

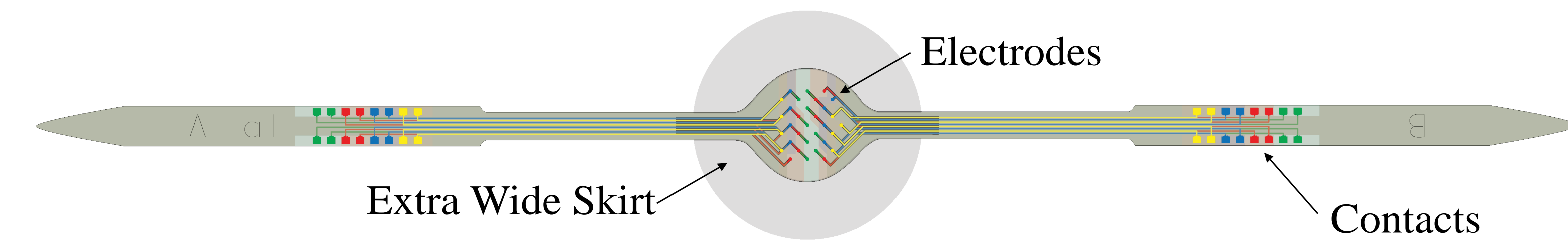
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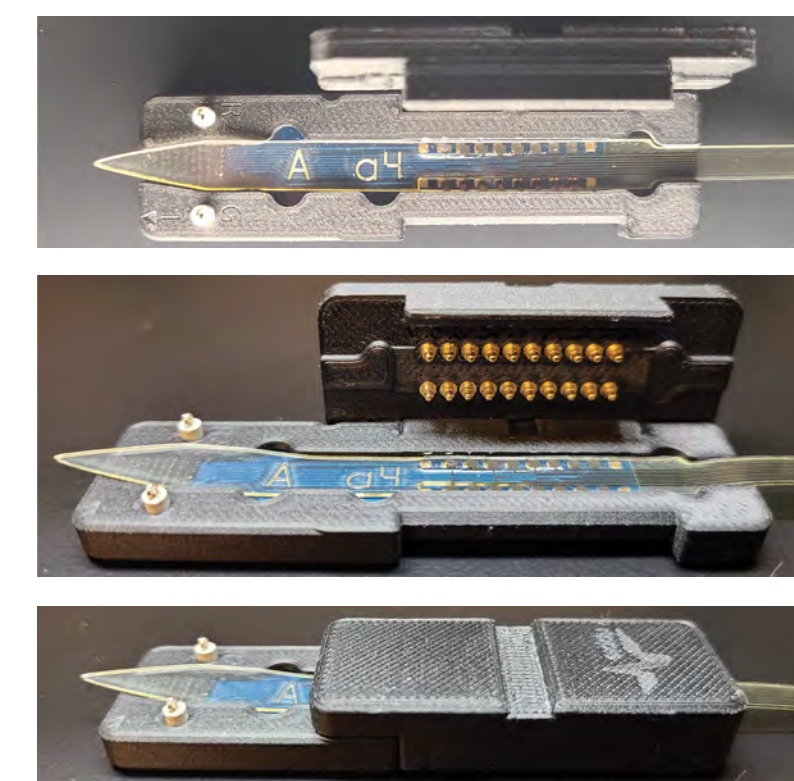
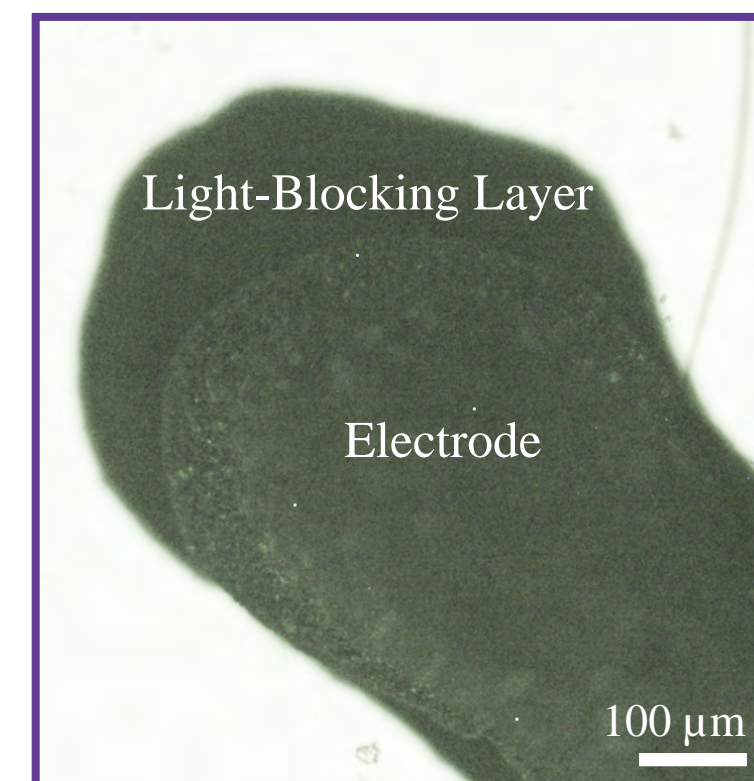
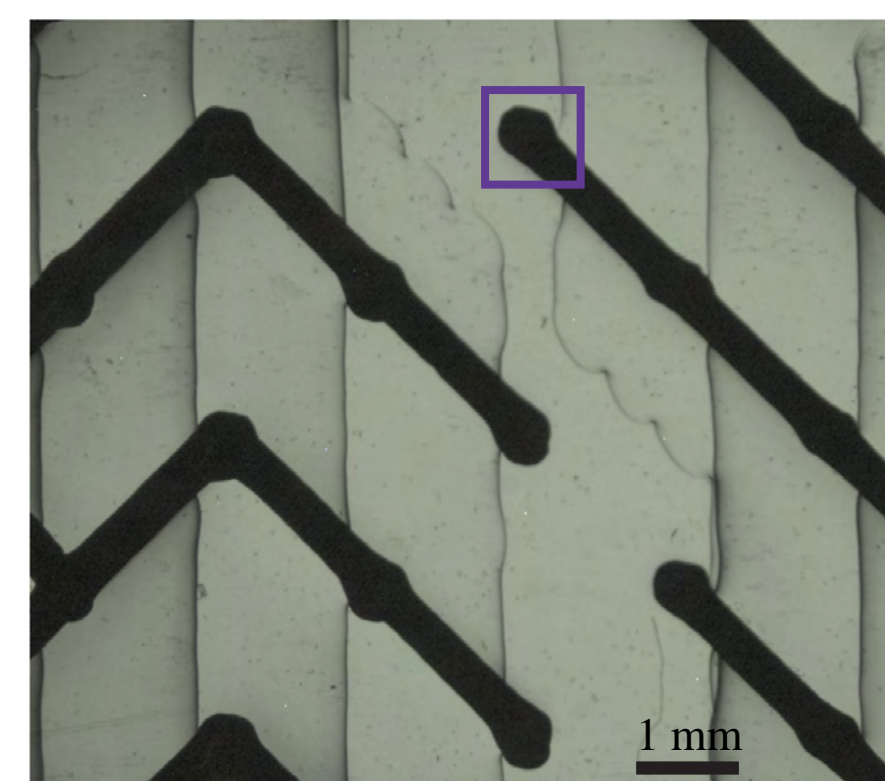
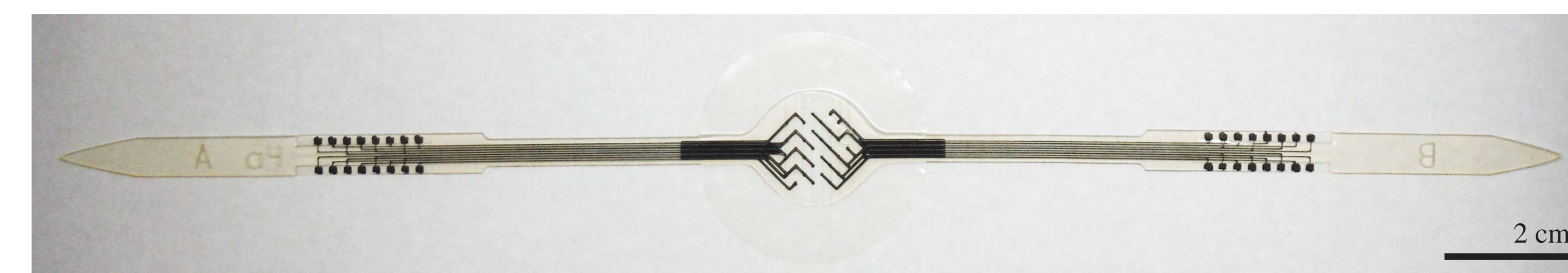
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Abstract -- Optogenetics