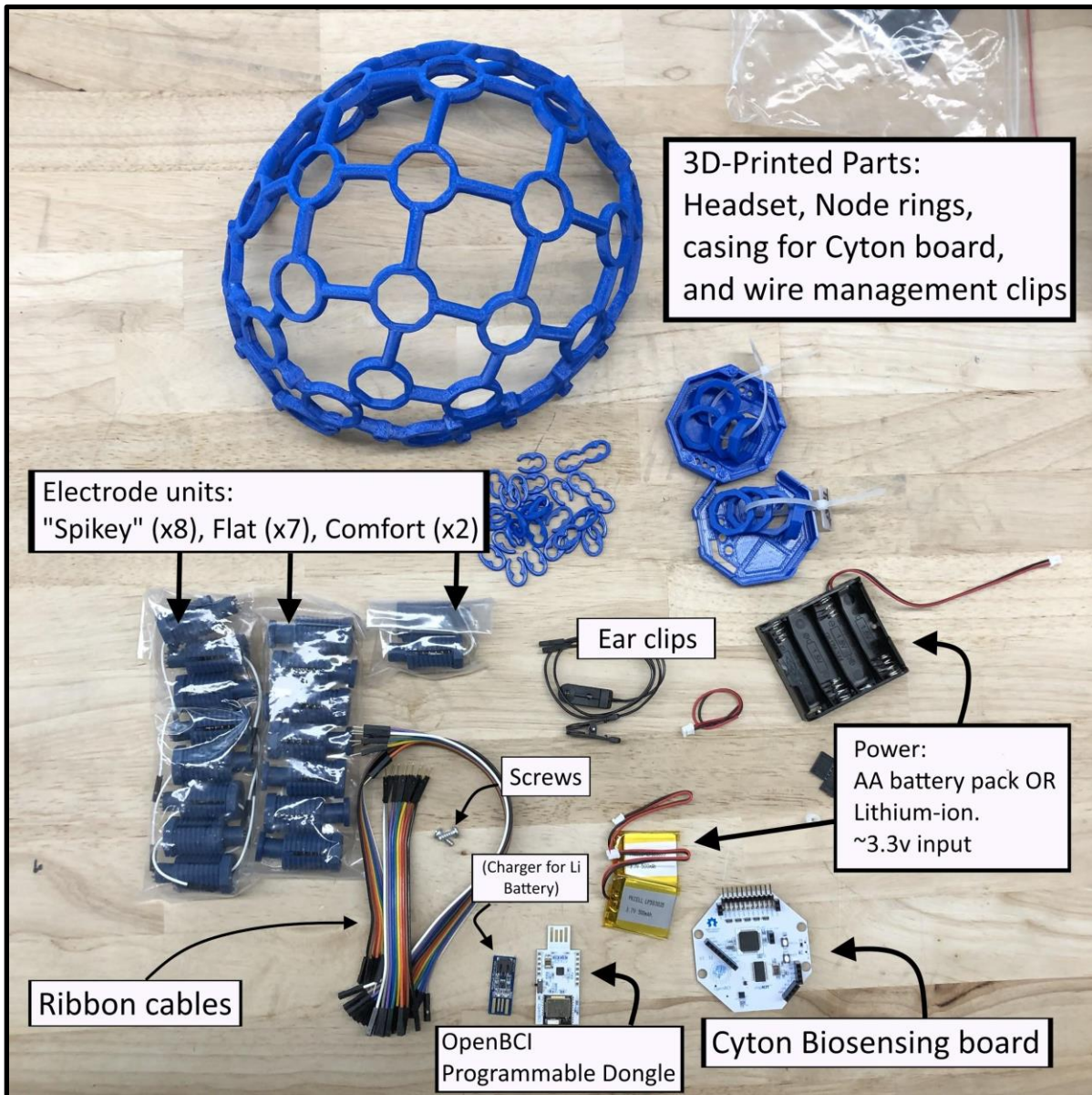


Constructing the OpenBCI™ Ultracortex Mark IV EEG Headset

By Trevor Foresta
April 19th, 2019



Parts List

***Note: For this assembly, we have chosen to construct the 8-channel "Print-It-Yourself" variant of the set. The parts list is as follows:**

3D-Printed parts:

