

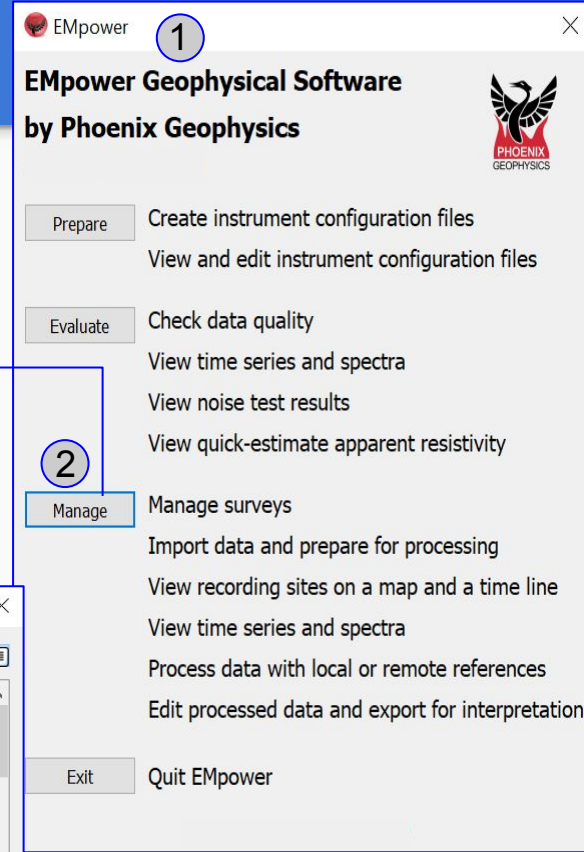
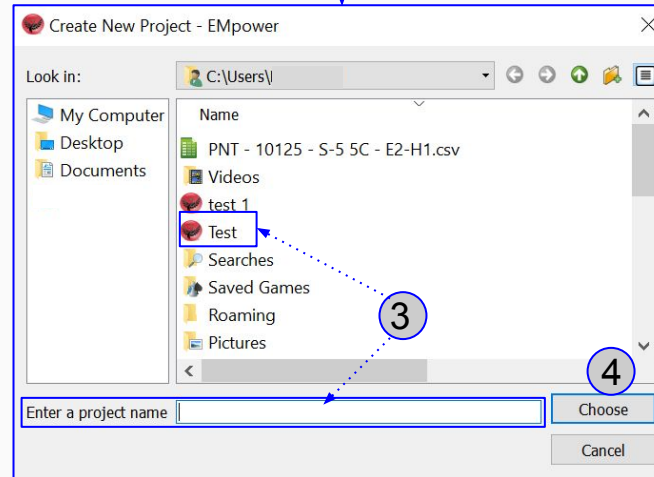
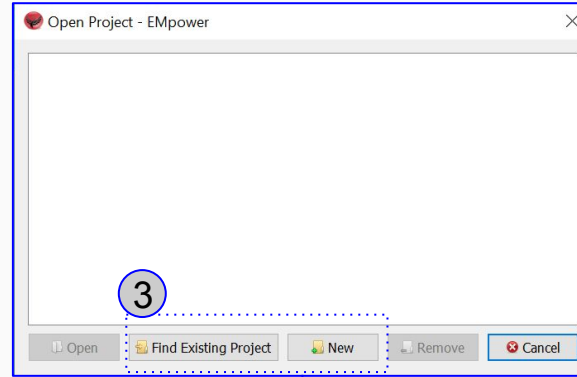
EMpower Data Management



- Creating or Opening a Project
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 - View Recording Details
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 - Processing Data Local / Remote References
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Creating or 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**
 - Select the Project
 - **To create a New Project**
 - Click **New**
 - Type the Project Name
4. Click **Choose**



Importing Data (Drag and Drop)

1. To add a new recording from the **SD Card**
 - Insert **SD card** in the computer slot or use a USB memory card reader
2. Select the file in the **File Explorer** window
3. Drag and drop the **Recording data** to the Timeline or Map
4. Wait for the import progress to finish



1



The screenshot shows the EMpower software interface. At the top, there are tabs for 'Recording Library' and 'Processed Data'. A 'File Explorer' window is open, displaying the contents of the 'FIELD TESTS (D:)' drive. The file 'NV FEB2018 5CSD' is selected. A mouse cursor is hovering over this file. A dashed blue arrow points from the selected file to a 'Copy' button on a map in the background. The map shows a coordinate system with 'Northing[m]' on the y-axis (ranging from -1050 to 950) and 'Easting[m]' on the x-axis (ranging from -1500 to -500). A '500m' scale bar is visible. At the bottom, a progress bar for 'EMpower' shows 'Copying 10125_5A8F4F8B_2_00000047.td1' with a progress indicator at 3%.

