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Research of large balloon production for KamLAND2

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KamLAND is a neutrino detector containing a 1-kiloton liquid scintillator, located 1000 meters underground at the Kamioka Mine. The experiment completed 22 years of data acquisition in August 2024. The KamLAND2 experiment, scheduled to start in fiscal year 2027, aims to further improve light collection efficiency by increasing the luminous flux of the liquid scintillator, introducing high quantum efficiency photomultiplier tubes (PMTs), and utilizing focusing mirrors for the PMTs. Additionally, the 13-meter-diameter balloon film containing the liquid scintillator will be remanufactured for KamLAND2. The same material and design as the proven KamLAND balloon will be used, but new measures will be implemented to reduce background contamination from the detector. These measures include the introduction of a cover film to prevent contamination during manufacturing at installation. EVOH, the material used for the surface of the balloon film, has high gas barrier properties to prevent the infiltration of (_^222)Rn from the outside. However, EVOH also has high hygroscopic properties, raising concerns that its characteristics may change in the high-humidity environment expected to prevent static electricity. Therefore, this study will investigate the effects of moisture on EVOH and the balloon film, ultimately evaluating the humidity requirements for the balloon with the cover film during production. A comprehensive overview of the balloon production process will also be presented.

Collaboration you are representing

KamLAND

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