EMpower
Data Management

Version: 250107 ID: DAA15

Recording Library

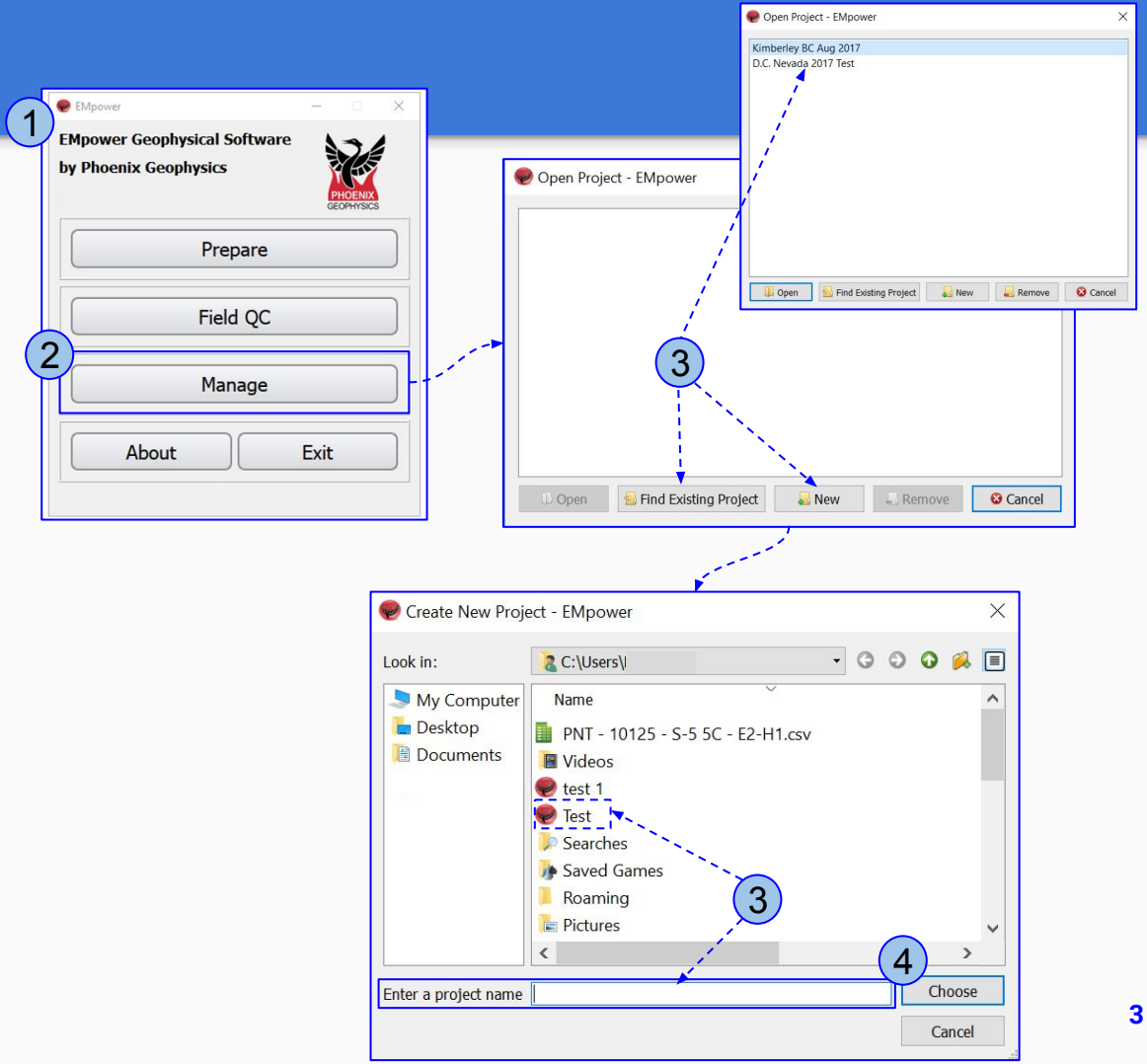
Creating / Opening a Project

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**



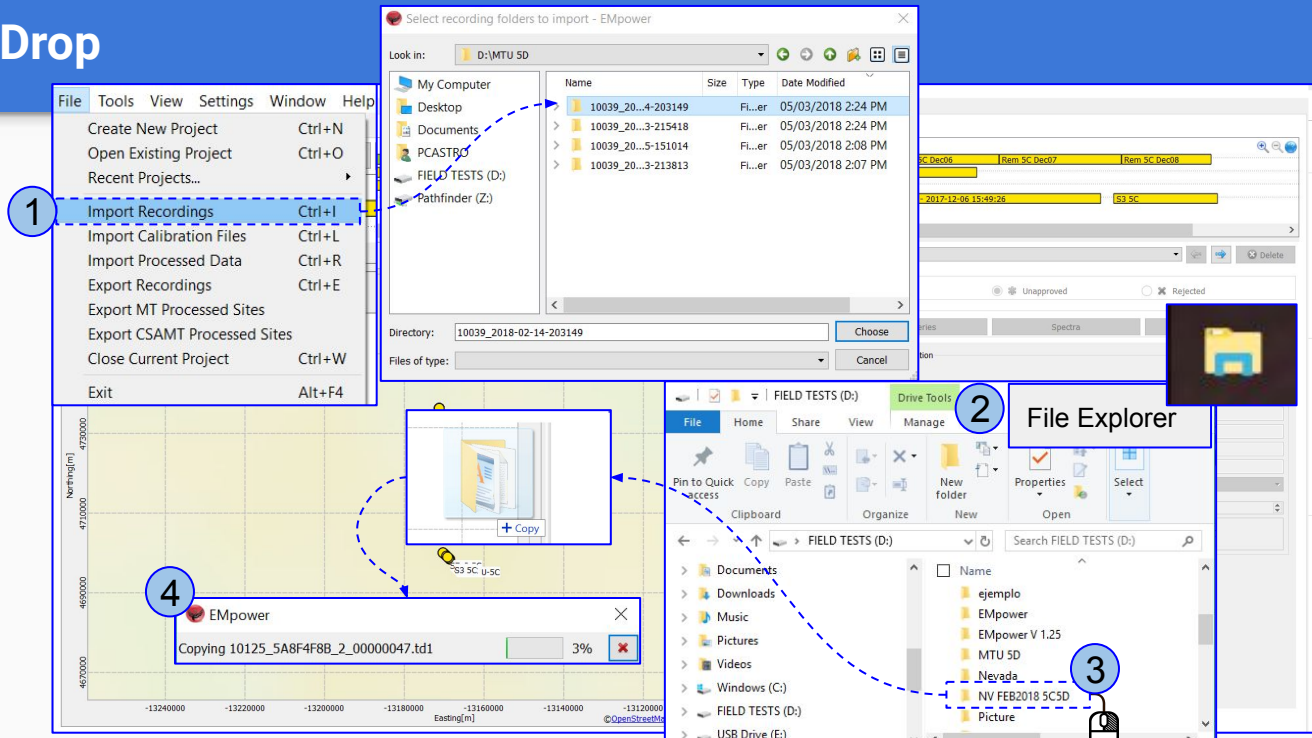
Importing Data / Drag and Drop

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



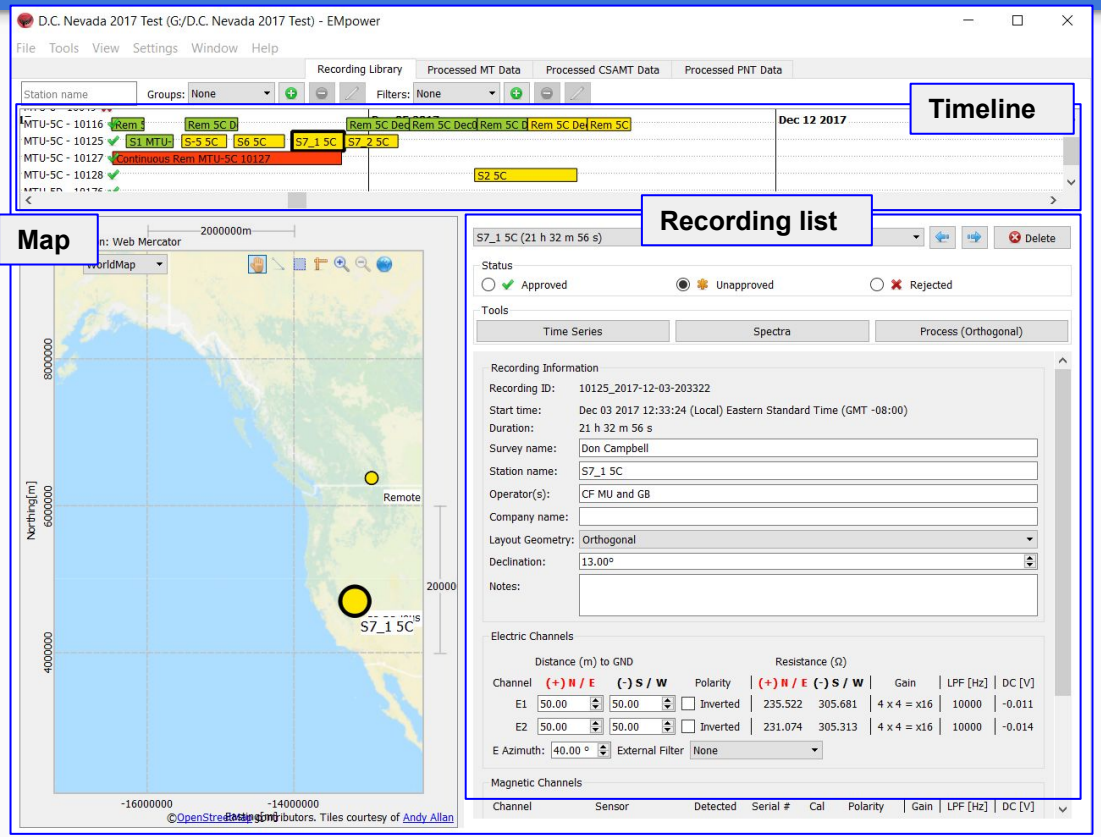
To add a recording from the **SD Card**

- 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

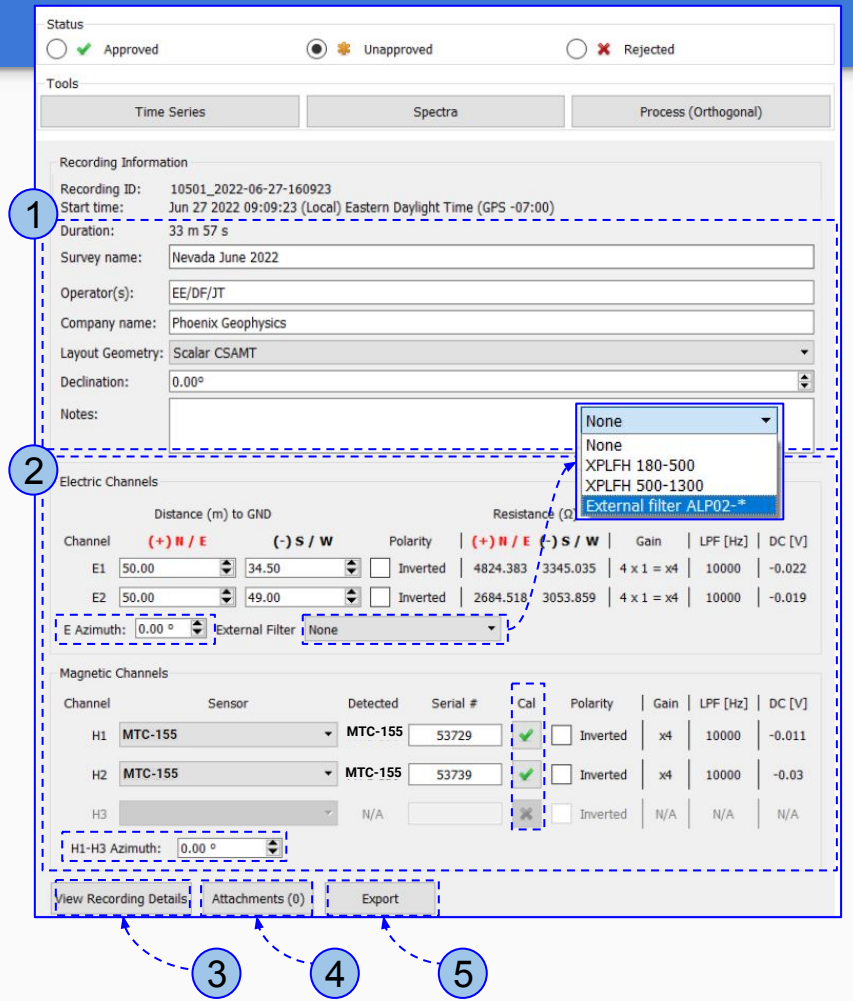


Selecting a recording in any of the views will automatically update the recording information in the other views

Verifying/Editing Recording Information

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

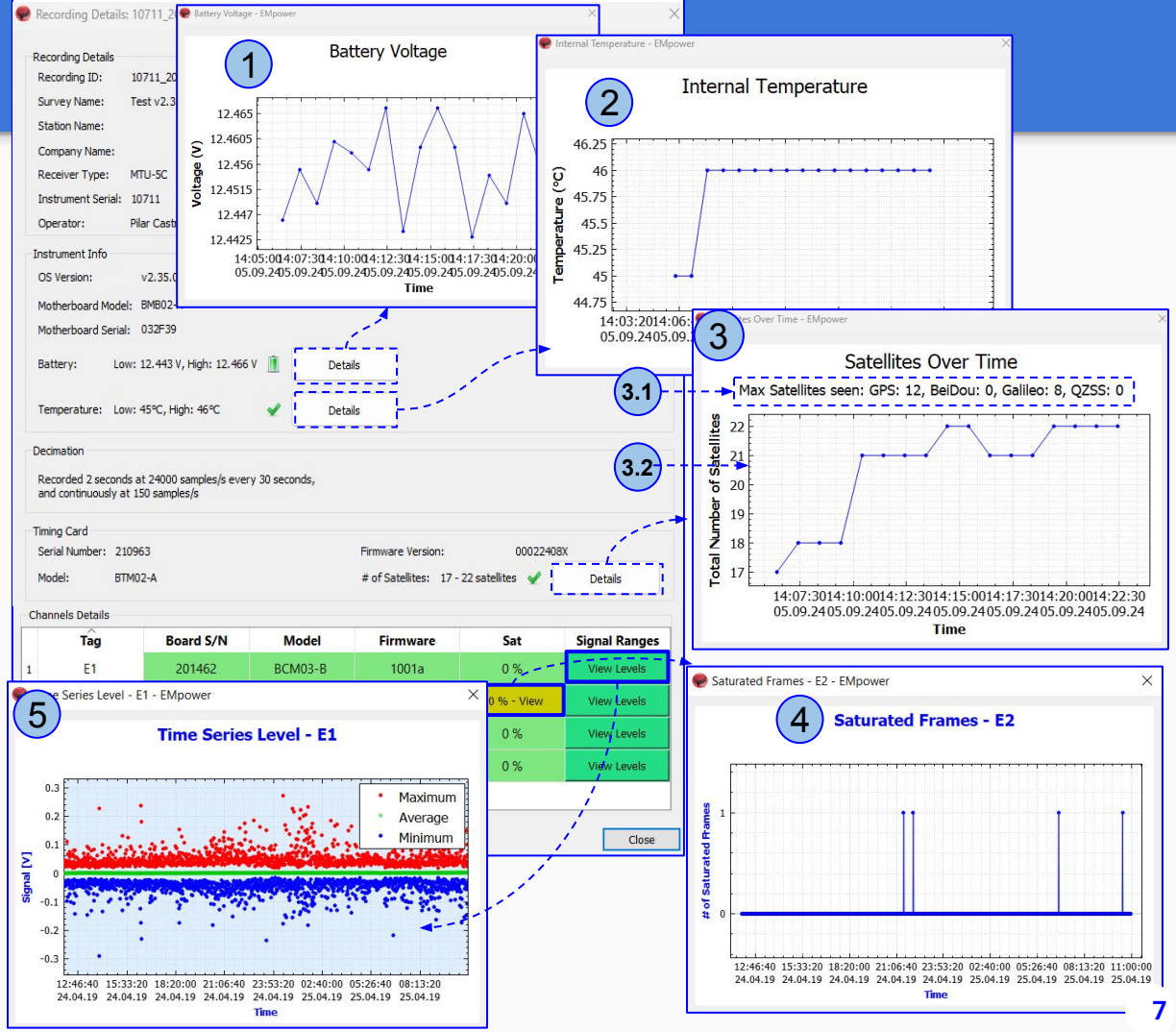
1. Review the Recording Information
   - Edit the enabled fields, if required
   - ⚠ If a warning is found, consult the *DAA24 System Troubleshooting manual*
2. Review the following information:
   - Declination
   - Dipole length
   - The **Azimuth** at which the E and H sensors were laid out
   - Use 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 **Cal**ibration 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)*



