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Developing measurements on activated samples in order to achieve sensitivity below ppt level

In nuclear and particle physics experiments, reduction of radioactive intrinsic background is one of the keys for the success of the experiments. In many cases the radioactive background generated from decay products of radio nuclides such as ^{232}Th, ^{238}U and ^{40}K could exactly overlap the observable energy regions of interest. In this context it is crucial to develop high-sensitivity analysis techniques to select the most suitable materials to be used in the experiments in order to reduce the radioactive contribution in the background, specifically coming from the components that make up the central detector.
Neutron activation analysis (NAA) is a good technique to study the radioactive contamination in traces of Th, U and K within the materials. This technique allows us to achieve sensitivity at the ppt level, but sometimes it is not enough to satisfy the strong demands coming from the latest experiments.
For this purpose, we have developed a measurement methodology that combining neutron activation analysis with systems of gamma spectroscopy in ultra-low background configurations working in coincidence technique, which allows us to achieve an extreme radioactive background reduction and performs very high sensitivity gamma measurements on samples activated.
The assay developed, has shown that it is suitable to achieve sensitivity below ppt levels for Th, U and K on materials used in rare event physics experiments.

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