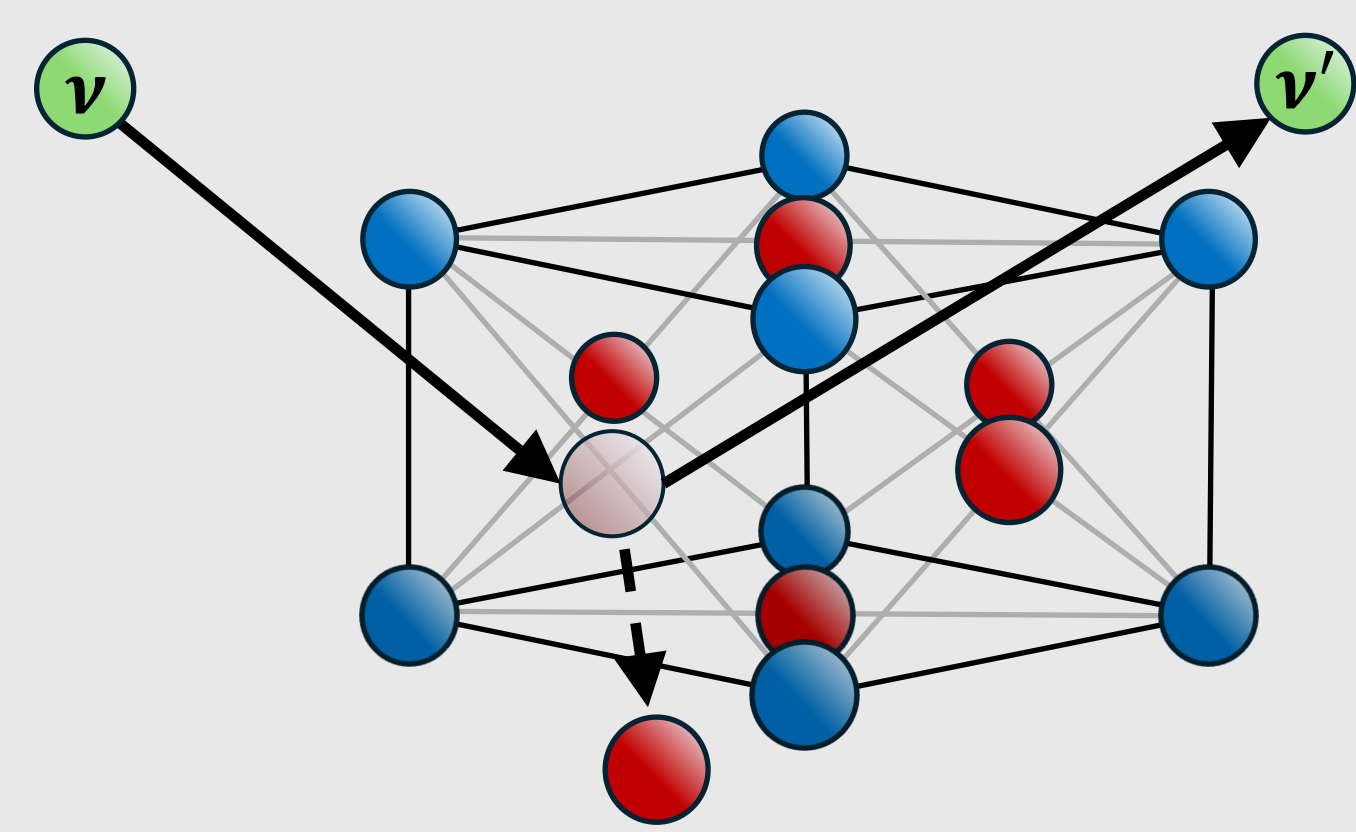


A Passive Detector for Observing Reactor CEvNS via Nuclear Recoil-Induced Crystal Defects