Recording Details

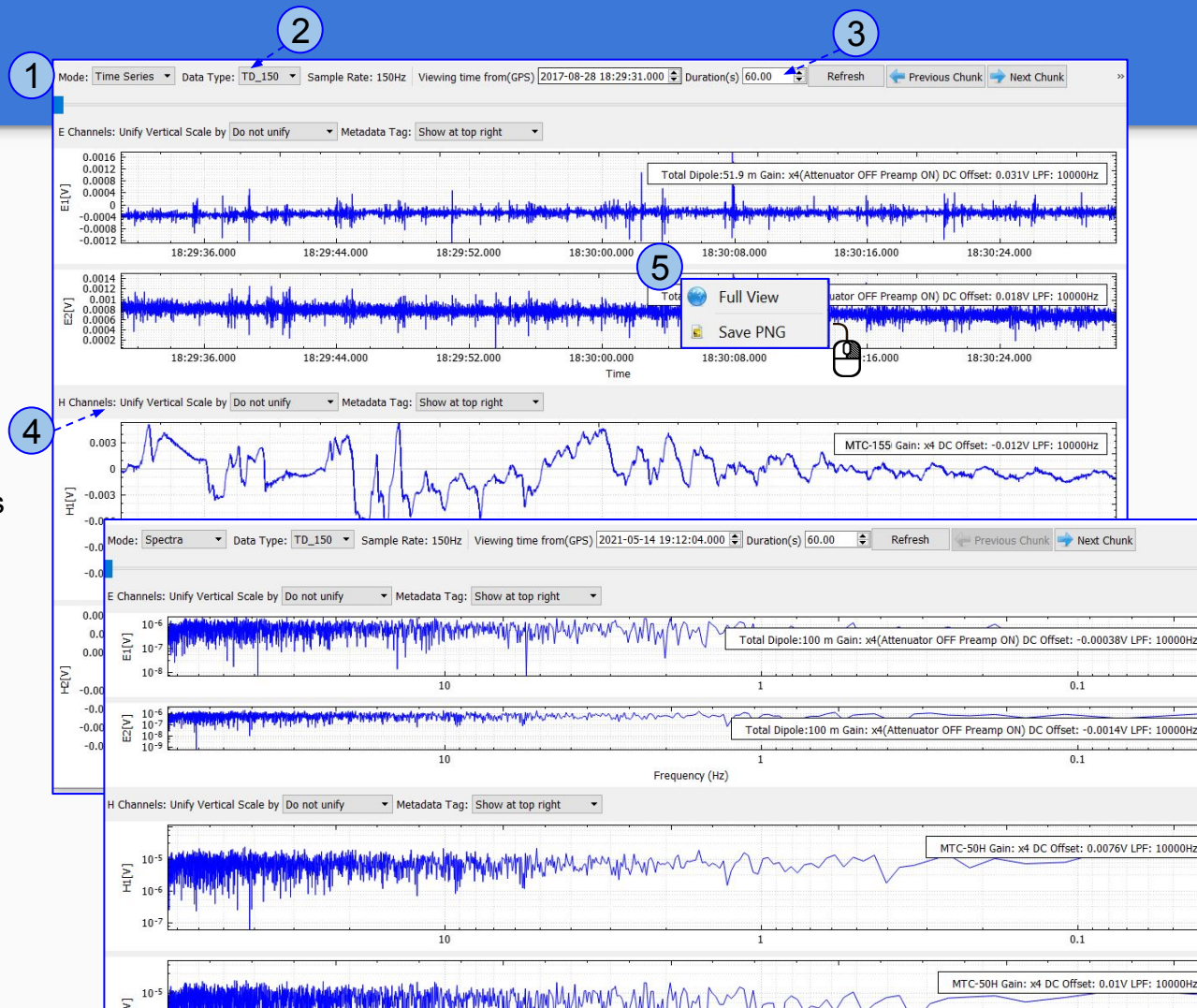
Ensure the following levels are within acceptable limits

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

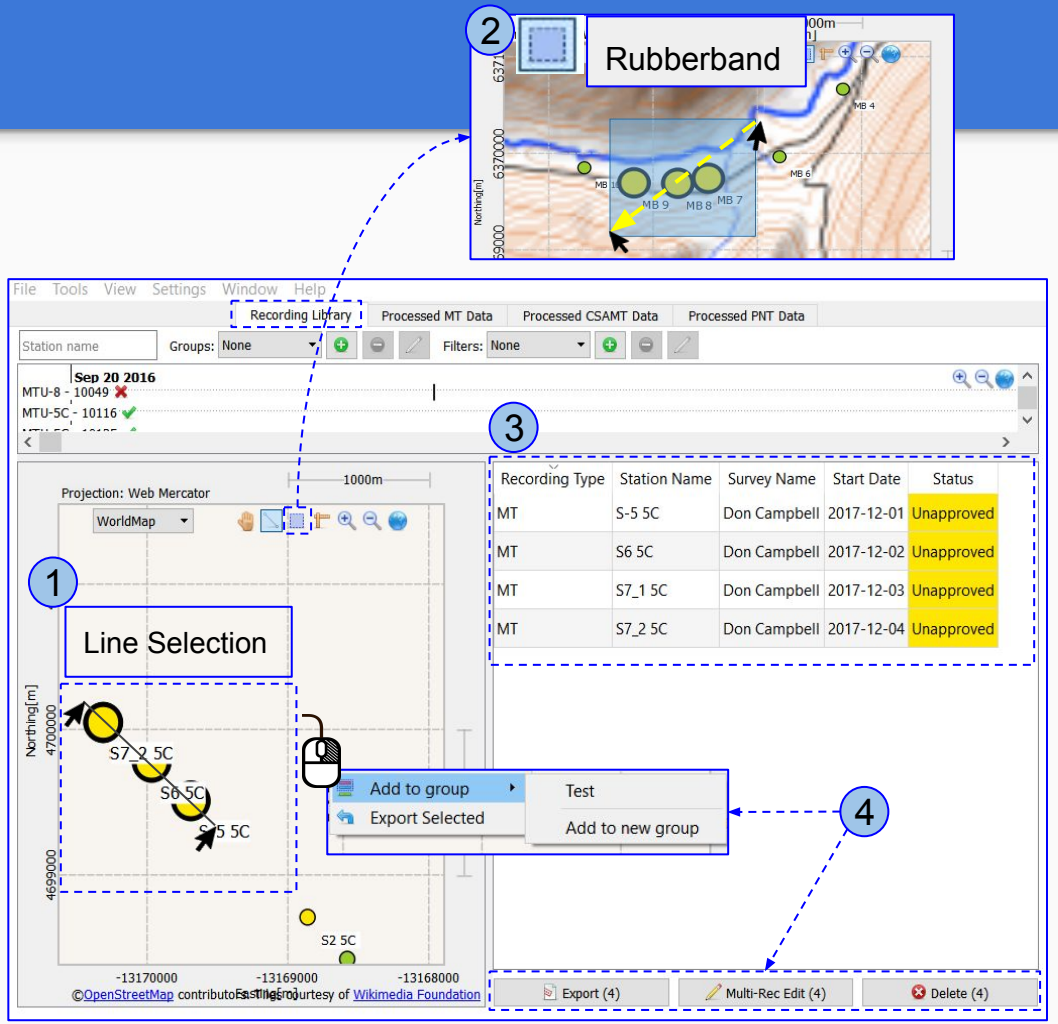
2. Use the **Rubberband** for large ranges

