Examples of results (1st period)

Discovery of the method of Fourier factorization with complex polarization bases, which enabled enhancement of optical theory of periodic nanostructures. Figure 1 shows the improvement of convergence of diffraction grating reflectances of the discovered method (Model C) compared to previous approaches (Models A and B).

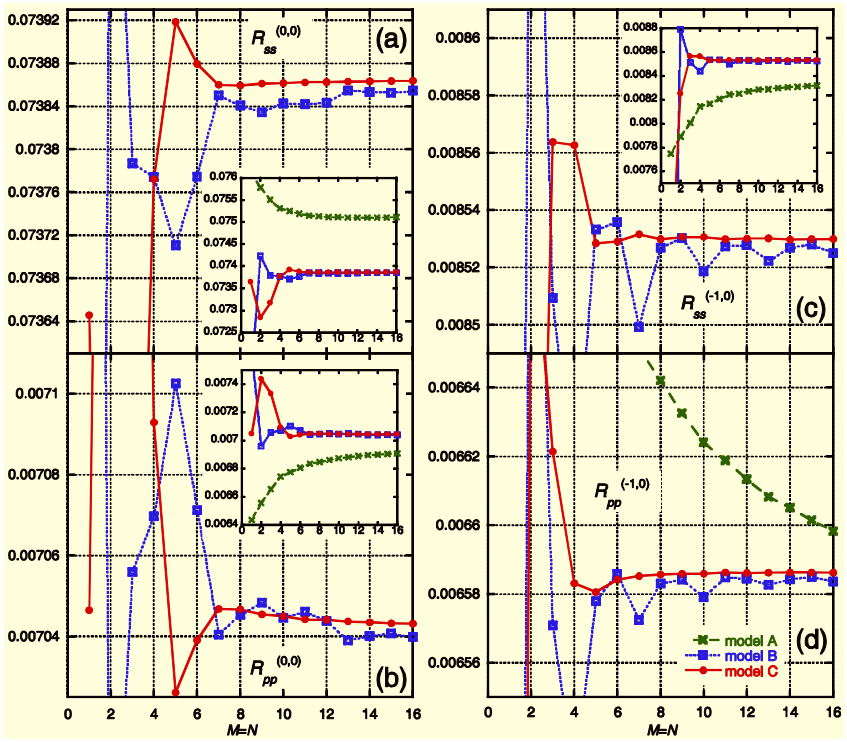

Figure 1

Discovery of the method of ultrafast switching of vortex chirality in magnetic circular nanodisks. Before that only vortex polarity (second of the two binary states of vortices) was switchable, and it was even claimed that to switch the chirality requires a geometric asymmetry. The researcher has proven the opposite, which is demonstrated in Figure 2.

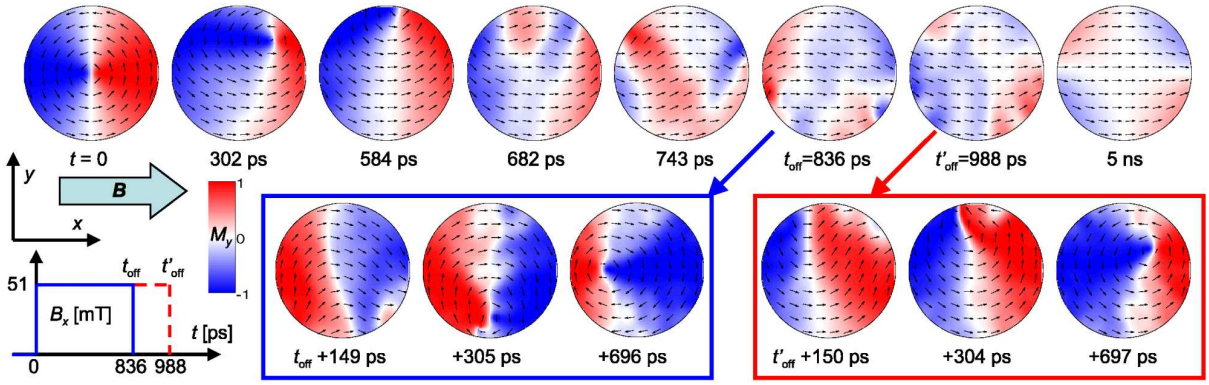

Figure 2

Examples of results (2nd period)

