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A Search for Sterile Neutrinos with SoLid

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The SoLid experiment intends to search for active-to-sterile anti-neutrino oscillation at very short baseline and perform a precise measurement of the ^{235}U anti- $\bar{\nu}_e$ spectrum at SCK•CEN BR2 in Belgium. A way to test this hypothesis is to look for distortions of the anti-neutrino energy caused by oscillation from active to sterile neutrino at several close stand-off distances ($\sim 6\text{-}9\text{m}$) from a compact reactor core. In addition the so-called “bump at 5 MeV”, can be tested at a almost pure ^{235}U neutrino source with SoLid at SCK•CEN BR2 research reactor.

A novel approach to measuring reactor anti- neutrinos was developed based on an innovative sandwich of composite Polyvinyl-Toluene and LiF:ZnS scintillators. High experimental sensitivity can be achieved with the combination of high granularity, high neutron-gamma discrimination using $^6\text{LiF:ZnS(Ag)}$ scintillator and precise localization of the inverse beta decay products. We will describe the principle of detection, the detector design and we will focus on the performance of the full scale SoLid prototype module installed at BR2 early 2015 demonstrating the technology and the segmentation capabilities in terms of background rejection. We will present first results on selecting inverse beta decay candidates using the 2015, and will show the physics reach of the next phase that will start data taking in mid 2017.

Experimental Collaboration

The SoLid Collaboration

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