Production of He-like ionic beams in both pure ground ($1s^2$) and mixed state ($1s^2$, 1s2s) with the use of Gas and Foil post-strippers for zero-degree Auger Projectile Electron Spectroscopy *

A. Laoutaris[1], I. Madesis[2,3], A. Dimitriou[2,3], A. Lagoyannis[3], M. Axiotis[3], E. P. Benis[4], T.J.M. Zouros[2,3]

[1]Dept. of Applied Physics, National Technical Univ. of Athens, GR 15780, Athens, Greece

[2]Dept. of Physics, University of Crete, GR 71003, Heraklion, Greece

[3]Tandem Accelerator Lab., INPP, NCSR Demokritos, GR 15310 Ag Paraskevi, Greece

[4]Dept. of Physics, University of Ioannina, GR 45110 Ioannina, Greece

The research initiative APAPES has established a new experimental station at the 5MV TANDEM of the NCSR "Demokritos" with a new beam line dedicated exclusively to atomic collisions physics research [1]. The experimental setup, developed for zero-degree Auger projectile spectroscopy, will perform high resolution studies of electrons emitted in ion-atom collisions at 0° with respect to the ionic beam direction. The apparatus consists of a hemispherical deflector analyzer, equipped with a 4-element zoom lens at its entry and a 2-dimensional position sensitive detector, together with a doubly-differentially pumped gas target. It is currently fully operational and used in performing systematic isoelectronic investigations of K-Auger spectra emitted from collisions of He-like ions with gas targets. Our goal is to provide a better understanding of the cascade feeding of the 1s2s2p ^{4}P metastable states produced in collisions of He-like and H-like ions with gas targets [2].

Our experimental measurements so far have been limited to electron capture to a mixed state ($1s^2$, 1s2s ^{3}S) 12 MeV C^{4+} ion beam generated at the terminal foil stripper. In order to perform measurements with both pure ground state as well as mixed state beams, it is necessary to incorporate: i) A terminal *gas* stripper [3], ii) A stripping point along the beam line after acceleration hosting both foil and gas (post) strippers. This also allows us to vary the fraction of metastable 1s2s ^{3}S component. The intensities of the expected beam charge states after stripping are calculated from a charge state analysis code using mainly the semi-empirical formulas of Nikolaev and Dmitriev [4] and Sayer [5] along with the beam energy, its characteristics (Z, atomic mass) and the incoming charge state.

A description of the characteristics and the operation principles of both gas and foil post- and terminal- strippers will be presented.

* Co-financed by the European Union and Greek national funds through OP: Education and Lifelong Learning, Research Program: THALES.

[1] I. Madesis *et al*., J. Phys. Conf. Ser. **583,** 012014 (2015)
[2] T.J.M. Zouros *et al* Phys. Rev. A **77**, 050701R (2008)
[3] E.P. Benis *et al.*, Phys. Rev. A **65**, 064701 (2002)
[4] I. S. Dmitriev *et al*., J. Exp. Theo. Phys. **47**, 615 (1964)
[5] R.O. Sayer Rev. Phys. Appl. **12**, 1543 (1977)