

EMpower Data Management



Recording Library.....	2
Processing Data	11
Advanced Search	21
Processed MT Data	25
Processed data editing	32
Processed PNT Data	38
Tools	41
Technical Support	47



Recording Library

Creating / Opening a Project	3
Importing Data/ Drag and Drop	4
Visual Representation of Sites	5
Verifying/Editing Recording Information	6
View Recording Details	7
Recording Details and QC	8
Multi-Selection tools	9
Export Recording	10

Creating / Opening a Project

1. Start **EMpower**

2. Click **Manage**

3. Open or Create a New Project

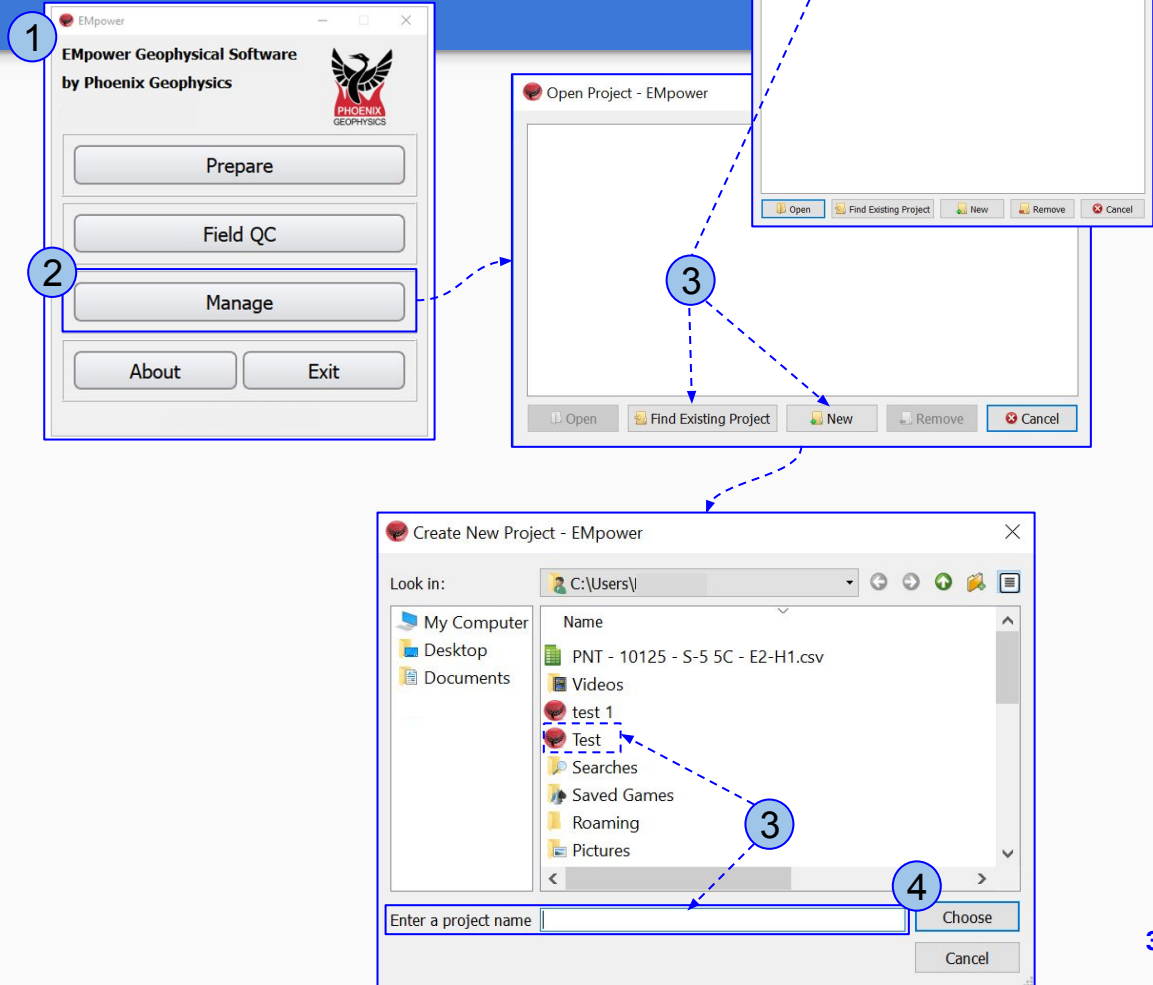
To Open an Existing Project

- Click **Find Existing Project** or select from the list (*previously used*)
- Select the Project

To create a New Project

- Click **New**
- Type the Project Name

4. Click **Choose**



Importing Data / Drag and Drop

Importing Data

1. Select **Import Recordings** from **File** menu
 - Select the recording and click **Choose**

Drag and drop

2. Select the **recording folder** in the **File Explorer** window
3. Drag and drop the **Recording data** to the Timeline or Map
4. Wait until charging is completed

1

2

3

4



To add a recording from the **SD Card**

- Insert **SD card** in the computer SD Card slot or use an external USB memory card reader

Visual Representation of Sites

- **Imported recordings are shown in three synchronized views**

- Timeline
- Map
- Recording information

- **Visual tracking**

Green	Approved
Yellow	Unapproved
Red	Rejected

The screenshot displays the EMpower software interface for a 'D.C. Nevada 2017 Test'. It features three main views:

- Timeline:** A horizontal view showing recording events for various stations (e.g., MTU-5C-10116, MTU-5C-10125, MTU-5C-10127, MTU-5C-10128) with colored bars indicating their status (Green for Approved, Yellow for Unapproved, Red for Rejected).
- Map:** A geographical map showing the location of the recording sites. A yellow circle highlights the location of 'S7_1 5C' on the map.
- Recording list:** A detailed view for the selected recording 'S7_1 5C (21 h 32 m 56 s)'. It includes fields for Status (Unapproved), Tools (Time Series, Spectra, Process (Orthogonal)), and Recording Information (Recording ID, Start time, Duration, Survey name, Station name, Operator(s), Company name, Layout Geometry, Declination, Notes).

Below the recording information, there are tables for Electric Channels and Magnetic Channels, showing parameters like Distance (m) to GND, Resistance (Ω), Gain, LFF [Hz], and DC [V].



Selecting a recording in any of the views will automatically update the recording information in the other views

Verifying/Editing Recording Information

The layout and recording information can be consulted and edited using the recording list

1. Review the Recording Information

- Edit the enabled fields, if required

⚠ If a warning is found, consult the [DAA24 System Troubleshooting manual](#)

2. Review the following information:

- Declination
- Dipole length
- The **Azimuth** at which the E and H sensors were laid out
- Use the External filter selector to indicate if an accessory was used during the recording. For details about each specific accessory, consult the manual of such accessory.
- The correct **Calibration** sensor will show a green mark

3. Review the information on **View Recording Details** (see next page)

4. To add more information (such as pictures, documents etc.) click the **Attachments** button

5. Export (see page 12)

Status: Approved Unapproved Rejected

Tools: Time Series Spectra Process (Orthogonal)

Recording Information

Recording ID: 10501_2022-06-27-160923
Start time: Jun 27 2022 09:09:23 (Local) Eastern Daylight Time (GPS -07:00)
Duration: 33 m 57 s
Survey name: Nevada June 2022
Operator(s): EE/DF/JT
Company name: Phoenix Geophysics
Layout Geometry: Scalar CSAMT
Declination: 0.00°
Notes:

Electric Channels

Channel	(+) N / E	(-) S / W	Polarity	(+) N / E	(-) S / W	Gain	LPF [Hz]	DC [V]
E1	50.00	34.50	<input type="checkbox"/> Inverted	4824.383	3345.035	4 x 1 = x4	10000	-0.022
E2	50.00	49.00	<input type="checkbox"/> Inverted	2684.518	3053.859	4 x 1 = x4	10000	-0.019

E Azimuth: 0.00° External Filter: None

Magnetic Channels

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-155	MTC-155	53729	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	-0.011
H2	MTC-155	MTC-155	53739	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	-0.03
H3		N/A		<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	N/A	N/A	N/A

H1-H3 Azimuth: 0.00°

View Recording Details Attachments (0) Export

View Recording Details

Ensure these levels are within acceptable limits:

1. Battery Voltage
2. Internal Temperature
3. Number of Satellites
4. Saturated Frames

- If saturation is not close to ~0%, review the channel configuration (see page 5), the gain might be too high and/or there is artificial noise on your site

5. Time Series Level

Recording Details: 10155_2019-04-24-085903 - EMpower

Recording Details		Timing Details	
Recording ID:	10155_2019-04-24-085903	Start Time:	Wed Apr 24 12:46:40
Survey Name:	10155 MT	Stop Time:	Thu Apr 25 00:00:00
Station Name:		Duration:	22 h 58 m 50 s
Company Name:		Latitude:	37.679°N
Receiver Type:	MTU-5D	Longitude:	123.792°E
Instrument Serial:	10155	Altitude:	1119.23 m
Operator:			

Instrument Info

OS Version: v1.27.1

Motherboard Model: BMB01-G

Motherboard Serial: 03100B

Battery: Low: 12.44 V, High: 12.869 V Details

Temperature: Low: 20°C, High: 38°C Details

Decimation

Recorded 0.1 seconds at 96000 samples/s every 60 seconds,
1 second at 24000 samples/s every 60 seconds,
and continuously at 150 samples/s

GPS Timing Card

Serial Number: 200188 Firmware Version: 00010029X

Model: BTM01-I # of Satellites: 7 - 12 satellites Details

Channels Details						
	Tag	Board S/N	Model	Firmware	Sat	Signal Ranges
1	E1	201462	BCM03-B	1001a	0 %	View Levels
2	E2	201427	BCM03-B	1001a	~0 % - Yellow	View Levels
3				1001a	0%	View Levels
4				1001a	0%	View Levels

1. Battery Voltage

2. Internal Temperature

3. Number of Satellites

4. Saturated Frames - E2

5. Time Series Level - E1

Recording Details and QC

1. The **Time Series** and **Spectra** shows the data available for QC

2. **Data Type** allow to switch between different data sampling rates (96K / 24K / 150 Hz)

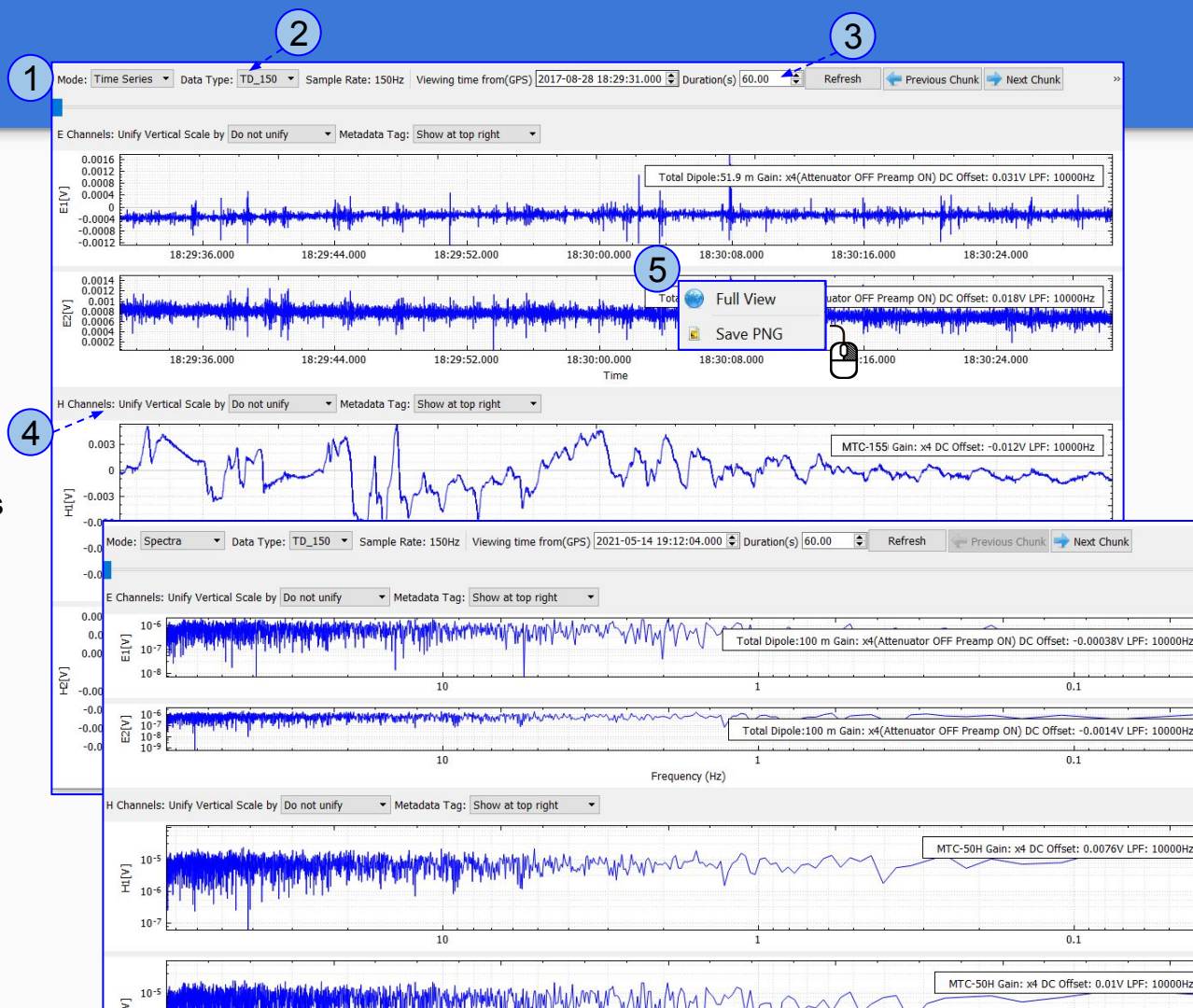
3. Define the duration in the plot

- Select or type the date and/or time as needed and refresh the plot

4. The **Unify Vertical Scale by**, allows to visualize by Channel scale


5. **Exporting**

- Right-click on the plot
- Save PNG




Multi-Selection tools

1. Use the **Line Selection** tool for specific sites

 Hold down the left-click and draw the line over the sites on the map

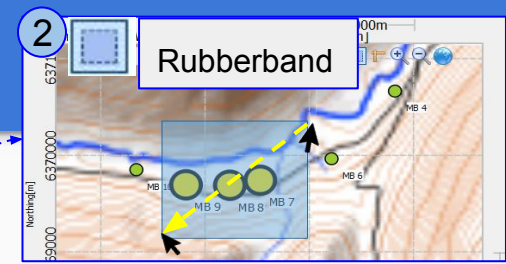
2. Use the **Rubberband** for large ranges

