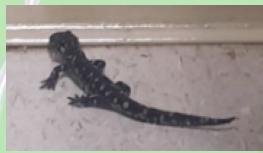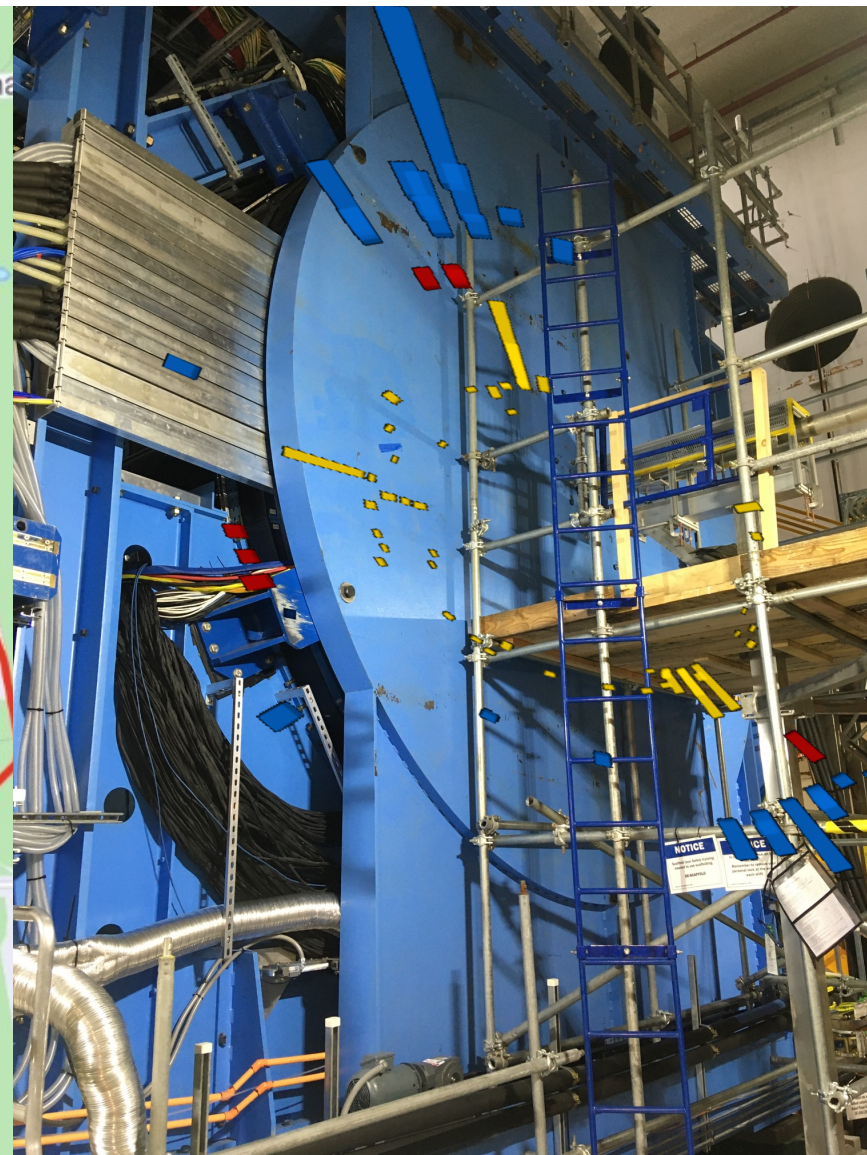# sPHENIX Status
RHIC Coordination Meeting
August 20, 2024

Jamie Nagle
University of Colorado Boulder
sPHENIX Run Coordinator

8/19/24

sPHENIX 2024

sPHENIX Data Taking:

Since August 13, 2024 sPHENIX is running at +1.5 mrad with TPC!

