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**Manipulating, Extending, and Re-Routing Optical Near Fields Using Epsilon-Near-Zero Metamaterials in Nano-Optics** NADER ENGHETA, ANDREA ALU, University of Pennsylvania — In recent years, we have developed the notion of lumped optical circuit nanoelements as building blocks for the design of nanoscale systems and components in nano-optics. In this context, we have also introduced the concept of an optical "nanocircuit board," based on epsilon-near-zero (ENZ) metamaterials. Using analytical methods and full-wave numerical simulations, we show here that optical fields in the near field of a source may be efficiently manipulated, "extended," and re-routed in arbitrarily-shaped air grooves carved in ENZ metamaterial substrates, that may effectively act as optical "wires" connecting different elements with essentially no phase variation. Such substrates may be obtained by using natural materials with the real part of permittivity near zero, e.g., SiC near 10.3 micron wavelength, or using layered stacks of epsilon-negative (e.g., metal) and epsilon-positive (e.g., dielectric) thin layers in the visible domain, for which the effective bulk substrate may exhibit epsilon-near-zero (ENZ) properties at certain wavelength regimes for transversally polarized electric field. In this talk, we will discuss some of the exciting features of such nano-optical structures for near-field manipulation, re-routing and extension.

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