

Charging APA 3

ProtoDUNE-SP Operations

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BNL

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APA 3 charging

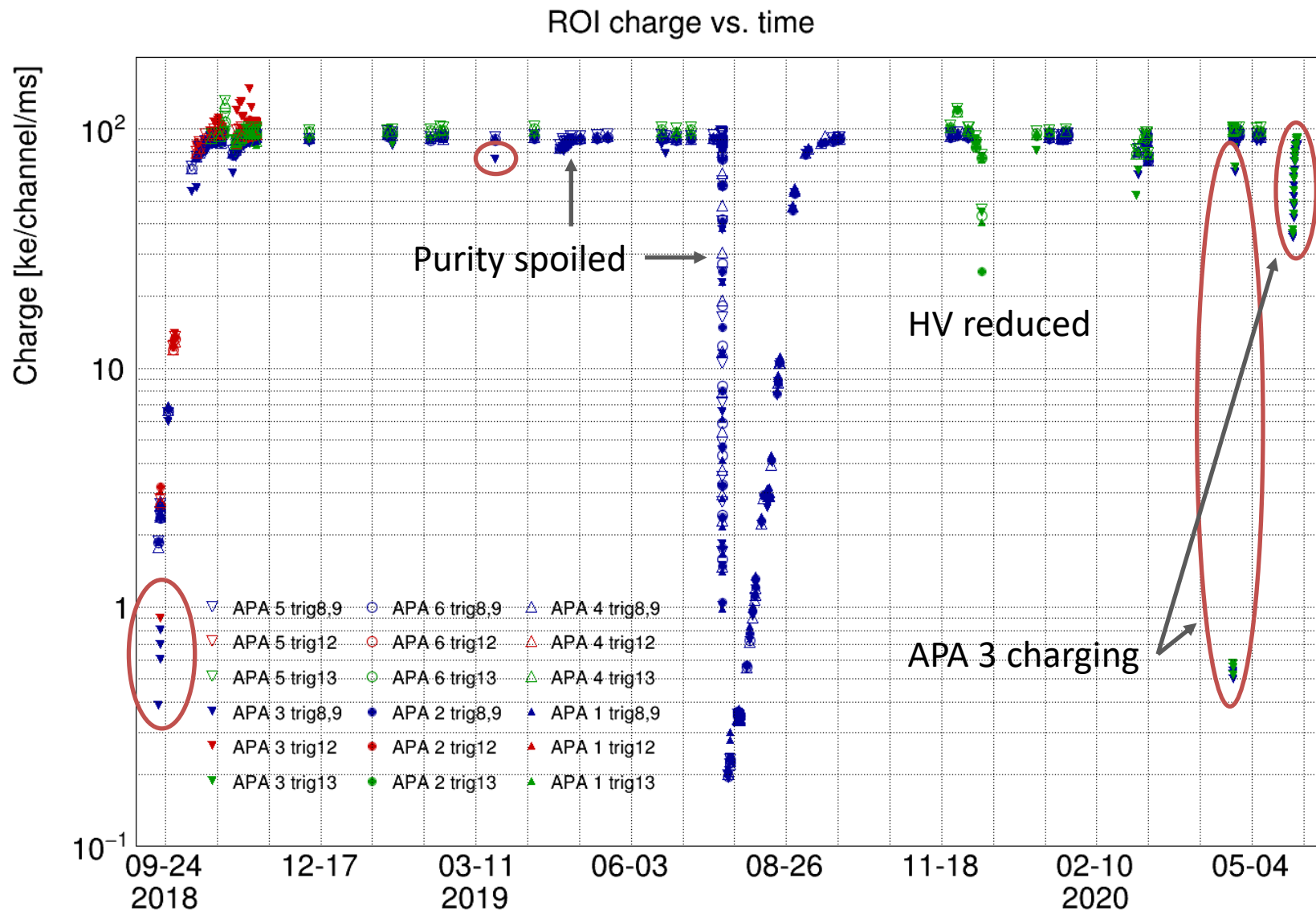
Grid plane for APA 3 is disconnected from HV

- Little signal seen on collection wires when cathode HV is first on
 - If cathode HV was off for a long time
- But collection signal appears as grid plane charges up with time
 - Evident on signal strength plots shown of following pages
 - Signal strength evaluated from TPC event data averaging the ROIs over each APA collection plane
 - Bad channels excluded
- Signal strength also sensitive to other detector conditions
 - LAr purity
 - Cathode HV

