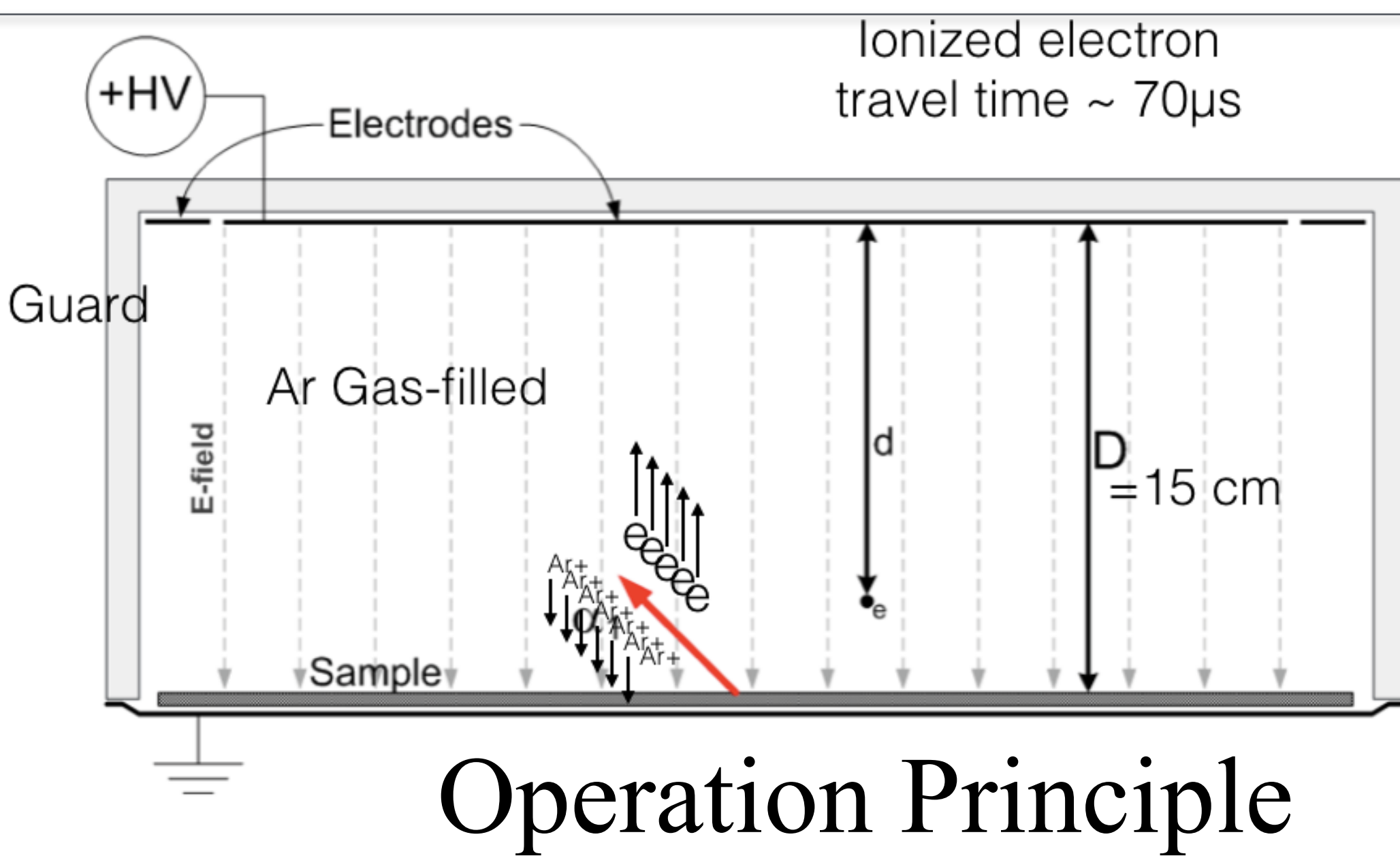
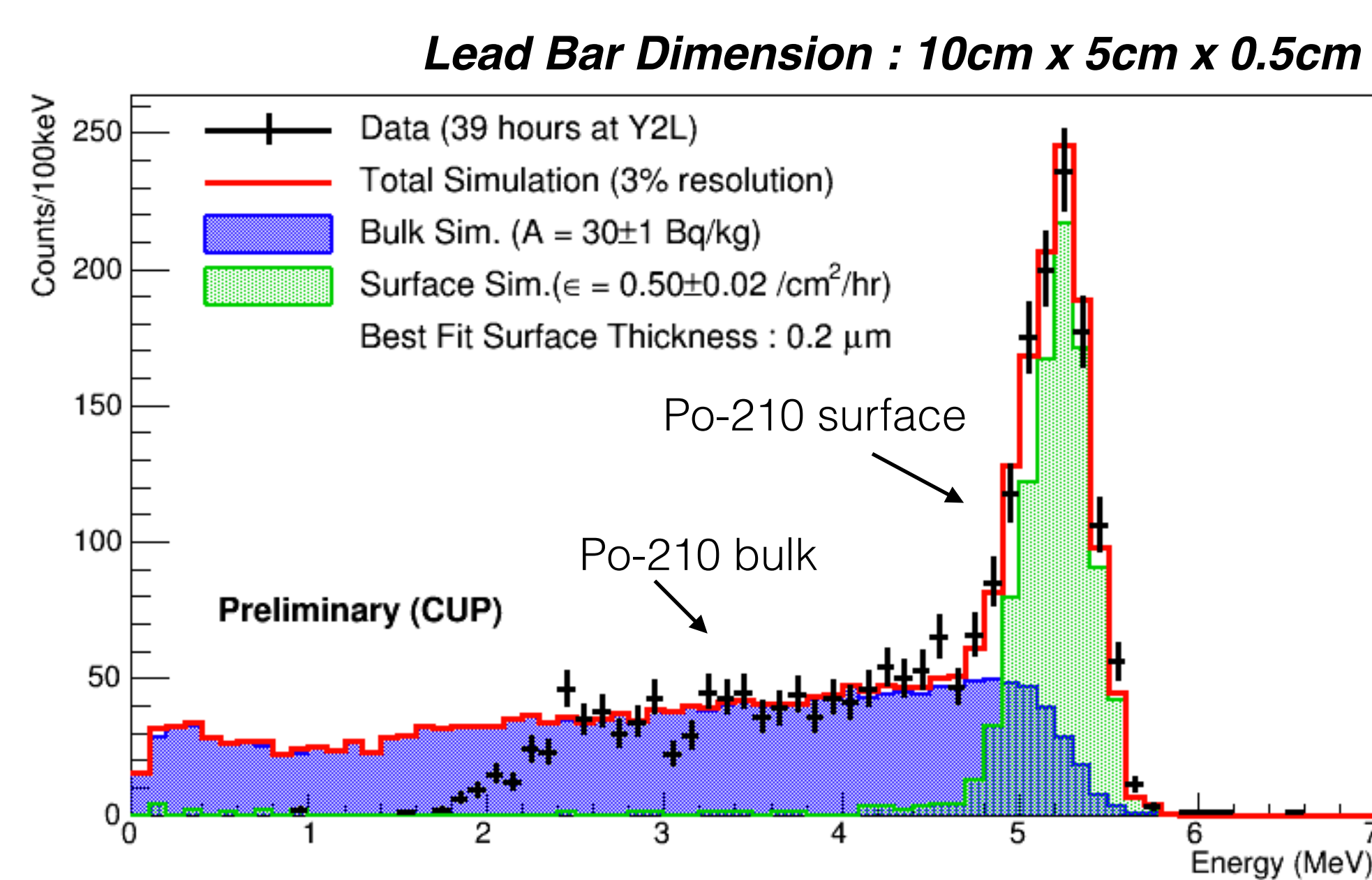
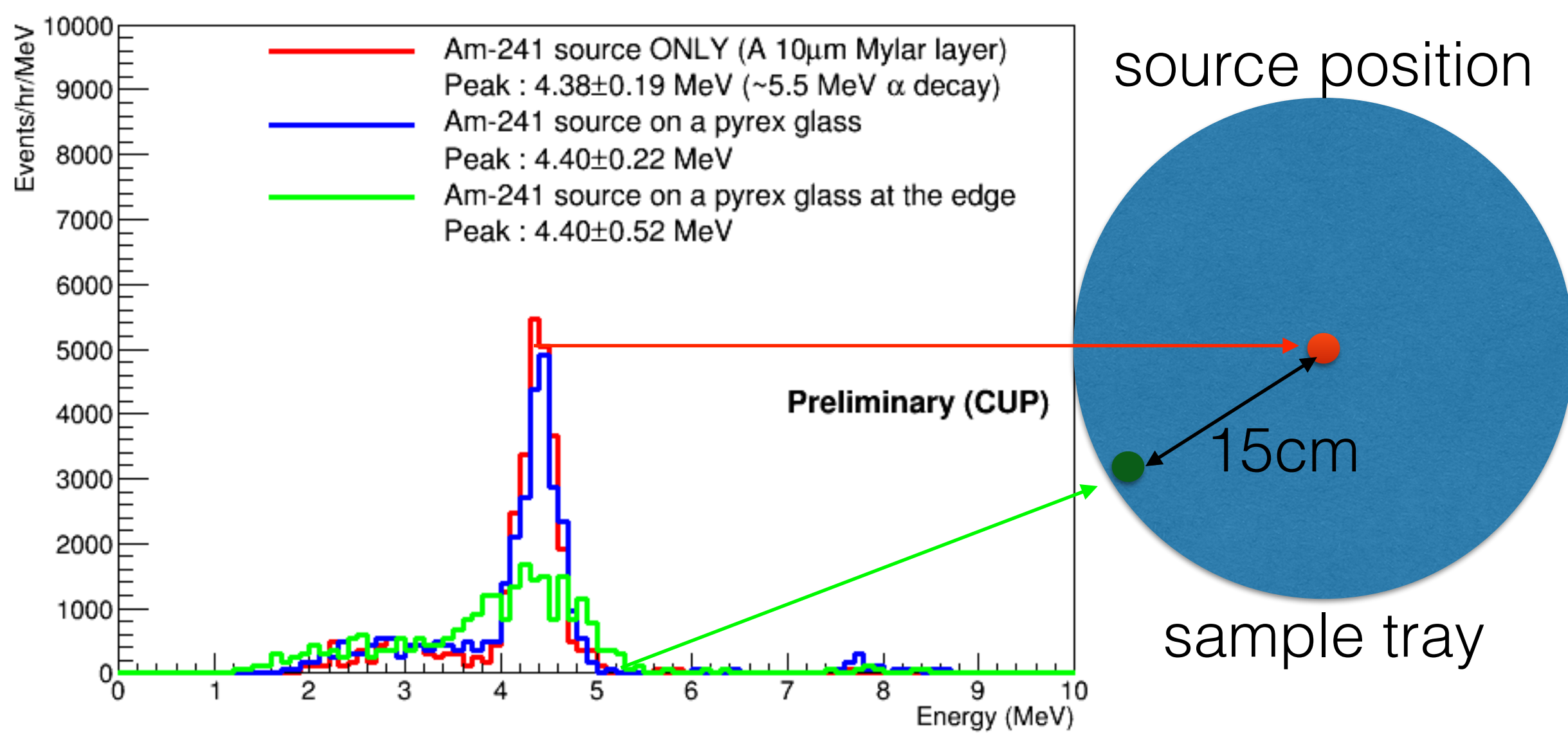


Chang Hyon Ha, Moo Hyun Lee, Hyun Su Lee, Govinda Adhikari, Pushparaj Adhikari, Jungsic Park,
Douglas Leonard, Stefen Lars Olsen, and Yeongduk Kim
Center for Underground Physics (IBS), Korea

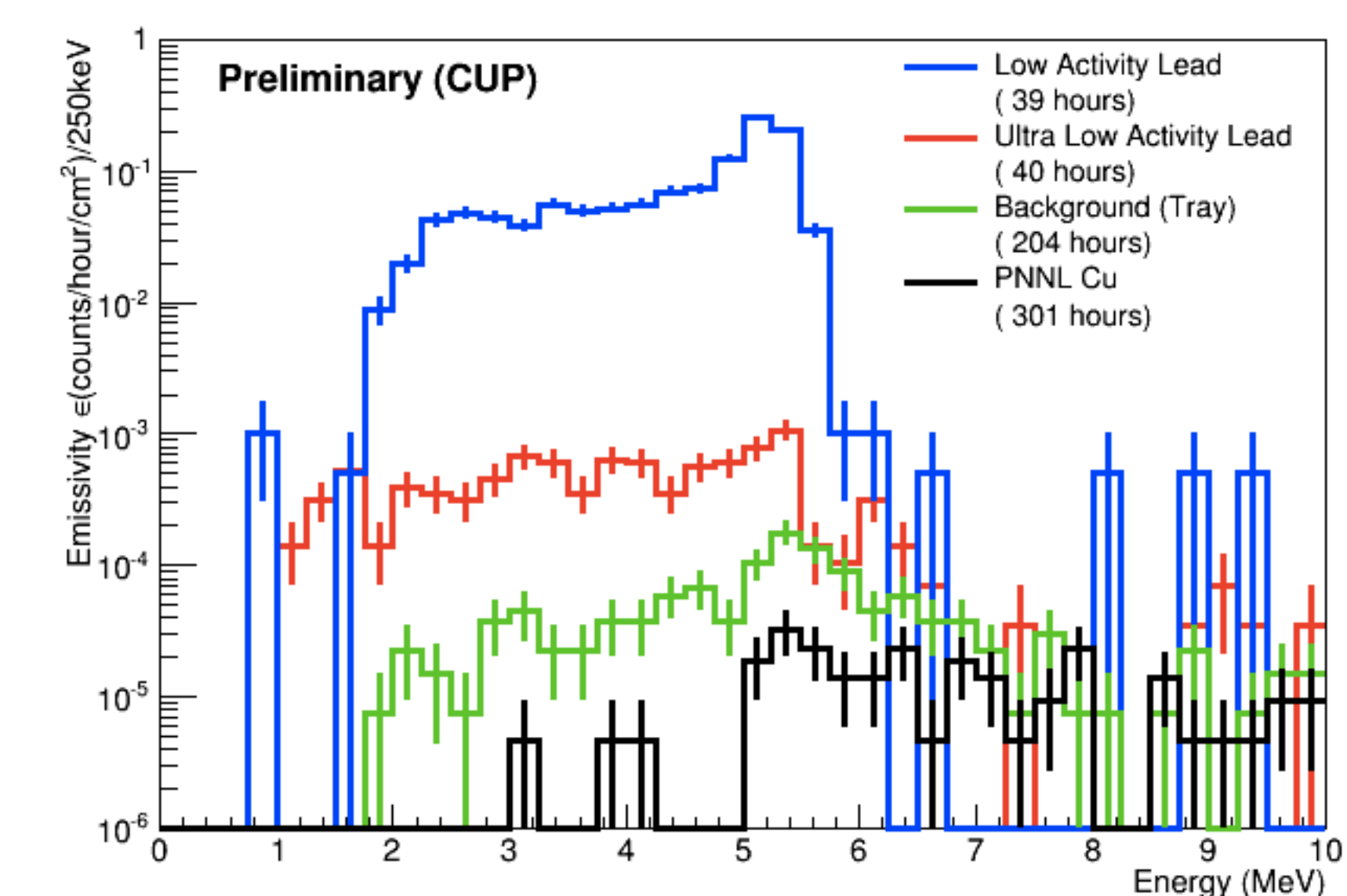
A high-sensitivity ionization detector for measuring alpha particles in a laminar sample has been operating in the Yangyang underground laboratory. The alpha counter is used to assay detector materials, especially their surface contamination, for the COSINE dark matter experiment and the AMoRE double beta decay experiment. Using distinct rise time, this instrument describes characteristic signals from ionization electrons produced from the sample tray and veto those from other sources. The detector can reach a sensitivity as low as $0.0001 \text{ count/cm}^2/\text{hr}$. In this presentation, in addition to the low-background measurements, surface alpha measurements with various treatments such as cleaning and artificial contamination are reported.



