

Metamaterials and topological non-separable light pulses

N. Papasimakis, A. Zdagkas, Y. Hou, O. Buchnev, and N. I. Zheludev

Flying Doughnuts are exact solutions of Maxwell equations in the form of single-cycle, space-time non-separable pulses propagating at the speed of light. They exhibit a complex topological structure with spectrally broadband vortices and interact with matter in non-trivial ways allowing to efficiently engage toroidal and non-radiating (anapole) excitations. In this talk, we will present metamaterial-based schemes for the generation of few-cycle optical Flying Doughnuts and will report on the full experimental characterization of such pulses. We will discuss their topological and spatiotemporal structure and its implications for light-matter interactions involving anapoles.