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Are Electron Partial Waves Real[1] O. YENEN, D.H. JAECKS, J.R. MACHACEK, T.J. GAY, University of Nebraska-Lincoln, K.W. MCLAUGHLIN, Loras College — Experiments determining the partial wave content of electrons are uncommon. The standard approach to partial wave expansion of the wavefunction of electrons often ignores their spin. In this non-relativistic approximation the partial waves are labeled by their orbital angular momentum quantum number, e.g. d-waves. As our previous work has shown, this non-relativistic approximation usually fails for photoelectrons. Partial waves should be further specified by their total angular momentum. With d-waves for example, one would need to distinguish between $d_{3/2}$ and $d_{5/2}$ partial waves. Although energetically degenerate, fully relativistic $d_{3/2}$ and $d_{5/2}$ partial waves of photoelectrons have fundamentally different angular distributions. Using experimental and theoretical methods we have developed, we obtain partial wave probabilities of photoelectrons from polarization measurements of ionic fluorescence. We found that for selected states of the residual ion, there are energy regions where the photoelectron is in a single partial wave with predictable angular distributions.

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