

# sPHENIX Status

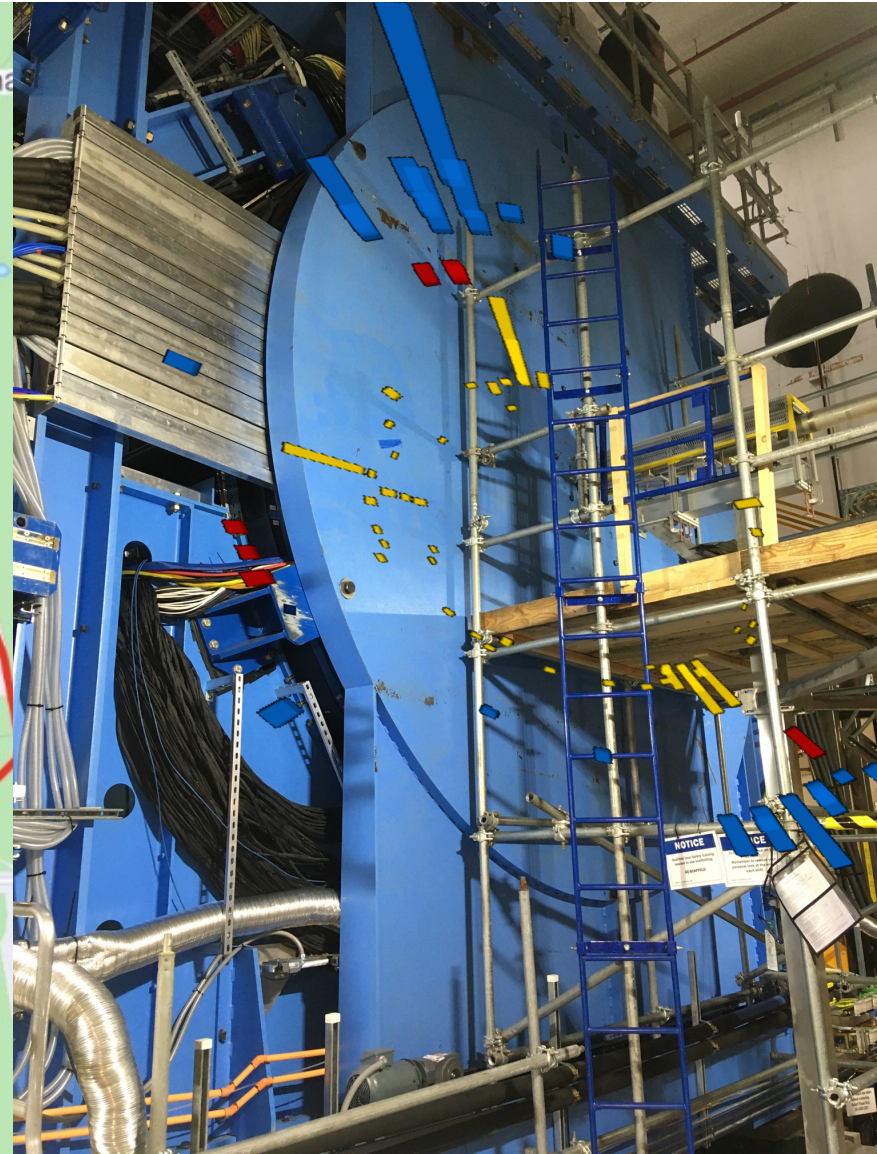
## RHIC Coordination Meeting

### July 30, 2024