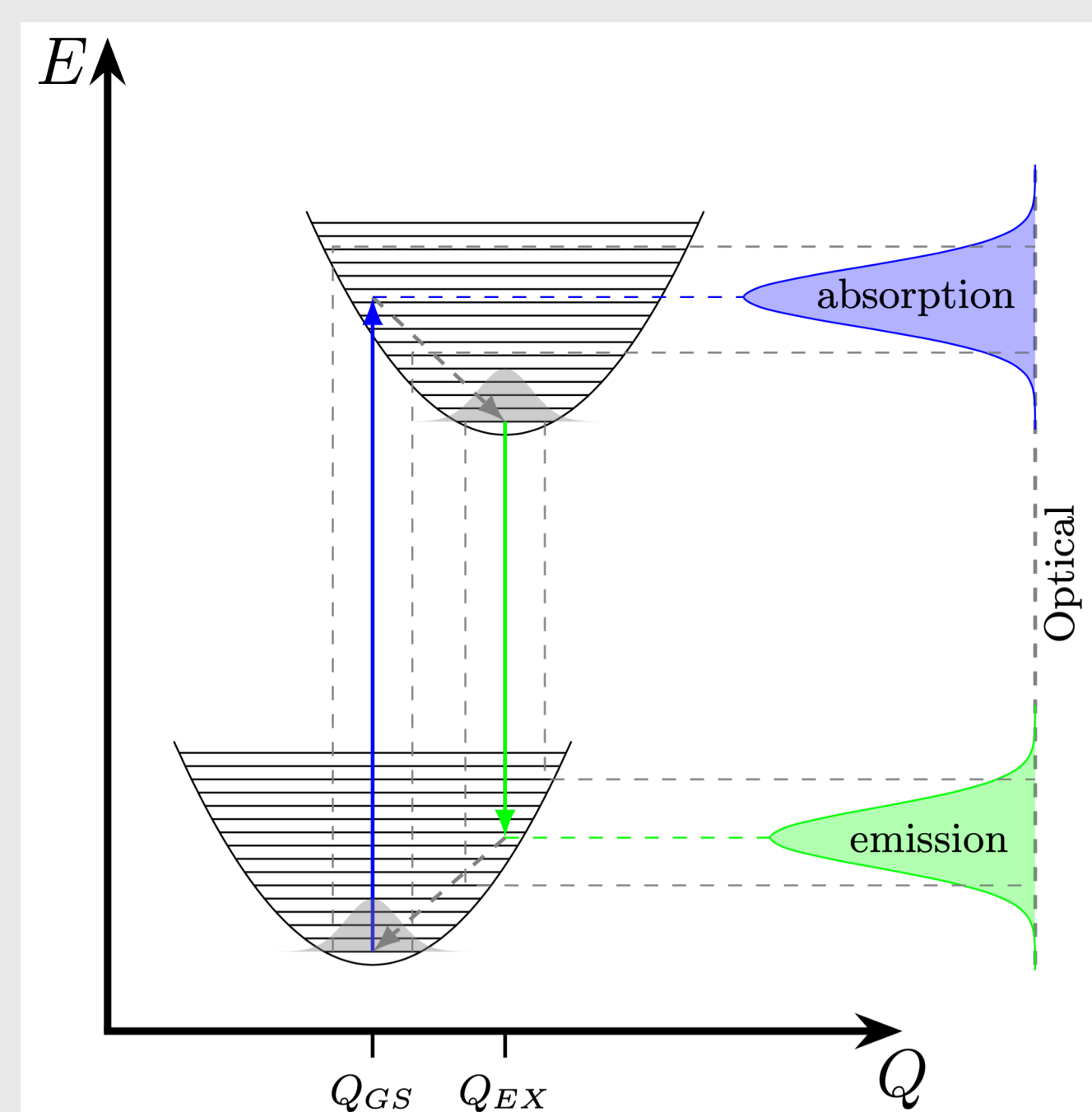
Samuel Hedges, Patrick Huber
Virginia Tech



