

## Multistability in the Kuramoto model with synaptic plasticity

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We propose a simplified phase model of the neuron dynamics including spike timing-dependent plasticity (STDP) based on experimental data of G.Bi and M.Poo, and we perform its detailed analysis by methods of nonlinear dynamics. We uncover a multistability phenomenon which consists in the co-existence of a fully synchronized, a fully desynchronized and a variety of clustered states of different configurations in a wide region of the parameter space. Dynamically, the synchronized state is given by a unique stable equilibrium, while desynchronized and clustered states correspond to stable periodic, quasiperiodic or chaotic motions. We point out an essential role of asymmetry of the STDP learning rule for the multistability phenomenon, and examine how the co-existence of synchronization and desynchronization depends on the distribution of natural frequencies of the individual oscillators.