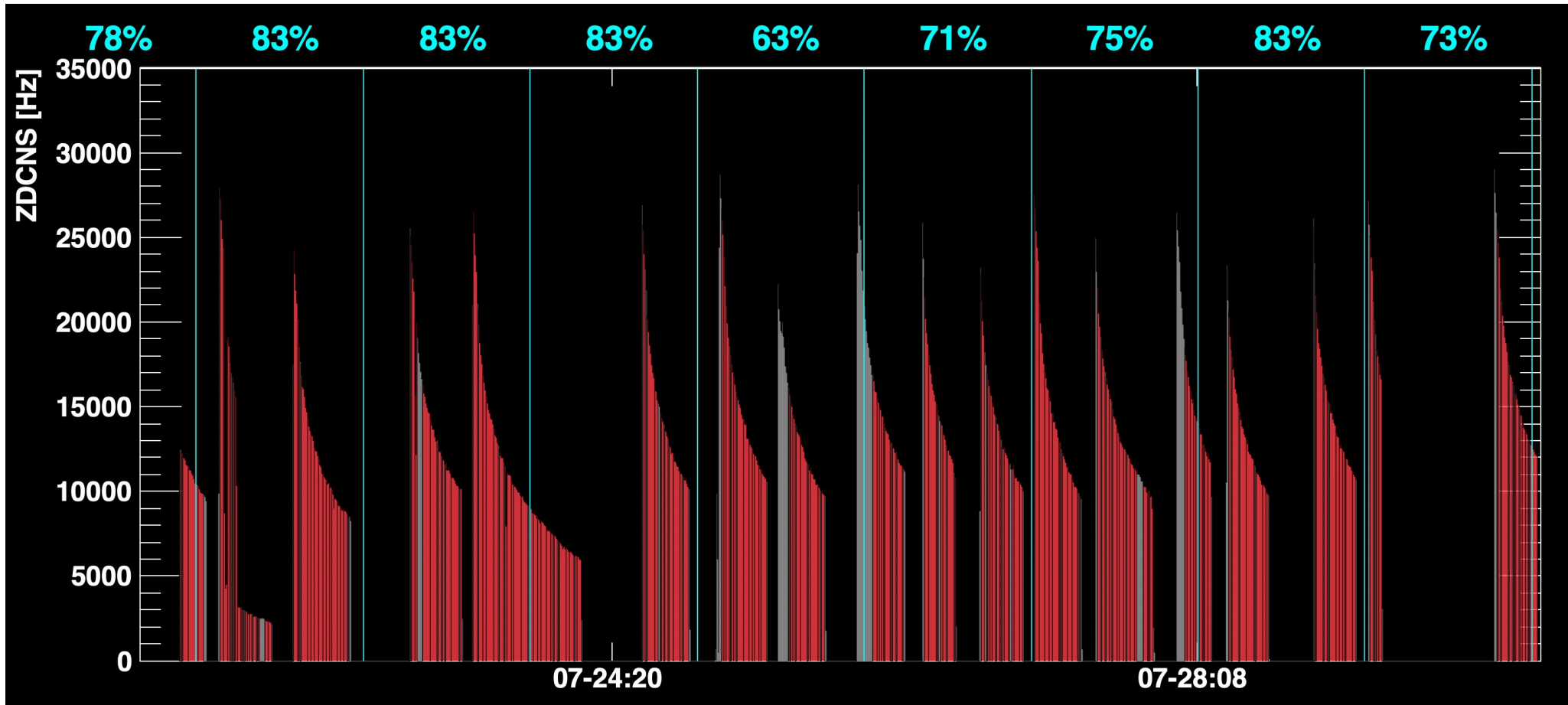
Jamie Nagle  
University of Colorado Boulder  
sPHENIX Run Coordinator

