Voltage-gated ion-channel proteins are key molecules for the generation and propagation of electrical signals in excitable cell membranes [1]. The voltage-dependent switching of these channels between conducting and nonconducting states is a major factor in controlling the transmembrane voltage. A non-extensive or generalized statistical mechanical approach is suggested for the steady-state analysis of the system. A two-state model for the voltage-dependent gating properties of a single channel is developed and the probability of open channels is computed within Tsallis’ entropy [2, 3]. The model is tested with the experimental results for the batrachotoxin-modified sodium channels from a squid optic nerve in planar bilayers, where a deviation occurs from the Boltzmann-Gibbs case [4].

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