 Hold down the left-click and drag over the sites on the map (*ensure to cover entirely all the sites needed*)

3. After selecting more than one recording in the Recording Library, the list of those recordings will appear on the right of the map

4. Use the selection to

- Add recordings to a group
- Multi-Rec Edit
- Export Time Series
- Delete recordings



Recording Library

Recording Type	Station Name	Survey Name	Start Date	Status
MT	S-5 5C	Don Campbell	2017-12-01	Unapproved
MT	S6 5C	Don Campbell	2017-12-02	Unapproved
MT	S7_1 5C	Don Campbell	2017-12-03	Unapproved
MT	S7_2 5C	Don Campbell	2017-12-04	Unapproved

Line Selection

Add to group

Export Selected

Test

Add to new group

Export (4)

Multi-Rec Edit (4)

Delete (4)

Export Recording

Select the Recording(s) from the Timeline, Recording Library or Map

**To export multiple recordings, see [Groups and filters](#)*

1. Use **Export Recordings**

- Right-click over the timeline or map
- **Export** button

2. Choose the Exporting Format

3. The recording(s) not supporting by JSON format will be market in red

The screenshot illustrates the export workflow in three steps:

- Step 1:** The user navigates to the 'Export Recordings' option in the 'File' menu. A right-click on the map also provides an 'Export Selected' option.
- Step 2:** The 'Export Recordings - EMpower' dialog is shown. The 'Exporting Format' section has 'Text format time series (JSON)' selected. A red dashed box highlights a recording in the 'Target Recordings' list that is not supported by the selected format.
- Step 3:** The 'Export Recordings - EMpower' dialog is shown again, but this time the 'Recording metadata report (CSV)' format is selected. The recording highlighted in red in the previous step is now supported and is no longer highlighted in red.

Channel	(+) N / E	(-) S / W	Polarity	(+) N / E (-) S / W	Gain	LPF [Hz]	DC [V]
E1	20.00	20.00	<input type="checkbox"/> Inverted	2827.515 1583.146	8 x 1 = x8	10000	-0.011
E2	20.00	20.00	<input type="checkbox"/> Inverted	3394.245 2759.743	8 x 1 = x8	10000	-0.0017

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-155	MTC-155	53094	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	0.0015
H2	MTC-155	MTC-155	57330	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	-0.025
H3		N/A		<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	N/A	N/A	N/A



Processing Data

Processing MT Data	12
Process Site Creation wizard (Electric)	13
Process Site Creation wizard (Magnetic)	14
Process Site Creation wizard (Reference) ...	15
Processing Timeframe / Parameters	16
Robust Template / Processing Queue	17
How to identify a reverse polarity	18
Magnetic Channels Corrections	19
Electric Channels Corrections	20

Processing MT Data

From the Recording Library tab:

1. Choose a recording to process
2. Review the Layout Geometry
3. Run the Process Site Creation Wizard, selecting:

Wizard, selecting:

- Electric Components
- Magnetic Components
- Reference Channels
- Processing Timeframe
- Processing Parameters

**These steps will be explained in the Following pages*

Verify that there is not a warning icon on the left of the channels or next to the Recording ID

The screenshot displays the software interface for processing MT data. At the top, the 'Recording Library' tab is active, showing a list of recordings with status icons (green checkmarks for approved, red X for rejected). A recording 'S7_1 5C' is selected, highlighted in orange. Below the library is a map showing the location of the recording site 'S7_1 5C' in a remote area. The map includes a scale bar and a north arrow. To the right of the map is the 'Process (Orthogonal)' wizard configuration panel. This panel includes fields for 'Recording ID', 'Start time', 'Duration', 'Survey name', 'Station name', 'Operator(s)', 'Company name', 'Layout Geometry', 'Declination', and 'Notes'. Below these are sections for 'Electric Channels' and 'Magnetic Channels', each with a table of channel parameters including distance to GND, resistance, gain, LPF, and DC voltage. The 'Electric Channels' table has columns for Channel, Distance (m) to GND, Resistance (Ω), Gain, LPF [Hz], and DC [V]. The 'Magnetic Channels' table has columns for Channel, Sensor, Detected, Serial #, Cal, Polarity, Gain, LPF [Hz], and DC [V]. A red circle with an exclamation mark is overlaid on the 'Status' section of the wizard, indicating a warning icon.

Process Site Creation wizard

Electric components

1. Select the recording with the desired electric lines from the Map, Timeline or Drop-down list
2. **Review / Edit** the E-Channel details
 - 2.1. Use the **Select Manually** button to change the Channel Selection (Ex/Ey)
 - 2.2. To change or add details use the **Edit** button
3. The **Navigation Bar** will display the components of the processed site being created
4. Click Next to continue

The screenshot displays the 'Process Site Creation - S7_2_5C - EMpower' interface. At the top, a table lists recordings with columns for date and recording ID. A recording 'S7_2_5C - 10125' is selected. Below the table is a map of the region around Calgary, Alberta, Canada, with a yellow dot indicating the recording location. A blue 'P' icon is placed next to the recording name on the map. To the right, the 'E-Channel details' panel shows configuration options for Ex and Ey channels, including dipole length, resistance, and calibration serial. A 'Select Manually' button is visible. Below this, a larger 'Channel Selection' dialog box is shown, allowing the user to choose between Ex and Ey channels. At the bottom, a navigation bar displays the site components and a 'Next' button. A legend at the bottom right explains the status icons: a blue 'i' for 'good to process', a yellow warning triangle for 'no available calibration file', and a red exclamation mark for 'no two mandatory electric channels'.

When a recording is selected, the letter **P (Primary)** will appear next to the channel name

The recording is good to process

The recording does not have an available calibration file

The recording does not have two mandatory electric channels

Process Site Creation wizard

Magnetic Channels

If the desired magnetic channels are in the same recording

1. Keep the option **Use magnetic channels from the same recording as electric channels** selected
2. Use **Select Manually** to modify as needed and click **Next**

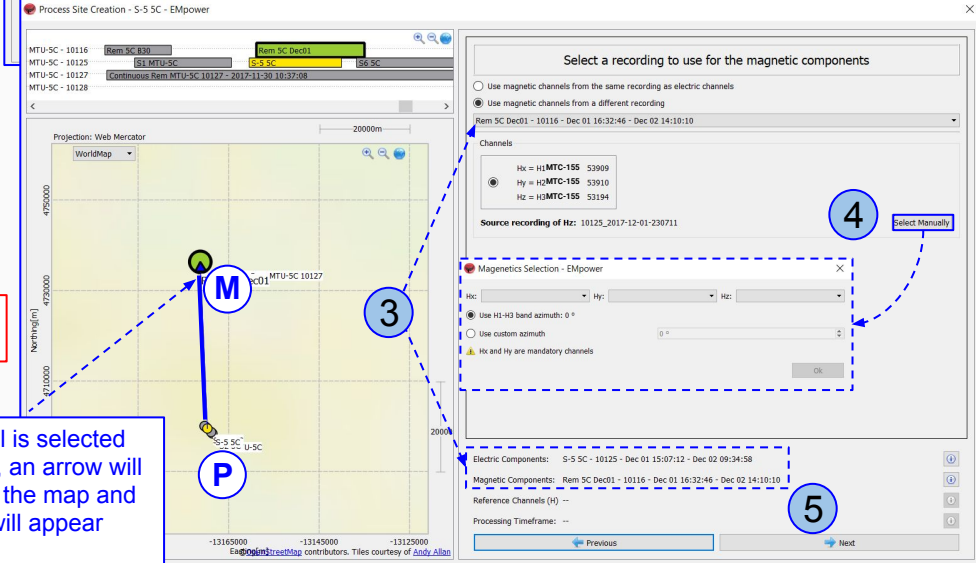
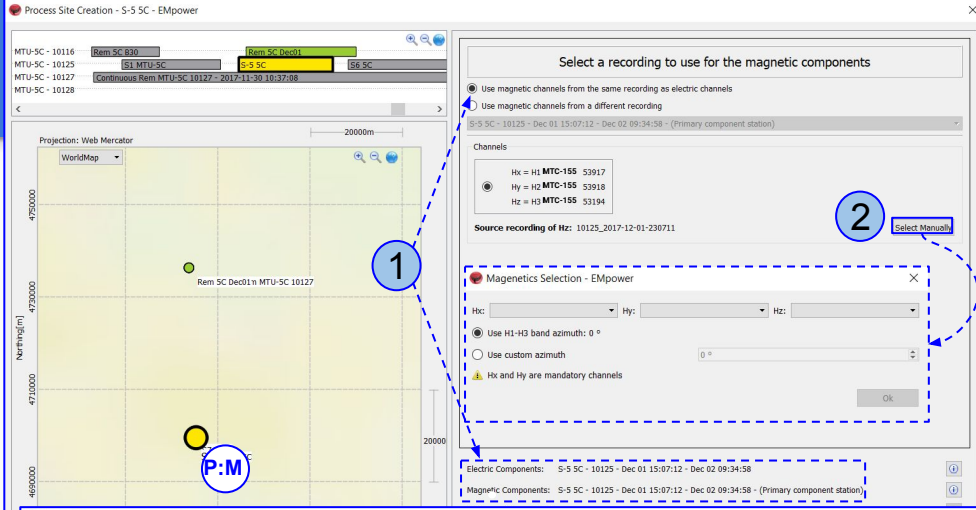
If need to borrow the magnetic channel data from a different recording

3. Select **Use magnetic channels from a different recording**
 - o Select a valid recording/magnetic sensors from the Map / Timeline or using the Drop-down and click **Next**

! Recordings with different Sampling Mode and/or Sampling Rate will not appear on the dropdown list "Use magnetic channels from a different recording".

4. Use **Select Manually**
5. Click **Next**

i When a magnetic channel is selected from a different recording, an arrow will be pointing to that site on the map and the letter **M (Magnetic)** will appear next to that site



Process Site Creation wizard

Reference Channels

Same recording

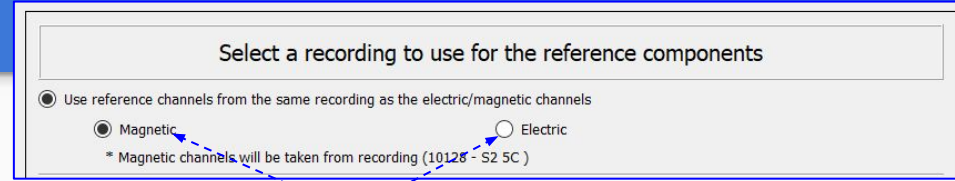
1. To use reference channels from the same recording as the electric/magnetic channels
 - o Select either the Magnetic Channels or Electric Channels
 - o Click **Next**

Remote reference

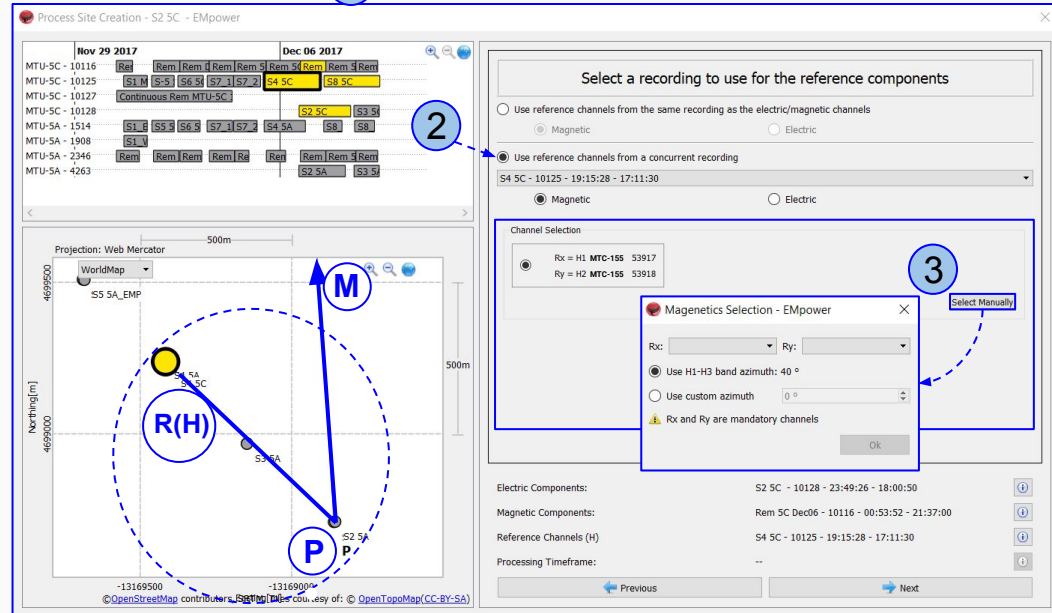
2. To use Reference channels from a concurrent recording select **“Use reference channels from concurrent a recording”**
 - o A concurrent recording with valid magnetic or electric channels will appear as non-gray in the Map / Timeline and in the drop-down list

Recordings with different Sampling Mode and/or Sampling Rate will not appear on the dropdown list “Use reference channels from concurrent a recording” .

