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Ultrafast time-resolved photoemission of a metallic tip/substrate junction[1] XIANG MENG, WENCAN JIN, HAO YANG, JERRY DADAP, RICHARD OSGOOD, Columbia Univ, NICHOLAS CAMILLONE III, Brookhaven National Lab — The strong near-field enhancement of metallic-tip nanostructures has attracted great interest in scanning microscopy techniques, such as surface-enhanced Raman scattering, near-field scanning optical microscopy and tip-enhanced nonlinear imaging. In this talk, we use a full vectorial 3D-FDTD method to investigate the spatial characteristics of the optical field confinement and localization between a tungsten nanoprobe and an infinite planar silver substrate, with two-color ultrafast laser excitation scheme. The degree of two-color excited field enhancement, geometry dependence, the exact mechanism of optical tip-substrate coupling and tip-substrate plasmon resonances are significant in understanding the electrodynamical responses at tip-substrate junction. The demonstrated measurements with subpicosecond time and subnanometer spatial resolution suggest a new approach to ultrafast time-resolved measurements of surface electron dynamics.

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