

sPHENIX Status

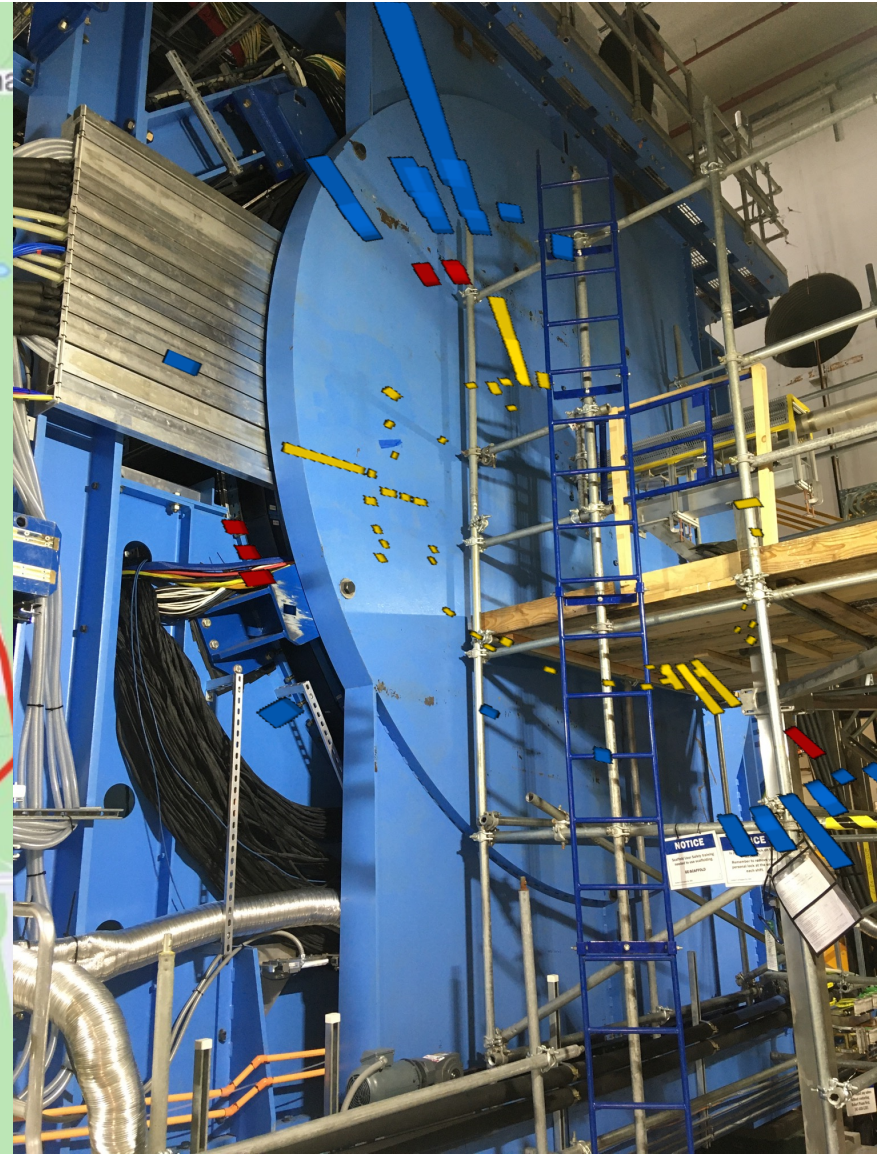
RHIC Coordination Meeting

June 18, 2024

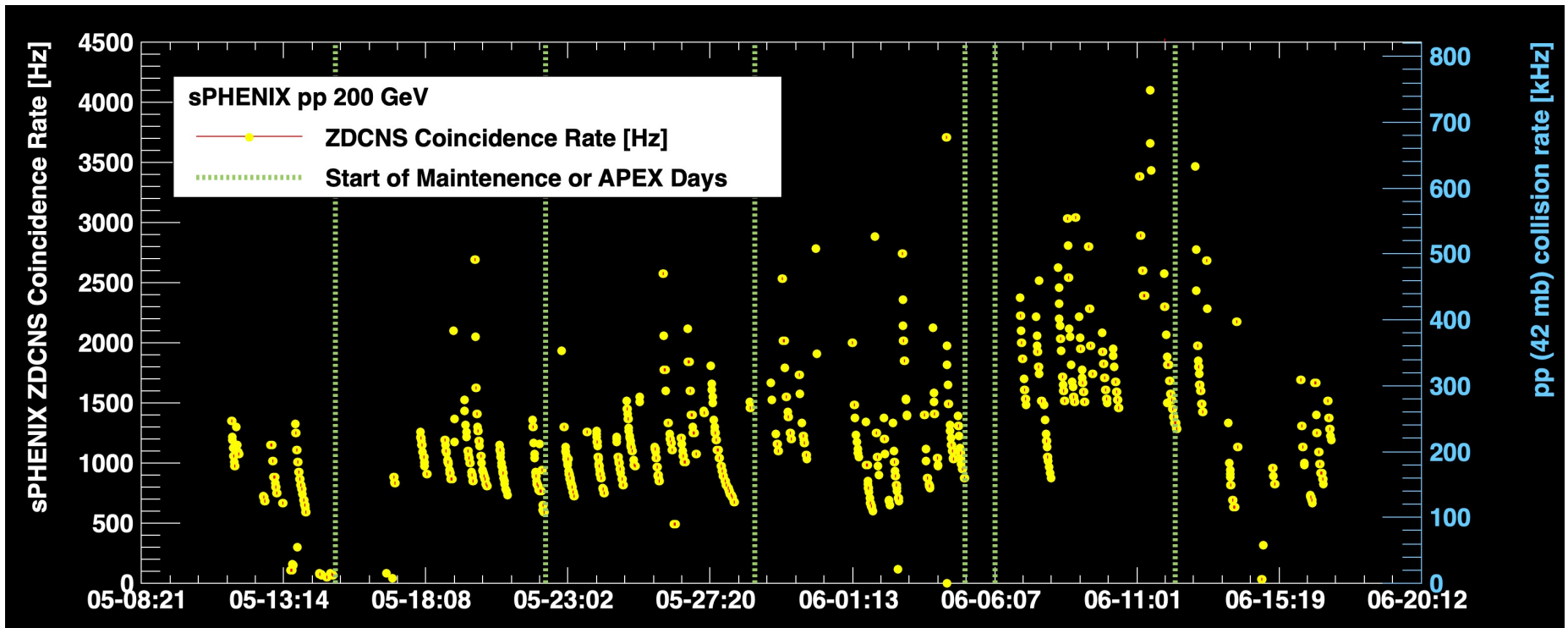
Jamie Nagle
University of Colorado Boulder
