

Poster presentation

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## Model of synaptic transmission in the calyx of Held

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The calyx of Held is a giant synaptic terminal in the MNTB of the auditory brainstem. Observations of postsynaptic responses to repeated stimulation reveal that this synapse exhibits complex behavior, which results from the interplay between processes such as vesicle pool depletion, activity-dependent recovery from depletion, synaptic facilitation and postsynaptic receptor desensitization. Intracellular calcium concentration ( $[Ca^{2+}]$ ) plays an important role in the neurotransmitter release and the regulation of short-term plasticity [1]. We build a detailed computational model of the synaptic transmission at the calyx, which captures all the above mentioned processes and includes the dynamics of calcium and its influence on the parameters of synaptic dynamics. The model is based on electrophysiological data obtained by patch clamp recordings from postsynaptic MNTB cells in rat brainstem slices. Calcium dynamics and the functional dependences of synaptic parameters on  $[Ca^{2+}]$  are modeled based on previously published data [2]. Stimulating the synapse at different frequencies (from 0.2 to 200 Hz) and using pharmacological manipulations, we were able to separate contributions of different processes and determine the parameters of synaptic dynamics, which fit experimental data. We compare the fit with the previous phenomenological model [3], which does not include explicit dynamics of intracellular  $Ca^{2+}$ .

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### References

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