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

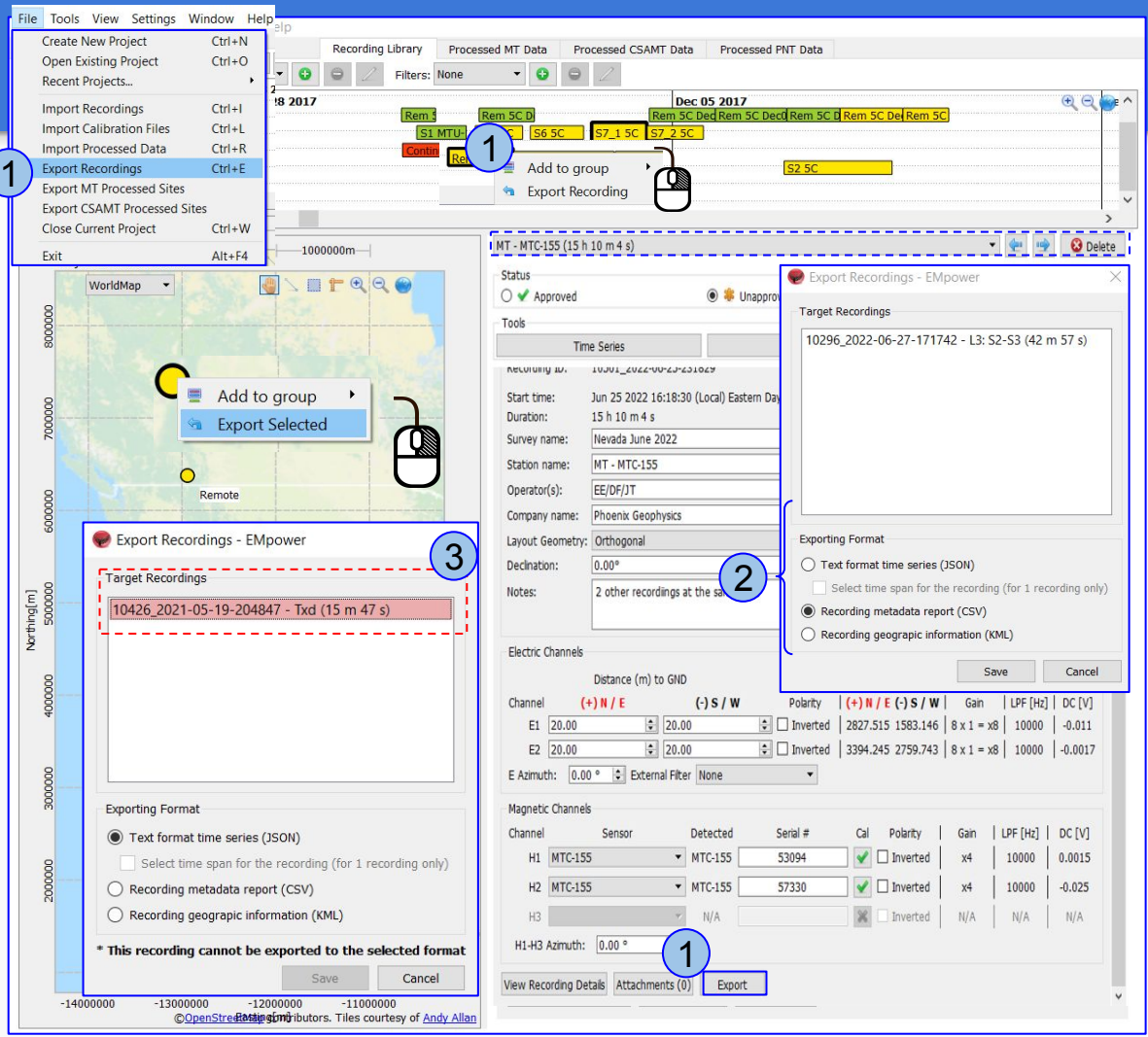


Export Recording

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



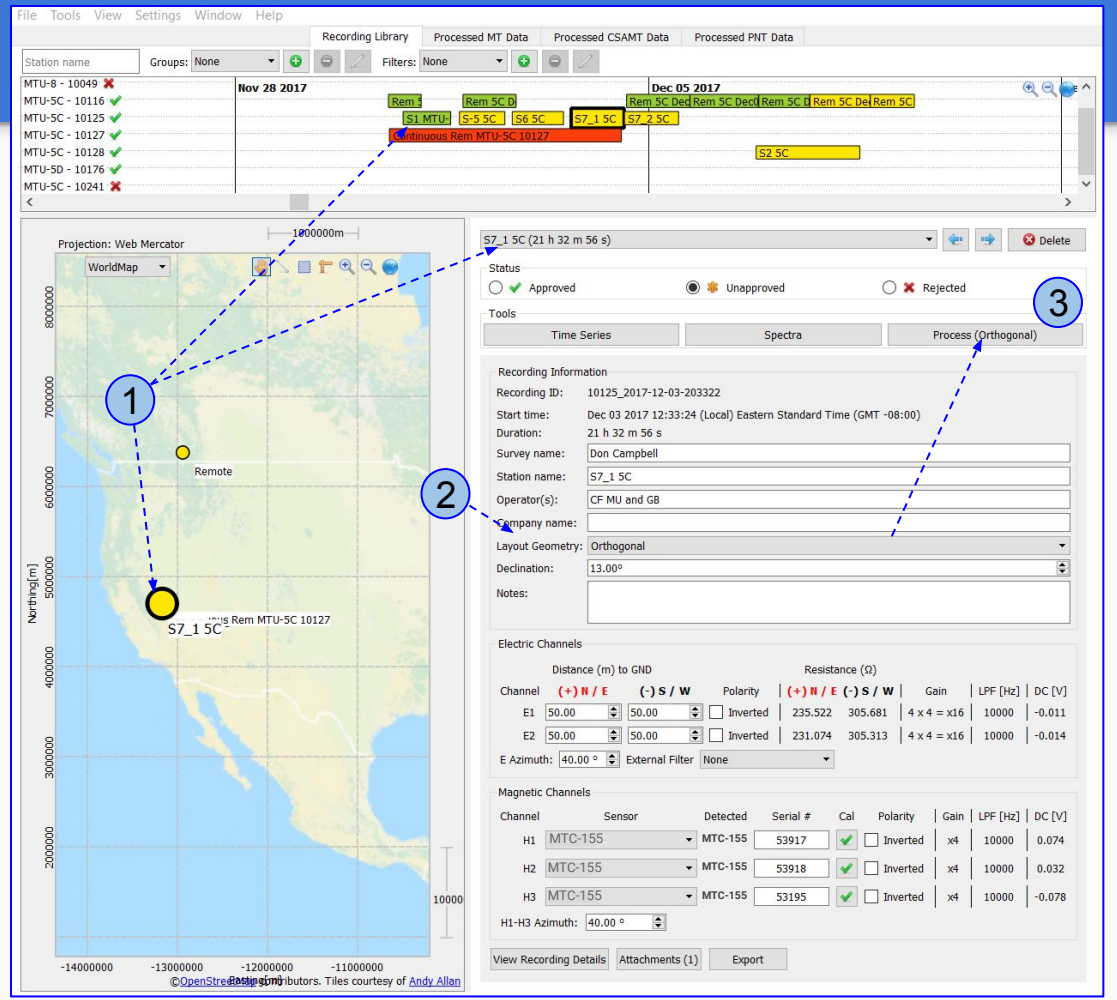
Processing Data

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

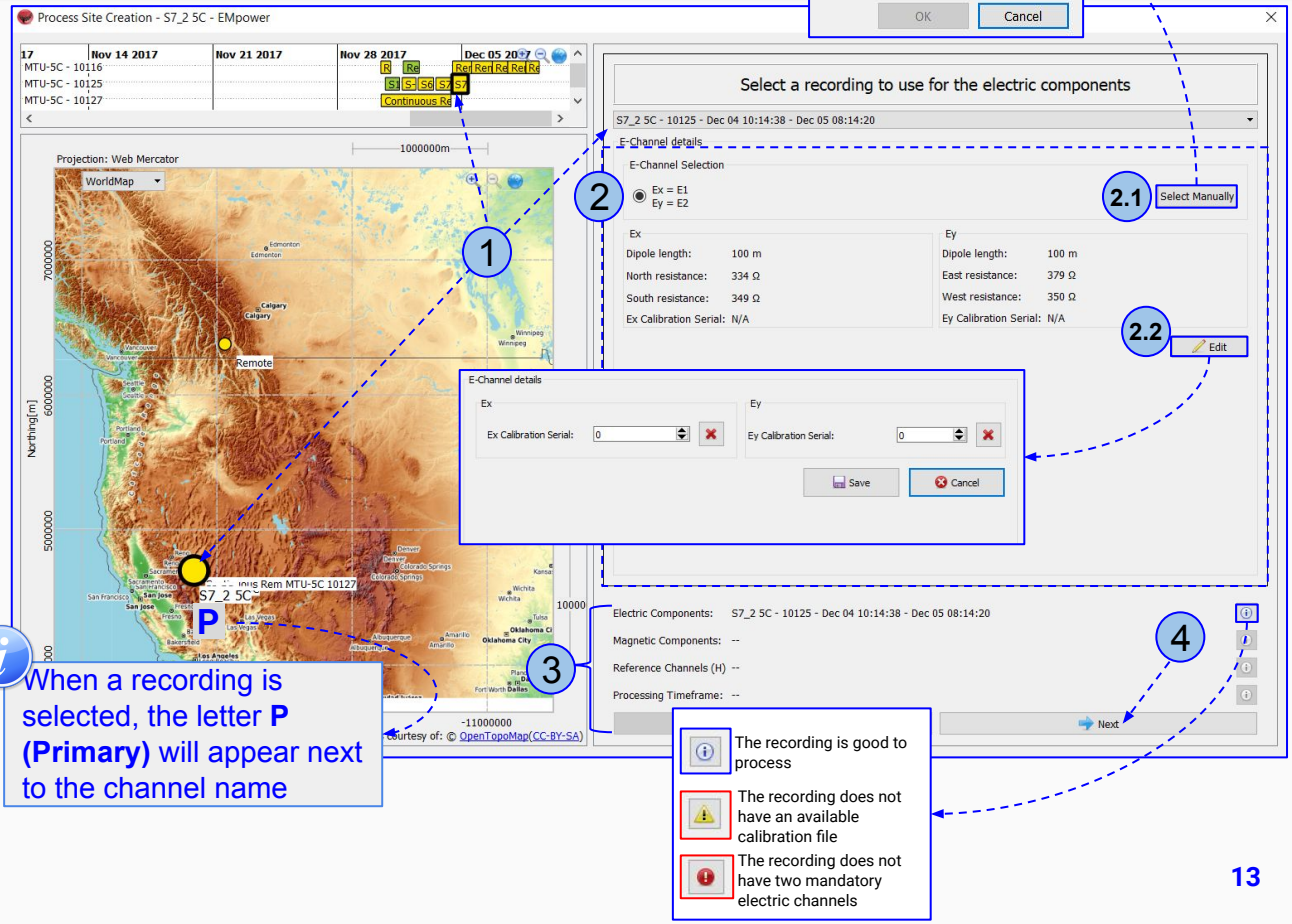
**These steps will be explained in the Following pages*



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

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



Process Site Creation wizard
Magnetic Channels

If the desired magnetic channels are in the same recording

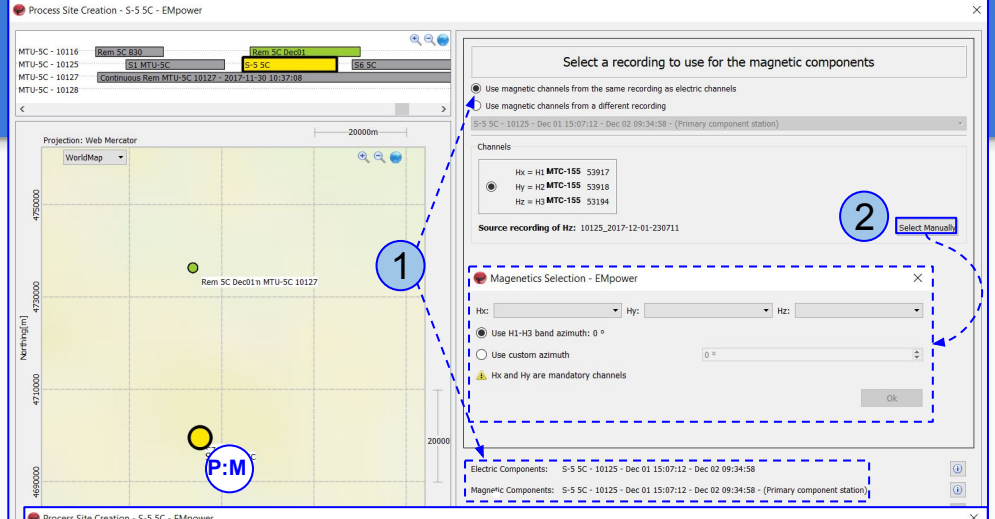
1. Keep the option **Use magnetic channels from the same recording as electric channels** selected
2. Use **Select Manually** to modify as needed and click **Next**

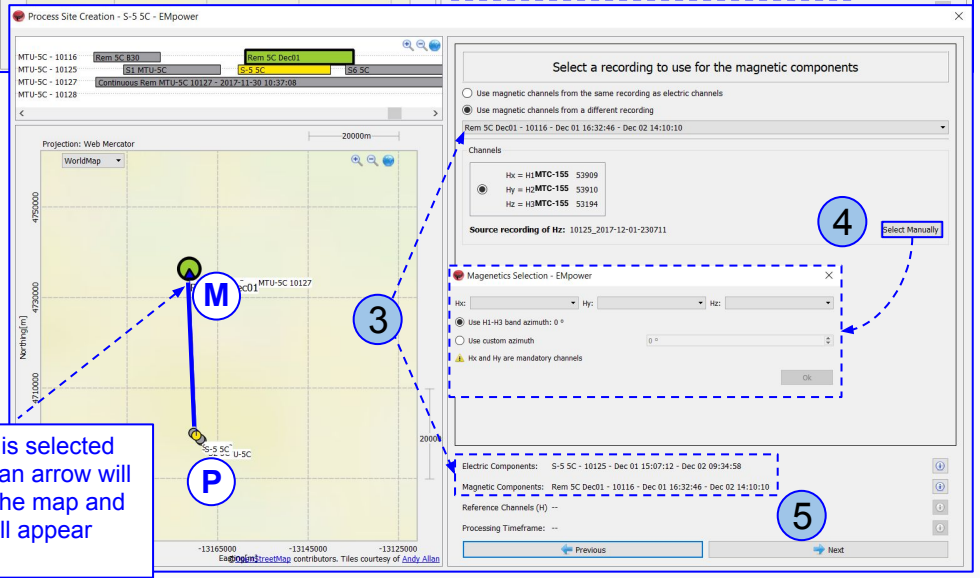
If need to borrow the magnetic channel data from a different recording

3. Select **Use magnetic channels from a different recording**
   - 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

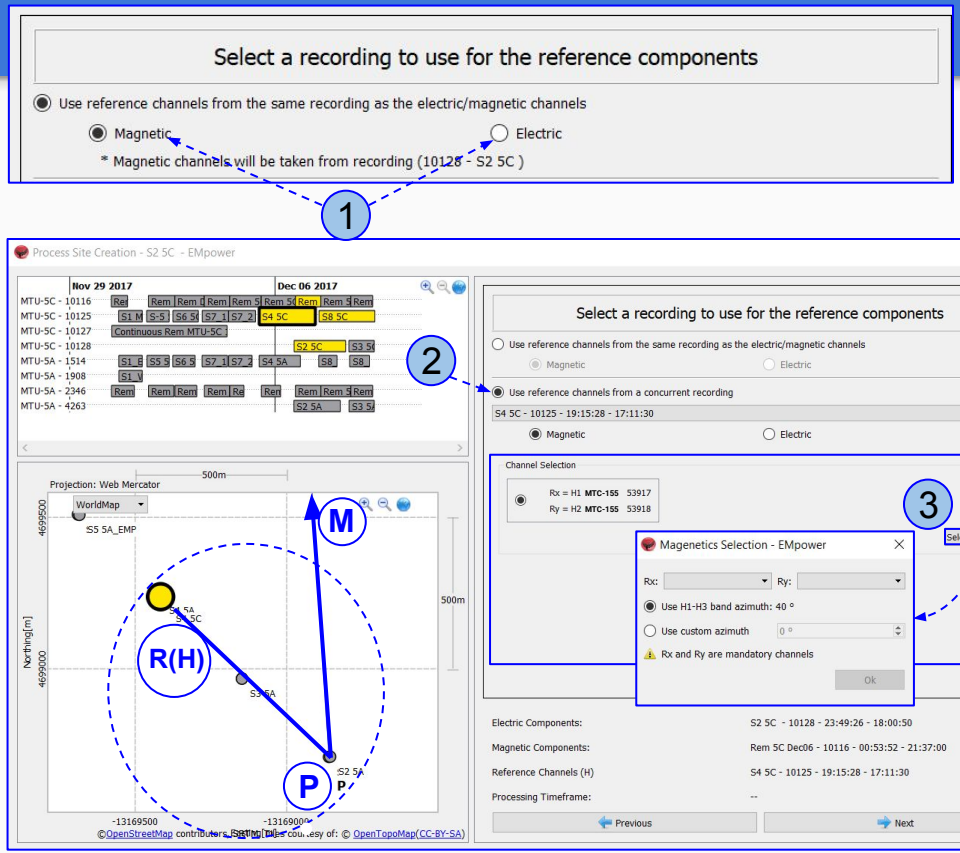
1. To use reference channels from the same recording as the electric/magnetic channels
   - Select either the Magnetic Channels or Electric Channels
   - Click **Next**

Remote reference

2. To use Reference channels from a concurrent recording select **“Use reference channels from concurrent a recording”**
   - 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” .

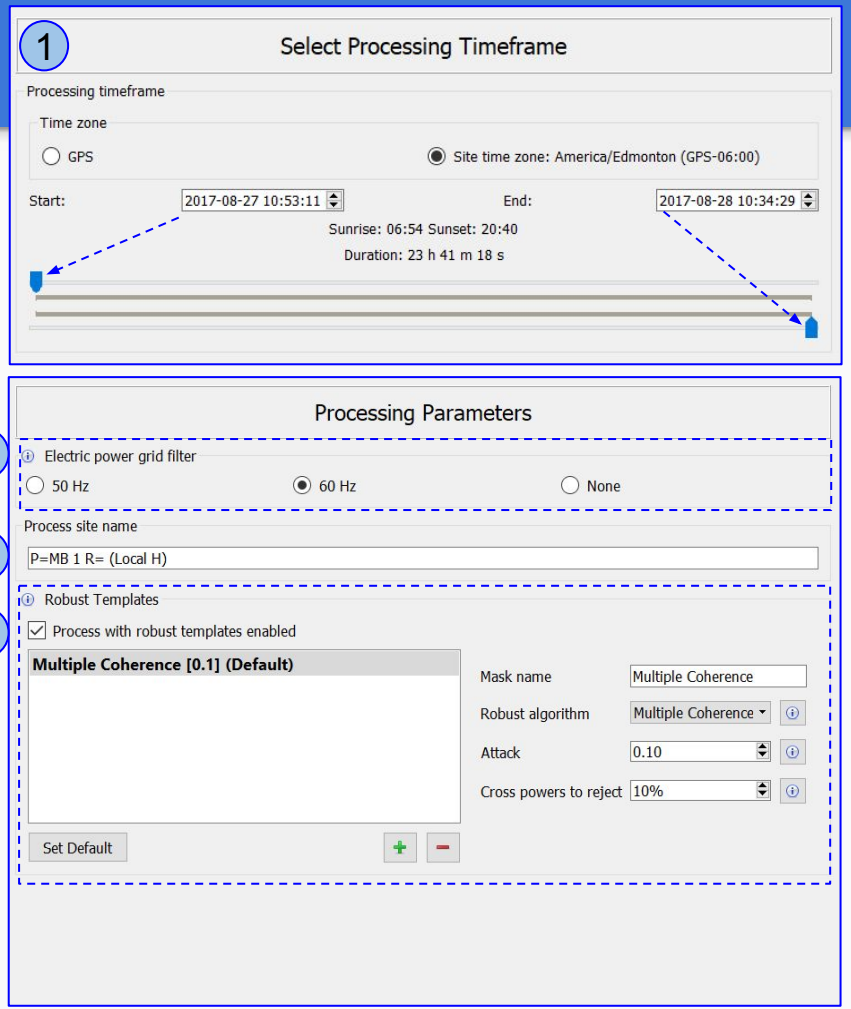
3. Use **Select Manually** as needed
   - Click **Next**



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 **R**eference 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)*

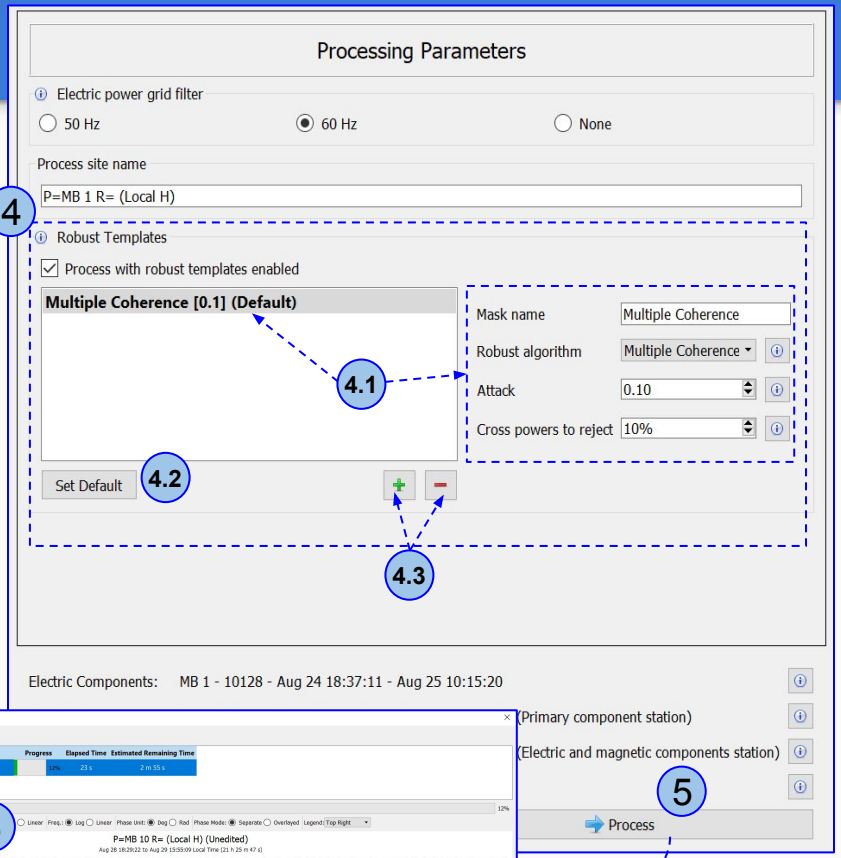


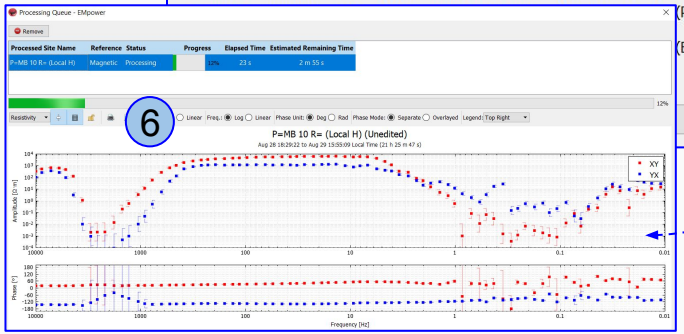
Robust Template / Processing Queue

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 <u>the current processing task only</u> 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





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

How to identify a reverse polarity

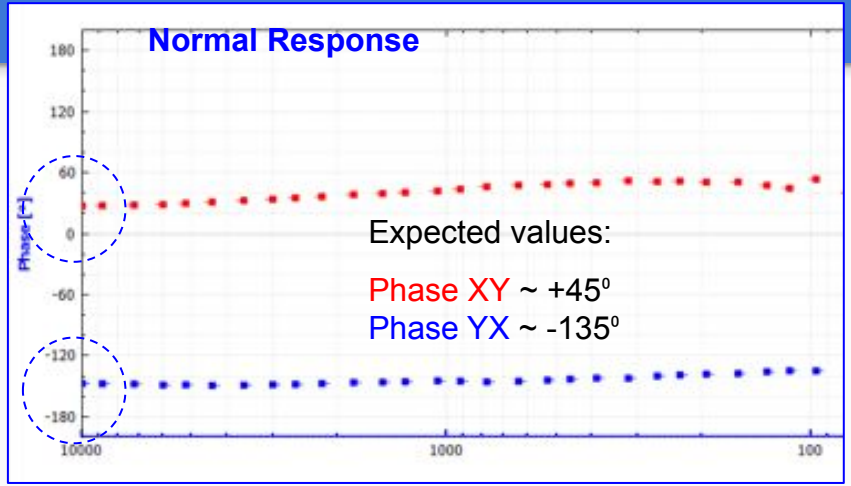
After processing the data, the phase plot will display an overlapping response, which is an indicator of a reverse polarity.

