Exploring the tunability of coupled MIM nanocavities through extremely thin liquid-crystals layers

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In this contribution, we experimentally demonstrate the possibility of engineering and actively controlling light confinement and mutual interaction between resonant modes in multilayer metamaterials (MIMTMIM). Polarization-dependent coupling was enabled by a high-birefringence liquid crystal film acting as *tunable nanometric cavity* whose thickness was continuously and precisely controlled by means of a surface forces apparatus. To show the versatility of our technique, we selectively control the detuning between overlapping localized modes and observe both frequency crossing and anti-crossing, thereby paving the way for the creation of open transmission channels in planar metamaterials.

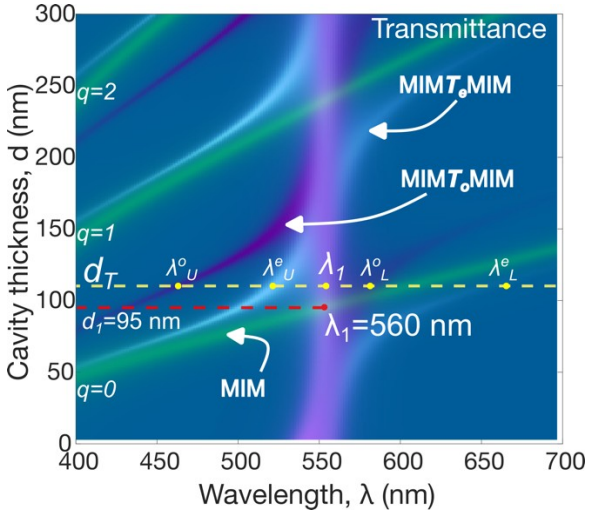

Fig. 1. Transmittance under normal incidence calculated using the TMM method for a MIM cavity (green lines) as a function of the wavelength λ and thickness of the I-layer, and for the three-cavity resonator as a function of λ
and thickness dT of the LC film (T-layer), for both ordinary (MIMToMIM, purple curves) and extraordinary polarizations (MIMTeMIM, cyan curves).