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POS-J101 – Constraining contributions from Kr-85 in DEAP-3600

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DEAP-3600 is a liquid argon detector designed to directly detect dark matter by searching for nuclear recoil (NR) events caused by elastically scattered weakly interacting massive particles, a prime candidate for dark matter. Pulse-shape discrimination properties of the argon allow for significant separation between electromagnetic recoil (ER) events and NR events. The majority of the events in the ER spectrum are beta decays of Ar-39, which is an isotope naturally present in argon. Several efforts are underway to study the Ar-39 spectrum in DEAP-3600. In order to perform these studies, we must have an extensive understanding of the possible background in the ER spectrum. A possible background contribution to this spectrum are events from Kr-85, a radioactive isotope that can potentially bypass the purification methods used to fill the detector with argon. Trace amounts of Kr-85 are produced in the atmosphere via interactions with cosmic rays and Kr-84, which could be present in atmospheric argon. Given that the beta spectrum endpoint (Q-value) of Kr-85 is slightly higher than Ar-39, excess events in the region just above the Q-value of Ar-39 are expected if there is any contamination by Kr-85. A full spectrum fit was done to search for potential contributions from this isotope.

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