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Surface Plasmon Polaritons: Geometric Resonance at Singularities YUNSHAN WANG, University of Notre Dame, Department of Chemical and Biomolecular Engineering, Graduate Student, HSUEH-CHIA CHANG, University of Notre Dame, Department of Chemical and Biomolecular Engineering, Professor — Unlike planar plasmonic waves, the electric field of radially confined surface plasmon polariton (SPP) at a geometric singularity does not decay from the interface, but rather interacts around the singularity. A discrete SPP spectral theory for solid and hollow cones/wedges shows that the resulting azimuthal optical capacitor produces an infra-red shift of the classical planar plasmonic resonant frequency with a larger bandwidth at small angles. An analysis of the conformal map between the complex spectral space and the complex permittivity space shows the resonant SPPs can be sustained by materials with positive permittivity, although negative permittivity provides higher intensification. Asymptotic analysis of the SPP dispersion relationship also provides a closed-form estimate of the optimum angle due to enhanced conductive loss at small angles and also a prediction of optimal frequency. Experimental confirmation with transmission and scattering measurements will also be reported.

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