2

File Explorer

3

4

Visual Representation of Sites

- Imported Recordings are shown in synchronized views

- Timeline
- Map
- Recording list

- Visual tracking

- Green - Approved
- Yellow - Unapproved
- Red - Rejected

The screenshot displays the E-Mpower software interface with three main views highlighted by blue boxes:

- Timeline:** Shows a horizontal bar chart of recordings for Dec 06 2017. Recordings are color-coded: green for approved (e.g., Rem 5C R30, S1 MTU-5C), yellow for unapproved (e.g., Rem 5C Dec01, S-5 5C), and red for rejected (e.g., Continuous Rem MTU-5C 10127).
- Map:** A map view showing the spatial distribution of sites. The selected site, S1 MTU-5C, is highlighted with a large green circle. Other sites shown include S4 5C, S3 5C, S8 5C5C, S2 5C, and S-5 5C.
- Recording list:** A detailed view of the selected recording (S1 MTU-5C, 19 h 22 m 5 s). It includes:
 - Status: Approved
 - Tools: Time Series, Spectra, Process(Orthogonal)
 - Recording Information:
 - Recording ID: 10125_2017-12-01-001137
 - Start time: Nov 30 2017 16:11:38 (Local) America/Los_Angeles (GMT-08:00)
 - Duration: 19 h 22 m 5 s
 - Survey name: Don Campbell
 - Station name: S1 MTU-5C
 - Operator(s): CF GB MU
 - Layout Geometry: Orthogonal
 - Declination: 13.00°
 - Electrodes table:


Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50	50	<input type="checkbox"/> Inverted	759.165	607.465	4 x 1 = x4	10000	0
E2	50	50	<input type="checkbox"/> Inverted	546.82	510.804	4 x 1 = x4	10000	0




Selecting recording in any of the views will automatically show update to others views

Verifying/Editing Recording Information

1. Verify that the following information is correct:
 - Dipole length
 - **Declination**
 - The inclination (**Azimuth**) of the layout
 - Calibration checkbox
2. Review the recording information and edit the enabled fields
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

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

Recording ID: 10116_2017-12-03-221659 

S6 5C (20 h 50 m 56 s) ← → Delete

Status
 Approved Unapproved Rejected

Tools
Time Series Spectra Process(Orthogonal)

Recording Information
Recording ID: 10125_2017-12-02-203505
Start time: Dec 02 2017 12:35:06 (Local) America/Los_Angeles (GMT-08:00)
Duration: 20 h 50 m 56 s

Survey name:
Station name: S6 5C
Operator(s): CF MU and GB
Layout Geometry: Orthogonal
Declination: 13.00°
Notes: MTU-5C 10125

Electrodes

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF [Hz]	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	<input type="text" value="50"/>	<input type="text" value="50"/>	<input type="checkbox"/> Inverted	216.078	253.663	4 x 4 = x16	10000	0.013
E2	<input type="text" value="50"/>	<input type="text" value="50"/>	<input type="checkbox"/> Inverted	225.164	216.557	4 x 4 = x16	10000	-0.006

E Azimuth:

Magnetic Sensors

Channel	Sensor	Detected	Serial #	Cal	Polarity	Gain	LPF [Hz]	DC [V]
H1	MTC-150	MTC-150	<input type="text" value="53917"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	0.074
H2	MTC-150	MTC-150	<input type="text" value="53918"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	0.034
H3	MTC-150	Unknown	<input type="text" value="53194"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> Inverted	x4	10000	0.0073

H1-H3 Azimuth:

1 2 3 4

[View Recording Details](#) [Attachments](#)

View Recording Details

Review that the following levels are within valid limits for quality control:

1. **Battery**
2. **Temperature**
3. **GPS Timing Card Verify**
4. **Channels Details**

If saturation is not close to 0%, the gain might be too high and/or there is artificial noise on your site.

Review the channel configuration (see pages 4,5)

Recording Details

Recording ID: 10039_2018-02-23-171514
Survey Name: NVFeb2018
Station Name: NV03
Receiver Type: MTU-SD
Instrument Serial: 10039
Operator: TH+GB+DF
Start Time: Fri Feb 23 17:15:14 2018 GMT(-00:00)
Stop Time: Fri Feb 23 18:07:17 2018 GMT(-00:00)
Duration: 52 m 3 s
Latitude: 37.205°N
Longitude: 114.690°W
Altitude: 1054.24 m
OS Version: v1.25.0
Motherboard Model: BMB01-G
Motherboard Serial:

Battery: Low: 11.879 V, High: 11.948 V Details

Temperature: Low: 14°C, High: 24°C Details

Decimation

Sampled continuously at 96000 samples per second

GPS Timing Card

Serial Number: 200127
Model: BTM01-I
Firmware Version: 00010028X

of Satellites: 10 - 12 satellites Details

Channels Details

Tag	Board S/M	Model	Firmware	Sat	
			10019	0%	
			10019	0%	
3	H1	201273	BCM03-B	10019	0%

