

Poster presentation

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Resonance of coefficient of variation induced by rebound currents for stochastic inhibitory inputs

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We study a Hodgkin-Huxley type neuron model describing the firing properties of an endogenously oscillating subthalamic neuron [1] incorporating a low-voltage activated (T-type) calcium current when the cell is affected by random alpha function inhibitory inputs (frequency, λ). The postinhibitory rebound current (parameterized by its maximal conductance, G_T) caused by the brief inputs can induce output spikes in response to two or more coincident arrivals or even a single strong enough inhibitory arrival [2]. Thus the output firing sequence becomes random, while the firing rate increases with λ . For small G_T , the coefficient of variation (CV) of the output spike sequence also increases with λ , but when the rebound is strong, the CV exhibits an unexpected and prominent local maximum at a preferred input frequency. At the preferred frequency, the firing rate has a maximum slope. Weaker input amplitudes can increase the preferred frequency, but the cell's firing rate, at the preferred λ , is independent of the input strength. This phenomenon may be useful in characterizing and identifying cells [3] that receive complex pattern of inhibitory inputs like those in subthalamic nucleus with T-type calcium currents [4].

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