MVTX and INTT in 100% streaming mode (running stably)

Running TPC with zero suppression in triggered mode with 50 µs extended readout

→ Sampling full luminosity with jet/photon triggers (**currently ~ 1.5 pb^{-1}/week**)

→ Open heavy flavor program with MVTX, INTT, TPC currently recording physics from 10% of all collisions (**currently ~ 0.15 pb^{-1}/week**)

sPHENIX BUP Goal for this run was 10% "streaming", which is achieved

We are working to increase this 10% as high as possible to maximize D, Λ_c, … physics

Select Big Partition

GL1	LL1	MBD
ZDC/sEPD	EMCAL	HCAL
INTT	TPOT	TPC
MVTX		

Toggle Host Select

Modify Subsystems Select subsystems Calo Handling

Run Control

10:12:06

Running for 0:13:50

Run: 51709

Events: 2478384 (2948.8 Hz)

Logging Enabled

Close

Pause

End

physics | beam | cosmics | calib | junk

xclock
Tue 20 Aug 2024 10:12:00 AM EDT

xPHENIX Cosmic Trigger Configuration

Instruction
Make sure if configuring between beam to cosmics, toggle the HCAL trigger mode

Trigger Configuration

Coincidence — Vertical / Horizontal

plain / plain
z-cross / z-cross
z-same / z-same
wide plain / wide plain
wide z-cross / wide z-cross
wide z-same / wide z-same

Singles
OHCAL
IHCAL
HCAL

Mode
Beam set mode

Trigger Control

LL1 Server OK

(ZDCN+ZDCS)/ZDC Coinc: 23
(MBD N+S >= 1)/ZDC Coinc: 73
MBD S/ZDC Coinc: 99
MBD N/ZDC Coinc: 97

Rejection Factors (MBD)
Crossing angle is: 1.5 mrad

Livetime (MBD)
99%

Jet 6: 219	Photon 2: 50
Jet 8: 2204	Photon 3: 296
Jet 10: 8868	Photon 4: 914
Jet 12: 29872	Photon 5: 3118

	Scaledown	Raw	Live	Scaled	Livetime
0: Clock	938315	9383.00 kHz	9330.24 kHz	0.01 kHz	99.44%
1: ZDC South	off	59.82 kHz	59.47 kHz	0.00 kHz	99.42%
2: ZDC North	off	55.84 kHz	55.53 kHz	0.00 kHz	99.44%
3: ZDC Coincidence	103	5.13 kHz	5.10 kHz	0.05 kHz	99.36%
8: MBD S >= 1	off	507.10 kHz	504.20 kHz	0.00 kHz	99.43%
9: MBD N >= 1	off	499.61 kHz	496.78 kHz	0.00 kHz	99.43%
10: MBD N&S >= 1	7637	374.71 kHz	372.59 kHz	0.05 kHz	99.43%
12: MBD N&S >= 1, vtx < 10 cm	123	179.03 kHz	178.02 kHz	1.44 kHz	99.43%
21: Jet 8 GeV	0	0.30 kHz	0.30 kHz	0.30 kHz	99.46%
22: Jet 10 GeV	0	0.09 kHz	0.09 kHz	0.09 kHz	99.63%
23: Jet 12 GeV	0	0.03 kHz	0.03 kHz	0.03 kHz	100.00%
29: Photon 3 GeV	2	1.91 kHz	1.90 kHz	0.63 kHz	99.41%
30: Photon 4 GeV	0	0.65 kHz	0.65 kHz	0.65 kHz	99.54%
31: Photon 5 GeV	0	0.22 kHz	0.22 kHz	0.22 kHz	99.39%
33: Jet 8 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.07 kHz	0.07 kHz	0.07 kHz	99.55%
34: Jet 10 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.02 kHz	0.02 kHz	0.02 kHz	100.00%
35: Jet 12 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.00 kHz	0.00 kHz	0.00 kHz	100.00%
36: Photon 3 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.58 kHz	0.58 kHz	0.58 kHz	99.43%
37: Photon 4 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.18 kHz	0.18 kHz	0.18 kHz	99.46%
38: Photon 5 GeV, MBD N&S >= 1, vtx < 10 cm	0	0.05 kHz	0.05 kHz	0.05 kHz	99.29%

