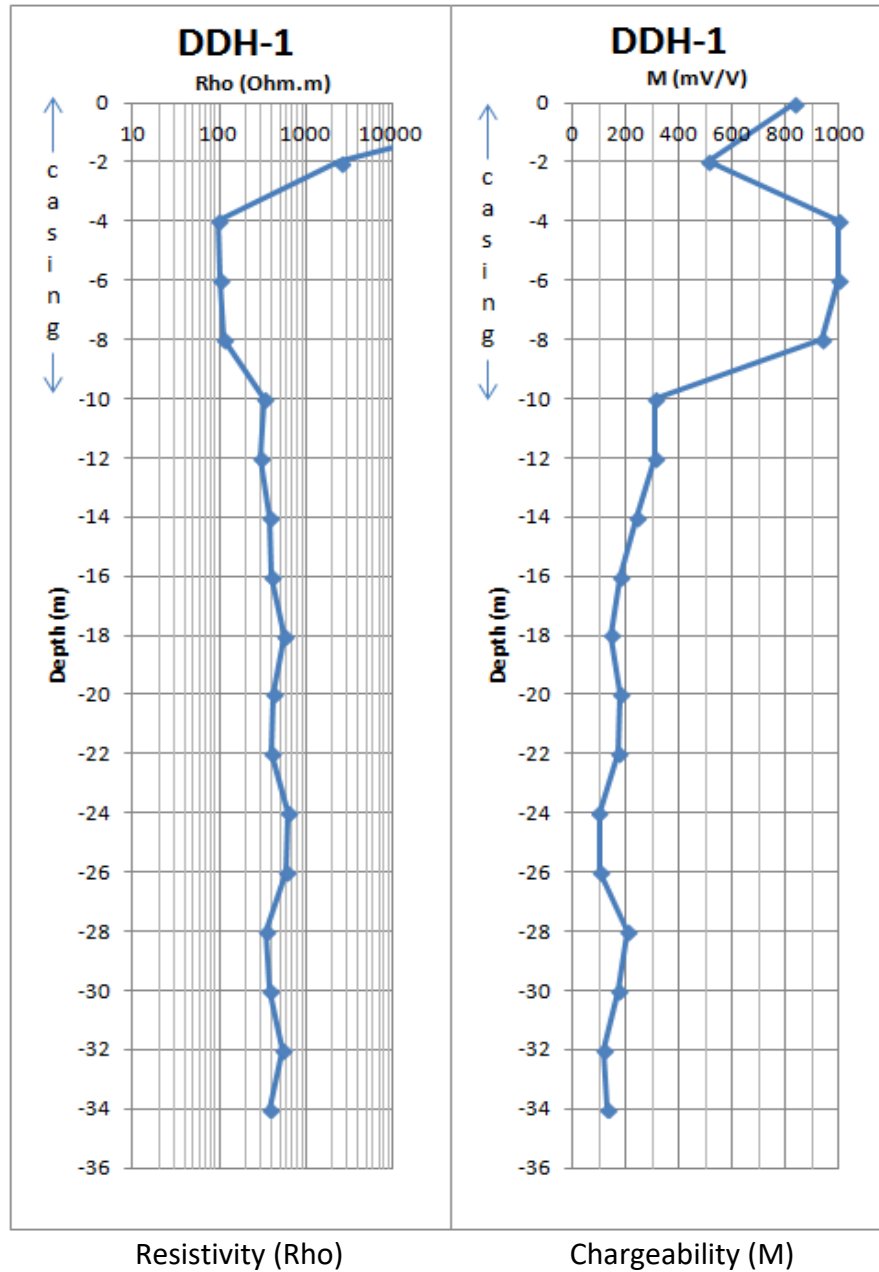

Dipole-Dipole configuration   Wenner configuration

Note: in Dipole-Dipole configuration, electrodes 1 and 2 are transmitting current and electrodes 3 and 4 are receiving voltage. In Wenner configuration, electrodes 1 and 4 are transmitting and electrodes 2 and 3 are receiving.

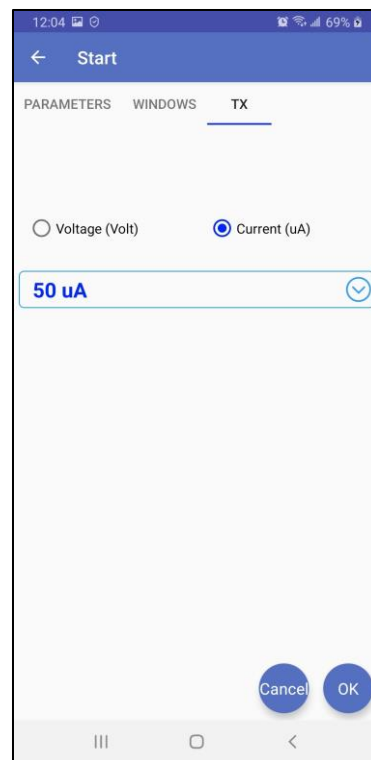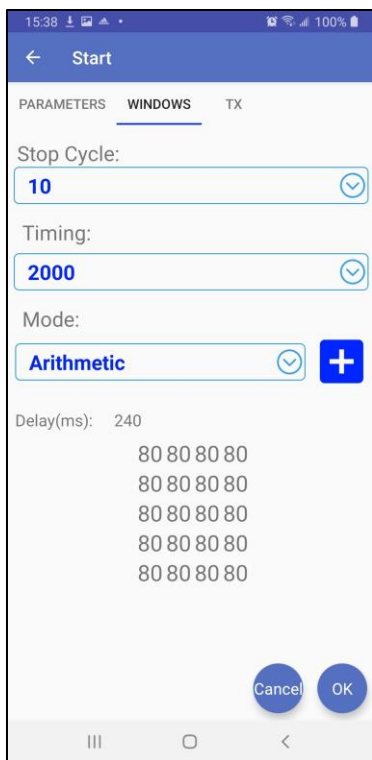Profile example with the GDD SCIP borehole probe.

