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Generation of Bright Isolated Attosecond Soft X-Ray Pulses Driven by Multi-Cycle Mid-Infrared Lasers[1] CARLOS HERNANDEZ-GARCIA, JILA, University of Colorado at Boulder, MING-CHANG CHEN, PEI-CHEI HUANG, National Tsing Hua University, Taiwan, CHRISTOPHER MANCUSO, FRANKLIN DOLLAR, BENJAMIN GALLOWAY, DIMITAR POPMINTCHEV, TENIO POPMINTCHEV, JILA, University of Colorado at Boulder, BARRY WALKER, University of Delaware, LUIS PLAJA, GIOE, Universidad de Salamanca, MARGARET MURNANE, HENRY KAPTEYN, AGNIESZKA JARON-BECKER, ANDREAS BECKER, JILA and Department of Physics, University of Colorado at Boulder — Advances in the understanding of macroscopic phase-matching of high harmonic generation (HHG) driven by mid-IR lasers have made it possible to generate bright, coherent, high harmonic x-ray beams in the UV to keV with attosecond or even zeptosecond bandwidths. We perform advanced theoretical analysis, corroborated with experimental results, to unveil the characteristics of HHG soft x-ray *as* pulses. We show that when mid-IR lasers are used to drive HHG, the conditions for optimal soft x-ray generation naturally coincide with the generation of bright isolated *as* pulses that are also shorter in duration if compressed. In addition, in contrast to *as* pulse generation in the EUV, multi-cycle driving laser pulses are more suitable for generating bright isolated soft x-ray bursts.

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