

V1.2 Aug 31 2022

Muse Lab Guide

Table of Contents

[Table of Contents](#)

[Install Muse Lab](#)

[Connect to Muse](#)

[USB Dongle: BLED112](#)

[OSC streaming from app](#)

[Visualize Data](#)

[Single graph](#)

[Graph adjustments](#)

[Multiple Graphs](#)

[Save Configuration](#)

[Example EEG data](#)

[Record Data](#)

[Record and Export](#)

[Markers](#)

[DSP settings](#)

1) Install Muse Lab

Run the installer appropriate for your OS from the drive link provided upon your form submission on our website.

2) Connect to Muse

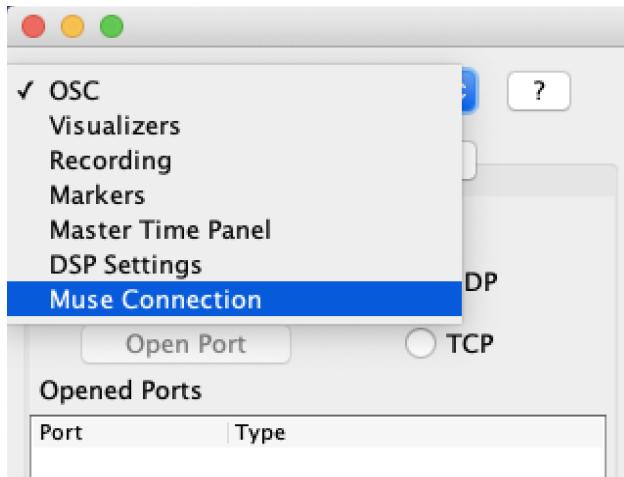
There are two ways to connect to a Muse device from MuseLab.

a) USB Dongle: BLED112

For your computer to connect directly to the Muse headband, it needs a serial Bluetooth dongle. Your computer's regular Bluetooth connection will not be enough. You learn more about this dongle from its maker's [website](#). It can be purchased from various retailers such as [DigiKey](#).

Once you have this dongle connected to your computer, follow these steps to connect your Muse:

- i) Go to the top drop down menu and select "Muse Connection"



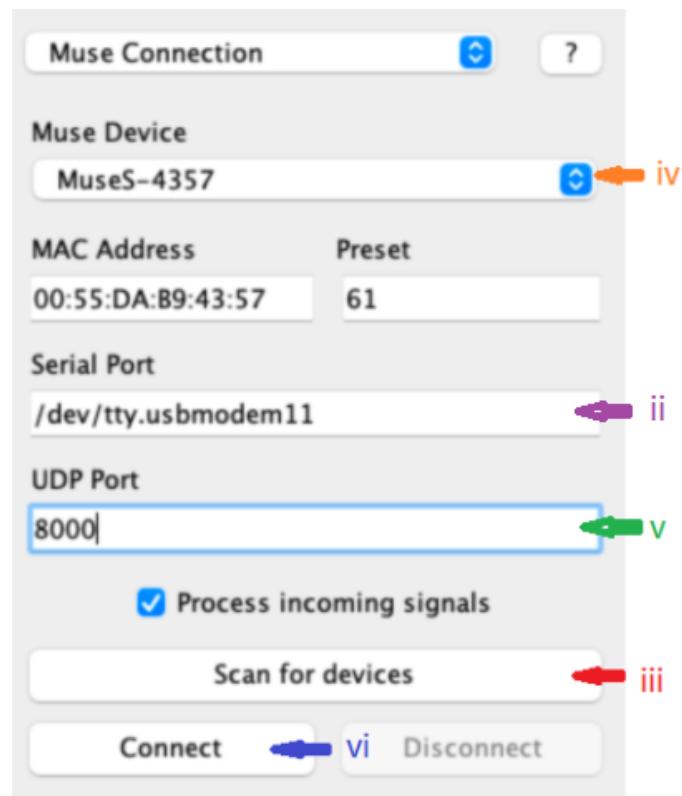
- ii) Ensure that you have connected your BLED112 dongle to the computer, then find which serial port it is using and fill in the serial port field.
 - (1) For Mac, open a terminal window and type `ls -l /dev/tty.usb*` and copy the returned value into the "Serial Port" field.
 - (2) For Windows, open Device Manager and expand "Ports (COM & LPT)", the COM port number will be shown as "Bluegiga Bluetooth Low Energy (COMx)". Enter the COMx value into the "Serial Port" field.
- iii) Turn on your Muse device then click the "Scan for devices" button at bottom.

iv) Muse Lab will search for all Muse devices in range and populate the drop down menu with their names. Click on the option that matches the last 4 digits of the serial number of your device.

v) Choose which UDP port you wish to use and enter the value in the “UDP Port” field. For example, 8000.

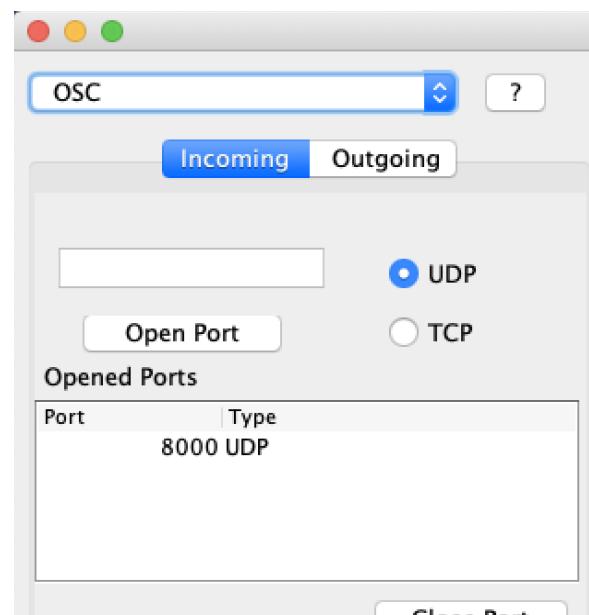
vi) Click the “Connect” button. The LED bar on the selected muse will stop pulsing and will show a solid bar with all LEDs on. This indicates the muse is connected and transmitting data.

