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Theoretical Study of Optical Transmission Enhancement through Sub-Wavelength Apertures: Determining the Role of Surface Plasmon Polaritons PHILIP FLAMMER, JAMES MARTINEAU, REUBEN COLLINS, IAN SCHICK, MICHAEL HOROWITZ, Colorado School of Mines, RUSSELL HOLLINGSWORTH, ITN Energy Systems, Inc. — Enhanced optical transmission (EOT) through sub-wavelength apertures in metal films has been observed from both experimental and theoretical studies of circular apertures surrounded by bulls-eye groove configurations or simpler linear apertures flanked by grooves. These studies have also generated much debate over the driving mechanisms involved. In this talk, theoretical results from a commercial finite element PDE solver will be presented with supporting experimental results for linear aperture/groove structures. This study confirms the integral role of surface plasmon polaritons in causing EOT, and also shows the importance of surface cavity resonances. Results will be presented exploring the role of the geometry of the grating structures, and how to tune the EOT resonance wavelength by changing the aperture/groove geometry. This material is based on work supported by the National Science Foundation under Grant No. DMI-052228.

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