





Using an active phase cancellation and multipair design for in-vivo focal temporal interference electrical brain stimulation

Towards focal non-invasive electrical brain stimulation

Conference Poster

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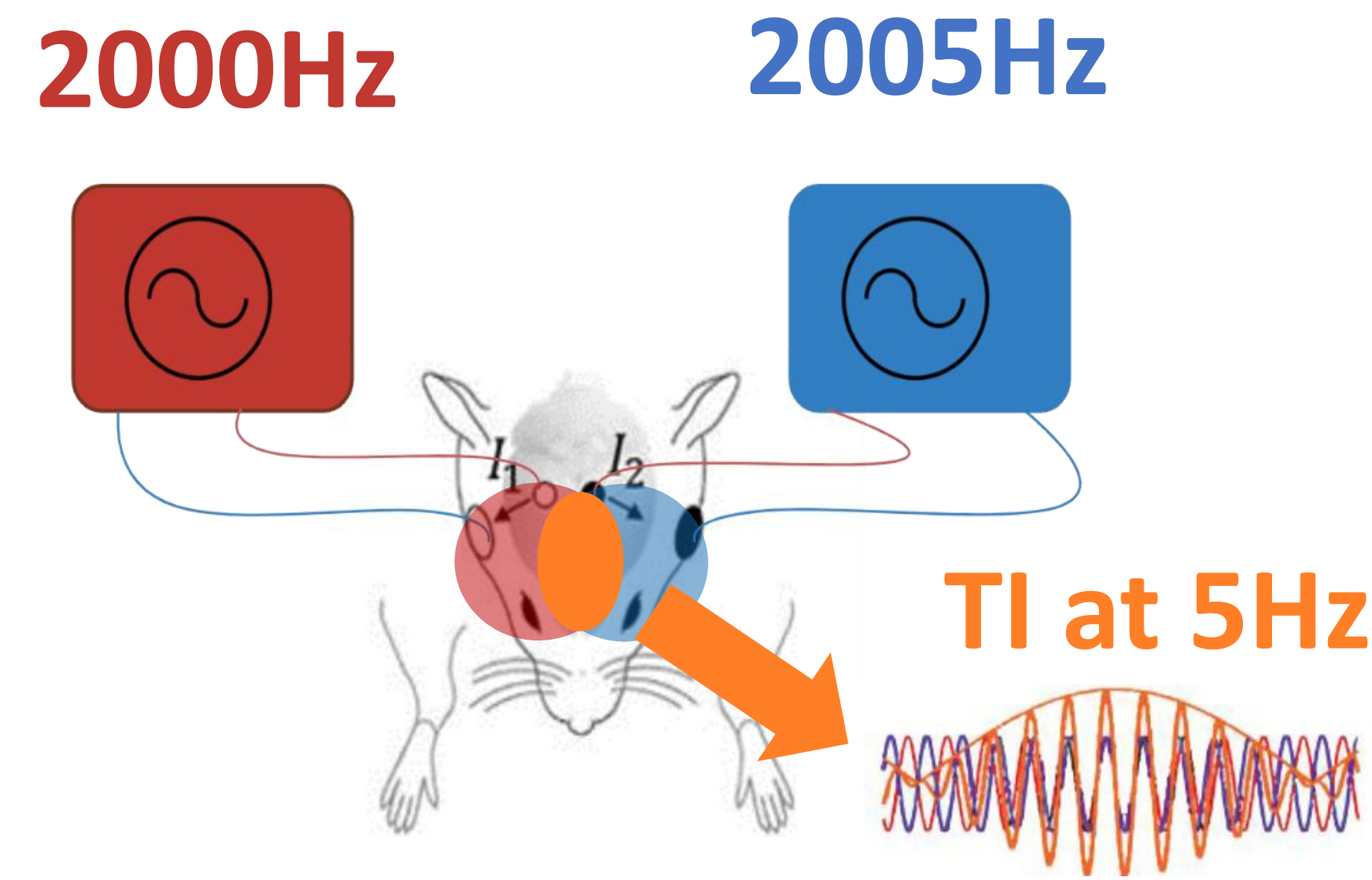
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Using an active phase cancellation and multipair design for *in-vivo* focal temporal interference electrical brain stimulation