**With the muse connected and transmitting, you will not see any signal data displayed. This is because Muse Lab is not yet listening for the data.



vii) Go to the top drop down menu and select “OSC”. Type the value of the UDP port that you chose earlier, then click the “Open Port” button. After opening the port you should start to see the Incoming Messages from muse.

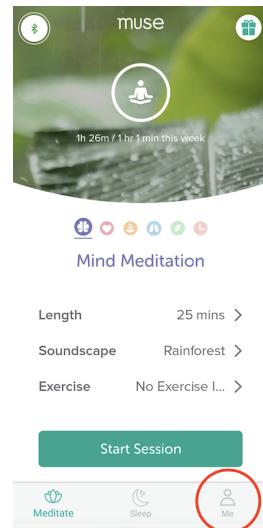
**Now the data is being received from muse but still no signals are displayed. We need to add a visualizer before we can see anything. Go to the [Visualize Data](#) section of this guide



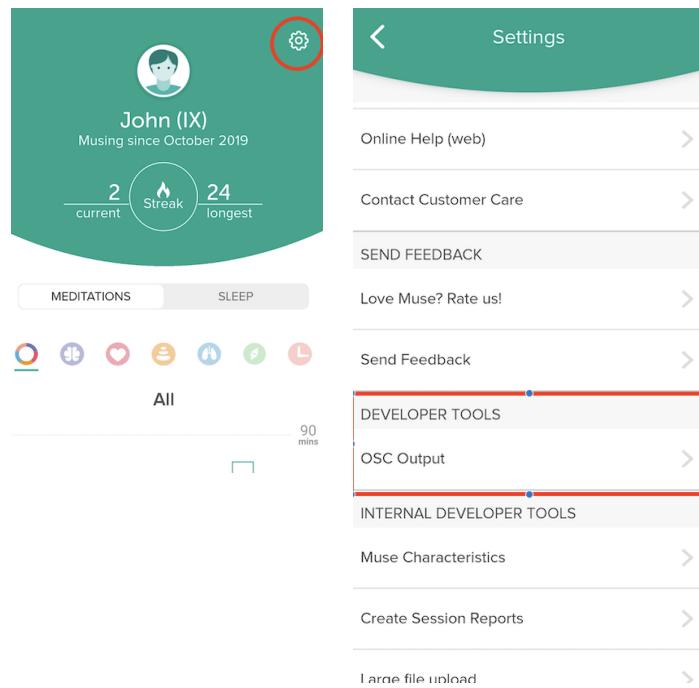
Rate	Path	Args	Sender	Port
51	/accel/	iii	/127.0....	8000
252	/eeg/	iiii	/127.0....	8000

b) OSC streaming from app

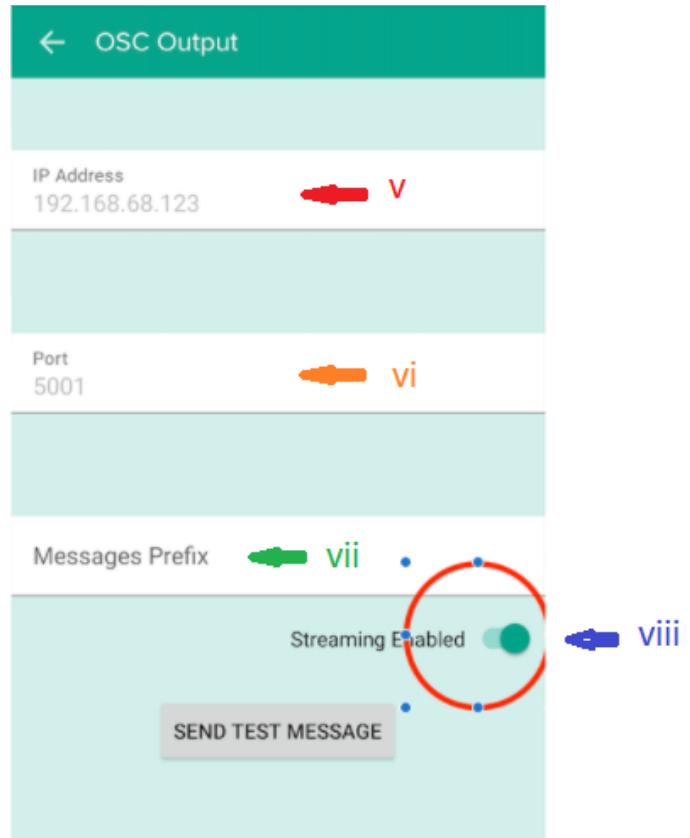
- i) Download and install the latest Muse App on the phone/tablet. Ensure your phone has Bluetooth enabled.
- ii) Open the Muse App and connect your muse device to the Muse App by tapping on the Bluetooth icon on the top left.
- iii) Navigate to the Me Screen, by tapping on the icon on the bottom right.



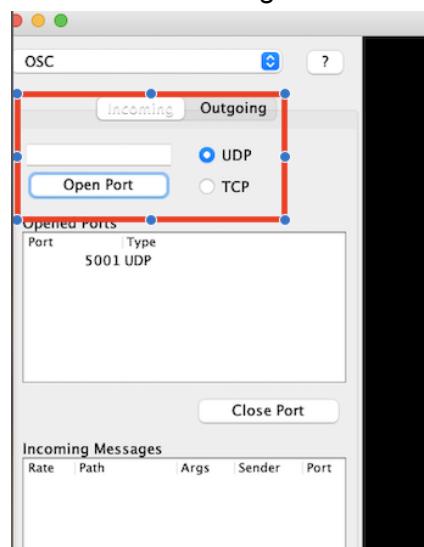
- iv) Open Settings by tapping on the gear icon on the top right. Then scroll down to OSC Output



- v) Identify the IP address of the computer you will stream too, enter this address in the IP Address box. (example 192.168.68.1)
- vi) Identify the port you wish to stream to (ex 5001)
- vii) Enter any message prefix you want as identifier or leave blank
- viii) Toggle the “Streaming Enabled” switch to start streaming. Now you must open Muse Lab and set it up to receive this stream.



