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THE BACKEND ELECTRONICS CARDS OF THE JUNO EXPERIMENT

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The Jiangmen Underground Neutrino Observatory (JUNO) is a next generation multi-purpose antineutrino detector currently under construction in Jiangmen, in China, with the main goal to determine the neutrino mass hierarchy, as well as several neutrino mass and mixing parameters with a precision at the sub-percent level. The reactor electron antineutrinos of two power plants at a baseline of 53 km will be detected in the central part of the detector, which consists of 20 ktons of liquid scintillator contained in a 35 m diameter acrylic sphere. The central detector is instrumented by more than 18000 20-inch photomultiplier tubes (PMTs), and about 25600 3-inch small PMTs. Two veto systems are added to reduce the backgrounds. Data taking is expected to start at the end of 2021.

The JUNO electronics system is separated into mainly two parts: the front-end electronics system performing analog signal processing (the underwater electronics), and after 100 meters Ethernet cables, the backend electronics system, sitting outside water, consisting of the Back-End Cards (BEC), the DAQ and the trigger. For the front-end electronics, global control units (GCU) digitize the incoming analog signals, then store the data in a large local memory waiting for trigger decision, and send out event data corresponding to a certain trigger acknowledgement as well as trigger requests to the outside-water system.

The BECs are used as concentrators to collect and compensate the incoming trigger request signals. The FPGA mezzanine cards handle all trigger request signals, and send their sum to the trigger system over an optical fiber. In order to test all the communication channels of the BECs in an efficient and fast way, a common baseboard with interfaces to different mezzanine boards is designed. The common baseboard is built to monitor and control the bit error rate of a loop connecting two channels of the BEC through a 100 m Ethernet cable.

The poster presents the JUNO electronics system, with an emphasis of the backend electronics system and on the BECs: their design, the various prototypes built, the tests already performed.

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