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Multi-Beam Plasma Generation of Terahertz: Order, Dissonance, and Their Advantages CLAYTON D. MOSS, Brigham Young University, SHAYNE A. SORENSON, Brigham Young University - Idaho, JEREMY A. JOHNSON, Brigham Young University — Terahertz (THz) radiation is a useful spectroscopic tool for studying nonlinear structural and electronic dynamics in a variety of systems. Often, nonlinear effects are only observed at high field strengths—which requires a source of intense THz pulses. Two-color laser-induced plasmas are an attractive THz source; our previous experimental work has shown that adding a third color can enhance THz output. Using numerical simulations based on the photocurrent model of coherent THz emission from laser-induced plasma we explore multi-beam THz generation that can be achieved in a tabletop environment. The scheme consists of three beams: an IR fundamental (1100-1800 nm), its second harmonic, and a third 800 nm pulse that in certain configurations can improve THz output. Considering experimental fixed-phase and random-phase THz generation schemes reveals that when order can be achieved throughout the setup it can be advantageous to use commensurate, ordered wavelengths. However, when phase stability cannot be achieved between the IR and 800 nm beams, using the natural dissonance of incommensurate color combinations can overcome this phase instability to still produce amplified, coherent THz pulses.

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