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The protoDUNE-SP LArTPC Electronics Production, Commissioning and Performance

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The protoDUNE-SP detector is a large-scale prototype of the single-phase Liquid Argon Time Projection Chamber (LArTPC) design proposed for the Deep Underground Neutrino Experiment (DUNE). 15360 LArTPC wires are instrumented with low electronic noise pre-amplifier and digitization ASICs integrated into Front End Motherboards (FEMBs) operating at cryogenic temperature within the cryostat. The large number of electronics channels and high performance specifications required a large-scale production electronics quality control effort, careful installation into Anode Plane Assemblies (APAs) and rigorous detector commissioning. This successful collaboration-wide effort achieved a working LArTPC wire readout percentage of 99.73% (15318 out of 15360 channels), and 92.83% operating with electronic noise levels less than 800e- ENC. This talk will summarize the implementation of the protoDUNE-SP cold electronics quality control, installation and commissioning efforts that enabled excellent electronics performance. Lessons learned relevant to the upcoming DUNE LArTPC electronics production will also be highlighted.

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