(1x) Headset frame, (35x) node ring inserts, (1x) board mount, (1x) board cover, (30x) wire clips

Mk IV Headset Kit:

(8x) spikey electrode units, (7x) flat electrode units, (2x) comfort units, (3x) ribbon cables, (2x) ear clips, (2x) #4 screws

Cyton board kit:

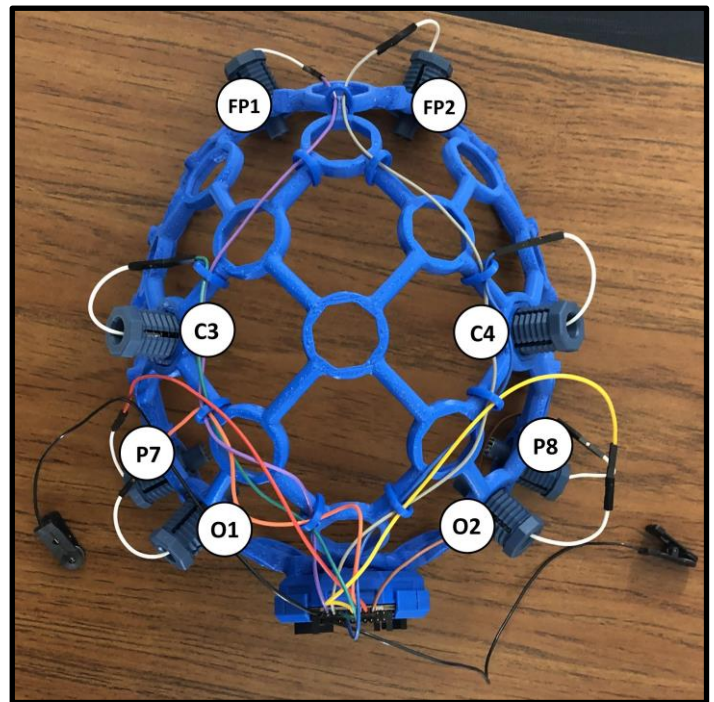
(1x) 32-bit Cyton Biosensing board, (1x) Programmable dongle, (1x) AA battery pack,

Other (Optional):

(1x) Lithium Ion Rechargeable Battery Pack (~500mAh), (1x) USB Lilon/LiPoly charger

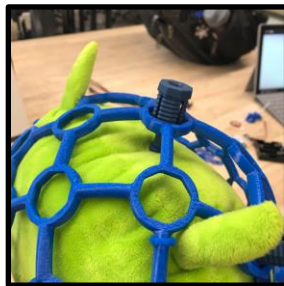
Step 1: Inserting Node Rings and Electrodes

First, we will need to glue in the node insert rings using super-glue into the selected ports: FP1, FP2, C3, C4, P7, P8, O1, and O2. After the rings are in, we will screw the electrodes in those set locations. Pictured right are the ports we will be using:



You may want to glue in rings for *each* of the ports on the headset, however they are only necessary for containing the electrodes. The rings can be held on using masking tape if the super glue still needs to dry.

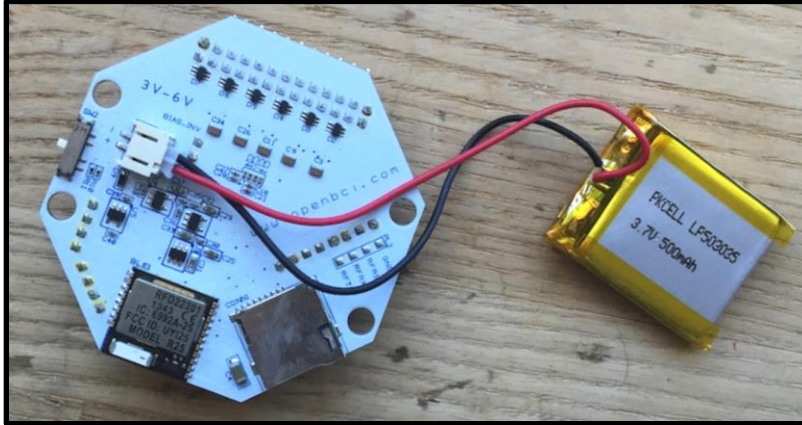
Once the rings are in, you can twist-in the **electrodes**: flat-top electrodes go in the front two ports (FP1 and FP2) and the spikey electrodes go into the remaining six ports.



