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Relativistic,>1MeV, photoelectrons from the single atom response of Ar and Xe to a 10^{19}W.cm^{-2} laser field ISAAC GHEBREGZIABHER, ANTHONY D. DICHIARA, ROB SAUER, JANE WAESCHE, SASI PALANIYAPPAN, BRUCE WEN, BARRY C. WALKER, Department of Physics and Astronomy, University of Delaware, Newark, Delaware 19716 — We measured photoelectron products, with a dynamic range of four orders of magnitude, from the single atom photoionization of argon and xenon exposed to relativistic laser intensity, 10^{19}W/cm^{-2}. The highest detected photoelectron energies from ionization in a circularly polarized laser field are 1.2MeV and 1.3MeV for Ar and Xe atoms respectively. The measurements show different photoelectron energy spectra for Ar and Xe. The spectrum for Ar drops rapidly by three orders of magnitude over the energy range from 0 to 250KeV. Beyond this range, the spectrum exhibits a broad local maximum at about 550KeV and extends out to 1.2MeV.The spectrum for Xe doesn't show local maximum, instead the spectrum drops by only three orders of magnitude over the entire range from 0 to 1.3MeV. Intensity dependent measurements show that photoelectrons with energies out to $5U_p$, where U_p is the nonrelativistic ponderomotive energy, are observable. Azimuthal distribution measurements from photoionization in a linearly polarized light show directional high energy electrons and isotropic low energy electrons.

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