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First results from the SoLid reactor neutrino experiment

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The SoLid Collaboration

The SoLid experiment intends to search for active-to-sterile anti-neutrino oscillations at the very short baseline (6-9 m) of the SCK•CEN BR2 research reactor (Mol, Belgium) to address the so called "Reactor Anti-neutrino Anomaly". Discrepancies between data and the theoretical predictions in some earlier neutrino experiments at short distances were observed when compared to the new predicted flux and spectra. This deficit could be explained by flavor oscillations of a new type of neutrino: the sterile neutrino.

A novel detector approach to detect the reactor anti-neutrinos was developed based on an innovative hybrid scintillator technology combining PVT and 6LiF:ZnS scintillators. The first scintillator serves as an anti-neutrino target for Inverse Beta Decay (IBD) reaction and measure the positron energy. The second scintillator tags the neutron capture by 6Li and allows to measure the characteristic IBD delay time. The system is highly segmented (5 cm) and read out by a network of wavelength shifting fibers and MPPCs. High experimental sensitivity can be achieved compared to other standard technologies thanks to the combination of high granularity, high neutron-gamma discrimination using 6LiF:ZnS(Ag) scintillator and precise localization of the IBD signals. The reconstruction of the full topology of the events allows a strong background rejection, necessary given the low overburden at the reactor building.

The detector has been taking physics data since 2018. We will present an overview of the experiment, the performances in terms of detector response, background rejection capabilities and the in articular the first physics results demonstrating the ability to probe the reactor antineutrino anomaly.

I read the instructions

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