Recording ID: 10116_2017-12-03-221659

1. **Battery Voltage**

2. **Internal Temperature**

3. **Number of Satellites**

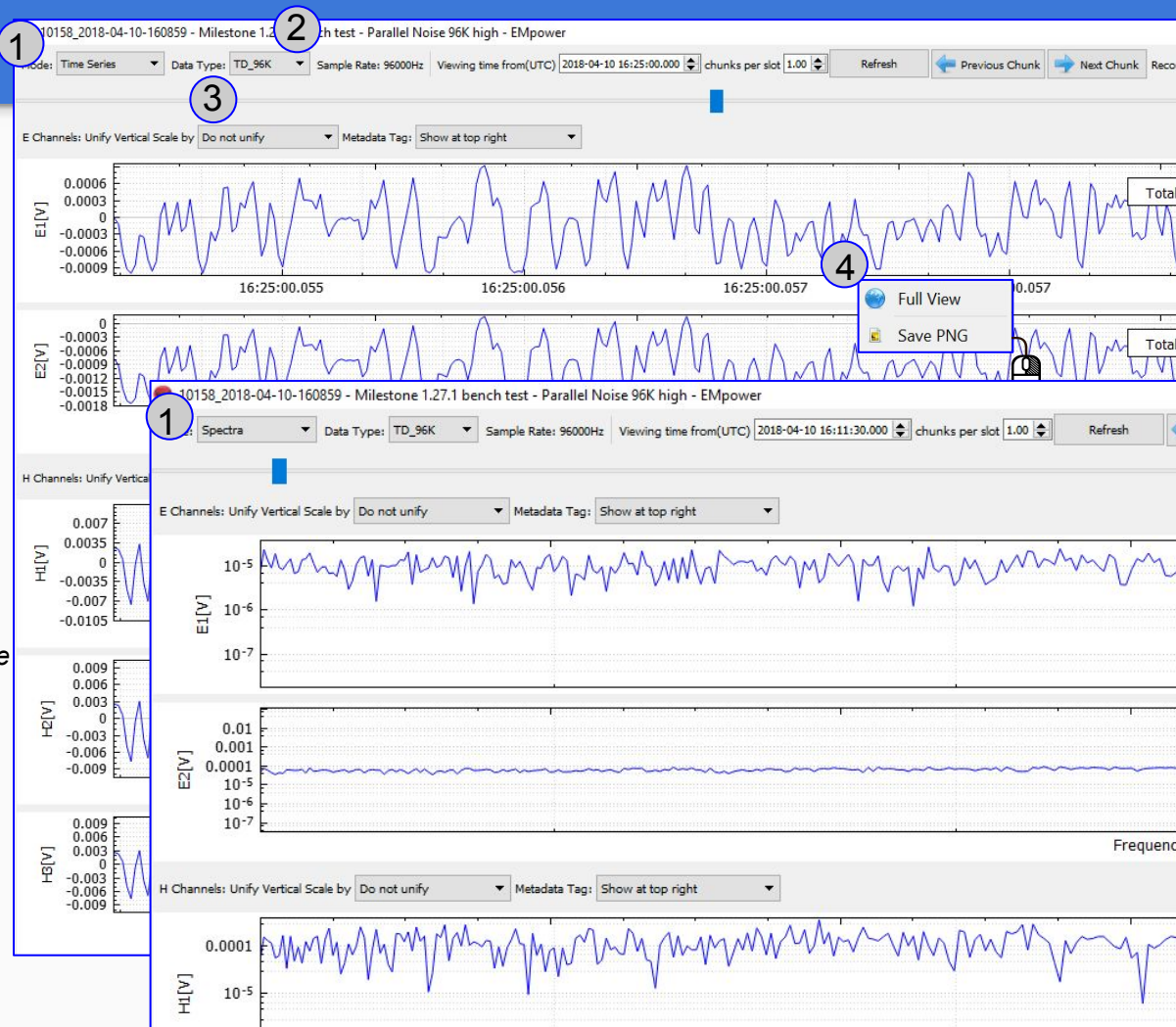
4. **Saturated Frames - E2**

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

Recording Details and QC

1. The **Time Series** and **Spectra** vies of the data available for QC
2. **Data Type** allow to switch between different rates (96K / 24K / 150 Hz)
3. The **Unify Vertical Scale by**, allows to visualize by Channel scale
4. **Exporting** plot using the right-click on the plot to export to PNG

**This features Apply for Time Series and Spectra mode*



Processing Data

From the Recording Library

tab:

1. Choose the **Recording** to be processed

2. Review the **Layout Geometry**

3. **Process Site Creation Wizard***:

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

*These steps will be explained in the next pages

The screenshot shows the EMpower software interface. At the top, the title bar reads "D.C. Nevada 2017 Test (D:/D.C. Nevada 2017 Test) - EMpower". Below the title bar is a menu bar with "File", "Window", and "Help". The main window is divided into several sections:

- Recording Library:** A table listing recordings. The first row is highlighted in yellow and contains: "Rem 5C R30", "Rem 5C Dec01", "Rem Dec02 5C", "Rem 5C Dec03", "Rem 5C Dec04", "Dec 06 2017", "Rem 5C Dec05", "Rem 5C Dec06", "Rem 5C Dec07", "Rem 5C Dec08".
- Map:** A map showing the layout geometry for "S1 MTU-5C". The map includes a grid with "Northing[m]" (4660000 to 4710000) and "Easting[m]" (-13180000 to -13080000) axes. A scale bar indicates 5000m. The map shows a central station "S1 MTU-5C" connected to several other stations: "S4 5C", "S3 5C", "S8 5C5C", "S2 5C", and "S-5 5C". A blue circle with the number "1" is placed over the map area.
- Processing Wizard:** A panel for "S1 MTU-5C (19 h 22 m 5 s)". It includes:
 - Status:** "Approved" (selected), "Unapproved", "Rejected".
 - Tools:** "Time Series", "Spectra", "Process(Orthogonal)" (selected). A blue circle with the number "3" is placed over the "Process(Orthogonal)" button.
 - Recording Information:** Recording ID: 10125_2017-12-01-001137, Start time: Nov 30 2017 16:11:38 (Local) America/Los_Angeles (GMT-08:00), Duration: 19 h 22 m 5 s, Survey name: Don Campbell, Station name: S1 MTU-5C, Operator(s): CF GB MU, Layout Geometry: Orthogonal.
 - Declination:** 13.00°.
 - Notes:** (empty field).
 - Electrodes:** A table with columns for Channel, Distance (m) to GND, Polarity, Resistance (Ω), Gain, LPF (Hz), and DC [V].

