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Photo Double Ionization of Helium Atoms beyond the Dipole Approximation TH. WEBER, M.S. SCHOEFFLER, A. BELKACEM, Lawrence Berkeley National Laboratory, R. DOERNER, T. JAHNKE, University of Frankfurt, A. LANDERS, Auburn University, C.L. COCKE, Kansas State University — This work tries to unravel the emission patterns and ionization mechanisms of highly correlated electrons in the simplest atomic many-body system (Helium) at high photon energies (900eV). We try to answer the following questions: 1.) Is there a third ionization mechanism beyond shake-off and knock-off, as predicted 30 years ago by Amusia et al., the quasi free (or equal energy sharing) mechanism? 2.) At which energies does the dipole approximation break down? So far all experiments have been done in an energy range where non-dipole effects are small. Accordingly, most of the advanced theories have restricted themselves to the dipole approximation. Hence, one objective of this experiment was to provide the first experimental data sensitive to non-dipole contributions to the two electron continuum. The goal was to gain a deeper understanding of the initial ground state of the simplest many-particle system helium. Moreover we were looking for a back-to-back-emission of the electrons, which would implicate a break down of the dipole-approximation and which would indicate processes where single photons couple to both electrons simultaneously via quadrupol transitions.

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