OPTICAL TRANSPARENCY MEASUREMENTS OF LINEAR ALKYLBENZENE SAMPLES WITH A CAMERA BASED DEVICE

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The ongoing C14 experiment [1] in CallioLab2, located at the depth of 1430 m in the Pyhäsalmi Mine, aims at measuring 14C/12C-ratios for several scintillator samples. The required sensitivity of 10-18 is three orders of magnitude below the limits of Accelerator Mass Spectrometry and reflects the needs of the neutrino experiment JUNO [2]. The samples contain LAB-based liquid scintillator. Linear alkylbenzenes (LAB) has the qualities required by large-scale liquid scintillators: high flash temperature, low toxicity, availability of bulk material, and low cost [3]. However, depending on the production process and the source of the raw materials, the C14 content varies widely jeopardizing low-energy neutrino physics program of JUNO. Hence the need for testing of each batch delivered by the suppliers.

In addition to C14-purity, optical transparency is the other key parameter required of the scintillator. To verify the results of various purification schemes it is necessary to measure light attenuation at the wavelengths corresponding to the scintillation light. While accurate measurements require sophisticated and expensive equipment, quick tests can be performed with simpler tools. We have built an inexpensive setup build using a Raspberry Pi 3 single-board computer, a RGB-LED light source, and a digital camera. The Raspberry Pi camera module takes pictures of the light source trough LAB samples placed in a transparent container. The intensity of the light reaching the camera depends on the transparency of the liquid. The first results have shown noticeable difference in intensity between unpurified and purified samples. As the next step we have to improve the construction of the liquid container allowing for measurements in oxygen-free environment.

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