Channel	Distance (m) to GND		Polarity	Resistance (Ω)		Gain	LPF (Hz)	DC [V]
	(+) N / E	(-) S / W		(+) N / E	(-) S / W			
E1	50	50	<input type="checkbox"/> Inverted	759.165	607.465	4 x 1 = x4	10000	0
E2	50	50	<input type="checkbox"/> Inverted	546.82	510.804	4 x 1 = x4	10000	0
 - E Azimuth:** 40°.
 - Magnetic Sensors:** (empty field).



Verify that there was 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 clicking on the Map, Timeline or drop-down list
2. **Review / Edit** the E-Channel details
3. **Navigation bar** Display the components of the processed site being created

The screenshot shows the 'Process Site Creation - S7_2_5C - EMpower' window. At the top, a list of recordings is displayed, with 'Continuous Rem MTU-5C 10127 - 2011-11-30 10:37:08' selected. A blue circle with the number '1' points to this recording in the list. Below the list is a map showing the site location with a yellow dot labeled 'Rem Dec02.5Cn MTU-5C 10127'. A blue circle with the number '3' points to the map. To the right, the 'E-Channel details' panel is shown, with a blue circle with the number '2' pointing to the 'Select Manually' button. The panel displays the following information:

Select a recording to use for the electric components

S7_2_5C - 10125 - 18:14:38 - 16:14:20

E-Channel details

E-Channel Selection

Use the following
EX = E1
EY = E2

Select Manually

Ex	Ey
Dipole length: 100 m	Dipole length: 100 m
North resistance: 334.1 Ω	East resistance: 379 Ω
South resistance: 349.1 Ω	West resistance: 350.3 Ω
Voltmeter measurements (V)	
AC: 0	DC: 0
Voltmeter measurements (V)	
AC: 0	DC: 0

Edit

Electric Components: S7_2_5C - 10125 - 18:14:38 - 16:14:20

Magnetic Components: --

Reference Components: --

Processing Timeframe: --

Previous Next



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

Process Site Creation wizard - Magnetic Channels

Local

1. Use the the same recording as electric channels, use Select Manually / Edit
- Click Next

Remote

2. To use another concurrent recording magnetic channels select **“Use magnetic channels from a different recording”**

3. Simultaneous recordings with valid magnetic sensors will appear (yellow / green) in the Map / Timeline or using the drop-down
Click Next

When a magnetic channel is selected from a different record, this records will be connected on the map and the letter **M** (Magnetic) appears next to the channel name

The screenshot displays the 'Process Site Creation - S-5 5C - EMpower' wizard. It is divided into two main panels: a map view and a configuration dialog.

Map View (Top Left): Shows a map with a grid. A point labeled 'Rem Dec02 5Cn MTU-5C 10127' is highlighted. A blue arrow points from this point to the configuration dialog.

Configuration Dialog (Top Right): Titled 'Select a recording to use for the magnetic components'. It has two radio buttons: 'Use magnetic channels from the same recording as electric channels' (selected) and 'Use magnetic channels from a different recording'. Below, a table shows magnetic channel data:

Channel	Hx	Hy	Hz
H1	MTC-150	53917	
H2	MTC-150	53918	
H3	MTC-150	53194	

Buttons 'Select Manually' and 'Edit' are visible.

Map View (Bottom Left): Shows a map with a grid. A point labeled 'Rem 5C Dec01' is highlighted in yellow. A blue arrow points from this point to the configuration dialog.

Configuration Dialog (Bottom Right): Titled 'Select a recording to use for the magnetic components'. It has two radio buttons: 'Use magnetic channels from the same recording as electric channels' and 'Use magnetic channels from a different recording' (selected). Below, a table shows magnetic channel data:

Channel	Hx	Hy	Hz
H1	MTC-150	53909	
H2	MTC-150	53910	
H3	N/A	N/A	

Buttons 'Select Manually' and 'Edit' are visible.

Wizard Progress (Bottom): Shows 'Electric Components: S-5 5C - 10125 - 23:07:12 - 17:34:58', 'Magnetic Components: Rem 5C Dec01 - 10116 - 00:32:46 - 22:10:10', and 'Reference Channels: --'. Navigation buttons 'Previous' and 'Next' are at the bottom.

