



Contribution ID: 123

Type: **Oral presentation**

Streaming readout system for the BDX experiment

Tuesday 20 October 2020 08:40 (20 minutes)

Due to the lack of results by ‘traditional’ Dark Matter (DM) searches, in the last years, the experimental activity extended to search for DM hints at different mass scales, through new experiments performed at accelerators. The Beam Dump eXperiment at Jefferson Laboratory aims to reveal dark matter particles produced in the interaction of an intense electron beam with the beam dump. An electromagnetic calorimeter (CsI(Tl) crystals read by SiPMs), protected by environmental background by an active veto counter (plastic scintillator with SiPM), will detect the interaction of DM with atomic electrons of the detector. The absence of an external trigger to start the data acquisition when an event of interest is produced, suggested to implement a full streaming DAQ system. The ~1000 channels of the BDX detectors will be digitized by custom flash digitizers and data streamed to a CPU farm for further elaboration. Low cost per channel, flexible front-end circuitry, high-performance timing system, adjustable memory buffer, and a fully trigger-less approach are the requirements driving the design of the BDX-WaveBoard, a 12 channel 250MHz 14 bits digitizer. Waveforms and timestamps (provided by a GPS for global synchronization) will be streamed to the TriDAS software developed for KM3NeT, an underwater neutrino telescope. In this contribution we will describe the WaveBoard, the TRIDAS and their performance as measured with a prototype of the BDX detector (BDX-MINI) during Spring 2019 data taking. Results will be compared to what obtained by running the DAQ in standard triggered mode.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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Session Classification: Oral presentations TRIG01

Track Classification: Data Acquisition System Architectures