Temporal Interference (TI) is a neurostimulation technique relying on the interference between two electrical fields (e.g. 2000 and 2005Hz) and permitting a non-invasive stimulation of deep brain structures. Infralimbic cortex (IL) is a deep cortical structure implicated in reward-based decision making and functionally resembling ventro-medial prefrontal cortex (vmPFC) in humans. In the current project we used TI to stimulate IL and suggested to use additional cancellation fields to increase the focality.



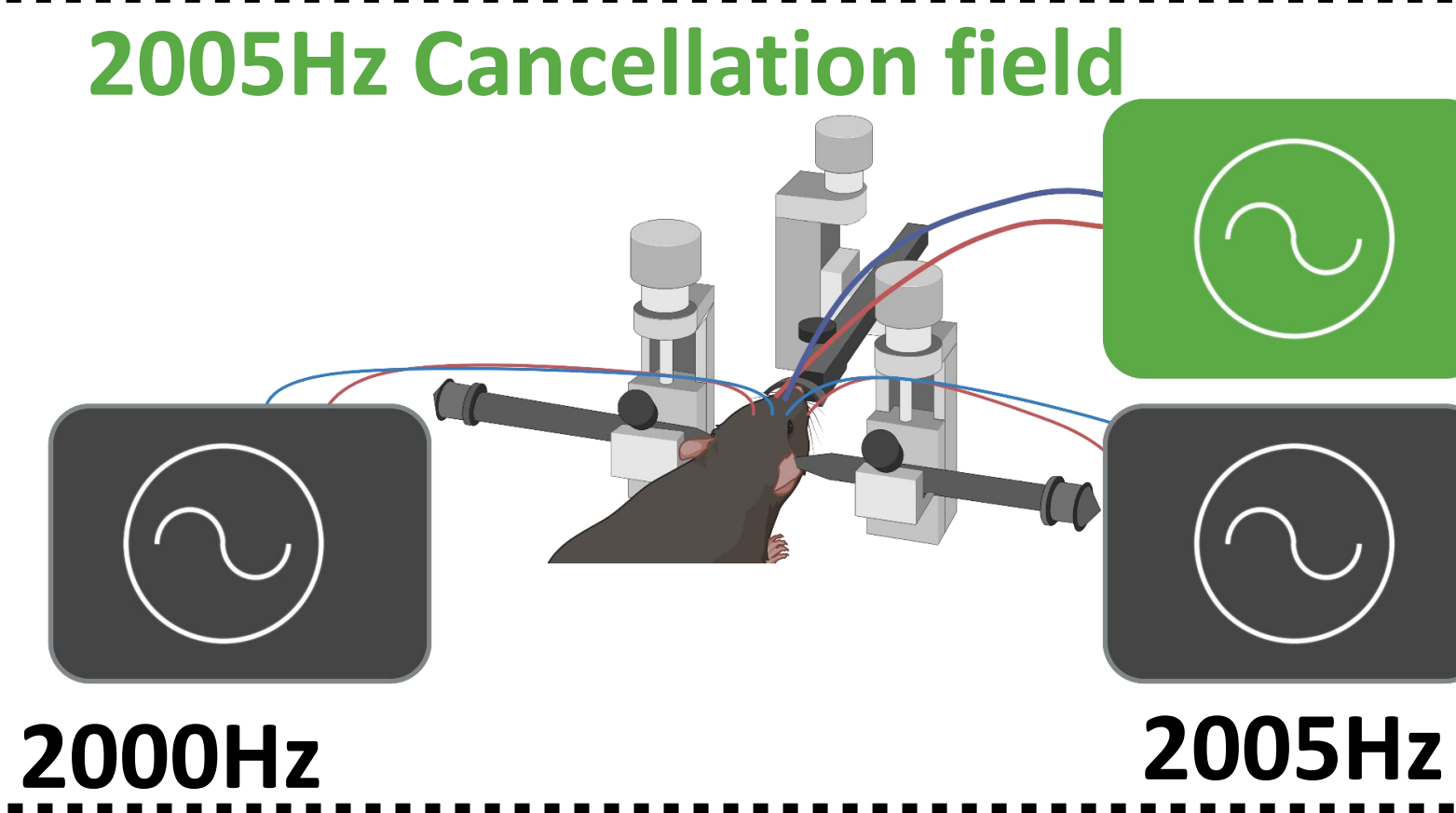
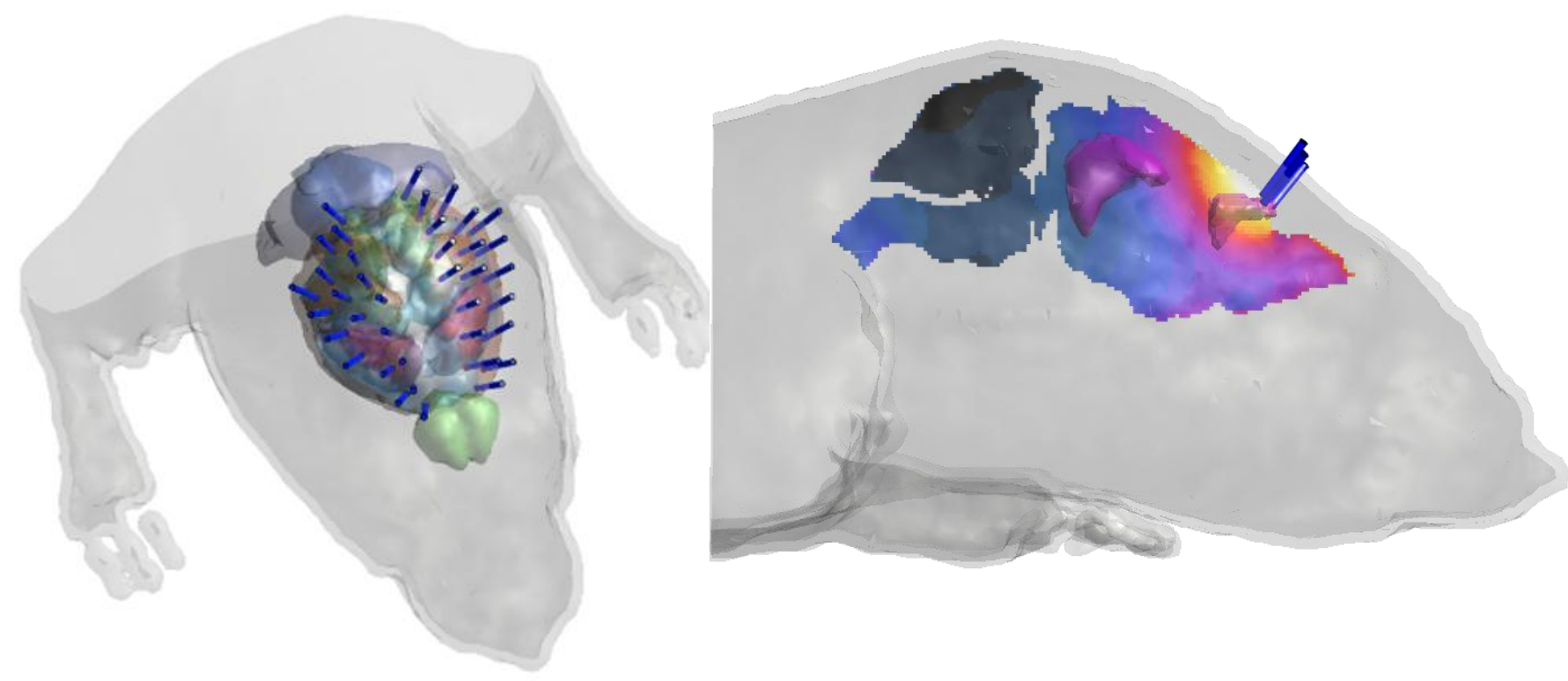
Methods

