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**A Statistical Model of Capillary-Based High-Harmonic Generation** PETER HORAK, ARTHUR DEGEN-KNIFTON, WILLIAM S. BROCKLESBY, Univ of Southampton — We present a novel, computationally fast method for estimation of high-harmonic spectra generated from ultrashort laser pulses propagating through gas-filled capillaries. In the regime of high pulse intensities, ionization-induced nonlinearities break up the pump pulse into a train of short sub-pulses. We show that a statistical analysis of the number, peak intensities, and temporal widths of these sub-pulses allows us to calculate approximate high-harmonic spectra via numerical simulations that run up to 100 times faster than full explicit simulations. While our current model does not include all aspects of high-harmonic phase matching and is therefore limited in predicting absolute output powers, we validate the model by comparison with full explicit simulations and with previous experimental results and find good qualitative agreement in features such as spectral broadening with pump pulse energy and gas pressure, photon flux versus capillary length, and spectral shaping by selectively exciting discrete harmonics.

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