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Improving high harmonic generation conversion efficiency[1] M. SAYRAC, A. KOLOMENSKI, S. ANUMULA, Y. BORAN, G. KAYA, N. KAYA, H. SCHUESSLER, Texas A&M University — High harmonic generation (HHG) can produce coherent light in the XUV spectral region. However, the conversion efficiency from IR to XUV is low. Here we present two different approaches to optimize XUV signal at moderate laser intensities of $\sim 1.5\text{x}10^{14}\text{W/cm}^2$. The first approach is optimizing HHG by mixing two gases with significantly different ionization potentials (IPs), such as H_2 (15.4eV) and Ne (21.6eV). HHG in H_2 gas takes place first due to its low IP, inducing excited states and facilitating ionization and HHG in the Ne gas with high IP [1]. The second approach is to study how HHG in gases (argon, hydrogen) depends on pressure changes in the gas jet causing variations of the matching conditions and absorption [2]. To enable measurements over a wide range of pressures we employed differential pumping with an additional chamber ($\sim 20\text{cm}^3$ volume) enclosing the gas jet. By increasing the gas jet pressure up to a maximum of $\sim$ 1.5bar for Ar, and $\sim$ 0.5bar for H_2, we observed the increase of the HHs output until the pressure in the jet reached an optimum of $\sim$ 0.2bar for Ar, and $\sim$ 0.5bar for H_2. The implementation of the additional cell enclosing the gas jet allowed to get a tenfold improvement of the HHG output. We performed modeling of the observed dependences and obtained good agreement with experimental results.

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Muhammed Sayrac
Texas A&M University

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