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A Complete Relativistic Determination of Photoelectron Partial Wave Probabilities by Polarization Analysis of the Fluorescence from an Excited Argon Photoion[1] KENNETH MCLAUGHLIN, Loras College, ORHAN YENEN, DUANE JAECKS, TIMOTHY GAY, JOSHUA MACHACEK, University of Nebraska, JOHN FURST, University of Newcastle-Ourimbah — Following atomic photoionization, the angular momentum of the photoelectron is coupled with that of the residual ion. For excited states, the angular momentum of this photoion can be directly assessed via fluorescence polarimetry, thereby allowing the photoelectron partial wave probabilities to be determined with high resolution and efficiency. This determination is not limited to the orbital angular momentum of the photoelectron but also allows a full relativistic partial wave analysis. Using circularly-polarized ionizing radiation from threshold to 2 eV above, we have measured the circularly-polarized fluorescence in the collision plane as well as the linearly-polarized fluorescence above this plane, thereby allowing the complete determination of all three partial wave probabilities for the Ar $3p^6$ to Ar^+ $3p^4 4p \;\; {}^2F_{7/2} + \varepsilon\; d_{5/2},\; g_{7/2},\; g_{9/2}$ photoionization process.

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