TIME-OF-FLIGHT ANALYSIS OF HEMISPHERICAL DEFLECTION ANALYZERS

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The hemispherical deflector analyzer (HDA) has become increasingly popular in electron spectroscopy, due to several advantages including: i) superior energy resolution approaching the sub meV level, ii) the use of flexible transfer lens systems that can be operated in different modes, optimizing selectively transmission, spatial or angular resolution and iii) high efficiency by using a fast, high-resolution two-dimensional position sensitive detector. Recent interest in the use of the HDA has been generated primarily from fields such as angle-resolved photoemission spectroscopy and time-resolved-X-ray photoelectron spectroscopy. Here, we present simulations of time-of-flight distributions of HDAs as a function of the entry aperture size, the launching angle spread, and the spread in energy for several pass energies. The theoretical background is summarized based on the Kepler orbit equation of an ideal field HDA and new results in the time spreads are presented in closed form analytic results.