

Plasmonic Resonances and their Effect on Scattering

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It is well-known that cavities made of Negative-Index Metamaterials (NIM) can exhibit localized waves on the interface between the metamaterial and the dielectric. Those waves are called surface plasmons which are highly oscillatory waves along the interface, and exponentially decreasing in the transverse direction. They are usually characterized in the context of the specific quasi-static case. In this presentation we provide a systematic mathematical characterization of emerging surface plasmons, based on asymptotics, for general metamaterial cavities and for the full wave problem. We found a condition on the metamaterial's properties indicating when surface plasmons can be excited in scattering problems. Surface plasmons can create strong light enhancement, which is challenging to capture numerically. We will illustrate this phenomenon using finite element method. This talk is based on [1].

- [1] C. Carvalho, Z. Moitier. *Asymptotics for metamaterial cavities and their effect on scattering*, 2020. Preprint, HAL-02965993.