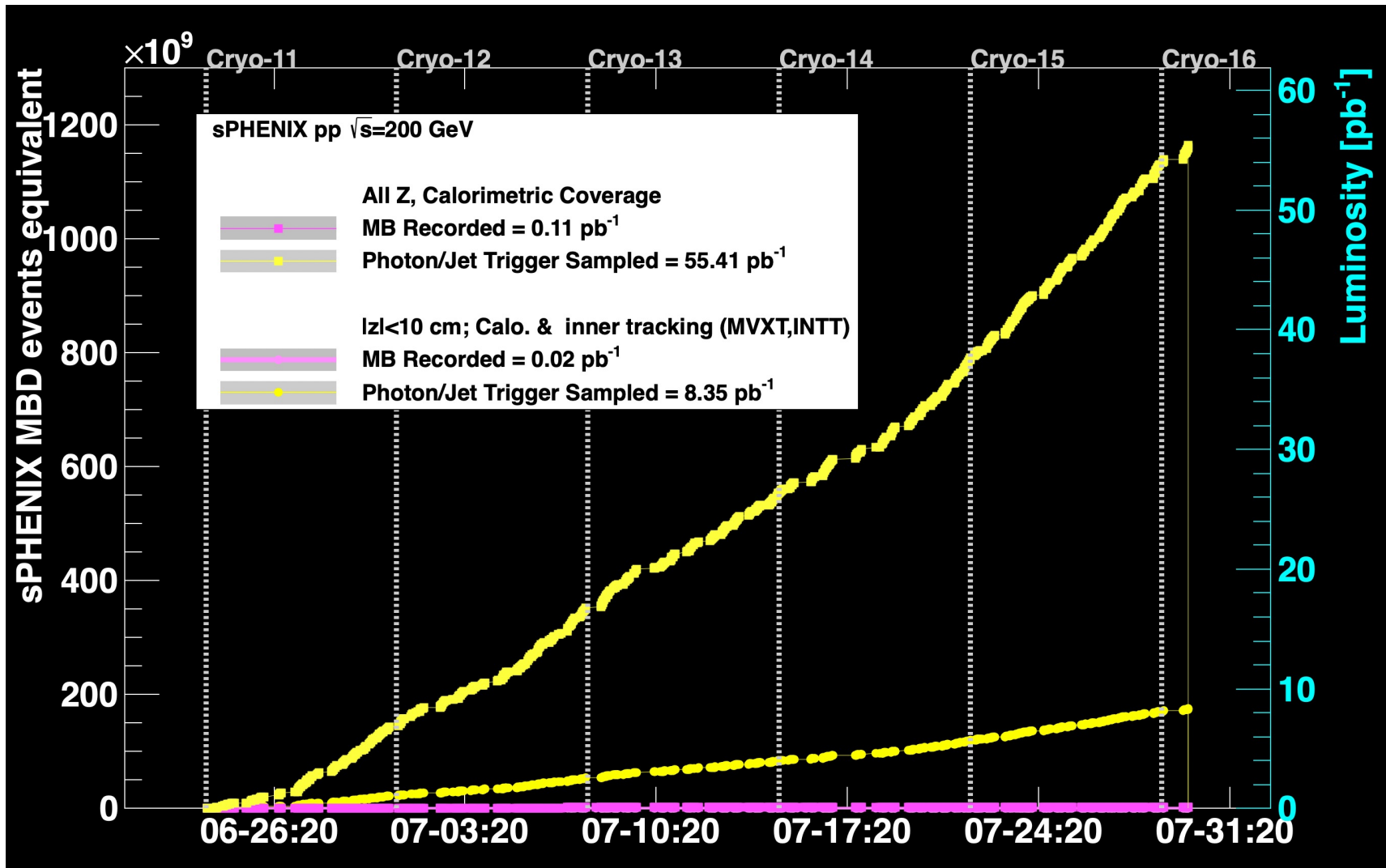
7/29/24

sPHENIX 2024



High efficiency data taking over the past week.  
Starting data taking 4-5 minutes after Physics Declared.





# TPC Status Update

Isobutane flow turned on Saturday, July 27, 2024.

48 hours gas turn over.

Cosmic data taken without beam on Monday, July 29, 2024.

Determine TPC High Voltage working point with cosmics – completed.

Currently taking beam data with TPC right now – Tuesday, July 30, 2024.

