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Characterization of JUNO Large-PMT electronics in a complete small scale test setup

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The Jiangmen Underground Neutrino Observatory (JUNO) is a neutrino medium baseline experiment under construction in southern China, expecting to begin data taking in 2023. The experiment has been proposed with the main goals of determining the neutrino mass ordering and measuring three oscillation parameters with sub-percent precision. To reach these goals, JUNO is located about 53 km from two nuclear power plants and will detect electron antineutrinos from reactors through inverse beta decay. Furthermore, an unprecedented energy resolution of 34 % at 1 MeV is required. The JUNO detector consists of 20 kt of liquid scintillator contained in a 35.4 m diameter acrylic vessel, which is instrumented with a system of about 18000 20-inch Large-PMTs and 25600 3-inch small-PMTs, with a total photocoverage greater than 75 %.

The signal from the Large-PMTs is processed by the JUNO electronics system, which can be divided into two main parts: the front-end electronics, placed underwater, consisting of a Global Central Unit (GCU); and the back-end electronics, outside water, consisting of DAQ and trigger. Each GCU reads three Large-PMTs and has the main tasks of performing the analog-to-digital conversion of the signals, generating a local trigger to be sent to the global trigger, reconstructing the charge, tagging events with a timestamp, and temporarily storing data in the local FPGA memory before transferring it to DAQ upon a global trigger request.

This contribution will focus on the description of the underwater electronics for the Large-PMTs. Results from tests on a small setup with 13 GCUs at Laboratori Nazionali di Legnaro, Italy, as well as from the integration test with 300 GCUs in China, will be presented.

In-person participation

Yes

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