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Swarming Behavior of Particle-Like Waves in Excitable Media

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Unstable waves in the photosensitive Belousov-Zhabotinsky reaction are stabilized by global feedback, and the motion of these waves is controlled by imposing excitability gradients that are regulated by a secondary feedback loop. We describe studies of these particle-like waves interacting with one another via realistic excitability potentials. Simulations and experiments with increasing numbers of mutually coupled waves have demonstrated very complex swarming behavior. Measures for characterizing the behavior, such as the average velocity and group size, will be discussed. We will also describe experiments and simulations of stabilized waves navigating excitability landscapes. Of particular interest is the interaction of a swarm with various obstacles as it navigates through the medium. [E. Mihaliuk, T. Sakurai, F. Chirila, and K. Showalter, Phys. Rev. E 65, 65602 (2002); T. Sakurai, E. Mihaliuk, F. Chirila, and K. Showalter, Science 296, 2009-2012 (2002); V. S. Zykov and K. Showalter, Phys. Rev. Lett. 94, 068302 (2005).]