Process Site Creation wizard - Reference Channels

Local

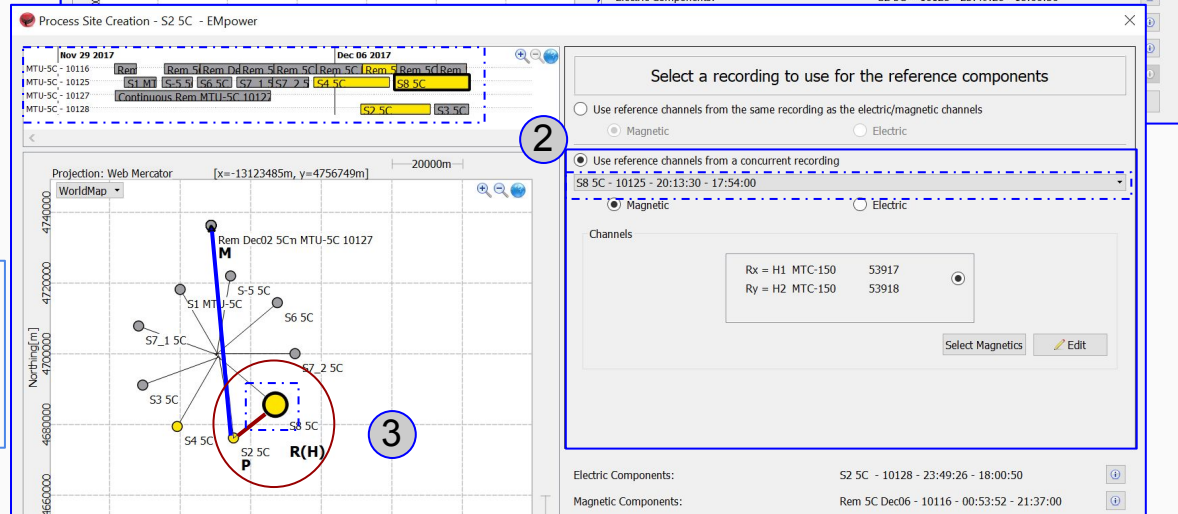
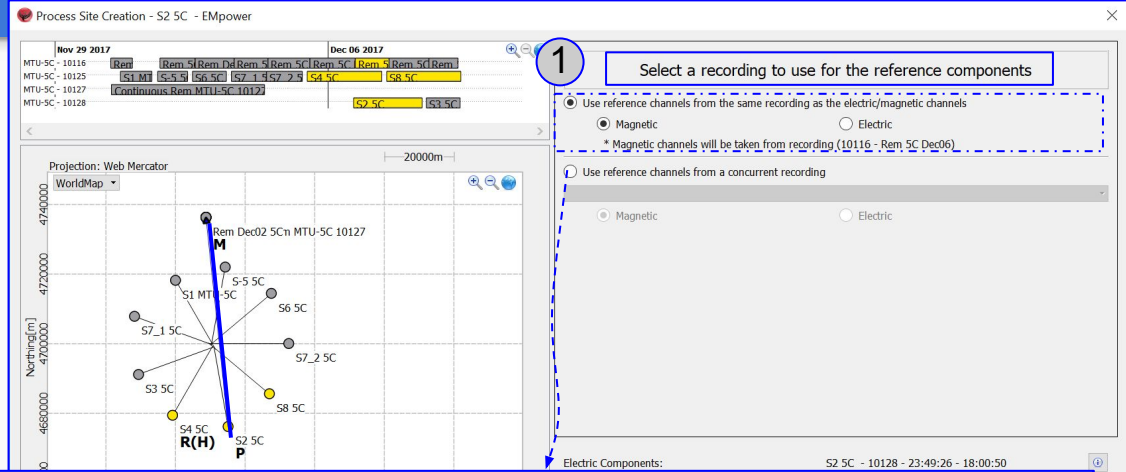
1. Select Magnetic or Electric Channel
- Click Next

Remote

2. To use Reference channels from a concurrent recording select **“Use reference channels from concurrent a recording”**
- Concurrent recording with valid magnetic or electric will appear (yellow or green) in the Map / Timeline and the drop-down list
- Click Next



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



Process Site Creation wizard

1. **Processing Time Frame**, allow to select the time segment that will be processed using the **Start - End** or by moving the blue indicators in the **Duration** timeline
 - Click Next
2. In the last step the **Processing Parameters** window
 - **Robust outlier rejection** is used for making corrections on the Processed data ([see Troubleshooting guide](#))
3. To reduce the effect of noise, select the frequency of the **Electric power grid filter** (North 60 Hz/ Rest of the world 50 Hz)
 - Click Process
4. The **Processing Queue** shows the processing of the site(s) selected

1. Select Processing Timeframe

Processing timeframe
Time zone: UTC Site time zone: America/Los_Angeles (UTC-08:00)
Start: 2017-12-07 20:13:30 End: 2017-12-07 21:37:00
Duration: 1 h 23 m 30 s

2. Processing Parameters

Robust outlier rejection
Granularity of data to analyse Parameter to optimise Acceptable if reached a value of Maximum rejection ratio
 Fine rejection (slow)
 Electric power grid filter
 50 Hz 60 Hz None
Process site name

3. Processing Queue - EMpower

Processed Site Name	Reference	Status	Progress	Elapsed Time	Estimated Remaining Time
P=S7_2_5C R= (Local H)	Magnetic	Done	100%	19 m 58 s	0 s

