A titanium transition-edge sensor for the in-situ detection of individual He$_2^*$ excimers in superfluid helium\textsuperscript{1} FAUSTIN CARTER, SCOTT HERTEL, CATHERINE MATULIS, MICHAEL ROOKS, DANIEL MCKINSEY, DANIEL PROBER, Yale University — Incident radiation can excite superfluid helium into a diatomic He$_2^*$ excimer, which decays through the emission of a 15 eV photon. Such excimers have been used as tracers to measure the superfluid’s quantum turbulence, thanks in part to the long half-life of the He$_2^*$ triplet state ($\sim$13 seconds). However, the efficient detection of single or a few excimers remains a challenge. We present a detector capable of in-situ detection of the He$_2^*$ excimers either directly (the excimer collides with the detector), or by collecting the 15 eV photon emission upon decay. This detector is based on a titanium superconducting transition-edge sensor (TES), with an energy resolution of 1.5 eV fwhm, coupled to an aluminum absorber. The TES is designed to operate from 20-300 mK in a dilution refrigerator. We will discuss operating characteristics of the detector and present preliminary data for detection of individual excimers.

\textsuperscript{1}We acknowledge support from YINQE, NSF MRSEC DMR-1119826, and NSF DMR-1007974.