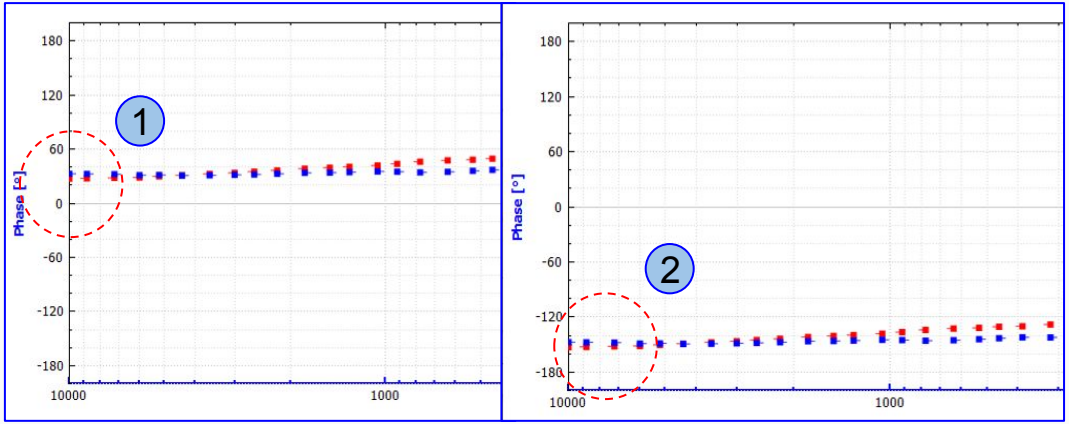
Identify the channel responsible for reverse polarity:

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.

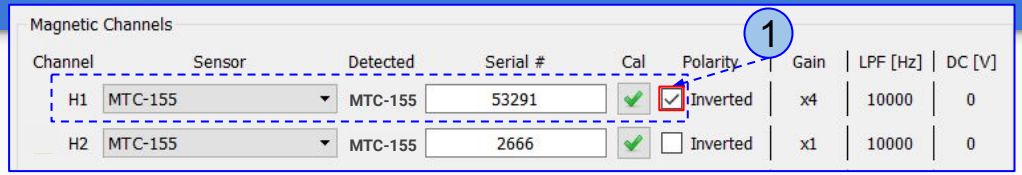


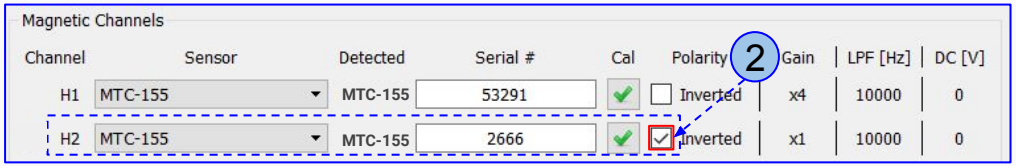


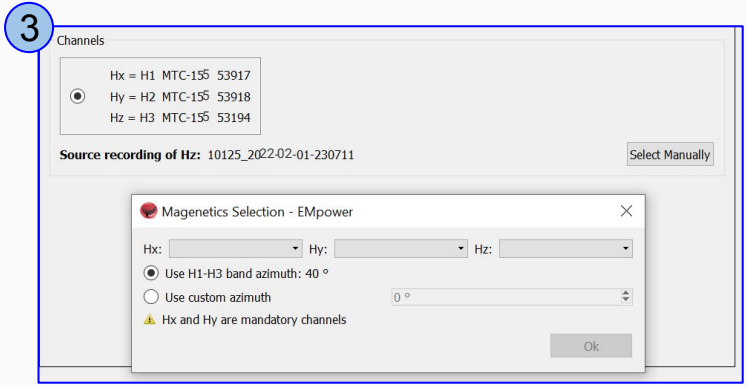
Magnetic Channels Corrections

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.





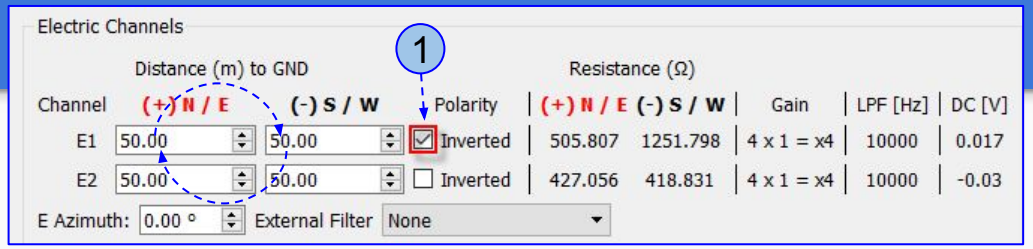


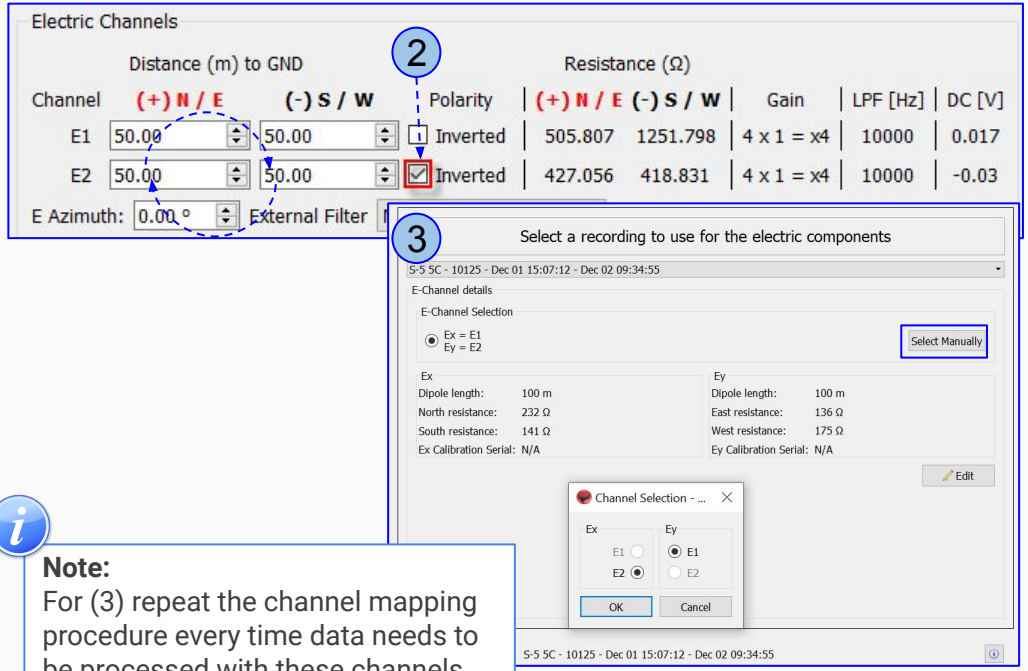
Note:
For (3) repeat the channel mapping procedure every time data needs to be processed with these channels

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 **N**orth electrode is connected to the **S**outh connector, and the **S**outh electrode connected to the **N**orth connector.
2. **Polarity Inverted on E2**
   - Occurs when the **E**ast electrode is connected to the **W**est connector, and the **W**est electrode connected to the **E**ast connector.
3. **Connections Interchanged on NS and EW**
   - Occurs when the **N**orth electrode is connected to the **E**ast connector, and the **S**outh electrode is connected to the **W**est connector, or vice versa.
     In the Electric components section of the Site processing wizard, click **Select Manually** and apply the appropriate correction.





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

Advanced Search

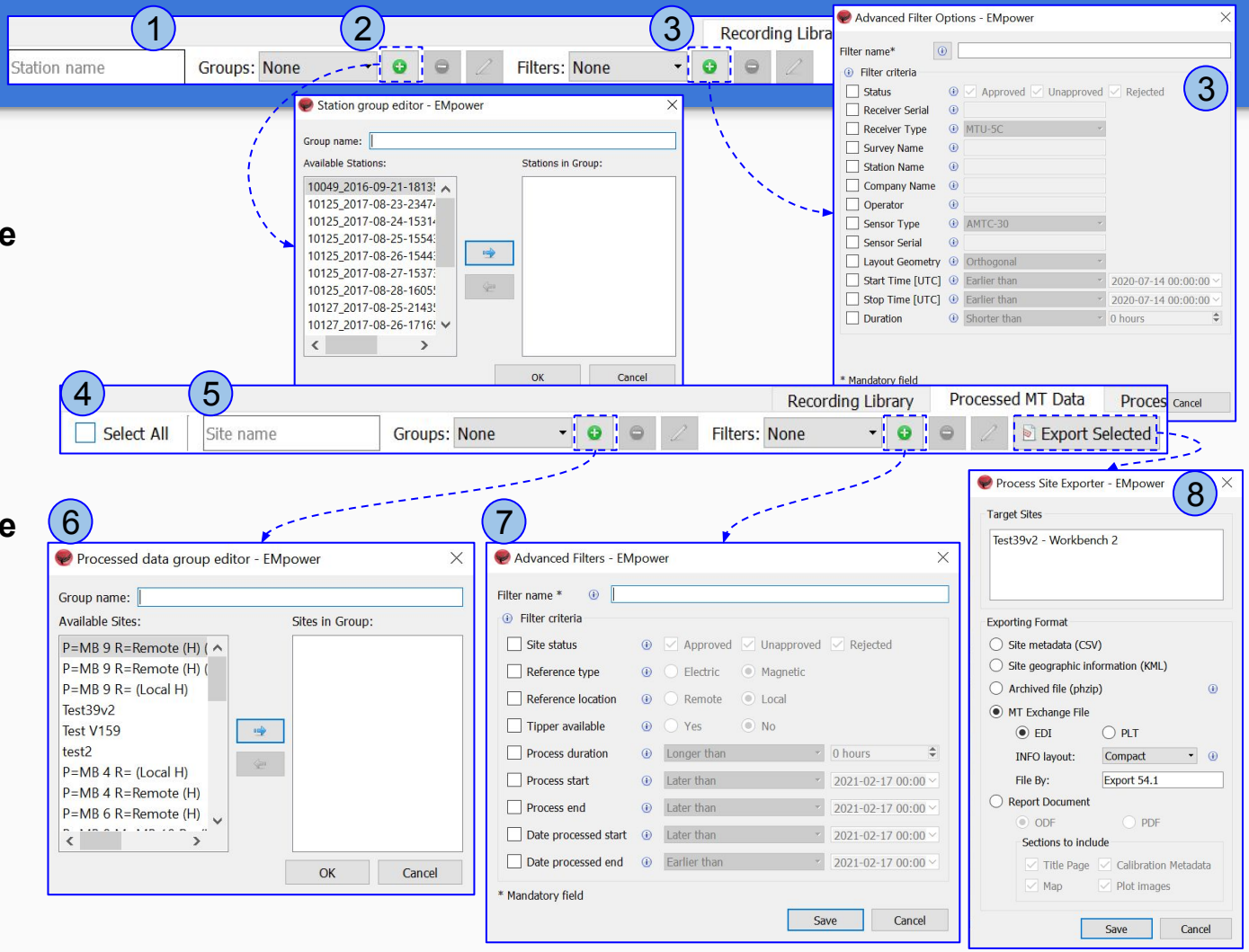
Toolbar (Sites list)

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**



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

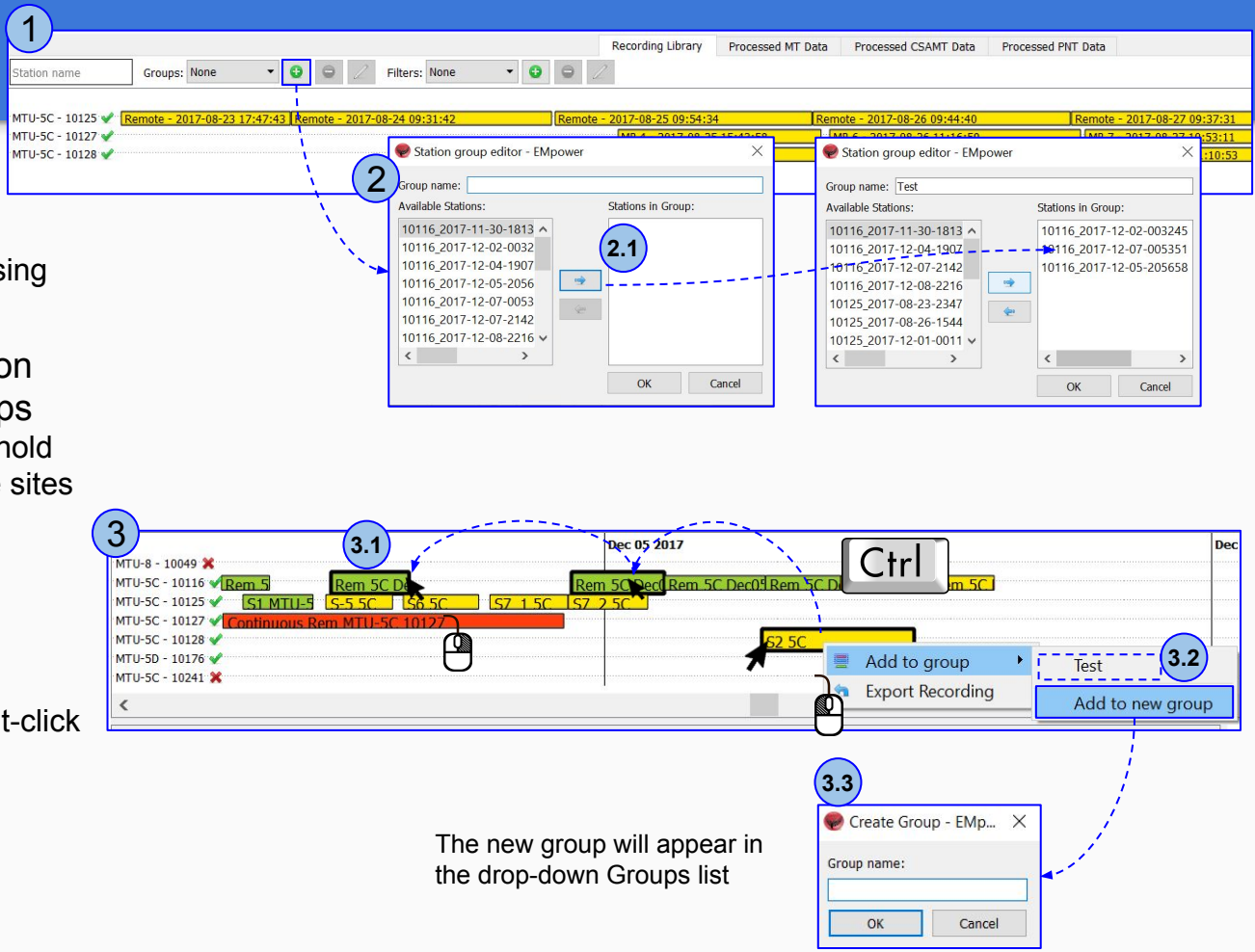
3.1. Use left-click to select the site and hold down the **Ctrl** key to select multiple sites (release the buttons)

