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High repetition rate HHG for VUV frequency combs DYLAN YOST, JILA University of Colorado Boulder, JUN YE, JILA University of Colorado Boulder, NIST — By coupling a low-phase-noise, short-pulse laser to a femtosecond enhancement cavity, it is possible to obtain a large enhancement of the pulse energy and subsequently drive the high harmonic process at very high repetition rates ($\sim$100 MHz repetition rates). The generated radiation has could potentially be used for a multitude of experiments requiring VUV radiation with exceptional temporal coherence. An open question is whether a high level of phase coherence can be maintained through the HHG process. In response, we have recently conducted experimental studies of the quantum paths which contribute to a given below-threshold harmonic order. In addition to answering fundamental questions pertaining to the high harmonic process, these studies will allow one to understand amplitude to phase noise conversion in HHG more precisely. Finally, to show that temporal coherence can be maintained in practice, we utilize a self-homodyne measurement and find that the coherence time is greater than $\sim$10 ns by measuring the pulse-to-pulse coherence within the harmonic pulse train.

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