

EMpower Data Management



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Recording Library

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Creating / Opening a Project

1. Start **EMpower**

2. Click **Manage**

3. Open or Create a New Project

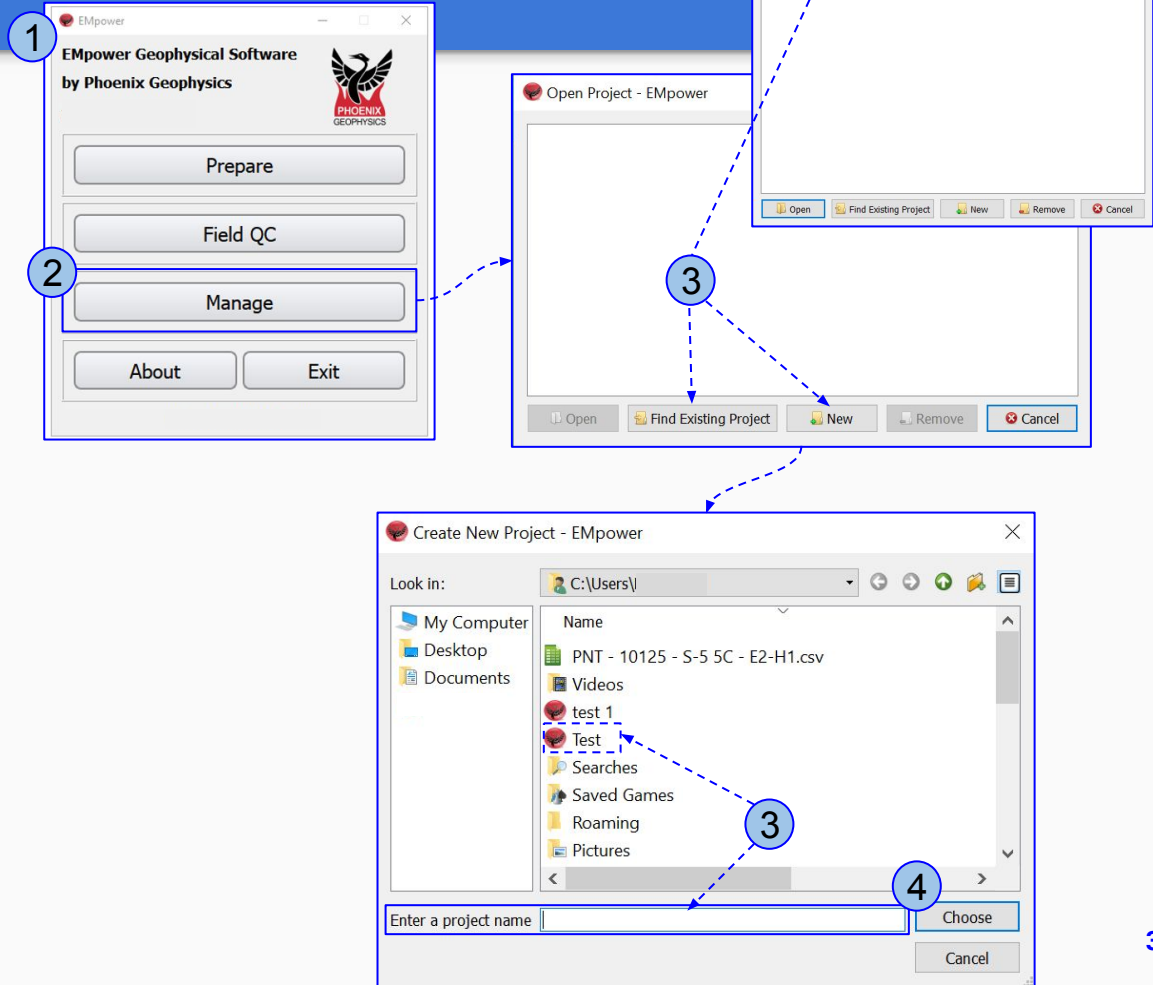
To Open an Existing Project

- 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

The composite image shows the following steps:

- 1**: The 'File' menu is open, and 'Import Recordings' is highlighted.
- 2**: A dialog box titled 'Select recording folders to import - EMpower' is shown, displaying a list of folders in 'D:\MTU 5D'. The folder '10039_20...4-203149' is selected.
- 3**: A File Explorer window is open to 'FIELD TESTS (D:)', and the folder '10039_20...4-203149' is selected.
- 4**: A map interface shows a data point being added to the timeline. A small dialog box indicates 'Copying 10125_5A8F4F8B_2_00000047.td1' with a progress bar at 3%.



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:** Shows a list of recordings for various stations (MTU-SC-10116 to 10128) with colored bars indicating their status (Approved, Unapproved, Rejected) and duration.
- Map:** A map view showing the geographic 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'. It includes recording information such as ID, start time, duration, survey name, station name, operator, and company name. It also displays electric channels with parameters like distance to GND, resistance, gain, LFF, and DC.



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

Recording Details

Ensure the following levels are within acceptable limits

1. Battery Voltage

2. Internal Temperature

3. Number of Satellites

3.1. **Max Satellites Seen** shows the highest number of satellites tracked for each constellation since power on and until the end of the corresponding recording.

3.2. The **Satellites Over Time** plot shows the number of satellites being tracked throughout the recording process, one point per minute.

4. Saturated Frames

- If saturation is not close to ~0%, review the channel configuration, the gain might be too high, or there could be artificial noise at the site

5. Time Series Level



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)

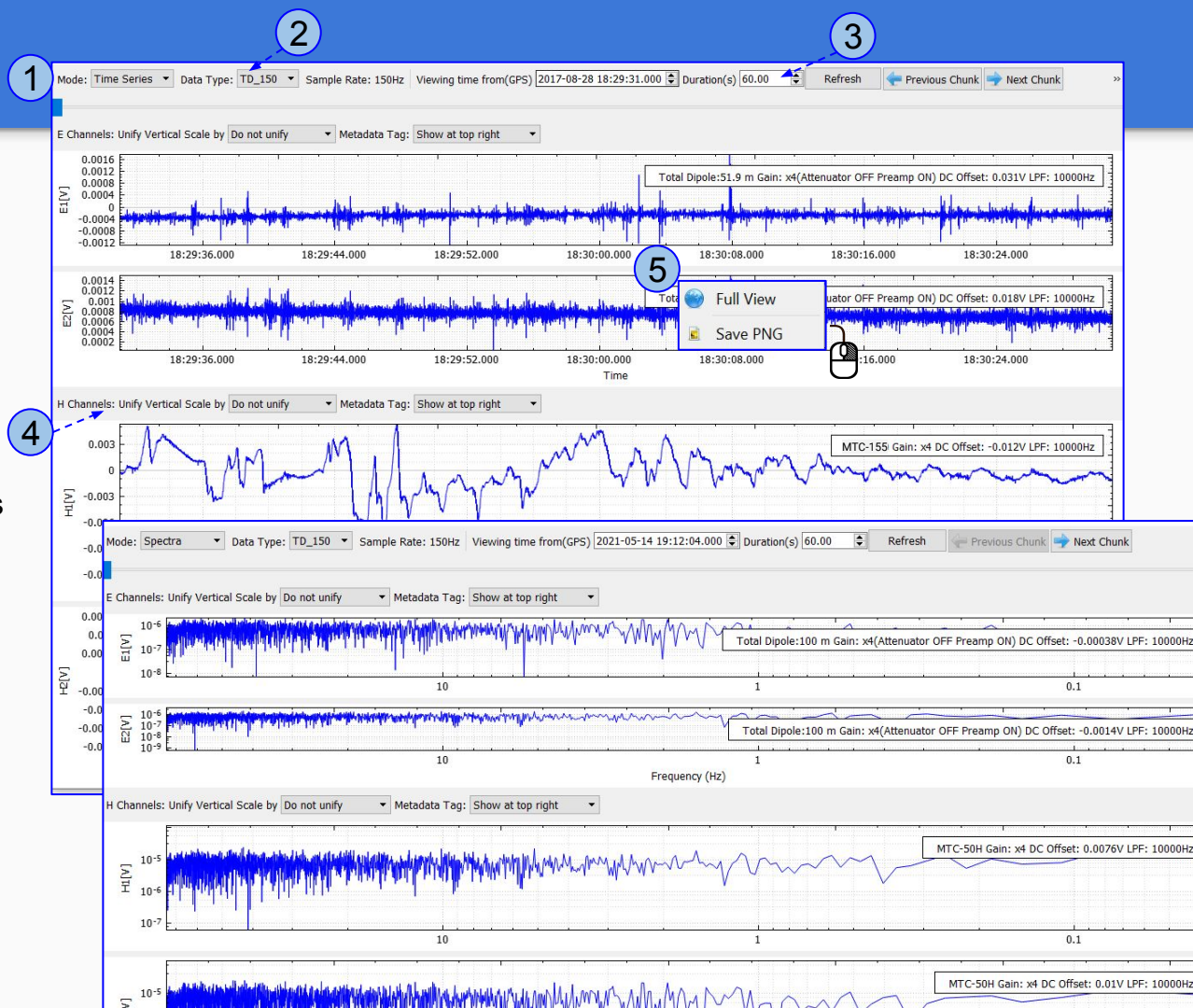
3. Define the duration in the plot

- 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

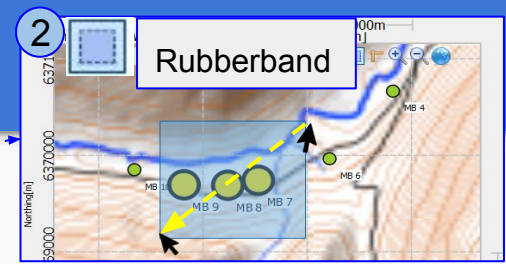
2. Use the **Rubberband** for large ranges

 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 right-clicks on the map or timeline, opening a context menu where 'Export Recordings' is selected.
- Step 2:** The 'Export Recordings - EMapower' dialog box appears, showing a list of 'Target Recordings'. One recording, '10426_2021-05-19-204847 - Txd (15 m 47 s)', is highlighted in red, indicating it is not supported by the selected JSON format.
- Step 3:** The user selects the 'Recording metadata report (CSV)' format. The 'Export Recordings - EMapower' dialog box is closed, and the 'Export Recordings - EMpower' details dialog box is shown, where the 'Export' button is highlighted.

