

Intrinsic Background Characterisation of an Ultra-pure NaI test Crystal for SABRE South

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The Sodium Iodide with Active Background Rejection (SABRE) experiment is a dark matter detector that aims to provide a model independent test of the annual modulation results of the DAMA/LIBRA collaboration, attributed to dark matter in the form of WIMPs (Weakly Interacting Massive Particles). SABRE will consist of dual detectors in the Northern and Southern hemispheres, individually called the SABRE North and SABRE South experiments. One of the main goals of SABRE is to use ultra-pure NaI crystal detector material, with minimal radio-contaminants, which will rival that of DAMA/LIBRA. This talk reports on characterisation results of an ultra-pure crystal called NaI-035, produced by the commercial company, RMD based in Boston, USA. This 3.7 kg crystal has been produced using AstroGrade powder from Merck, which is some of the purest starting powder commercially available.

In April 2022, the crystal was sent to the Laboratori Nazionali del Gran Sasso underground laboratory in Italy, for characterisation and radioactivity counting. This talk will present preliminary results of the crystal measurements, with a focus on determining ^{238}U and ^{232}Th contamination present in the crystal through identification of $^{214}\text{Bi} - ^{214}\text{Po}$, and $^{212}\text{Bi} - ^{212}\text{Po}$ coincidences, that occur as daughter decays.