

Abstract Submitted
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Coherent Field Emission by Superfocused Plasmons¹ JULIA MAJORS, Department of Physics, University of California, Irvine, ALEJANDRO RODRIGUEZ PEREZ, JOONHEE LEE, V. ARA APKARIAN, Department of Chemistry, University of California, Irvine — Field emission takes place upon focusing propagating surface plasmon polaritons (SPP) at the apex of a sharp metal tip. The effect is demonstrated with remotely launched SPPs on a silver probe tip. We couple femtosecond laser pulses through a grating inscribed on the taper of a smooth, silver wire 30 μ m from the apex. Field-emitted current is directly correlated with the radiation of the super-focused SPP at the apex. Both current and radiation at the apex are measured as a function of incident polarization on the grating. In the absence of incident light at the apex, the local field of the “naked” surface plasmon modulates the tunneling barrier that drives the field emission. We give a detailed analysis of the governing dynamics in the presence and absence of an applied extractor field, and clearly distinguish contributions to tunneling current from Fermi electrons, athermal electron-hole pair distribution created by Landau damping of the plasmon, and the thermalized electrons. Independent of the distribution of the electrons in the metal half-space the emission acquires coherence by the time-dependent field of the plasmon in the vacuum half-space.

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