

Connectivity Induced Synchronization in Cortical Neuronal Cultures

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Synchronization of cortical neural cultures is studied as a function of the effective network connectivity \bar{k} in the phenomenon of synchronized firing (SF). The synchronized bursting frequency f during SF of the networks is found to be much slower than the characteristic time scale of a neuron and is an increasing function of \bar{k} . Although some aspects of the observed SF is similar to the array enhanced synchronization, detailed comparison of measured spike statistics from synchronized and non-synchronized cultures suggests that the nature of synchronization during SF is different from that of the array-enhanced synchronization. Possible mechanisms of SF and the nature of the synchronization are discussed.