- ix) In Muse Lab, go to the top drop down menu and select “OSC”. Type the value of the UDP port that you chose earlier, then click the “Open Port” button. After opening the port you should start to see the Incoming Messages from muse.
**If not receiving messages in the Incoming Messages window, toggle the streaming button off then on again



- x) To ensure the signal stays on, the mobile device connected needs to stay on the active screen and the device needs to stay awake or the connection will drop causing lost signal on Muse Lab. To achieve this with, starting a mind meditation at this point will keep the device open and keep streaming to Muse Lab.

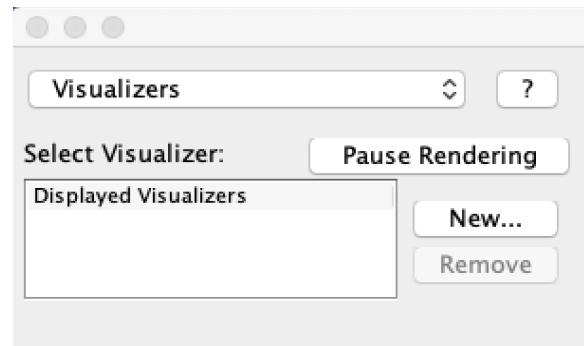
**Now the data is being received from muse but still no signals are displayed. We need to add a visualizer before we can see anything. Go to the [Visualize Data](#) section of this guide

3) Visualize Data

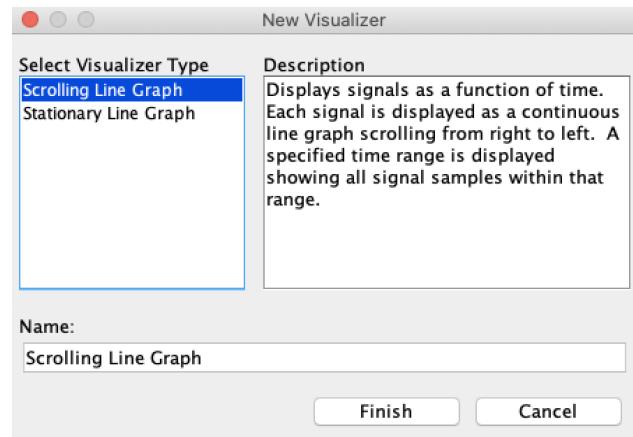
a) Single graph

Now the data is being received from muse but still no signals are displayed. We need to add a visualizer before we can see anything.

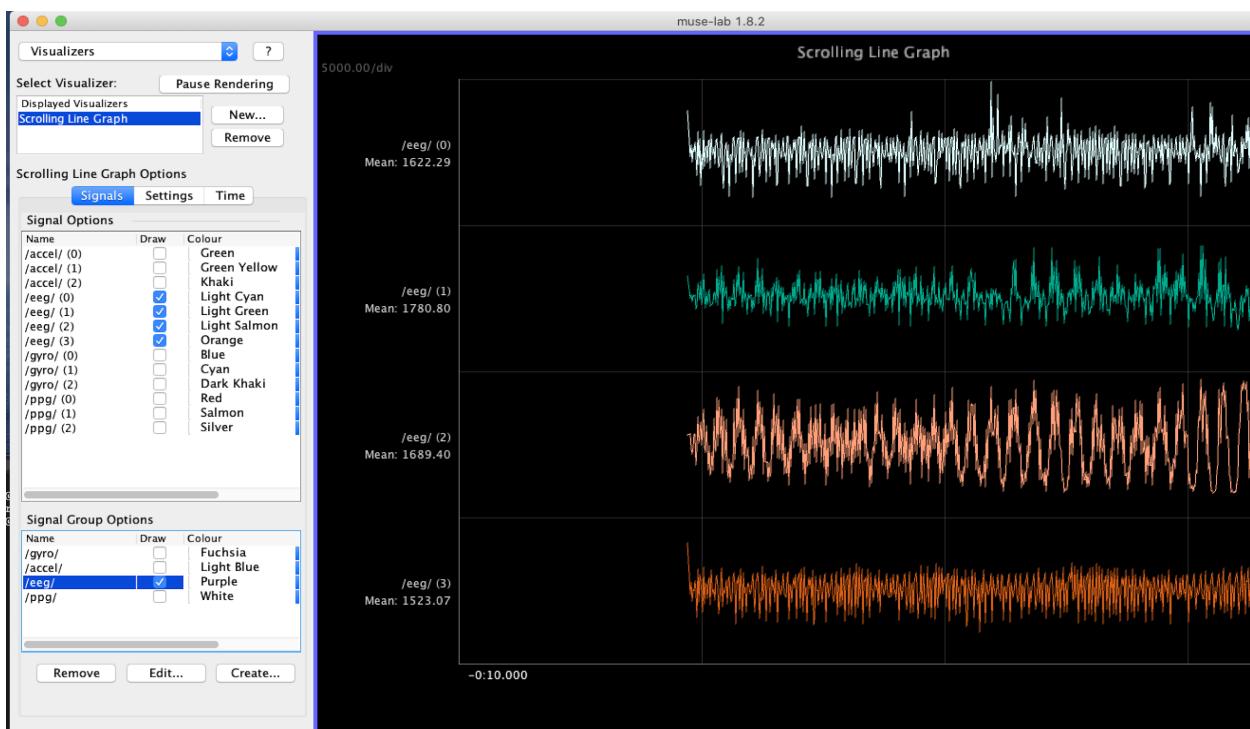
- i) Go to the top drop down menu and select “Visualizers”



- ii) Click “New...” and select “Scrolling Line Graph”. You may name the graph in desired, and click Finish.

