Canadian Association of Physicists | Association canadienne des physiciens et physiciennes

Contribution ID: **1724** Type: **CLOSED - Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Characterizing Surface Plasmon Polaritons Propagation at Lossy Interfaces

Tuesday, 30 May 2017 14:30 (15 minutes)

We characterize the propagation of surface plasmon polaritons (SPPs) at planar lossy interfaces by investigating the behavior of the energy flux and field intensity at the interface. For interfaces between dispersive and nondispersive linear, homogeneous and isotropic materials with positive, zero, and negative permittivity and permeability, a narrow transition frequency window separates propagating SPPs from leaky SPPs. We derive conditions on the permittivity and permeability corresponding to whether the SPPs are propagating or leaky. Ascertaining propagation characteristics of surface plasmon polaritons is important to check the viability of a given study or application. As an application we show that in frequency regions where one material has a double-negative refractive index, the SPPs are leaky, rather than propagating.

We acknowledge financial support from NSERC, Alberta Innovates Technology Futures, China's 1000 Talent Plan and the Institute for Quantum Information and Matter, an NSF Physics Frontiers Center (NSF Grant PHY-1125565) with support of the Gordon and Betty Moore Foundation (GBMF-2644).

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Session Classification: T3-2 Quantum and Nano-Photonics I (DAMOPC) | Photonique quantique et nanoscopique I (DPAMPC)

Track Classification: Division of Atomic, Molecular and Optical Physics, Canada / Division de la physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)