Radioactivities of AMoRE Crystals

The AMoRE experiment searches for neutrinoless double beta decay of ^{100}Mo using cryogenic molybdate crystals operated at millikelvin temperatures. A detailed understanding and reduction of radioactive backgrounds near the region of interest is essential for improving the experimental sensitivity. In particular, radioactive contamination on or near the crystal surfaces can produce degraded alpha events that may contribute to the background continuum.

In this work, we study the radioactivities of AMoRE crystals using alpha events observed in the AMoRE-I data. Alpha-induced signals provide a powerful tool for identifying internal and surface contaminations from natural decay chains such as ^{238}U and ^{232}Th. In addition, sequential alpha decays with characteristic energies and time correlations can be used to tag specific decay-chain segments and to distinguish bulk contamination from surface-related activity. By analyzing the energy spectra, event topology, and delayed-coincidence signatures of alpha events, we estimate the activities of relevant radionuclides in the detector crystals.

We present preliminary results on the radioactivity levels of AMoRE crystals and discuss their implications for background modeling and future background reduction strategies in AMoRE.