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Filtering Components in Optical Nanocircuits Using Plasmonic Metamaterials NADER ENGHETA, ANDREA ALU, University of Pennsylvania — Following our recently developed concept of lumped nanocircuit elements at optical frequencies, here we apply analytical and numerical techniques to demonstrate that various arrangements of such optical nanoelements may provide relatively complex optical nanocircuits with various filtering functions, such as bandpass filters, in optical domains. These optical nanocircuit units, operating as nanofilters, are sub-wavelength in size and are formed by collecting and arranging plasmonic and non-plasmonic nanostructures in proper orders and topology in a planar geometry. Our study shows how such optical nanocircuits may provide resonant responses, with transfer functions that allow filtering the incoming optical signals at will. The input signal may be coupled into such nanofilters using plasmonic nanoantennas, and the output of such elements may be coupled with another section of the nanocircuit or connected to a nanowaveguide carrying out the signal, mimicking the functionalities of low-frequency filters in RF circuits. We present samples of our theoretical results and discuss related physical insights. Future steps in this work will also be mentioned.

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