Charge States of $^{229m}$Th: Path to Finding the Half-Life$^1$ MOLLY WAKELING, Washington State University, JASON BURKE, Lawrence Livermore National Laboratory, TIMOTHY CORDEIRO, United States Air Force Academy, GRANT SALK, Rochester Institute of Technology — $^{229}$Th nuclei created from the alpha decay of $^{233}$U were studied using the Time of Flight (TOF) technique by measuring the time difference between alpha particle detection by a silicon detector and $^{229}$Th recoil nuclei detection by a multi-channel plate detector (MCP). The experiments proved that the recoiling $^{229}$Th nuclei were produced in the 1+ and greater charge states. This implies that $^{229m}$Th will decay by bound internal conversion, emitting photons that can be detected to measure the half-life of this isomeric state, which is currently unknown. The charge states were observed by measuring the TOF of nuclei coming from an electroplated $^{233}$U (0.2 $\mu$Ci, areal density 0.006 mg/cm$^2$) source in vacuum.

$^1$This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.