3. Use **Select Manually** as needed
 - o Click **Next**



1



2

3



When a channel (**H** magnetic or **E** electric) is selected from a concurrent site the letters **R(H)** or **R(E)** appears next to the Reference site name

Processing Timeframe / Parameters

1. The **Select Processing Timeframe**, allows to select the time segment of the recording that will be processed
 - Use the **Start - End fields** or move the blue indicators in the **Duration** selectors to select the desired Start and End times of the Processing Timeframe.
 - Click Next
2. In the **Processing Parameters** window to reduce the effect of power line noise
 - Select the frequency of the **Electric power grid filter** that corresponds to the frequency carried by the power lines in the region
3. Type the **Process site name**
4. Robust Templates (*see next page*)

1 Select Processing Timeframe

Processing timeframe

Time zone

GPS Site time zone: America/Edmonton (GPS-06:00)

Start: 2017-08-27 10:53:11 End: 2017-08-28 10:34:29

Sunrise: 06:54 Sunset: 20:40

Duration: 23 h 41 m 18 s

2 Processing Parameters

3

4

Electric power grid filter

50 Hz 60 Hz None

Process site name

P=MB 1 R= (Local H)

Robust Templates

Process with robust templates enabled

Multiple Coherence [0.1] (Default)

Mask name	Multiple Coherence
Robust algorithm	Multiple Coherence
Attack	0.10
Cross powers to reject	10%

Set Default + -

Robust Template / Processing Queue

4. Enable Robust Templates by checking **Process with robust templates enabled**

4.1. Select the **Robust Mask**

- Change the parameters as needed

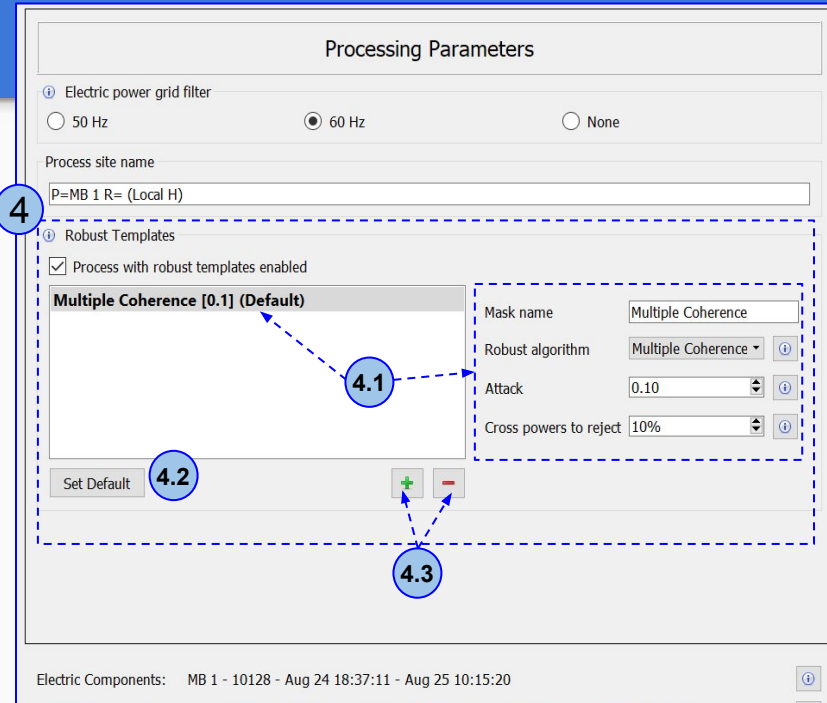
4.2. Use the **Set Default** button to change the default Mask for the current processing site(s)

4.3. Add or delete Robust Mask Template(s)

**All changes will be applied to the current processing task only and subsequent processing will default to the Robust Template configured in the Project Settings.*

5. Click the **Process** button

6. The **Processing Queue** shows the processing of the site(s) selected



Processing Parameters



Electric power grid filter
 50 Hz 60 Hz None

Process site name
P=MB 1 R= (Local H)

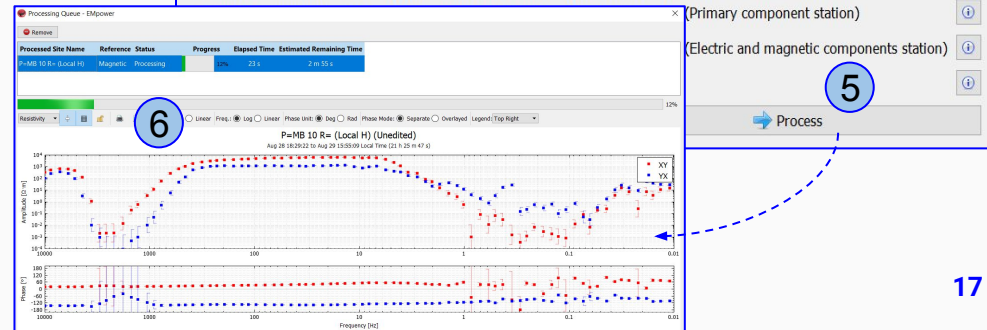
Robust Templates
 Process with robust templates enabled

Multiple Coherence [0.1] (Default)

Mask name: Multiple Coherence
Robust algorithm: Multiple Coherence
Attack: 0.10
Cross powers to reject: 10%






















Set Default
 

Electric Components: MB 1 - 10128 - Aug 24 18:37:11 - Aug 25 10:15:20



Processing Queue - EMpower

Processed Site Name	Reference	Status	Progress	Elapsed Time	Estimated Remaining Time
P=MB 10 R= (Local H)	Magnetic	Processing	<div style="width: 20%;"></div> 20%	23 s	2 m 55 s

Resolvability:                     

Amplitude (dB) vs Frequency (Hz) plot for P=MB 10 R= (Local H) (Unedited)

Process

All the processing with **Robust Templates** enabled will automatically generate a workbench named "Robust" in the Crosspower Editor

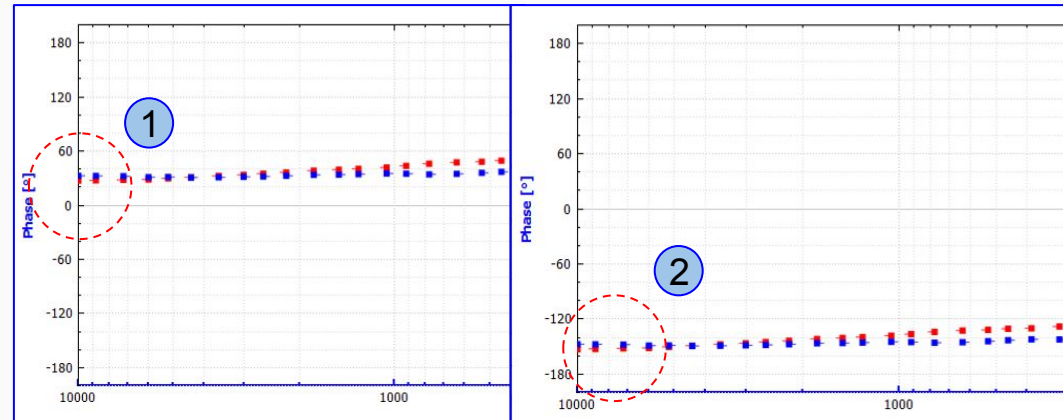
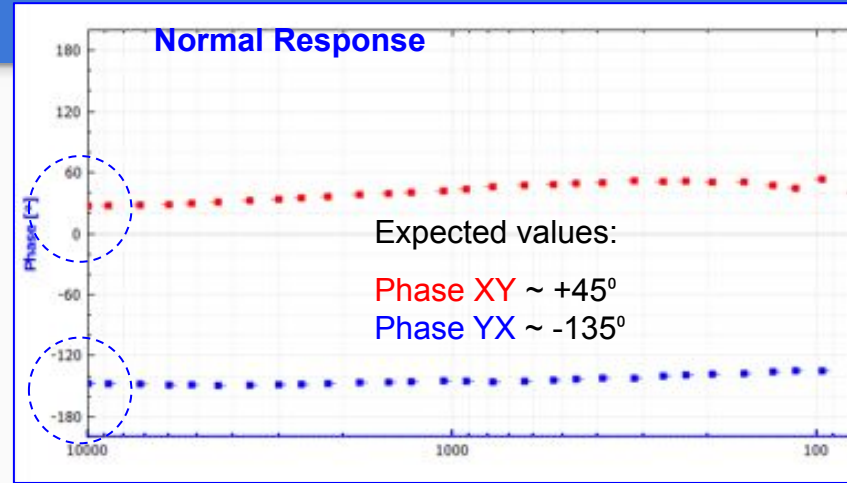
How to identify a reverse polarity

After processing the data, the phase plot will display an overlapping response, which is an indicator of a reverse polarity.

Identify the channel responsible for reverse polarity:

1. The first plot shows that **H1 or E2** channels are the source of the reverse polarity
2. If channel **H2 or E1** are the source, the plot will display a different phase position

Once we identify the problematic channel, we can proceed with the corrections. (see next page)



Note that in the majority of the cases, a reverse polarity can be easily fixed in EMpower.

Magnetic Channels Corrections

EMpower provides a solution to fix a reverse polarity by adjusting some parameters to compensate for layout errors.

1. H1(Hx) Polarity Inverted: occurs when the sensor's connector is oriented to the North

- Check the Inverted checkbox

2. H2(Hy) Polarity Inverted: occurs when the sensor's connector is oriented to the East

- Check the Inverted checkbox

3. H Connections interchanged

- Identify the sensors that were plugged into the wrong connector on the receiver. Then, while selecting the Magnetic Components in the Site processing wizard, click on **Select Manually** and choose the appropriate connection mapping from the dropdown lists.

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-155	MTC-155	53291	✓	<input checked="" type="checkbox"/> Inverted	x4	10000	0
H2	MTC-155	MTC-155	2666	✓	<input type="checkbox"/> Inverted	x1	10000	0

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-155	MTC-155	53291	✓	<input type="checkbox"/> Inverted	x4	10000	0
H2	MTC-155	MTC-155	2666	✓	<input checked="" type="checkbox"/> Inverted	x1	10000	0

Channels

Hx = H1 MTC-155 53917
Hy = H2 MTC-155 53918
Hz = H3 MTC-155 53194

Source recording of Hz: 10125_2022-02-01-230711 Select Manually

Magnetics Selection - EMpower

Hx: Hy: Hz:

Use H1-H3 band azimuth: 40 °
 Use custom azimuth

⚠ Hx and Hy are mandatory channels

Ok



Note:

For (3) repeat the channel mapping procedure every time data needs to be processed with these channels

Electric Channels Corrections

EMpower is able to correct possible mistakes in the field layout (polarity or connection)

1. Polarity Inverted on E1

- Occurs when the **North** electrode is connected to the **South** connector, and the **South** electrode connected to the **North** connector.

2. Polarity Inverted on E2

- Occurs when the **East** electrode is connected to the **West** connector, and the **West** electrode connected to the **East** connector.

3. Connections Interchanged on NS and EW

- Occurs when the **North** electrode is connected to the **East** connector, and the **South** electrode is connected to the **West** connector, or vice versa.

In the Electric components section of the Site processing wizard, click **Select Manually** and apply the appropriate correction.