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

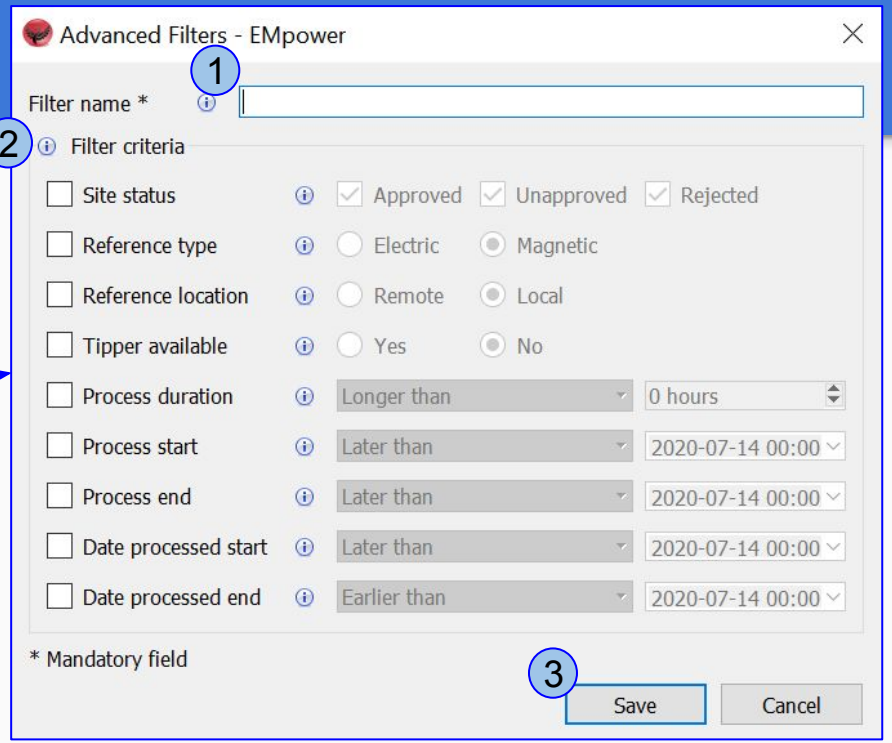


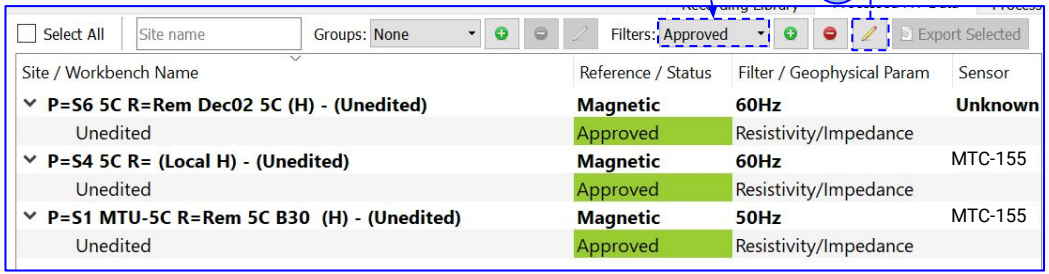
The new group will appear in the drop-down Groups list

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**

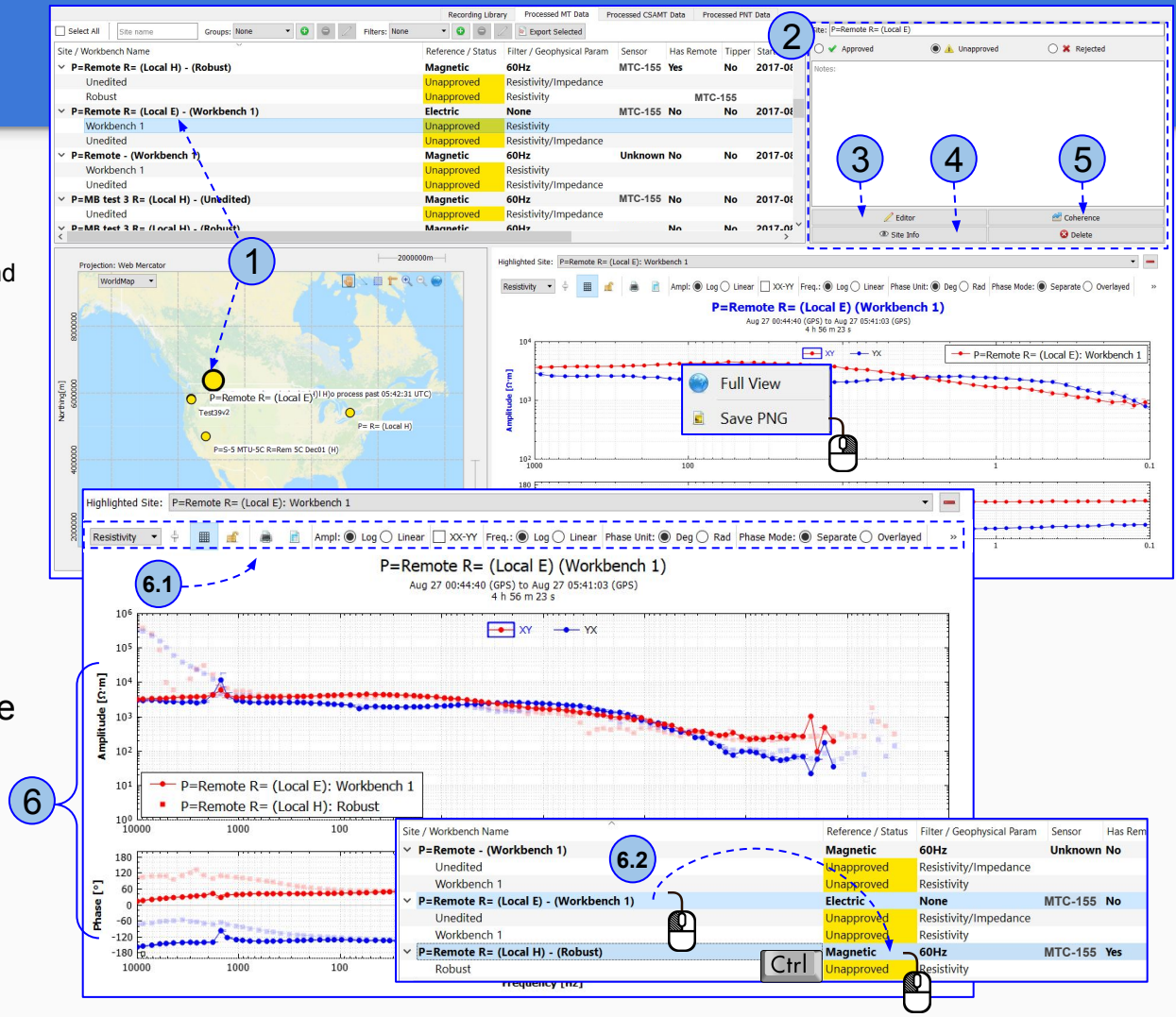




Processed MT Data

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

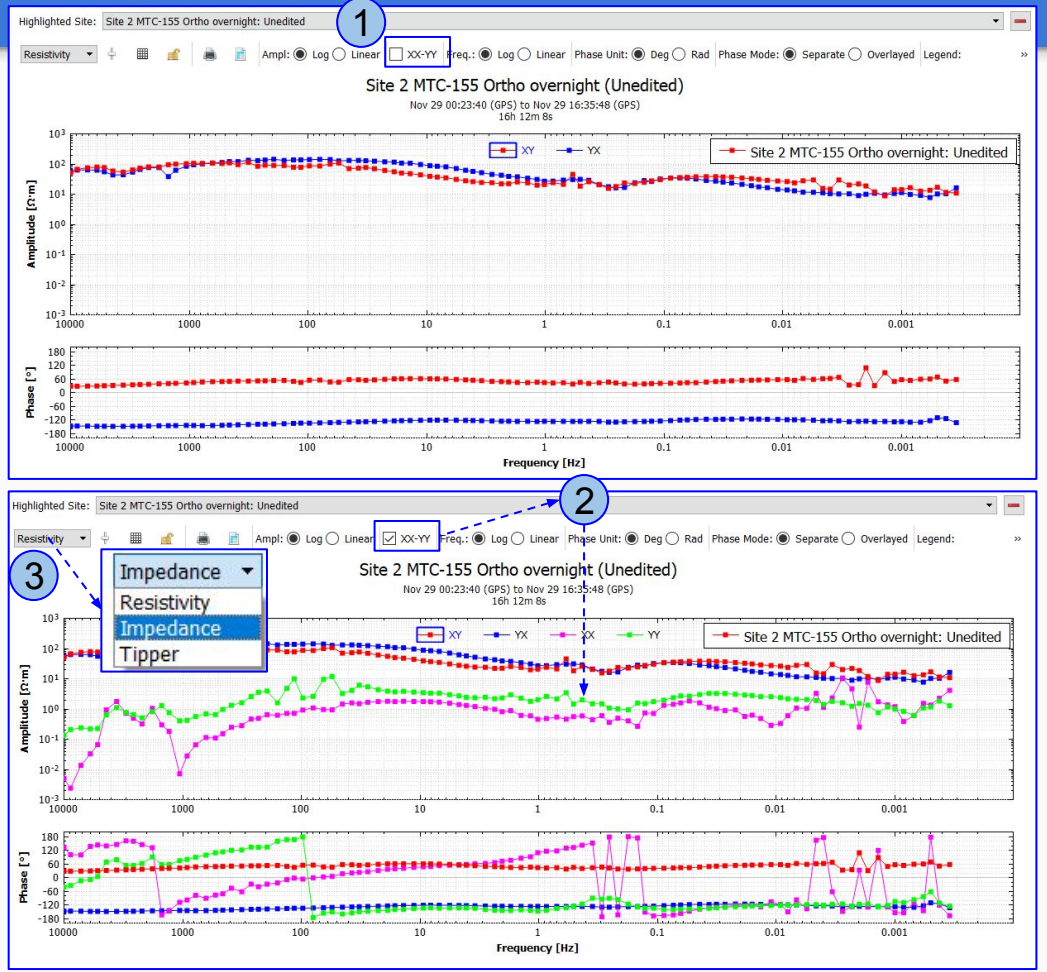


Plotting diagonal elements

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

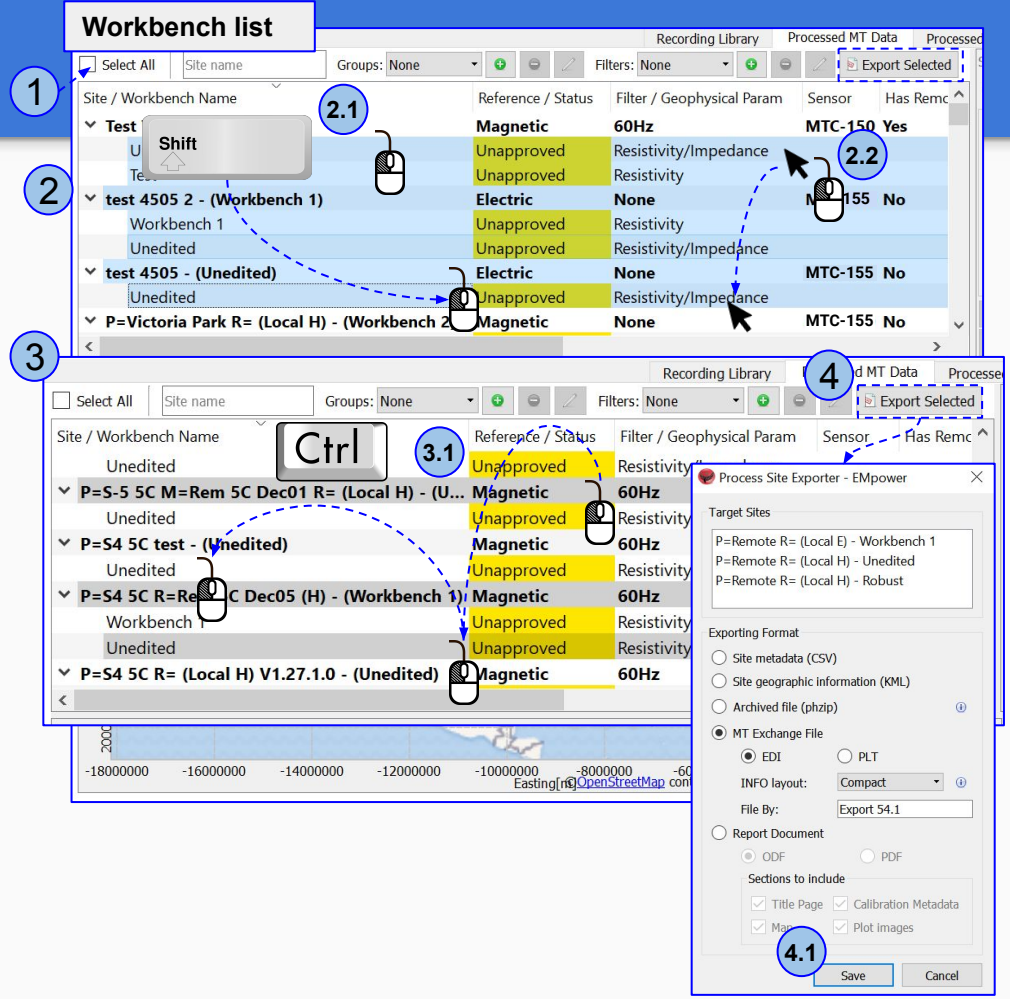
   - **2.2.** Hold the Left-click on the site and drag up/down to select items

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:

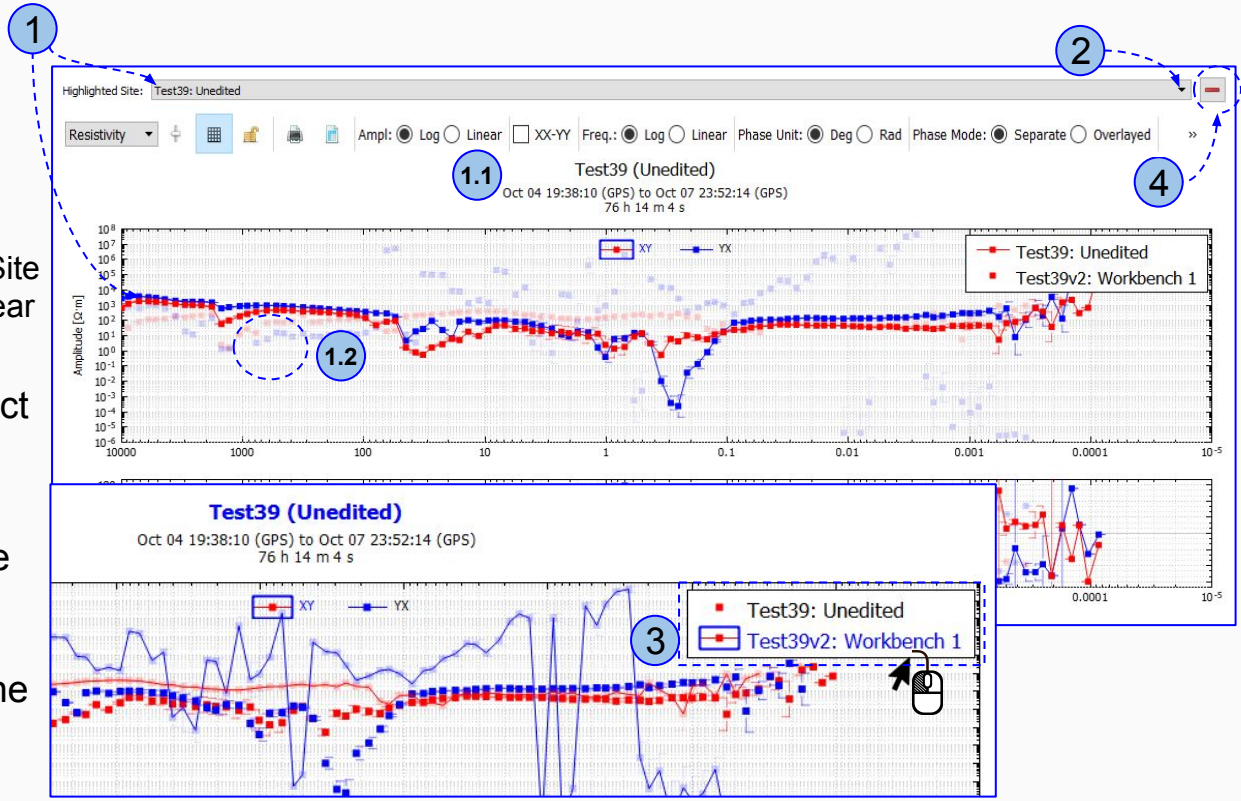
4. Click the **Export Selected** button
   - **4.1.** Complete the information as needed and click the **Save** button



