ProtoDUNE-SP Beam Run: Detector Status

Kevin Wood ProtoDUNE-SP DAP Meeting November 15, 2018





High Voltage

- 2 classes of HV instability:
 - 1) Fast discharges:
 - O(10/day) recorded by the DCS fast acquisition
 - All of them report a current signal on at least one ground plane
 - Total charge from PS correspond to total charge on planes
 - 2) Sustained excessive current streams:
 - Few per day (rate builds up over time)
 - Typically current limiting
 - Only a fraction of the PS current visible on US-BL-Top ground plane & beam plug
- NOTE: The BL-US end wall's termination point was not properly connected during installation. Therefore, we are unable to tune the voltage here. It sits at it's 'natural' ~ -1kV instead of -1.665kV.





High Voltage

- On October 17, we changed to a replacement high voltage power supply
 - The new PS shows some evidence of inducing noise on some wires corresponding to the ~35kHz switching frequency _





High Voltage

- On October 17, we changed to a replacement high voltage power supply
- · We also changed our philosophy for dealing with "streamers" at this time
 - Before: continue running when streamers open up, operate at lower voltages to try and mitigate
 - After: inhibit triggers, lower the voltage until current draw returns to nominal, raise voltage to nominal, allow triggers
- Typically takes ~10 minutes when a human needs to perform the recovery procedure
 - At its worst, streamers open up once every 4 hours or so
 - Conservatively, >95% uptime achievable
- An automated recovery mode is being implemented into the PS controls soon
 - Should increase uptime





Purity

- Discrepancy between purity monitor measurements (top purity monitor plotted below) and measurements from tracks
- Started to see the beam faintly on Oct. 3. The beam run started in earnest on Oct 11, around the time we achieved 3ms • argon
- Recirculation pumps turned off for ~22 hours on October 29th at 13:30 due to a drastic change in atmospheric pressure • that affected the controls in an unforeseen way
 - Purity monitor software also went offline for a few days around this time _





Beam Data Accumulation



- While acquiring beam data, issues with the PDS and beam left TPC readout are often ignored
- As long as the beam right TPC is being read out well, we continue the run
- Don't trust the run type and beam momentum tags in the metadata too much...
- Double check detector configuration stated in shifter notes with slow controls when in doubt and when possible

Beam Data Accumulation

Roberto Acciarri

Momentum	Total Triggers	Expected Pi trig.	Expected Proton trig.	Expected Electr. trig.	Expected Kaon trig.
0.3 GeV/c	269K	0	0	242K	0
0.5 GeV/c	340K	1.5K	1.5K	296K	0
1 GeV/c	1089K	382K	420K	262K	0
2 GeV/c	728K	333K	128K	173K	5K
3 GeV/c	568K	284K	107K	113K	15K
6 GeV/c	702K	394K	70K	197K	28K
7 GeV/c	477K	299K	51K	98K	24K
All momenta	4175K	1694K	779K	1384K	73K

Beam line simulation. \rightarrow







