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A 14C Screening Setup for Liquid Scintillator at JUNO

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The Jiangmen Underground Neutrino Observatory (JUNO) is a multi-purpose neutrino detector under construction in China, with the main goal of determination of the Neutrino Mass Ordering (NMO). This detector will be filled with 20 kton of linear alkylbenzene (LAB) based liquid scintillator as a target, contained inside an acrylic vessel of diameter about 35 meters. For low signal event rate experiments like JUNO, control of natural radioactivity background is crucial. The ^{14}C background with 156 keV Q-value in JUNO's liquid scintillator is one of the main backgrounds in pp solar neutrino detection.
An experimental setup was built to measure ^{14}C concentration in LAB and select low ^{14}C LAB for JUNO liquid scintillator. It was designed to take small samples with volume of 1L with the purpose of fast screening. The LAB samples to be measured are prepared as liquid scintillator by adding 2.5 g/L 2,5-diphenyloxazole (PPO) and 3 mg/L p-bis(o-methylstyryl)-benzene (bis-MSB). The setup was developed at the JUNO detector cavern (~700m of rock shield) and utilizes two low-background R11410 photomultiplier tubes (PMTs) at both ends of a cylindrical acrylic container, facing the liquid scintillator to perform coincidence measurements. Lead and copper (OFHC) shielding are used to reduce external radioactivity. In this poster, the details of the design, analysis and results will be presented.

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