If you feel the electrodes have been screwed in too far or you would just like to test the feel of the headset with the electrodes in, you might want to find a “test subject” (such as a pillow, etc.) to try fitting the headset on

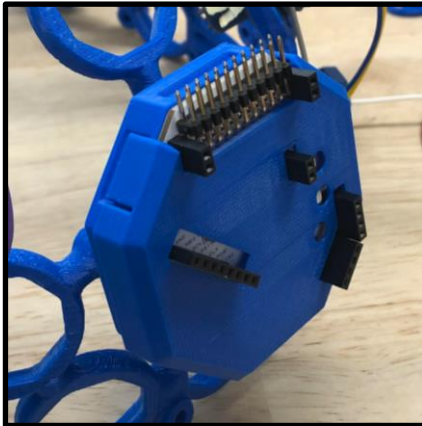
Step 2: Mounting the Cyton Board

Screw in the board mount for the Cyton board on the back of the headset with the #4 screws. The mount will have a hole, and the hole should be facing down.



Locate the battery input on the back of the board (pictured left):

If you are using a Lithium ion battery, you can fit in beneath the board and sandwich it between the board and the mount. If you are using the AA battery pack, you will have to affix it to an open space on the headset using tape or glue. In which case, the hole in the bottom can be used to reach the battery input on the board.



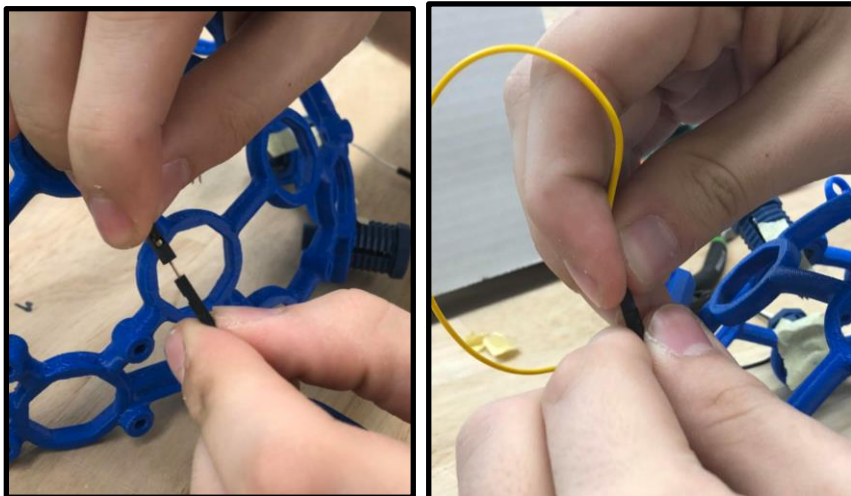
Finally, you can close the mount with the top cover piece. The top cover should fit on with no adhesives or screws needed.

