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P1.081 Light yield and energy resolution studies for SoLid phase 1

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on behalf of SoLid collaboration

The SoLid experiment is searching for sterile neutrinos from a nuclear research reactor. It looks for inverse beta decays (a positron and a neutron in delayed coincidence) with a very segmented detector made of thousands of scintillating cubes. SoLid has a very innovative hybrid technology with 2 different scintillators. The cubes are made of Polyvynil-Toluene (PVT) to detect the positrons and 6LiF:ZnS sheets are put on one face of each PVT cube to detect the neutrons. The scintillation signals are brought by wavelength shifting fibre to MPPCs. It allows us to do an efficient pulse shape analysis to identify the signals from neutrons and positrons. The first module SM1 (288 kg) took data in 2015 and the construction of SoLid phase 1 (about1.5 t) is about to start. To improve the energy resolution of SoLid phase 1, an study was made to increase the light yield studying separately the scintillators: PVT and ZnS.

SoLid phase 1 is developing an innovative neutron trigger strategy based on the ZnS scintillation. A test bench has been built to fully characterize and improve the neutron detection with the ZnS using an AmBe source.

To study the positron light yield on the PVT, another test bench was built with a ^{207}Bi source. The design of the cubes and the wrapping or the type and the configuration of the fibres have been improved. An increase in the PVT light yield by about 40% was achieved, and the resolution of the positron energy was improved on the test bench from 20 % to 16 % at 1 MeV.