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Extraordinary SPP propagation distance in epitaxially grown silver film[1] YANWEN WU[2], Department of Physics, University of South Carolina, Columbia, SC 29208, CHENGDONG ZHANG, JISUN KIM, MATT ZHANG, LIUYANG SUN, CHIH-KANG SHIH, XIAOQIN LI, Department of Physics, University of Texas at Austin, Austin, TX 78712, YANG ZHAO, N. MOHAMMADI ESTAKHRI, XING XIANG LIU, ANDREA ALÙ, Department of Electric and Computer Engineering, University of Texas at Austin, Austin, TX 78712, GREG PRIBIL, J.A. Woollam Co., Inc., 645 M Street, Suite 102, Lincoln, NE 68508, USA
— We measured greatly enhanced propagation distances of surface plasmon polaritons (SPPs) on an atomically-smooth epitaxial silver *(Ag)* film beyond what was previously considered possible. These extraordinary propagation lengths approach the fundamental limit determined by the new optical constants measured in these films. We excited and detected the SPPs in reflection geometry. Light incident on a single groove launched the SPPs, which were subsequently detected at a series of output coupling slits with increasing distance from the launching site. We used incident wavelengths of 632nm and 880nm and extracted propagation distances of 22μm and 42μm, respectively. Calculations using the optical constants measured on the same film predict distances of 42μm at 63nm and 155μm at 880nm. The discrepancy is mainly due to scattering from the 1-2 monolayer fluctuations at the *Ag* surface. The propagation distance extrapolated from our measurements far exceeds the speculated theoretical limit ($\sim$ 5X) in template stripping *Ag* films.

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[2]Work done at University of Texas at Austin

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