The details dialog box shows the following information:

- Status: Approved
- Tools: Time Series
- Recording ID: 10426_2021-05-19-204847
- Start time: Jun 25 2022 16:18:30 (Local) Eastern Day
- Duration: 15 h 10 m 4 s
- Survey name: Nevada June 2022
- Station name: MT - MTC-155
- Operator(s): EE/DF/JT
- Company name: Phoenix Geophysics
- Layout Geometry: Orthogonal
- Declination: 0.00°
- Notes: 2 other recordings at the station
- Exporting Format: Recording metadata report (CSV)
- Electric Channels: Distance (m) to GND
- Channel E1: 20.00, 20.00, Inverted, 2827.515 1583.146, 8 x 1 = x8, 10000, -0.011
- Channel E2: 20.00, 20.00, Inverted, 3394.245 2759.743, 8 x 1 = x8, 10000, -0.0017
- E Azimuth: 0.00 °, External Filter: None
- Magnetic Channels:
- Channel H1: MTC-155, MTC-155, 53094, Cal, Inverted, x4, 10000, 0.0015
- Channel H2: MTC-155, MTC-155, 57330, Cal, Inverted, x4, 10000, -0.025
- Channel H3: N/A, N/A, N/A, Cal, Inverted, N/A, N/A, N/A
- H1-H3 Azimuth: 0.00 °



Processing Data

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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, which is divided into several sections: 'Recording Information', 'Electric Channels', and 'Magnetic Channels'. The 'Recording Information' section shows details such as 'Recording ID: 10125_2017-12-03-203322', 'Start time: Dec 03 2017 12:33:24 (Local) Eastern Standard Time (GMT -08:00)', 'Duration: 21 h 32 m 56 s', 'Survey name: Don Campbell', 'Station name: S7_1 5C', 'Operator(s): CF MU and GB', and 'Company name:'. The 'Electric Channels' section shows a table of channels with columns for 'Channel', 'Distance (m) to GND', 'Resistance (Ω)', 'Gain', 'LPF [Hz]', and 'DC [V]'. The 'Magnetic Channels' section shows a table of channels with columns for 'Channel', 'Sensor', 'Detected', 'Serial #', 'Cal', 'Polarity', 'Gain', 'LPF [Hz]', and 'DC [V]'. The interface also includes a 'Status' section with radio buttons for 'Approved', 'Unapproved', and 'Rejected', and a 'Tools' section with buttons for 'Time Series', 'Spectra', and 'Process (Orthogonal)'. A red warning icon is visible in the bottom left corner of the interface.

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

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

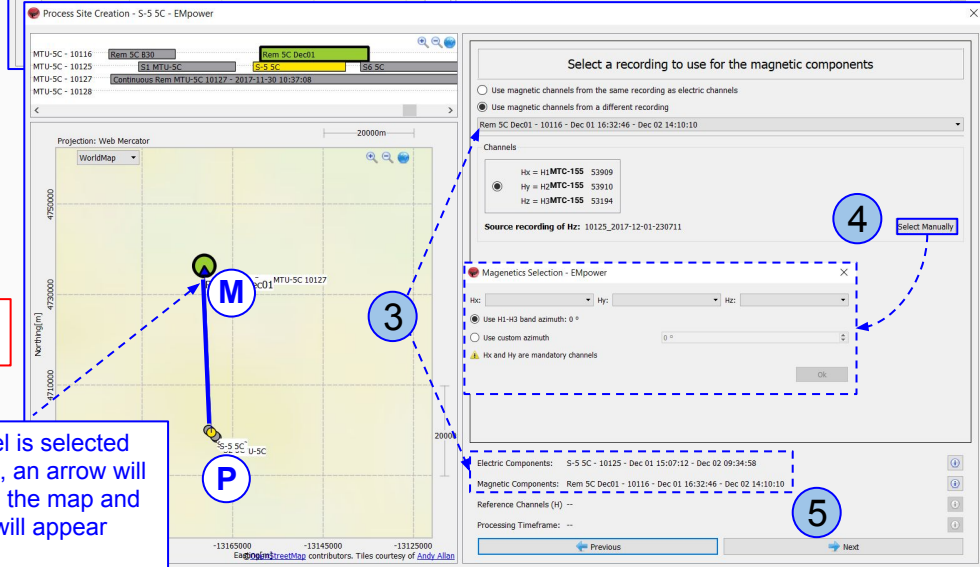
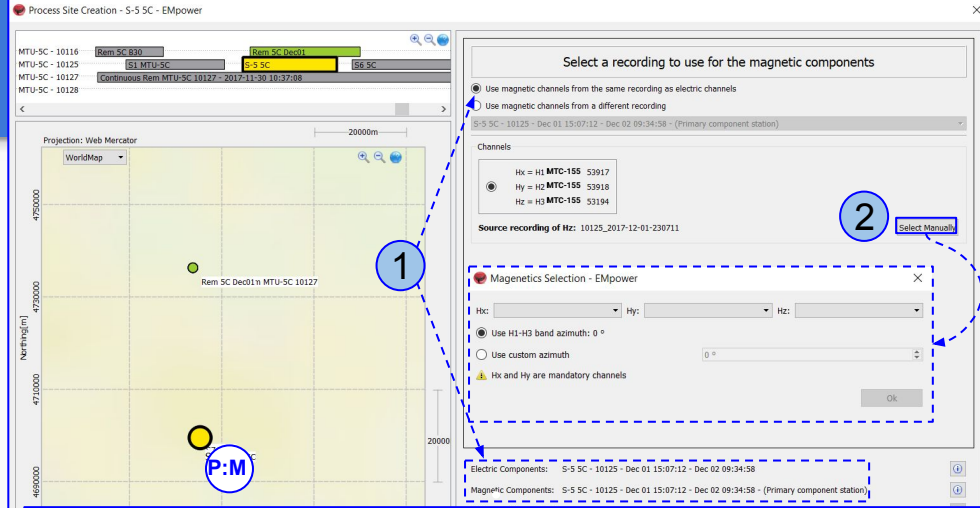
1. Keep the option **Use magnetic channels from the same recording as electric channels** selected
2. Use **Select Manually** to modify as needed and click **Next**

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**



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

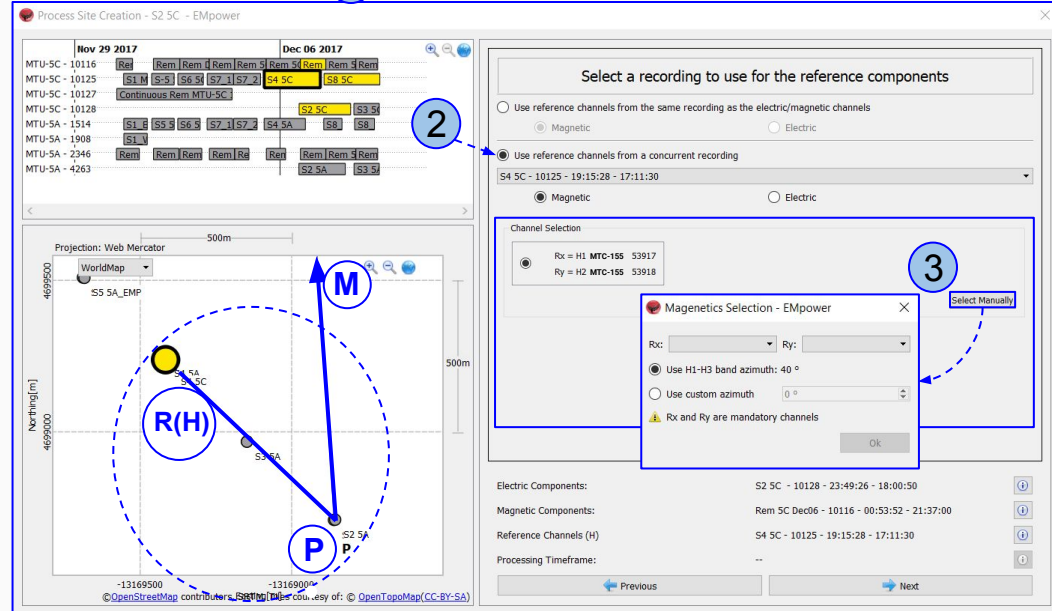
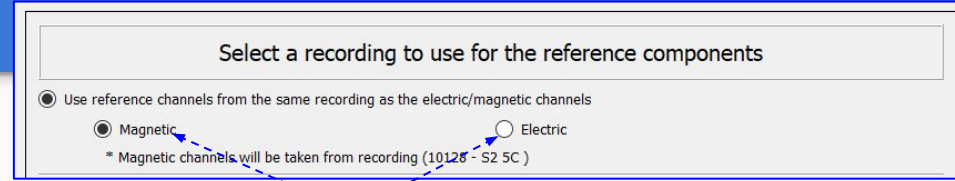
1. To use reference channels from the same recording as the electric/magnetic channels
 - o Select either the Magnetic Channels or Electric Channels
 - o Click **Next**