Working with multi-sites

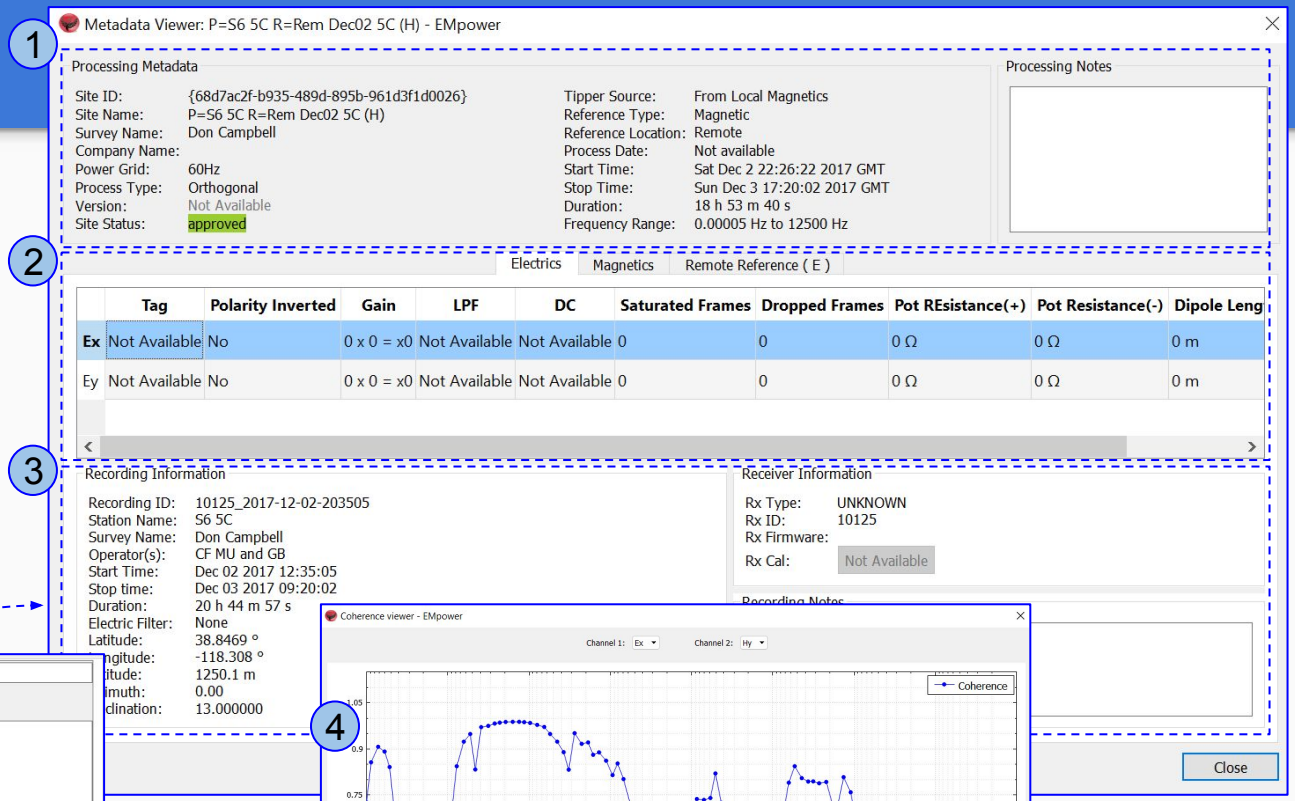
EMpower has the functionality to work with multiple sites. Select the sites as needed *(see previous page)*

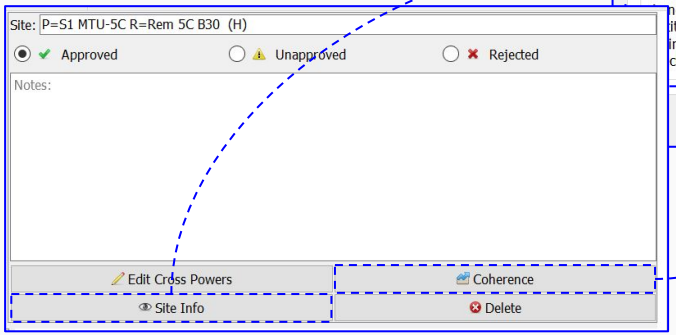
1. The highlighted site will be in the foreground
   - 1.1. The plot title will show the Highlighted Site
   - 1.2. Other selected sites in the plot will appear in attenuated colour
2. To change the Highlighted Site, select the Highlighted Site from the drop down menu
3. To switch between curves, select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

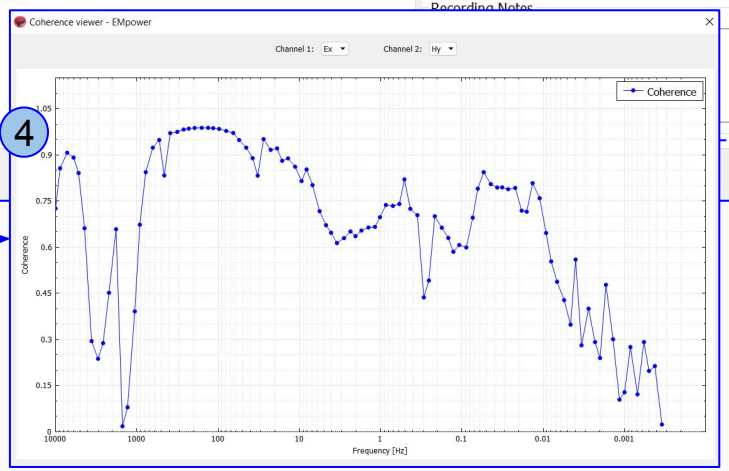


Site Info - Coherence

1. General **Processing Metadata** information
2. **Channels details**
   - Electrics
   - Magnetics
   - Remote Reference (E)
3. **Recording Information**
4. **Coherence**

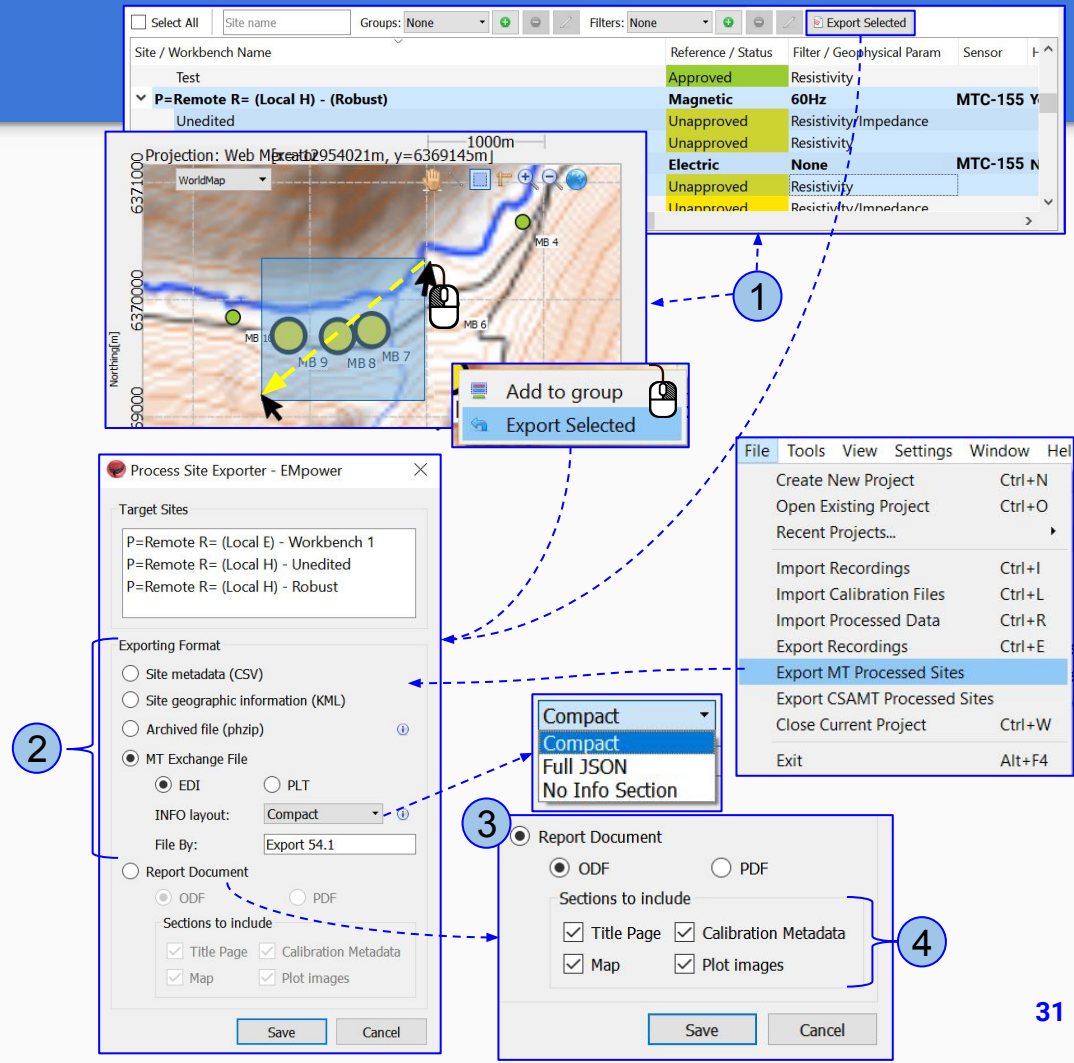






Process Site Exporter

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



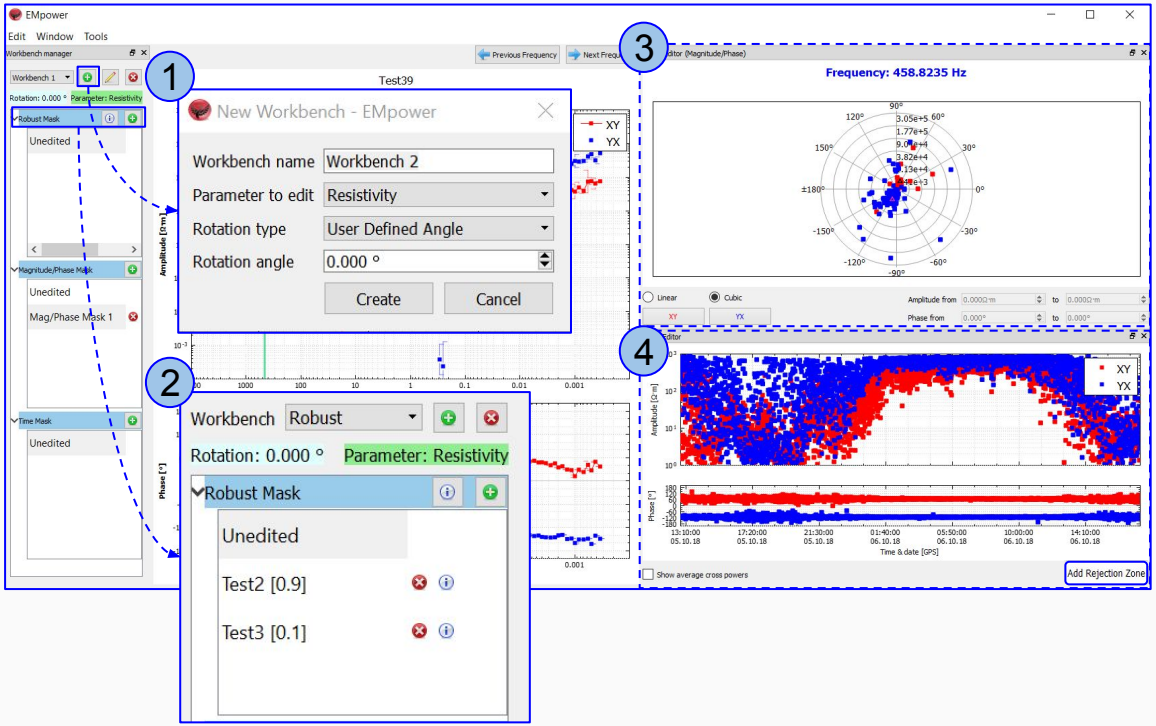
Processed data editing

Crosspower Editor

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)

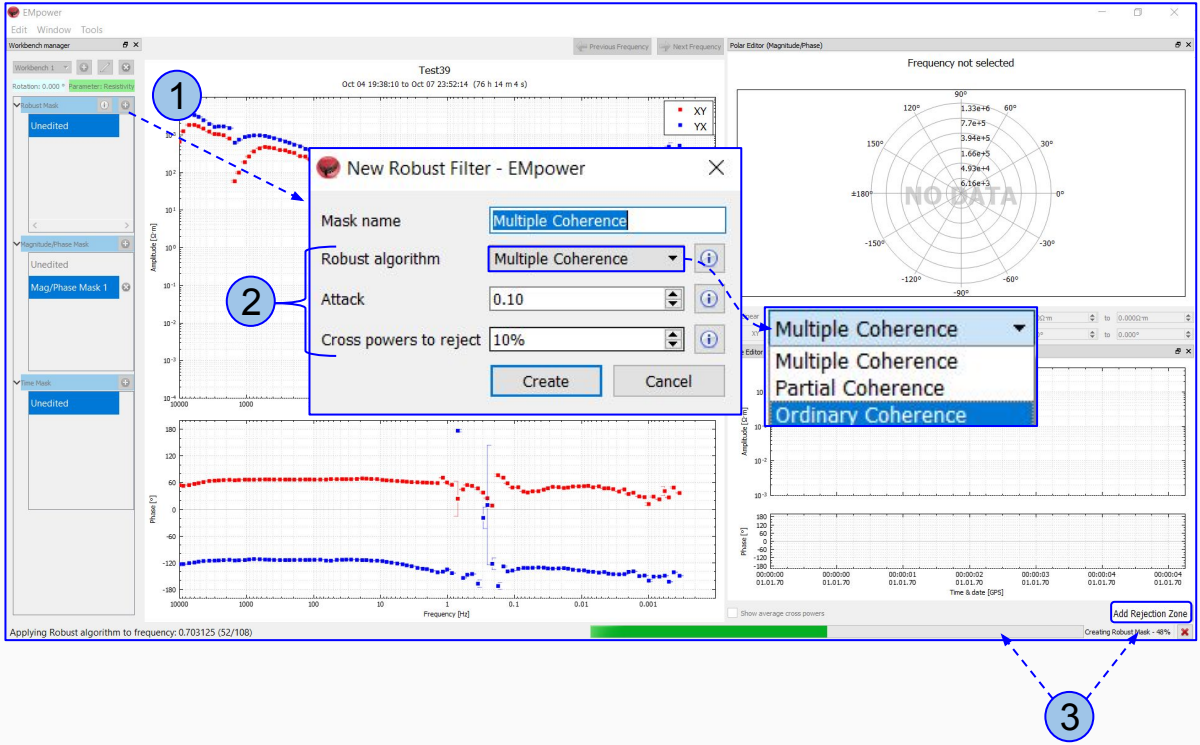


For more details see the Crosspower Editor manual

Robust Mask

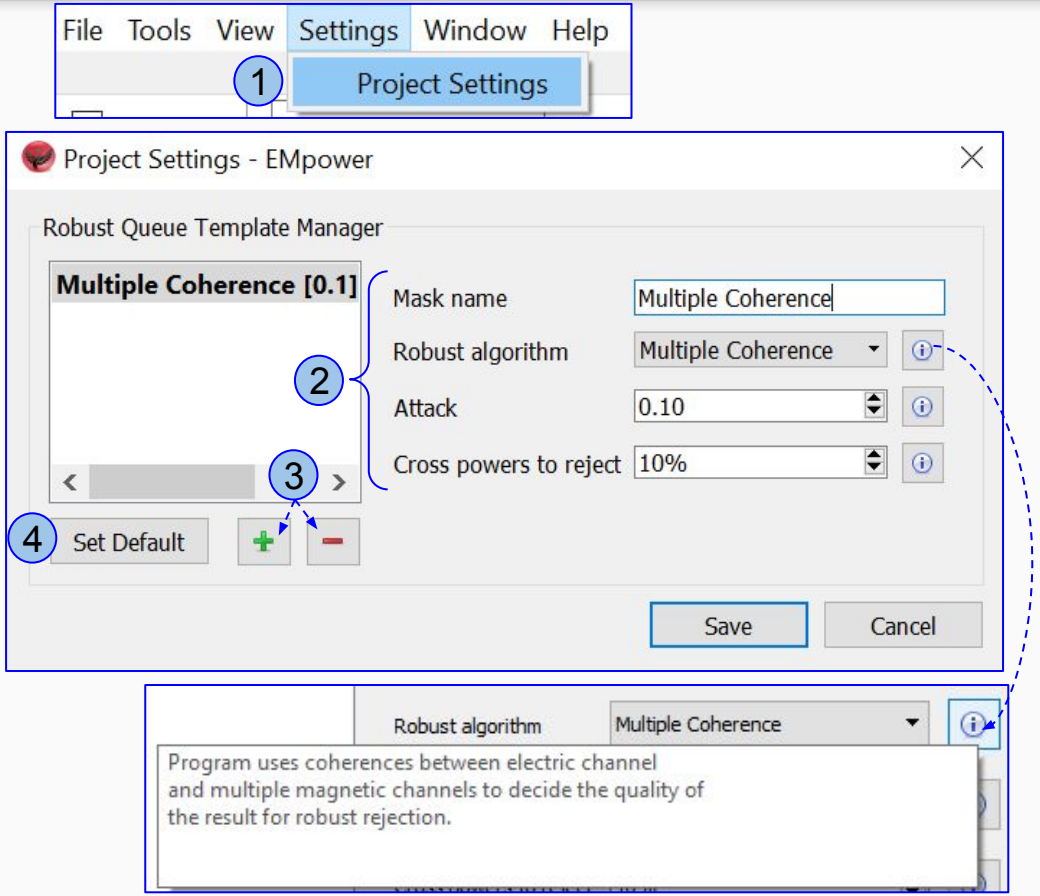
The Robust Mask algorithm fixes the most common problems