sPHENIX Run Coordinator

6/18/24

sPHENIX 2024



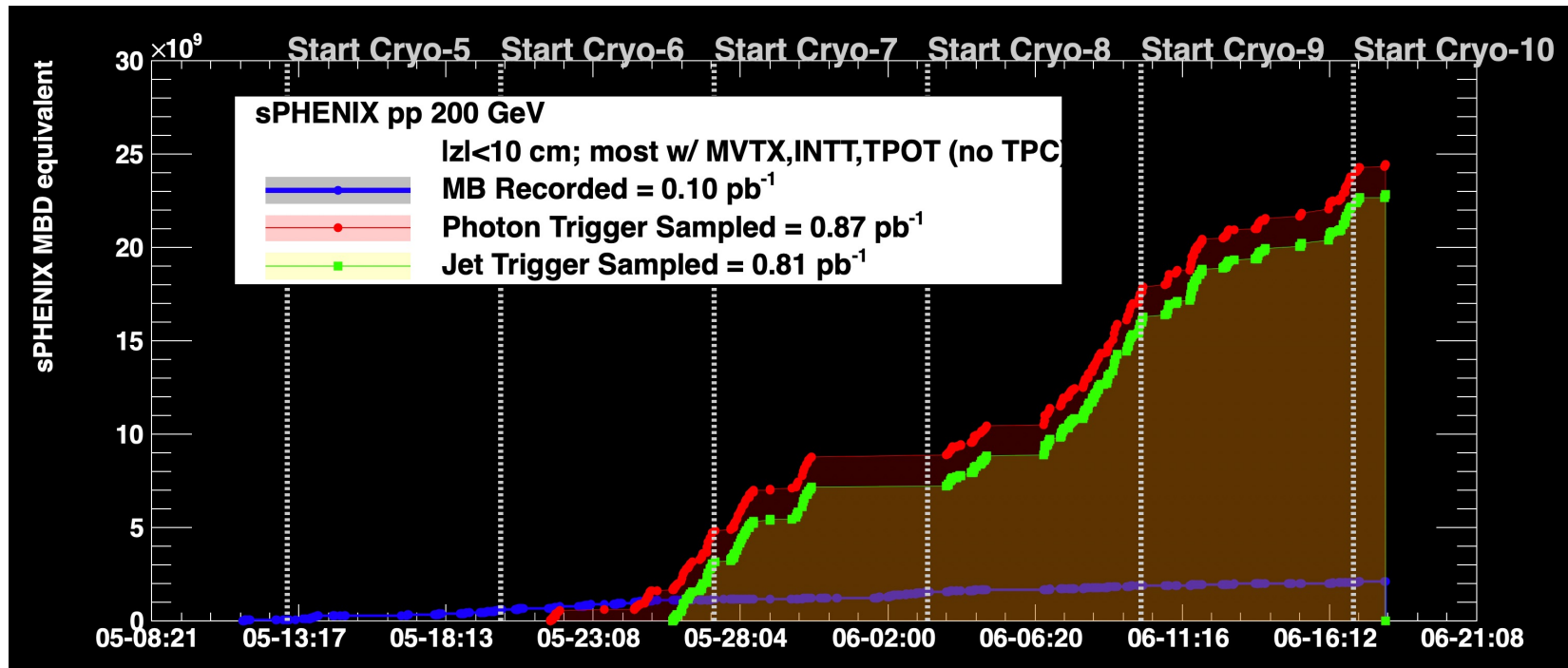
Data taking update



Short period at 1.1 mrad

Stores this past weekend,
long time to declare physics...

