Recoil effects due to electron shake-off following the beta decay of $^6$He$^1$ GORDON W.F. DRAKE, EVA SCHULHOFF, University of Windsor — There are currently several experiments in progress to search for new physics beyond the Standard Model by high precision studies of angular correlations in the $\beta$ decay of the helium isotope $^6$He to form $^6$Li + $e^- + \bar{\nu}_e$ [1,2]. After the $\beta$ decay process, the atomic electrons of $^6$Li$^+$ adjust to the sudden change of nuclear charge from 2 to 3. We calculate the probabilities for electron shake-up and shake-off, including recoil effects, by the use of a Stieltjes imaging representation of the final states. A variety of sum rules provides tight consistency checks on the accuracy of the results. Results obtained previously [3] indicate that there is a 7$\sigma$ disagreement between theory and experiment for the additional nuclear recoil induced by the emission of atomic shake-off electrons. This disagreement will be further studied, and the results extended to the $1s2p\; ^3P$ and metastable $1s2s\; ^3S$ states as initial states of $^6$He before $\beta$-decay.


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