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

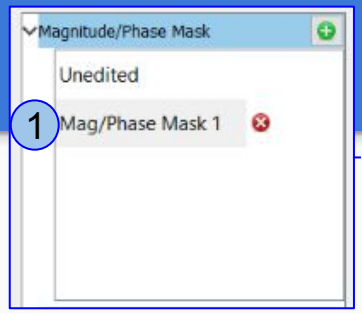


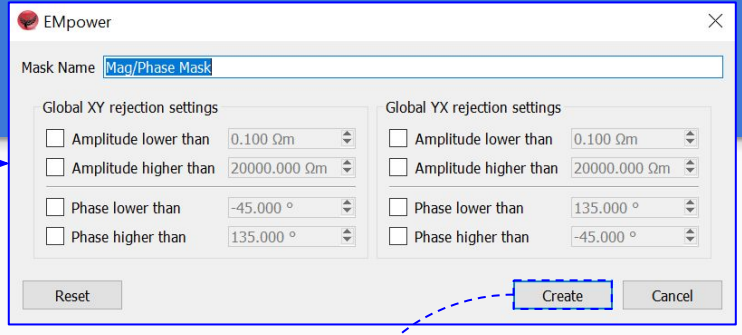
Project Settings - Robust Templates

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

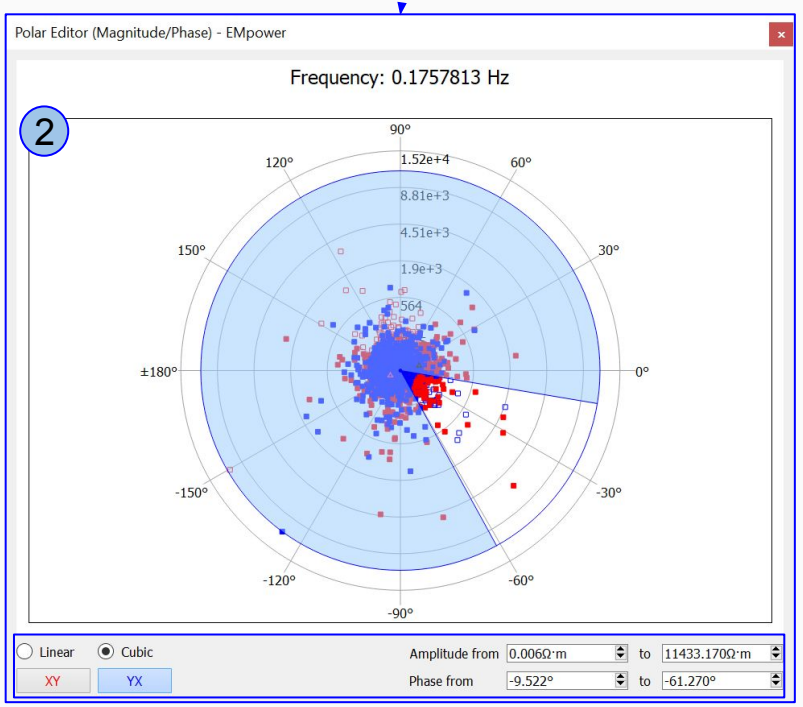


Polar Editor





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 rage



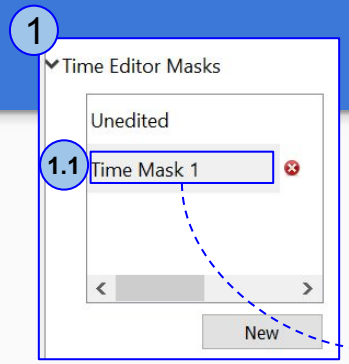
Time Editor

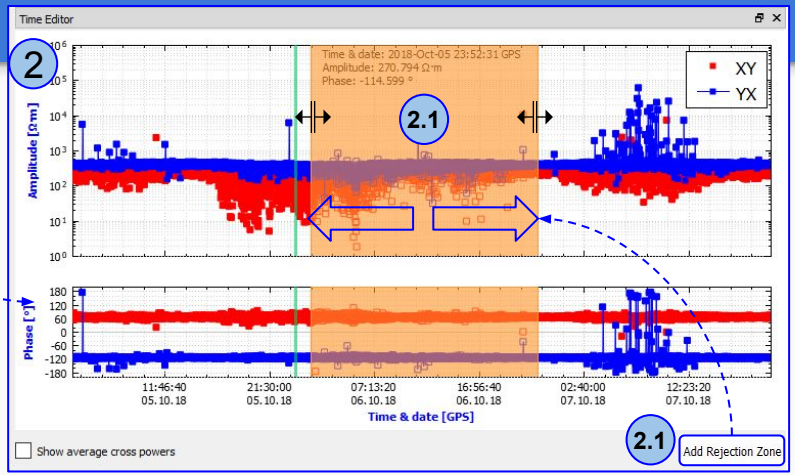
1. Create a New **Time Editor Mask**
- **1.1.** The Mask Name can be edited by right-clicking on it

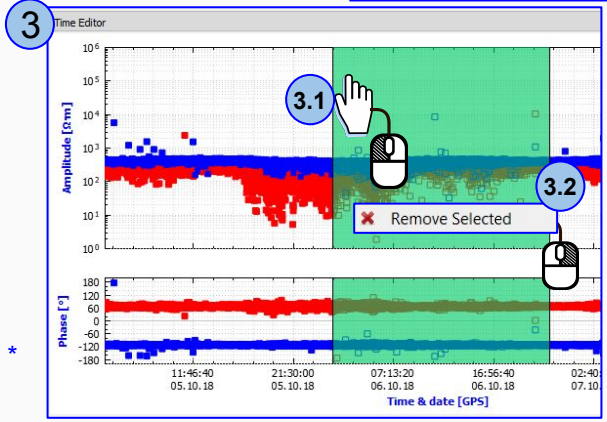
2. To add a new rejection area
- **2.1.** Click the **Add Rejection Zone** button
- **2.2.** Left-click and hold, and start dragging to the left or right to select the area of crosspower rejection

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.*





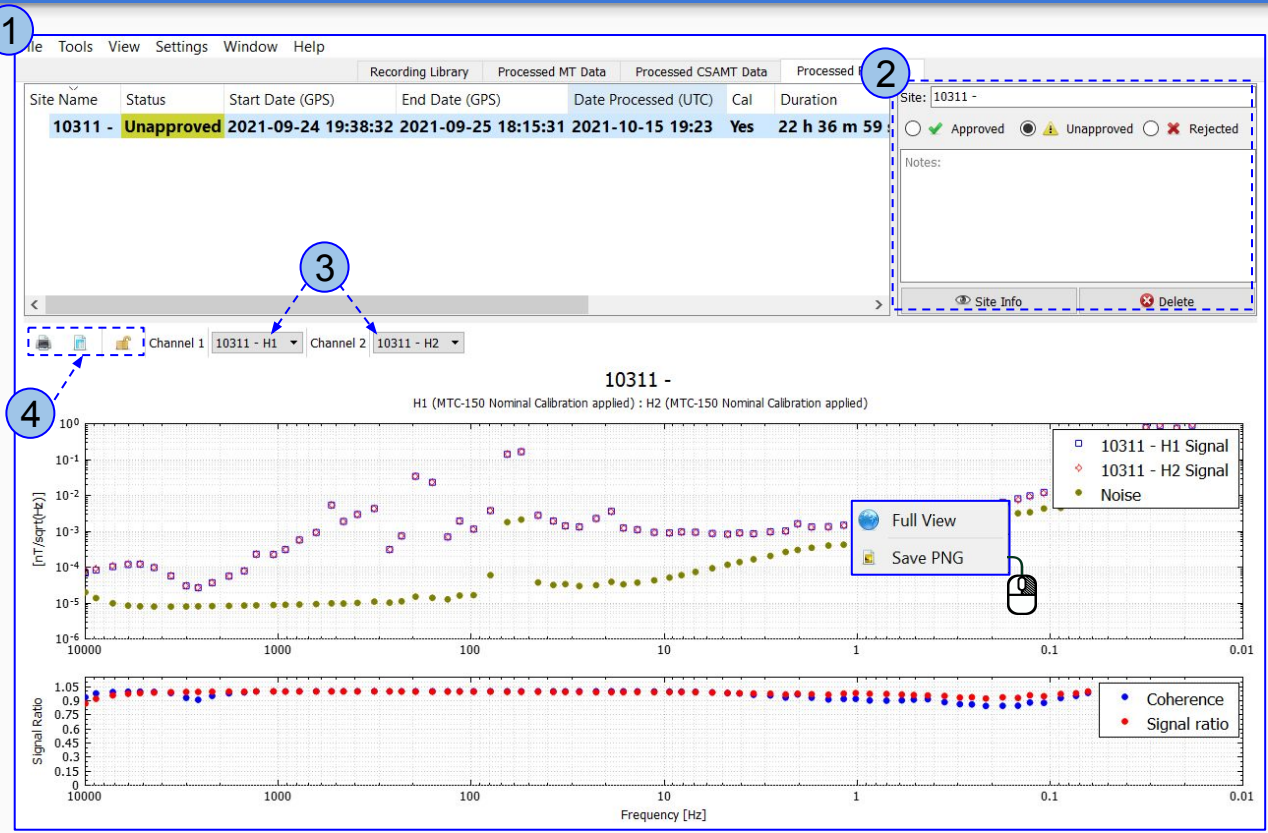


Processed PNT Data

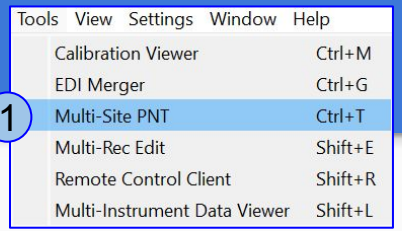
Processed PNT Data

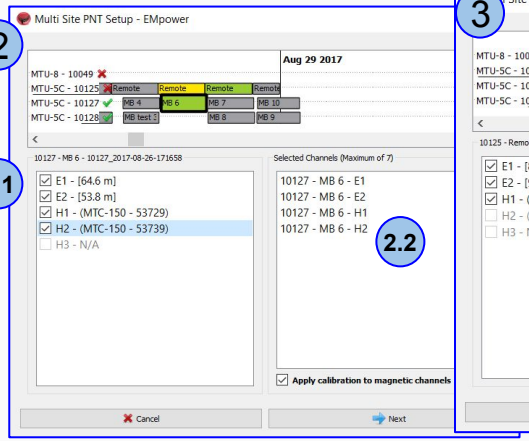
This tab shows processed Parallel Noise data

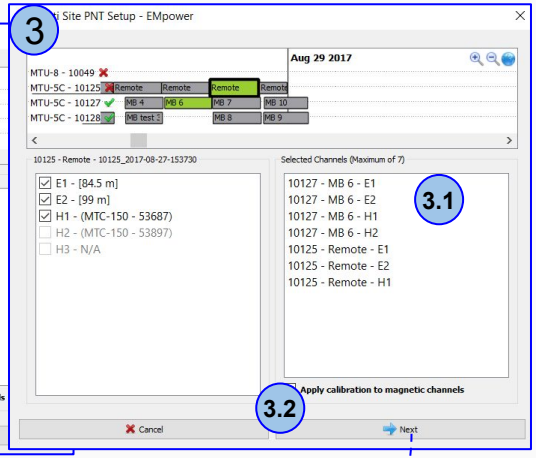
1. Area to Select the Site of interest and view its metadata
2. Area to edit information of the selected Processed **Site**
   - Site Name
   - Mark the site as Approved, Unapproved or Rejected
   - Relevant Notes for the processing
3. Selectors to choose the **Channels** to be analysed and displayed
4. Tools
   - **Print** the plot
   - **Export** the values in CSV format
   - **Lock / Unlock** plot scale

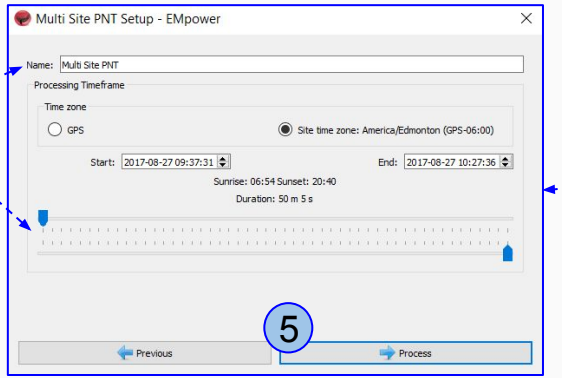


Multi-Site PNT









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**

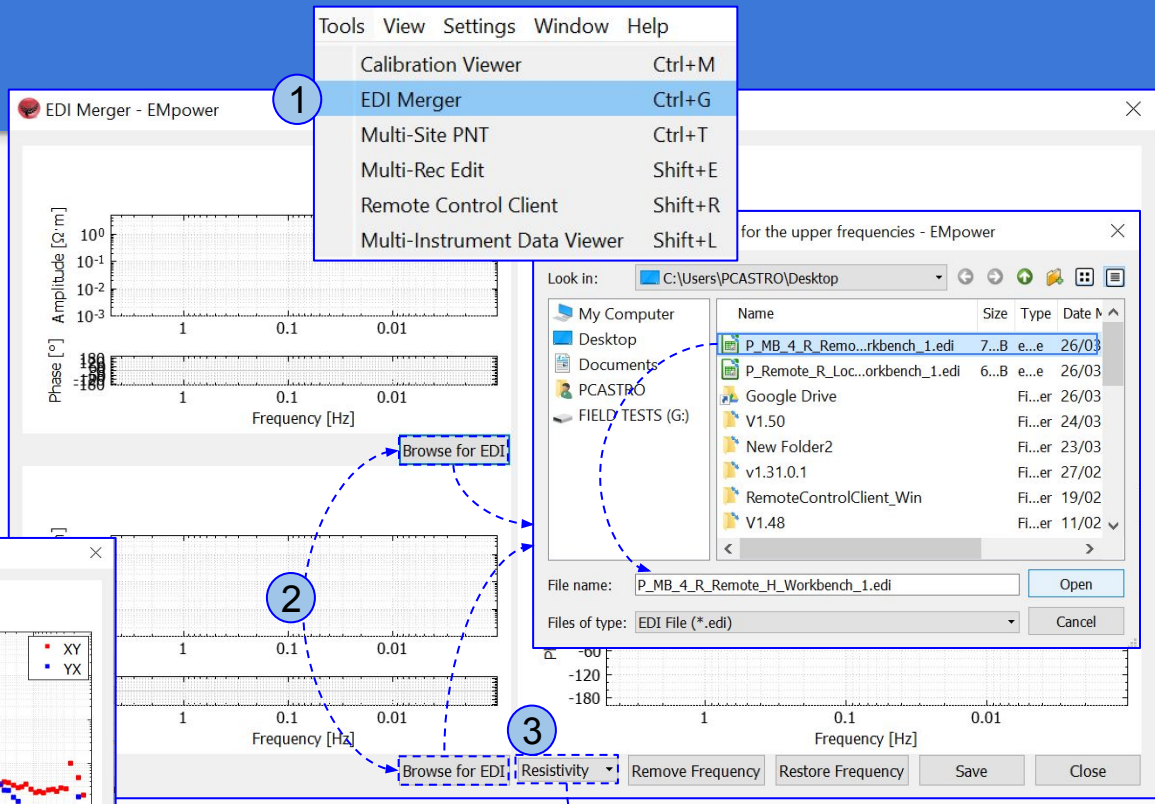
4. Define the Name and Duration, the time available depends on the overlapped time between all the recordings selected

