NP04 TPC Electronics Performance and Testing Plans

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FD1 Technical Board Meeting

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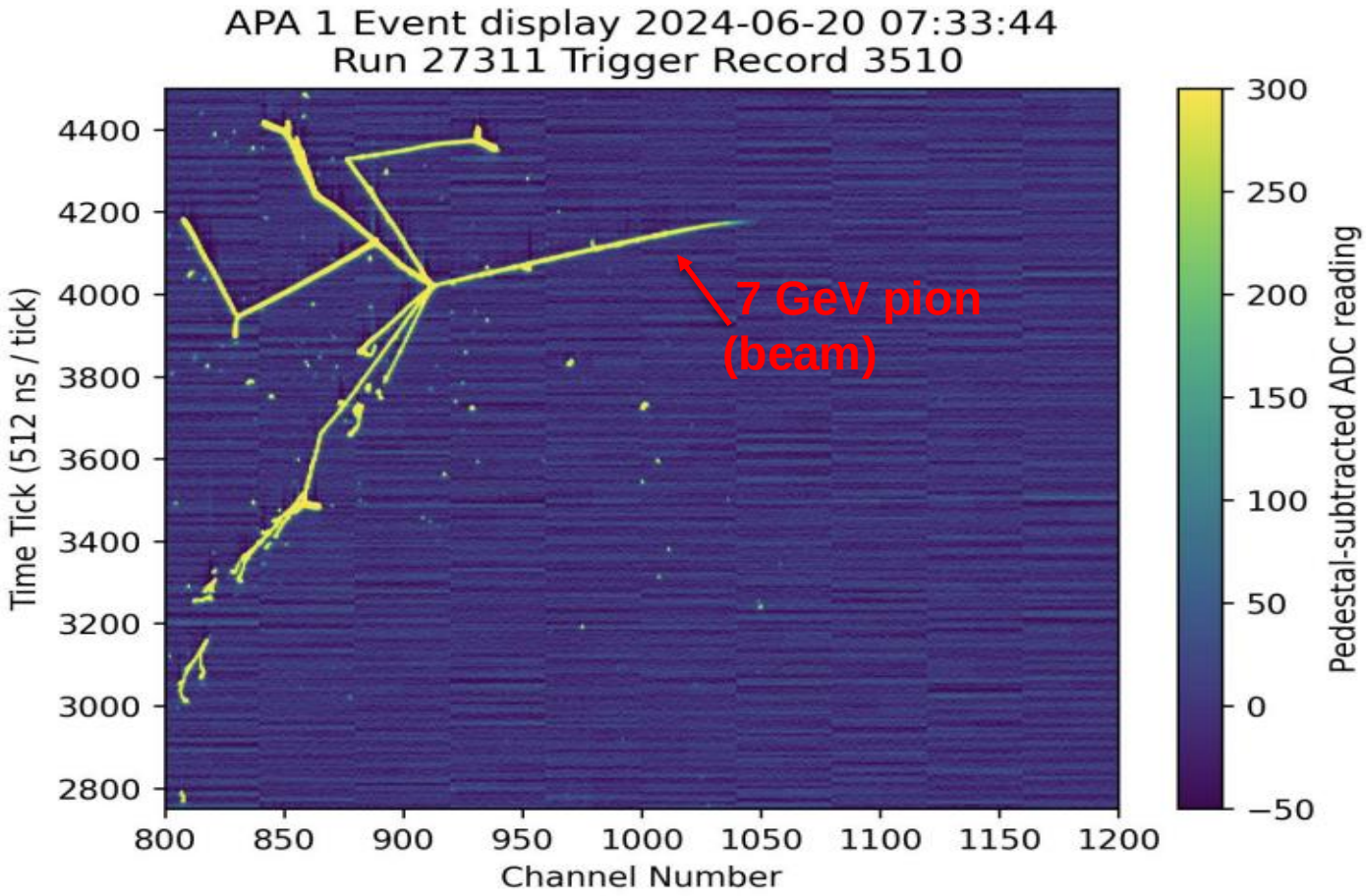
- TPC readout electronics have been performing reliably for the past few months
- Overall noise performance is decent. APA#3 and #4 near ideal noise level . APA#1 and #2 have slightly higher coherent noise. With offline CNR filtering, all four APAs have comparable noise level

Beam Event



Performace Summary, Current Status, and Issues

- NP04 instrumented with 80 Frontend Motherboards on four APAs → 10,240 readout channels
- Commissioned the electronics with 100% of CE channels operational
- About 20 channels are disconnected from the APA due to broken APA wires and other issues
- Lost 10 channels during NP04 operations, likely damaged by some sort of discharge. DCS recorded large current spikes on the APA bias lines right before the channels died. All on APA#4. Two separate incidents within a week
- History of the problem channels is recorded here
- Observed shorts on APA wires that come and go. May be due to conductive debris floating around. Happened on all four APAs at different times. At the moment, only APA#4 still has shorted wires (6 channels). Masked off at the trigger level
- History of the shorted channels is recorded here

- Decision of the CE group is to run the frontend electronics at gain setting of 7.8 mV/fC. Beam data (except the first week) were taken at the new gain setting
- Discussion to run at a lower gain started a while ago. Original motivation was to increase the dynamic range with a minimal penalty on the electronic noise
- Also to avoid saturating the frontend electronics. Observed at ICEBERG and NP04 that if channels are fully saturated by large pulses, the FEMB ground or power rails could be affected. Shows up as “cross talk” between channels
- APA#1 X-wires are floating. Charges are mostly collected on the second induction layer

Post-Beam Testing Plan

- Would like to request ~ 1 week of dedicated CE study time after the beam run
- Will need the cathode and APA bias HV off for our studies
- Noise and calibration studies (~ 1 day)
- Large amplitude pulser scans to study saturation effects (~ 2 days)
- Turn off CE for an extended period of time (~3 days) to verify that CE can be powered back on after dormant in LAr for a few days
- Work with other Consortia to understand the ground-shake events