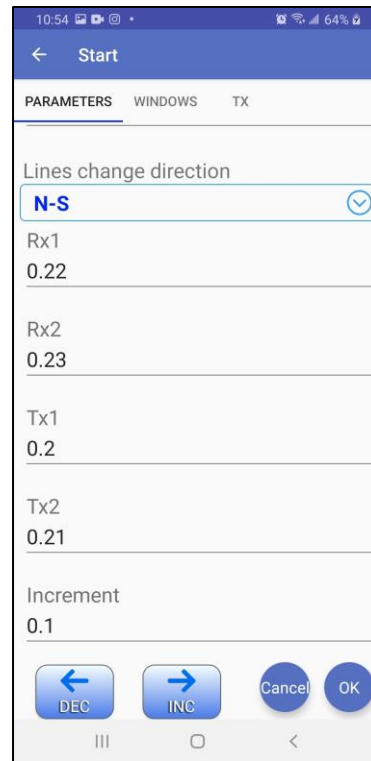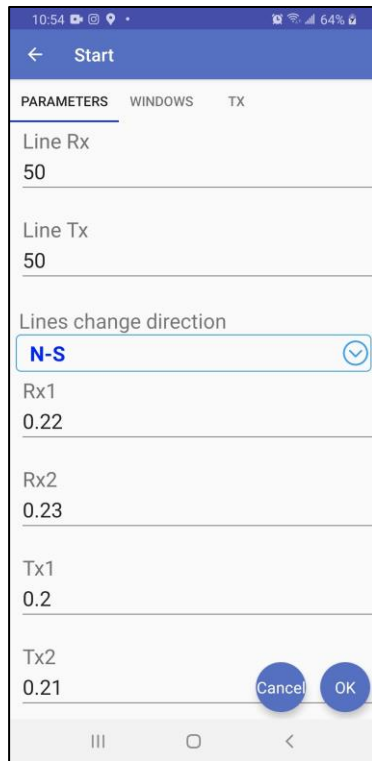Resistivity (Rho)   Chargeability (M)

To begin a survey, create a project in **Field** mode.

Click on **START** to verify the contact between your receiving electrodes and then click on **NEXT** if you want to continue the reading.
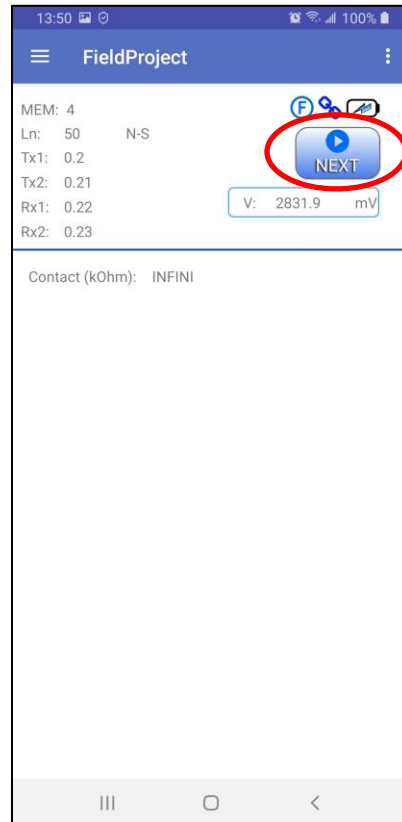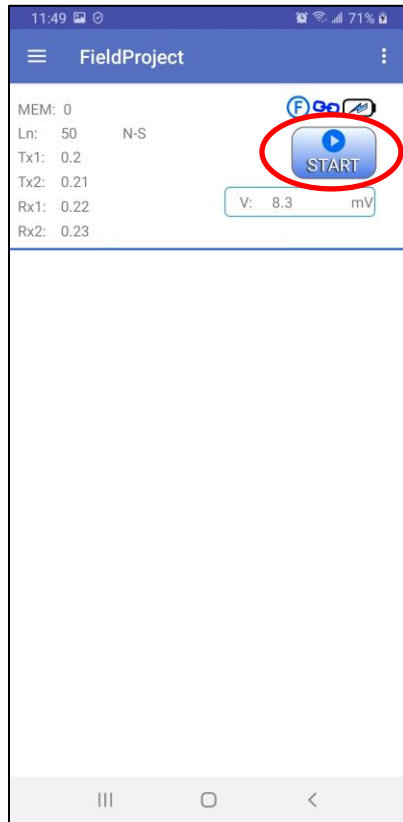
The following windows appears. Configure your reading as described in **Chapter 9.3**.

The **PARAMETERS** tab allows you to fill the fields: Lines (Tx-Rx, should be the same with borehole probe), Stations (Tx-Rx) and the Increment (displacement). You can use ![DEC] and ![INC] buttons to move backward or forward all electrodes together with the defined Increment when you take consecutive readings.

The **WINDOWS** tab allows you to select Stop Cycle, Timing and Windows Mode.

The **TX** tab allows you to select Voltage or Current at the transmitting electrodes. For borehole survey, we suggest the Current mode.

Click **Ok** to continue reading. Once the reading is synchronised, you will see results on the main screen. You can wait for the number of stacks defined in configuration (Stop Cycle) then it will stop automatically or stop it any time with ![STOP] button.