4. Processing Queue - EMpower

P=S7_2_5C R= (Local H) (Unedited)
Dec: 04 18:14:38 to Dec 05 16:14:20 UTC (21 h 59 m 42 s)

Amplitude [Ω·m]

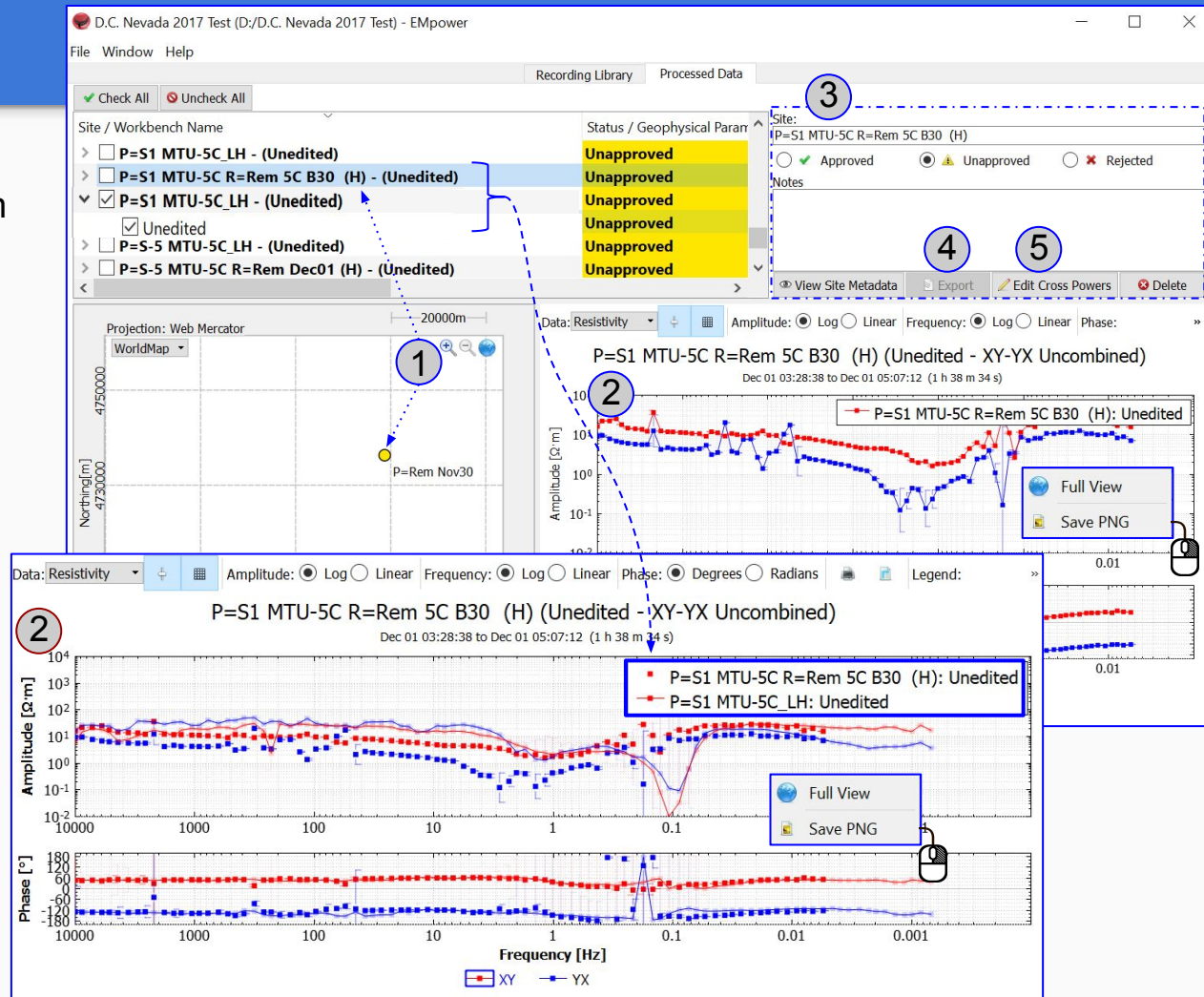
XY
YX

Previous Process

Visualizing Processed Data

Processed data tab

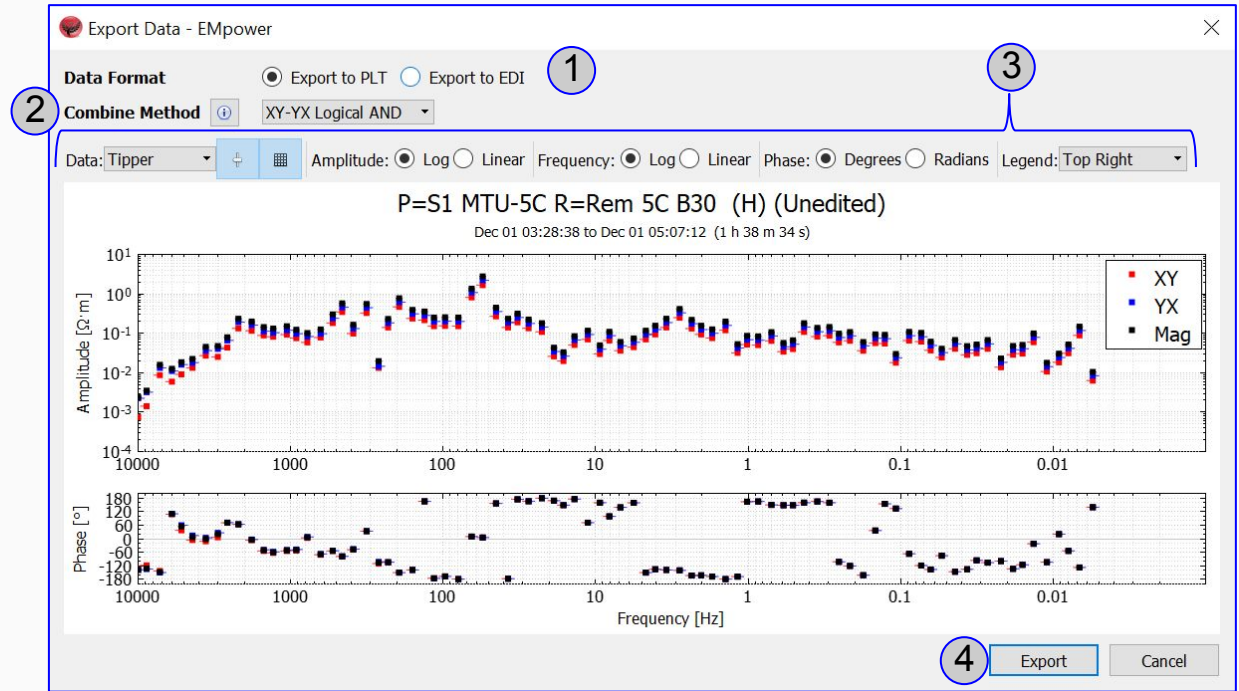
1. Select the **Processed Site** from the Site / Workbench list or Map.
2. The **Plot** shows the Amplitude and Phase from the Processed Site selected
 - Use the **Toolbar plot** for additional features
 - Add Processed Site(s)
