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Bright solid high harmonic generation on GEMINI PW: unlocking a pathway to SF-QED

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For over twenty years high harmonic generation from the interaction between a relativistic laser pulse and solid target (SHHG) has been heralded as a realistic route to the Schwinger limit, the electromagnetic field intensity at which SF-QED effects can be probed in vacuum. Despite extensive simulation campaigns and the development of theoretical models of increasing sophistication, experimental evidence has been plagued by poor conversion efficiencies, typically producing XUV beams of micro-Joules of energy with no successful SHHG experiments on fs PW class lasers until now. Here we present our recent results from the PW class Gemini laser system, demonstrating bright harmonic production in the XUV range. Through analysis of numerical simulation and experimental data, evidence for why it worked is presented and to highlight the key parameters requiring attention to unlock this pathway in extreme field physics.

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