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50.00	50.00	<input checked="" type="checkbox"/> Inverted	505.807	1251.798	4 x 1 = x4	10000	0.017
E2	50.00	50.00	<input type="checkbox"/> Inverted	427.056	418.831	4 x 1 = x4	10000	-0.03

E Azimuth: 0.00 ° External Filter: None

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50.00	50.00	<input type="checkbox"/> Inverted	505.807	1251.798	4 x 1 = x4	10000	0.017
E2	50.00	50.00	<input checked="" type="checkbox"/> Inverted	427.056	418.831	4 x 1 = x4	10000	-0.03

E Azimuth: 0.00 ° External Filter: None

Select a recording to use for the electric components

S-5 SC - 10125 - Dec 01 15:07:12 - Dec 02 09:34:55

E-Channel details

E-Channel Selection

Ex = E1
 Ey = E2

Ex	Ey
Dipole length: 100 m	Dipole length: 100 m
North resistance: 232 Ω	East resistance: 136 Ω
South resistance: 141 Ω	West resistance: 175 Ω
Ex Calibration Serial: N/A	Ey Calibration Serial: N/A

Channel Selection - ...

Ex	Ey
<input type="radio"/> E1 <input checked="" type="radio"/> E2	<input checked="" type="radio"/> E1 <input type="radio"/> E2

S-5 SC - 10125 - Dec 01 15:07:12 - Dec 02 09:34:55



Note:

For (3) repeat the channel mapping procedure every time data needs to be processed with these channels



Advanced Search

Toolbar (Sites list)	22
Groups	23
Filters	24

Toolbar (Sites list)

Recording library

1. Quick search by **Site name**
2. **Groups** (Slide 19-20)
3. **Filters** (Slide 21)

Processed MT Data

4. **Select All** the Sites
5. Quick search by **Site name**
6. **Groups** (Slide 19-20)
7. **Filters** (Slide 21)
8. **Export Selected**

The image displays the EMpower software interface with several dialog boxes and toolbars. Numbered callouts (1-8) point to specific features:

- 1:** Station name search field in the Recording Library toolbar.
- 2:** Groups dropdown menu in the Recording Library toolbar.
- 3:** Filter criteria selection buttons in the Recording Library toolbar.
- 4:** Select All checkbox in the Processed MT Data toolbar.
- 5:** Site name search field in the Processed MT Data toolbar.
- 6:** Groups dropdown menu in the Processed MT Data toolbar.
- 7:** Filter criteria selection buttons in the Processed MT Data toolbar.
- 8:** Export Selected button in the Processed MT Data toolbar.

Dialog boxes shown include:

- Station group editor - EMpower:** Shows available stations and stations in a group.
- Advanced Filter Options - EMpower:** Shows filter criteria such as Status, Receiver Serial, Survey Name, etc.
- Processed data group editor - EMpower:** Shows available sites and sites in a group.
- Advanced Filters - EMpower:** Shows filter criteria such as Site status, Reference type, Process duration, etc.
- Process Site Exporter - EMpower:** Shows target sites and exporting format options.

Groups

1. Create new group

2. Type the **Group Name**

2.1. Select the sites from the right list using the blue arrow

3. Add sites using the Multi-Selection tools or by following the next steps

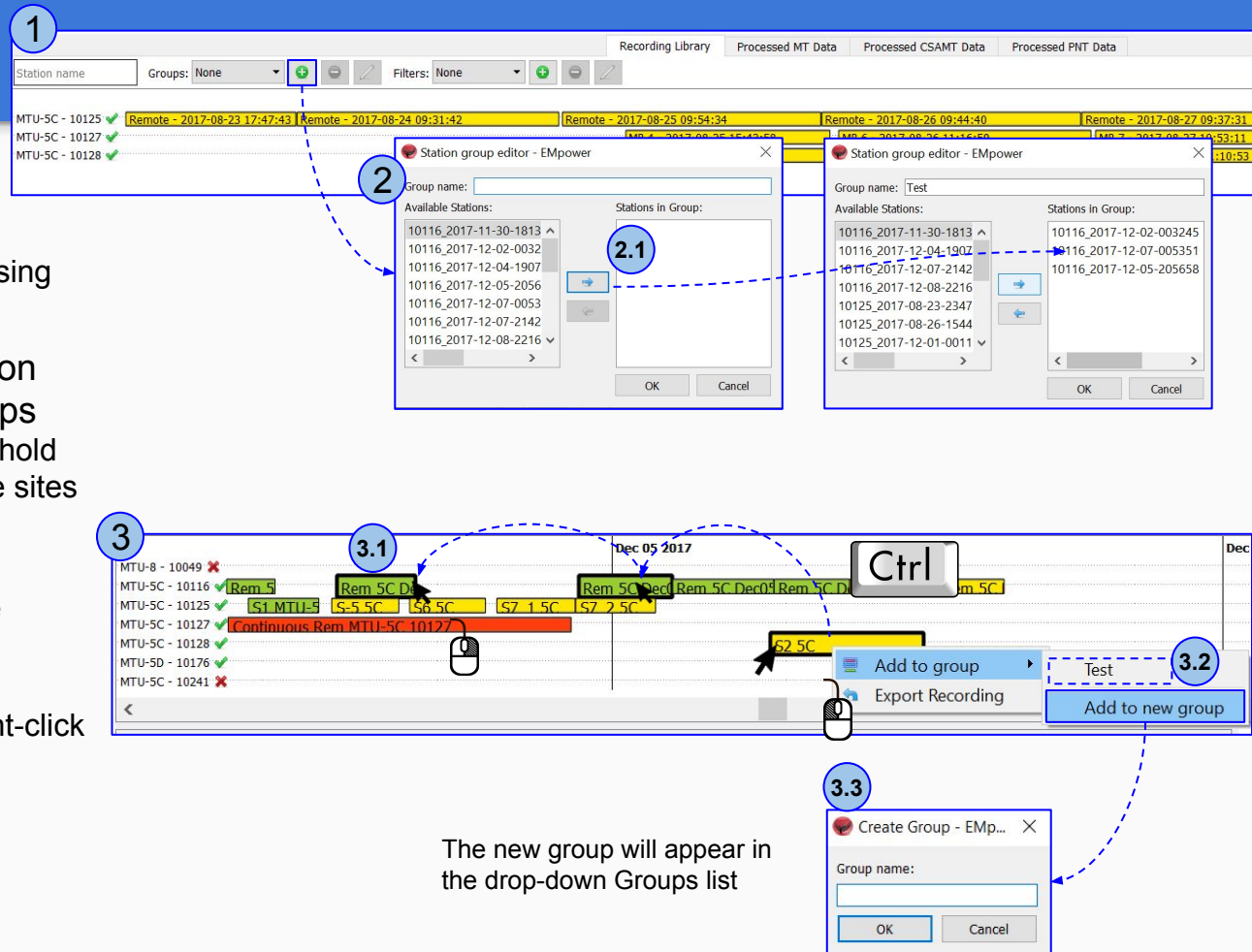
3.1. Use left-click to select the site and hold down the **Ctrl** key to select multiple sites (release the buttons)

3.2. Select **Add to group** from the Right-click menu and select the existing group

or

3.3. Select **Add to group** from the Right-click menu and **Add to new group**

4. Create new group




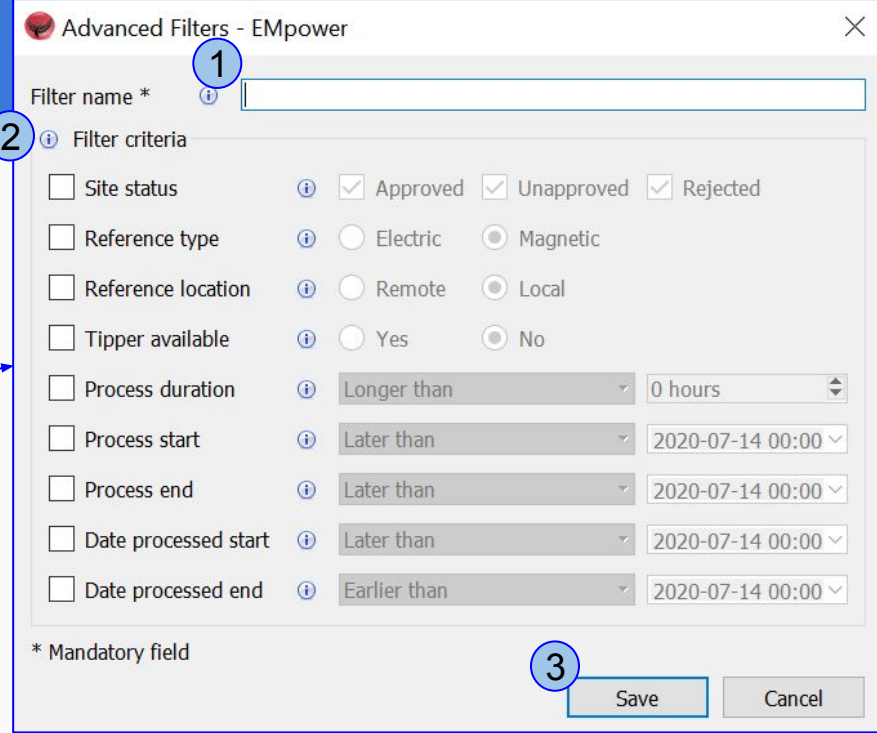
The screenshot shows the EMpower software interface. At the top, there are tabs for 'Recording Library', 'Processed MT Data', 'Processed CSAMT Data', and 'Processed PNT Data'. Below these is a 'Station name' field and a 'Groups' dropdown menu set to 'None'. A plus icon next to the dropdown is circled with a '1'. A list of stations is visible below, including 'MTU-5C - 10125', 'MTU-5C - 10127', and 'MTU-5C - 10128'. Two 'Station group editor - EMpower' dialog boxes are open. The first dialog has an empty 'Group name' field and a list of 'Available Stations' with a blue arrow pointing to a station ID, circled with a '2.1'. The second dialog has 'Test' in the 'Group name' field and a list of 'Stations In Group'. A right-click context menu is open over the station list, showing options like 'Add to group' and 'Export Recording'. A 'Ctrl' key icon is shown, and a blue dashed line indicates the selection of multiple sites. A '3.2' circle points to the 'Add to group' option, and a '3.3' circle points to the 'Add to new group' option. A '3.1' circle points to a station ID in the list. A '3' circle points to the main station list area. At the bottom, a 'Create Group - EMp...' dialog box is shown with an empty 'Group name' field and 'OK' and 'Cancel' buttons.

The new group will appear in the drop-down Groups list

Filters (Processed MT Data)

The Advanced Filter can work with individual sites or with Groups

1. Name the **Filter** (**mandatory field*)
2. Select the **Filter criteria**
3. Save the **Filter**
4. The new **Filter** will be added to the drop down list
5. Use the Edit  button to add or change **Filter criteria**



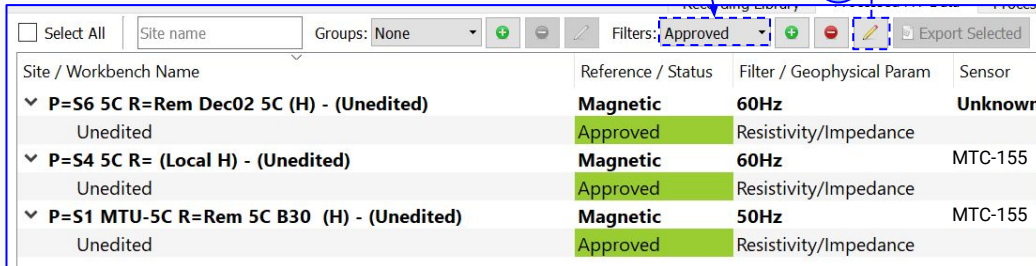
Advanced Filters - EMpower

Filter name *

Filter criteria

- Site status Approved Unapproved Rejected
- Reference type Electric Magnetic
- Reference location Remote Local
- Tipper available Yes No
- Process duration
- Process start
- Process end
- Date processed start
- Date processed end

* Mandatory field



Site / Workbench Name	Reference / Status	Filter / Geophysical Param	Sensor
▼ P=S6 5C R=Rem Dec02 5C (H) - (Unedited)	Magnetic	60Hz	Unknown
Unedited	Approved	Resistivity/Impedance	
▼ P=S4 5C R= (Local H) - (Unedited)	Magnetic	60Hz	MTC-155
Unedited	Approved	Resistivity/Impedance	
▼ P=S1 MTU-5C R=Rem 5C B30 (H) - (Unedited)	Magnetic	50Hz	MTC-155
Unedited	Approved	Resistivity/Impedance	



Processed MT Data

Visualizing Processed Data	26
Plotting diagonal elements	27
Processed Site Selection	28
Working with multi-sites	29
Site Info - Coherence	30
Process Site Exporter	31

Visualizing Processed Data

1. Select the **Processed Site** from the Workbench list or Map
2. Edit the Processed Site (Name, Status and Notes)
3. The **Edit Cross Powers** feature removes outlying cross powers from the calculation of resistivity, phase, and other geophysical parameters
4. Site Info
5. Coherence
6. The **Plot** shows the Amplitude and Phase of the selected Processed Site
 - 6.1. Use the **Plot toolbar** to access additional plot features
 - 6.2. Add Processed Site(s) by selecting the site in the Workbench list

The screenshot displays the software interface with several key components:

- Site List (Top):** A table listing sites with columns for Site/Workbench Name, Reference/Status, Filter/Geophysical Param, Sensor, Has Remote, Tipper, and Status. Sites include 'P=Remote R= (Local H) - (Robust)', 'P=Remote R= (Local E) - (Workbench 1)', 'P=Remote - (Workbench 1)', and 'P=MR test 3 R= (Local H) - (Robust)'. The 'Local E' site is highlighted in blue.
- Map (Middle Left):** A map showing the location of the selected site 'P=Remote R= (Local E) (Workbench 1)' in the Pacific Northwest region of the United States.
- Site Info Panel (Middle Right):** A panel for the selected site showing details like 'P=Remote R= (Local E) (Workbench 1)', 'Aug 27 00:44:40 (GPS) to Aug 27 05:41:03 (GPS)', and '4 h 56 m 23 s'. It includes a 'Full View' button and a 'Save PNG' button.
- Plot (Bottom):** A plot showing Amplitude [F-m] and Phase [°] versus Frequency [Hz]. The Amplitude plot shows data for 'P=Remote R= (Local E): Workbench 1' (red line) and 'P=Remote R= (Local H): Robust' (blue line). The Phase plot shows data for the same sites. A 'Plot toolbar' is visible above the plot.
- Workbench List (Bottom Right):** A list of sites with columns for Site/Workbench Name, Reference/Status, Filter/Geophysical Param, Sensor, and Has Remote. The 'Local E' site is selected, and the 'Local H' site is highlighted in blue.

