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Surface-Plasmon Polaritons at Lossy Curved Interfaces

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We construct a model for surface-plasmon polaritons propagation along lossy curved interfaces and introduce a set of conditions to characterize surface-plasmon polaritons propagation at these interfaces. Mathematically, we employ conformal transformation to map the curved interfaces between lossy linear, isotropic and homogeneous materials to planar interfaces between lossy inhomogeneous materials. Proceeding from Maxwell's equations, we then derive the dispersion equations of surface-plasmon polaritons at homogeneous curved and inhomogeneous planar interfaces. We solve the dispersion equation at the inhomogeneous materials planar interfaces as a consistency check and to give intuition about the homogeneous materials at curved interfaces. We present examples of metamaterials with both positive and negative electromagnetic susceptibilities forming a circularly curved interface with air. Our characterization of surface-plasmon polaritons is useful for checking the viability of the proposed application.

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