Reset Scaledowns Select Triggers Expert Control

Trigger Control

			Raw	Live	Scaled	Livetime			Raw	Live	Scaled	Livetime
0: Clock	938315	Modify	9383.00 kHz	9329.99 kHz	0.01 kHz	99.44%	21: Jet 8 GeV					
1: ZDC South	off	Modify	59.84 kHz	59.50 kHz	0.00 kHz	99.42%	22: Jet 10 GeV					
2: ZDC North	off	Modify	55.80 kHz	55.49 kHz	0.00 kHz	99.44%	23: Jet 12 GeV					
3: ZDC Coincidence	103	Modify	5.11 kHz	5.08 kHz	0.05 kHz	99.41%	24: Photon 2 GeV+ MBD NS >= 1					
4: HCAL Singles/Coincidence	off	Modify	3.71 kHz	3.69 kHz	0.00 kHz	99.37%	25: Photon 3 GeV + MBD NS >= 1					
5: Clock2	off	Modify	9383.00 kHz	9329.99 kHz	0.00 kHz	99.44%	26: Photon 4 GeV + MBD NS >= 1					
8: MBD S >= 1	off	Modify	507.31 kHz	504.39 kHz	0.00 kHz	99.42%	27: Photon 5 GeV + MBD NS >= 1					
9: MBD N >= 1	off	Modify	499.91 kHz	497.04 kHz	0.00 kHz	99.43%	28: Photon 2 GeV					
10: MBD N&S >= 1	7637	Modify	374.88 kHz	372.74 kHz	0.05 kHz	99.43%	29: Photon 3 GeV					
11: MBD N&S >= 2	off	Modify	254.94 kHz	253.49 kHz	0.00 kHz	99.43%	30: Photon 4 GeV					
12: MBD N&S >= 1, vtx < 10 cm	123	Modify	179.06 kHz	178.05 kHz	1.44 kHz	99.43%	31: Photon 5 GeV	0	Modify	0.22 kHz	0.22 kHz	0.22 kHz 99.46%
13: MBD N&S >= 1, vtx < 30 cm	off	Modify	339.77 kHz	337.84 kHz	0.00 kHz	99.43%	32: Jet 6 GeV, MBD N&S >= 1, vtx < 10 cm	off	Modify	0.79 kHz	0.78 kHz	0.00 kHz 99.48%
14: MBD N&S >= 1, vtx < 60 cm	off	Modify	372.16 kHz	370.03 kHz	0.00 kHz	99.43%	33: Jet 8 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.07 kHz	0.07 kHz	0.07 kHz 99.61%
15: HCAL Singles + MBD NS >= 1	off	Modify	122.62 kHz	121.94 kHz	0.00 kHz	99.44%	34: Jet 10 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.02 kHz	0.02 kHz	0.02 kHz 100.00%
16: Jet 6 GeV + MBD NS >= 1	off	Modify	1.71 kHz	1.70 kHz	0.00 kHz	99.49%	35: Jet 12 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.00 kHz	0.00 kHz	0.00 kHz 100.00%
17: Jet 8 GeV + MBD NS >= 1	off	Modify	0.17 kHz	0.17 kHz	0.00 kHz	99.65%	36: Photon 3 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.58 kHz	0.58 kHz	0.58 kHz 99.45%
18: Jet 10 GeV + MBD NS >= 1	off	Modify	0.04 kHz	0.04 kHz	0.00 kHz	100.00%	37: Photon 4 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.19 kHz	0.19 kHz	0.19 kHz 99.53%
19: Jet 12 GeV + MBD NS >= 1	off	Modify	0.01 kHz	0.01 kHz	0.00 kHz	100.00%	38: Photon 5 GeV, MBD N&S >= 1, vtx < 10 cm	0	Modify	0.05 kHz	0.05 kHz	0.05 kHz 99.38%
20: Jet 6 GeV	off	Modify	2.57 kHz	2.55 kHz	0.00 kHz	99.48%						