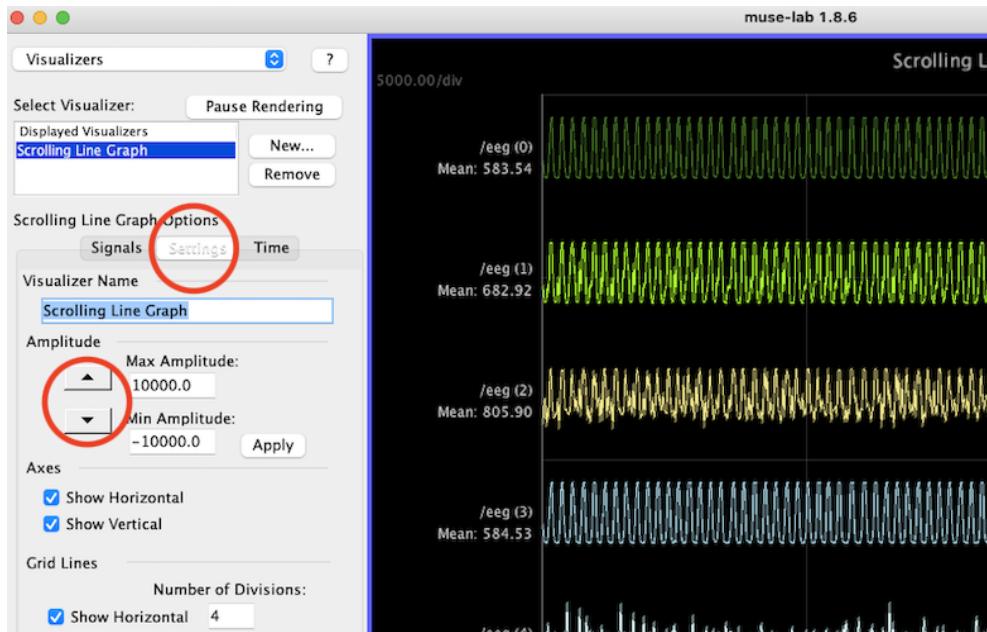


- iii) Now select a single signal from the “Signal Options” or a group of signals from “Signal Group Options” and you should begin to see the data scrolling into view.

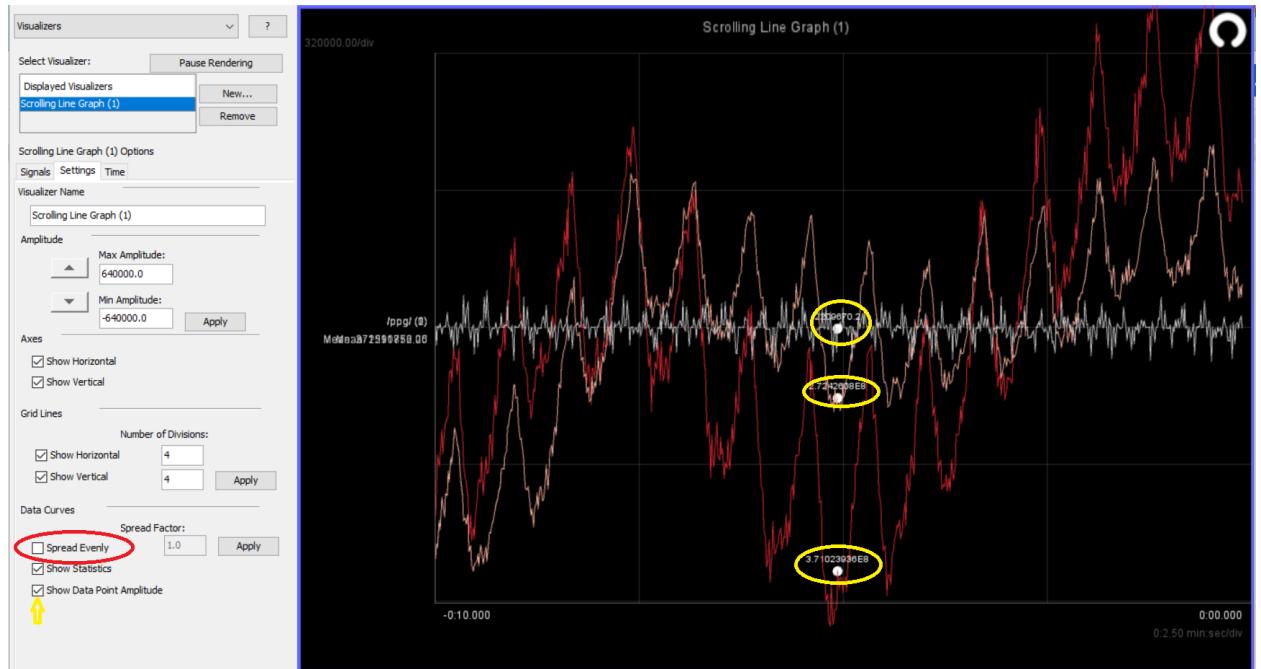


b) Graph adjustments

Open the Settings tab to adjust the graph.