Nuclear Recoil-Induced Crystal Damage



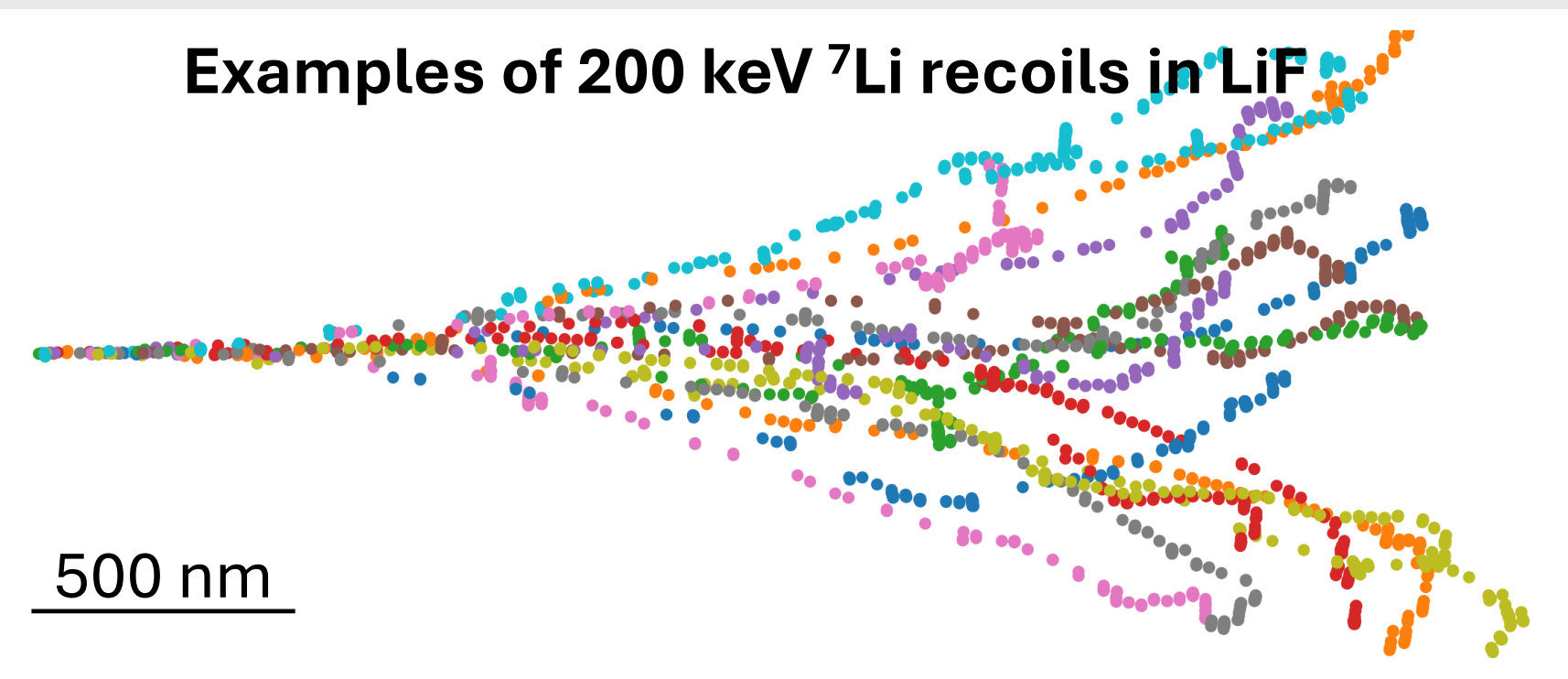
Coherent elastic neutrino-nucleus scattering (CEvNS) can induce **persistent damage** to a crystal lattice.



M. G. Perez, et al., *J. Appl. Phys.* **137**, 244401 (2025)

Produced vacancies can trap electrons, forming **optically-active color centers**.