Data taking update

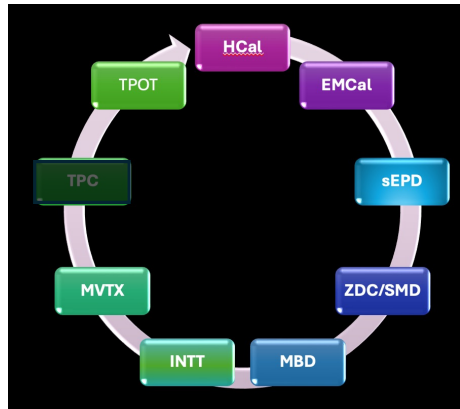


RHIC time in store is an issue.

sPHENIX has significantly improved uptime and running (modulo fire alarm on Friday)

Even with best slopes for data taking, would estimate 40-50 weeks to achieve 45 pb^{-1} (minimum goal)

Running all systems except TPC



Sampling full luminosity
with photon and jet triggers,
and running > 10 kHz with
high livetime.

MVTX, INTT data integrity
checks look good.

Trigger Control

	Raw	Live	Scaled	Livetime
0: Clock	9383.00 kHz	9217.67 kHz	0.00 kHz	98.24%
1: ZDC South	23.85 kHz	23.42 kHz	0.00 kHz	98.18%
2: ZDC North	20.99 kHz			
3: ZDC Coincidence	466	1.30 kHz		
4: HCal Singles	off	0.99 kHz		
5: HCal Coincidence	off	9383.00 kHz		
8: MBD S >= 1	off	231.65 kHz		
9: MBD N >= 1	off	189.28 kHz		
10: MBD N&S >= 1	50	105.89 kHz		
11: MBD N&S >= 2	off	51.06 kHz		
12: MBD N&S >= 1, vtx < 10 cm	off	42.17 kHz		
13: MBD N&S >= 1, vtx < 30 cm	off	79.45 kHz		
14: MBD N&S >= 1, vtx < 60 cm	off	87.20 kHz		
15: HCal Singles + MBD NS >= 1	off	21.68 kHz		
16: Jet 4 GeV + MBD NS >= 1	off	9.15 kHz		
17: Jet 6 GeV + MBD NS >= 1	2	0.92 kHz	0.91 kHz	98.34%
18: Jet 8 GeV + MBD NS >= 1	0	0.15 kHz	0.15 kHz	98.42%
19: Jet 10 GeV + MBD NS >= 1	0	0.09 kHz	0.09 kHz	98.13%
20: Jet 4 GeV	off	24.70 kHz	24.25 kHz	98.18%
21: Jet 6 GeV	off	3.23 kHz	3.17 kHz	98.25%
22: Jet 8 GeV	4	0.71 kHz	0.70 kHz	98.07%
23: Jet 10 GeV	0	0.47 kHz	0.46 kHz	97.87%
24: Photon 1 GeV+ MBD NS >= 1	off	33.31 kHz	32.71 kHz	98.20%
25: Photon 2 GeV + MBD NS >= 1	2	4.53 kHz	4.45 kHz	98.23%
26: Photon 3 GeV + MBD NS >= 1	0	1.41 kHz	1.39 kHz	98.12%
27: Photon 4 GeV + MBD NS >= 1	0	0.52 kHz	0.51 kHz	98.09%
28: Photon 1 GeV	off	433.23 kHz	425.52 kHz	98.22%
29: Photon 2 GeV	off	13.35 kHz	13.11 kHz	98.16%
30: Photon 3 GeV	4	4.89 kHz	4.80 kHz	98.14%
31: Photon 4 GeV	0	2.11 kHz	2.07 kHz	98.12%

