Contribution ID: **947** Type: **Poster Presentation**

Neutron calibration of the SoLid detector

SoLid is a reactor neutrino experiment, located at BR2@SCK-CEN (Mol, Belgium), searching for very-short baseline neutrino oscillation (~ 10 m). Its main objectives are to confirm the so-called Reactor Antineutrino Anomaly (RAA), and to test in-fine the existence of light sterile neutrino(s). This experiment is based on a new kind of neutrino detector specially designed against background. The fiducial volume is made of composite solid scintillators (PVT and ^{6}Li screens), which is compact and highly segmented (8000 voxels/m^{3}).

As most of reactor neutrino experiments, neutrinos are detected through inverse beta decay reaction (IBD), which produces a positron and a neutron. To perform a sensitive oscillation analysis, one of the most important requirement is to control perfectly the detection efficiency, which is in IBD case directly driven by the neutron detection efficiency. Regarding the SoLid setup, the challenge arise from the very large number of cells (around 15 000). Then, two automated system, CALIPSO and CROSS, were designed in order to irradiated each cells with well-calibrated neutron source (AmBe et ^{252}Cf).

First, this poster will present the calibration strategy adopted by the collaboration to determine the neutron efficiency at percent level. Then, it will describe the Monte-Carlo simulation (GEANT4/MCNP) which allows us to estimate geometrical effects and systematics errors arising from neutron transport. To conclude, it will present first results coming from detector commissioning.

Experimental Collaboration

SoLid

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Session Classification: Poster session

Track Classification: Neutrino Physics