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**



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

Processing Parameters

2 Electric power grid filter

50 Hz 60 Hz None

Process site name

3 P=MB 1 R= (Local H)

4 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

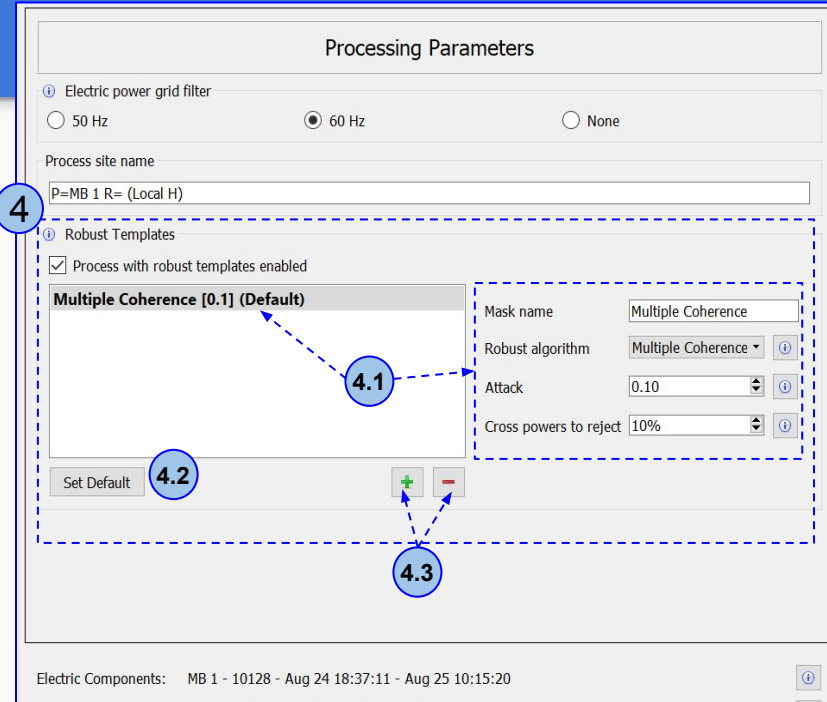
4.2. Use the **Set Default** button to change the default Mask for the current processing site(s)

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)

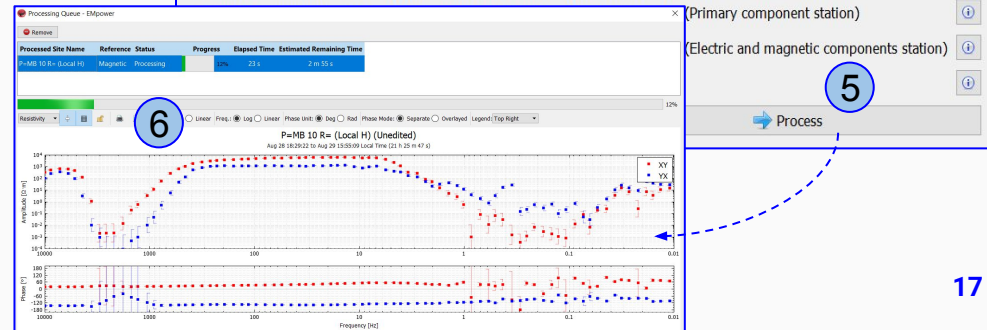
Robust Templates
 Process with robust templates enabled

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	20%	23 s	2 m 55 s

Resolvability: 12%

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

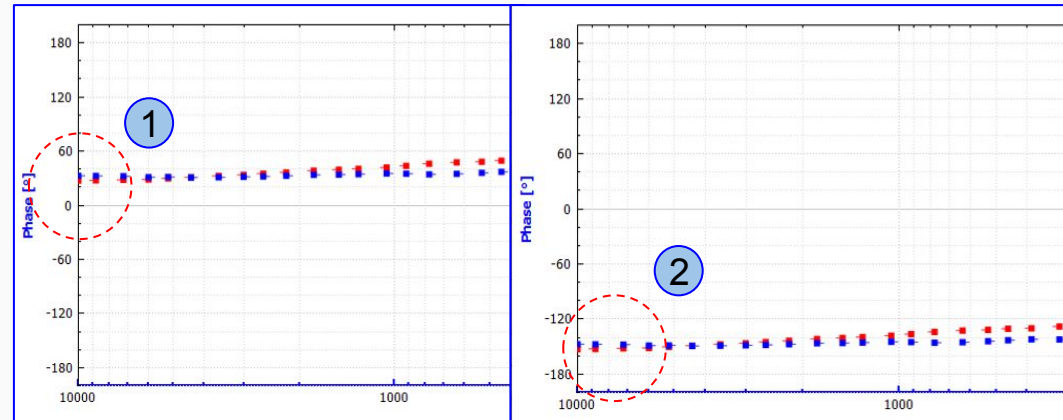
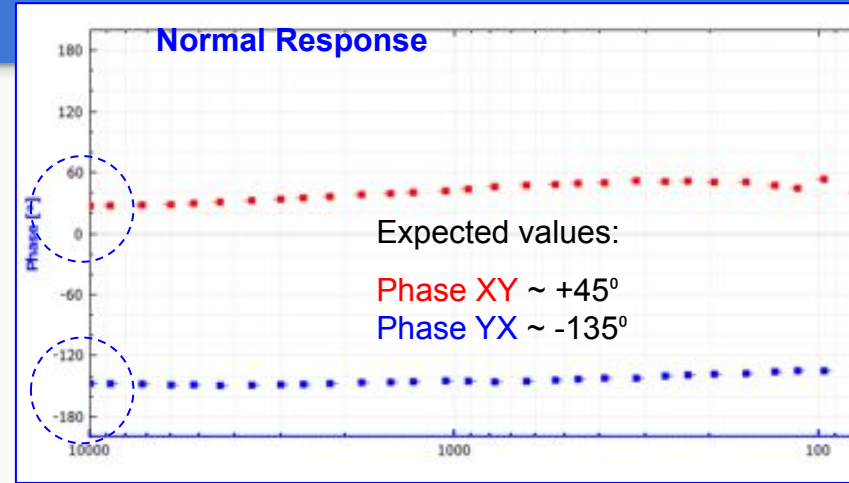
After processing the data, the phase plot will display an overlapping response, which is an indicator of a reverse polarity.

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 checked="" 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 checked="" 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

Select Manually

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 type="radio"/> E1	<input type="radio"/> E2

OK Cancel

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

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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 a series of software interface elements with numbered callouts (1-8) indicating specific features and workflow steps:

- 1:** Recording Library toolbar, highlighting the search field, Groups dropdown, and Filters dropdown.
- 2:** Station group editor - EMpower dialog, showing the Group name field and Available Stations list.
- 3:** Advanced Filter Options - EMpower dialog, showing Filter name* and Filter criteria (Status, Receiver Serial, etc.).
- 4:** Processed MT Data toolbar, highlighting the Select All checkbox and Export Selected button.
- 5:** Processed MT Data toolbar, highlighting the search field.
- 6:** Processed data group editor - EMpower dialog, showing the Group name field and Available Sites list.
- 7:** Advanced Filters - EMpower dialog, showing Filter name* and Filter criteria (Site status, Reference type, etc.).
- 8:** Process Site Exporter - EMpower dialog, showing 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

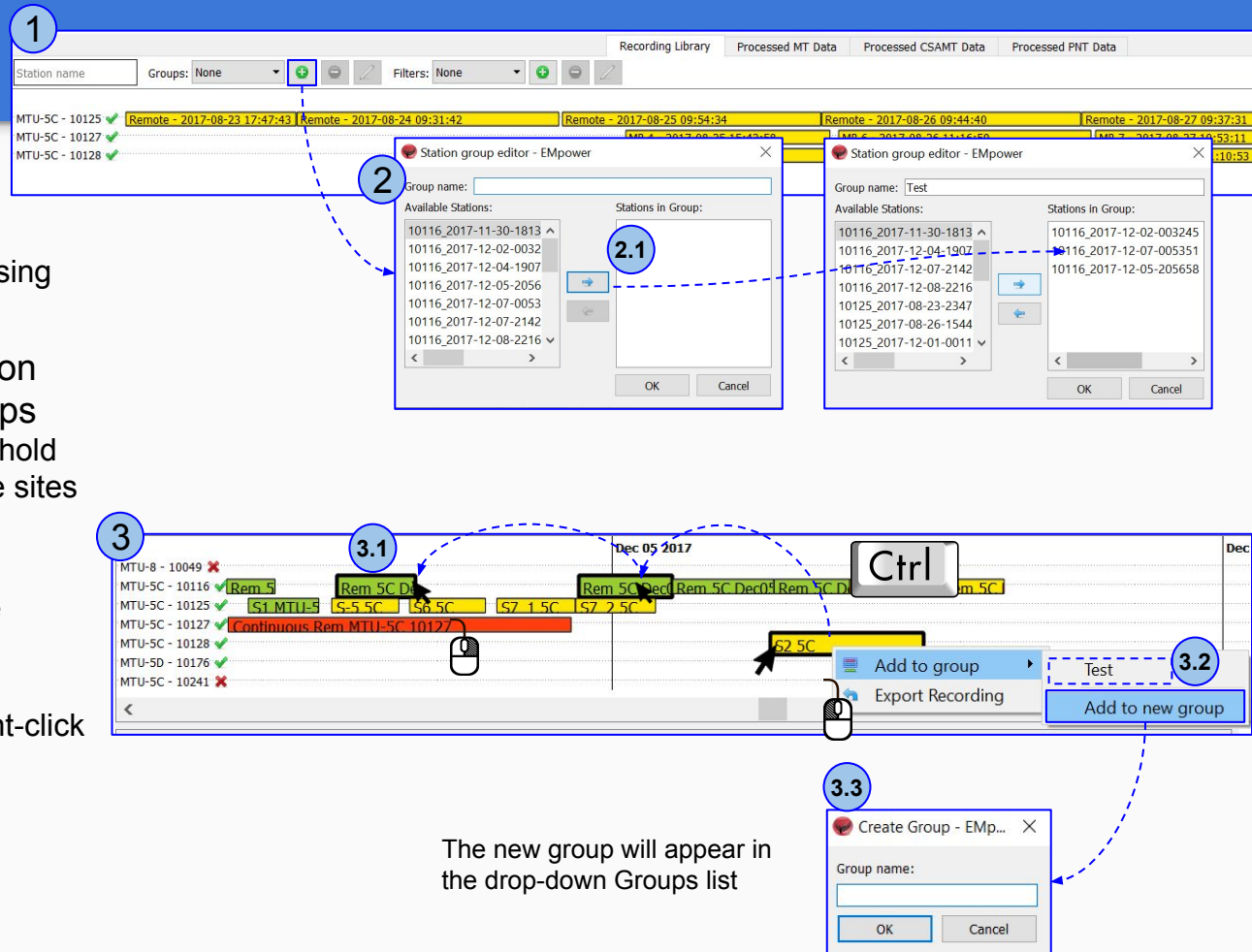
3.1. Use left-click to select the site and hold down the **Ctrl** key to select multiple sites (release the buttons)