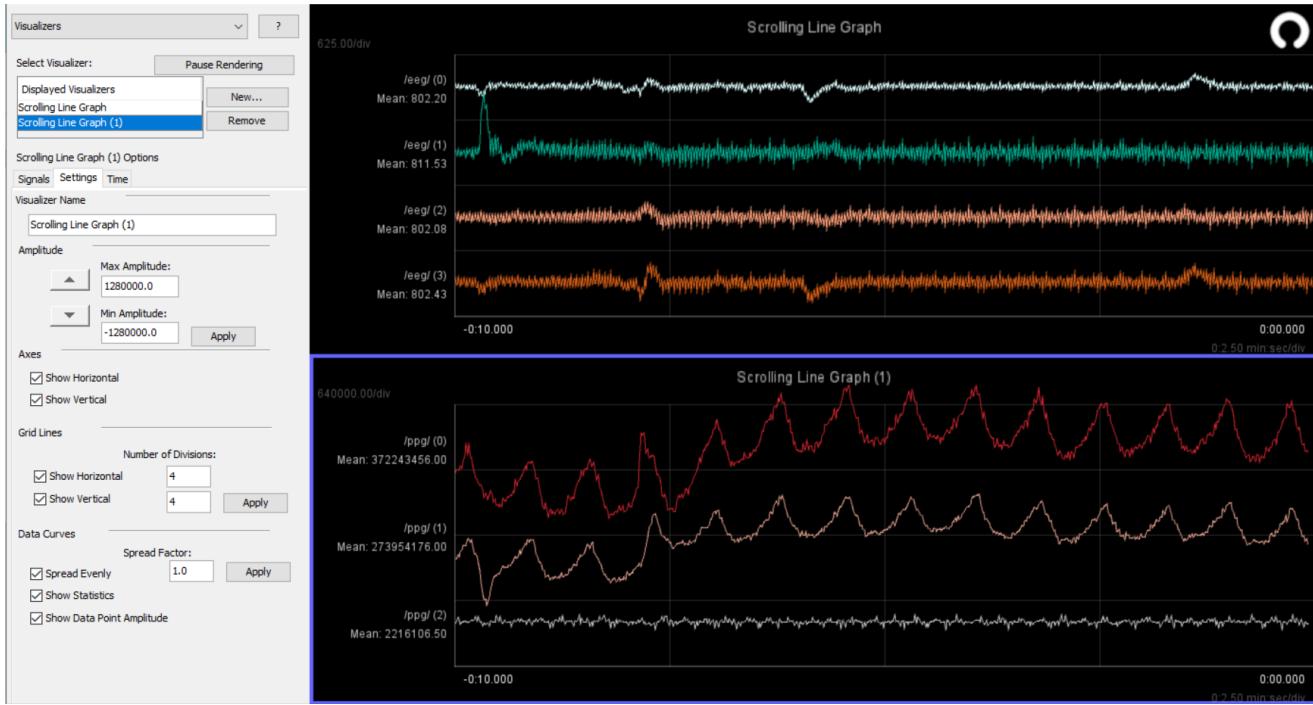
- i) You can set Amplitude limits if you know what values to expect. You can also adjust the amplitude (vertical) "zoom" by using the top and bottom arrows, or the time (horizontal) "zoom" by using the left and right arrows. Make sure the graph is selected to do this, by clicking in the empty black area of the graph so that it has a color border.
- ii) You can set the name of the graph in the "Visualizer Name" textbox.
- iii) You can also center all signals in the graph on the same axis by deselecting "Spread Evenly" near the bottom
- iv) The default is to have the cursor pointer show the amplitude of each curve at that point in time. This can also be deselected



c) Multiple Graphs

You can add another separate line graph to visualize different signals with different amplitude settings. Simple repeat the following steps:

- Click “New...” and select “Scrolling Line Graph”. You may name the graph in desired, and click Finish.
- Now select a single signal from the “Signal Options” or a group of signals from “Signal Group Options” and you should begin to see the data scrolling into view.

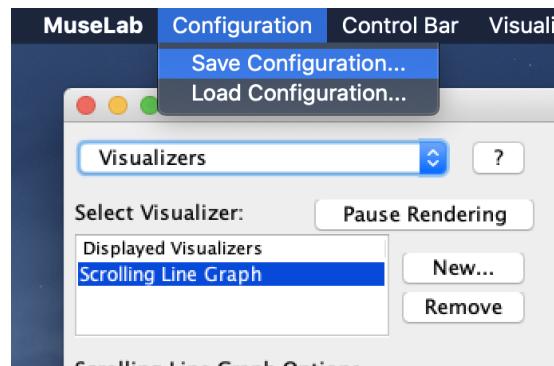


d) Save Configuration

Once you are happy with how things are set up, you can save the configuration.

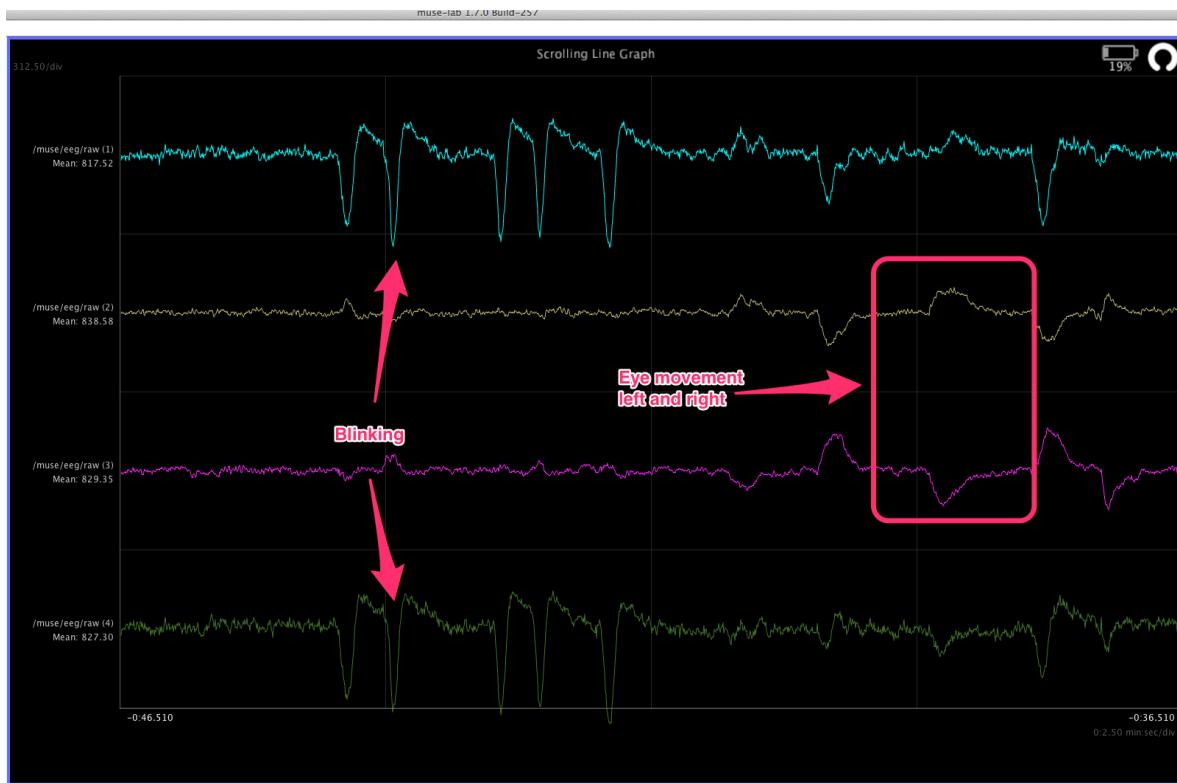
- Select “Save Configuration” from the “Configuration” menu.
- Use “Load Configuration” to restore these settings the next time you open the application.

