**Krupa, Martin**; **Gielen, Stan**; **Gutkin, Boris**

**Adaptation and shunting inhibition leads to pyramidal/interneuron gamma with sparse firing of pyramidal cells.** (English) Zbl 1409.92044

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Summary: Gamma oscillations are a prominent phenomenon related to a number of brain functions. Data show that individual pyramidal neurons can fire at rate below gamma with the population showing clear gamma oscillations and synchrony. In one kind of idealized model of such weak gamma, pyramidal neurons fire in clusters. Here we provide a theory for clustered gamma PING rhythms with strong inhibition and weaker excitation. Our simulations of biophysical models show that the adaptation of pyramidal neurons coupled with their low firing rate leads to cluster formation. A partially analytic study of a canonical model shows that the phase response curves with a near zero flat region, caused by the presence of the slow adaptive current, are the key to the formation of clusters. Furthermore we examine shunting inhibition and show that clusters become robust and generic.

**MSC:**

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gamma oscillations; spike frequency adaptation; clustered oscillations; multiple timer scales; shunting inhibition

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