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**Attosecond Control of Relativistic Electron Bunches using Two-Colour Fields** SERGEY RYKOVANOV, Helmholtz Institute Jena, MARK YEUNG, Queen's University Belfast, JANA BIERBACH, Friedrich Schiller University Jena, LU LI, Queen's University Belfast, ERICH ECKNER, STEPHAN KUSCHEL, ABEL WOLDEGEORGIS, CHRISTIAN ROEDEL, ALEXANDER SAEVERT, GERHARD PAULUS, Friedrich Schiller University Jena, MARK COUGHLAN, BRENDAN DROMEY, Queen's University Belfast, MATT ZEPF, Helmholtz Institute Jena — Energy coupling during relativistically intense laser-matter interactions is encoded in the attosecond motion of strongly driven electrons at the pre-formed plasma-vacuum boundary. Studying and controlling this motion can reveal details about the microscopic processes that govern a vast array of light-matter interaction physics and applications. These include research areas right at the forefront of extreme laser-plasma science such as laser-driven ion acceleration1, bright attosecond pulse generation and efficient energy coupling for the generation and study of warm dense matter. Here we experimentally demonstrate that the precise addition of a second laser beam operating at the second harmonic of the driving laser pulse can lead to attosecond control over the trajectories of relativistic electron bunches formed during such interactions. Significant enhancements in the resulting high harmonic yield were observed with potential applications as a source of ultra-bright, extreme-ultraviolet attosecond radiation for atomic and molecular pump-probe experiments.

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