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Channel noise reduction due to gating charge effects GERHARD SCHMID, IGOR GOYCHUK, PETER HÄNGGI, University of Augsburg, Germany — We investigate the influence of gating charge effects on the channel noise-induced spontaneous spiking activity of excitable membrane patches [1] within a stochastic Hodgkin-Huxley model [2]. The random switching of the channel gates between an open and a closed configuration is always connected with movement of gating charge within the cell membrane. At the beginning of an action potential the gating current is opposite to the direction of the ion current through the membrane. Therefore, the excitability is expected to become reduced due to the influence of gating current. Our study revealed that while the deterministic modelling with gating charge effects does not differ dramatically from the original Hodgkin-Huxley model for the standard set of parameters, the corresponding stochastic model which takes into account the channel noise – i.e. the fluctuations of the number of open ion channels – does behave very differently for intermediate-to-large membrane patch sizes. A main finding is that spontaneous spiking activity becomes drastically reduced [1].

[1] G. Schmid, I. Goychuk, and P. Hänggi, *Phys. Biol.*, in press (2006); (arXiv:abs/q-bio.NC/0611040).

[2] G. Schmid, I. Goychuk, and P. Hänggi, *Europhys. Lett.* **56**, 22 (2001)

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