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 illustrates the steps for creating a new group in the EMpower software. The main window shows a list of stations and a 'Groups' dropdown menu. The 'Station group editor - EMpower' dialog boxes are used to select stations and create a new group. The 'Create Group - EMP...' dialog box is shown with the 'Group name' field. The 'Add to group' menu is shown with 'Test' selected. The 'Ctrl' key is shown over the main window. The date 'Dec 05 2017' is shown in the top right corner.

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

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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:

- Top Panel:** A table listing sites and workbenches. The selected site is **P=Remote R= (Local E) - (Workbench 1)**. The table columns include Site / Workbench Name, Reference / Status, Filter / Geophysical Param, Sensor, Has Remote, Tipper, and Status.
- Map:** 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:** A detailed view of the selected site, including its name, status, and notes. It also shows a list of sites in the workbench.
- Plot:** A graph showing Amplitude [F-m] and Phase [°] versus Frequency [Hz]. The plot includes data for the selected site and other sites in the workbench. The plot toolbar includes options for Full View and Save PNG.

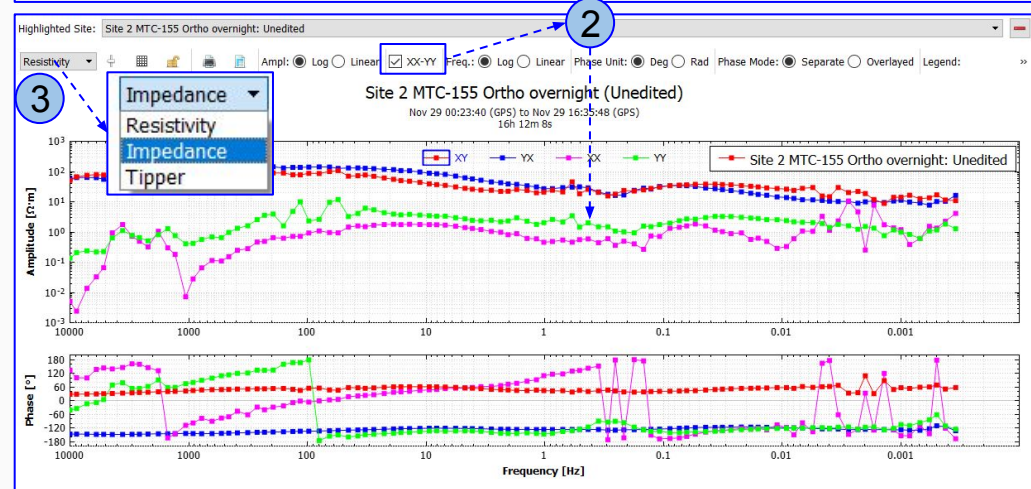
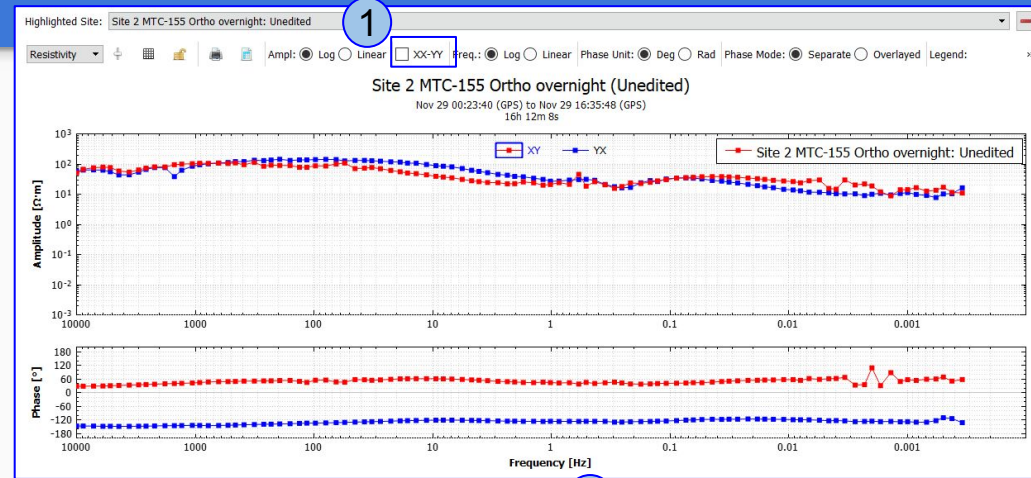
Site / Workbench Name	Reference / Status	Filter / Geophysical Param	Sensor	Has Remote	Tipper	Status
▼ P=Remote R= (Local H) - (Robust)	Magnetic	60Hz	MTC-155	Yes	No	2017-01
Unedited	Unapproved	Resistivity/Impedance				
Robust	Unapproved	Resistivity			MTC-155	
▼ P=Remote R= (Local E) - (Workbench 1)	Electric	None	MTC-155	No	No	2017-01
Workbench 1	Unapproved	Resistivity				
Unedited	Unapproved	Resistivity/Impedance				
▼ P=Remote - (Workbench 1)	Magnetic	60Hz	Unknown	No	No	2017-01
Workbench 1	Unapproved	Resistivity				
Unedited	Unapproved	Resistivity/Impedance				
▼ P=MB test 3 R= (Local H) - (Unedited)	Magnetic	60Hz	MTC-155	No	No	2017-01
Unedited	Unapproved	Resistivity/Impedance				
▼ P=MR test 3 R= (Local H) - (Robust)	Magnetic	60Hz	No	No	No	2017-01
Unedited	Unapproved	Resistivity/Impedance				

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 [Multi-Selection Tools](#)

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		
Unapproved	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

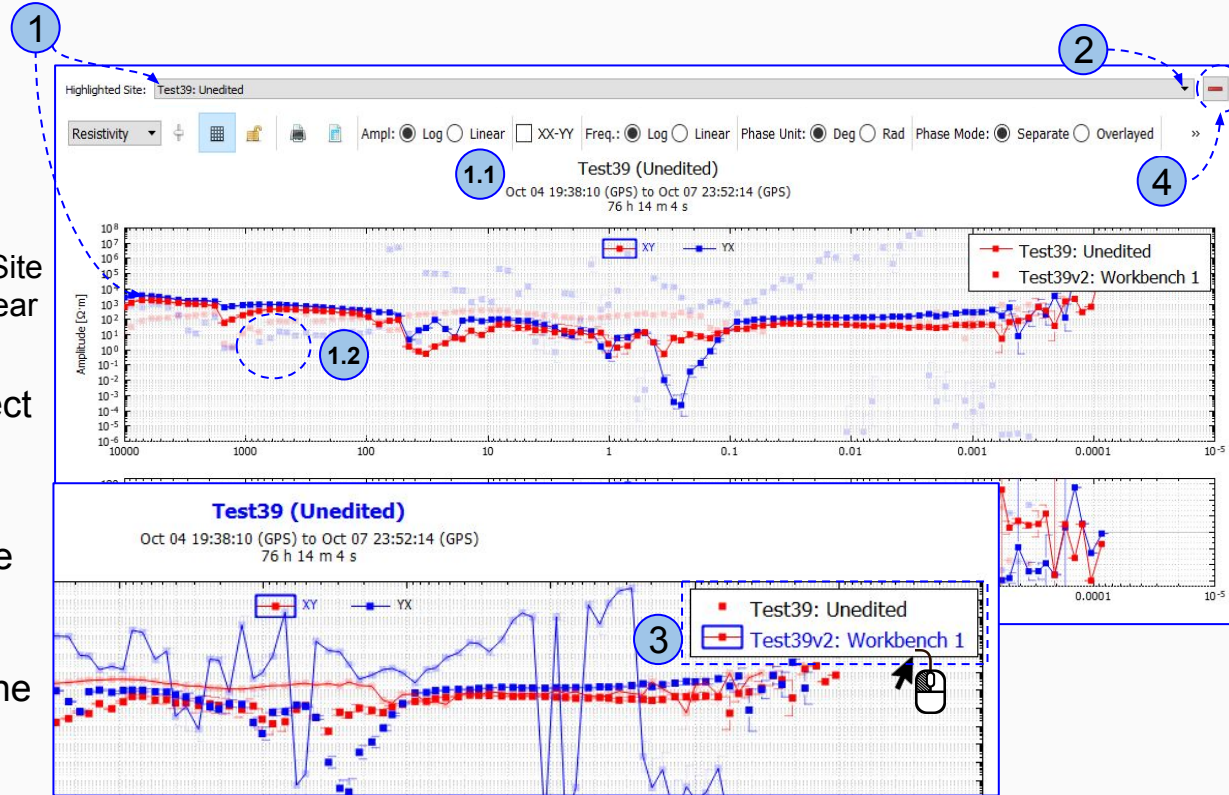
Sections to include:

- 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	Recording Notes	
Duration:	20 h 44 m 57 s		
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 selection interface with a map showing sites MB 4, MB 6, MB 7, MB 8, and MB 9. A blue box highlights a group of sites. A dashed blue arrow labeled '1' points from this box to the 'Export Selected' button in the top right.
- Top Right Panel:** A table of site data with columns for Reference / Status, Filter / Geophysical Param, and Sensor. The 'Export Selected' button is highlighted in the top right corner.
- Process Site Exporter - EMpower Window:** A dialog box with the following sections:
 - Target Sites:** A list of site names including 'P=Remote R= (Local E) - Workbench 1', 'P=Remote R= (Local H) - Unedited', and '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'. Under 'MT Exchange File', there are radio buttons for 'EDI' (selected) and 'PLT'. An 'INFO layout:' dropdown is set to 'Compact'.
 - File By:** A text field containing 'Export 54.1'.
 - Report Document:** Radio buttons for 'ODF' (selected) and 'PDF'. Below it, a 'Sections to include' section has checkboxes for 'Title Page', 'Map', 'Calibration Metadata', and 'Plot Images', all of which are checked.
- Exporting Format Dropdown:** A small window showing a dropdown menu with options: 'Compact' (selected), 'Compact', 'Full JSON', and 'No Info Section'. A dashed blue arrow labeled '3' points from this dropdown to the 'MT Exchange File' section of the dialog.
- Menu:** A menu with 'Export MT Processed Sites' highlighted. A dashed blue arrow labeled '2' points from this menu item to the 'Process Site Exporter' dialog box.
- Report Document Section:** A detailed view of the 'Report Document' section, showing the 'Sections to include' checkboxes. A dashed blue arrow labeled '4' points from this section to the 'Report Document' section of the dialog box.




Processed data editing Crosspower Editor

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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

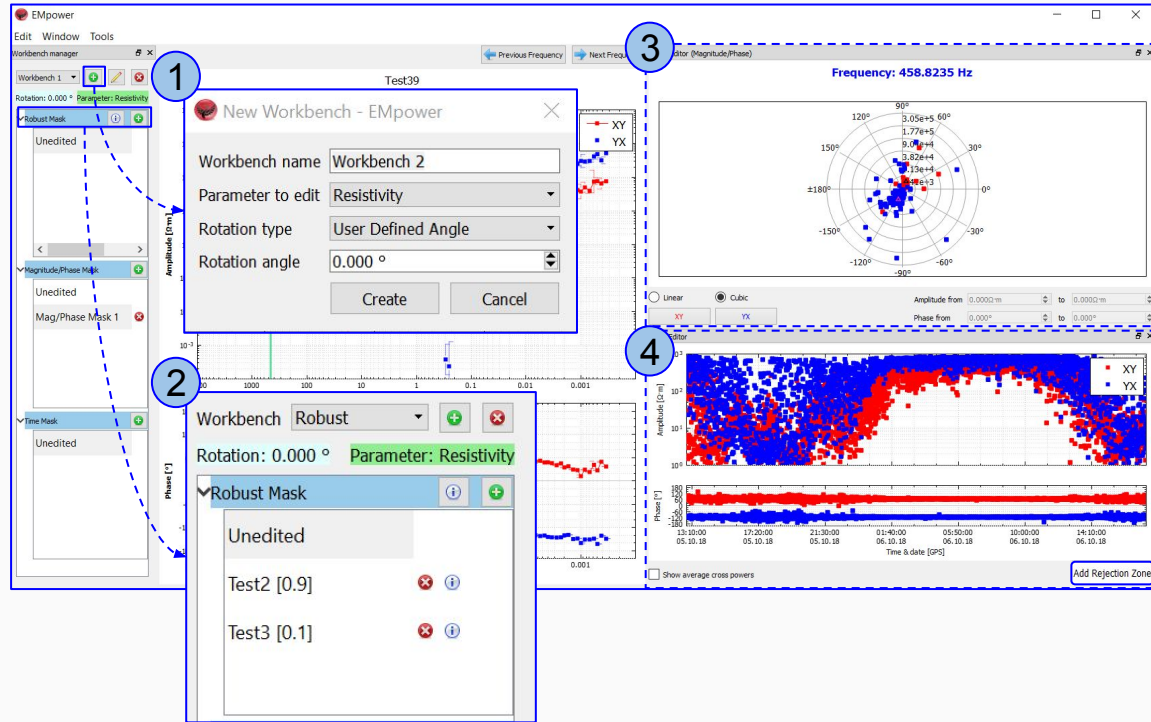
2. When the site is processed using a Robust Template, the Workbench list will include Robust and the Robust mask will display the Robust Templates created on the Project setting (page 8)

