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Enhancement of Light Transmission through Thin-Film Bulls Eye Structures[1] SINAN SELCUK, KWANGJE WOO, DAVID B. TANNER, ARTHUR F. HEBARD, Department of Physics, University of Florida — Previous researchers have shown that light transmitted through a single hole in a silver film can be strongly enhanced by the presence of periodic concentric groove structures (bull's eye) on the film. We present a systematic study of the wavelength dependence (0.3 – 2.0 μm) as measured by a Zeiss microscope photometer of the transmission of bull's eye structures with varying dimensions. A focused ion beam microscope is used to drill successively larger holes on the same structure thus facilitating the identification of transmission emanating from the hole compared to transmission associated with evanescent waves coupled through the opaque portions of the structure. The intensity and spectral distribution of the transmitted light is correlated with variation of sample parameters including the film thickness (40 – 100 nm), groove periodicity (2.0- 4.0 μm), hole diameter (0.5 – 10 μm) and phase difference between the entrance and exit groves. The relevance of surface plasmons to the enhanced transmission and the predictions of theory will be discussed.

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