

Surface Plasmon-like Modes on Perforated Perfect Metal Plate Systems

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Whether we can mimic surface plasmon on perfect metal structure arouses arguments recently. In this paper we took wave mode expansion both inside and outside of plates and tried to analytically solve bounded surface states on multi perforated perfect metal plate (PPMP) systems. We will show that there are indeed surface modes bounded on these multi-plate systems and the number of modes as well as their physical origins matches well with normal metal thin film results. Our finite difference time domain simulation also provided qualitative results. Though the argument is still unsolved here about the effectiveness of surface plasmon on this kind of metamaterials, we find, at long wavelength limit, those perforations on perfect metal plate will provide it a similar surface plasmon property. And we may take use of this kind of surface plasmon-like modes to achieve similar physical properties of thin metal films at microwave frequency.