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Design and Implementation of the TDAQ System for the JUNO-TAO Detector

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The Taishan Antineutrino Observatory (TAO or JUNO-TAO) will be deployed next to a core of the Taishan Nuclear Power Plant to measure the reactor neutrino spectrum precisely as a reference spectrum for JUNO. TAO also aims to measure the fine structures for the first time and to test the nuclear database used in the summation calculation of the spectrum. The ultra-high energy resolution of TAO is realized via an almost full coverage of its target volume, 2.8 ton gadolinium-doped liquid scintillator, with about $10 m^2$ of cutting-edge silicon photomultipliers (SiPMs) with an high photon detection efficiency. However, this will bring high data rate due to the dark count of SiPMs. The TDAQ system, designed as a pure digital system, will process the high input data rates of $O(100 \text{ Gbps})$ from the TAO detector by executing trigger algorithms on FPGA and compression strategies on CPU. Finally, it will suppress the data storage bandwidth to less than 100 Mbps which is limited by TAO onsite network. In this talk, the detailed design and implementation of TAO TDAQ system will be presented.

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