Run Control

Running for 0:05:29
Run: 45939
Events: 2241645 (17205.6 Hz)
Logging Enabled

Trigger Control

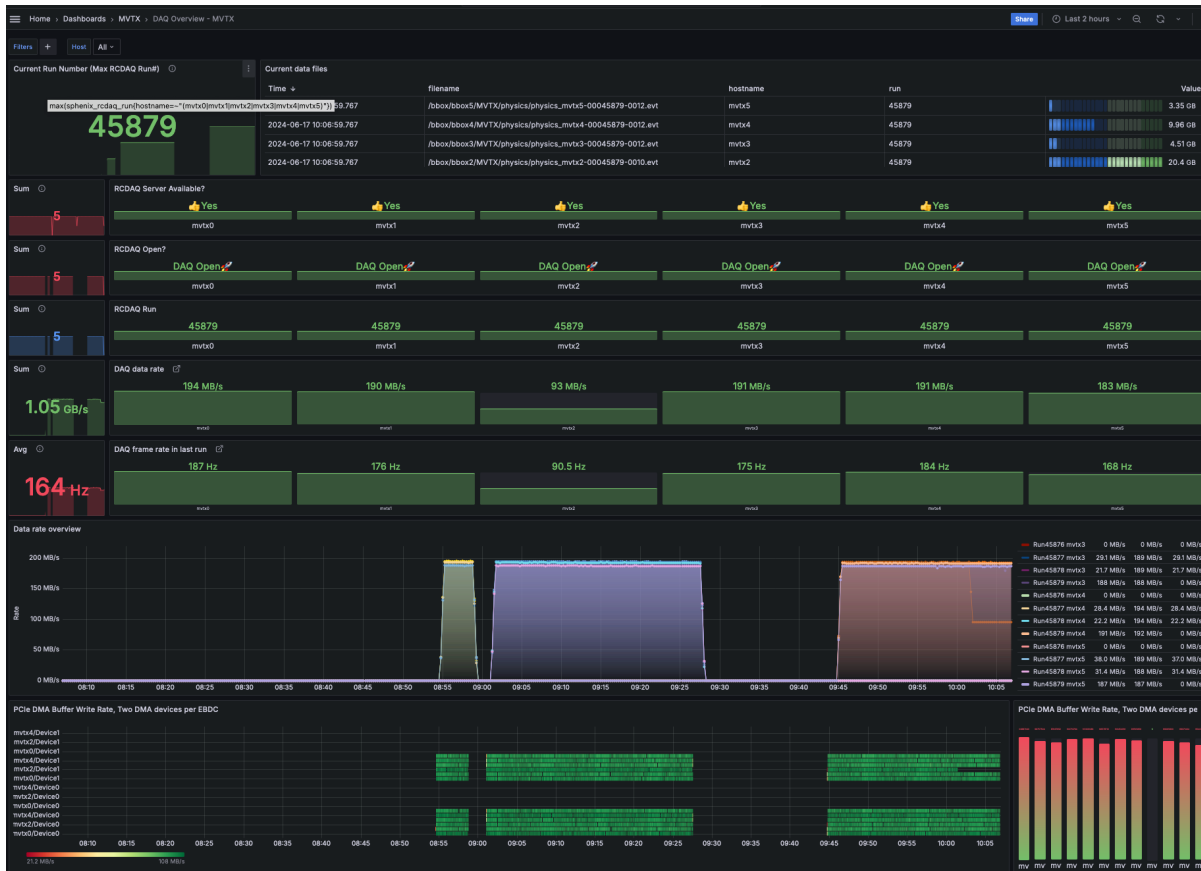
LL1 SERVER PROBLEM

Rejection Factors (MBD)

Trigger	Photon 1	Photon 2	Photon 3	Photon 4
Jet 4: 11	3			
Jet 6: 109	22			
Jet 8: 688	71			
Jet 10: 1190	195			

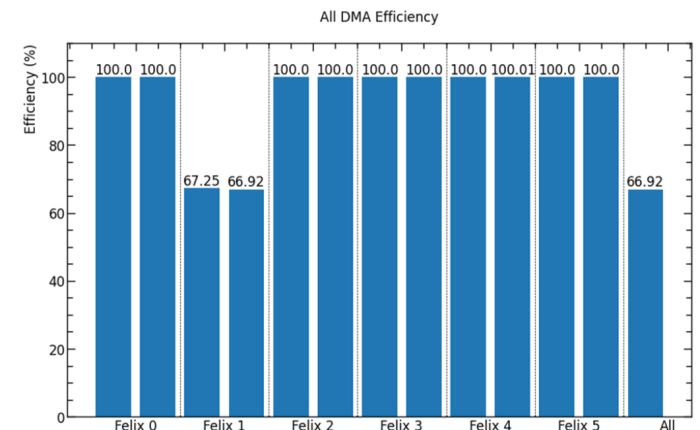
Trigger Control

	Scaledown	Raw	Live	Scaled	Livetime
ZDC South	off	23.86 kHz	23.43 kHz	0.00 kHz	98.18%
ZDC North	off	21.01 kHz	20.62 kHz	0.00 kHz	98.18%
ZDC Coincidence	466	1.30 kHz	1.28 kHz	0.00 kHz	98.15%
MBD S >= 1	off	231.69 kHz	227.41 kHz	0.00 kHz	98.15%
MBD N >= 1	off	189.32 kHz	185.80 kHz	0.00 kHz	98.14%
MBD N&S >= 1	50	105.91 kHz	103.99 kHz	2.04 kHz	98.19%
Jet 6 GeV + MBD NS >= 1	2	0.93 kHz	0.91 kHz	0.30 kHz	98.33%
Jet 8 GeV + MBD NS >= 1	0	0.15 kHz	0.15 kHz	0.15 kHz	98.40%
Jet 10 GeV + MBD NS >= 1	0	0.09 kHz	0.08 kHz	0.08 kHz	98.08%
Jet 8 GeV	4	0.71 kHz	0.69 kHz	0.14 kHz	98.06%
Jet 10 GeV	0	0.46 kHz	0.45 kHz	0.45 kHz	97.87%
Photon 2 GeV + MBD NS >= 1	2	4.53 kHz	4.45 kHz	1.48 kHz	98.23%
Photon 3 GeV + MBD NS >= 1	0	1.41 kHz	1.39 kHz	1.39 kHz	98.13%
Photon 4 GeV + MBD NS >= 1	0	0.52 kHz	0.51 kHz	0.51 kHz	98.18%
Photon 3 GeV	4	4.89 kHz	4.80 kHz	0.96 kHz	98.14%
Photon 4 GeV	0	2.11 kHz	2.07 kHz	2.07 kHz	98.15%

