

FANS & ANPh Conferences Abstracts

Nonlinear space-time dynamics in microstructured systems

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I will review recent research activities on the spatio-temporal dynamics of ultrashort pulses in microstructured photonic lattices obtained particularly at the Abbe Center of Photonics of the Friedrich Schiller University Jena in Germany. In particular, I will show that photonic lattices allow to stabilize otherwise unstable nonlinear waves. Using this stabilization scheme we are able to observe experimentally the evolution of light bullets which are fully symmetric stable three dimensional nonlinear objects in space and time. The preparation and observation of such pulsed beams provides major experimental challenges. Hence besides general principles, details of the experimental techniques will be discussed as well. Our recent experimental results open an entirely new domain of optical research on complex nonlinear space-time solutions which might eventually become important for the control of light in applications under extremely nonlinear conditions.

Light control with metamaterials and plasmonic structures

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I will review recent theoretical and experimental results on tunability of periodic photonic structures and metamaterials, in particular the results obtained at our Nonlinear Physics Center at the Australian National University in Canberra (<http://www.rsp.phys.anu.edu.au/nonlinear/>). In particular, I will discuss our recent advances in the control of light propagation in metamaterials and plasmonic structures. We suggest and demonstrate experimentally the functional metamaterials controlled with externally imposed patterns of light. We fabricate a light-tunable microwave metamaterial structure and prove its unique functionalities for reflection, shaping, and focusing of electromagnetic waves. For optical metamaterials, we demonstrate an efficient polarisation-dependent control of spontaneous emission of quantum dots through their coupling to magnetic metamaterials, and a sharp difference in the interaction of quantum dots with magnetic and electric resonances of the split-ring optical metamaterial.