Reset GL1

RHIC uptime (in declared physics)
sPHENIX DAQ uptime

+0 mrad, high lumi running w/o TPC
+1.5 mrad, running w/ TPC

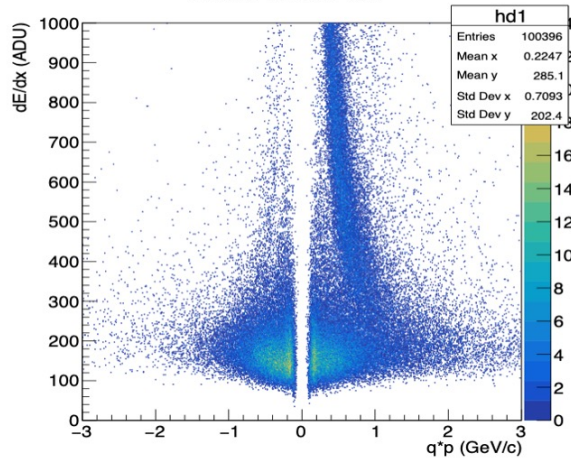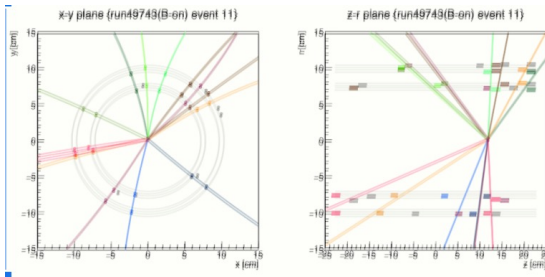# sPHENIX Data Quality:

Zero-suppressed
dE/dx run 51488

TPC gain/efficiency are reasonable.

Today TPC group raised HV slightly (3300 → 3350 V). Some concern about lower gain with high load at the start of store.
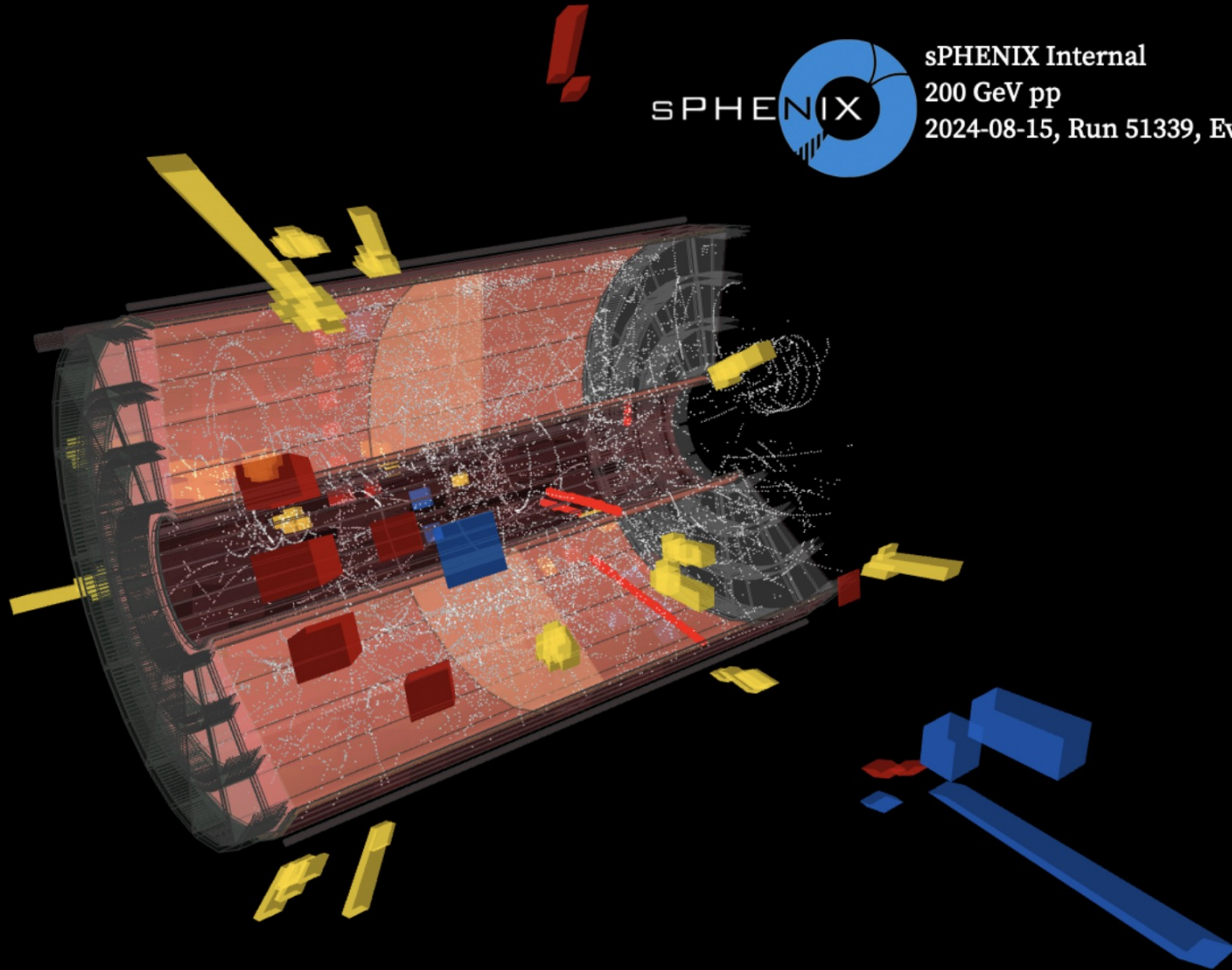
INTT tracks and MIP characterization.   Tracks connecting MVTX, INTT, TPC in streaming / extended readout.

