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EM Wave Transmission through a Nano-hole in a Plasmonic Layer DESIRE DESIRE MIESSEIN, NORMAN J. MORGENSTERN HORING, HARRY LENZING, Department of Physics and Engineering Physics, Stevens Institute of Technology, Hoboken, NJ 07030, GODFREY GUMBS, Department of Physics and Astronomy, Hunter College, CUNY, New York, NY 10065 — We examine the role of the angle of incidence of an incoming EM wave in its transmission through a subwavelength nano-hole in a thin semiconductor plasmonic layer. Fully detailed calculations and results are exhibited for p- and s-polarizations of the incident wave for a variety of incident angles in the near, middle and far zones of the transmitted radiation. Our dyadic Greens function formulation includes both (1) the electromagnetic field transmitted directly through the 2D plasmonic layer and (2) the radiation emanating from the nano-hole. Interference fringes due to this superposition are explicitly exhibited. Based on an integral equation formulation, this dyadic Greens function approach does not involve any appeal to metallic boundary conditions. It incorporates the role of the 2D plasmon of the semiconductor layer, which is smeared due to its lateral wave number dependence. We find that the interference fringes, which are clustered near the nano-hole, flatten to a uniform level of transmission directly through the sheet alone at large distances from the nano-hole.

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