Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Enhanced
Optical Transmission with Coaxial Apertures MICHAEL HAFTEL, Naval Research Laboratory, CARL SCHLOCKERMANN, Munich University of Applied Sciences, SHANNON ORBONS, ANN ROBERTS, DAVID JAMIESON, University of Melbourne, DARREN FREEMAN, BARRY LUTHER-DAVIES, Australian National University — Recently it has been shown that "cylindrical" surface plasmons (CSP's) on cylindrical interfaces of coaxial ring apertures produce a new form of extraordinary optical transmission (EOT) that extends to ever increasing wavelengths as the dielectric ring narrows.[1] Using analytic and FDTD calculations we present some of the consequences of CSP's on EOT as well as experimental confirmation of such effects. We find that EOT, even with cylindrical apertures, is aided by the increase in cutoff wavelength due to CSP's, which is a consequence of the mode structure of individual apertures. CSP effects also explain most of the long-wavelength features of transmission spectra measured for CR apertures. We also show that CSP's can be "spoofed" at low frequencies by coaxial apertures in metamaterials consisting of a (macroscopic) periodic dielectric structure embedded in a perfect conductor.

[1]F. I. Baida et al., Phys. Rev. B **67,** 155314 (2003); M.I Haftel et al., Appl. Phys. Lett. **88**, 193104 (2006).

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Date submitted: 07 Nov 2006 Electronic form version 1.4