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MEMS for Tunable Plasmonic Coupling TOM STARK, MATTHIAS IMBODEN, SABRI KAYA, ALKET MERTIRI, SHYAMSUNDER ERRAMILLI, DAVID BISHOP, Boston Univ — The localized surface plasmon resonance (LSPR) of sub-wavelength holes in metals depends upon the geometry, composition, refractive index, and near field coupling to neighboring particles. Sub-wavelength holes in metals can exhibit extraordinary optical transmission (EOT) at the resonance frequency and, for certain geometries, polarization-dependent transmission. We present a microelectromechanical system, tunable Fabry-Perot etalon. One interface is a suspended gold metamaterial and the other is a gold reflector. The reflectance, measured with a Fourier transform infrared spectrometer, exhibits the convolution of the EOT through the holes and Fabry-Perot resonances. Using MEMS, we modulate the etalon length from 1 to 20 μm, thereby tuning the free spectral range from about 5000 to 250 cm^{-1} and shifting the reflection minima and maxima across the infrared. When the separation between the metamaterial and gold reflector approaches the decay length of the LSP electric fields, interactions with image currents generated in the gold reflector become significant. By tuning the separation in this regime, we will tune the near field coupling between the LSPR and image currents and tune the LSPR of the system, effectively creating a sensing substrate with a tunable LSPR frequency.

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