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Simulation of environmental radioactivity

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The study of environmental radiation is a challenging task. It is well known that natural gamma radiation may vary depending on the altitude, type of soil, building materials and even human presence. All these variables and uncertainties make it difficult to foresee the background radiation present at a specific region beforehand. In order to better understand the contributions of each individual background source, the EnsarRoot framework has been adapted for this goal.

EnsarRoot has been further developed to include a series of gamma-rays generators characteristic of the main natural radioactive sources. Considering these improvements, the framework reproduces gamma yields originated from decays of the three radioactive chains: Uranium (from which ^{222}Rn comes), Actinium and Thorium. Gammas emitted in the decay of ^{40}K have been also included. The data considered for all generators has been taken from the National Nuclear Data Center.

This report summarizes the simulation process to obtain a typical gamma background spectra, as well as, the benchmark between the simulated spectra and background measurements were done using an HPGe (High Purity Germanium) detector, which has been included as well in the EnsarRoot framework. The excellent resolution of the HPGe detector allows a very detailed analysis of the photon emitted by a wide range of nuclei. Experimental measurements and simulated data could be analyzed on equal footing using the same framework.

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