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Far-infrared transmission through periodic arrays of cross-shaped holes LUYI YAN, CHANG LONG, DAVID TANNER, University of Florida, N. BRADMAN, N. MCFARLAND, J.B. MARBRUGER, Advanced Plasmonics Inc. — The far-infrared transmission of light incident on a free-standing metal film perforated with periodic cross-shaped holes is investigated. These metal-mesh filters show enhanced "extraordinary" infrared transmission at particular wavelengths. A number of filter samples having different periodicities and geometries have been measured over frequencies from 20-650 cm^{-1}/0.6-19.5 THz. The results will be compared with calculations from surface plasmon polariton (SPP) theory. It is shown that for certain periodicity and geometry, the SPP mode and the localized surface plasmon (LSP) mode may have their resonance peaks nearly superimposed on each other. The bandwidth of this transmission peak is related to the ratio of the width and length of the cross-shaped holes. The correlation between transmission properties and the incident angle of the far-infrared light has also been measured for both polarization conditions. As the incident angle is increased, the transmission peak shows a blue shift when illuminated by s-polarized light, while for p-polarized light it splits into two parts which shift in opposite directions.

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