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Control of plasmonic coupling and radiative emission in tip-enhanced photoluminescence VASILY KRAVTSOV, SAMUEL BERWEGER, JOANNA M. ATKIN, MARKUS B. RASCHKE, University of Colorado, Boulder — We study plasmon enhanced photoluminescence (PL) as a probe of local fields and plasmonic coupling in metallic nanostructures and nanogaps, and to gain microscopic insight into the mechanisms of tip–sample coupling in tip-enhanced spectroscopy in particular, and the behavior of radiative emitters in the proximity of interfaces in general. For that purpose we measure the laser induced PL response of a nanogap formed by a sharp Au tip and a flat Au sample surface, with distance precisely controlled using shear force feedback. We find three different distance regimes for the PL spectral behavior, characterized by non-monotonic changes in the PL intensity and linewidth, as well as the shift of the emission peak position, on a scale of several nanometers. Through relating the PL signal to the underlying mechanism of plasmonic enhancement, we describe the behavior of the plasmonic resonance of a nanogap of a varying size, where the weak dipole coupling gradually transforms into the higher order multipole and charge transfer coupling modes. The role of the plasmon nonlocality and the influence of the dielectric surface layer are discussed.

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