3. Polar Editor

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

4. Time Editor

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



Robust Mask

The Robust Mask algorithm fixes the most common problems

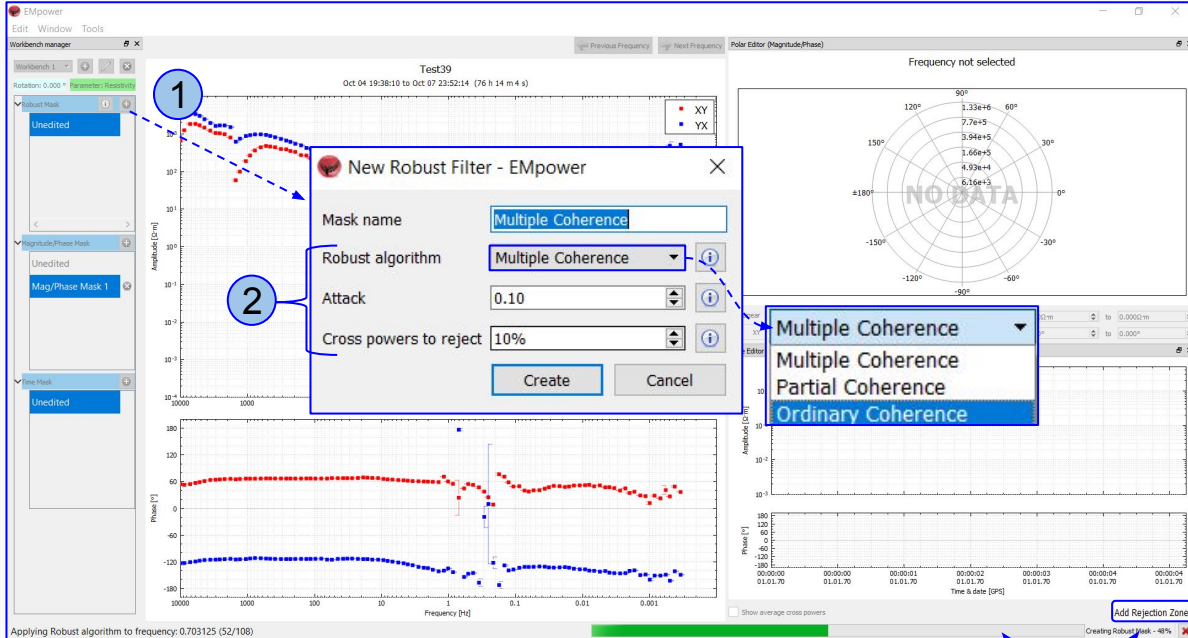
1. Create a Robust Mask

- Type the **Mask Name**

2. Use the different options to obtain the desired information

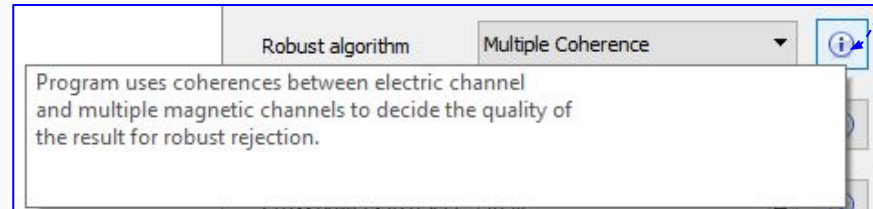
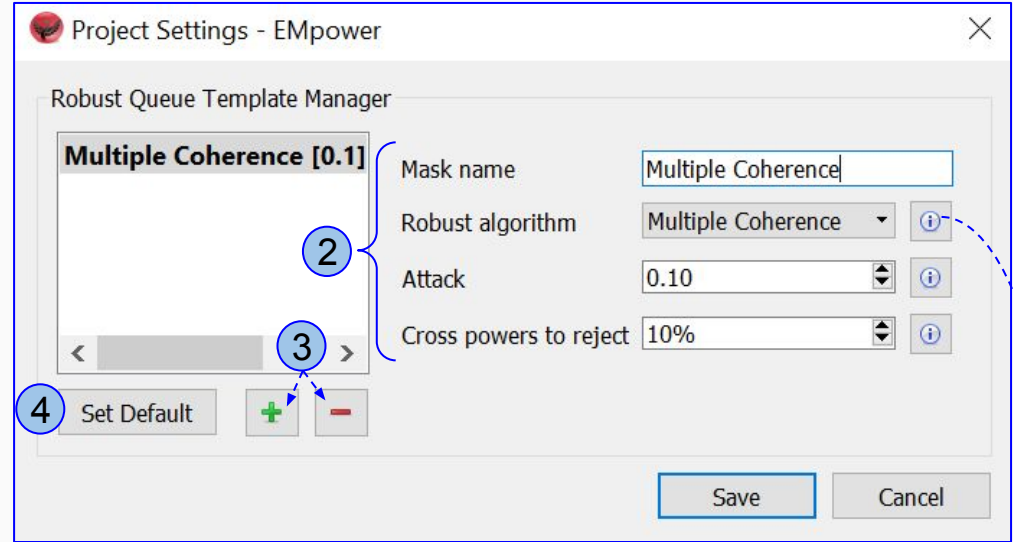
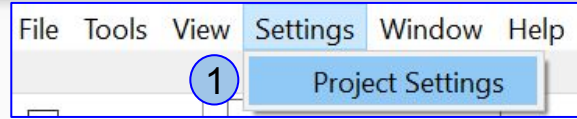
- Select the **Robust algorithm**
- Define the **Attack**
- Select the percent of **Cross powers to reject**

3. Wait until the process is completed

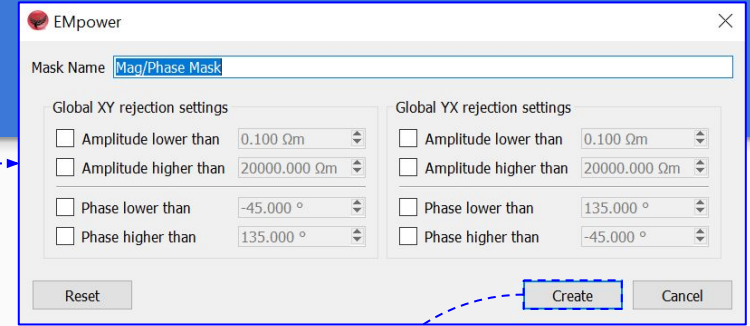


Project Settings - Robust Templates

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

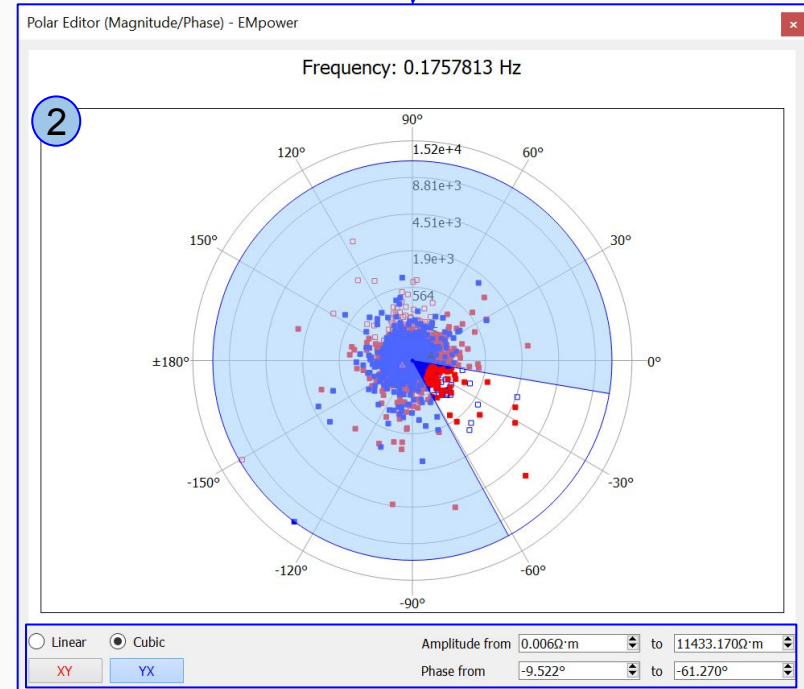


1. Create a New Magnitude/ Phase Editor Polar Masks

- 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 Rejection Zone** button

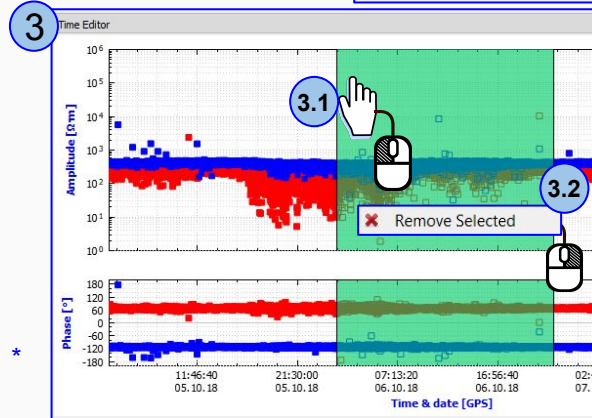
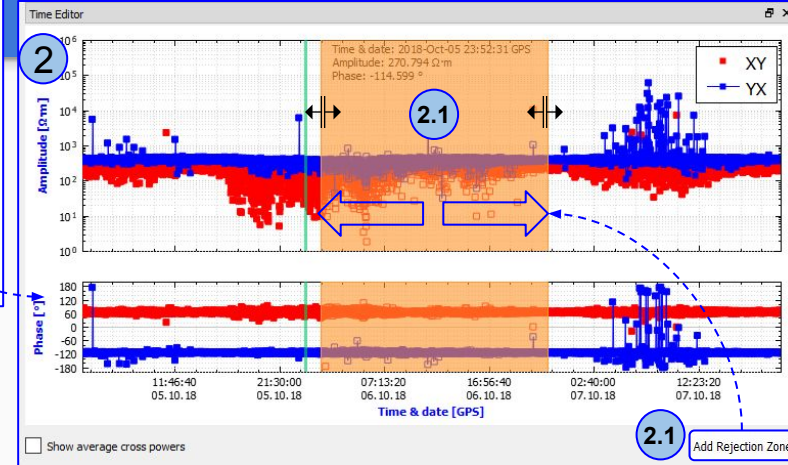
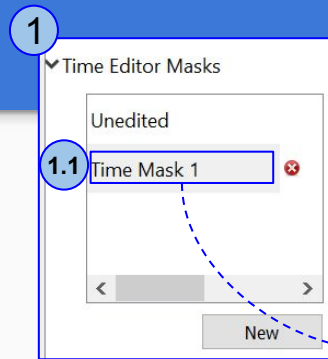
2.2. Left-click and hold, and start dragging to the left or right to select the area of crosspower rejection

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
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Processed PNT Data

This tab shows processed Parallel Noise data




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

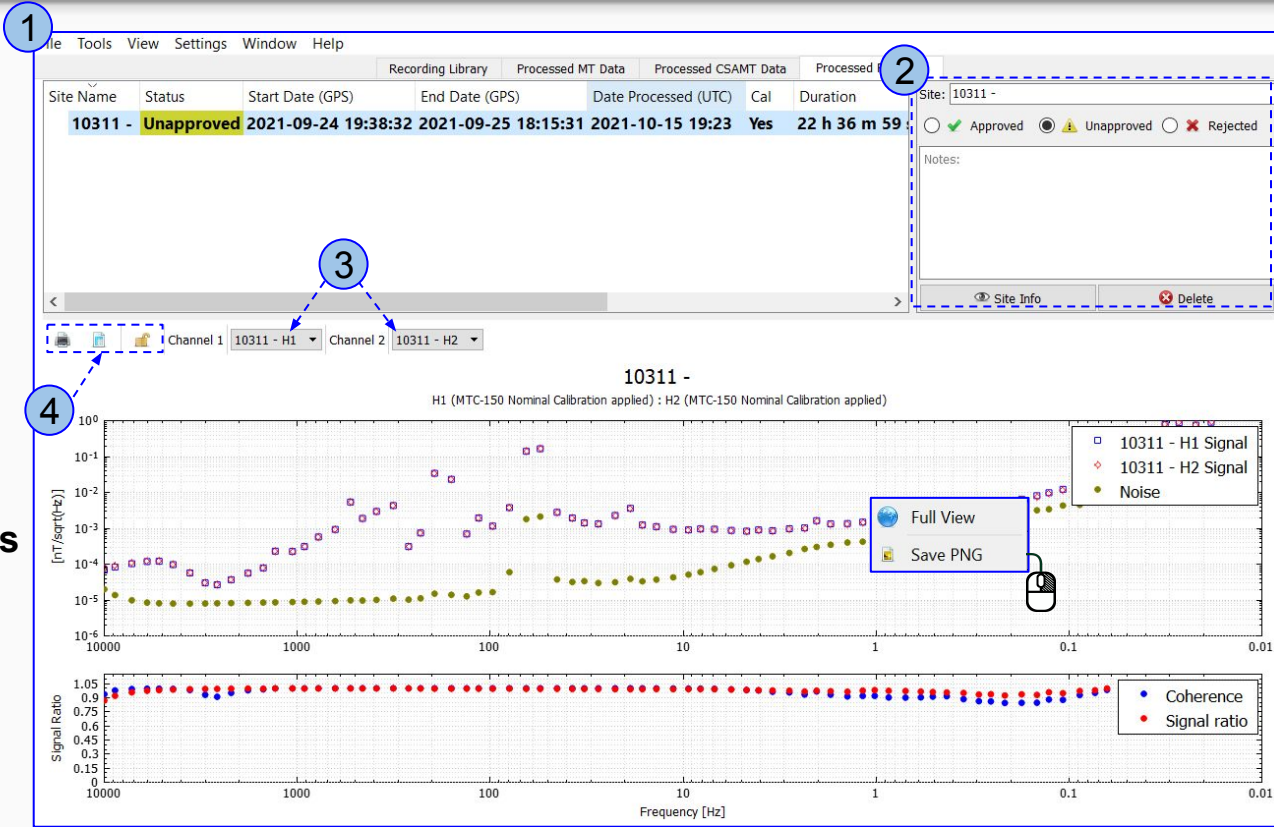
2. Area to edit information of the selected Processed **Site**