Primary trigger focus on events with |z| < 10 cm.

sPHENIX Internal
200 GeV pp
2024-08-15, Run 51339, Event #2

Increasing streaming / extended data rate

Optimization of data volume via compression (not turned on) and tuned zero suppression

Currently riding the sPHENIX Buffer Box I/O limit wave.

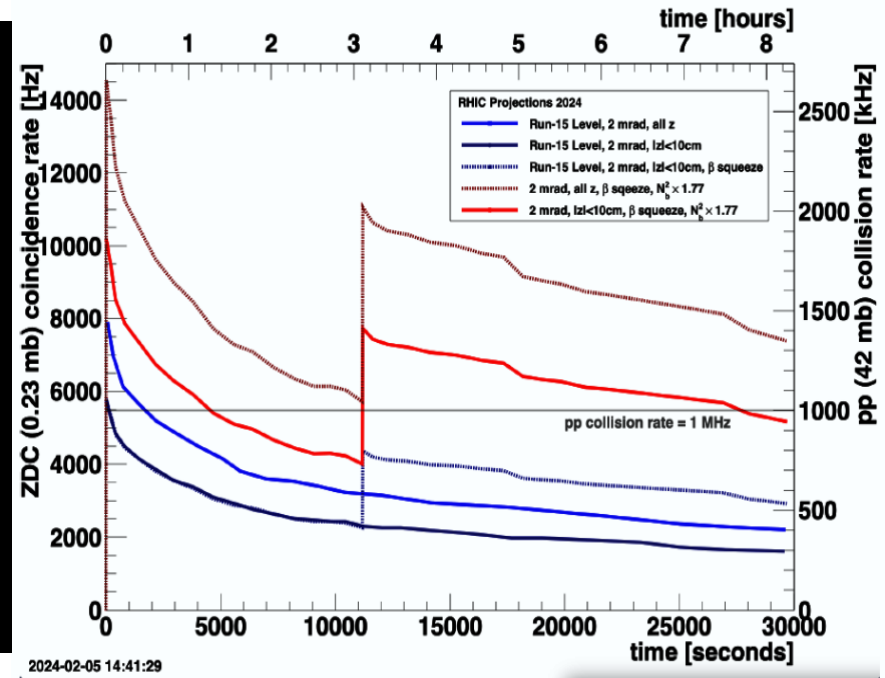Optimization of read/write and lustre file system settings

