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POSTER PRESENTATION

Modeling the LFP footprint of unitary thalamic inputs to sensory cortex

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The depth-resolved synaptic local-field potential (LFP) footprint in sensory cortex following firing in individual thalamic projection neurons can be accurately measured by averaging cortical multielectrode (ME) LFP signals over thousands of spontaneous thalamic firing events [1,2]. This spike-triggered LFP method offers a unique window into the thalamocortical connection. However, the interpretation of the detailed spatiotemporal profile of this LFP footprint is not trivial as the LFP signal reflects a weighted sum over contributions from all dendritic transmembrane currents located in the vicinity of the recording electrode [3]. We here present results from a biophysically detailed computational study of this LFP footprint, focusing on the thalamocortical LFP response in layer 4 of rodent barrel cortex [1]. As illustrated in Fig. 1, the model considers large populations of synaptically activated RS (regular spiking cells) and/or FS (fast-spiking cells) (Fig. 1AB). The computational model, implemented in Python with NEURON, is constrained to predict plausible intracellular EPSCs [4] (Fig. 1C) and EPSPs (Fig. 1D). The model not only predicts the LFP (Fig. 1E), but also the ground-truth CSD

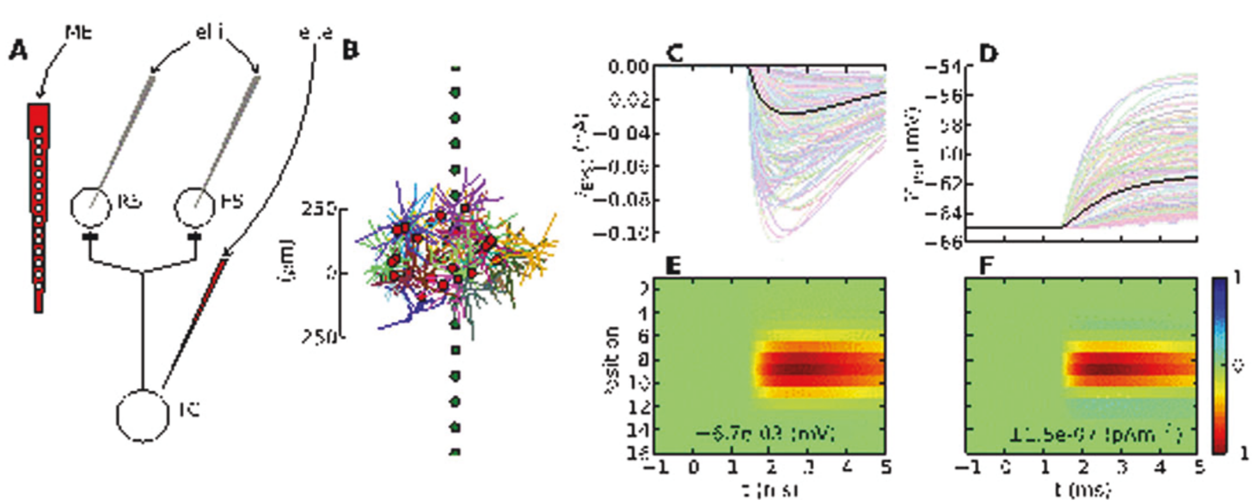

Figure 1 Model overview. **A.** Schematic of recording of unitary thalamic projection pattern to layer 4 with thalamic single-unit electrode (el.e), cortical clamp electrodes (el.i) and cortical multielectrode (ME) [1,2,4]. **B.** Example model population of reconstructed RS cells with ME penetrating population. **C.** EPSCs of model population, black line: average EPSC. **D.** EPSPs of model population, black line: average EPSP. **E.** ME LFP response **F.** 'Ground truth' CSD.

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(current source-density) (Fig. 1F) that can be used to test CSD estimation methods [5]. Candidate models mimicking experimental findings [1,2] will be presented.

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