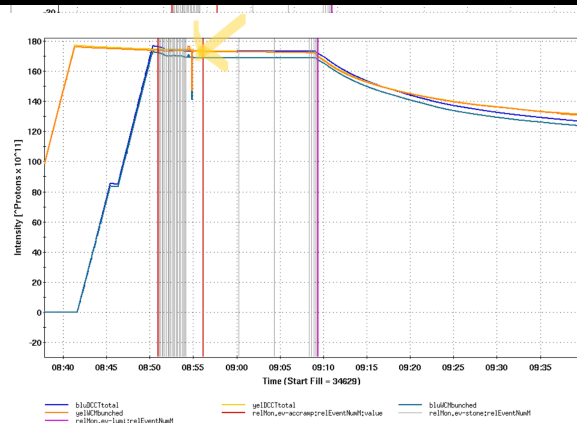
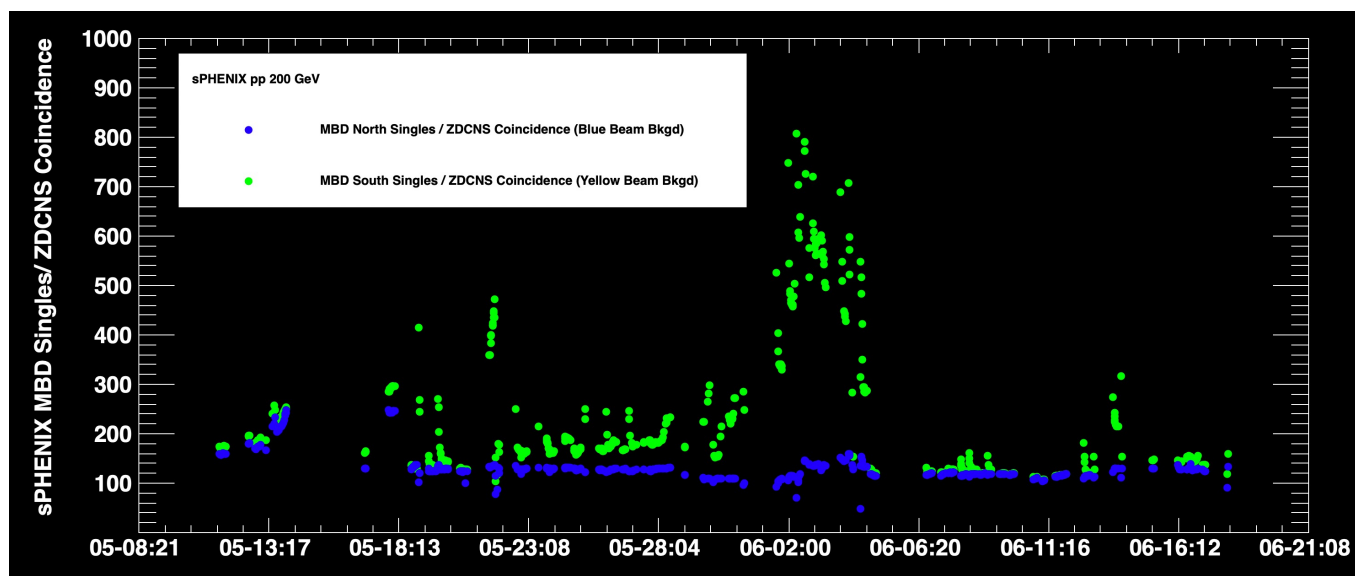


MVTX very steady logging rate in full streaming mode with firmware updates and changes to Buffer Box / Lustre configuration.

