

XXXX(X) scintillation neutrino detector with ultra-low energy threshold

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A concept of SrI2(Eu) scintillation neutrino detector with ultra-low energy threshold is being developed in INR RAS to detect recoil electrons with energy lower than 1 keV. The detector will have a simple scalable structure and consist of 64-channel layers of scintillation detector modules. The modules consist of four small SrI2(Eu) crystals with SiPM readout. The detector can be used to study neutrino spectrum at low-energy range for isotope decay and reactor neutrinos. The SrI2(Eu) scintillator has light yield of up to 120 p.e./keV that provides the ability to detect extremely low energy deposition. Setting detection threshold of 6 photoelectrons allows to detect energy deposition greater than 100 eV, if SiPMs photon detection efficiency (PDE) is 50%. SrI2(Eu) emission spectrum aligns well with SiPM maximum PDE. SiPMs operation temperature below -60 ensures the suppression of dark current rate (DCR) of used SiPM-matrixes and satisfies the low threshold measurement requirement. SiPMs DCR waste studied for different temperatures and operating voltages. The parameters of detector modules were studied for few samples of scintillators produced by different companies. The measurements show satisfactory light yield of tested samples.

Section

Neutrino physics and nuclear astrophysics

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