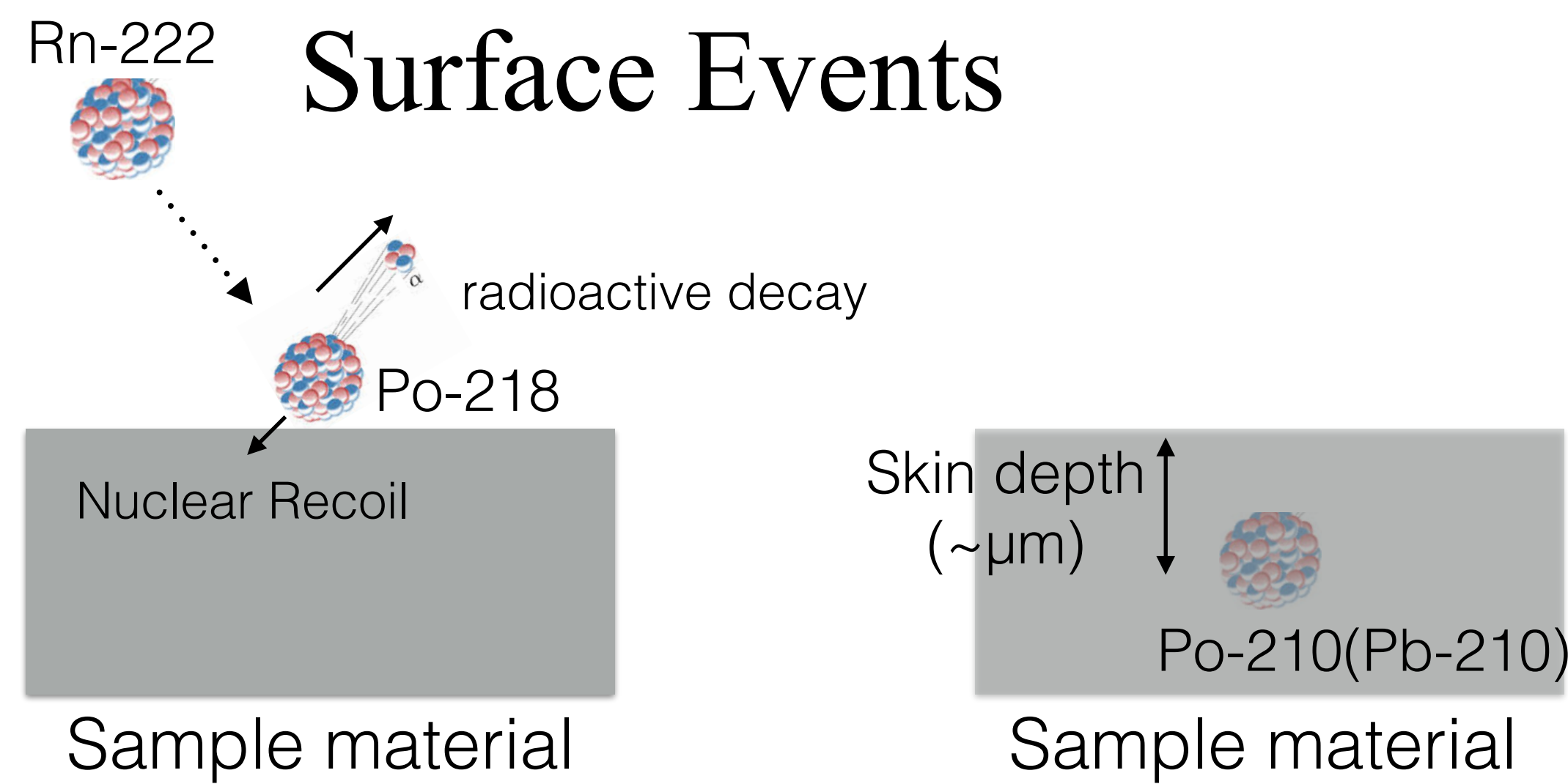
Calibration



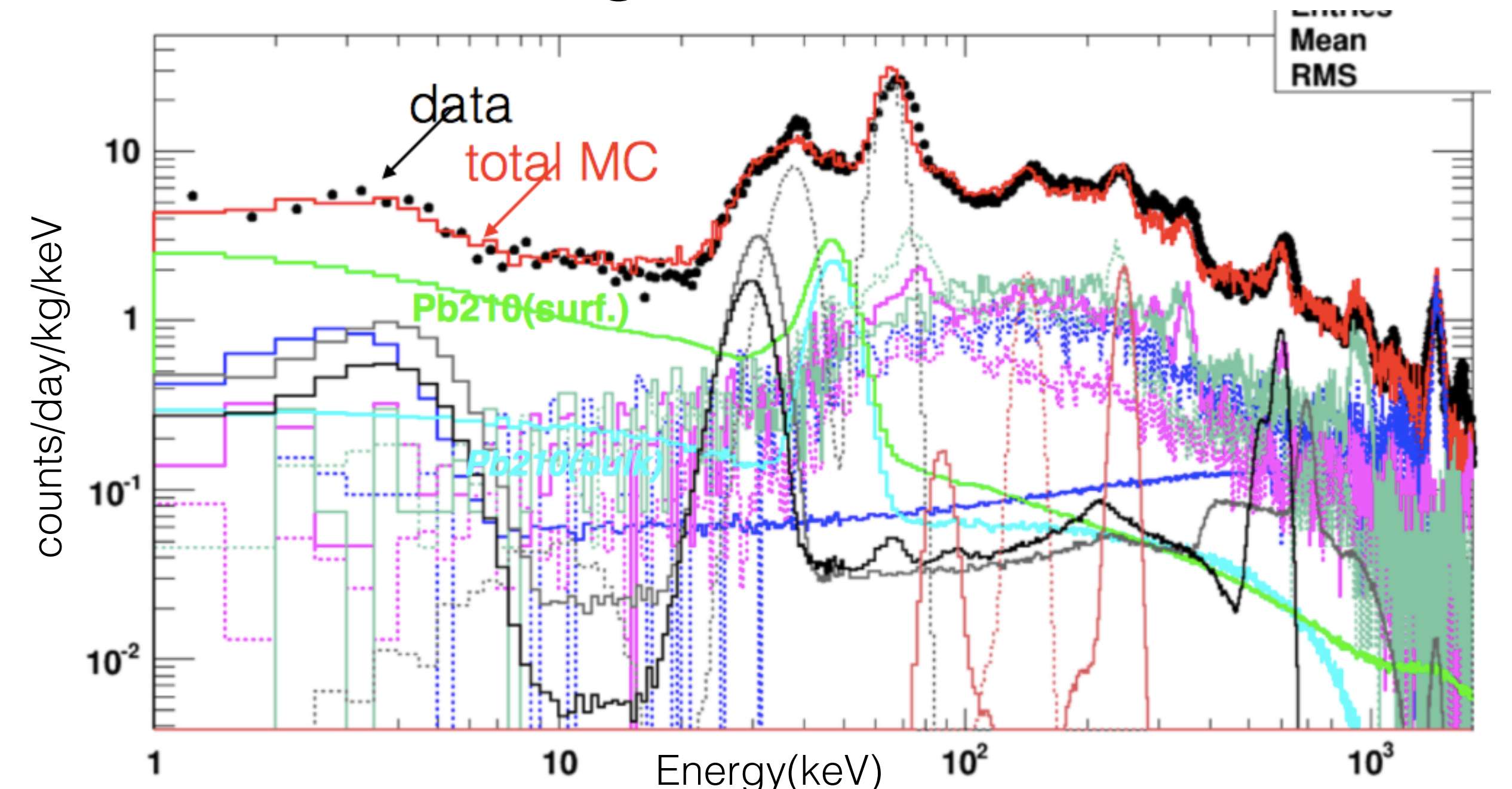
Low activity measurements



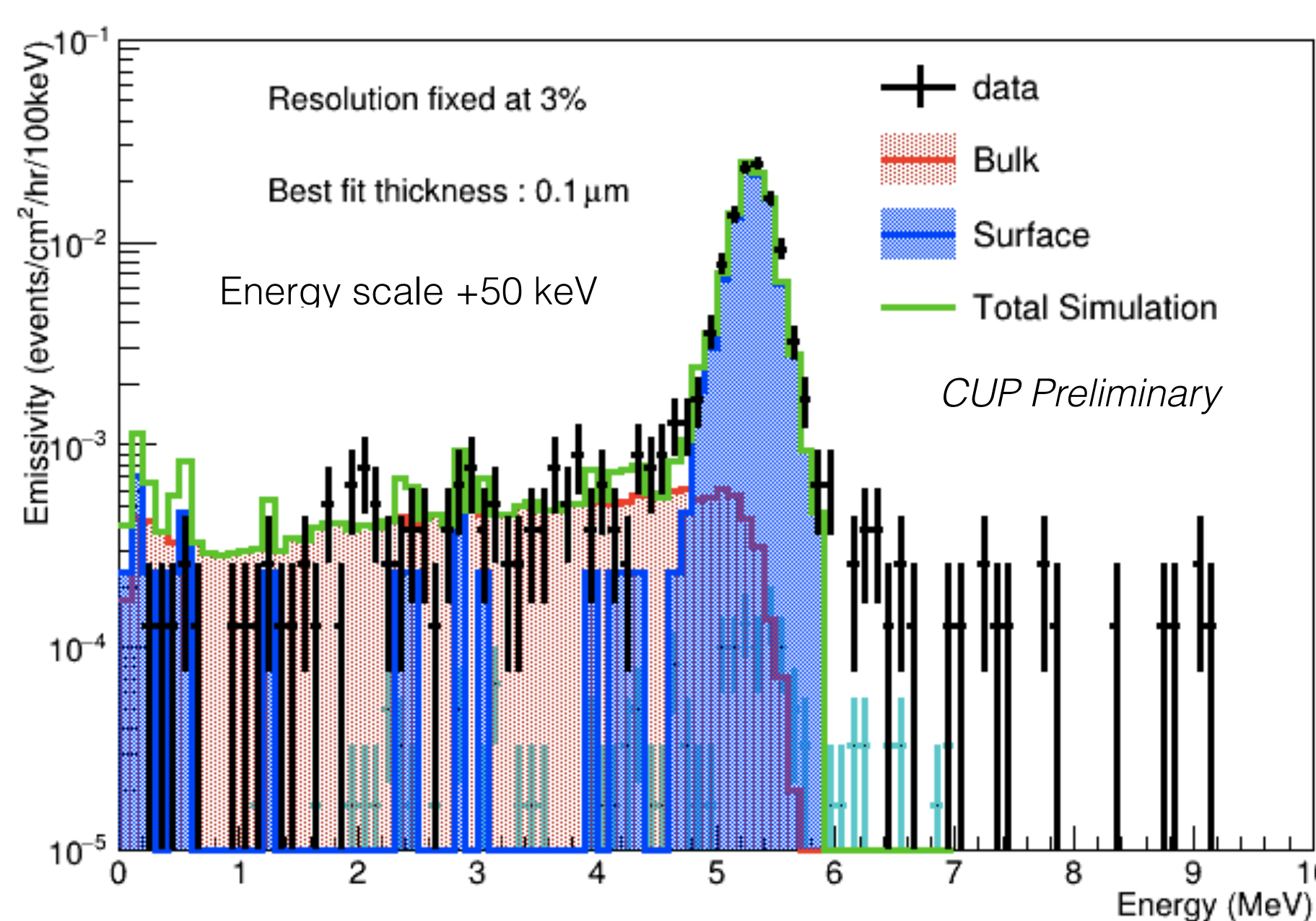
- Surface Alpha is critical to understand our main background