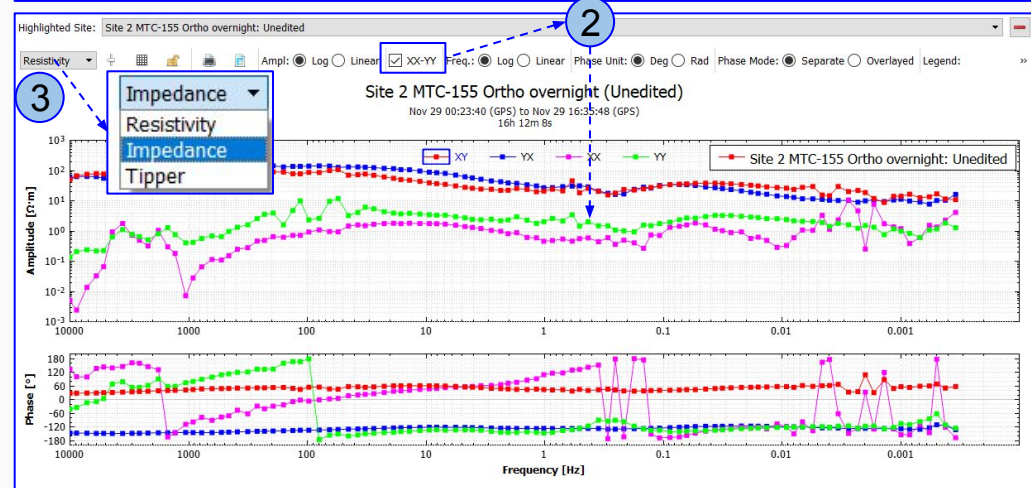
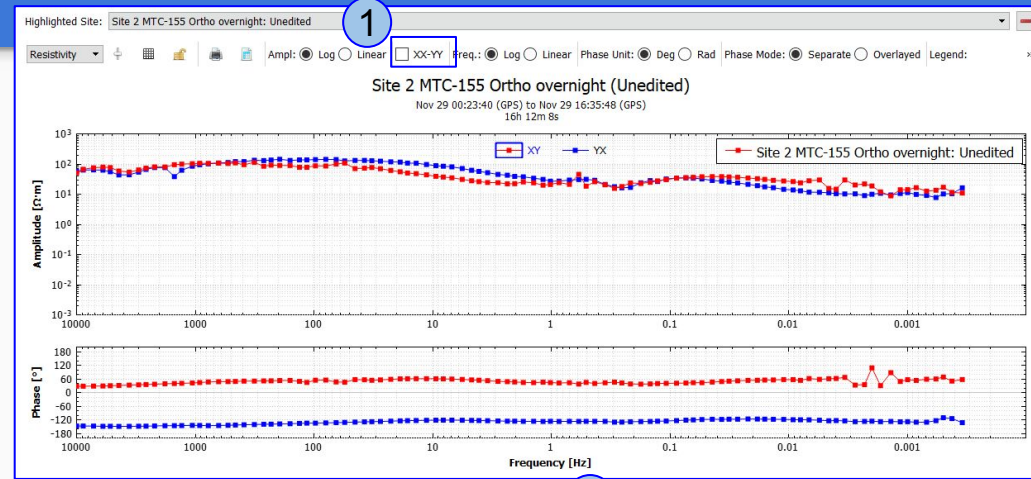
Numbered callouts (1-6.2) indicate the sequence of actions described in the text.

Plotting diagonal elements

EMpower has the capability to see the off-diagonal **Impedance/Resistivity** elements of the MT tensor in the plot. The **XX-YY** elements are essential components for several dimensionality tools (*Shift skew, Ellipticity, Polar diagrams, etc.*)

In the Processed Data tab, after select the **Processed Site**

1. Select the **XX-YY** to show the diagonal elements in the plot
2. The **Plot** will show two additional lines of the MT tensor for the site
3. The tool works with geo-modes **Resistivity** and **Impedance**



Processed Site Selection

Select:

1. Select all the processed sites
2. Select a group of processed sites
 - 2.1. Left-click on the first site on the list, press and hold the **Shift** key and left-click on the last site

Or

- 2.2. Hold the Left-click on the site and drag up/down to select items

3. To select specific processed sites

- 3.1. Left-click on the first site on the list and hold the **Ctrl** key until the last processed site is selected

*To select site(s) from the map see [page 11](#)

Export:

4. Click the **Export Selected** button
 - 4.1. Complete the information as needed and click the **Save** button

The screenshot displays the 'Workbench list' window with a table of site data. The table has columns for Site / Workbench Name, Reference / Status, Filter / Geophysical Param, Sensor, and Has Remc. The 'Export Selected' button is highlighted in the top right. A 'Process Site Exporter - EMpower' dialog box is open, showing 'Target Sites' and 'Exporting Format' options. The 'MT Exchange File' format is selected, and the 'Save' button is highlighted.

Site / Workbench Name	Reference / Status	Filter / Geophysical Param	Sensor	Has Remc
Test	Magnetic	60Hz	MTC-150	Yes
Unapproved	Unapproved	Resistivity/Impedance		
Unapproved	Unapproved	Resistivity		
test 4505 2 - (Workbench 1)	Electric	None	MTC-155	No
Workbench 1	Unapproved	Resistivity		
Unedited	Unapproved	Resistivity/Impedance		
test 4505 - (Unedited)	Electric	None	MTC-155	No
Unedited	Unapproved	Resistivity/Impedance		
P=Victoria Park R= (Local H) - (Workbench 2)	Magnetic	None	MTC-155	No

Target Sites:

- P=Remote R= (Local E) - Workbench 1
- P=Remote R= (Local H) - Unedited
- P=Remote R= (Local H) - Robust

Exporting Format:

- Site metadata (CSV)
- Site geographic information (KML)
- Archived file (phzip)
- MT Exchange File
 - EDI
 - PLT

INFO layout: Compact

File By: Export 54.1

Report Document:


- ODF
- PDF

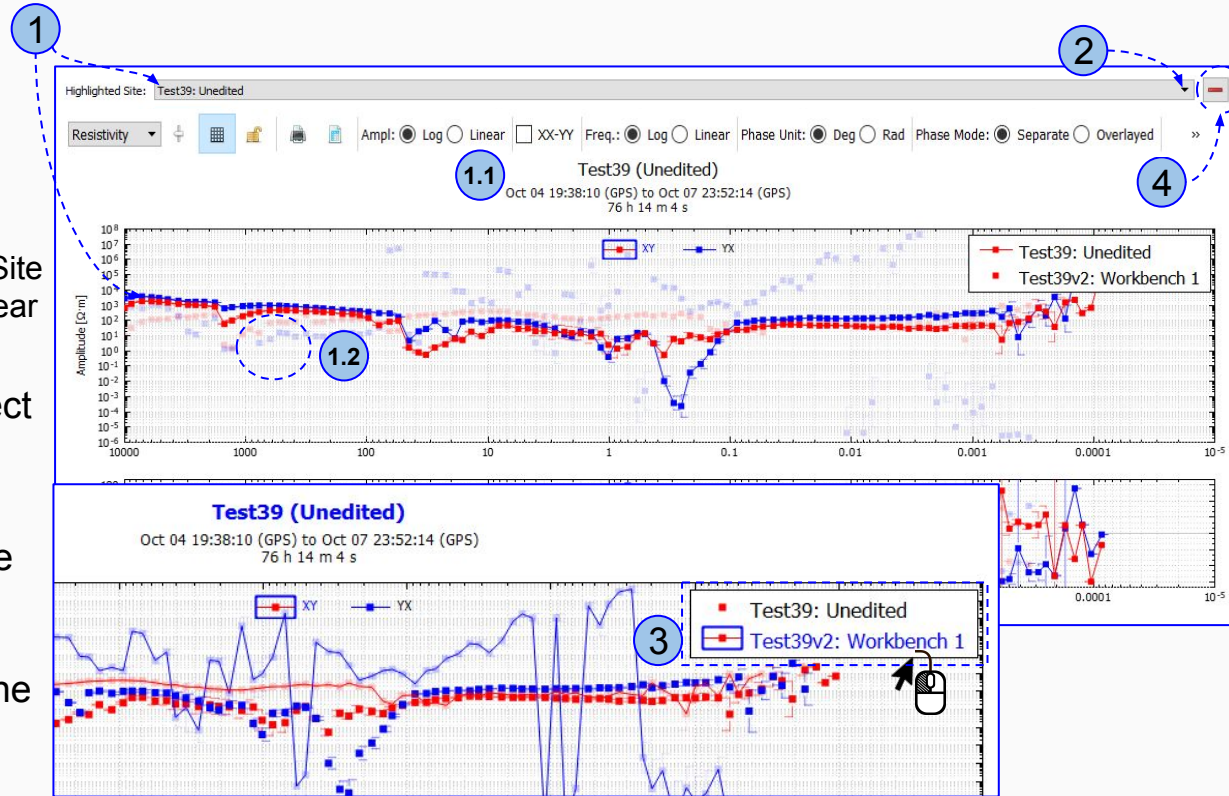
Sections to include:

- Title Page
- Calibration Metadata
- Map
- Plot Images

Working with multi-sites

EMpower has the functionality to work with multiple sites. Select the sites as needed (see *previous page*)

1. The highlighted site will be in the foreground
 - 1.1. The plot title will show the Highlighted Site
 - 1.2. Other selected sites in the plot will appear in attenuated colour
2. To change the Highlighted Site, select the Highlighted Site from the drop down menu
3. To switch between curves, select the site on the plot legend
4. To remove a site from the plot use the button 



Site Info - Coherence

1. General Processing Metadata information

2. Channels details

- Electrics
- Magnetics
- Remote Reference (E)

3. Recording Information

4. Coherence

1 Metadata Viewer: P=S6 5C R=Rem Dec02 5C (H) - EMpower

2 Processing Metadata

Site ID:	{68d7ac2f-b935-489d-895b-961d3f1d0026}	Tipper Source:	From Local Magnetics
Site Name:	P=S6 5C R=Rem Dec02 5C (H)	Reference Type:	Magnetic
Survey Name:	Don Campbell	Reference Location:	Remote
Company Name:		Process Date:	Not available
Power Grid:	60Hz	Start Time:	Sat Dec 2 22:26:22 2017 GMT
Process Type:	Orthogonal	Stop Time:	Sun Dec 3 17:20:02 2017 GMT
Version:	Not Available	Duration:	18 h 53 m 40 s
Site Status:	approved	Frequency Range:	0.00005 Hz to 12500 Hz

Processing Notes

3 Recording Information

Recording ID:	10125_2017-12-02-203505	Receiver Information	
Station Name:	S6 5C	Rx Type:	UNKNOWN
Survey Name:	Don Campbell	Rx ID:	10125
Operator(s):	CF MU and GB	Rx Firmware:	
Start Time:	Dec 02 2017 12:35:05	Rx Cal:	Not Available
Stop time:	Dec 03 2017 09:20:02		
Duration:	20 h 44 m 57 s	Recording Notes	
Electric Filter:	None		
Latitude:	38.8469 °		
Longitude:	-118.308 °		
Altitude:	1250.1 m		
Azimuth:	0.00		
Declination:	13.000000		

4 Coherence viewer - EMpower

Site: P=S1 MTU-5C R=Rem 5C B30 (H)

Approved Unapproved Rejected

Notes:

Edit Cross Powers Coherence

Site Info Delete

Process Site Exporter

1. Select Site(s) - Processed MT Data
 - Modify Groups/Filters as needed
 - Check the desired processed sites or use Check all the processed sites to export (See [Advanced Search](#))
2. Use the **Export Selected** option to open the Process Site Exporter
3. Select one of the **Exporting Format**
4. **Report Document** give the option to create a customized report, by selecting the sections that will be included

The image illustrates the workflow for using the Process Site Exporter. It consists of several interconnected windows and panels:

- Top Panel:** A site list table with columns for Reference / Status, Filter / Geophysical Param, and Sensor. The 'Export Selected' button is highlighted.
- Map View:** A topographic map showing site locations (MB 4, MB 6, MB 7, MB 8, MB 9) with a blue selection box and arrows pointing to the 'Add to group' and 'Export Selected' buttons.
- Process Site Exporter - E-Mpower Window:** A dialog box with the following sections:
 - Target Sites:** P=Remote R= (Local E) - Workbench 1, P=Remote R= (Local H) - Unedited, P=Remote R= (Local H) - Robust.
 - Exporting Format:** Radio buttons for Site metadata (CSV), Site geographic information (KML), Archived file (phzip), and MT Exchange File (selected). Under MT Exchange File, 'EDI' is selected, and 'INFO layout' is set to 'Compact'.
 - File By:** Export 54.1.
 - Report Document:** Radio buttons for ODF (selected) and PDF. A 'Sections to include' list has checkboxes for Title Page, Calibration Metadata, Map, and Plot Images.
- Menu:** A 'File' menu with 'Export MT Processed Sites' highlighted.
- Format Selection:** A dropdown menu showing 'Compact', 'Full JSON', and 'No Info Section'.

