

## Investigation of the ionization of neon by an attosecond XUV pulse with the time-dependent Schrödinger equation

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**Synopsis** We investigate theoretically the single ionization of neon by an attosecond XUV pulse, aiming at a better understanding of the outgoing electron wave-packet in the early stages of its detachment. To do so, we integrate the one-electron time-dependent Schrödinger equation numerically. The non-local interaction with the spectator electrons in the time-dependent hamiltonian is accounted for with a configuration-averaged effective Hartree-Fock potential.

Recent advances in attosecond XUV pulse generation pave the way for time-resolved investigation and control of electron wave-packets [1].

Fairly inert and simple, rare-gases offer good opportunities for exploring the new experimental techniques. A good example is the study of photo-electron spectra of rare-gases in streaking experiments where the effective asymptotic delay between the absorption of an XUV photon and the release of an electron by the atom is revealed [2]. The interpretation of this as well as of similar experiments often relies on single-particle models where the interaction of the photoelectron with the remaining electrons in the atom is approximated by a local static potential. The assumptions at the basis of these models, however, come with two major limitations: they do not account for the underlying many-electron processes which unfold on the same time-scale as the photoelectron emission, and they do not properly enforce the exclusion principle.

With the present contribution we tackle those issues. We investigate theoretically the single ionization of neon by an attosecond XUV pulse, aiming at a better understanding of the outgoing electron wave-packet in the early stages of its detachment. To do so, we integrate the one-electron time-dependent Schrödinger equation numerically where the interaction between the electron and external field, considered as classical, is treated at the level of the dipole approximation and where the non-local interaction with the spectator electrons in the time-dependent hamiltonian is accounted for with a configuration-averaged effective Hartree-Fock potential.

### References

- [1] F. Krausz and M. Ivanov 2009 *Rev. Mod. Phys.* **81** 163
- [2] M. Schultze *et al* 2010 *Science* **328**, 1658

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