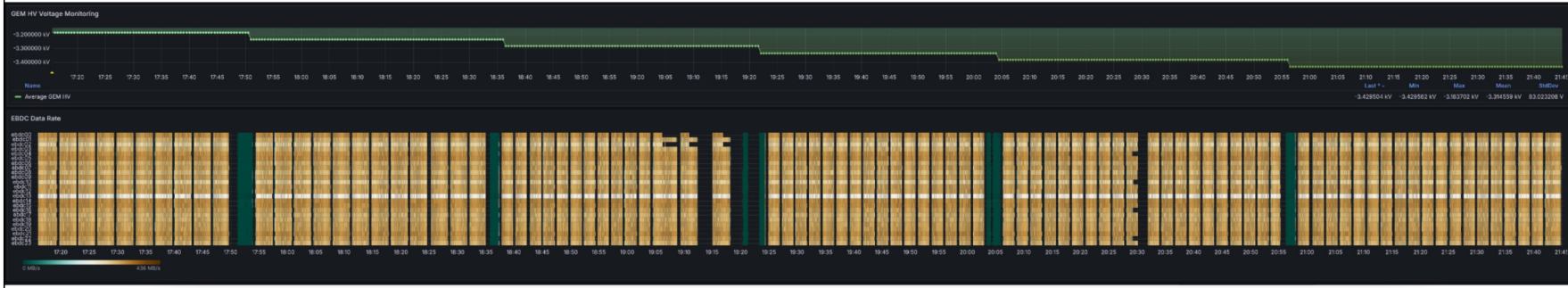
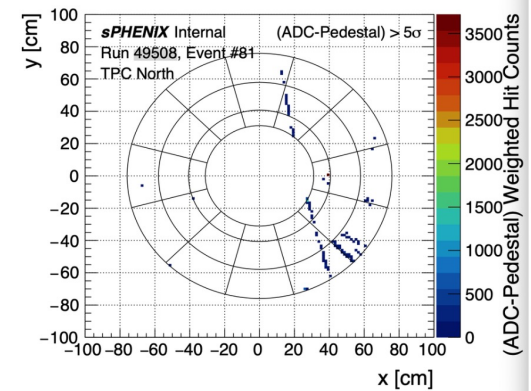
- 6x6 bunch store with zero crossing
- Determine module by module gain balancing
- Critical test and fast analysis turnaround
- Followed by producing the new HV divider resister and installation with an access: in a few days
- Progress towards full luminosity operation with HV, and start of full collision commissioning

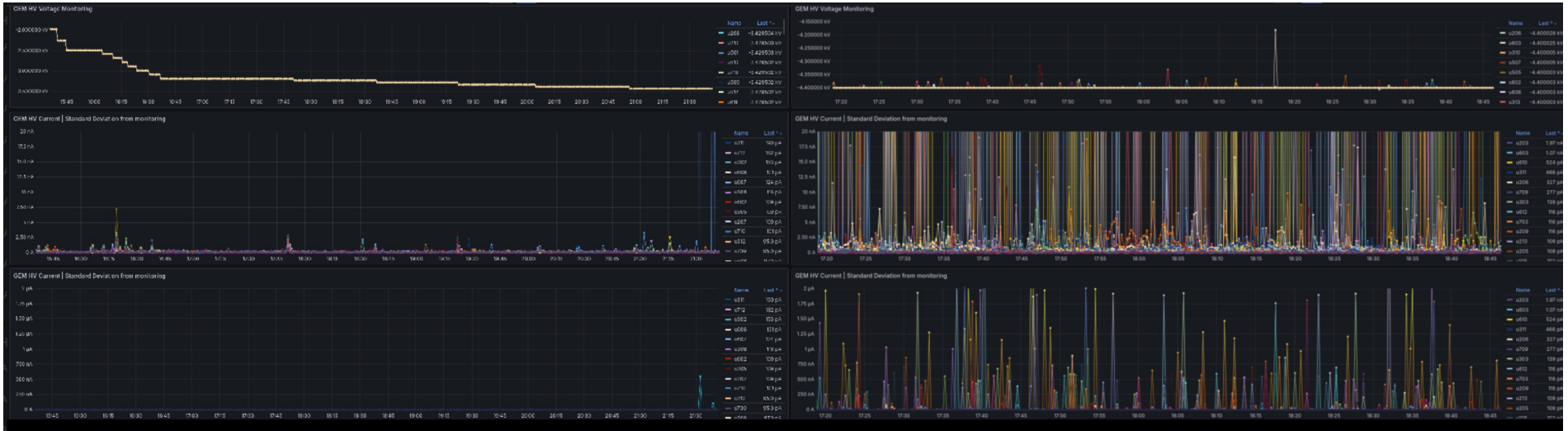
# Gas: Ar:cf4:Iso (75:20:5)

## Cosmic run report

- Smooth running
  - Very little discharge activity on TPC GEM
- Six HV settings scanned, 3.20kV...3.45kV in 50V interval
  - ~15x 2min big partition runs at each HV → 100k event per HV set point
  - Expected to scan from below to above the TPC workpoint
  - Big partition run with HCal vertical wide cosmic trigger with GL1+TPC+TPOT+HCal
- Run list : <https://chat.sdcc.bnl.gov/sphenix/pl/hzizpdgnw7ro3njfx1nkf3xxxh>