Numbered callouts (1, 2, 3, 4) indicate the sequence of steps: 1. Selecting sites on the map and clicking 'Export Selected'; 2. The 'Process Site Exporter' dialog opening; 3. Selecting the 'Compact' format; 4. Configuring the 'Report Document' sections.




Processed data editing Crosspower Editor

Editing Cross Powers	33
Robust Mask	34
Project Settings - Robust Templates	35
Polar Editor	36
Time Editor	37

Editing Cross Powers

Edit Cross Powers, is a tool to create multiple edition masks without changing the original (Unedited) data. Masks can be used to clean noisy sites

1. To create a new **Workbench**

- Click the icon 
- Type the **Workbench name**
- Complete the information as needed
- Click the **Create** button

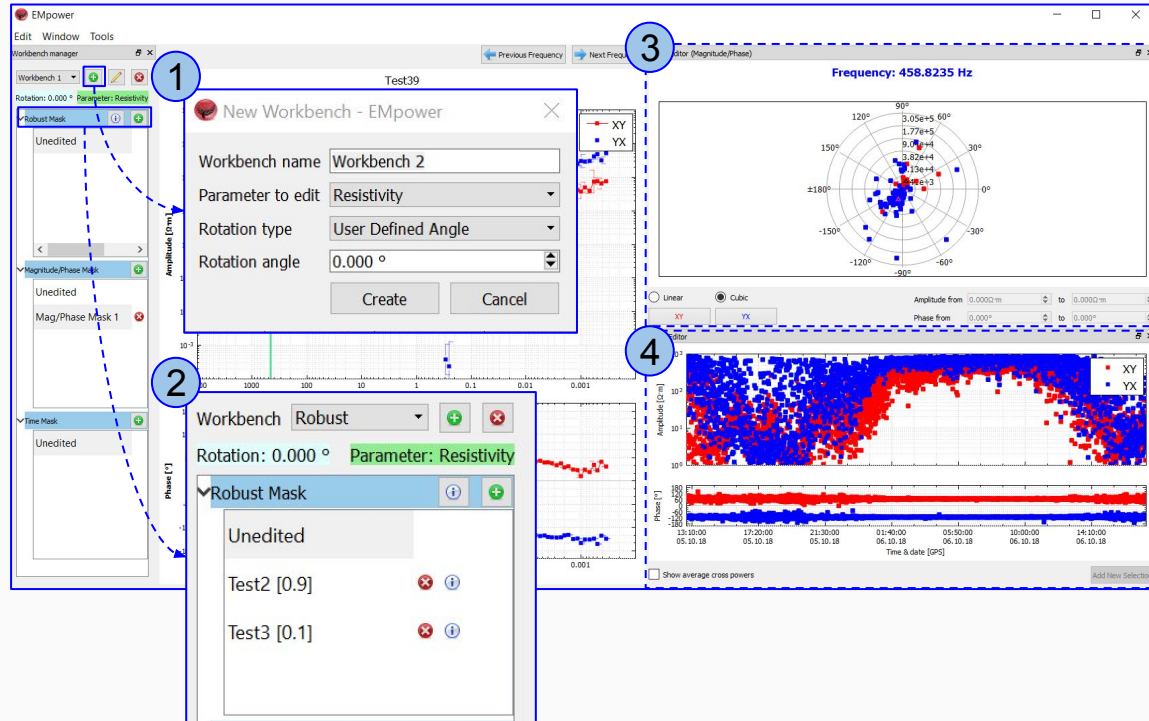
2. When the site is processed using a Robust Template, the Workbench list will include Robust and the Robust mask will display the Robust Templates created on the Project setting (page 8)

3. Polar Editor

- Create a **Polar Editor Mask**(page 24)

4. Time Editor

- Create a **Time Editor Mask**(page 25)



**For more details see the [Crosspower Editor manual](#)*

Robust Mask

The Robust Mask algorithm fixes the most common problems

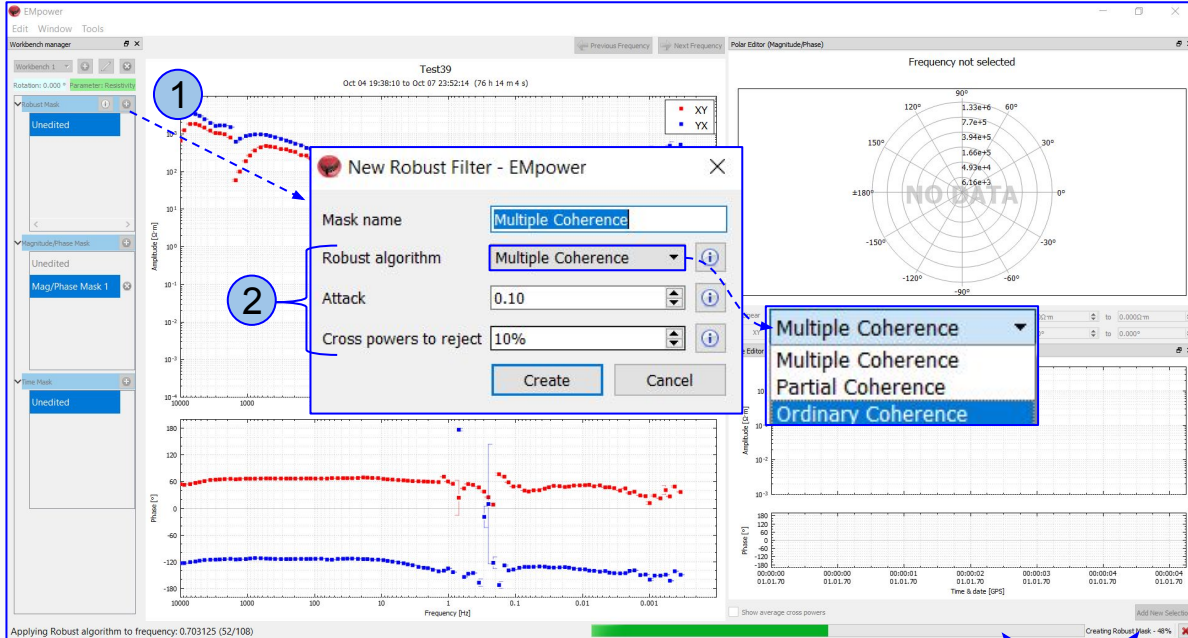
1. Create a Robust Mask

- Type the **Mask Name**

2. Use the different options to obtain the desired information

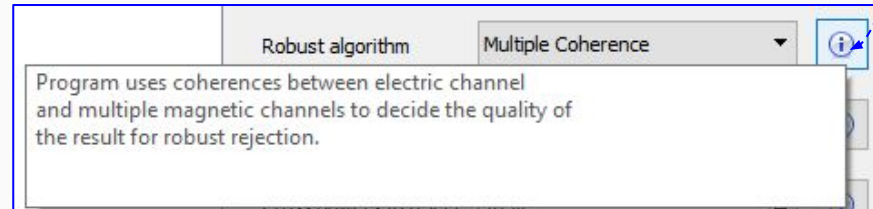
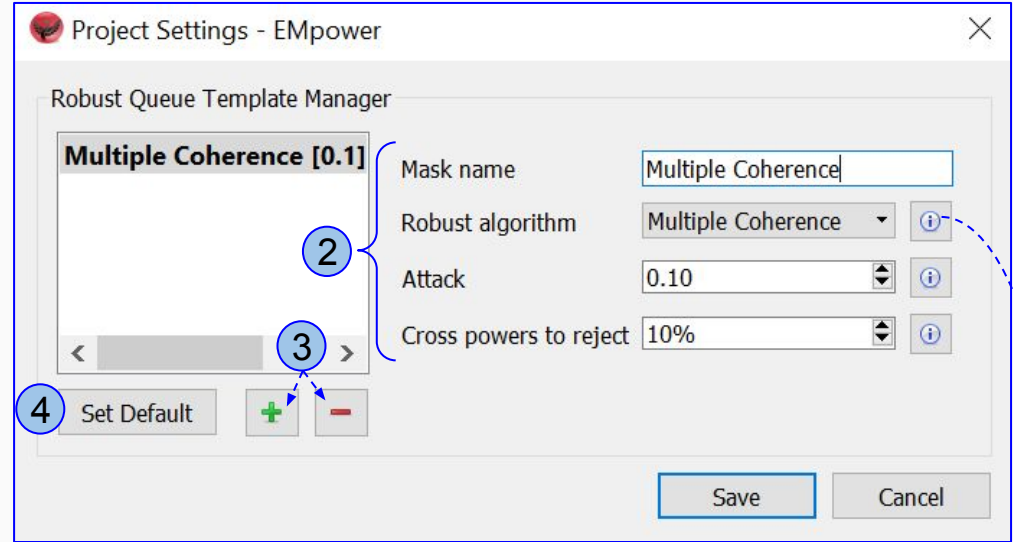
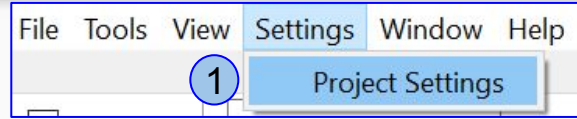
- Select the **Robust algorithm**
- Define the **Attack**
- Select the percent of **Cross powers to reject**

3. Wait until the process is completed

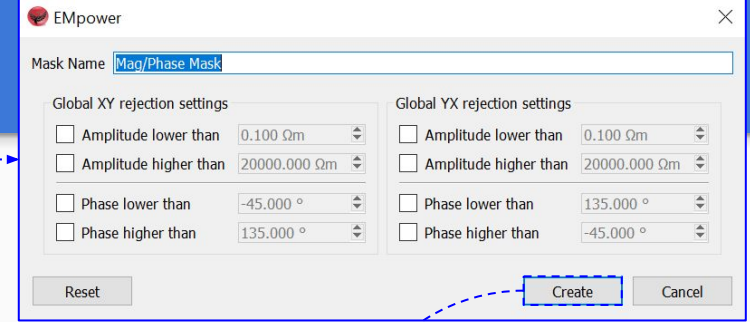
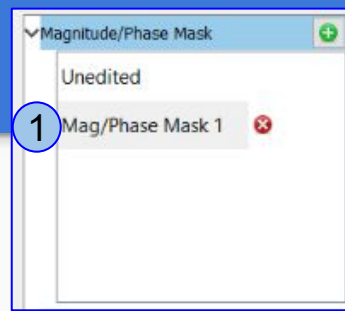


Project Settings - Robust Templates

1. Select **Project Settings** from Setting menu
2. Define the parameters for the **Robust Mask Template**
 - This *template only applies to the current project*
3. Add, Modify or Delete a Robust Mask
4. **Set Default**
 - The "default" in settings will be the robust mask selected after processing for any processing in the project



Polar Editor

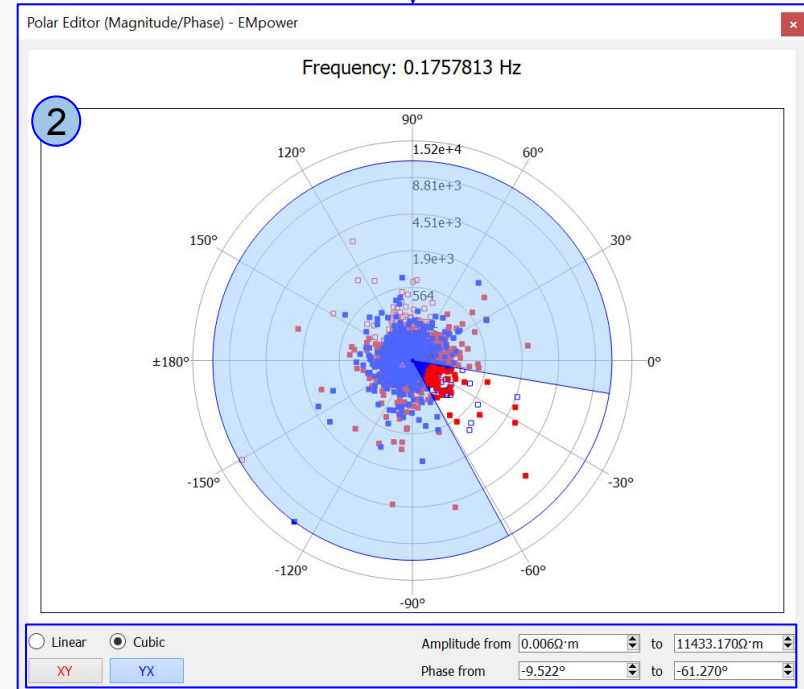


1. Create a New Magnitude/ Phase Editor Polar Masks

- Type the **Mask Name**
- Edit the **Global XY rejection settings** as needed
- Click the **Create** button