is a powerful neuroscientific tool which allows neurons to be modulated by optical stimulation. Despite widespread optogenetic experimentation in small animal models, optogenetics in non-human primates (NHPs) remains a niche field, particularly at the large scales necessary for multi-regional neural research. We previously published a large-scale, chronic optogenetic cortical interface for NHPs which was successful but came with a number of limitations. In this work, we present an optimized interface which improves upon the stability and scale of our previous interface while using more easily replicable methods to increase our system's availability to the scientific community. Specifically, we (1) demonstrate the long-term (~3 months) optical access to the brain achievable using a commercially-available transparent artificial dura with embedded electrodes, (2) showcase large-scale optogenetic expression achievable with simplified (magnetic resonance-free) surgical techniques, and (3) effectively modulated the expressing areas at large scales (~1 cm²) by light emitting diode (LED) arrays assembled in-house.

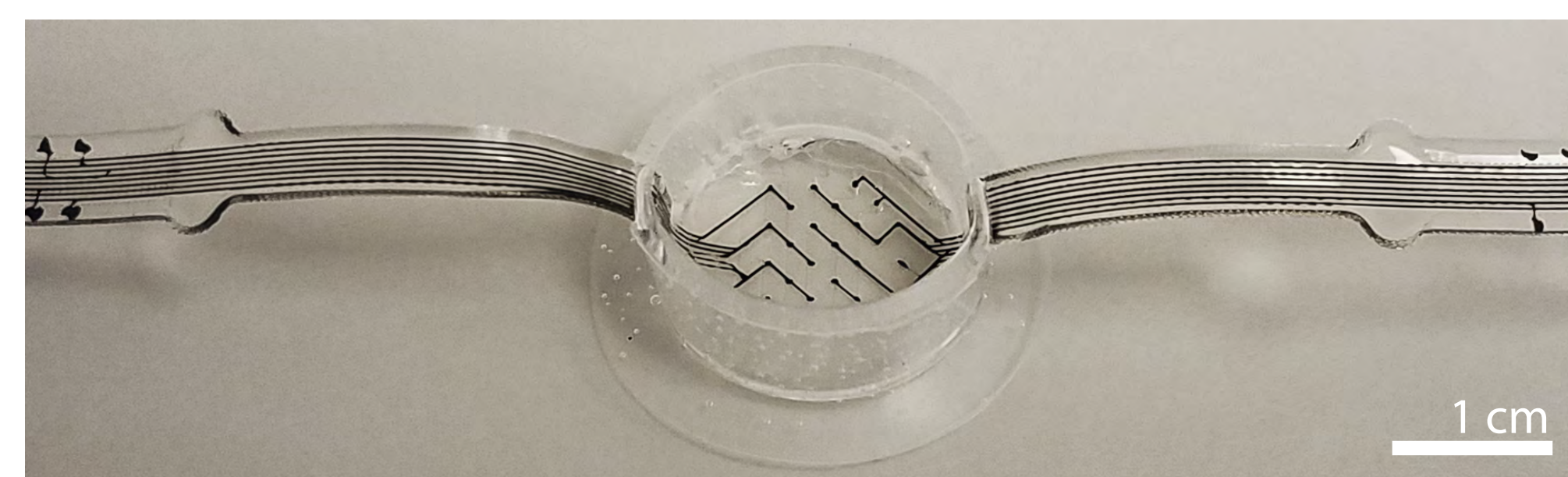
Multi-Modal Artificial Dura (MMAD)



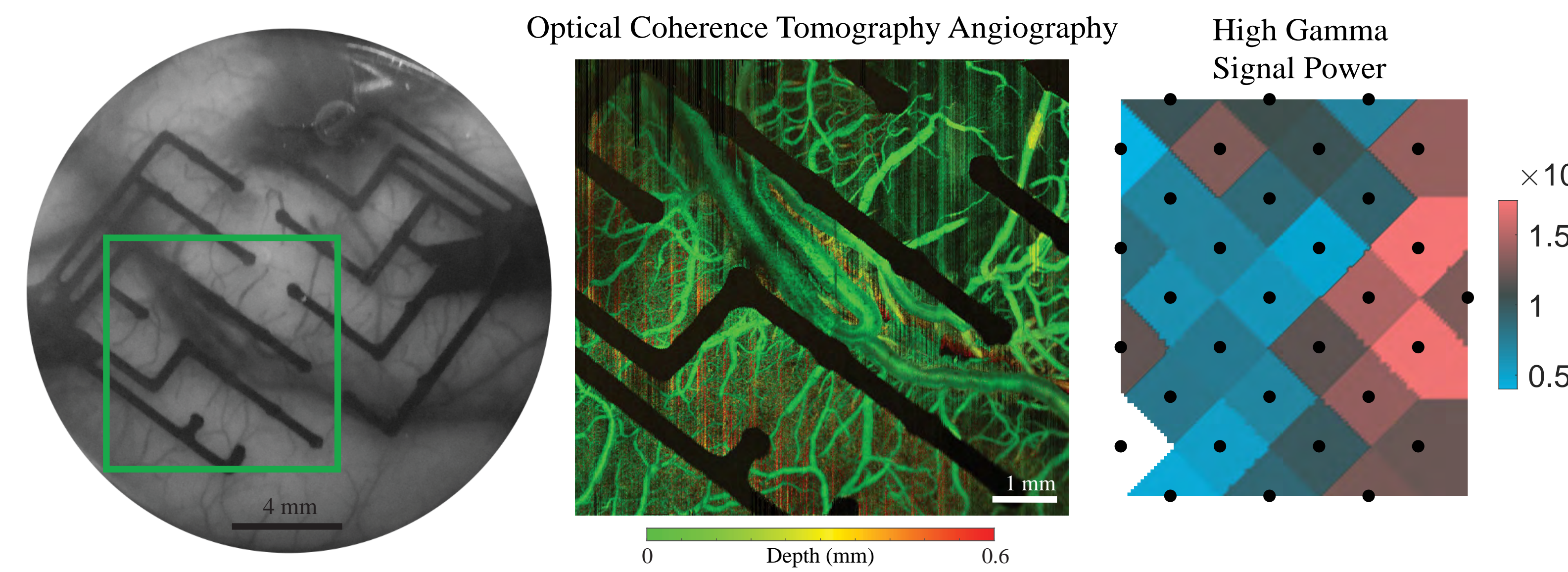
MMAD printed with interleaved conductive and non-conductive (transparent) layers



