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## **DUNE DAQ R&D integration in ProtoDUNE Single-Phase at CERN**

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The DAQ system of ProtoDUNE-SP successfully proved its design principles and met the requirements of the beam run of 2018. The technical design of the DAQ system for the DUNE experiment has major differences compared to the prototype due to different requirements and the environment. The single-phase prototype in CERN is the major integration facility for R&D aspects of the DUNE DAQ system. This covers the exploration of additional data processing capabilities and optimization of the FELIX system, which is the chosen TPC readout solution for the DUNE Single Phase supermodules. One of the fundamental differences is that DUNE DAQ relies on self-triggering. Therefore real-time processing of the data stream for hit and trigger primitive finding is essential for the requirement of continuous readout, where Intel AVX register instructions are used for better performance. The supernova burst trigger requires a large and fast buffering technique, where 3D XPoint persistent memory solutions are evaluated and integrated. In order to maximize resource utilization of the FELIX hosting servers, the elimination of the 100Gb network communication stack is desired. This implies the design and development of a single-host application layer, which is a fundamental element of the self-triggering chain.

This paper discusses the evaluation and integration of these developments for the DUNE DAQ, in the ProtoDUNE environment.

### **Consider for promotion**

No

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