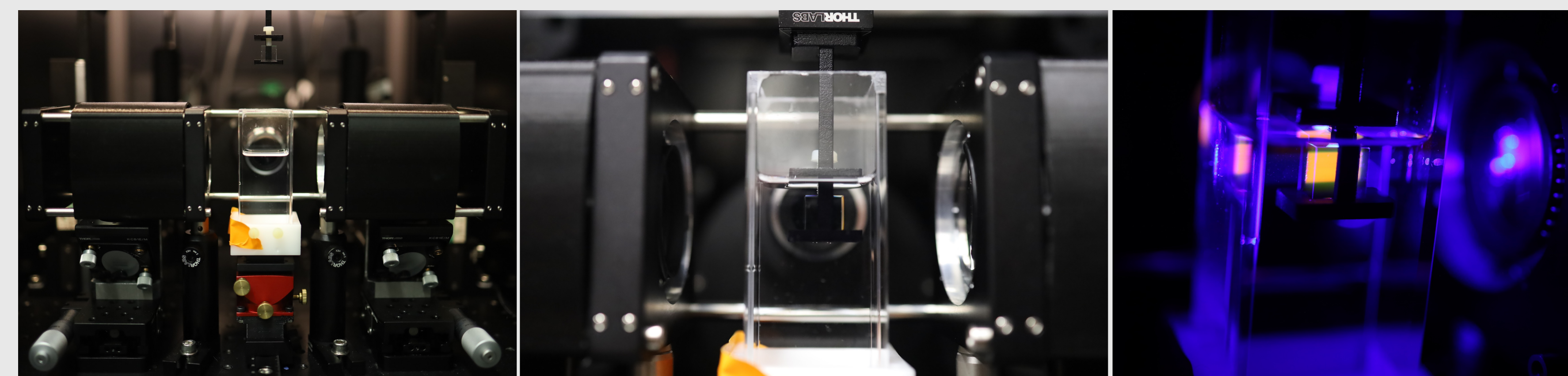
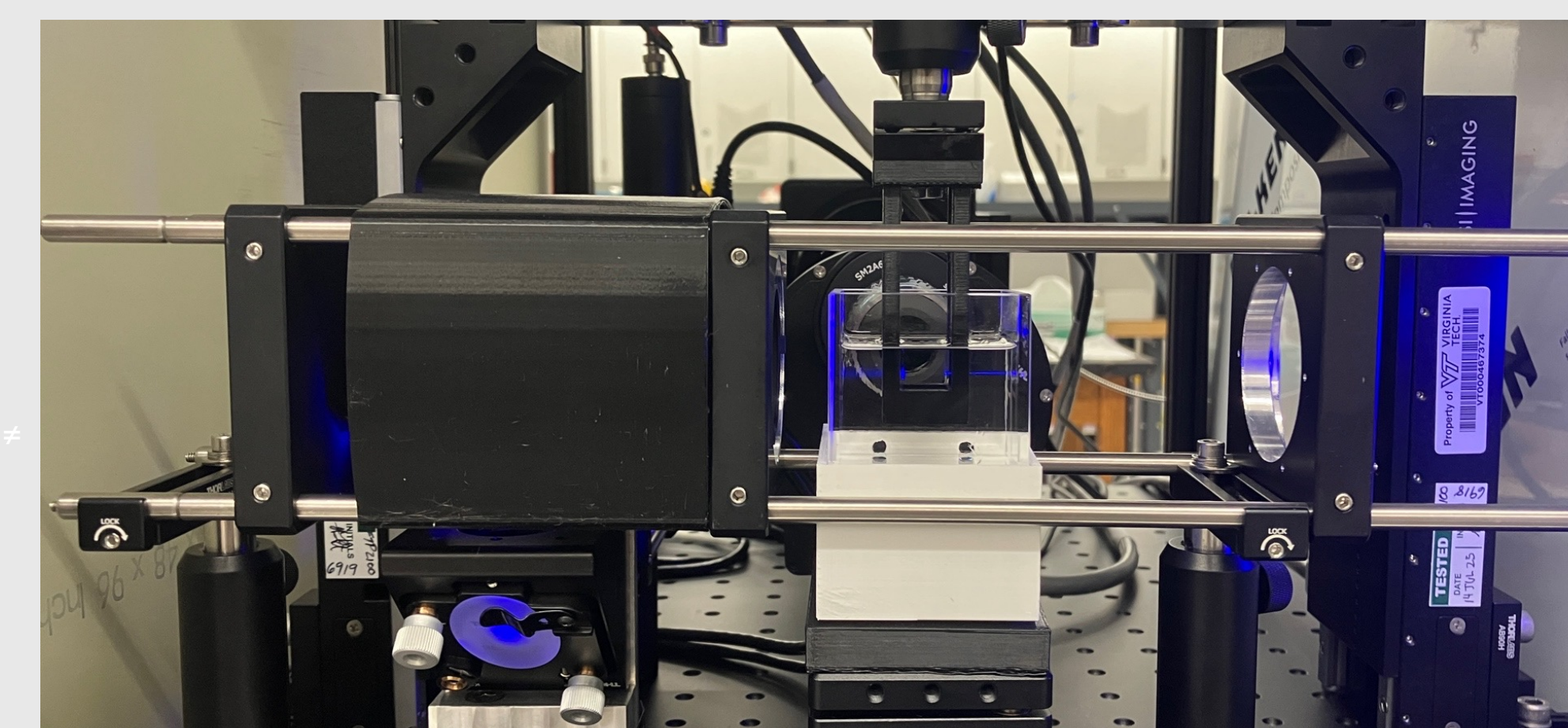
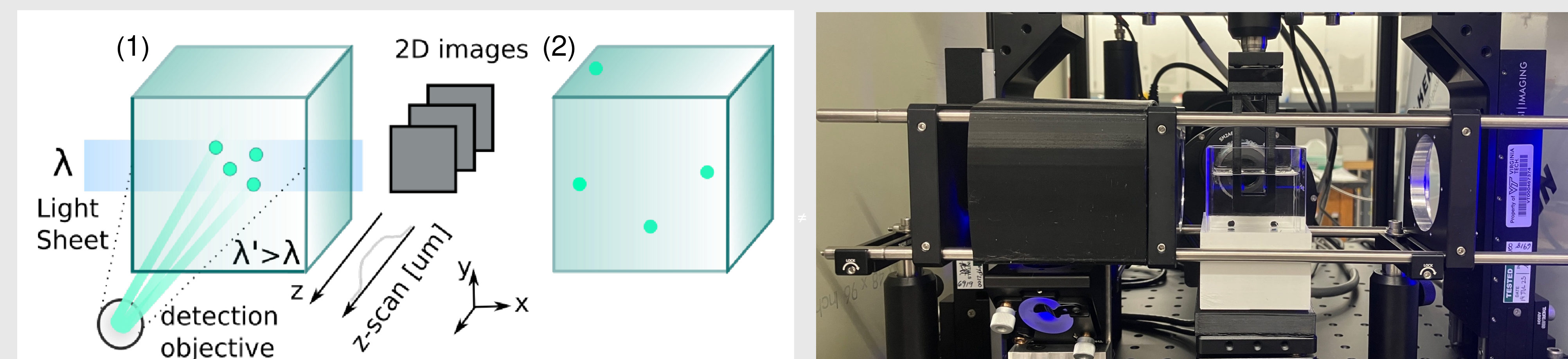
Examples of 200 keV ${}^7\text{Li}$ recoils in LiF



