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Software triggering in the XENON1T DAQ

The XENON1T will soon be the world's largest and most-sensitive dark matter experiment. Dark-matter particles would be detected by their interaction with 2.2 tonnes of liquid xenon viewed by approximately 250 PMTs. In order to calibrate our detector, we must use radioactive sources that will result in roughly 300 MB/s of data coming from the flash ADC boards connected to our PMTs. An overview of our DAQ system will be presented. The decision was made to use exclusively a software trigger, which performs signal processing and identifies events. Even though software triggers have been deployed at larger high-energy physics experiments, we have built the software trigger mostly using preexisting software packages and commodity computers. We will discuss the requirements, design, and difficulties of deploying a software trigger on smaller experimental scales, while also briefly discuss our R&D efforts triggering with commodity GPUs.

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