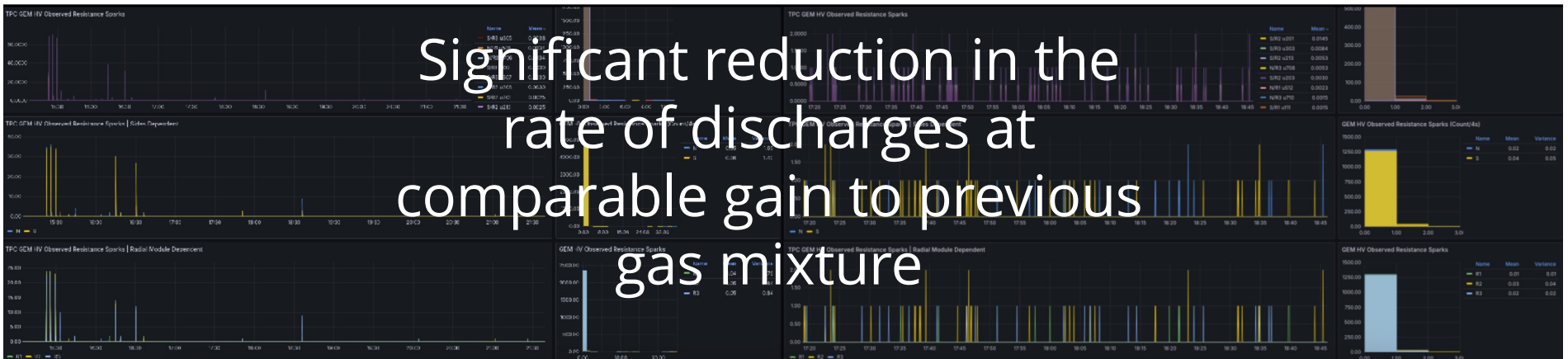
3.2kV in offline (start point of HV scan)  
by Yeonju Go





Iso cosmic run

N2 cosmic run



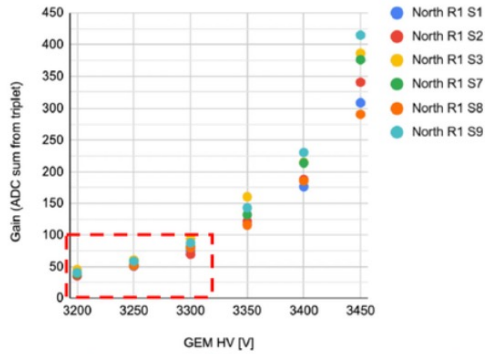
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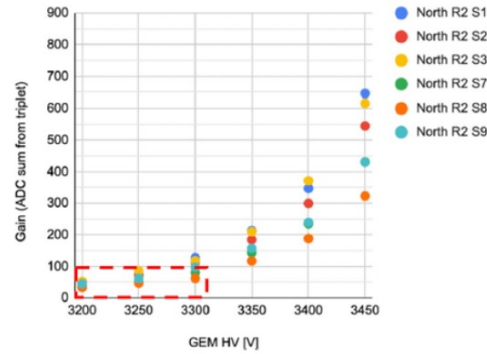
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## Gain vs GEM HV

HV vs North R1 Module Gain Avg



HV vs North R2 Module Gain Avg



Gain analysis based on Cosmic data (Iso gas) on Aug 29  
Aim for 100ADU  $\rightarrow$   $\sim$ 3.3kV HV setpoint

