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Dynamic Broadband Rabi Shifting in Laser-Generated Micro-Plasmas RYAN COMPTON, ALEX FILIN, DMITRI A. ROMANOV, ROBERT J. LEVIS, Department of Chemistry, Department of Physics, and Center for Advanced Photonics Research — Coherent broadband radiation in the form of Rabi sidebands is observed when a picosecond probe laser propagates through a weakly-ionized, electronically-excited micro-plasma generated in the focus of an intense pump beam. The sidebands arise from the interaction of the probe beam with pairs of excited states of a constituent neutral atom via the induced Rabi oscillation. The pertinent excited states with dipole transitions near the laser carrier frequency become populated in the process of plasma cooling evolution (oxygen and argon plasmas were studied). Sideband shifting of > 90 meV from the carrier frequency results in an effective bandwidth of 200 meV. The sidebands are controlled by the intensity and shape of the probe pulse; with amplitude, shift, and spectral fringes in agreement with the predictions of a time-dependent generalized Rabi-cycling model. Thus, the giant Rabi shift is both tunable and coherent over a wide range of frequencies and over a wide range of atomic transitions.

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