

Background studies for NaI(Tl) detectors in the ANAIS dark matter project

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Several large NaI(Tl) detectors, produced by different companies, have been operated in the Canfranc Underground Laboratory (LSC) in the frame of the ANAIS (Annual modulation with NaI Scintillators) project devoted to the direct detection of dark matter.

For those detectors, activities from the natural chains of ^{238}U and ^{232}Th and ^{40}K in the NaI(Tl) crystals have been evaluated. Discrimination of alpha particles vs. beta/gamma background by Pulse Shape Analysis (PSA) has been applied for quantifying the content of the natural chains while coincidence techniques were used for ^{40}K . A description of the methods followed and the presentation of the main results in this background characterization of NaI(Tl) detectors will be made.

In particular, a complete background model has been developed for a 9.6 kg detector after several months of data taking in Canfranc. Radioactive contaminations in the main detector and shielding components have been determined by different complementary techniques, including HPGe spectrometry. Then, Monte Carlo simulations using Geant4 package have been carried out to evaluate their contribution. At high energies, most of the measured background is nicely reproduced; at low energy some non-explained components are still present, although some plausible background sources have been analyzed. The NaI(Tl) crystal has been confirmed to be the dominant contributor to the measured background.

Finally, preliminary data about cosmogenic induced activity in NaI(Tl) detectors obtained with two NaI(Tl) crystals, 12.5 kg mass each, recently produced and being characterized at this moment in Canfranc will be presented.

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