Yeonju Go

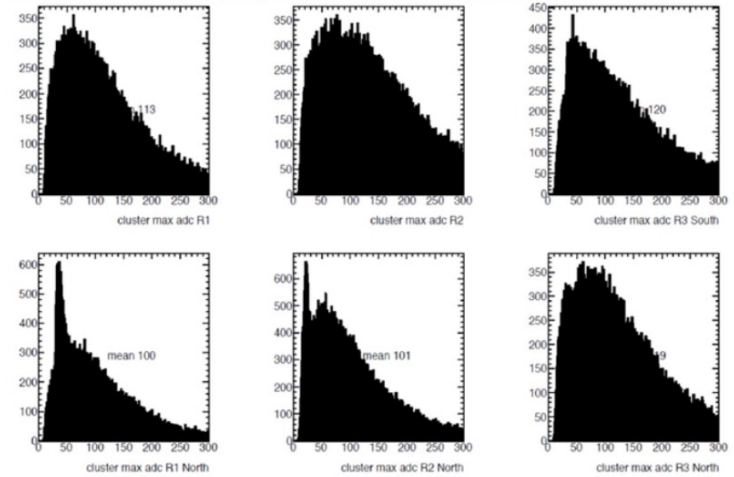
8/27

- Cluster size vs HV (all tracks/tracks with  $p_T > 1$  GeV/c) and possibly vs GEM
- Cluster charge (and/or max ADC) vs HV (vs GEM)
- Cluster count vs HV (total, and per  $>1$ GeV/c track)
- Mini-sparks frequency vs HV, comparison cosmics vs beam, and vs beam intensity
- Triplet analysis-based gain (cosmics)
- $dE/dx$  vs sign  $\times$   $p$  (beam)
- Gain balancing plot: Measured change vs predicted change
- Distortion plot vs Silicon & TPOT

7/30/24

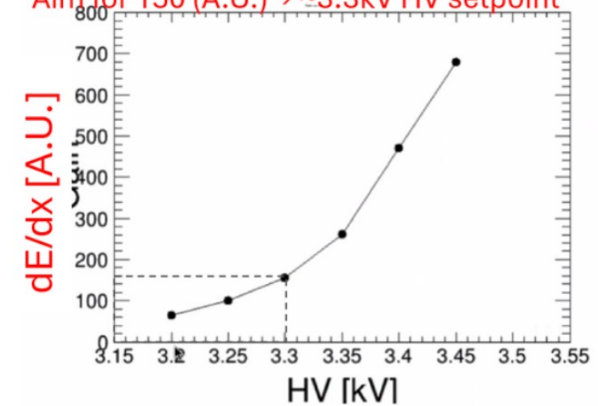
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Cluster on track based on Cosmic data (Iso gas) on Aug 29  
Cluster ADC energy sum at 3.3kV HV setpoint

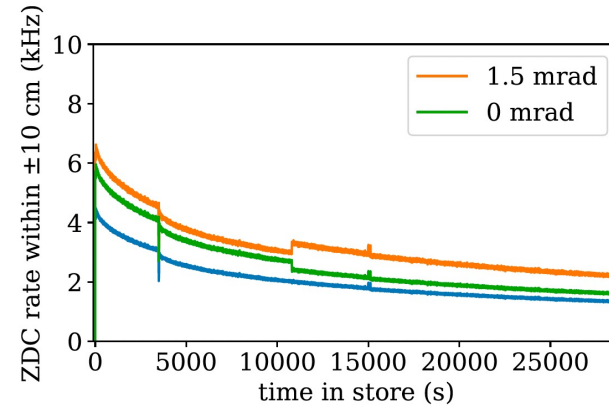
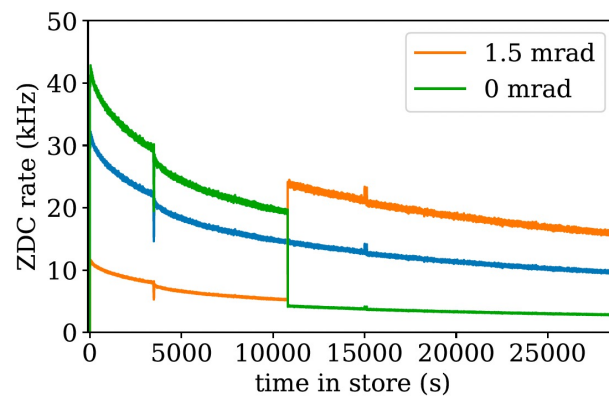


- Clear change in qualitative shape of max ADC distribution
- One pad frac  $\sim$ 8-12%

$dE/dx$  analysis based on Cosmic data (Iso gas) on Aug 29  
Aim for 150 (A.U.)  $\rightarrow$   $\sim$ 3.3kV HV setpoint