3. **Edit Processed Site** (Name, Status and Notes)
4. **Exporting Data** (page 14)
5. The **Edit Cross Powers** removes outlying cross powers from the calculation of resistivity, phase, and other geophysical parameters (see pages 15-17)



Exporting Processed Data

Processed Data

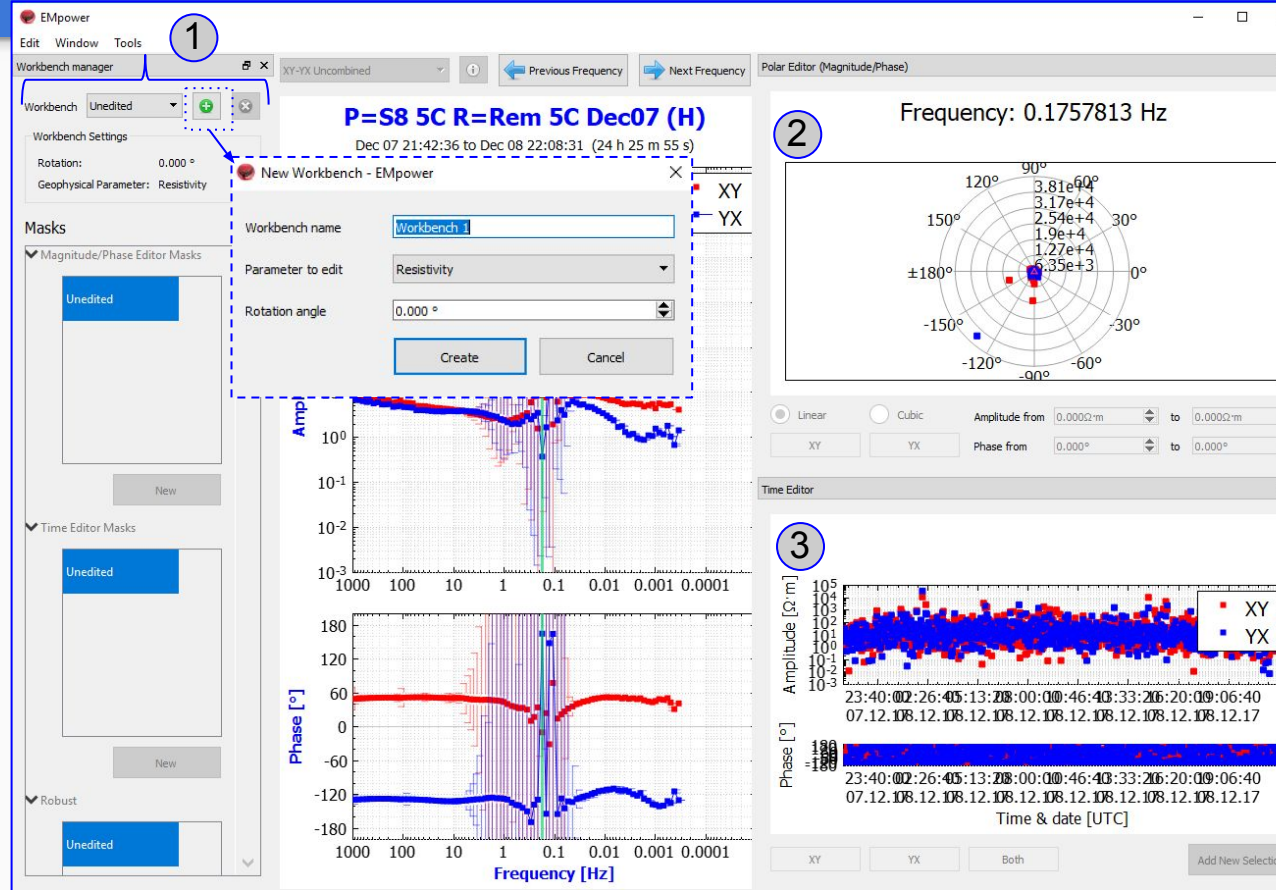
1. **Select the Data Format**
PLT or EDI
2. Use the **Combine Method**
Uncombined or Logical
3. Use the **Toolbar plot** for
additional changes
4. **Export** the processed site



