

# INTRODUCTION

## Problem:

It is difficult to efficiently switch between channels in-vivo in rodent models while factoring in:

- 1) Electrical Isolation
- 2) Rapid Switching
- 3) Limiting Expensive Tech

## Solution:

A microcontroller controlled device that requires only 1 Isolated Stimulation Device that can rapidly switch between stimulation parameters within a 500Hz rate without significant signal loss or any electrical interference from the microcontroller or other present technology

# Bioelectric Router for Adaptive Isochronous Neuro Stimulation (BRAINS) Board - A Programmable Device for Multipolar Stimulation



Anschutz

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# FUNDING

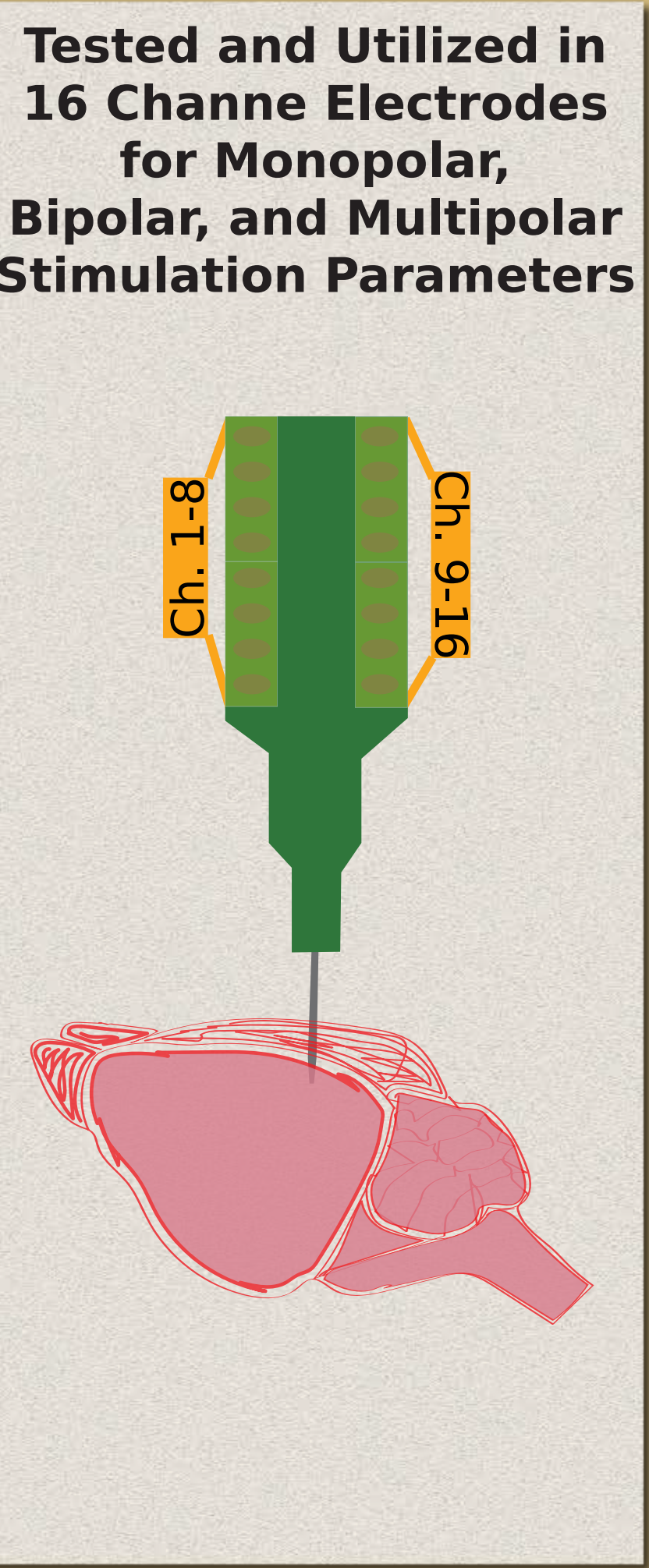
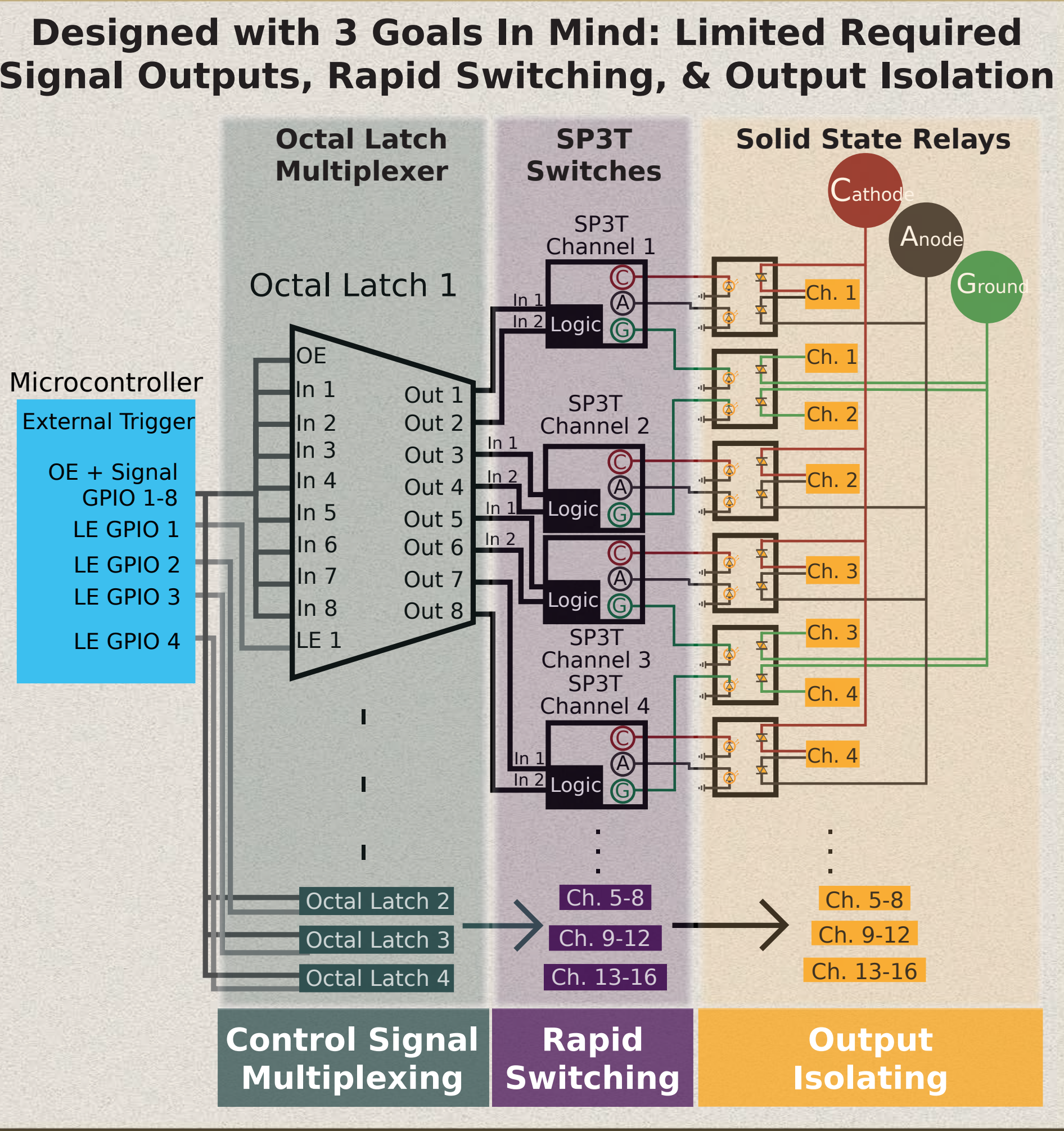
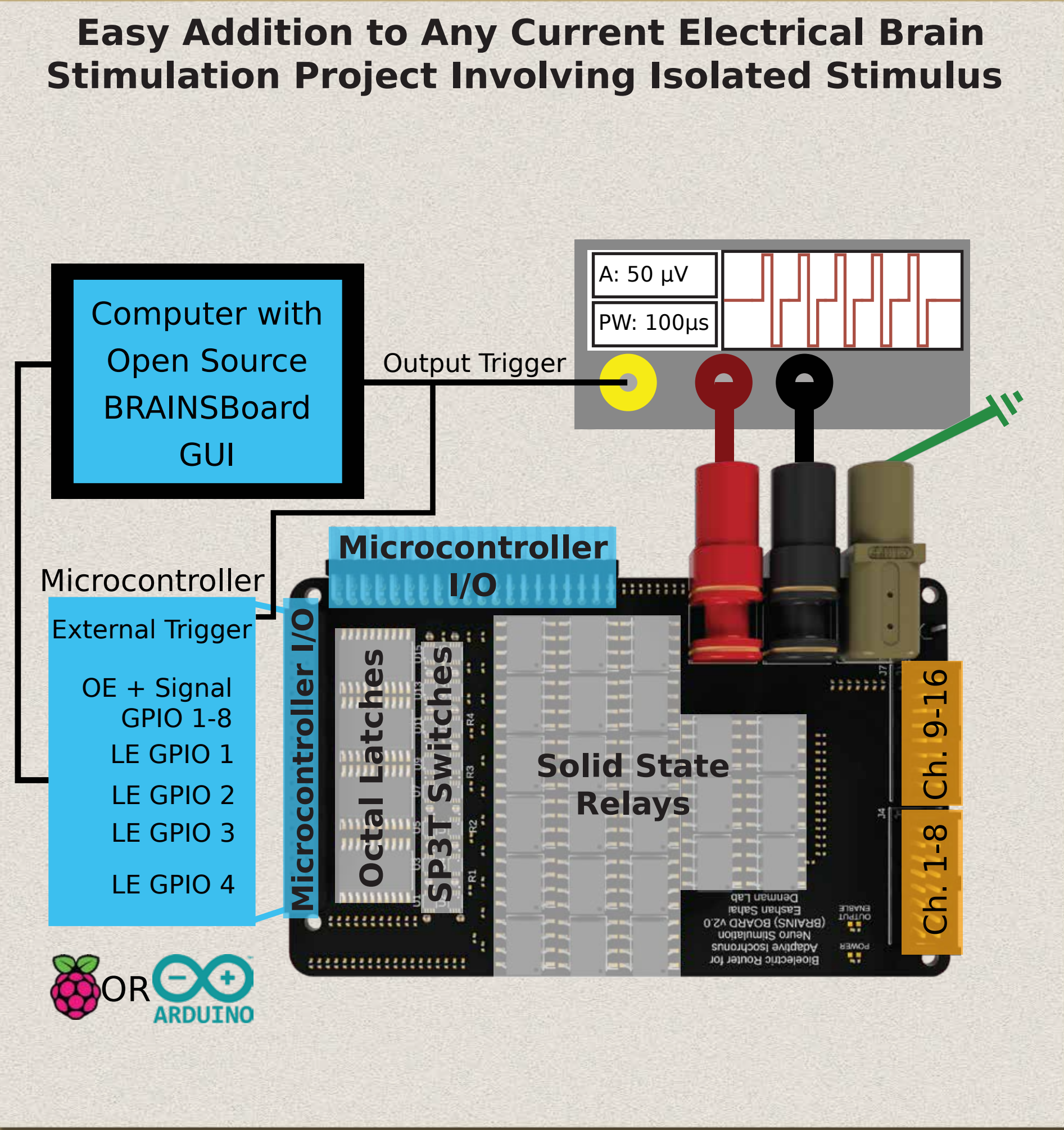
Supported by: BRAIN Initiative  
NINDS RO1NS120850