Once TPC running 24/7 for physics,  
then switch to starting stores at +1.5 mrad



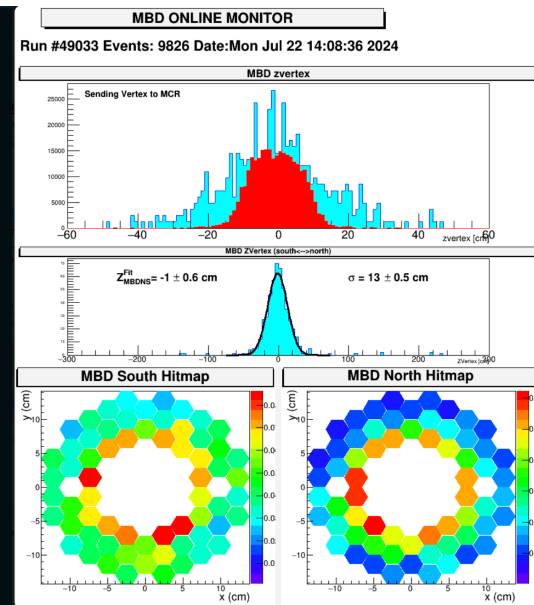
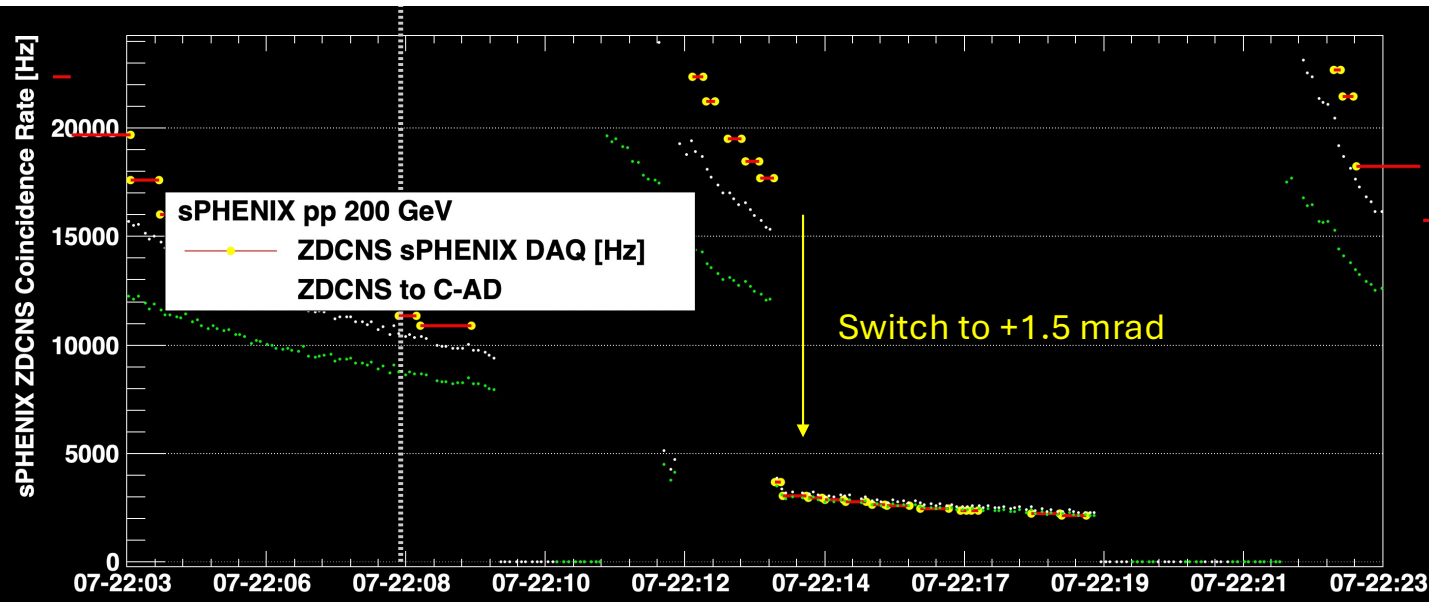
This assumes 1.5 mrad can support 11% intensities more intensity than 0 mrad.

Summary table

	1.5 mrad first	0 mrad first	Ratio
$L_{int}^{10}$ (units of ZDCs)	74362	61635	1.206
$L_{int}^{-10}$	298549	320974	0.93







July 22, 2024 – steering from 0 mrad to +1.5 mrad (maximum from aperture constr.)