MMAD molded into classic “top hat” shaped silicone artificial dura



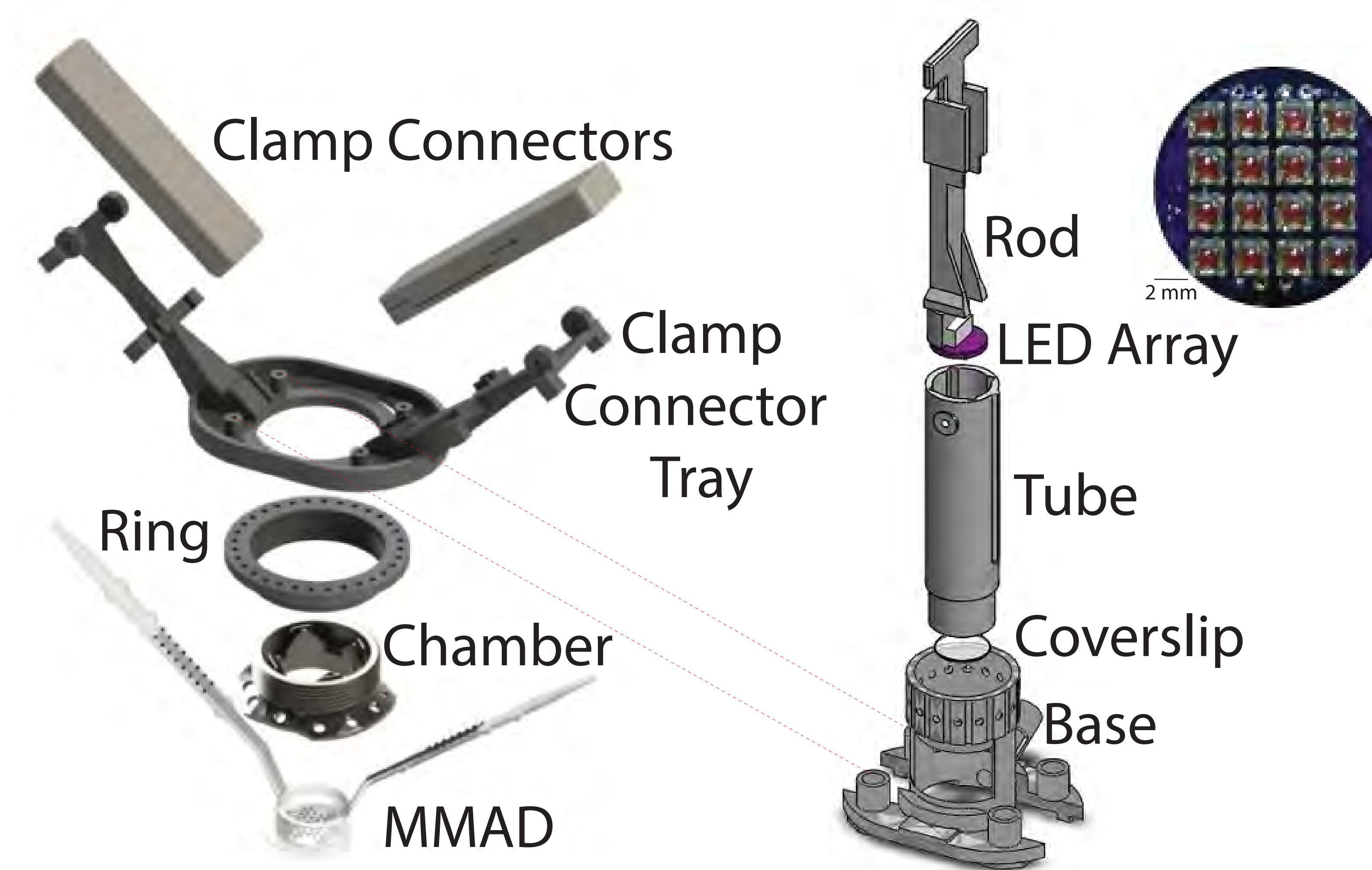
Acute Validation of MMAD



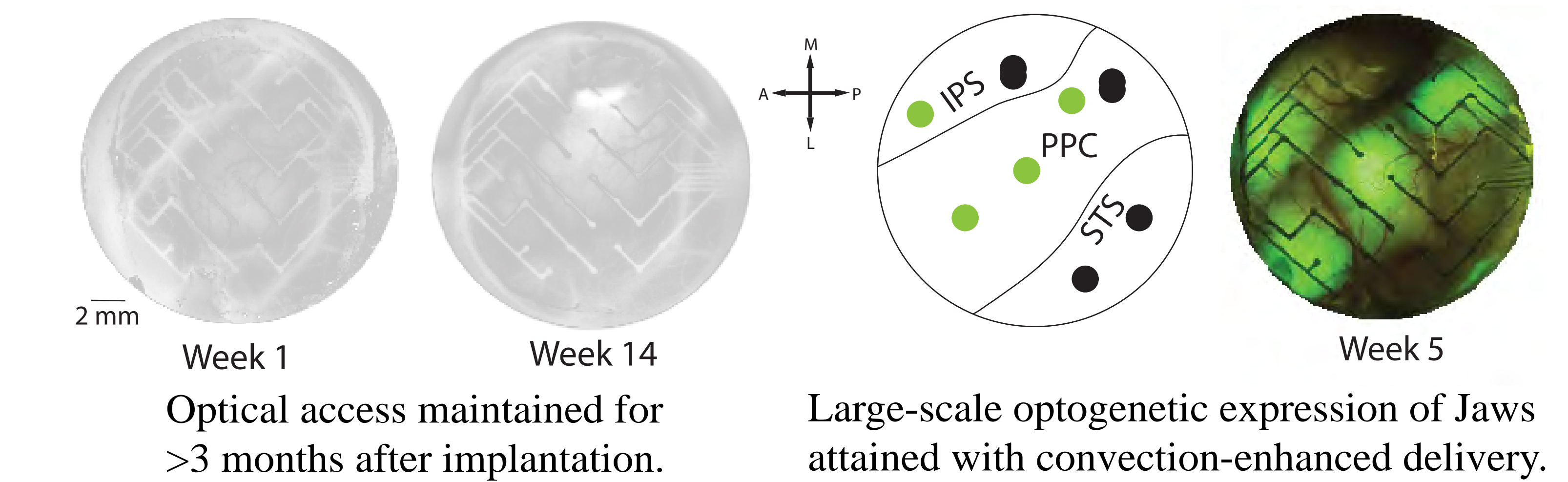
Chamber and Stack-up



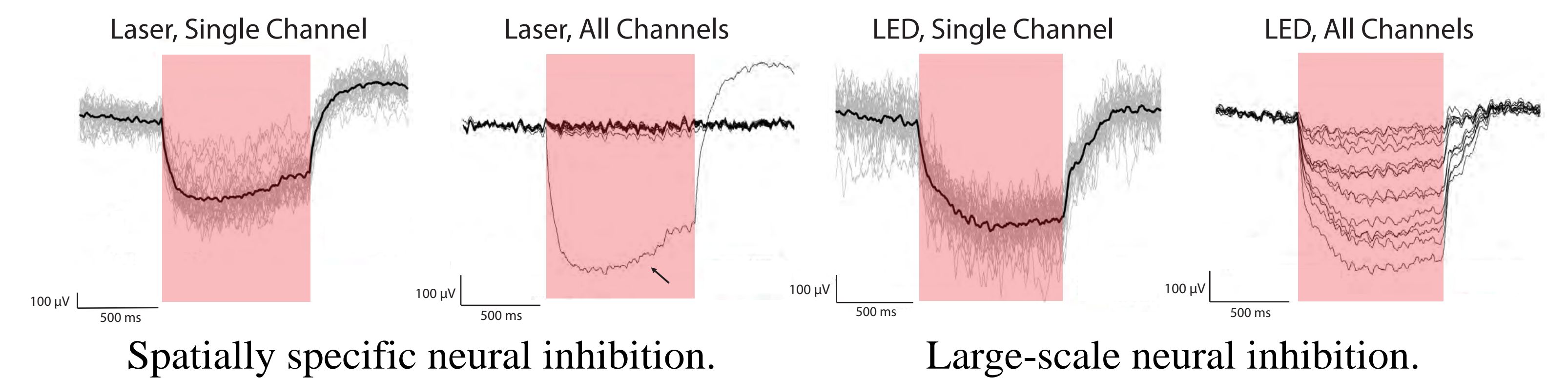
A **model skull** based on MRI data was used to design a **chamber** custom-fitted to the skull.