- 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

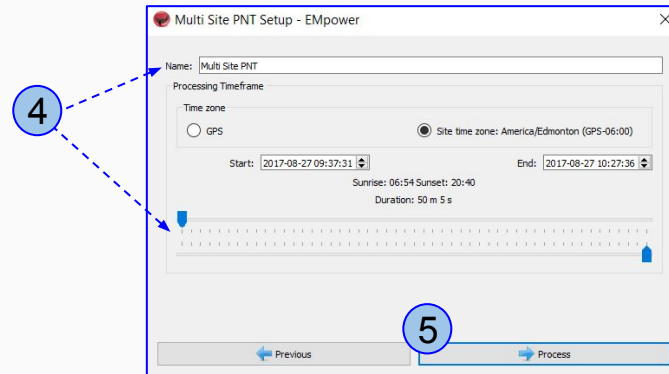
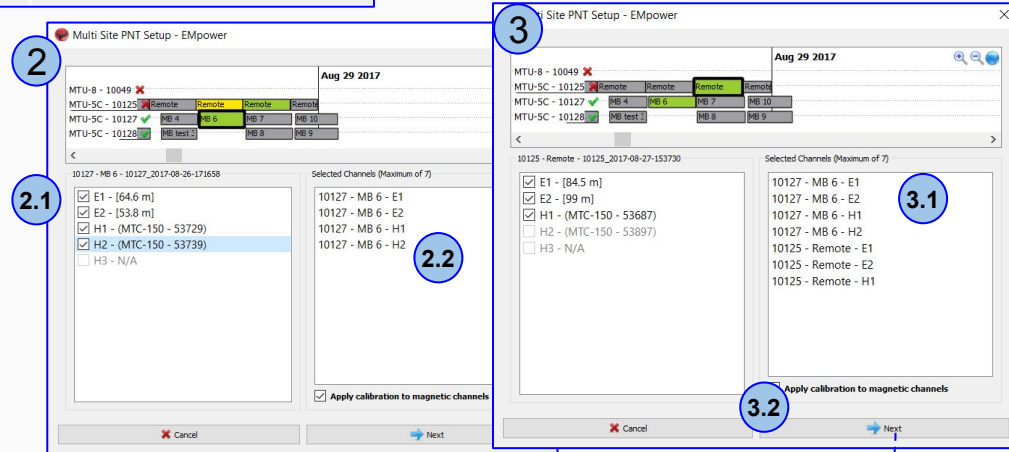
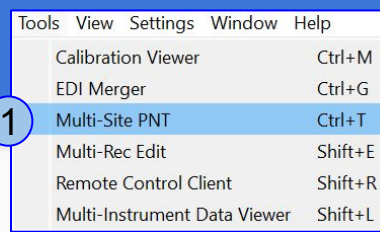
4. Tools

-  **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



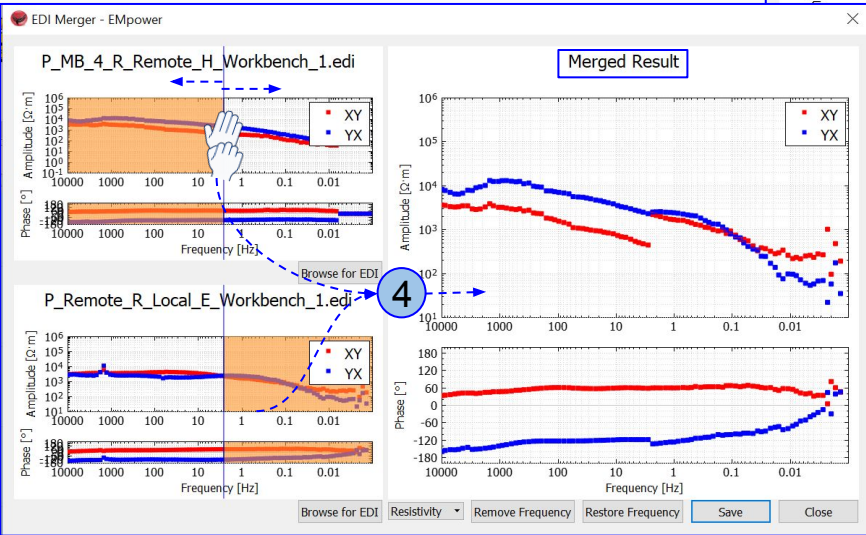
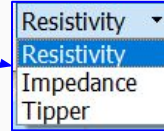
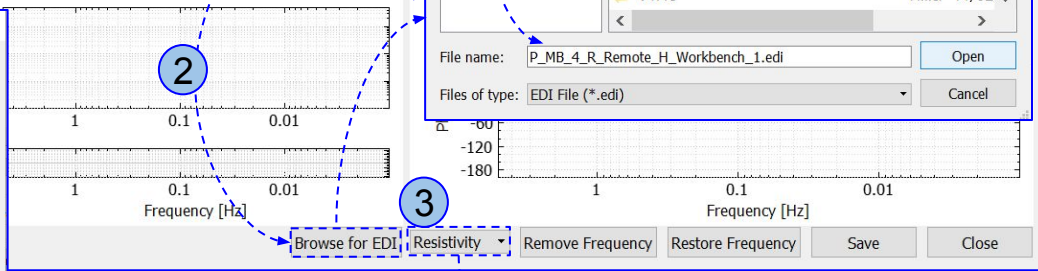
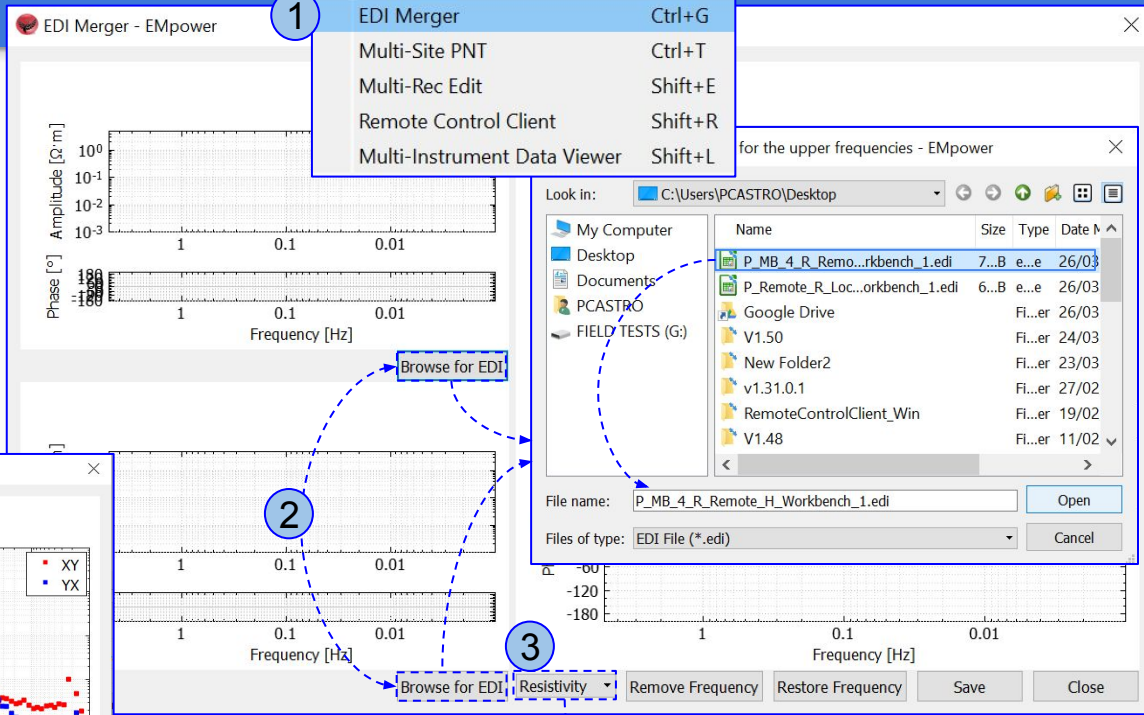
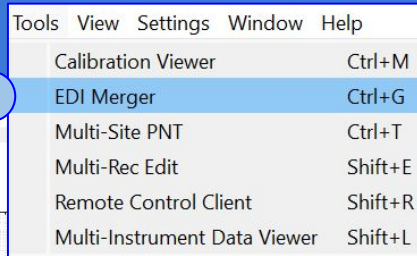