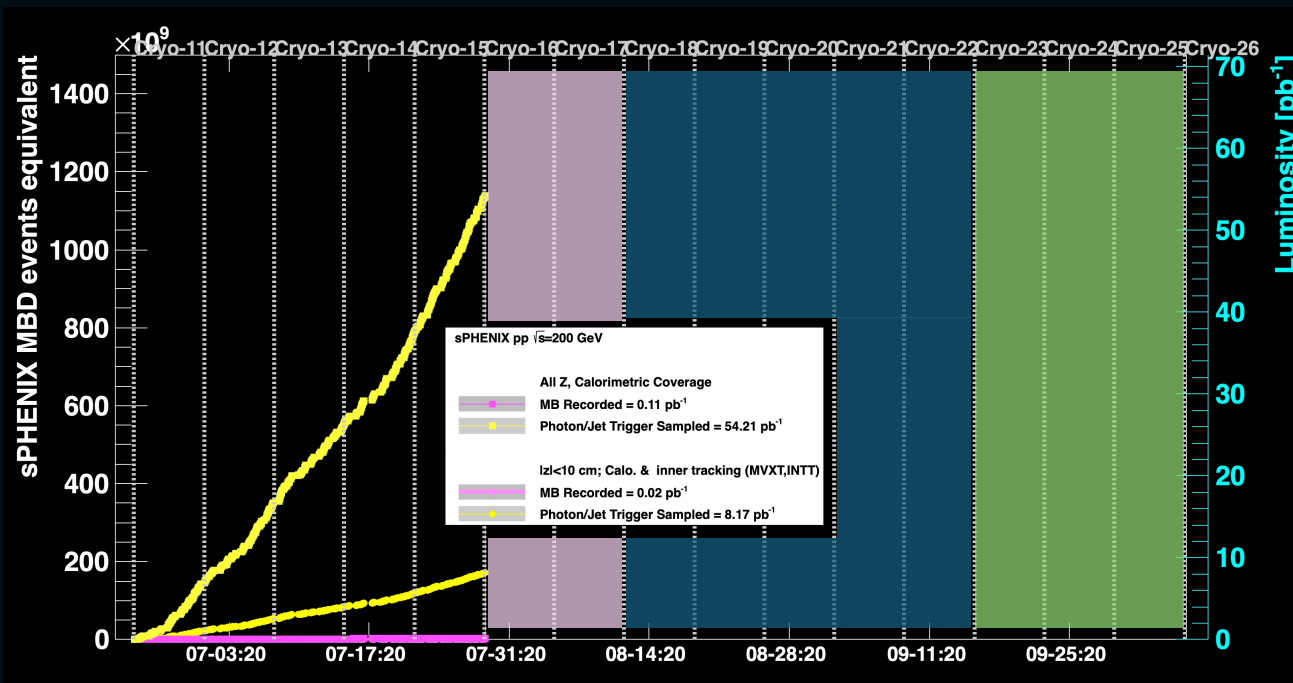
ZDCNS rate 2-4 kHz over all z-vertices, with 55% within  $|z| < 10$  cm.

Using 3 kHz ZDCNS rate (550 kHz pp 42mb rate all Z).

If running smoothly (60% RHIC uptime, 60% sPHENIX uptime), TPC could sample for jets/photons  $1.4 \text{ pb}^{-1} / \text{week}$  ( $|z| < 10$  cm) and full 100% streaming for open heavy flavor  $1.4 \text{ pb}^{-1} / \text{week}$ . Lots of hidden assumptions in there...

# One scenario (just as an example)

- TPC up and fully running in 2 weeks (optimistic)
- Extend pp running (19+3 cryo-weeks), until Sept. 16
- 3 weeks of AuAu 200 GeV at the end.



5 weeks pp running w/ TPC might yield  $7.0 \text{ pb}^{-1}$  with full detector within  $|z| < 10$  cm.

Much less than  $45 \text{ pb}^{-1}$  sampled in BUP goal. However, could be double heavy flavor streaming sample ( $10\% \rightarrow 100\%$ ).  
Optimistic.

# Summary

- Excellent, efficient data taking for jet program continues at zero crossing angle (all z-vertices for calorimeter program)
- INTT and MVTX mostly in full streaming mode
- TPC running with isobutane  
Careful, systematic approach to physics
- Reminder that “working point” HV with beam is the start of full collision commissioning. Likely need additional special stores, 1-2 multi-hour accessed for resistor swaps, new TPC firmware tests, data throughput reliability work, zero suppression, noise mitigation, etc.
- Commitment to make it all work.