Question

Location of the stimulation electrodes

Spreading of the electrical field

Whole-brain physiological response to TI



Method

Computational modelling

In-vivo Local Field Potentials (LFP)

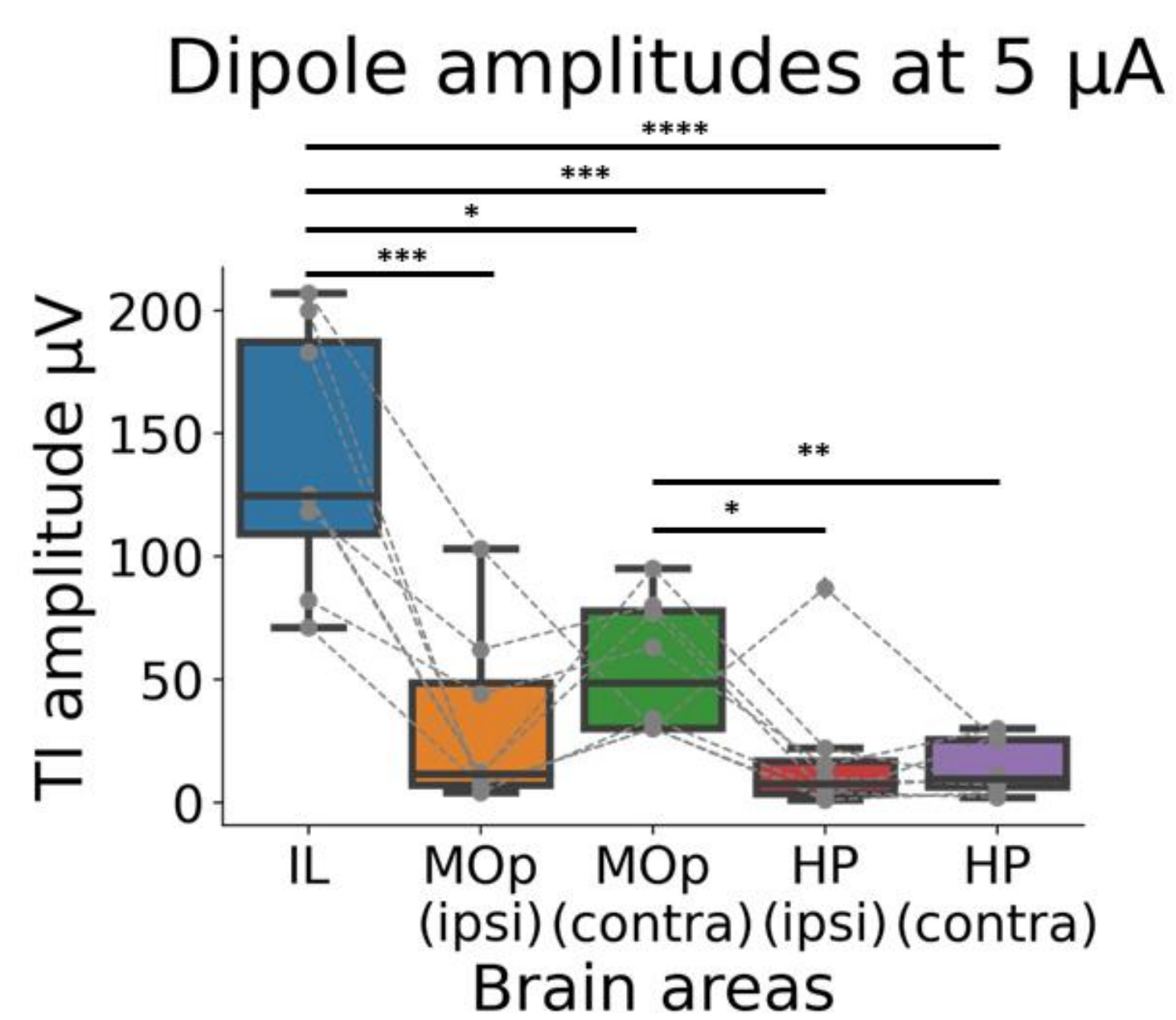
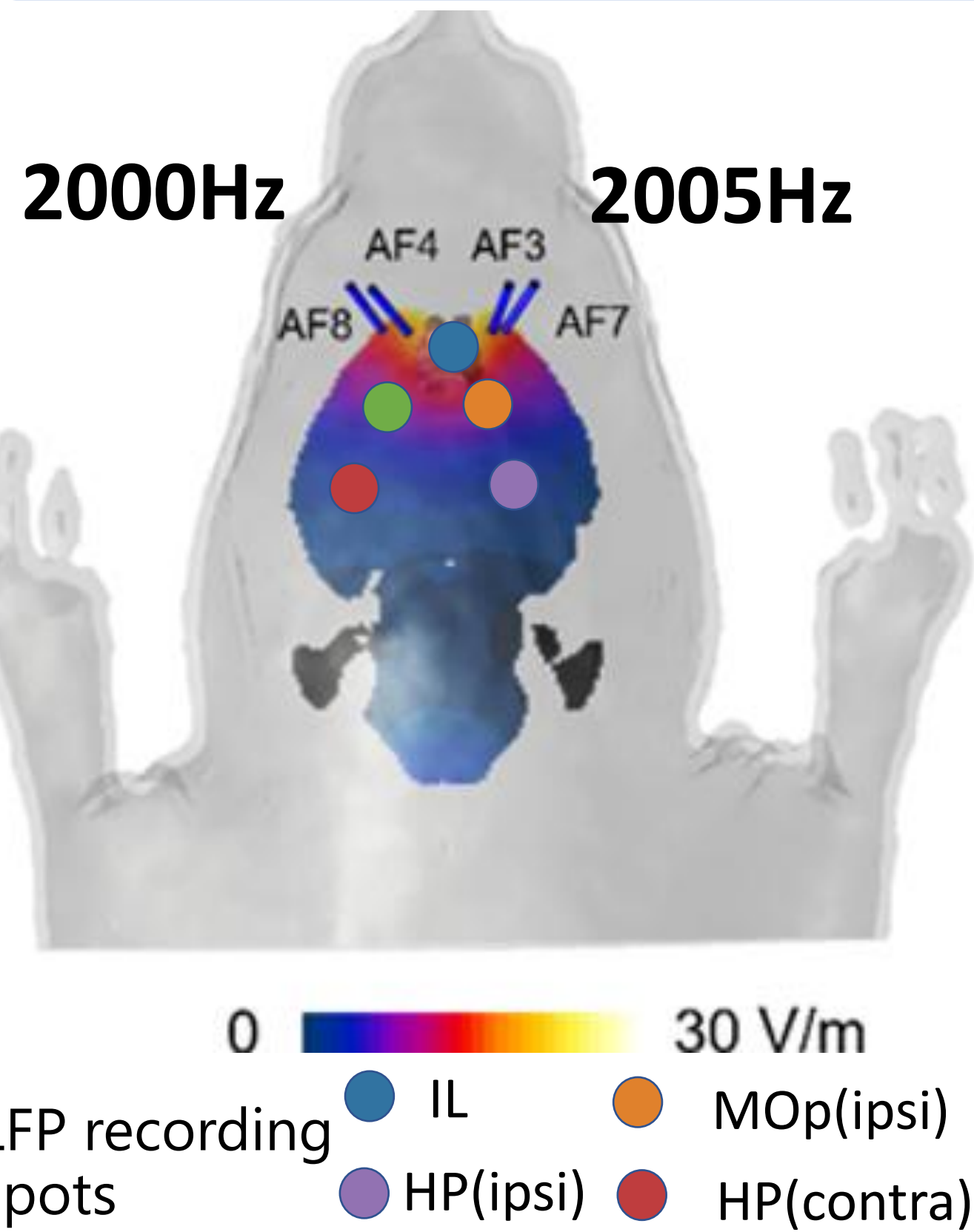
Functional Magnetic Resonance Imaging (fMRI)