Editing Cross Powers

Edit Cross Powers, is a tool to create multiple edition masks without changing the original (Unedited) Data to clean noisy sites

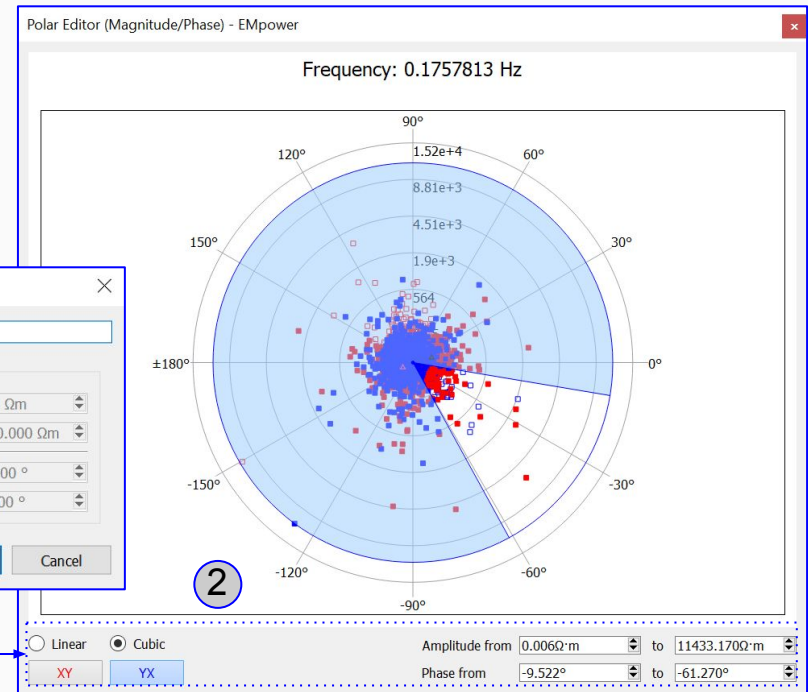
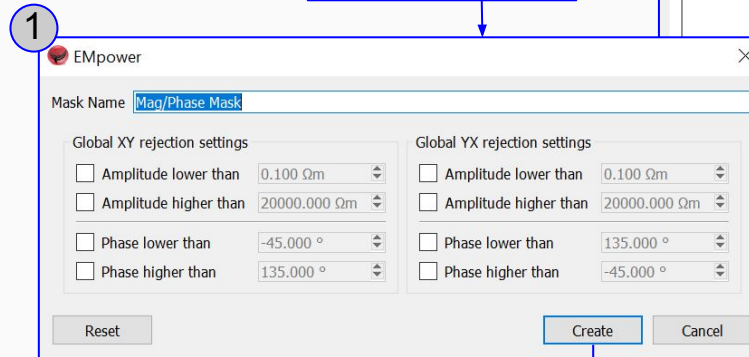
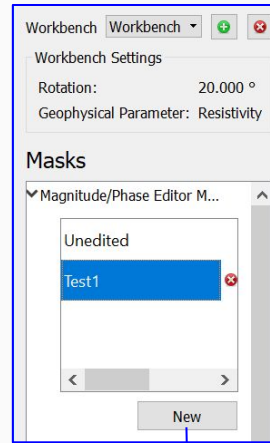
1. To create a new **Workbench** click the green (+) icon, complete the information and click **Create**
2. **Polar Editor**
 - Create a **Polar Editor Mask**(see page 16)
3. **Time Editor**
 - Create a **Time Editor Mask**(see page 17)



Polar Editor

1. **Create a New Magnitude/Phase Editor Polar Masks,** define a Mask Name, choose the Amplitude and Phase ranges
 - Click Create button

2. The polar editor plot has been created. Use the different tools to obtain the desired information
 - Linear / Cubic
 - XY / YX
 - Amplitude range
 - Phase range



Time Editor

1. When a polar editor plot has been created **XY / YX** will be reflected on the Time Editor
2. **Create a New Time Editor Masks**
 - Mask Name (click right)
3. **To Add New Selection**
 - Click, drag and drop