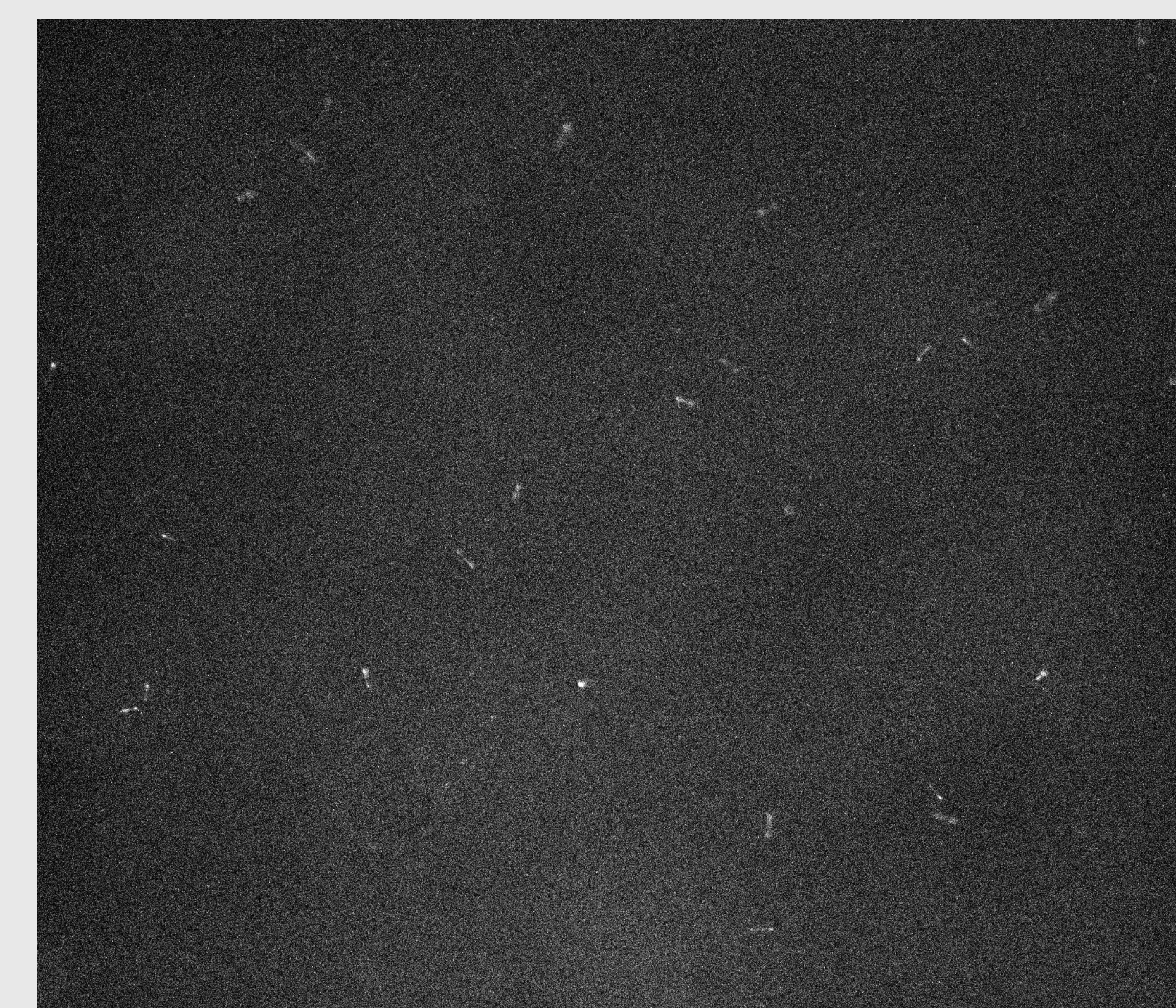
Recoiling nucleus can create additional defects, forming **fluorescent damage tracks**.

