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Standing wave plasmon modes interact in an antenna-coupled nanowire[1] JARED DAY, NICOLAS LARGE[2], PETER NORDLANDER, NAOMI HALAS, Rice University — In a standing wave optical cavity, the coupling of cavity modes, e.g. through a nonlinear medium, results in a rich variety of nonlinear dynamical phenomena, such as frequency pushing and pulling, mode-locking and pulsing, and modal instabilities. Metallic nanowires of finite length support a hierarchy of longitudinal surface plasmon modes with standing wave properties: the plasmonic analog of a Fabry-Pérot cavity. Here we show that positioning the nanowire within the gap of a plasmonic nanoantenna introduces a passive, hybridization-based coupling of the standing-wave nanowire plasmon modes with the antenna structure, mediating an interaction between the nanowire plasmon modes themselves. Frequency pushing and pulling, and the enhancement and suppression of specific plasmon modes, can be controlled and manipulated by nanoantenna position and shape. Dark-field spectroscopy, CL spectroscopy and imaging, and finite-difference time-domain calculations are performed to investigate these surface plasmon "drift." Near-field coupling of nanoantennas to nanowire optical cavities shows that plasmon hybridization is a powerful strategy for controlling the radiative LDOS of nanowires, and could ultimately enable strategies for active control of emission properties in nanowire-based devices.

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