****The last saved configuration will be applied automatically when you next start the application.**

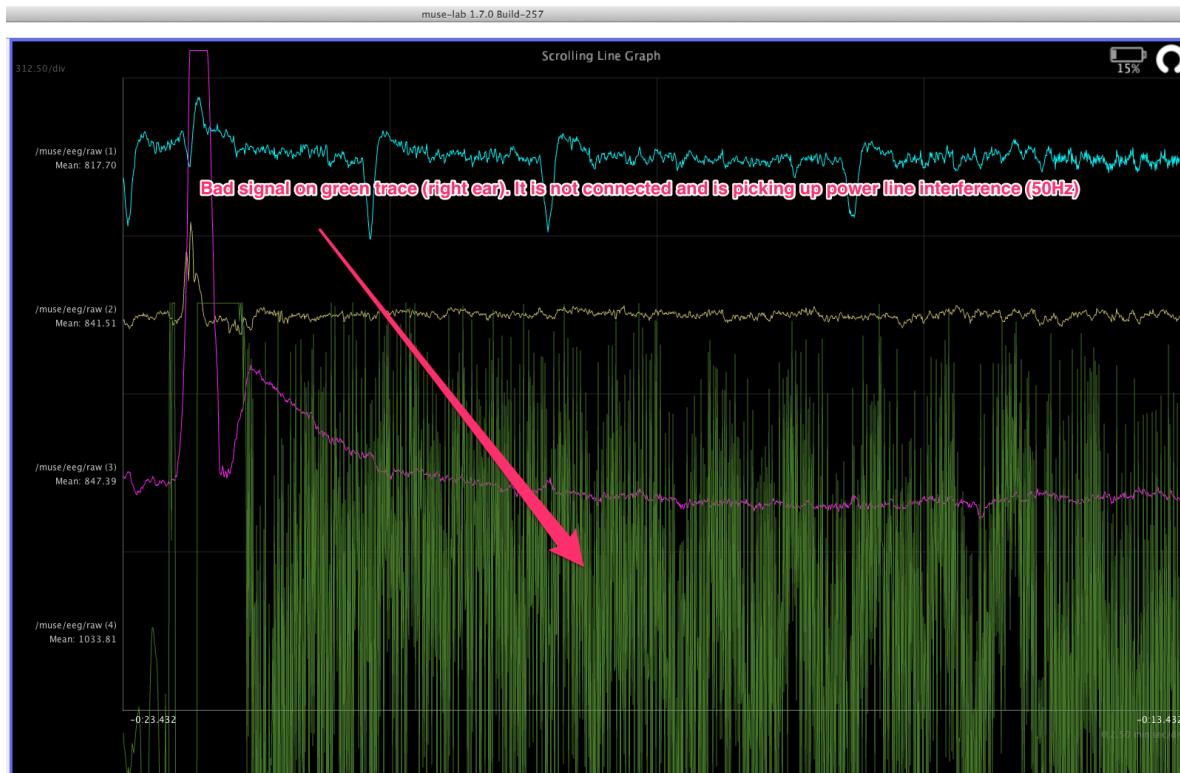


4) Example EEG data

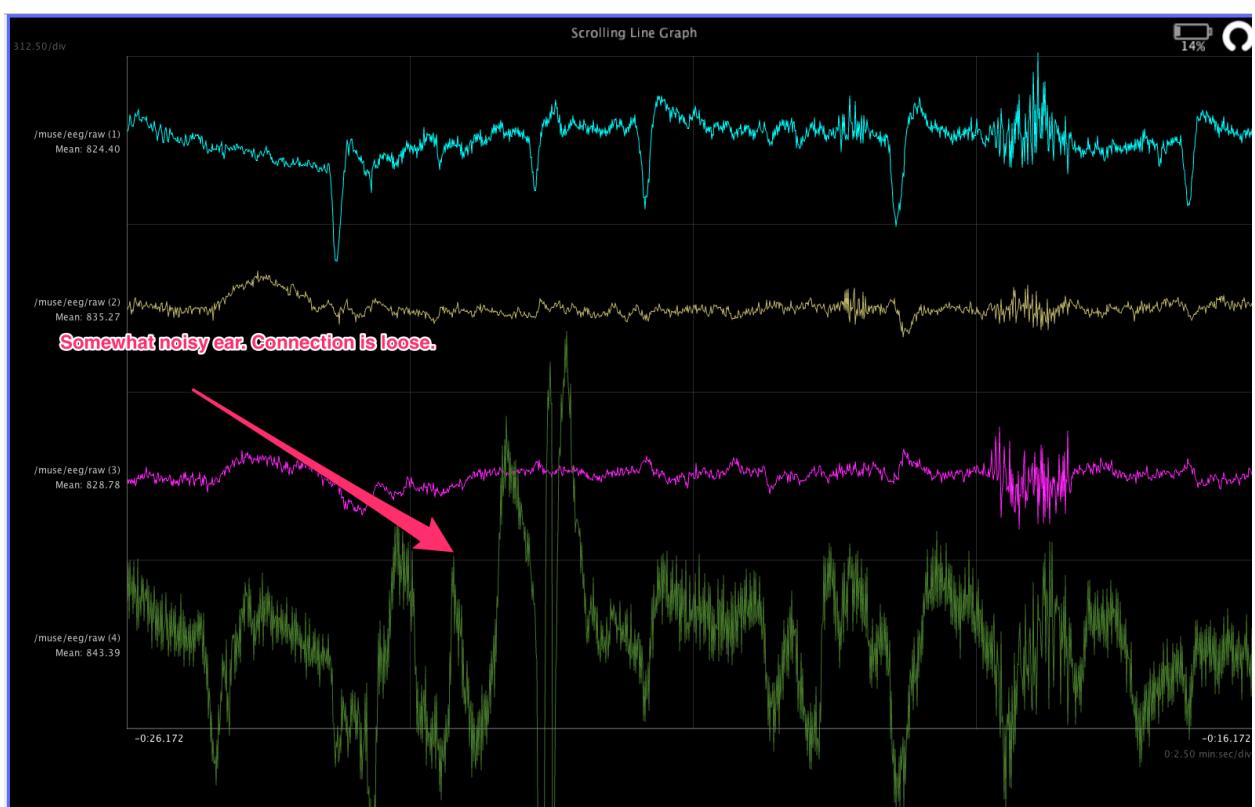
Here are some example signals you can expect to see



The above plot shows what good signal should look like, with some artifacts labelled for your reference.



