Contribution ID: **342** Type: **Poster**

Novel High Sensitivity Analysis for Determination of Ultra-Trace Elements in Liquid Samples

Thursday, 26 May 2022 15:59 (1 minute)

Rare events search experiments are one of the challenges of modern physics. Sensitivity of this kind of experiments is conditioned by the background usually coming from materials of the experimental apparatus.

In this context it is crucial to develop high-sensitivity analysis techniques to select the most suitable materials in order to reduce the radioactivity contribution at the background coming from the different components of the detector.

For this purpose we have developed a methodological approach which combines neutron activation analysis (NAA), radiochemical treatments and high sensitivity measurements by a novel β-γ low background detector made of a liquid scintillator and an high purity germanium (HPGe) operating in time coincidence. This measurement system is suitable to detect well-defined time correlated events allowing to obtain a strong reduction of background, increasing the sensitivity. The procedure developed enable to perform measurements of uranium and thorium trace concentrations on activated liquid samples.

Tests conducted so far have demonstrated how this methodology is well suited in the context of ultra-trace element measurements techniques achieving limits of contaminations for ^{238}U and ^{232}Th at 10^{-14} g/g (<1μBq/kg) level.

Collaboration

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Session Classification: Detectors Techniques for Cosmology and Astroparticle Physics - Poster session