2. Use the different tools to obtain the desired information

- Linear / Cubic
- XY / YX
- Amplitude range
- Phase range



Time Editor

1. Create a New Time Editor Mask

- 1.1. The Mask Name can be edited by right-clicking on it

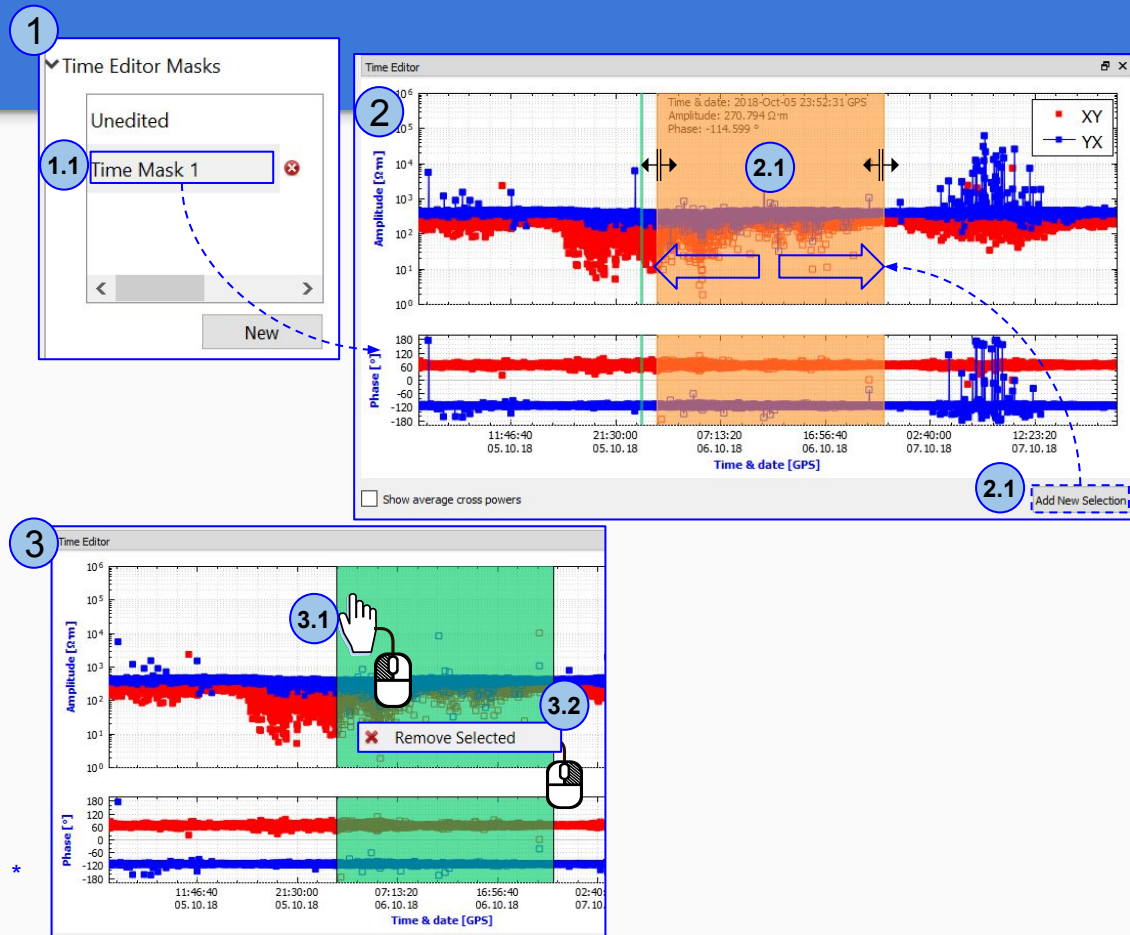
2. To add a new rejection area

- 2.1. Click the **Add New Selection** button
- 2.2. Left-click and hold, and start dragging to the left or right to select the area of crosspower rejection

3. To remove an existing rejection area:

- 3.1. Left-click on the area to be deleted
- 3.2. Then right-click the option **Remove Selected** that appears on the screen

* *The crosspowers rejected in the polar editor will be shown in the time editor and vice versa.*





Processed PNT Data

Processed PNT Data	39
Multi-Site PNT	40

Processed PNT Data

This tab shows processed Parallel Noise data




1. Area to Select the Site of interest and view its metadata

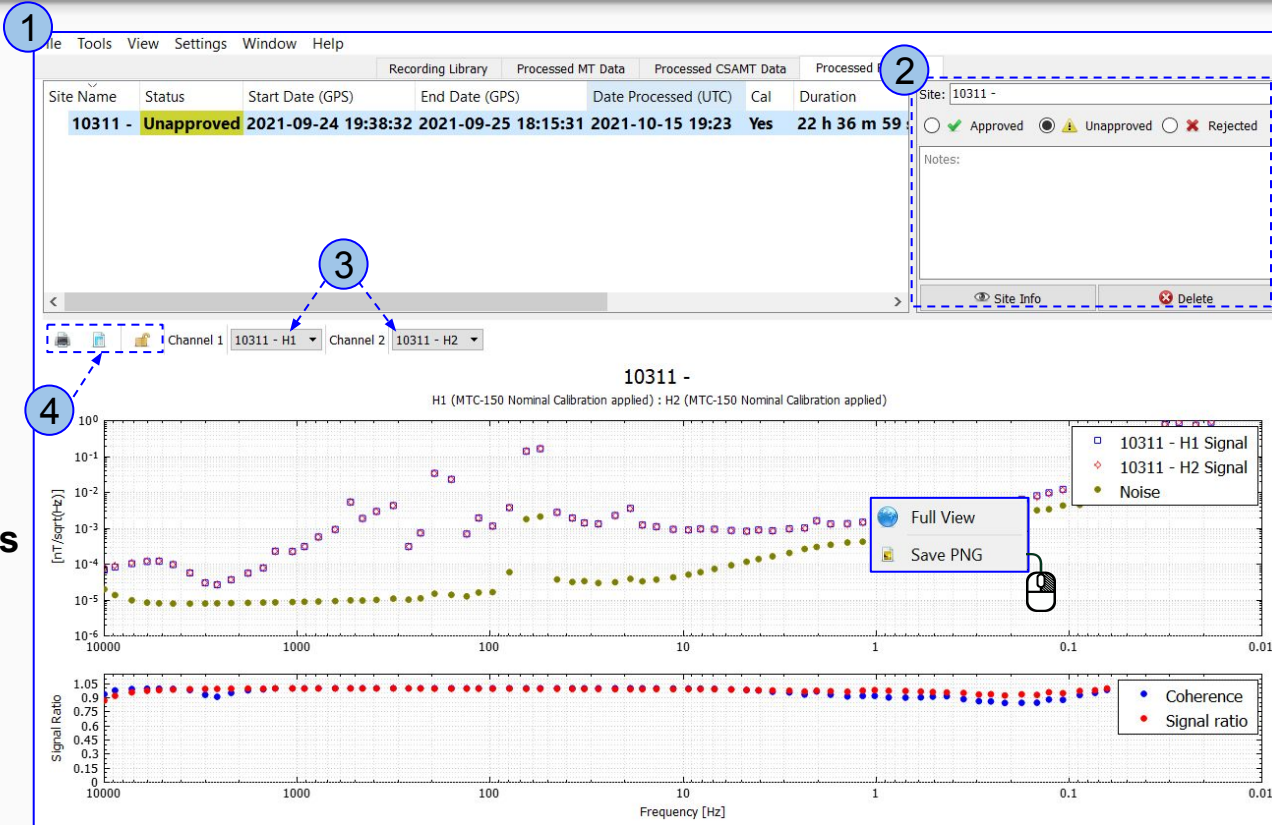
2. Area to edit information of the selected Processed **Site**

- Site Name
- Mark the site as Approved, Unapproved or Rejected
- Relevant Notes for the processing

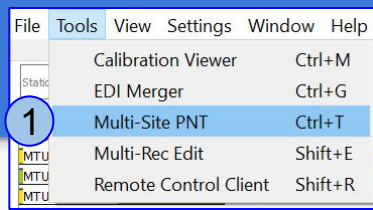
3. Selectors to choose the **Channels** to be analysed and displayed

4. Tools

-  **Print** the plot
-  **Export** the values in CSV format
-  **Lock / Unlock** plot scale



Multi-Site PNT



1. Use the **Multi-Site PNT (Ctrl+T)** tool to process Parallel Noise data using specific channels from different recordings

2. Select the recording(s)

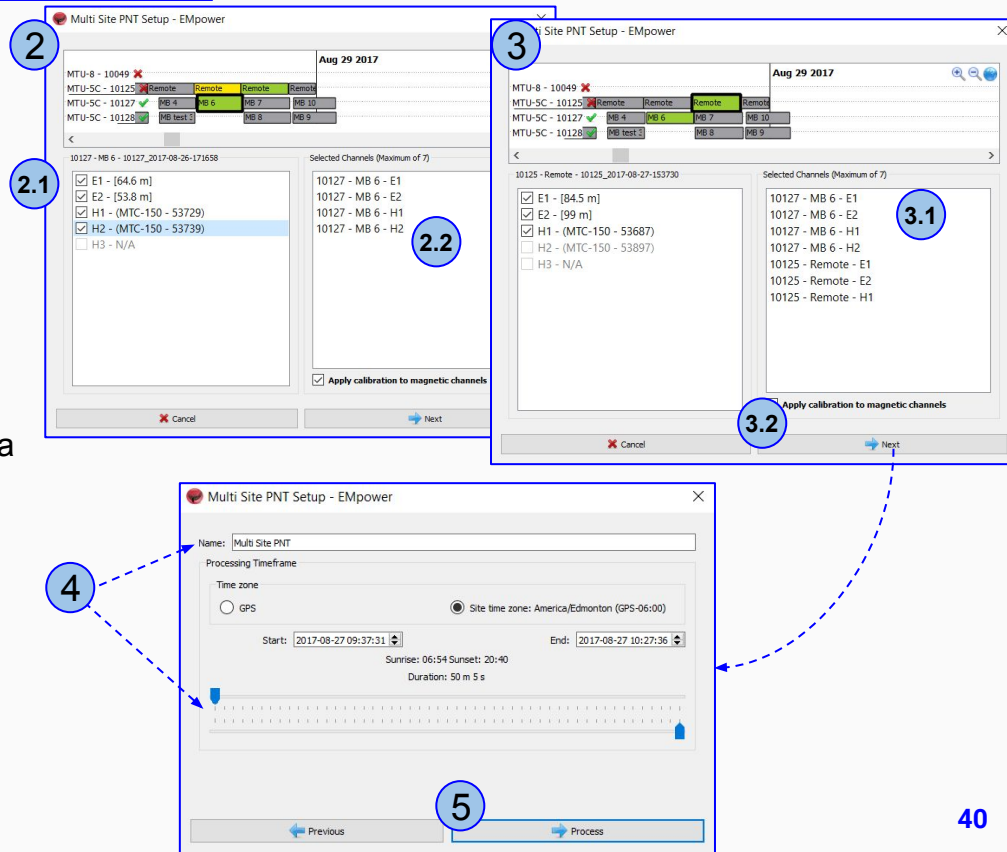
- 2.1. Select the first Recording and define the channels
- 2.2. Select for another recording(s) the channels that will be used (no more than 7)

3. **Apply calibration to magnetic channels**

- 3.1. When the selected sensor does not have associated calibration available in the project **EMpower** will apply a generic calibration
- 3.2. Click **Next**

4. Define the Name and Duration, the time available depends on the overlapped time between all the recordings selected

5. To begin processing click the **Process** button





Tools

EDI Merger <Create>	42
EDI Merger <Edit and Save>	43
Multi-Rec Edit	44
Multi - Instrument Viewer	45

EDI Merger <Create>

1. **EDI Merger (Ctrl+G)** tool is used to combine two EDI files into one.
2. Select the EDI files by using the **Browse for EDI** button
3. Choose one of the Geophysical Mode
4. The **Merged Results** plot shows the highlighted area on the EDI plots

The screenshot displays the EDI Merger - EMpower software interface. The main window shows a menu with the following items:

Tools	View	Settings	Window	Help
Calibration Viewer				Ctrl+M
EDI Merger				Ctrl+G
Multi-Site PNT				Ctrl+T
Multi-Rec Edit				Shift+E
Remote Control Client				Shift+R
Multi-Instrument Viewer				Shift+L

The interface also shows a file selection dialog box with the following details:

- File name: P_MB_4_R_Remote_H_Workbench_1.edi
- Files of type: EDI File (*.edi)
- Buttons: Open, Cancel