Signal strength vs time is monitored

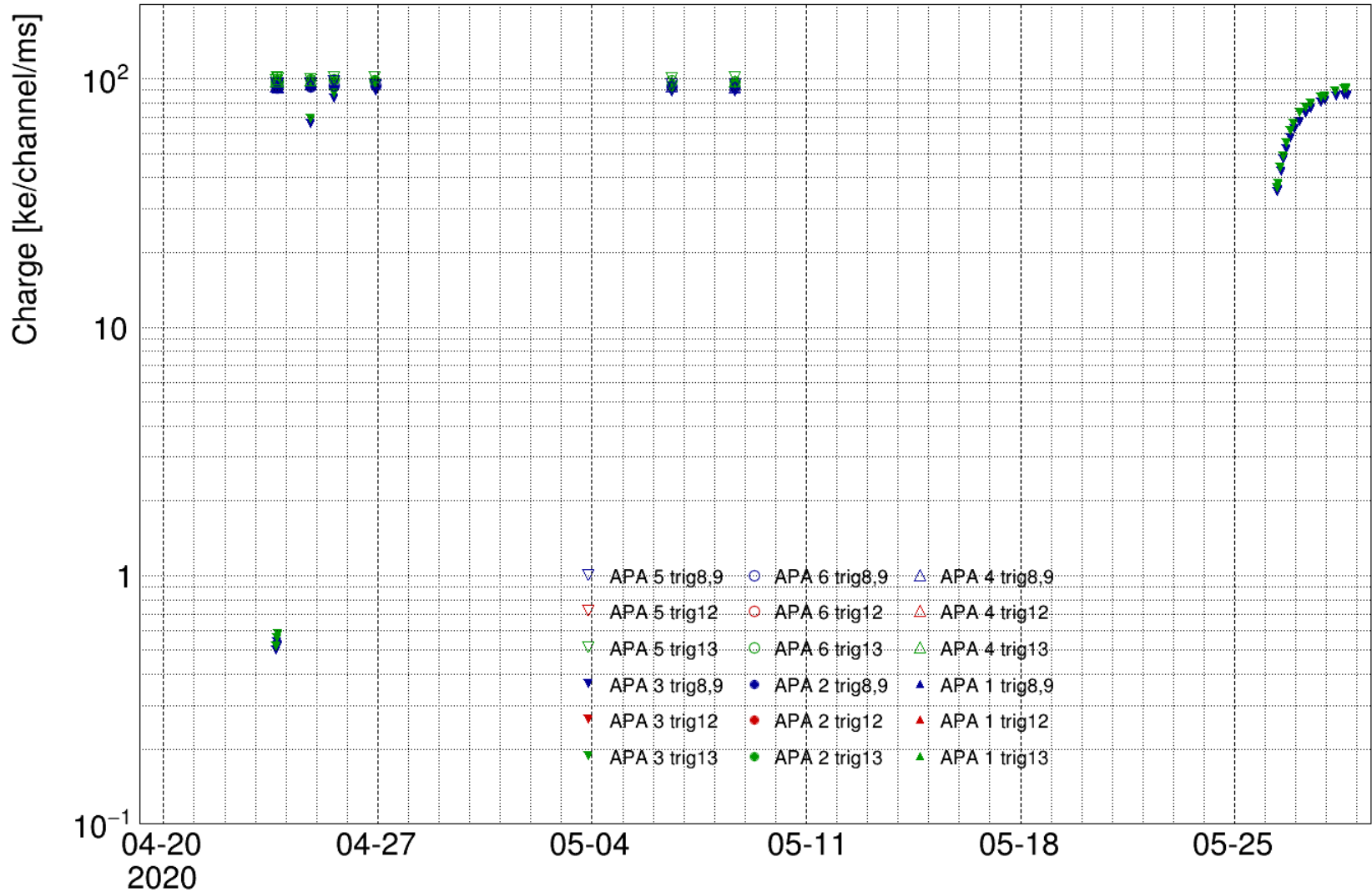
- <https://internal.dunescience.org/people/dladams/protodune/monitoring>
- Updated with recent data
- A couple plots follow

Signal strength for full run



Recent signal strength

ROI charge vs. time



Discharging rate

APA 3 discharges slowly

- Good—we need it to hold charge for normal operation

Discharging rate

- Try to estimate the discharge rate from the recent data
 - April 23, HV turned on after 38 days off, first signal 0.55 ke/ms
 - May 26, HV on after 12 days off, first signal 35 ke/me
- Comparing with 90 ke/ms when fully charged, I get exponential discharge times of 13 days and 7.5 days
 - These are inconsistent
 - Single exponential is not the right model?
 - Different detector conditions?
- Difficult to get data to study this
 - We have to shut HV off for days or weeks to get each point

Charging rate

Charging slow but faster than discharging

- Good—we need APA 3 to charge up

Charging rate

- Much easier to study charging
- Need one long HV shutdown followed by many days of data taking
- Covid shutdown presented an opportunity
 - But we only took one short run a day after restart
- Recently HV off for 12 days
 - Data data continuously since HV turned on
 - Thanks Serhan!
 - Data only taken with APA 3
 - Started data taking at 35% but we have lots of data since then
 - From here out, good enough to get one or two runs per day (or less) until we are confident we have reached the plateau