Results

1. Conventional two-fields TI (i.e. dipole) causes off-target stimulations.

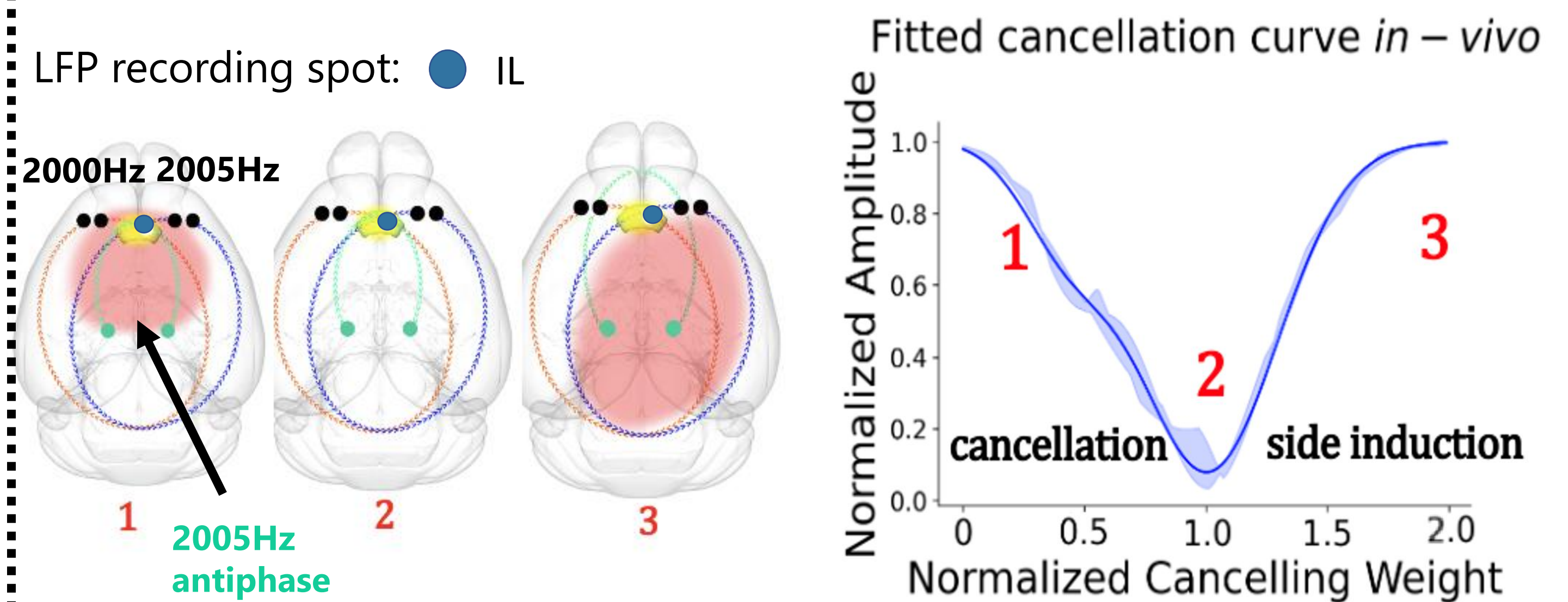
1.1 *In-silico*, Dipole TI (1000µA)