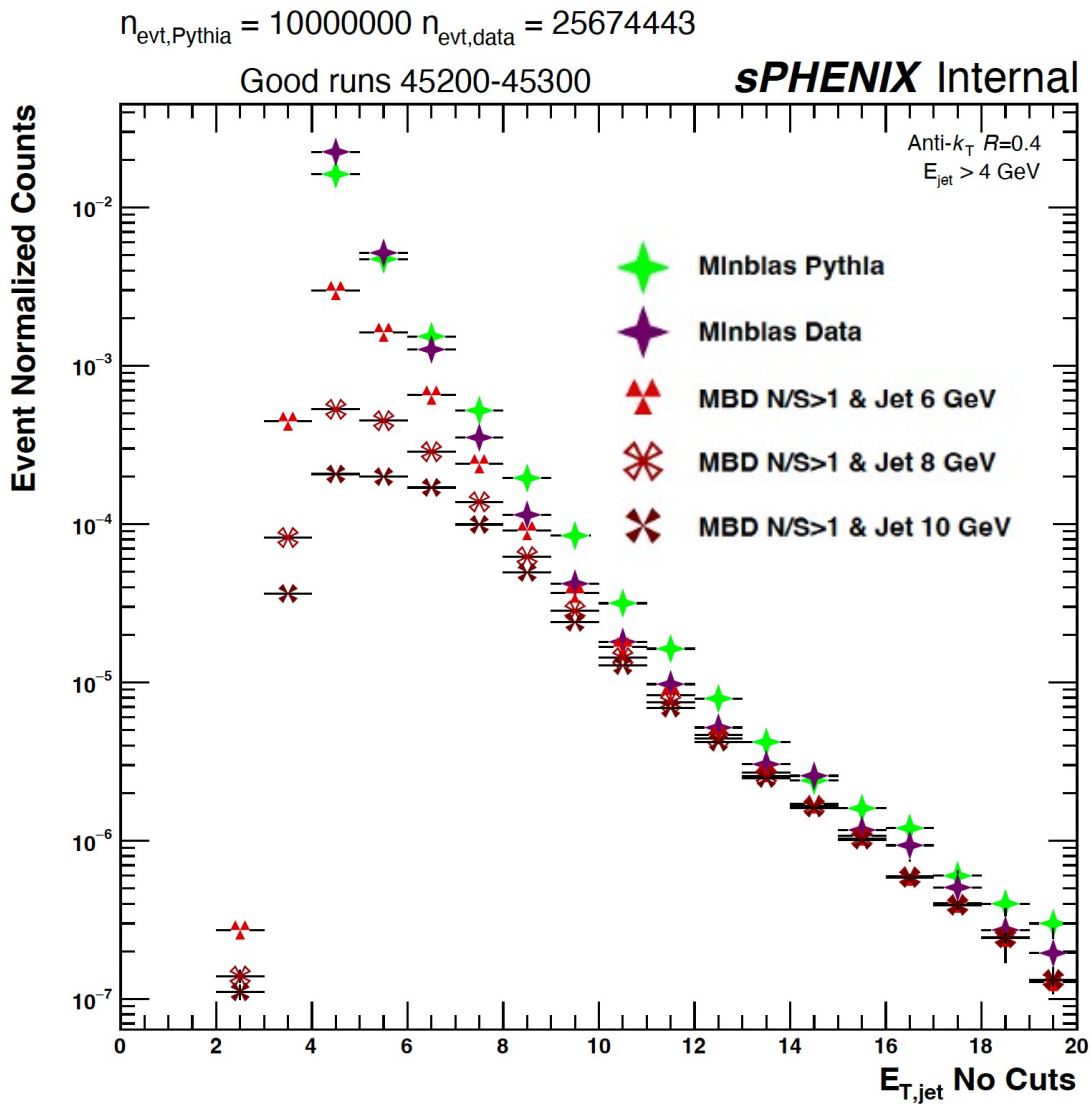
Remaining issue might be VTRx heat issue (seen in all CERN experiments). Working on additional cooling.



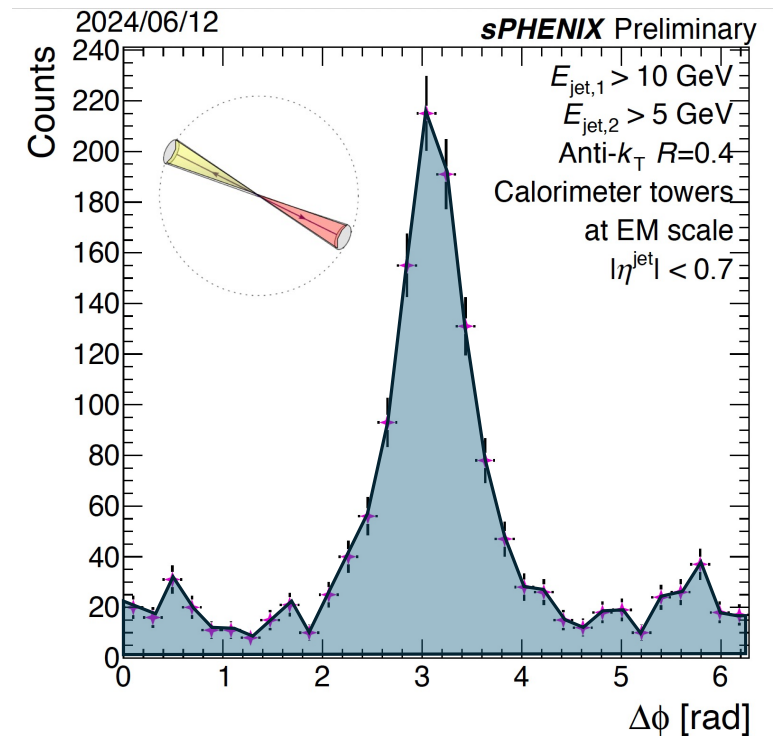
Backgrounds and start of store procedure



Thanks for C-AD / Kin coordination.
We are configuring our whole system as soon as clocks are stable, then turning on voltages when physics declared.