Tools

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

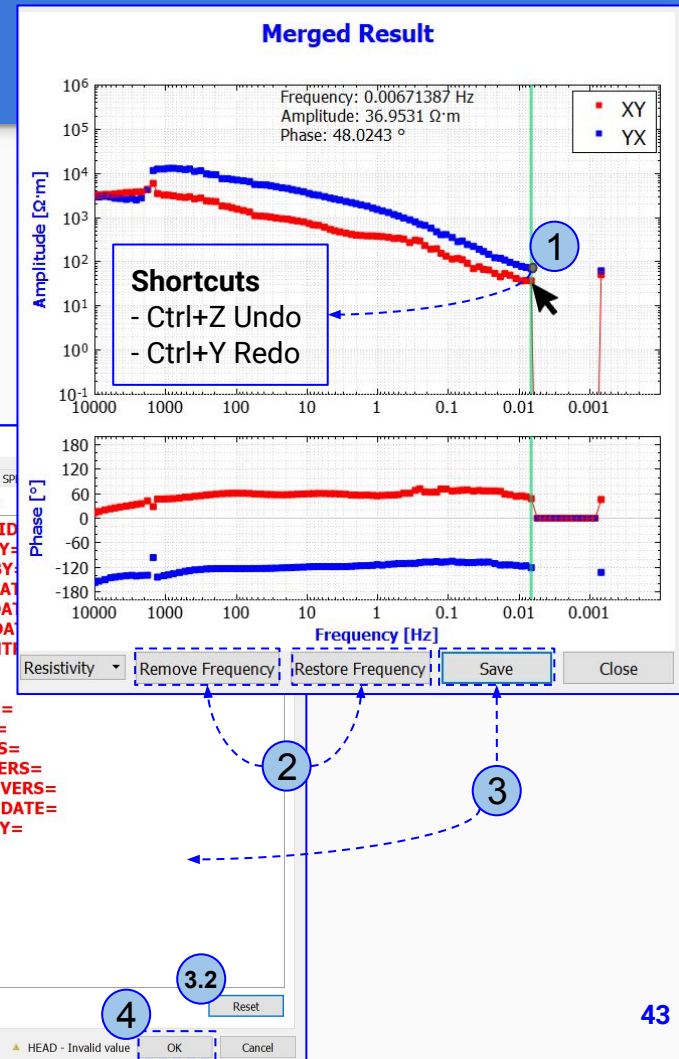
EDI Merger <Create>

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



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

The screenshot shows the 'Tools' menu with 'Multi-Rec Edit' highlighted. Below the menu is a map showing a grid of recordings. To the right is a table of recordings with columns: Recording Type, Station Name, Survey Name, Start Date, and Status.

Recording Type	Station Name	Survey Name	Start Date	Status
MT	Remote	Kimberley, BC : Aug 2017	2017-08-23	Unapproved
MT	Remote	Kimberley, BC : Aug 2017	2017-08-24	Unapproved
MT	Remote	Kimberley, BC : Aug 2017	2017-08-25	Unapproved
MT	Remote	Kimberley, BC : Aug 2017	2017-08-26	Unapproved
MT	Remote	Kimberley, BC : Aug 2017	2017-08-27	Approved
MT	Remote	Kimberley, BC : Aug 2017	2017-08-28	Rejected
MT	MB 4	Kimberley, BC : Aug 2017	2017-08-25	Approved
MT	MB 6	Kimberley, BC : Aug 2017	2017-08-26	Approved
MT	MB 7	Kimberley, BC : Aug 2017	2017-08-27	Unapproved
MT	MB 10	Kimberley, BC : Aug 2017	2017-08-28	Approved
MT	MB 1	Kimberley, BC : Aug 2017	2017-08-25	Unapproved
MT	MB test	Kimberley, BC : Aug 2017	2017-08-25	Unapproved

The screenshot shows the 'Multi Rec Editor - EMpower' window. It has a 'Recording filter' dropdown set to 'MT'. Below it is a table of recordings with columns: Station Name, Survey Name, and Color. The 'Recording Information' dropdown is open, showing 'Electric Channels' and 'Magnetic Channels'. The 'Edit Selected Rows' button is highlighted.

Station Name	Survey Name	Color
10125_2017-08-23-234742	Remote Kimberley, BC : Aug 2017	---
10125_2017-08-24-153141	Remote Kimberley, BC : Aug 2017	---
10125_2017-08-25-155433	Remote Kimberley, BC : Aug 2017	---
10125_2017-08-26-154439	Remo	---

The screenshot shows the 'Batch Editing - EMpower' window for 'Magnetic Channels' and 'Electric Channels'. It has various input fields for sensor type, serial, polarity, azimuth, distance to ground, and declination.

Channel Type	Distance (m) to ground (+)	Distance (m) to ground (-)	Polarity	Inverted	Azimuth	Declination
Magnetic Channels	0.00 m	0.00 m	<input type="checkbox"/>	<input type="checkbox"/>	0.00°	0.00°
Electric Channels	0.00 m	0.00 m	<input type="checkbox"/>	<input type="checkbox"/>	0.00°	0.00°

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

Multi-Instrument Data Viewer

The **Multi-Instrument Data 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 Data 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 of recordings. A 'Multi Channel Selection' dialog box is open, showing a list of receivers and their channels. The 'Recording Library' menu is highlighted with a blue dashed box and a circled '1'. The 'Multi Channel Selection' dialog has three numbered callouts: '1.1' points to the recording list, '2' points to the channel selection list, and '2.3' points to the 'Timeline' header. A 'View' button is circled with a '3'.

Recording Library

- 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 Data Viewer (Shift+L)**

Multi Channel Selection - EMpower

Timeline

Nov 29 2022

- U-5C - 10273 1 - 2022-11-28 14:55:32
- MTU-5C - 10283 1 - 2022-11-28 14:55:36
- MTU-5C - 10283 2 - 2022-11-28 14:53:40
- TXD-1 - 10307

10343 - Site 2 - 10343_2022-11-28-225339

Selected Channels (Max 8 Channels)

- E1 - [40 m]
- E2 - [40 m]
- H1 - (MTC-155 - 57482)
- H2 - (MTC-155 - 57469)
- H3 - (MTC-155 - 57483)

10283 - Site 1 - E1

10283 - Site 1 - E2

10283 - Site 1 - H1

10283 - Site 1 - H2

10343 - Site 2 - E1

10343 - Site 2 - E2

10343 - Site 2 - H1

10343 - Site 2 - H2

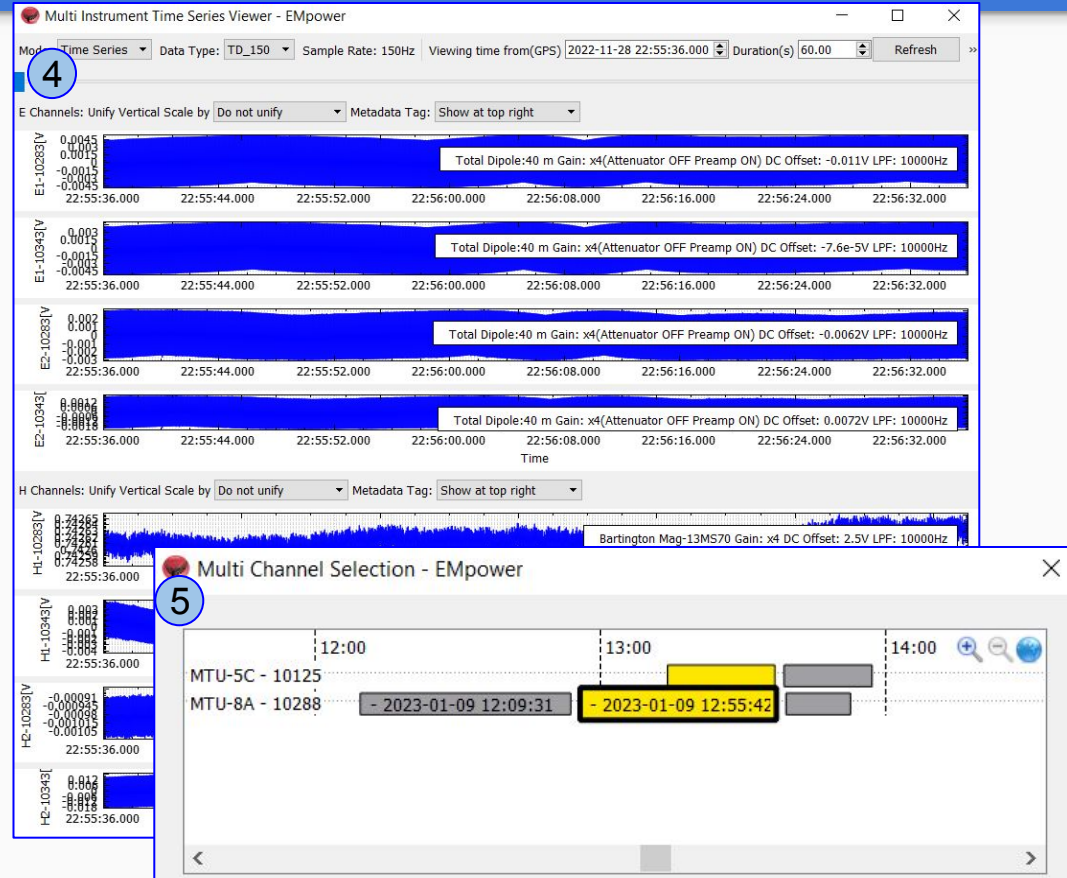
Cancel View

Multi - Instrument Time Series 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.



Software Recommendations

- Do not copy data to your computer, instead create a project where you want the data, and import the data into the project from the card
- Use parallel tasks
 - Import data in parallel
 - Process several sites in parallel
- When editing, prefer starting with robust and only clear details manually after





Please check out the [FAQs](#)

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

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