The double- and triple-photoionization process in which two (or three) electrons are simultaneously emitted from an atom is of fundamental importance for the understanding of electron correlation. The triple-to-single photoionization ratio is a convenient way to quantify this correlation and to investigate its photon energy dependence. Many experimental and theoretical investigations have dealt with double photoionization with a strong emphasis on helium, while the study of triple photoionization (i.e., simultaneous emission of three electrons) has been lagging behind mainly due to its small cross section and the possible presence of sequential processes. Early investigations of the triple ionization process concentrated on the threshold region of oxygen and neon as well as neon and argon. However, the prime candidate for studying triple photoionization is lithium, which becomes a bare ion after triple ionization takes place. Since it has only three electrons, sequential processes (autoionization) can not contribute to the triple-ionization cross section. The first (and only) triple photoionization experiments with lithium have been performed in the late 1990s [1,2] and theoretical investigations followed. Noteworthy here is that so far the only other experimental triple ionization study of Li was done by electron impact using a 1000-eV impact energy [3].

Previous photoionization measurements were performed at photon energies below 424 eV with rather large error bars above 300 eV. In order to investigate the high energy behavior of the triple photoionization process we have taken data with greatly reduced statistical errors in the 300 to 420 eV range and significantly extended the energy range up to 650 eV. We compare our data to recent theoretical calculations and predicted high-energy limits [4].

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References: