The APAPES project at the tandem accelerator facility of "Demokritos":
A progress report

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The APAPES project (atomic physics with accelerators: projectile electron spectroscopy) has established in Greece the discipline of Atomic Physics with accelerators. The experimental setup is currently fully operational at the tandem accelerator facility of "Demokritos" [1]. The APAPES research interests are primarily focused on collision dynamics investigations by exploiting the possibilities offered by the metastable He-like (1s2s ¹³S) ion beams at collision energies of few MeV/u [2]. He-like beams are routinely delivered by tandem accelerators in a (1s² ¹S, 1s2s ¹³S) mixed-state content. However, our group has developed a technique that allows for determining the ion beam content and, in cases, even separating the contributions of the ground, 1s² ¹S, and metastable, 1s2s ¹³S, ion beam states, to the Auger projectile electron spectra [3,4]. Based on this, we have initiated a systematic isoelectronic investigation on: (a) The production of Li-like 1s2s(3S)nl²⁴L states by direct nl transfer and transfer-excitation processes. These studies, among others, shed light onto the long-standing controversy about the population enhancement of the 1s2s2p ⁴P state from higher lying quartet states through the selective cascade feeding mechanism [5,7]. (b) The production of 2s2p ¹³P hollow states by excitation, double excitation and transfer loss processes. Our experimental data are in accordance with state-of-the-art theoretical three-electron atomic orbital coupled channel calculations using the semi-classical close-coupling approach [8]. Here, experimental results to date will be reported, while the overall progress of the APAPES project and near future plans will be reviewed.

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References