Step 3: Wiring the Nodes

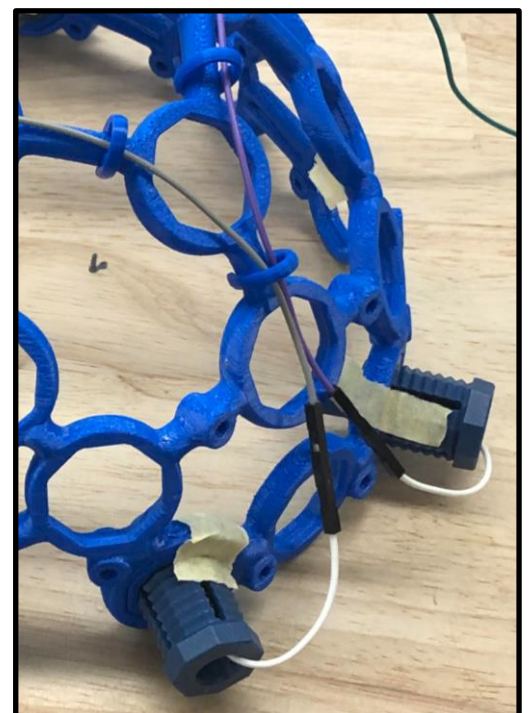
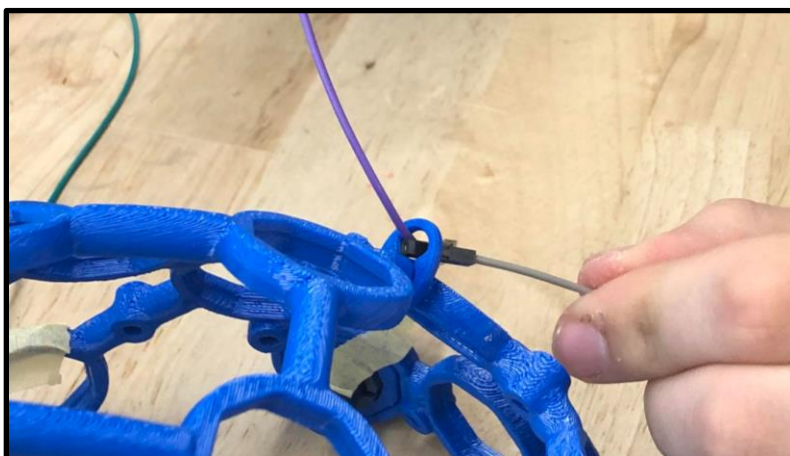
The wiring will be done using the jumper cables included in the set. There are 3 sizes: 12", 8", and 4". From the 12" set, peel off the **Gray** and **Purple** wires, from the 8" set, peel off the **Blue**, **Green**, **Orange**, and **Yellow** wires, and finally from the 4" set peel of the **Brown** and **Red** wires.

The male end of the colored wires will go into the female end of the electrode nodes. For which colors go to which nodes, refer to the chart pictured right:

Electrode	Wire Color
FP2	Grey
FP1	Purple
C4	Blue
C3	Green
P8	Yellow
P7	Orange
O2	Brown
O1	Red



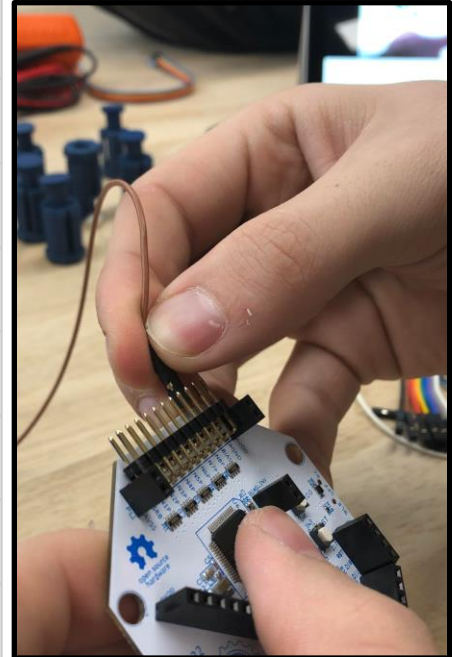
After all wires have been connected, you will need to line them along the headset all the way to the back, keeping them attached using the 3D-printed wire clips.



Step 4: Wiring the Electrodes to the Board

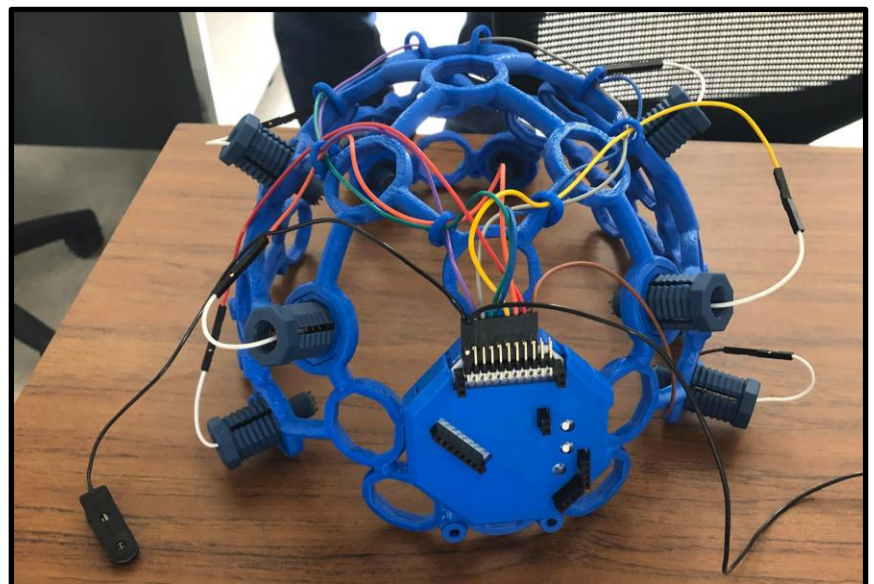
Next you will need to connect those wires from the previous step into the board. The electrode wires correspond to these pins on the board:

Electrode	Wire Color	Cyton Board Pin
Ear Clip	Black	Bottom SRB pin (SRB2)
FP1	Purple	Bottom N1P pin
FP2	Grey	Bottom N2P pin
C3	Green	Bottom N3P pin
C4	Blue	Bottom N4P pin
P7	Orange	Bottom N5P pin
P8	Yellow	Bottom N6P pin
O1	Red	Bottom N7P pin
O2	Brown	Bottom N8P pin
Ear Clip	Black	Bottom BIAS pin



As pictured, you can take the board out of its mount to wire the electrodes in better.

After you have finished this step, the physical assembly of the headset will be complete. The headset is now ready for testing.



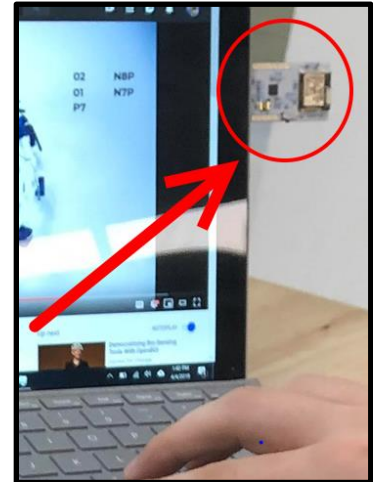
Step 5: Setting up the GUI

From the OpenBCI download page:

(https://docs.openbci.com/OpenBCI%20Software/01-OpenBCI_GUI)

you will need to download their GUI, and depending on your machine, you may need to install drivers. Make sure you are on a laptop with Bluetooth capability.

Plug in the dongle (provided in the kit) into your laptop. This will serve as your connection to the headset via Bluetooth.



Once you have started the GUI, navigate through the control panel as pictured:

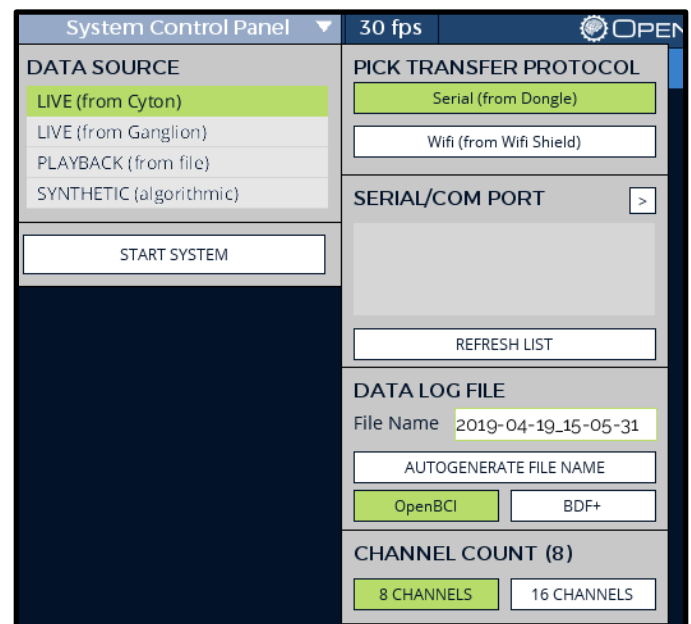
Data source: LIVE (from Cyton)

Transfer protocol: Serial (from Dongle)