Our In-Vivo Project:

PSTR028.02 / G10  
Sat 10/5 PM

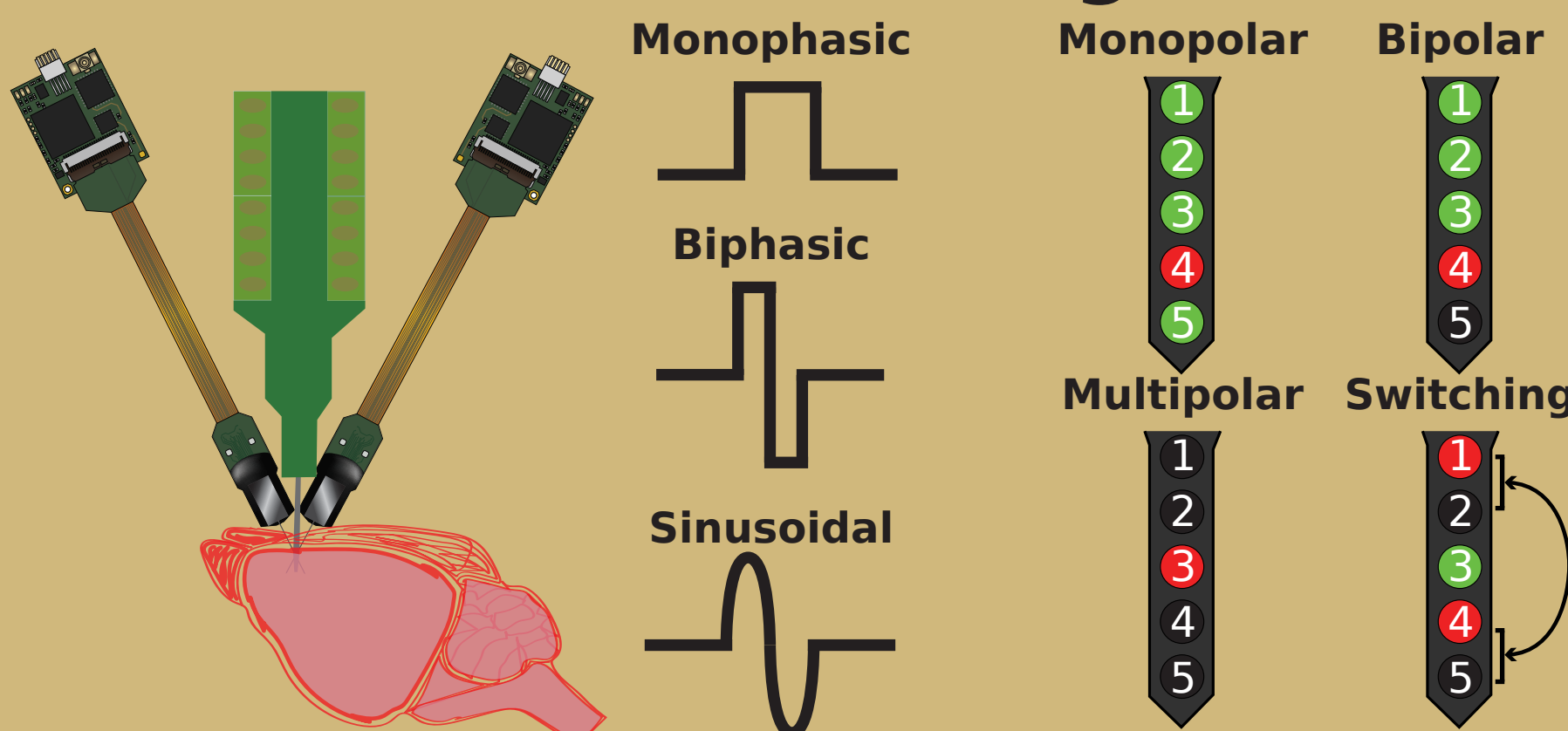


# BRAINSBoard CONCEPT AND SCHEMATIC

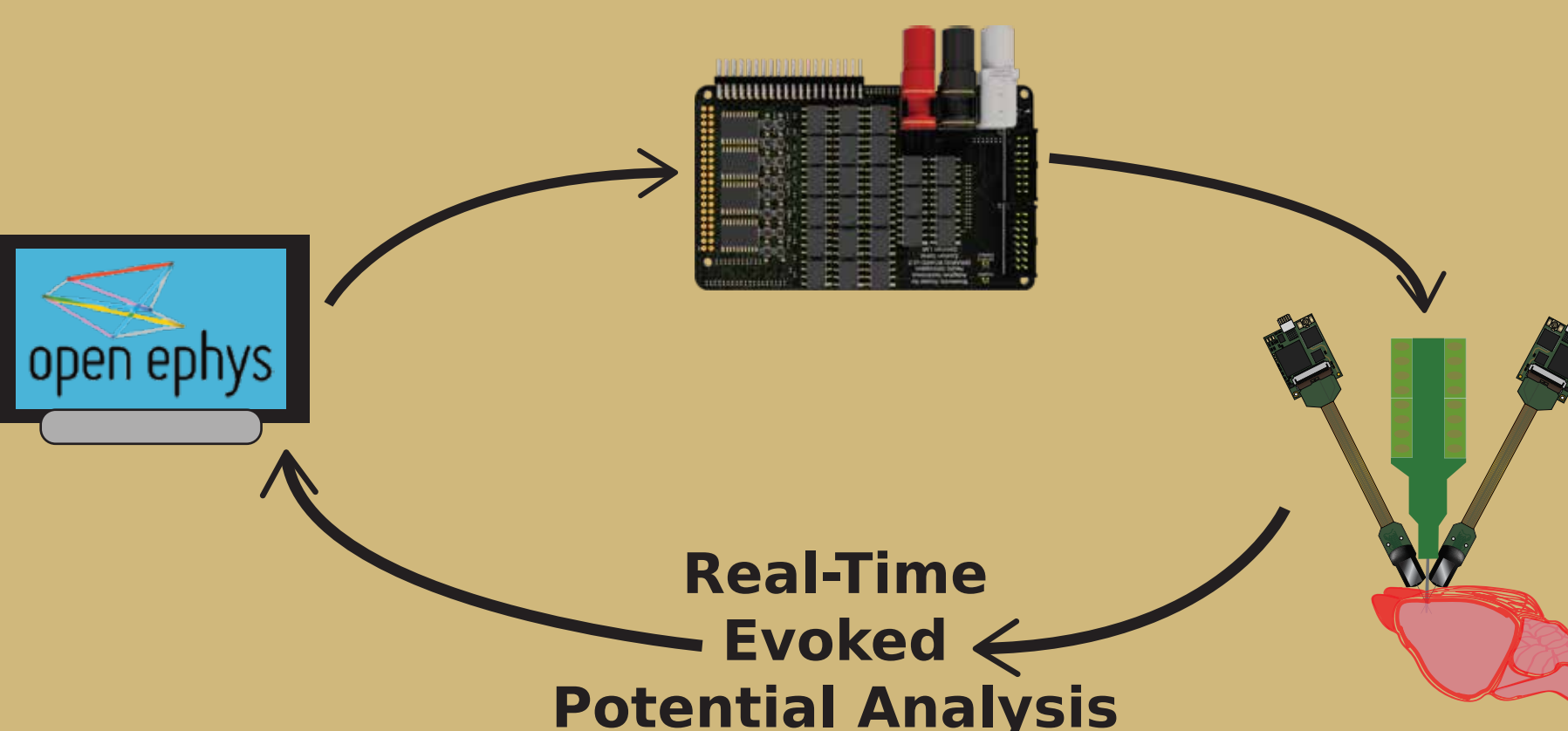


# FUTURE GOALS

## In-Vivo Testing

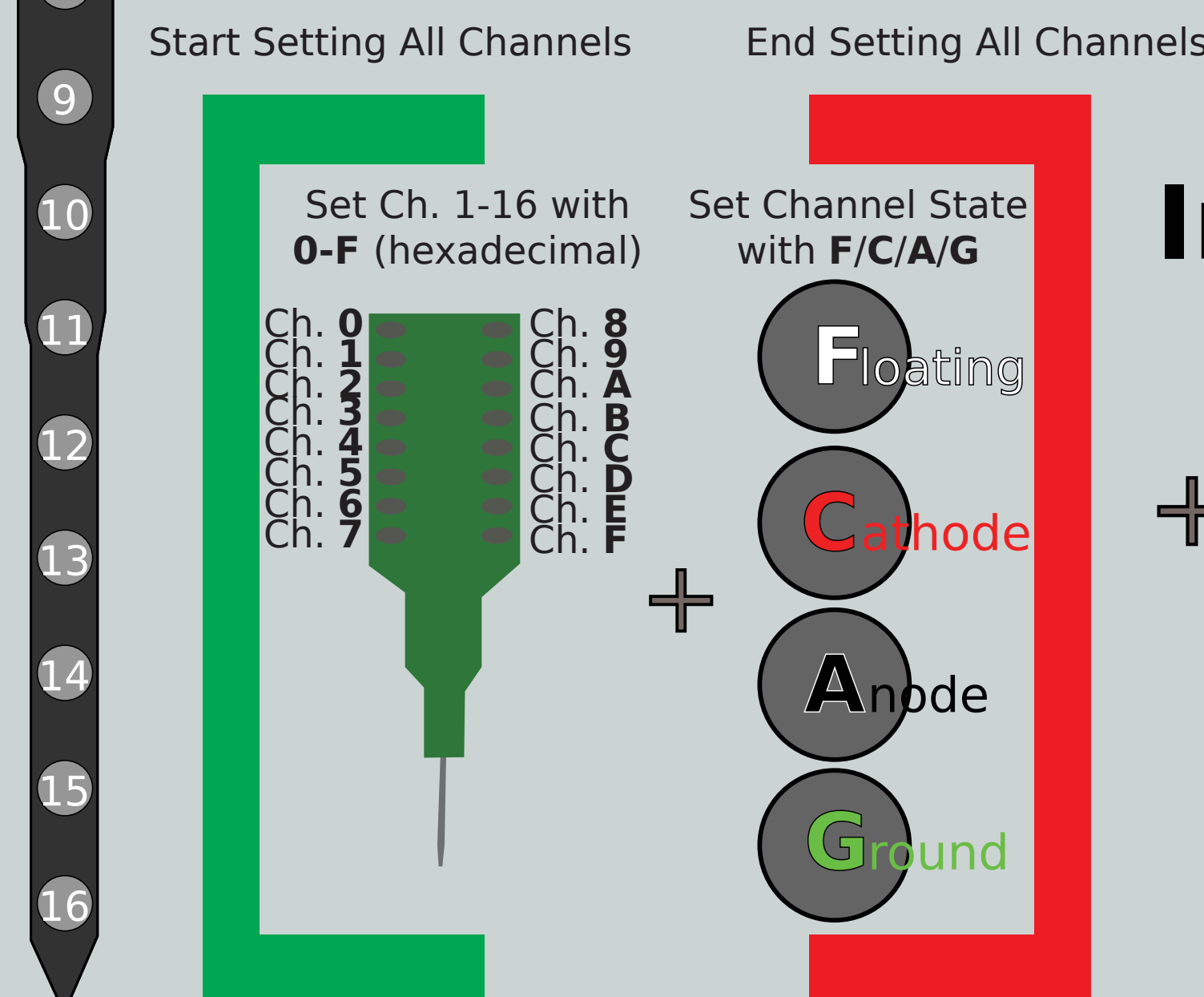


## Progress Towards Closed Loop Stimulation Parameter Testing



# MULTIPLEXED CONTROL SIGNAL

Output Enabled Pin #	Latch Enable Pin #1	Latch Enable Pin #2	Latch Enable Pin #3	Latch Enable Pin #4	Outputted Signal Per Channel
Sig. In 1	1	5	9	13	Low + High
Sig. In 2	2	6	10	14	Low + High
Sig. In 3	3	7	11	15	Low + High
Sig. In 4	4	8	12	16	Low + High
Sig. In 5					Low + High
Sig. In 6					Low + High
Sig. In 7					Low + High
Sig. In 8					Low + High



