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Phase synchronization analysis of voltage-sensitive dye imaging during drug-induced epileptic seizures. DAISUKE TAKESHITA, VASSILIY TSYTSAREV, SONYA BAHAR, Dept. of Physics and Astronomy and Center for Neurodynamics, University of Missouri-St. Louis — Epileptic seizures are generally held to result from excess and synchronized neural activity. However, recent studies have suggested that this is not necessarily the case. We investigate how the spatiotemporal pattern of synchronization changes during drug-induced in vivo neocortical seizures in rats. Epileptic seizures are caused by the potassium channel blocker 4-aminopyridine, which is often used in experiments to induce epileptic seizures. In our experiments, the neocortex is stained with the voltage-sensitive dye RH-1691. The intensity changes in dye fluorescence are measured by a CCD camera and are consistent with the signal from local field potential recording. We apply phase synchronization analysis to the voltage-sensitive dye signals from pairs of pixels in order to investigate the degree to which synchronization occurs, and how spatial patterns of synchrony may change, during the course of the seizure. Our preliminary results show that two distant pixels are well synchronized during a seizure event.

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