Fluorescent Light-Sheet Microscopy

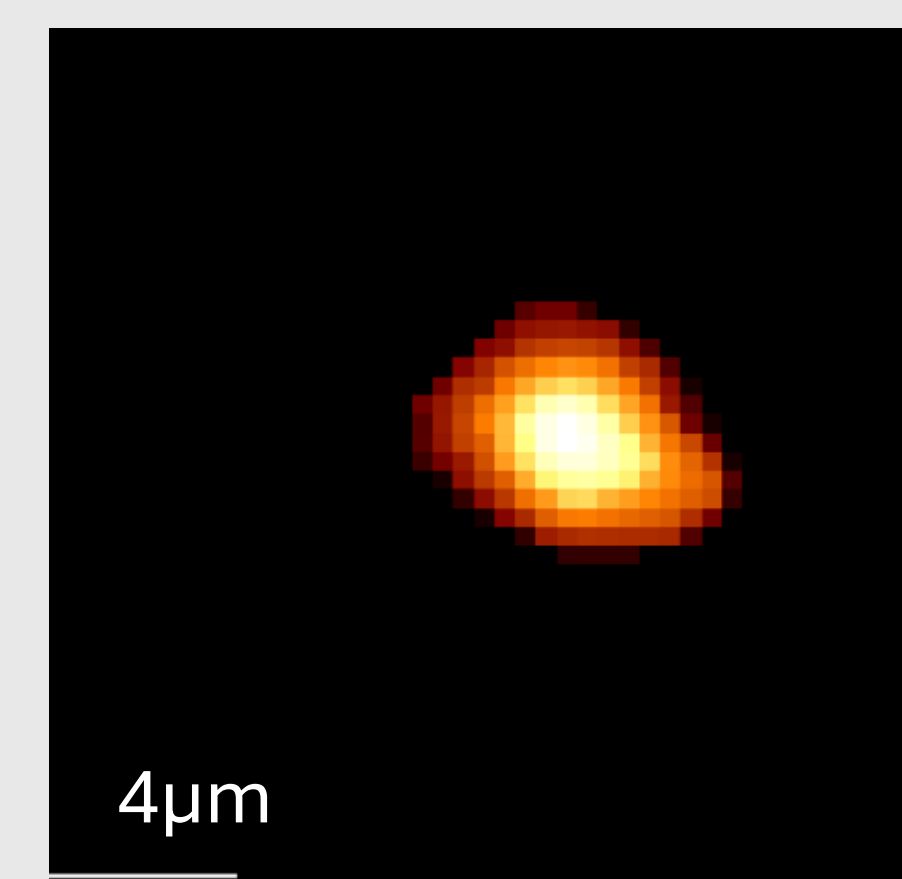
Goal: Detect CEvNS-induced nuclear recoils in LiF using fluorescent light-sheet microscopy



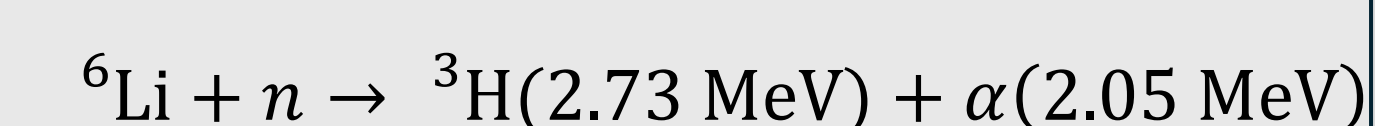
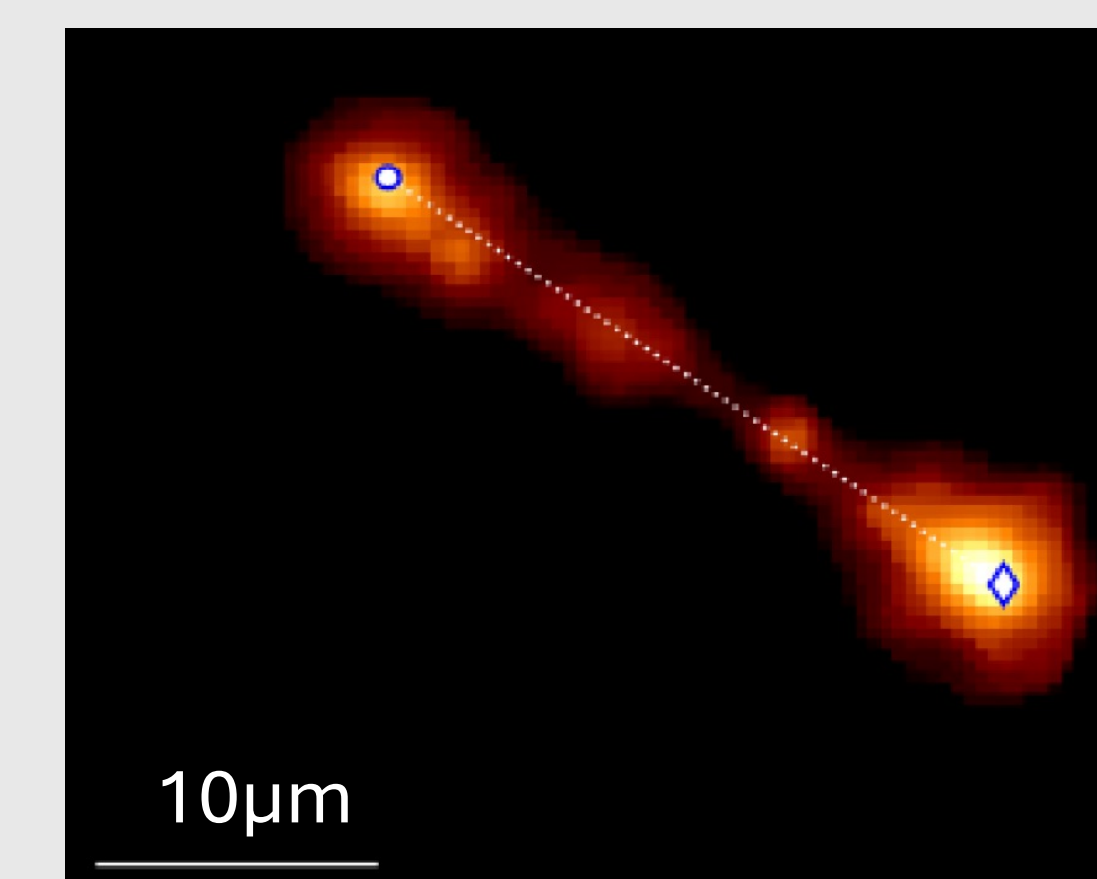
mesoSPIM Data



