Robust chimera states in SQUID metamaterials with local interactions

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Abstract

We report on the emergence of robust multiclustered chimera states in a dissipative-driven system of symmetrically and locally coupled identical superconducting quantum interference device (SQUID) oscillators. The "snakelike" resonance curve of the single SQUID is the key to the formation of the chimera states and is responsible for the extreme multistability exhibited by the coupled system that leads to attractor crowding at the geometrical resonance (inductive-capacitive) frequency. Until now, chimera states were mostly believed to exist for nonlocal coupling. Our findings provide theoretical evidence that nearest-neighbor interactions are indeed capable of supporting such states in a wide parameter range. SQUID metamaterials are the subject of intense experimental investigations, and we are highly confident that the complex dynamics demonstrated in this paper can be confirmed in the laboratory.

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