- Artificial contamination of Rn-222
- Penetration depth is estimated
- Cleaning study is on-going



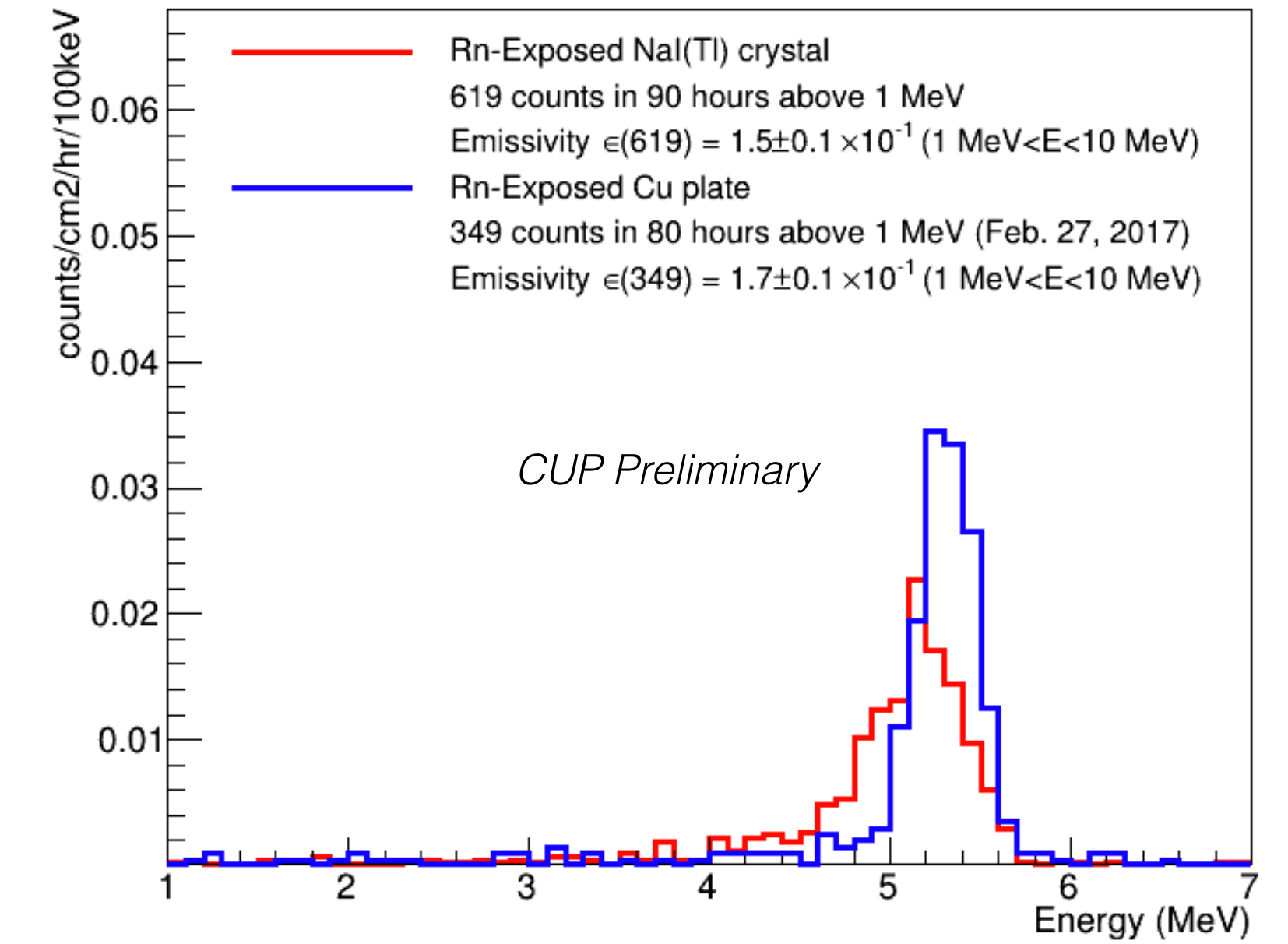
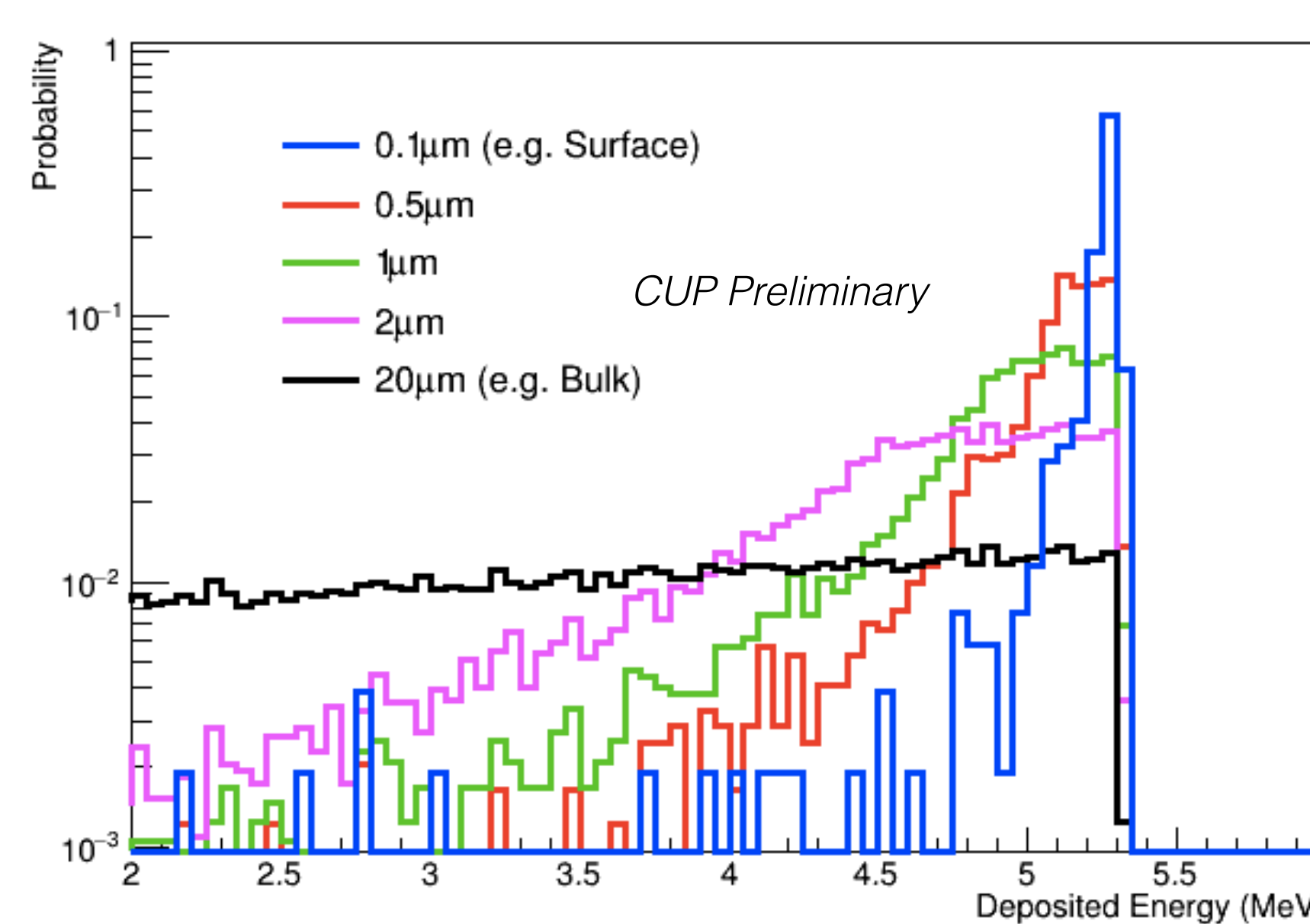
Understanding of Surface Pb-210



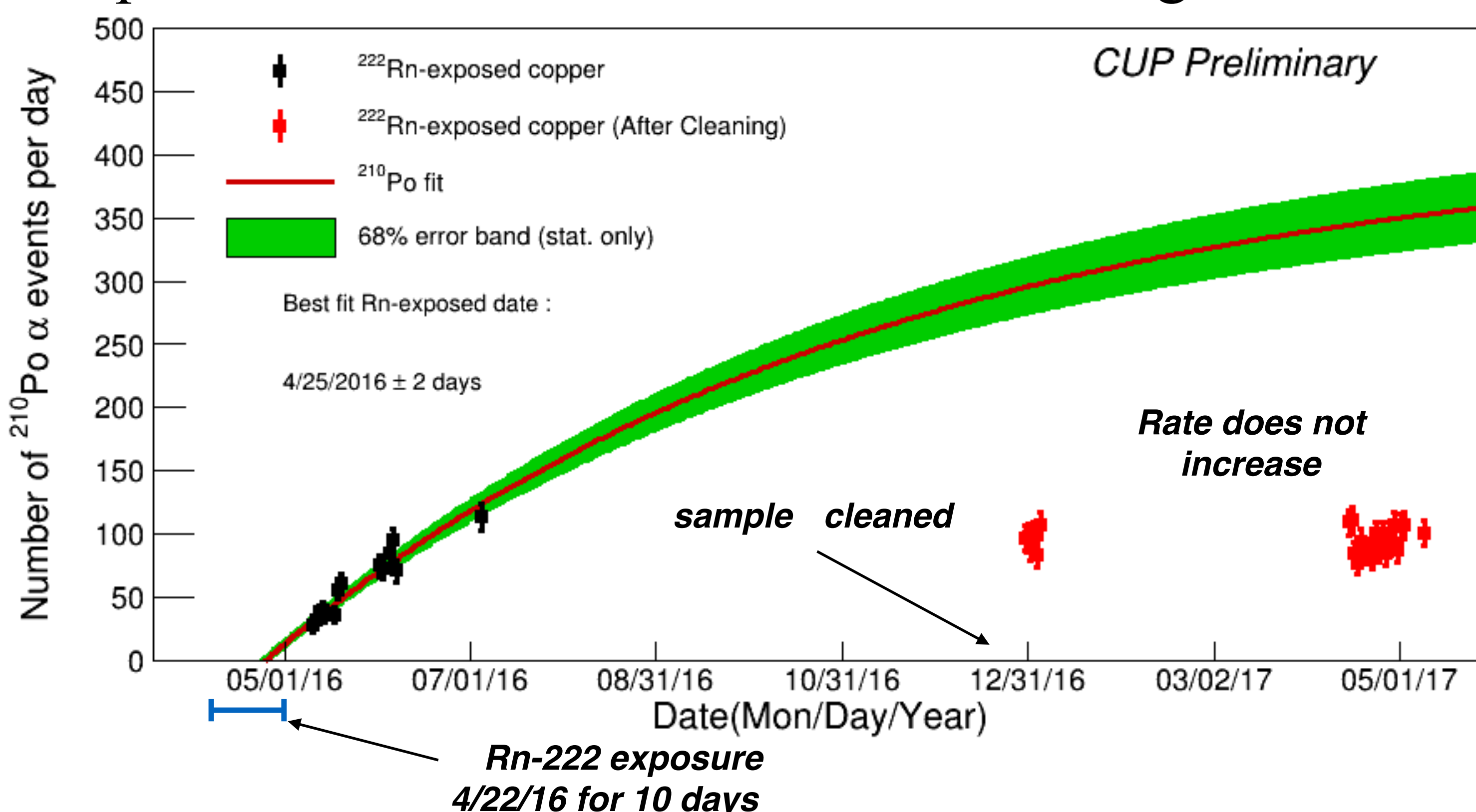
How deep can Po-210 penetrate in Cu?



Po-210 alpha range PDFs



Pinpoint contamination & Effect of cleaning with Rn-222



Summary

- An Ar ionization chamber alpha counter at Yangyang has been used to study surface contamination in the detector materials for rare event search detector experiments.
- Low activity samples including Cu plate and NaI powders are measured in the chamber.
- With a Rn-exposed Cu plate and a NaI(Tl) crystal, we have been studying effect of surface contamination from a Rn-222 source.
- A maximum likelihood fit has been developed to extract surface contamination parameters from the ionization chamber alpha data.
- Sample treatment methods are also developed for removal of the surface contamination.