1.2 *In-vivo*, Dipole TI (5µA)+LFP

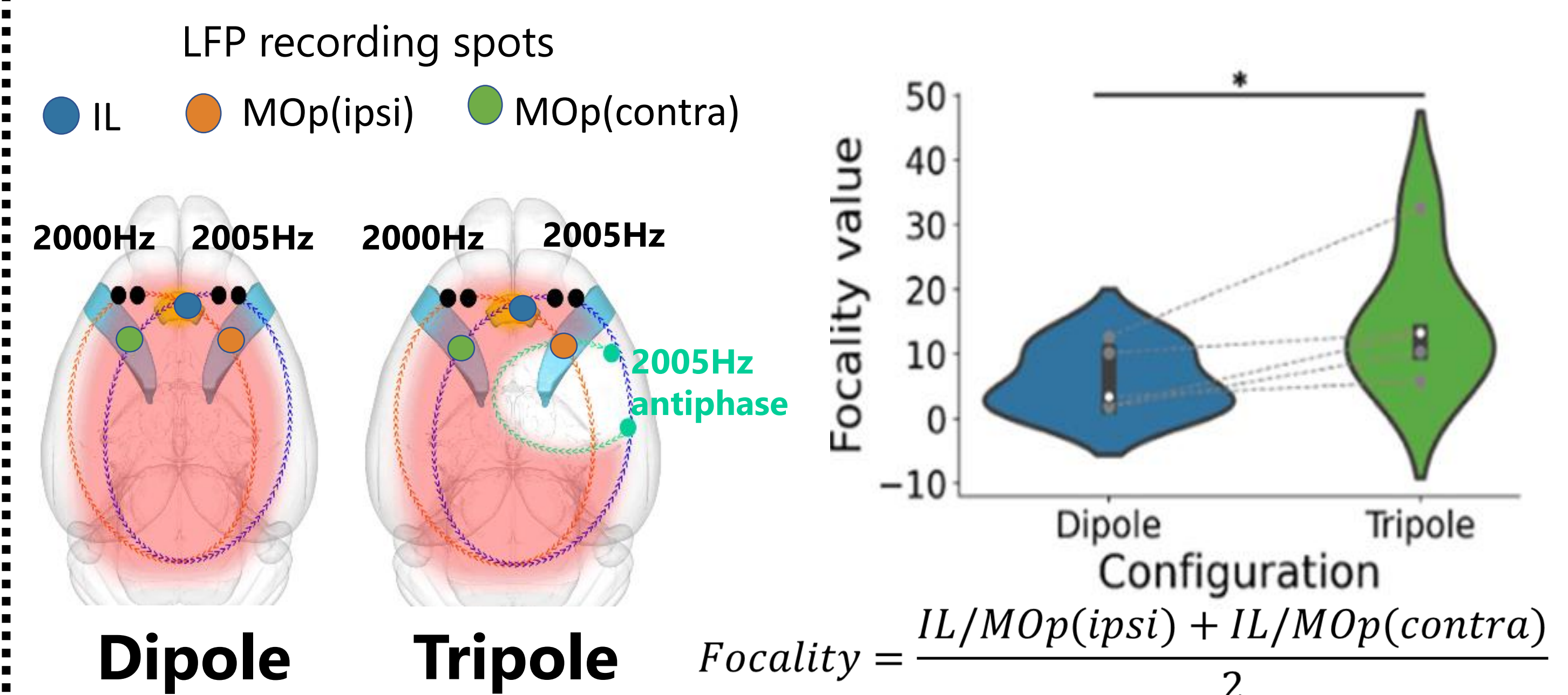


2. An additional phase-shifted cancellation field can be used to diminish off-target stimulations.

2.1 *In-vivo*, Dipole (5µA) + front cancelling + LFP



2.2 *In-vivo*, Dipole (5µA) + side cancelling + LFP



z-scores

3.9
2.3
1.3 *In-vivo*, Dipole TI (700µA) + fMRI
Stim(2000 & 2005Hz) – Sham (2000 & 2000Hz) contrast