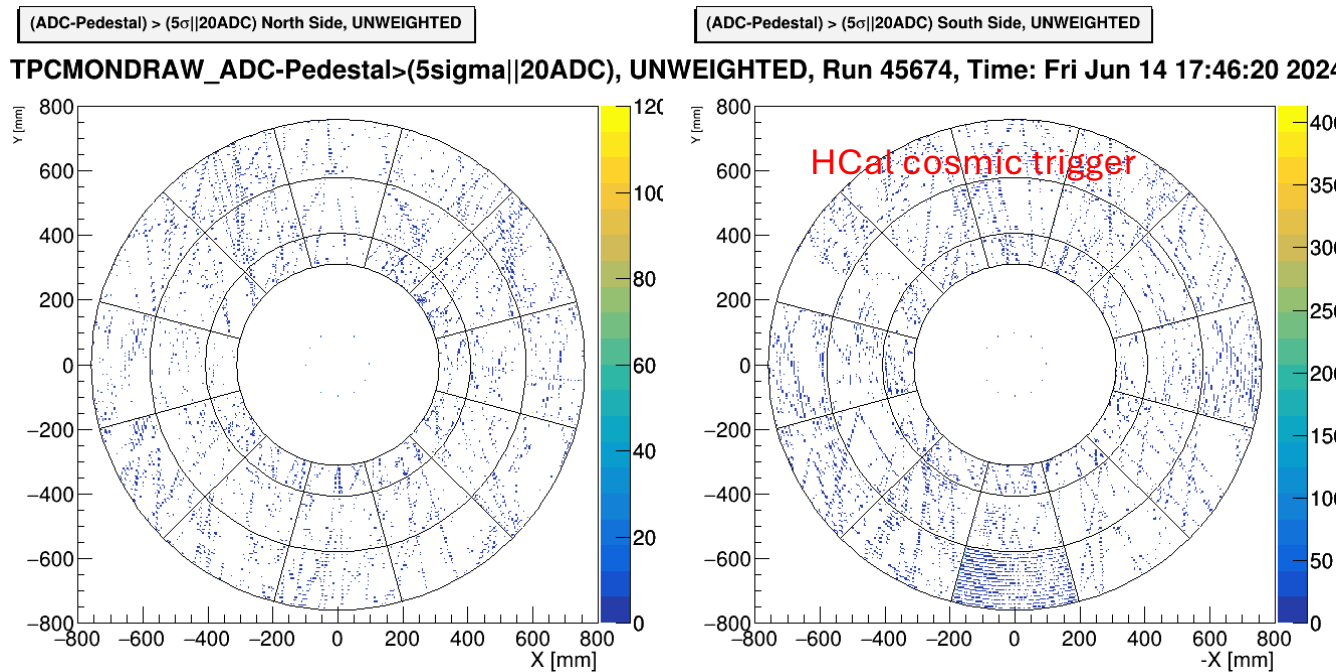


Young people on sPHENIX are excited to pushing on multiple data checks – low level to higher level objects



TPC Update

On Thursday last week, took cosmic runs at 4.2 kV, 4.3 kV, 4.35 kV, 4.4 kV



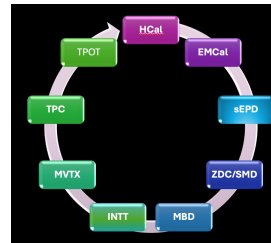
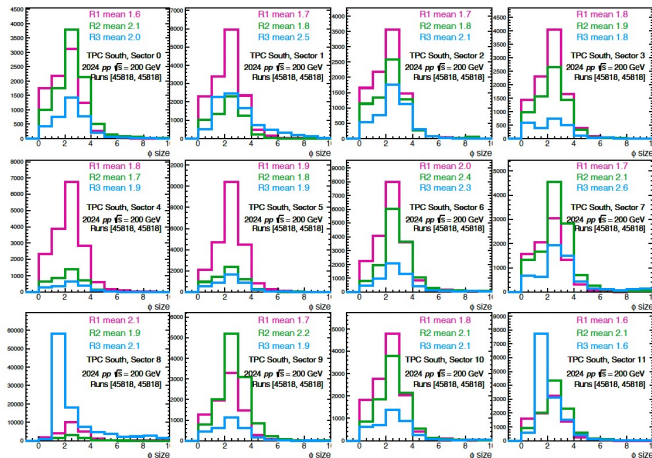
Over the weekend, ran with beam at 4.1, 4.2, 4.3 kV. Large sparking and damage at 4.3 kV (disappointing). Extensive discussion on Monday with TPC group/experts.

