*In vitro testing*

We tested the efficacy of our stimulation and measurement paradigm by simulating a neural environment lacking an endogenous field in a beaker of saline. We placed 250 mL of 0.9% sodium chloride solution into a glass beaker and immersed a 96-channel silicon microelectrode implant (Utah Microelectrode Array, Blackrock Systems, Salt Lake City, UT) in the solution. We placed the anode and cathode of the DC-Stimulator Plus (NeuroConn GmbH, Ilmenau, Germany) in the beaker of saline transverse to the microelectrode implant.

We selected a pair of adjacent electrodes on the array and converted them to a single bipolar-referenced channel. This electrode pair formed the same single bipolar-referenced channel used to measure local field potentials from PFC during in vivo testing. All electrode channels were digitized at 1000 Hz. The recordings were referenced to a metal beaker stand that the glass beaker was sitting on.

The beaker received three forms of stimulation: closed-loop stimulation using our filter, open-loop constant sinusoidal stimulation at 11.5 Hz, and open-loop stimulation using an 8-16 Hz filtered neural waveform recorded from a previous day. For each stimulation paradigm, we applied trials of 10 seconds of stimulation followed by a 40 seconds of rest. Stimulations occurred as blocks of 10 trials followed by several minutes of rest.

Documenting the Day of Collection:

Rather uneventful, things in large part went as expected.

Used Data Bank A and verified that activity was occurring on electrodes.

I used the .ccf file from the previous recordings. This used the same reference electrode and designated elec1-83 as the analog output on analog output ch 1. I scaled the output to give 500mV of stimulation peak to peak. The open-loop and old brain were also scaled to that range. Verification was performed on a scope.

The data is collected in one set of Blackrock files.

Analog In 1 is the input to the analog filter

Analog In 2 in the output of the analog filter

The order of conditions is open-loop (11.5Hz), old-brain, closed loop. (again all stimulating in a 500mv P2P range).

10 stimulations of each condition

Stimulations of ten seconds followed by 40 seconds of rest. 5 minutes between conditions.

No bubbles were formed on the electrodes, as seen during Jake’s saline test.

I have also attached an excel sheet with the trials with the information pertaining to incorrect stimulation enclosed. Will send scans of my lab notebook.

Detailed methods of stimulation: