

Atomic and Laser Physics Seminar

28th January at 11.30

In the Audrey Wood Seminar Room

Dr Agapi Emmanouilidou

(Department of Physics and Astronomy, UCL)

Host: Prof Justin Wark

Interaction of atoms and molecules with free electron lasers

ABSTRACT

We explore the formation of inner hollow states with two or three inner-shell holes in atoms and diatomic molecules by free-electron-laser radiation. For Ar, we find that even-charged Ar ion states can be more populated than odd-charged Ar ion states. This depends on the pulse intensity and the number of energetically accessible inner-shell holes [1]. Moreover, keeping the nuclei fixed we explore the interaction of N₂ with free-electron laser (FEL) pulses. We formulate rate equations for the energetically allowed molecular and atomic transitions and we account for dissociation through additional terms in the rate equations. Solving these equations for different parameters of the FEL pulse, allows us to identify the most efficient parameters of the FEL pulse for obtaining the highest contribution of double core hole states in the final atomic ion fragments [2]. Finally, we briefly discuss our numerical calculations for Ar to support a recent experiment that reports the observation of multiple ionisation of argon through multi-XUV-photon absorption induced by an unprecedentedly powerful laser driven high-order harmonic generation source [3].

- [1] A.O.G Wallis, H. I. Banks and A. Emmanouilidou, Phys. Rev. A 91, 063402 (2015).
- [2] H. I. B Banks, D. A. Little, J. Tennyson, and A. Emmanouilidou, Physical Chemistry Chemical Physics 19, 19794 (2017).
- [3] A. Nayak, et al. Phys. Rev. A 98, 023426 (2018).