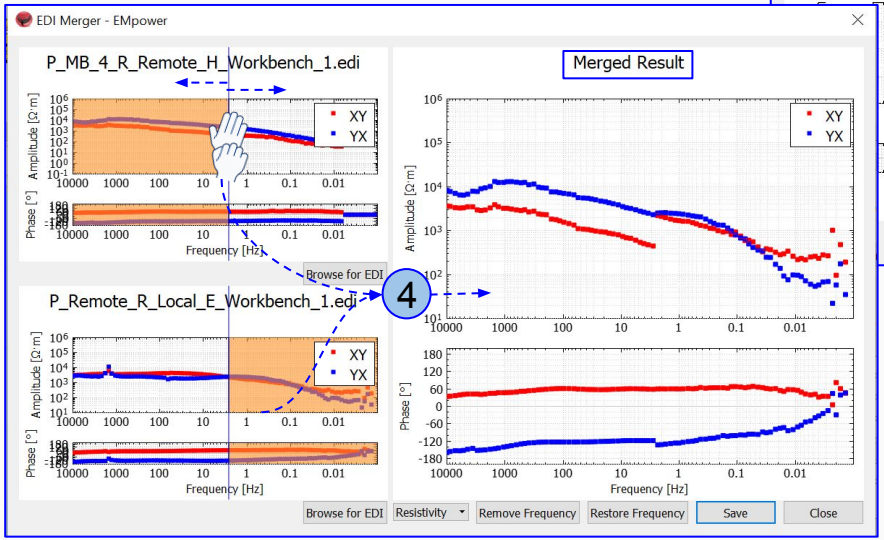
5. To begin processing click the **Process** button

Tools

EDI Merger <Create>

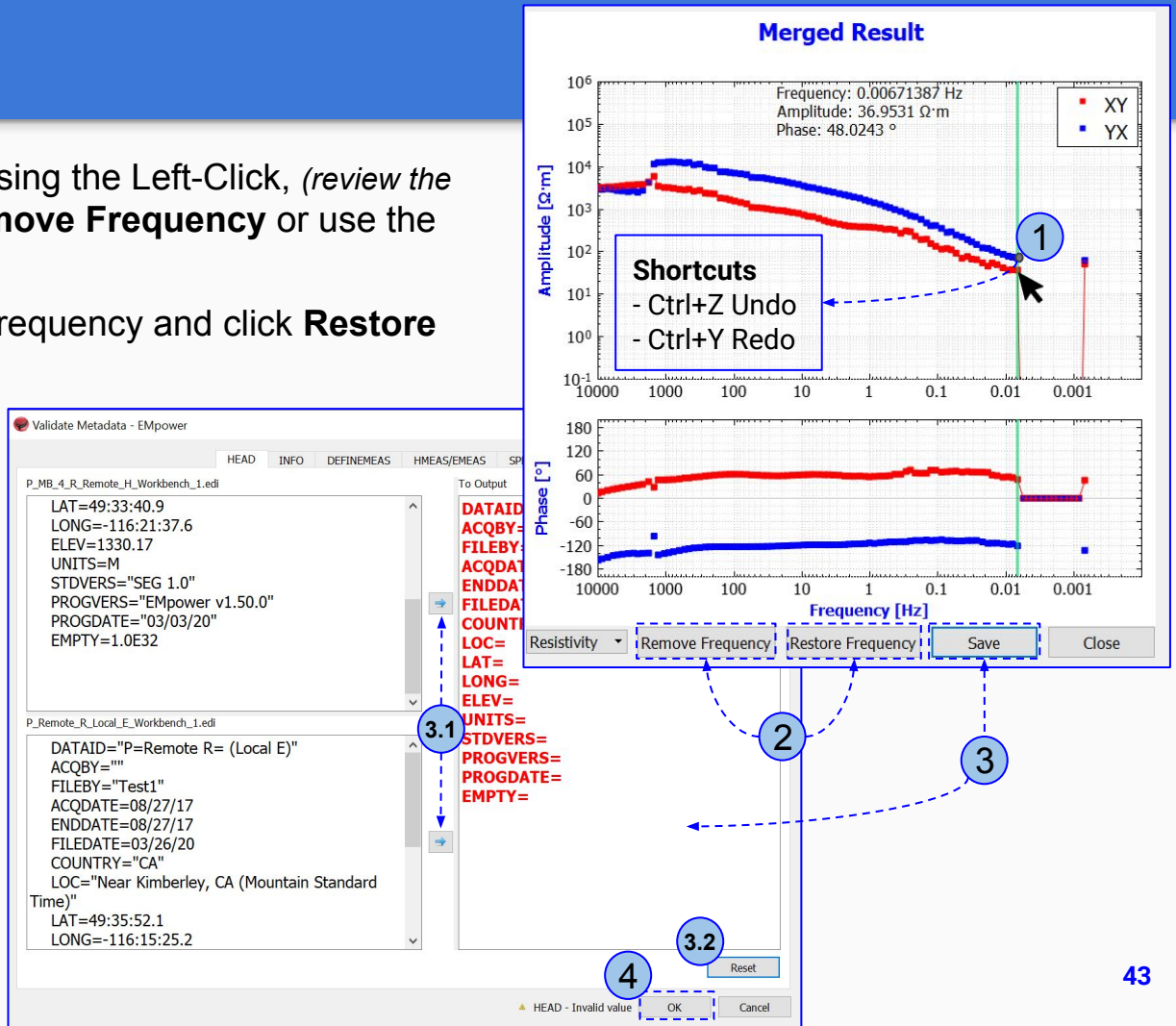
1. **EDI Merger (Ctrl+G)** tool is used to combine two EDI files into one.
2. Select the EDI files by using the **Browse for EDI** button
3. Choose one of the Geophysical Mode
4. The **Merged Results** plot shows the highlighted area on the EDI plots





EDI Merger <Edit and Save>

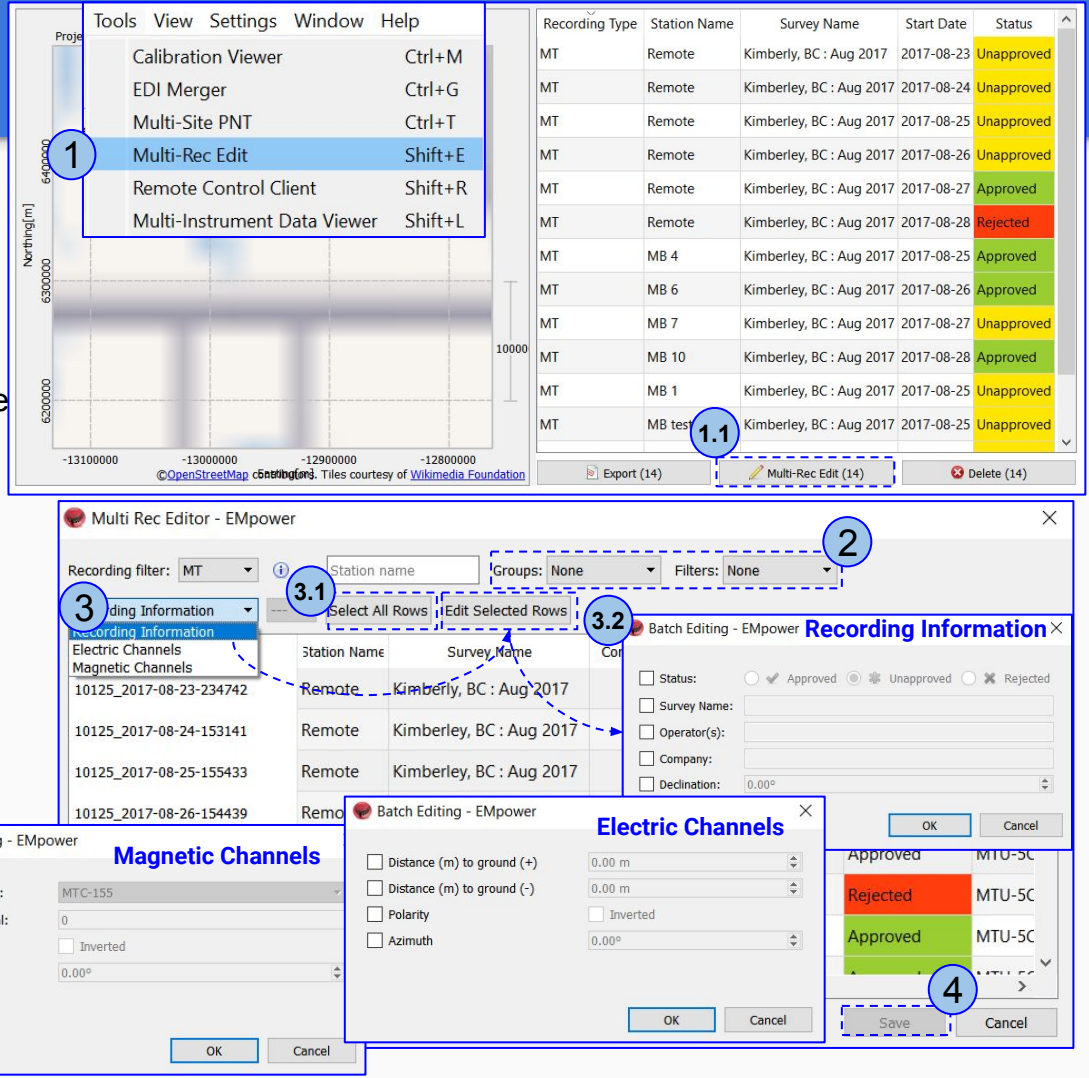
1. To exclude a frequency, select it by using the Left-Click, *(review the information on the top plot)* and click **Remove Frequency** or use the Delete key
2. To recover the frequency, select the frequency and click **Restore Frequency**
3. Click **Save** button and fill out the metadata of the merged 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

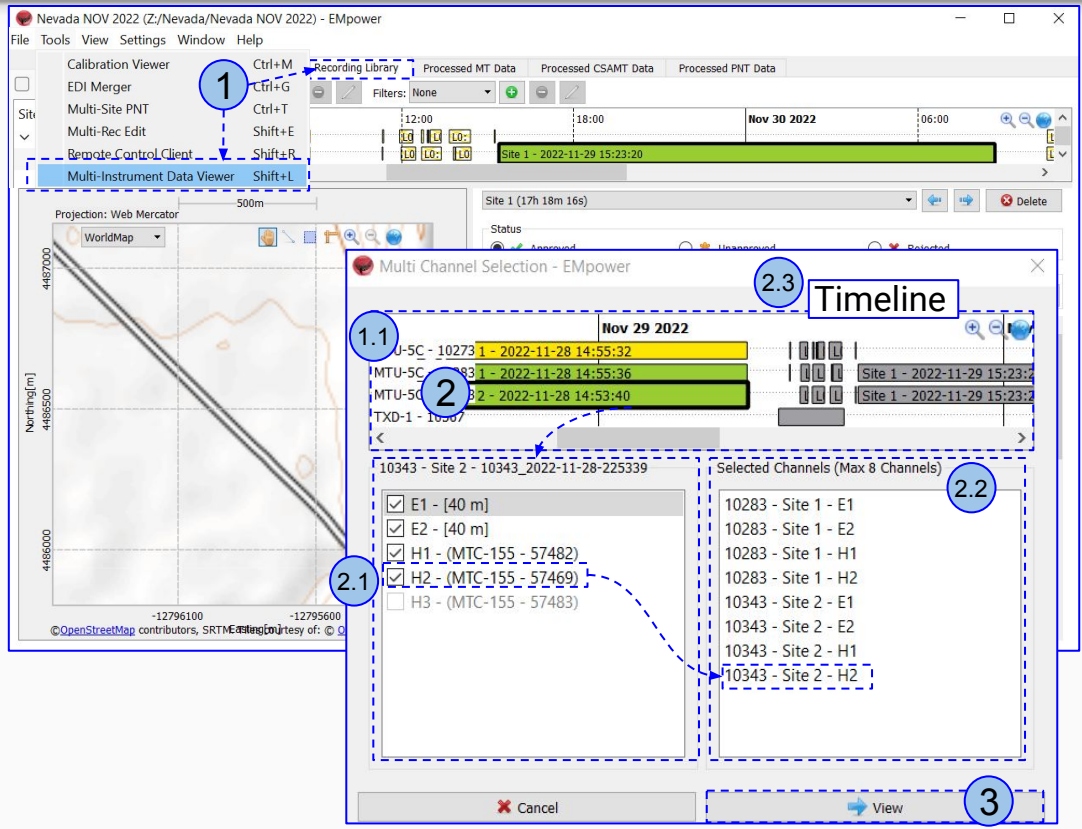


Rows with "----" consist of either disabled channels or not applicable channels of receiver type.

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

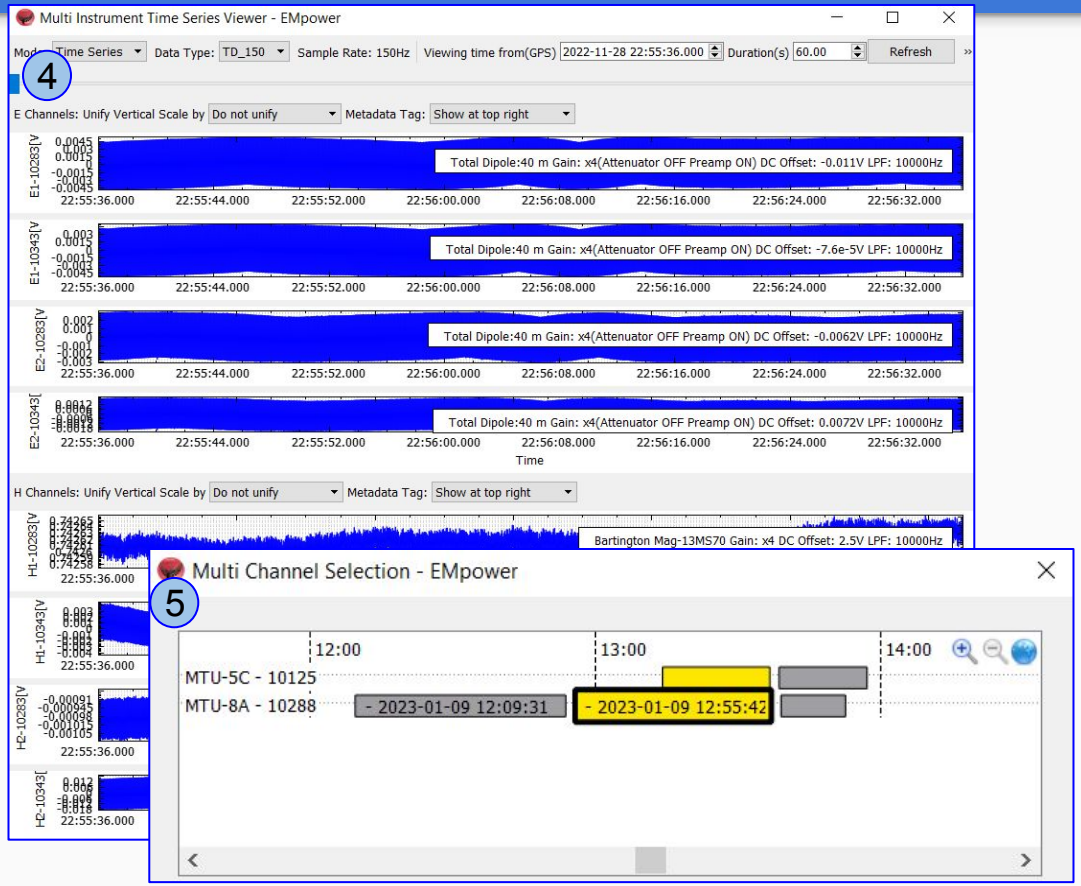


Multi - Instrument Time Series Viewer

4. The **Multi Instrument Time Series Viewer** will display the selected channels
5. When two time series recordings overlap the data, EMpower will starts 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

Technical Support Contact

Please check out the FAQs
https://phoenixgeophysics.freshdesk.com/
Or email us at: *support@phoenix-geophysics.com*