

# Wavelength Scaling of High Harmonic Generation Efficiency

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**Synopsis:** We present a measurement of the dependence of xuv yield, from high harmonic generation, on laser wavelength. Parameters important to phase matching such as focusing geometry and mode quality were controlled and the measured HHG yield was normalized to the number of emitters in the interaction volume. We find that XUV yield scales as  $\lambda^{-6.3 \pm 1.1}$  in Xe and  $\lambda^{-6.5 \pm 1.3}$  in Kr at a constant laser intensity.

Using longer wavelength laser drivers for high harmonic generation is desirable because the highest XUV frequency scales as the square of the wavelength. Recent numerical studies predict that high harmonic efficiency falls dramatically with increasing wavelength, with a very unfavorable  $\lambda^{-(5-6)}$  scaling [1].

We performed an experimental study of the high harmonic yield over a wavelength range of 800-1850nm. A thin gas jet was employed to minimize phase matching effects, and the laser intensity and focal spot size were kept constant as the wavelength was changed.

Ion yield was simultaneously measured so that the total number of emitting atoms was known. By simultaneously measuring HHG and ionization we normalize to the number of emitters and isolate the single atom response.

We found that the scaling at constant laser intensity is  $\lambda^{-6.3 \pm 1.1}$  in Xe and  $\lambda^{-6.5 \pm 1.3}$  in Kr over the wavelength range of 800-1850nm, somewhat worse than the theoretical predictions. Our poster describes the experimental details, data analysis and results.

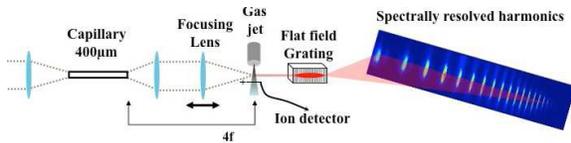


Fig. 1. Experimental layout.

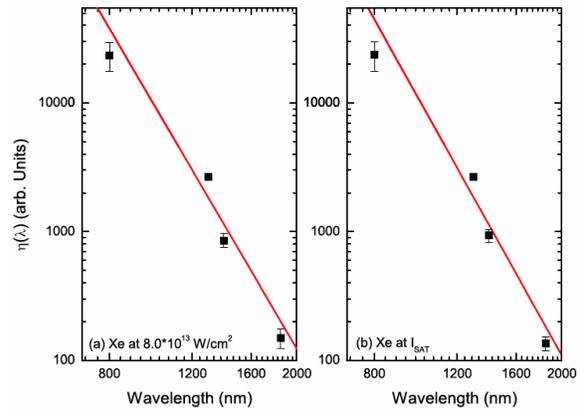


Fig. 2. Wavelength scaling of Xe.

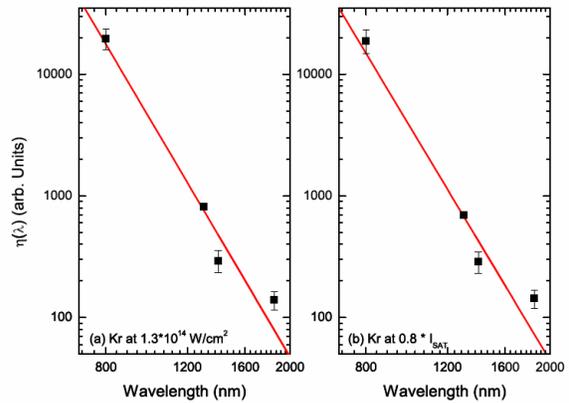


Fig. 3. Wavelength scaling of Kr.

## References

[1] J. Tate, T. Augustine, H. G. Muller, P. Salières, P. Agostini, and L. F. DiMauro, *Phys. Rev. Lett.* **98** 013901 (2007).

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