## Compatibility:

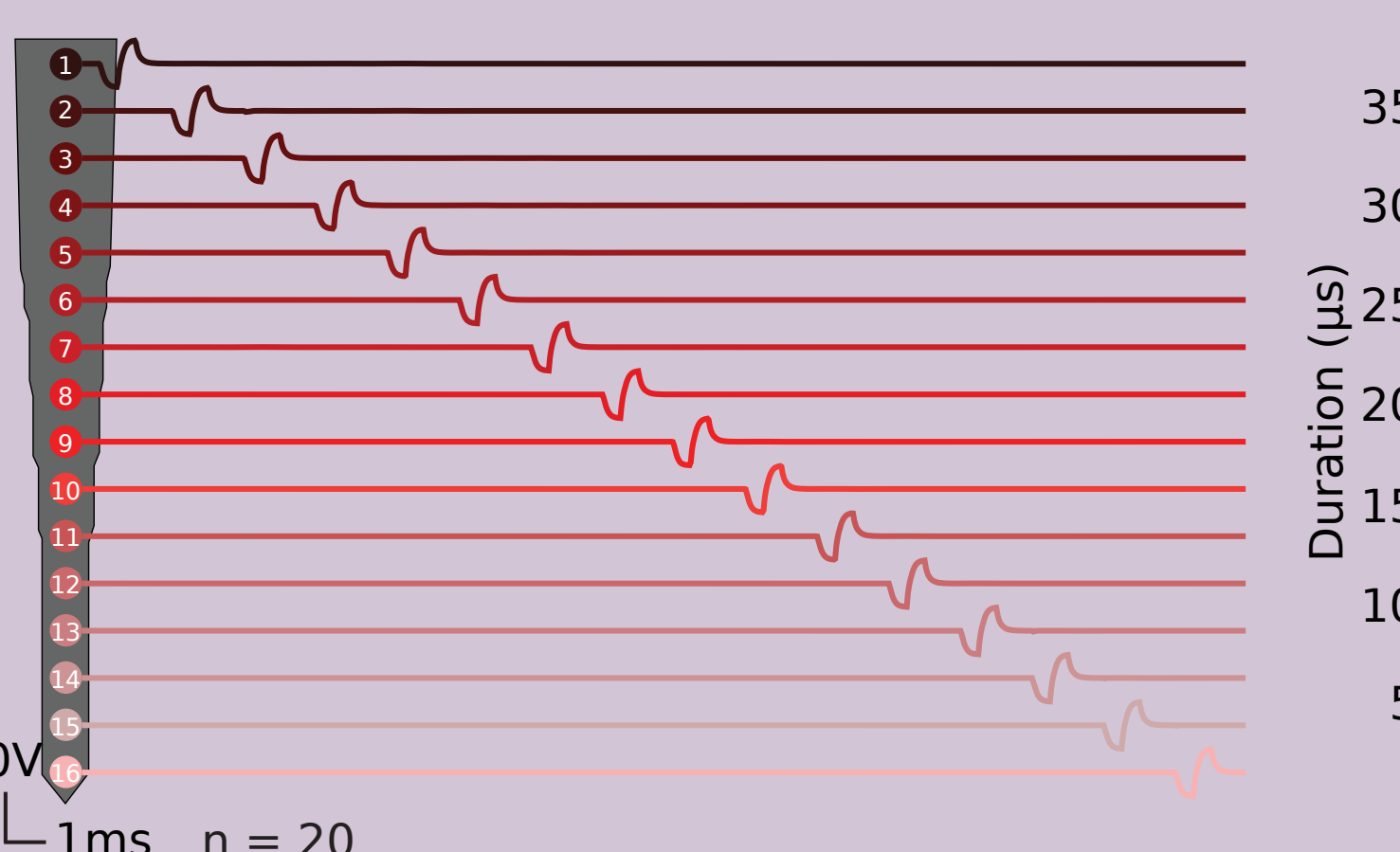


## Future Integration: open ephys

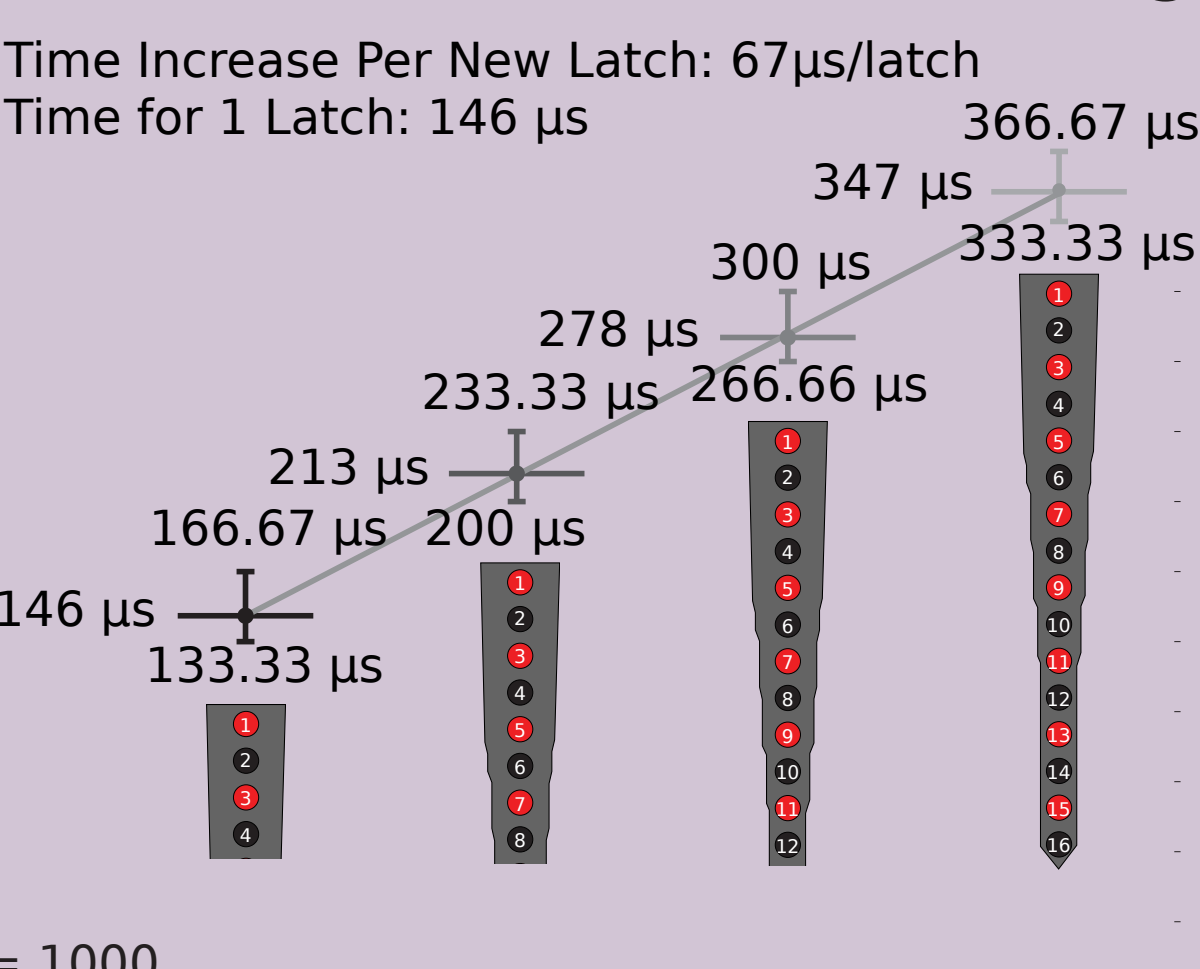
x - delay: wait for external trigger  
+ {time}{units} - delay: integer time then u for  $\mu$ s, m for ms, and s for seconds  
I{count} - loop: if no count given then infinite, otherwise will loop for count number