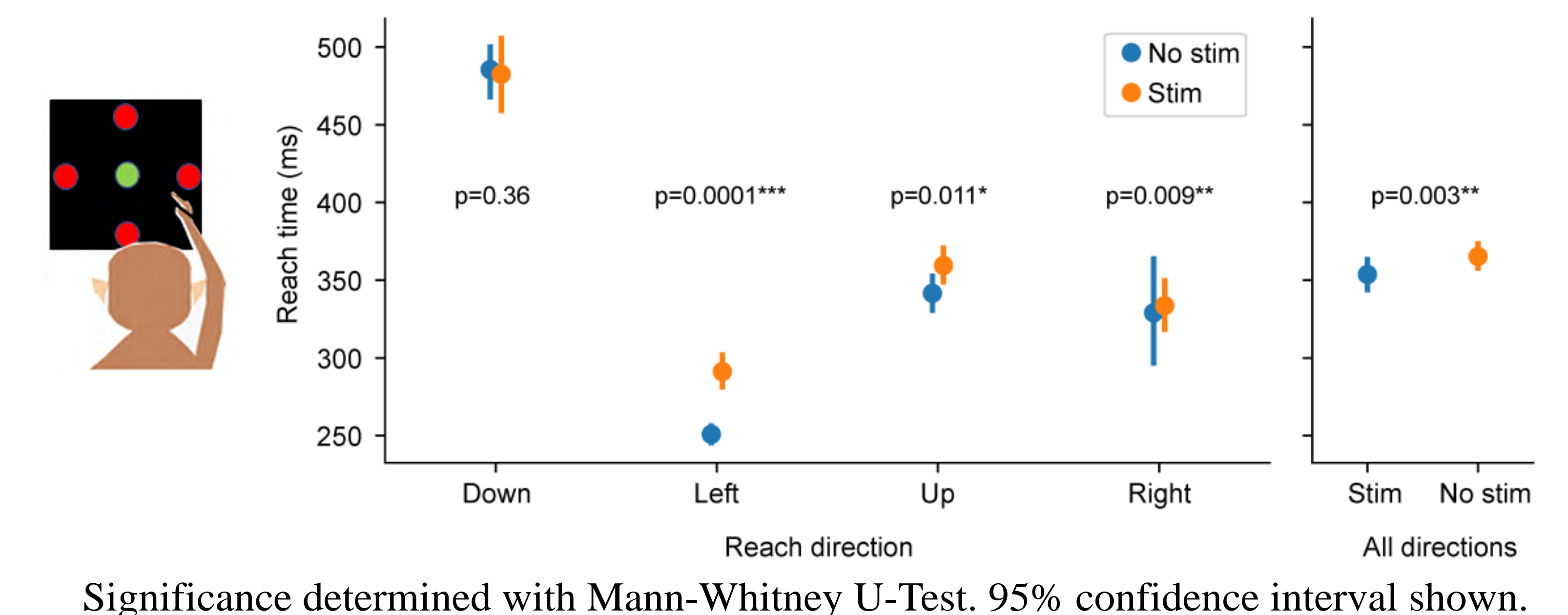
Large-Scale Optical Access and Optogenetic Expression



Optical Stimulation



Optical Stimulation-Evoked Behavioral Response



Griggs et al., *J. Neural Eng.*, 2021
Griggs et al., *SPIE*, 2019
Griggs et al., *EMBC*, submitted
Griggs et al., unpublished

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