8/20/24

Luminosity
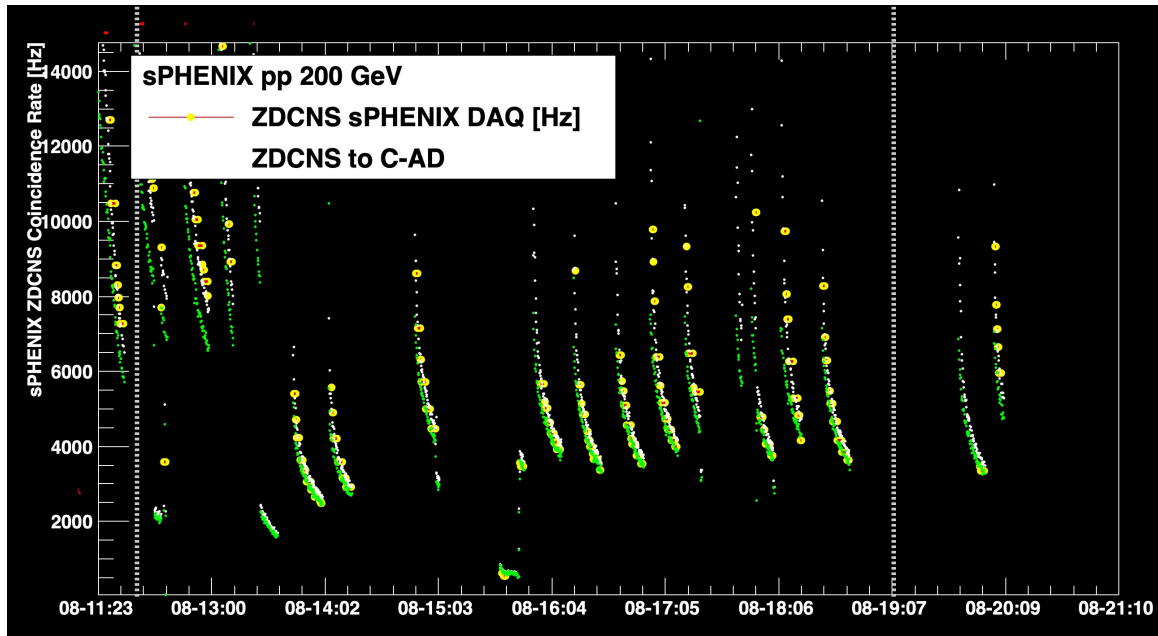
These ZDC rates have ~ 50% within |z| < 10 cm.
Close to Run-15 level projections.

Calculus on trying the beta squeeze
early next week
(Machine Development, backgrounds).

Other items

Landau cavity → beam losses are endangering events for TPC.   Minor damage so far, but also loss of communication with TPC Central Membrane (requiring access).
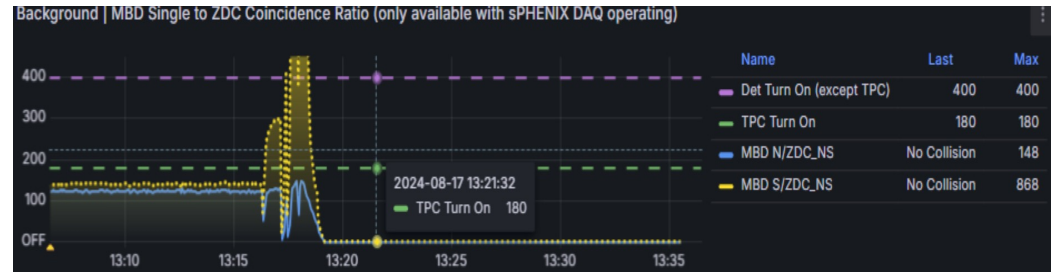
Very pleased protection is changed.   Thank you for addressing the issue.

Second Vernier Scan complete. Thanks Angelika et al.

Checking hourglass effect (~ 5% level). Finalizing numbers.

MBDNS>=1 ≅ 26.7 mb
ZDCNS   ≅ 0.26 mb

Background | MBD Single to ZDC Coincidence Ratio (only available with sPHENIX DAQ operating)

Name	Last	Max
Det Turn On (except TPC)	400	400
TPC Turn On	180	180
MBD N/ZDC_NS	No Collision	148
MBD S/ZDC_NS	No Collision	868

- Beam intensity, multi-collision for MBD, accidental corrections for ZDC are applied.

