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High harmonics and attosecond pulses emerging from laser filament[1]

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We have performed fully non-adiabatic calculations of filamentation self-compression and the generation of coherent XUV radiation via harmonic generation in argon at atmospheric pressure. We show that both the high-intensity laser pulse and the XUV radiation can be coupled out of the filament via a short pressure gradient, and that the XUV light emerges from the truncated filament as an isolated self-focused attosecond pulse with a peak intensity approaching 10^{11} W/cm^2. We show that the laser intensity in an ultrashort pulse filament can exceed the clamping intensity by more than a factor of three over several cm of propagation, and discuss that the XUV yield presents an excellent diagnostic of these intensity spikes because of its extremely nonlinear dependence on peak intensity.

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