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Independent Noise Can Synchronize Interacting Networks of Pulse-Coupled Oscillators[1] HERMANN RIECKE, JOHN MENG, Northwestern University — Structured networks comprised of subnetwork modules are ubiquitous. Motivated by the observation of rhythms and their interaction in different brain areas, we study a network consisting of two subnetworks of pulse-coupled integrate-fire neurons. Through mutual inhibition the neurons in the individual subnetworks can become synchronized and each subnetwork can exhibit coherent oscillatory dynamics, e.g. an ING-rhythm. In the absence of coupling between the networks the rhythms will in general have different frequencies. We investigate the interaction between these different rhythms. Strikingly, we find that increasing the noise level in the input to the individual neurons can synchronize the rhythms of the two networks, even though the inputs to different neurons are uncorrelated, sharing no common component. A heuristic phase model for the coupled networks shows that this synchronization hinges on the fact that only a fraction of the neurons may spike in a given cycle. Thus, the synchronization of the network rhythms differs qualitatively from that of individual oscillators.

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