TPC Diagnostics and Plan

TPC Gain with Ar:CF₄:N₂ 65:25:10

- Run 45818, TPC: GEMs: 4.1 kV, CM: 44.3 kV

	S0	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
South R3	59.9	75.7	54.6	51.0	52.6	48.5	58.1	66.1	95.5	50.7	52.6	65.7
South R2	53.1	56.5	46.4	44.6	41.9	43.2	61.4	59.4	47.6	57.5	49.3	54.8
South R1	38.0	40.9	38.9	43.1	42.4	49.6	45.1	37.8	52.6	40.4	52.0	39.1
North R3	47.4	45.4	57.5	49.8	47.9	48.3	57.7	47.4	50.6	47.5	49.2	49.8
North R2	43.5	47.1	43.7	42.6	45.8	41.7	40.2	40.5	45.0	40.8	41.8	41.8
North R1	38.7	34.2	35.8	37.5	37.5	160.2	37.1	37.9	37.5	40.6	39.3	35.4



Run TPC with this gas mixture at 4.1 kV. Lower efficiency / resolution – being evaluated in detail.

Dedicated time each day (~ 6 hours). Some running w/o ZS (30 Hz) and bringing online full ZS and needed firmware updates.

Checking stability at this working point. **Running all systems together in this state as of yesterday.**

In parallel, pushing forward to switch to isobutane mixture that has a much lower discharge point.

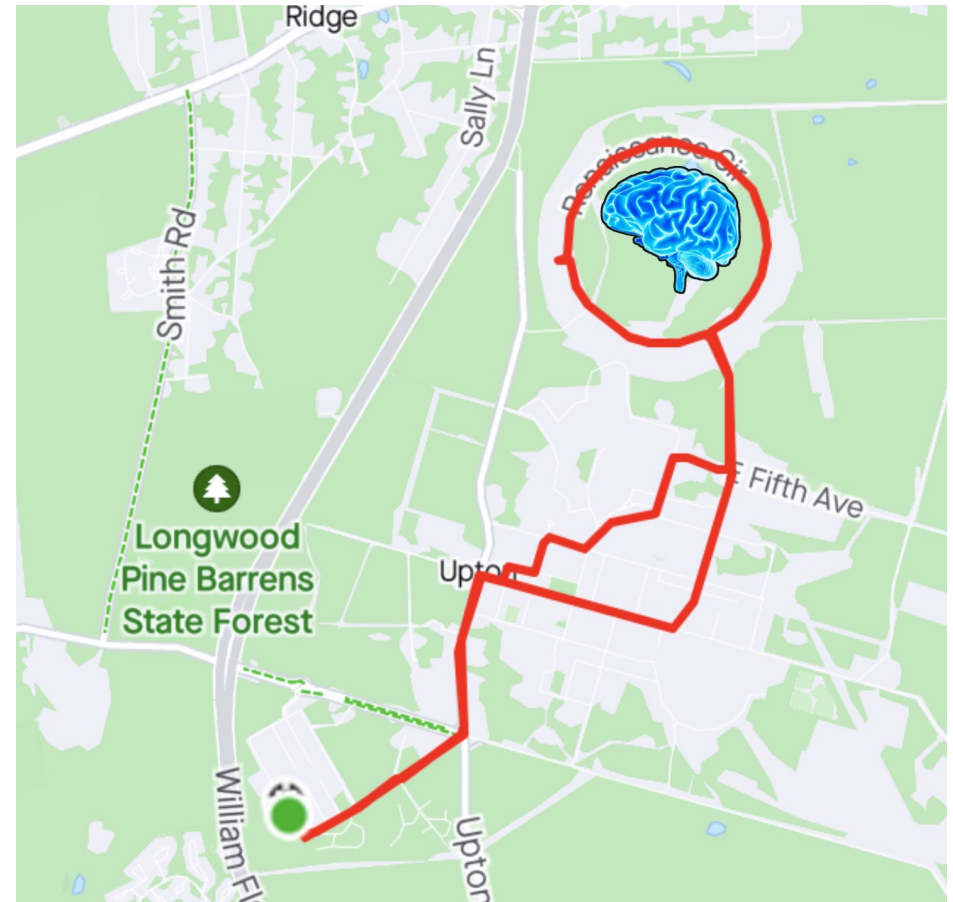
Brainstorming...

A few notes from sPHENIX

- Calorimeters can use collisions over all vertices (e.g., γ -jet).
- At low luminosity we can run with smaller crossing angle (but then beam-beam issues).
- Spin is much lower priority for sPHENIX.
- Beginning of store luminosity mostly lost (long time to physics declared).
- Length of store hard to optimize, machine reliability issues.
- At this point, we just want to enable C-AD to check/test things to inform a decision discussion (not today).

6/18/24

sPHENIX 2024



Everything on the table for us...

98