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Quasi-Linear and Nonlinear High-Harmonic Generation from Ultraintense Ultrafast Laser Plasmas ROBIN MARJORIBANKS, Dept. of Physics and IOS, University of Toronto, Canada, CEDRIC THAURY, FABIEN QUERE, DSM/DRECAM, CEA, France, JEAN-PAUL GEINDRE, PATRICK AUDEBERT, LULI, CEA/CNRS/Ecole Polytechnique, France, PASCAL MONOT, PHILIPPE MARTIN, DSM/DRECAM, CEA, France — High-harmonic generation from ultra-intense laser-solid interaction has the potential for efficient generation of attosecond pulses, from a plasma so thin that phase-matching issues need not arise. However, extremely difficult constraints on laser-pulse contrast for solid interaction have routinely meant that new effects of nonlinear optical physics cannot be teased out from the hydrodynamic effects. New beamline-engineered systems of double plasma-mirrors have changed this completely, and we have discovered that the process of high-harmonic generation in laser-solid interactions is actually comprised of two disparate processes, a quasi-linear process of Coherent Wakefield Emission (efficient for ultrafast laser pulses down to I = 10^{15} W/cm^2), as well as the nonlinear Relativistic Oscillating Mirror mechanism. Both depend crucially on aspects of optical and plasma-wave phase-control during the interaction.

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