

COMPTON IONIZATION OF ATOMS NEAR THRESHOLD AS A METHOD OF SPECTROSCOPY OF OUTER SHELLS

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Recently unique experiments have been carried out to measure the fully (FDCS) and single (SDCS) differential cross sections of Compton ionization of helium atoms near the threshold of single ionization [1]. The photon energy was about 2 keV, and the energy of the detected electrons did not exceed 10 eV.

An adequate theoretical description in this energy range can be carried out in the framework of the so-called A^2 approximations. The corresponding matrix element looks exactly like the usual first Born approximation (FBA) in the case of ionization of an atom by a fast particle (electron, proton, heavy ion). This analogy allows us to treat the process under consideration on a par with such well-known methods of spectroscopy of the outer shells of atoms and molecules as (e, 2e), (p, pe), etc. It should be noted that the contribution to the second-order matrix element of the term including two sequential dipole transitions is extremely small in this kinematic region, which makes Compton ionization a valuable spectroscopic tool.

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