DETERMINATION OF THE EFFECTIVE SOLID ANGLE OF THE 1s2s2p ^{4}P METASTABLE AUGER DECAY IN FAST ION-ATOM COLLISIONS USING SIMION 8.1 IN A MONTE-CARLO TYPE SIMULATION

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The research initiative APAPES [1] has established a dedicated beam line for research on atomic collisions which is located at the 5MV TANDEM accelerator of the National Research Center "Demokritos" in Athens. The set up consists of a hemispherical deflector analyzer (HDA) with a 2-dimensional position sensitive detector (PSD) combined with a doubly-differentially pumped gas target.

Basic aim of this initiative is the investigation of the decay of the 1s2s2p ^{4}P metastable states formed in energetic He-like-ion-atom collisions by single electron capture. These states have long lifetimes (10^{-6} -10^{-9} s) and thus the projectile ions can Auger decay well after their excitation in the target area making the determination of the effective detection solid angle, which is necessary for the calculation of the absolute cross section, extremely difficult.

Here, we present Monte – Carlo type simulations, using the SIMION 8.1 package [2]. Random electron distributions in energy and emission angles were used to simulate the metastable Auger decay along the projectile ion trajectory, while the number of electrons detected at the PSD was recorded. Also included in these simulations for the first time are kinematic effects particular to Auger emission from fast moving projectile ions such as line broedening and solid angle limitations allowing for a more accurate and realistic line shape modeling.

Comparison with previously published data concerning metastable ^{4}P and prompt Auger projectile states formed by electron capture in collisions of 25MeV F^{7+} with H_2 and12.0 MeV C^{4+} with Ne [3] were found to be in excelent agreement.[4].

These results are important in the accurate evaluation of the 1s2s2p ^{4}P/^{2}P ratio of K-Auger cross sections who's observed non-statistical production by electron capture into He-like ions, recently a field of interesting interpretations [5], awaits further resolution.

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