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Generation of Phase Controlled Current Patterns Using a Spatial Light Modulator KAMALESH JANA, SHAWN SEDERBERG, KATHERINE HERPERGER, PAUL CORKUM, Joint Attosecond Science Laboratory, University of Ottawa and National Research Council — Generation of controlled current on an ultrafast timescale underpins numerous applications such as THz generation and, as we will show, the generation of intense, THz magnetic impulse. The phase difference between a fundamental beam and its second harmonic determines the amplitude as well as the direction of the generated current [1]. We present measurements of spatial distribution of photocurrent in low temperature gallium arsenide (Lt-GaAs). Two femtosecond laser pulses, one a circularly polarized fundamental (1482 nm) and the other a linearly polarized second harmonic (741 nm) were used to drive the current in the GaAs. The phase of the second harmonic pulse is controlled at each 20 m pixel of a Spatial Light Modulator (SLM). The transverse phase pattern of the second harmonic pulse is transferred to the current distribution in the GaAs. By introducing different phase patterns to the SLM we generate reconfigurable current patterns in GaAs and, as a result, complex magnetic field distributions. The same idea is applicable to gases to generate arbitrary current patterns. In fact, it is possible to drive much larger current in gases with high ionization potential as they withstand very high electric field [2]. Our measurement provides a novel and robust way to generate structured THz beam and magnetic field pulses which find many applications in optoelectronics, spintronics and imaging. 1. E. Dupont et al. Phys. Rev. Lett. 74, 3596 (1995). 2. S. Sederberg et al. Phys. Rev. X 34, 011063 (2020).

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