

Abstract Submitted  
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**Mode life time study of transmission resonances in bilayer sub-wavelength metallic hole arrays**<sup>1</sup> Z.H. HANG, C.T. CHAN, H.M. SU, K.S. WONG, Hong Kong University of Science and Technology, H.B. CHAN, University of Florida — Enhanced optical transmission occurs on bilayer periodic subwavelength hole arrays in metal films at wavelength where surface excitation can be induced by incident light. Two different types of transmission resonances (surface plasmon mode and gap guided mode) with different mode confinement are found in this structure. Simulation at microwave frequencies found that the mode life time of these two resonance modes have different dependence on the gap thickness between the two perforated metallic films. Gap guided modes with long life time was found. The delay time of a short laser pulse at infrared wavelength passing through similar bilayer subwavelength metallic hole arrays was also experimentally measured and large delay time was found to correlate with the two transmission resonances in this system. The experimental results agree with numerical calculations and mode life time simulations. The difference at different wavelengths (microwave and infrared) of these two resonance modes was studied.

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