DYNAMICS OF A NEURONAL NETWORK WITH INHIBITORY AND ELECTRICAL COUPLING

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ABSTRACT

We consider a model for two mutually coupled pacemaker neurons with both inhibitory and electrical coupling. Each neuron can be viewed as a relaxation oscillator. This network may exhibit a variety of rhythms including synchronous, anti-phase and almost in-phase oscillations. Using geometric dynamical systems methods, we analyze the existence and stability properties of each activity pattern. We further describe how the patterns depend on both intrinsic and synaptic parameters. In particular, we find conditions for when electrical coupling leads to stable antiphase behavior.

Keywords: Electrical Synapses, Inhibitory Synapses, Synchronization.