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Asynchronous electrical activity in epileptic seizures[1] KATHERINE HOLMAN, Towson University, EUGENE LIM, Ohio Wesleyan University, STEPHEN GLISKE, WILLIAM STACEY, University of Michigan, CHRISTIAN FINK, Ohio Wesleyan University — High-frequency oscillations (HFOs) have been postulated to be potential biomarkers for focal epileptic seizures, with fast ripples (>250 Hz) as the most interesting candidate. The mechanisms underlying the generation of fast ripples, however, are not well understood. In this study, we draw upon results from previous computational studies on HFOs to develop a new mathematical model from first principles describing the generation of HFOs through asynchronous neuronal firing. Asynchrony in the model is obtained with the introduction of two parameters of heterogeneity: variability in the inter-spike interval (ISI) and jitter. The model predicts the generation of harmonic narrow-band oscillations if the heterogeneity-governing parameters do not differ from the predefined ISI by more than 20%. Comparisons against results from a separately constructed computational model verify the accuracy of the model in study. These results provide us with a rigorous framework in which we may investigate the mechanisms driving the generation of abnormal HFOs, and may serve as groundwork for future research in epileptogenesis.

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