Above: totally disconnected ear.



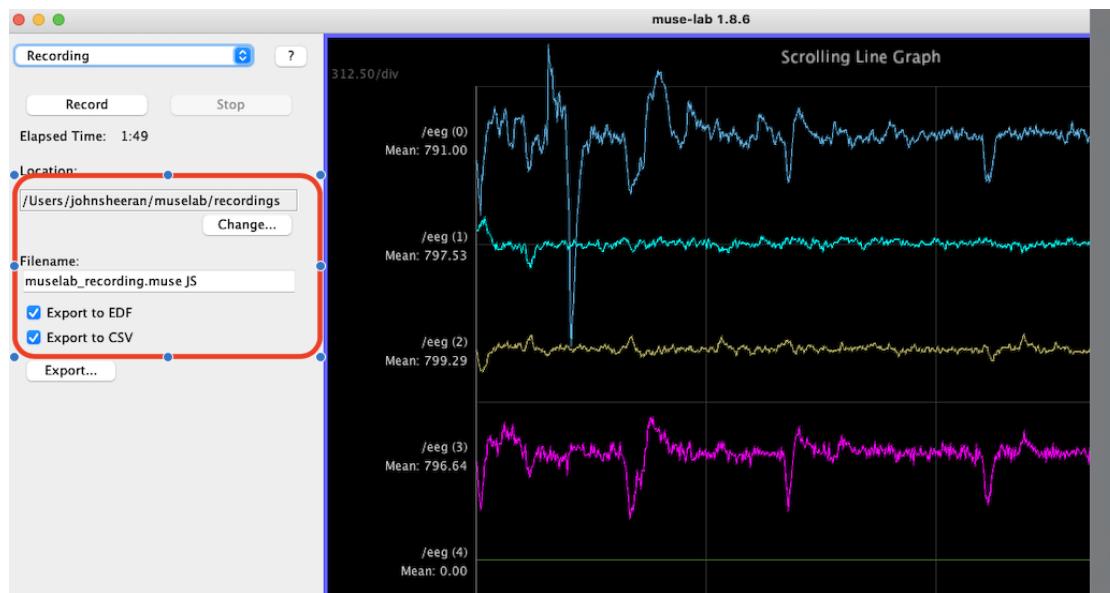
Above: an ear electrode with a poor connection, but not completely disconnected.

5) Record Data

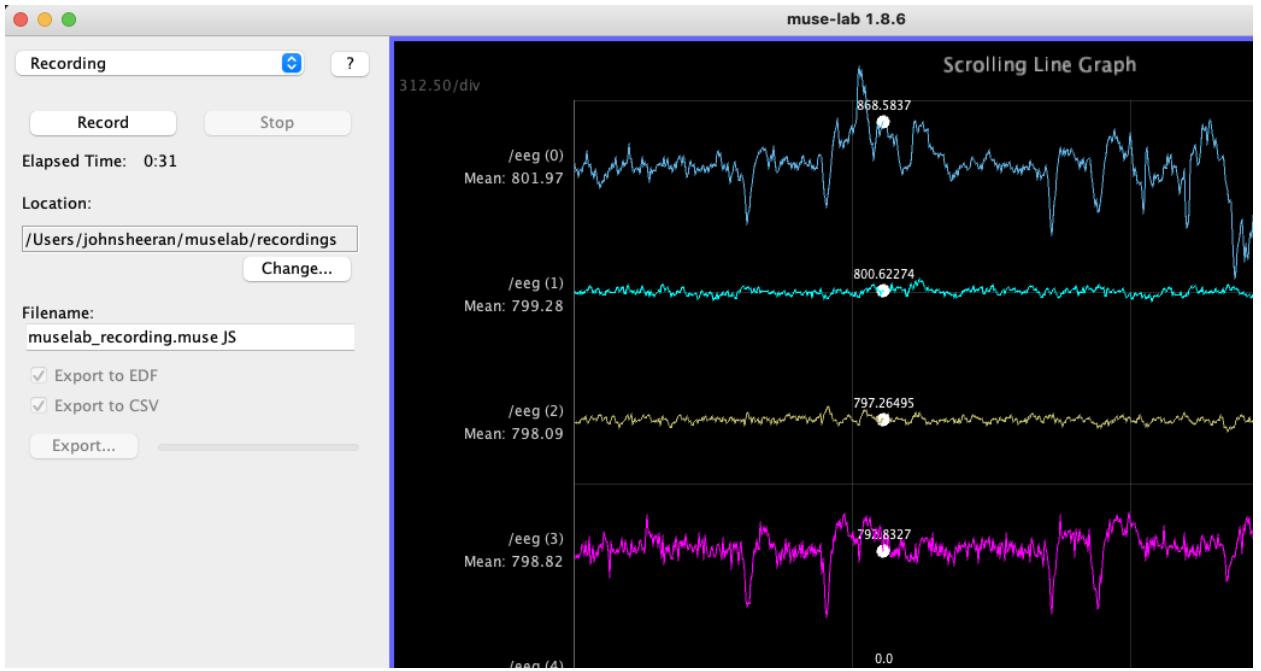
a) Record and Export

MuseLab records in a proprietary .muse file format. However, you can select to export the recording in either EDF or CSV format.

- i) From the top drop down menu, select “Recording.”
- ii) Select the location you want the files saved to, enter the name of the file and select EDF and/or CSV for export.



- iii) Press the “Record” button and allow the elapsed time to your desired recording length, then press the “Stop” button to end the recording. You will see a START and STOP markers on the graph to match. Once the recording has stopped, the data will be exported if that option was selected. The export button will be greyed out until finished.



- iv) Once the export is finished, the export button will stop being greyed out and the files should be in your chosen location.

