Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Search for optical emission from the Th 229m low-lying nuclear state RANDY KNIZE, MARK LINDSAY, MATTHEW ROTONDARO, US Air Force Academy — We conducted an experiment to measure the energy and lifetime of the VUV optical transition from the Th 229m nuclear excited state to the ground state (transition energy estimated to be 7.8 eV). Many groups over the past decades have attempted to spectroscopically detect this lowest energy nuclear excited state. If its lifetime is long as expected, this state could function as a very isolated long coherence time qbit, and it could be extremely important as an ultra-narrow clock transition for time metrology. We used a 15 nm thick film of highly purified U 233 source to implant Th 229m ions in the surfaces of substrates of CaF2, MgF2, and sapphire. We measured the time decay over 15 hours of the resulting VUV fluorescence and phosphorescence photons, with energy resolution provided by a series of bandpass interference filters over a range of 140 to 240 nm. We also measured photons coming from the implanted Th without time delay, as a function of the energy. These results are compared with a control experiment having the Th ions blocked by thin films, but the large background of alphas and betas still let through.

Mark Lindsay
US Air Force Academy

Date submitted: 01 Feb 2019 Electronic form version 1.4