Data log file: OpenBCI

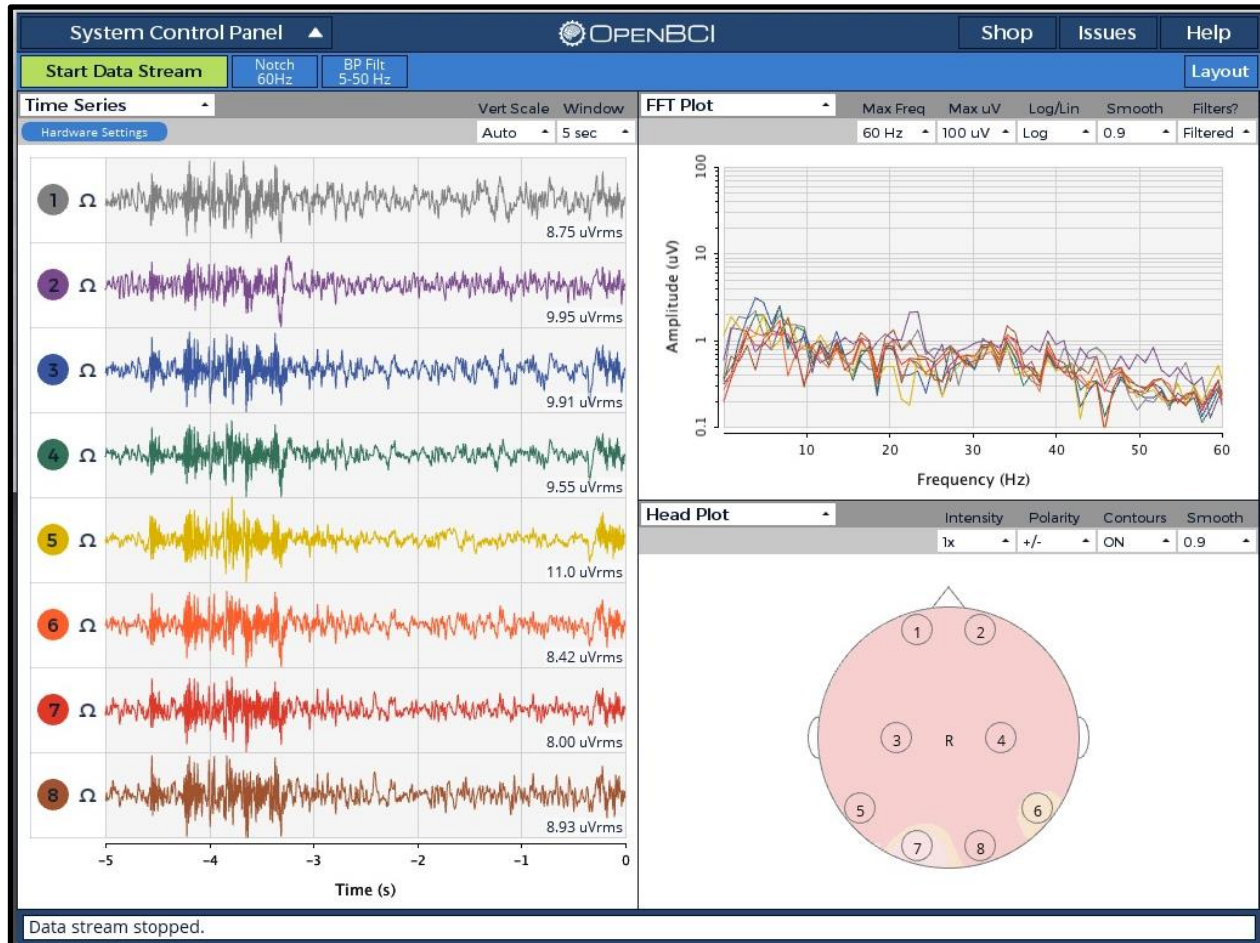
Channel count: 8 channels

When you are ready, click on *START SYSTEM*.



Step 6: Retrieving Signals

Now that the GUI is set up, you will need a test subject with a well-sized head. Make sure their head fits comfortably, and that all of the nodes are pressed against them. When you click on Start System, the signals will start coming in. Your table should look something like this:



If you are not seeing any signals, you will need to double check your connections, possibly your bluetooth.

A variety of signals can be produced by your test subject performing different actions. Try closing your eyes, blinking, or clenching your teeth! You will see that these actions will produce changes in signals. You are now ready to begin tests with your OpenBCI Ultracortex Mk. IV Headset.

Bonus Photos