# RAPID SWITCHING

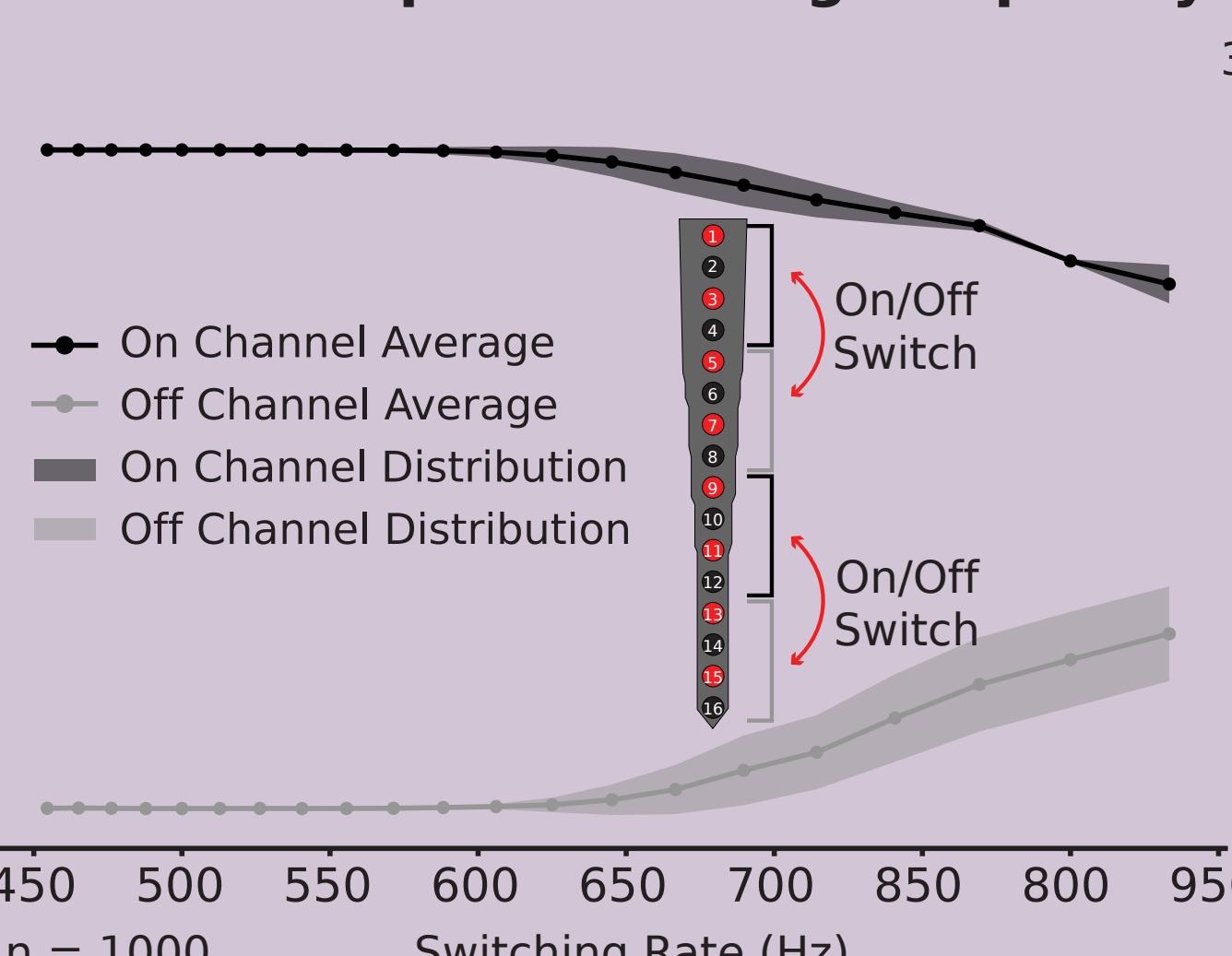
## Multichannel Monopolar Cathode Leading 500 $\mu$ s Biphasic Rapid Switching at 500 Hz



