高次高調波によるアト秒 X 線パルスの増幅
Amplification of X-ray attosecond pulses

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In 2019, as a continuation of our research performed in 2018, we have investigated the amplification of attosecond pulses in argon and in helium. The research is based on the single-electron numerical solution of the time-dependent Schrödinger equation (TDSE) for atomic processes in intense laser fields. The simulations that we performed in argon confirmed the amplification in the 25 - 50 eV photon energy region observed in the experiments. The simulations performed with helium as amplifying medium have provided interesting insight in the physical processes involved in the observed amplification around 100 eV far from the ionization threshold of helium. In particular, from our simulations it can be understood how having He^+ ions in excited states results in a decisive effect for parametric processes at high photon energies to be efficient in high-harmonic generation with helium. The results from our numerical simulations are therefore an important step for the understanding and realization of full coherent plasma X-ray lasers seeded by parametric amplified high-harmonics. An article reporting both theoretical and experimental results has been submitted to Phys. Rev. A, and an oral presentation on the results will soon be given at 2020 OSA High-brightness Congress.

発表論文（謝辞あり）

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2. C. Serrat, J. Seres, E. Seres, T-H. Dinh, N. Hasegawa, M. Nishikino and S. Namba, "Parametric attosecond pulse amplification from high order harmonic generation in He^+ far from the ionization threshold.", Phys. Rev. A Rapid Communication (under review).

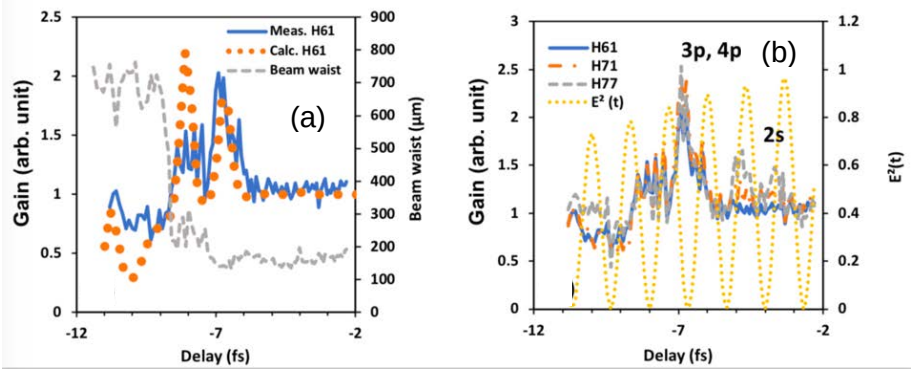

Figure: (a) Comparison of the measured and the calculated parametric gain together with the harmonic beam waist. (b) Measured gain dynamics at three harmonic lines: H61, H71 and H77.