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Optical circulation and power flow rotation with nonreciprocal plasmonic structure[1] ARTUR DAVOYAN, NADER ENGHETA, Department of Electrical and Systems Engeenering, University of Pennsylvania — In this work we propose a concept for tailoring the near-zone optical field with the plasmonic nanostructures mixed with MO materials, and demonstrate a novel effect of a subwavelength power flow circulation. We study both analytically and numerically plasmonic nanostructures embedded into magneto-active media, and analyze their resonances and corresponding eigenmode spectra. We show that when the structure is degenerate the magneto-optical activity, when introduced, causes strong interaction between these modes. Such intermodal interaction leads to a formation of a novel set of rotating states and to a frequency splitting between them. We study the plane wave excitation of such nanostructures and reveal a strong power flux circulation around such structures in the presence of magneto-optical activity. We will discuss a possible application of the observed effect and propose a subwavelength optical circulator. In particular, we study numerically a plasmonic nanostructure embedded into the core of the Y-junction formed by single mode optical waveguides. We show that mixing the plamonic nanostructures with magneto-optical materials it is possible to break significantly the symmetry between the output arms of the junction and almost completely isolate one of them.

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