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Modulating the amplitude and phase of the complex spectral degree of coherence with plasmonic interferometry DONGFANG LI, DOMENICO PACIFICI, Brown University — The spectral degree of coherence describes the correlation of electromagnetic fields, which plays a key role in many applications, including free-space optical communications and speckle-free bioimaging. Recently, plasmonic interferometry, i.e. optical interferometry that employs surface plasmon polaritons (SPPs), has enabled enhanced light transmission and high-sensitivity biosensing, among other applications. It offers new ways to characterize and engineer electromagnetic fields using nano-structured thin metal films. Here, we employ plasmonic interferometry to demonstrate full control of spatial coherence at length scales comparable to the wavelength of the incident light. Specifically, by measuring the diffraction pattern of several double-slit plasmonic structures etched on a metal film, the amplitude and phase of the degree of spatial coherence is determined as a function of slit-slit separation distance and incident wavelength. When the SPP contribution is turned on (i.e., by changing the polarization of the incident light from TE to TM illumination mode), strong modulation of both amplitude and phase of the spatial coherence is observed. These findings may help design compact modulators of optical spatial coherence and other optical elements to shape the light intensity in the far-field.

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