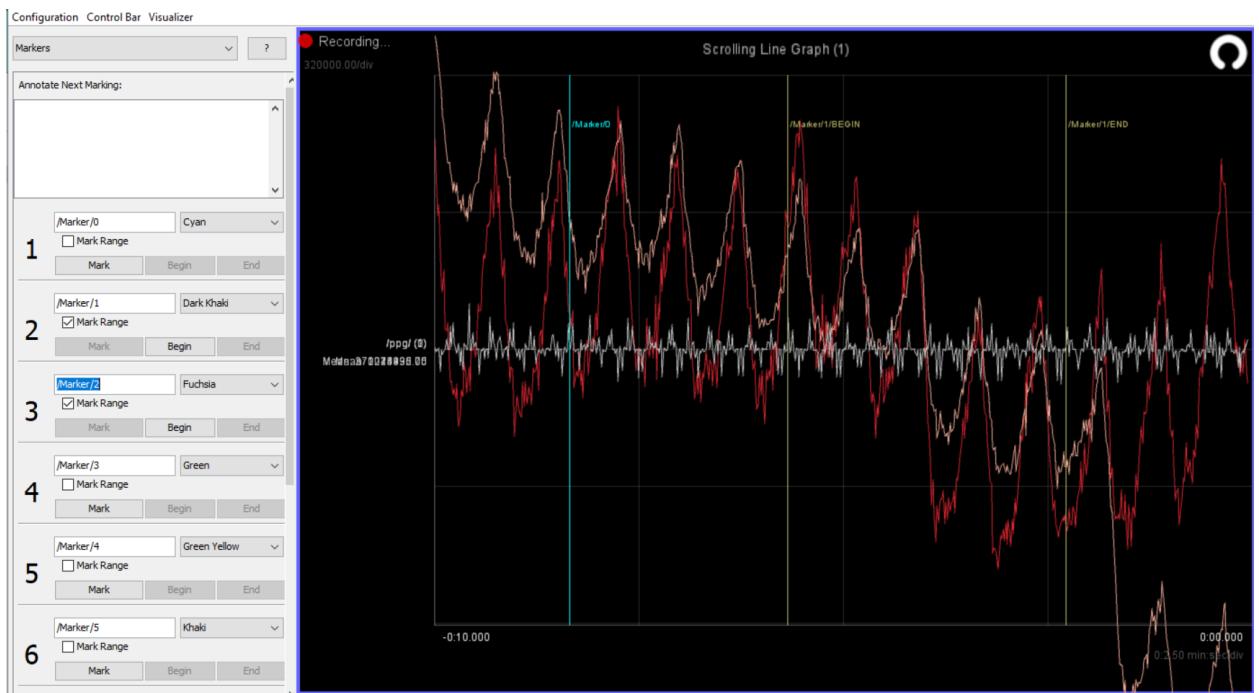
Brain Waves EDF		View	Group	Share	Add Tags	Action	Search
Name		Date Modified	Size	Kind			
muselab_recording.csv		Today at 9:22 AM	239 KB	Comma-separated (.csv)			
muselab_recording.edf		Today at 9:21 AM	45 KB	Document			
muselab_recording.muse JS		Today at 9:21 AM	301 KB	Document			

- v) You can also convert an existing .muse file to .edf. To do that, check which format you wish to convert to and click on “Export...”. From the file browser, select the muse file you would like to convert and click “Open”.

b) Markers

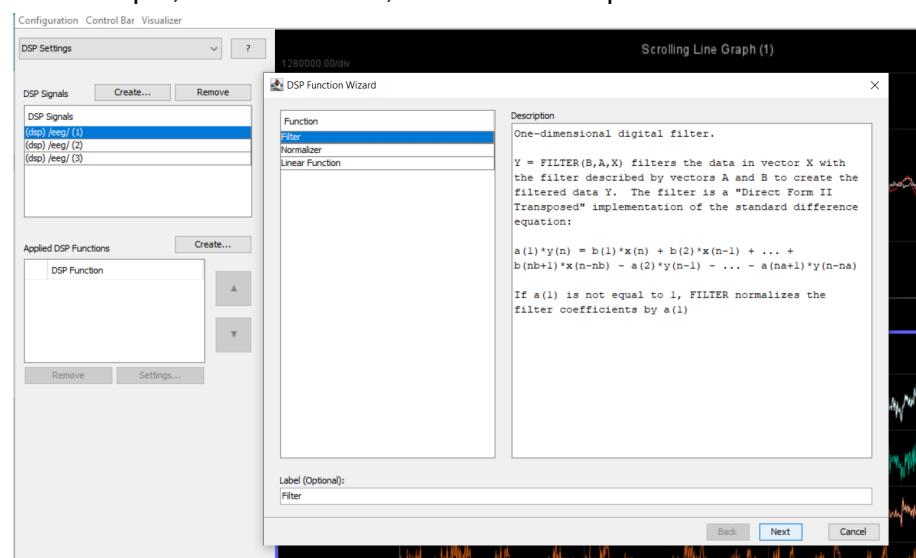
You can add markers to the recording either using OSC messages or by manually adding them on MuseLab.

- i) From the top drop down menu, select “Markers”
- ii) Name the marker by using the OSC message or just giving it an indicative name.
- iii) You can make a marker a range pair by selecting the “Mark Range” checkbox
- iv) Start a recording as in the previous section.
- v) To manually add markers, navigate back to the “Markers” menu and click ‘Mark’ or ‘Begin’



6) DSP settings

- From the top drop down menu, select “DSP Settings”.
- To add a DSP function select the “Create...” button from the Applied DSP Function section. You can select a Filter, Normalizer or Linear Function. Each has its own description and parameters to enter.
- For example, for a 60Hz filter, select the first option and click “Next”



- iv) You must add the input and output coefficients. For example, for a 60Hz:

Input Coefficients: “1.000000000000000, -0.395039441772236,

2.039014040138930 , -0.395039441772236, 1.000000000000000”

Output Coefficients: “1.000000000000000 , -0.361027305588269,

1.688402551318755, -0.303106042562707, 0.706757063215189”

