* Electronic Address: phoevel@physik.tu-berlin.de
[1] Berlin Institute of Technology
[2] Crete Center for Quantum Complexity and Nanotechnology, Heraklion
[3] National Center for Scientic Research Demokritos, Athens

Controlling chimera states by a block of excitable units

Philipp Hövel[1*], Thomas Isele[1], Johanne Hizanidis[2], Astero Provata[3]

Systems of nonlocally coupled oscillators can exhibit complex spatio-temporal patterns, called chimera states, that consist of coexisting domains of spatially coherent (synchronized) and incoherent (desynchronized) dynamics. First observed in systems of identical elements with symmetric coupling topology, these hybrid states have been intensively studied during the last decade. We explore the influence of a block of excitable units on the existence and behavior of chimera states in a nonlocally coupled ring-network of FitzHugh-Nagumo elements. The FitzHugh-Nagumo system, a paradigmatic model in many fields from neuroscience to chemical pattern formation and nonlinear electronics, exhibits oscillatory or excitable behavior depending on the values of its parameters. Until now, chimera states have been studied in networks of coupled oscillatory FitzHugh-Nagumo elements. In the present work, we find that introducing a block of excitable units into the network may lead to several interesting effects. It allows for controlling the position of a chimera state as well as for generating a chimera state directly from the synchronous state.

References

[1] T. Isele, J. Hizanidis, A. Provata, and P. Hövel:, Controlling chimera states: The influence of excitable units , Phys. Rev. E 93, 022217 (2016)