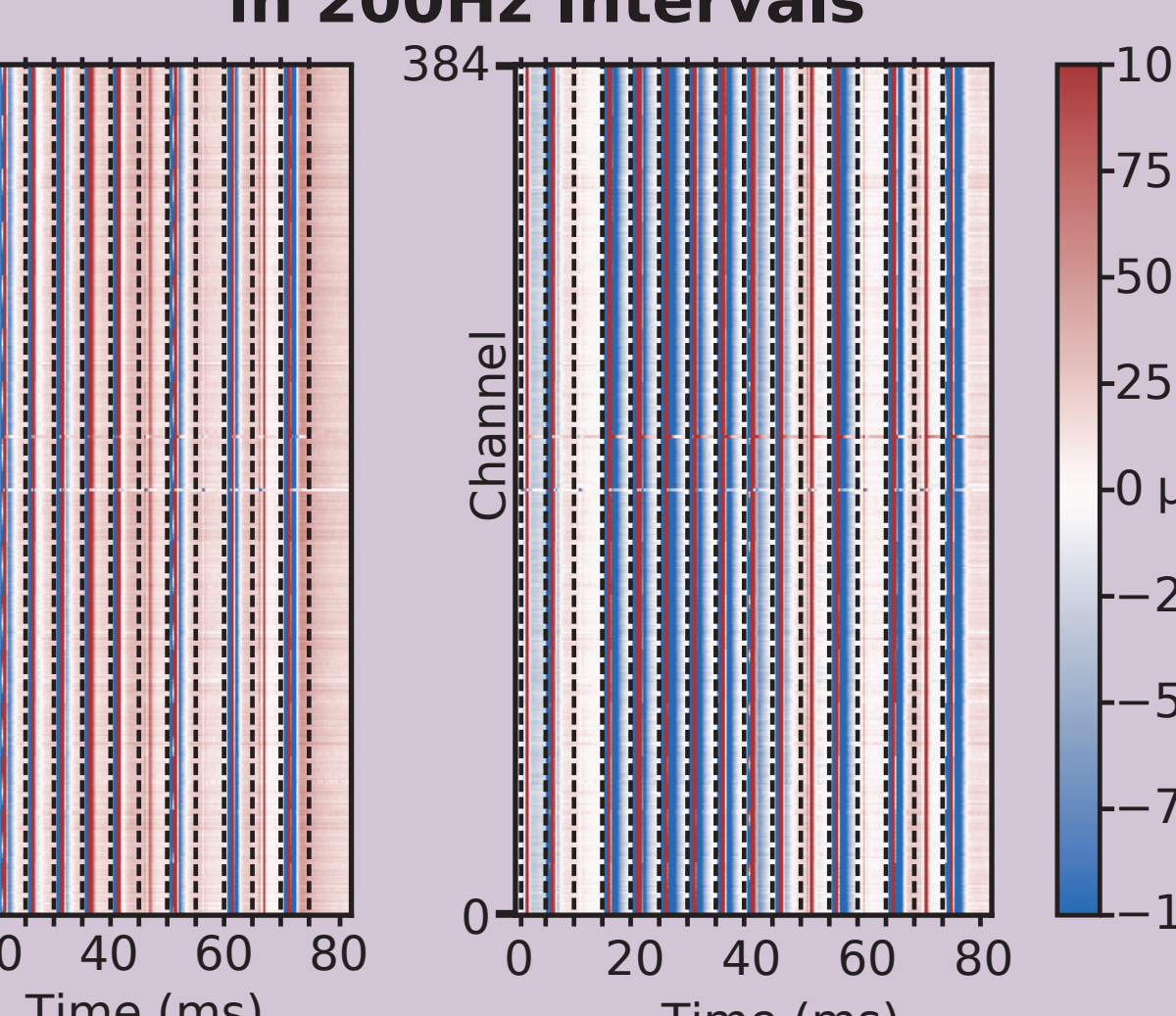
## Octal Latch and SP3T Delay With Arduino When Channel Switching



## Current Leakage to Inactive Channels Based on Rapid Switching Frequency



## Rapid Switching Heatmap With Neuropixel Recording In Saline in 200Hz Intervals



# OUTPUT ISOLATION

