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Scalings of High-Order Harmonics from Relativistic Electron Spikes

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We experimentally study the new regime of relativistic high-order harmonic generation from gas jet targets driven by multi-terawatt relativistic-irradiance (>10^{18} W/cm^2) femtosecond lasers [1, 2]. The XUV and soft x-ray harmonics are coherently emitted by extremely sharp, structurally stable, oscillating electron density spikes resulting from plasma flow catastrophes in relativistic plasma.

In experiments performed with the J-KAREN laser [3] we measured dependences of the harmonic yield on several parameters, including the gas jet density and laser pulse energy, and found a very steep dependence of the yield on the focal spot quality.

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2. A S. Pirozhkov, *et al*., "High order harmonics from relativistic electron spikes," *New J. Phys.* **16** (9), 093003-30 (2014).
3. H. Kiriyama, *et al.*, "High temporal and spatial quality petawatt-class Ti:sapphire chirped-pulse amplification laser system," *Opt. Lett.* **35** (10), 1497-1499 (2010).