The model can be used to simulate modes of photonic crystals of an arbitrary cross-section. Figure 3 shows an example of mode in a crystal made as 2D-periodic infinite array of cylinders of a split-ring cross-section. The graph compares convergences of three methods of Fourier factorization.

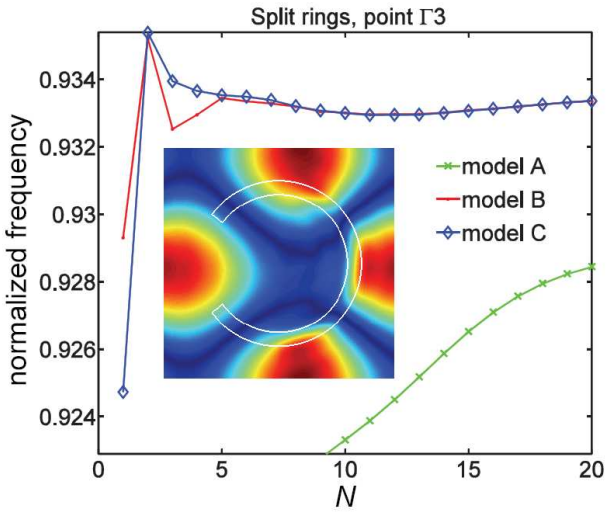

Figure 3

Magneto-photonic crystals (photonic crystals with magnetic materials) exhibit an interesting property called “hybridization of modes”. Two different mode polarizations (which are in isotropic crystals entirely independent), cross here from one to the other while changing the wave vector ***k***. The phenomenon becomes apparent near the points of symmetry G, X, M (Figure 4, where blue curves have magnetization along *x*-axis, red along *y*-axis, green along 45°, and black is the isotropic case without magnetization). Examples of modes are displayed in Figure 5.

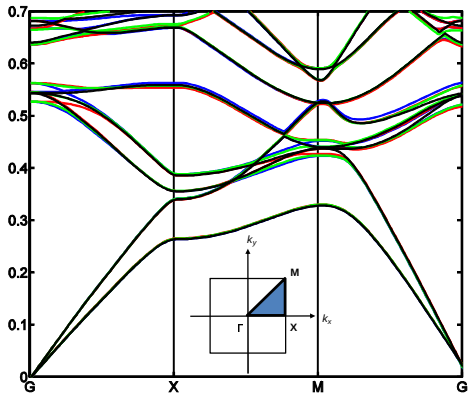

Figure 4

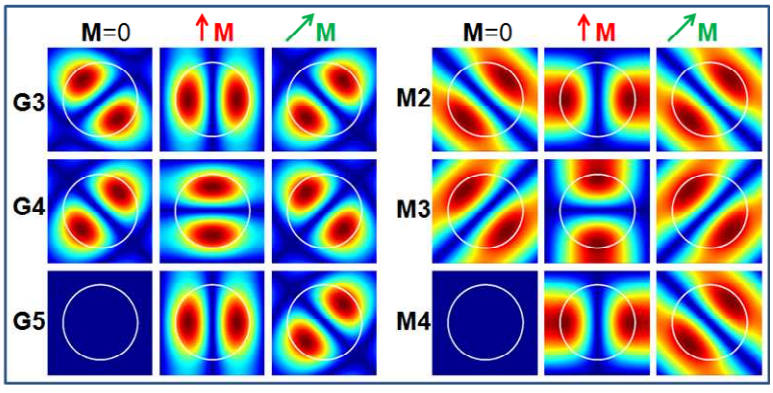

Figure 5