Theory of Plasmon-assisted Transmission of Entangled Photons

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abstract The recent surface plasmon entanglement experiment [E. Altwischer et al., Nature (London) 418, 304 (2002)] is theoretically analyzed. The entanglement preservation upon transmission in the non-focused case is found to provide information about the interaction of the biphoton and the metallic film. The entanglement degradation in the focused case is explained in the framework of a fully multimode model. This phenomenon is a consequence of the polarization-selective filtering behavior of the metallic nanostructured film.