Fill #	34785		34949	
Detector	MBD	ZDC	MBD	ZDC
f_RHIC [kHz]	78	78	78	78
sigma_x [um]	285	257*	285	264.69
sigma_y [um]	276	250*	275	255.95
N_Blue [10^9]	15056	15056	12199	12199
N_Yellow [10^9]	18335	18335	18158	18158
# of Bunch Blue	111	111	111	111
# of Bunch Yellow	111	111	111	111
N_Blue*N_Yellow	2.76052E+26	2.76052E+26	2.21509E+26	2.21509E+26
Machine Luminosity/bunch [/s/cm^2]	3.54E+29	4.28E+29	2.85E+29	3.30E+29
Machine Luminosity/bunch [/s/mb]	353.8	428.1	284.9	329.6
R_max [Hz] (Total)	1.05E+06	1.33E+04	8.42E+05	9.68E+03
Cross Section [mb]	26.8	0.28	26.6	0.26
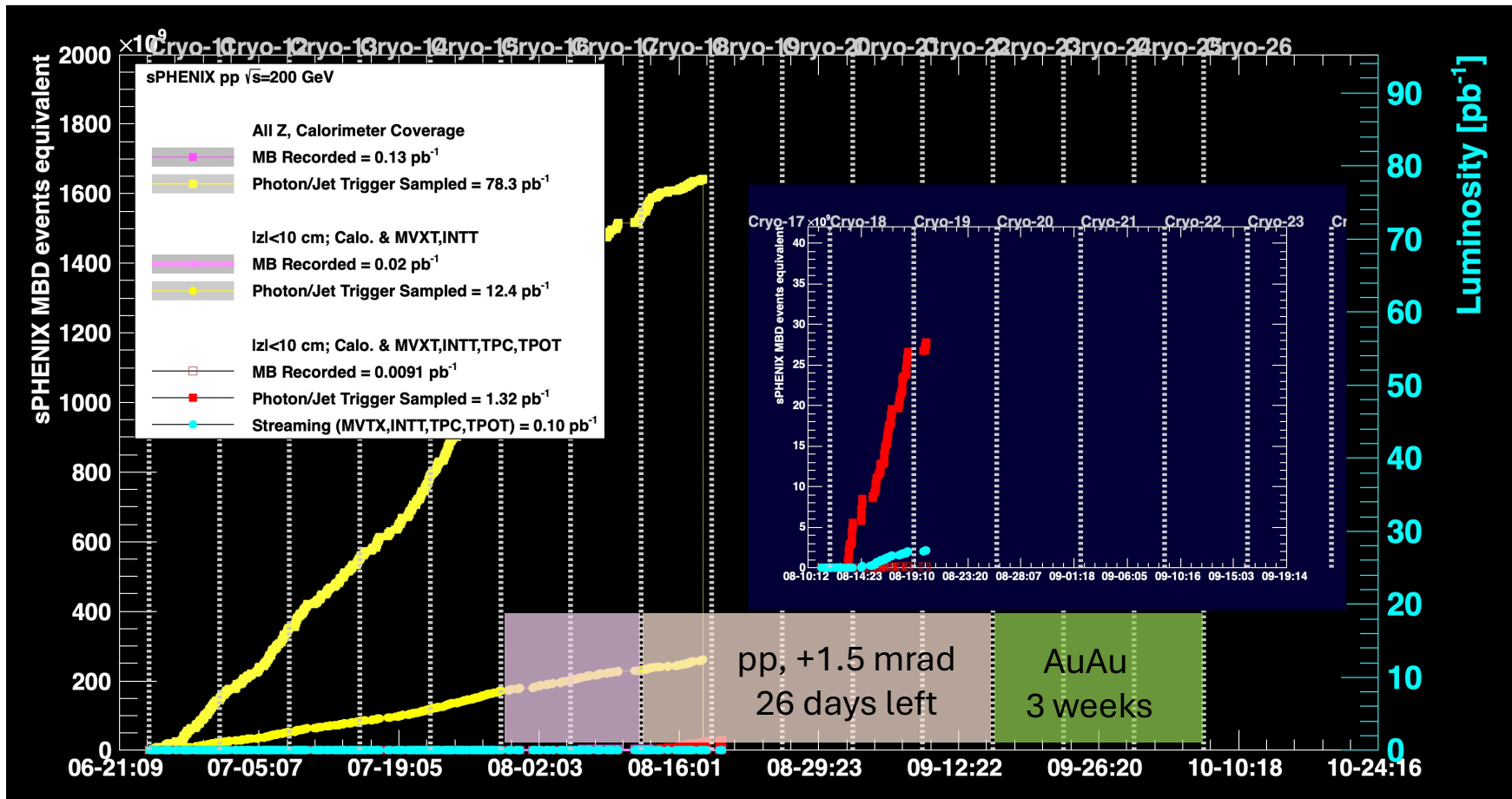
At current rate, expect 6.9 pb-1 for jet/photon triggered data with full tracking [BUP 45]
At current rate, expect 0.7 pb^{-1} for open heavy flavor stream/extended tracking [BUP 4.5]
Pushing on higher streaming rates.   Question on beta squeeze calculus.

sPHENIX 2024