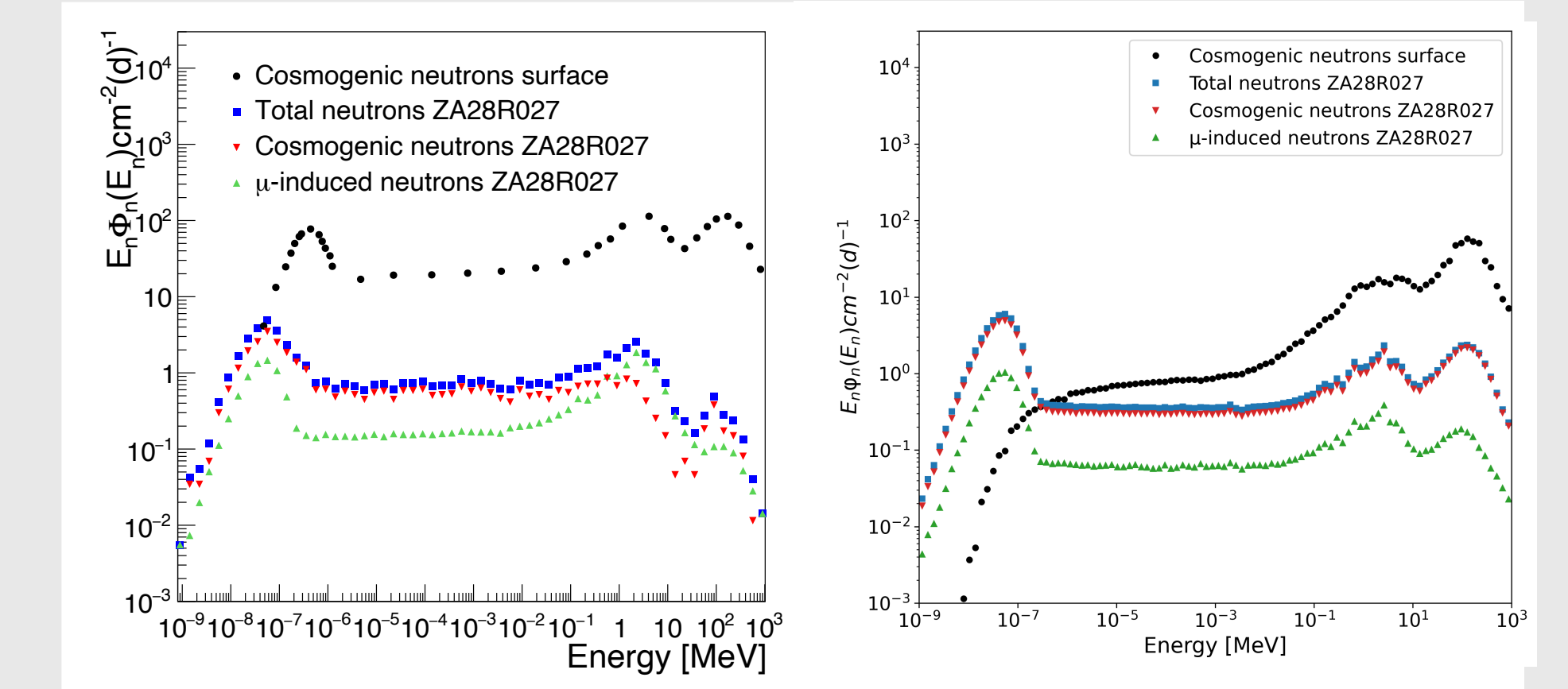
Fast elastic scatter



Thermal neutron capture on ${}^6\text{Li}$



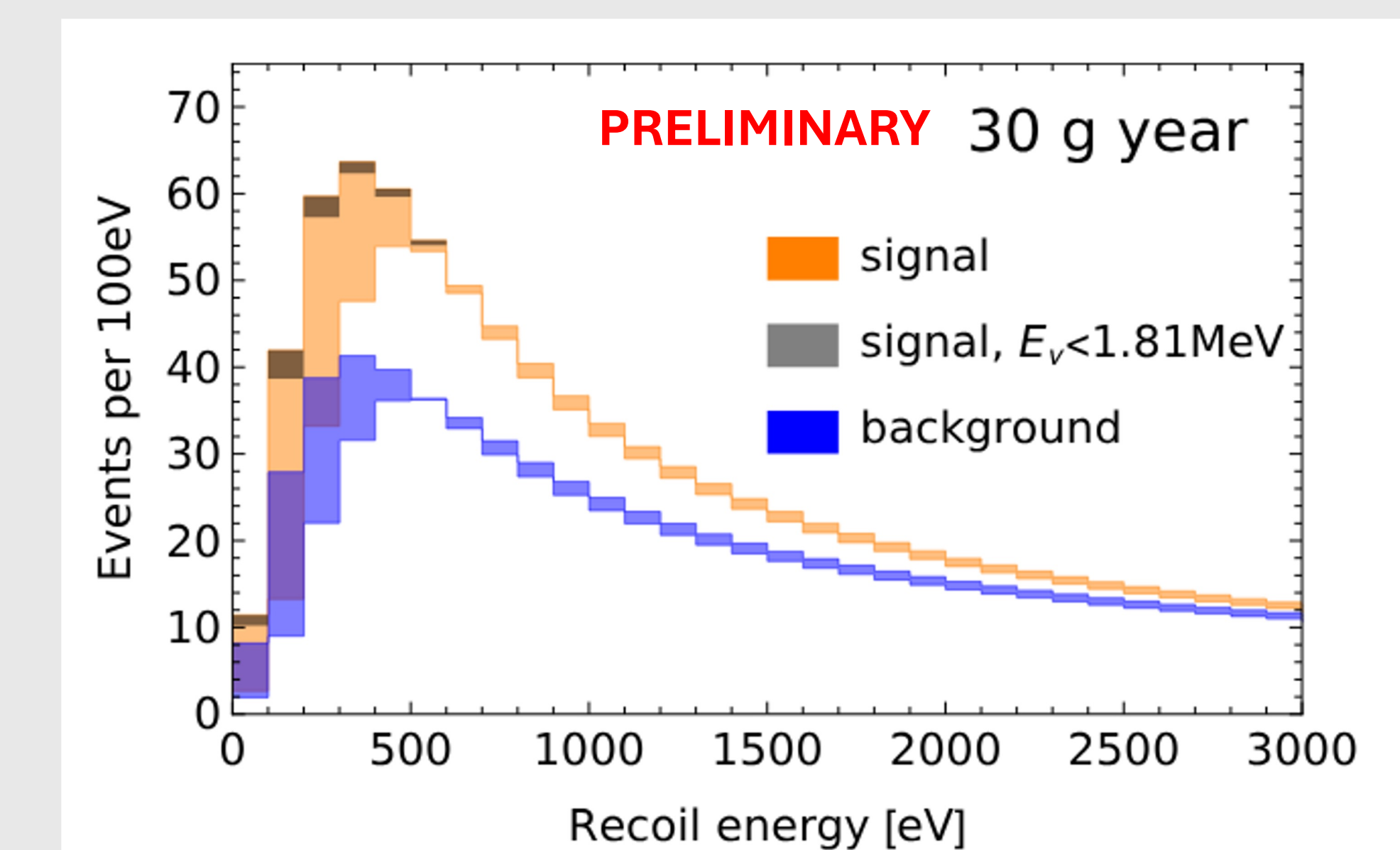
Background Simulation



E. Sánchez García, et al., *Eur. Phys. Jour. C* **85**, 465 (2025)

Geant4 + CRY sim with simplified geometry.

Signal Predictions



Acknowledgements

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