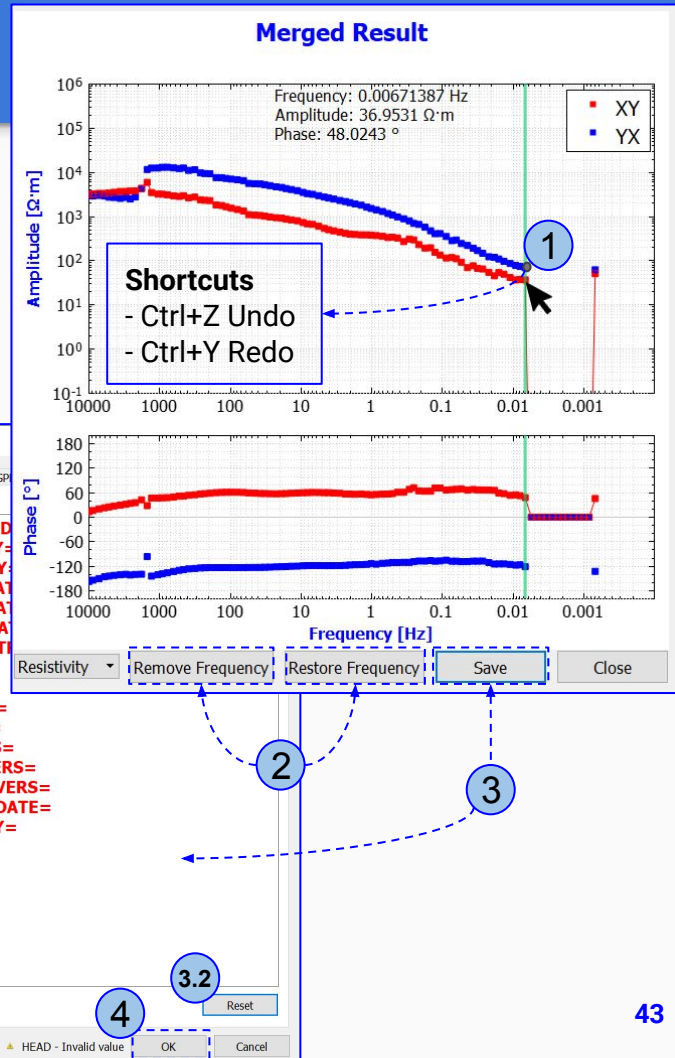
The main window displays two plots: Amplitude [$\Omega \cdot m$] and Phase [$^\circ$] versus Frequency [Hz]. The plots show data for XY and YX components. A 'Browse for EDI' button is visible on the plot area. A 'Merged Result' plot is also shown, displaying the combined data. A 'Resistivity' dropdown menu is visible, with options: Resistivity, Resistivity, Impedance, Tipper.

Numbered callouts (1, 2, 3, 4) indicate the steps described in the text:

- 1: Points to the 'EDI Merger' menu item.
- 2: Points to the 'Browse for EDI' button in the file selection dialog.
- 3: Points to the 'Resistivity' dropdown menu.
- 4: Points to the 'Browse for EDI' button in the main plot area.

EDI Merger <Edit and Save>

1. To exclude a frequency, select it by using the Left-Click, (*review the information on the top plot*) and click **Remove Frequency** or use the Delete key
2. To recover the frequency, select the frequency and click **Restore Frequency**
3. Click **Save** button and fill out the metadata of the merged EDI in each tab
 - 3.1. Use the blue arrows to select the information from respective EDI file. This information can be manually edited in the merger EDI file.
 - 3.2. To clear the selection use the **Reset** button
4. Once the all the Metadata has been filled click **OK** button to save the merged EDI



Multi-Rec Edit

The Multi-Rec Edit tool is used to update multiple recordings and channels simultaneously.

1. Select **Multi-Rec Edit**

1.1. The tool can be launched from the Recording Library when multiple recordings are selected from the map or timeline, the list will appear on the right of the map. (see page 11)

2. Choose the Groups and/or Filters as needed

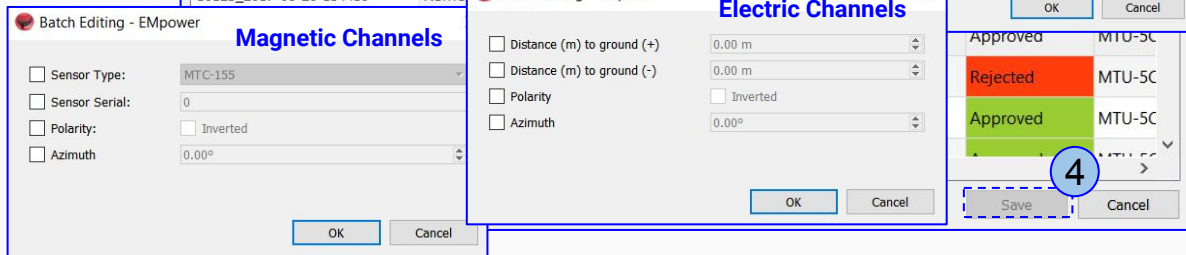
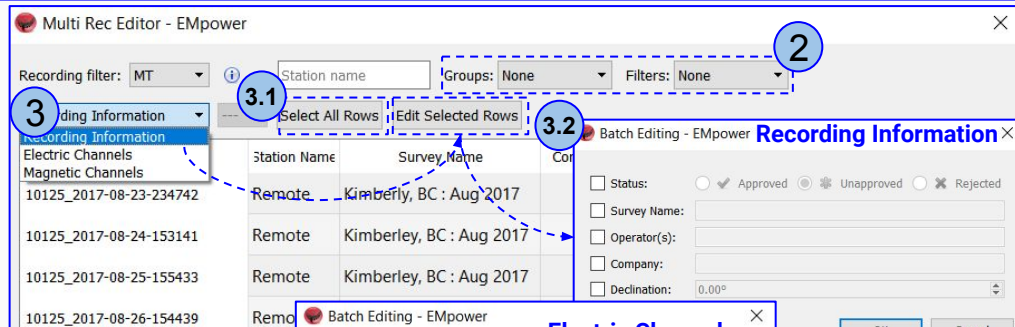
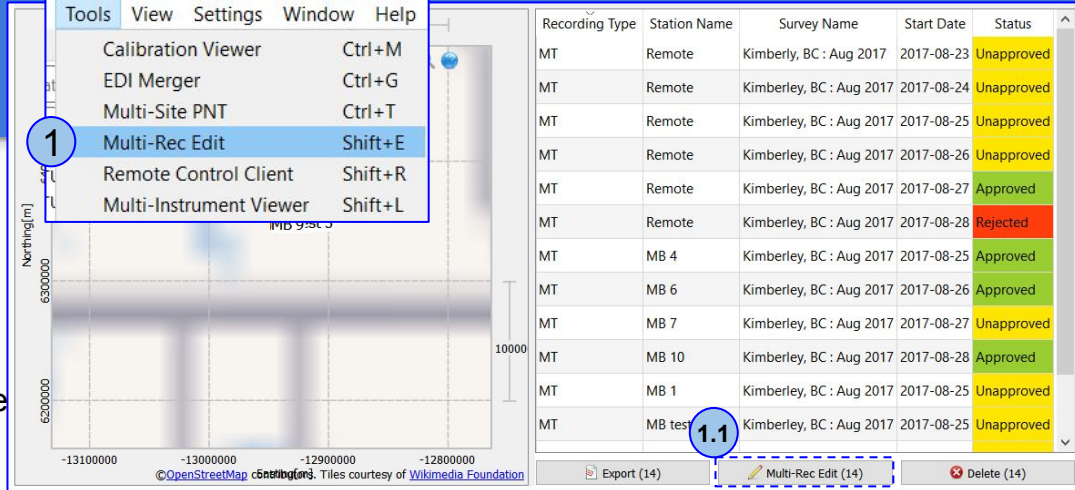
3. Choose between recording Information or Channels that will be modified.

3.1. Select All Rows or select the necessary rows (see pages 21-22)

3.2. Click the **Edit Selected Rows**

3.3. Made the necessary adjustments

4. Click Save button



! Rows with "----" consist of either disabled channels or not applicable channels of receiver type.

Multi - Instrument Viewer

The Multi-Instrument viewer tool was designed to visualize multiple channels from different data recordings simultaneously (*8 channels maximum*).

1. From the Recording Library Tool menu, select **Multi-Instrument Viewer**

1.1. The Multi Channel Selection window will display the recordings in the project

2. To compare two or more receivers, the recordings must be using the same type (*MT/CSAMT*) and the same decimation scheme

2.1. The channels used by the selected receiver will be on the left list, use the check-box to select the channel.

2.2. The selected channels will be displayed in the list on the right (*Receiver Number - Name - Channel*).

2.3. After selecting the first receiver, the list of the recordings on the timeline will show the available recordings

3. Click View button

The screenshot shows the EMpower software interface. The main window displays a map and a timeline. A 'Multi Channel Selection' dialog box is open, showing a list of receivers and channels on the left, a list of selected channels on the right, and a timeline of recordings on the top right. Numbered callouts (1, 1.1, 2, 2.1, 2.2, 2.3, 3) highlight the steps described in the text.

1. From the Recording Library Tool menu, select **Multi-Instrument Viewer**

1.1. The Multi Channel Selection window will display the recordings in the project

2. To compare two or more receivers, the recordings must be using the same type (*MT/CSAMT*) and the same decimation scheme

2.1. The channels used by the selected receiver will be on the left list, use the check-box to select the channel.

2.2. The selected channels will be displayed in the list on the right (*Receiver Number - Name - Channel*).

2.3. After selecting the first receiver, the list of the recordings on the timeline will show the available recordings

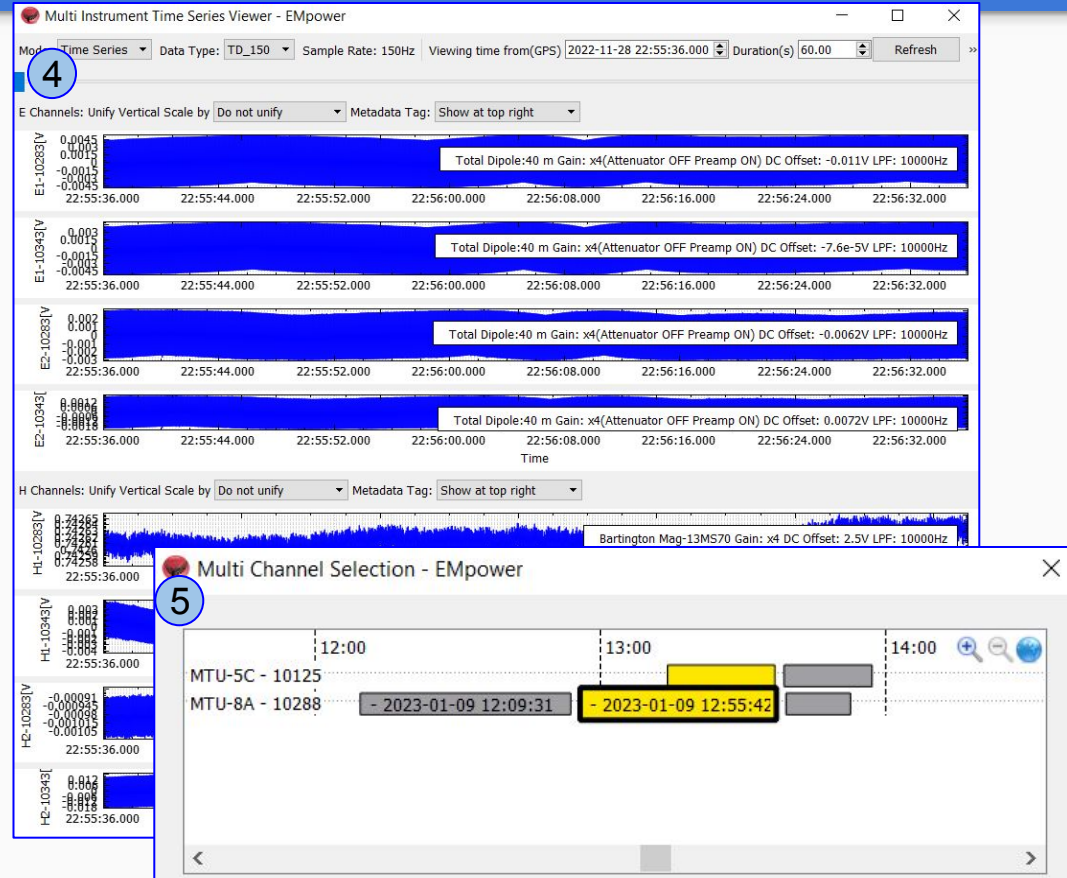
3. Click View button

Multi - Instrument Viewer

4. The Multi Instrument Time Series Viewer will display the selected channels
5. When two time series recordings overlap the data, EMpower will start at the final time a recording started and ends at the time the earliest recording ends

Example

When the site is operating with multiple receivers at the same time, but the expected results sometimes are not congruent. This tool allows to compare the specific channels with another similar recording and detect the problem, sometimes caused by animals or environmental sources.





Please check out the [FAQs](#)

<https://phoenixgeophysics.freshdesk.com/>

Or email us at: support@phoenix-geophysics.com