

sPHENIX status

Hugo Pereira Da Costa, LANL
RHIC Coordination Meeting
May 28, 2024

Luminosity delivered to sPHENIX



Delivered collision rate improving significantly

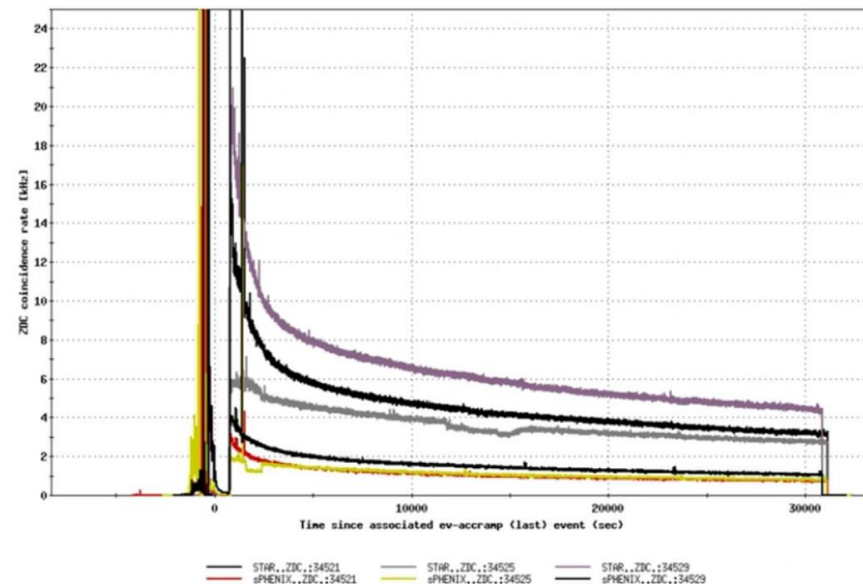
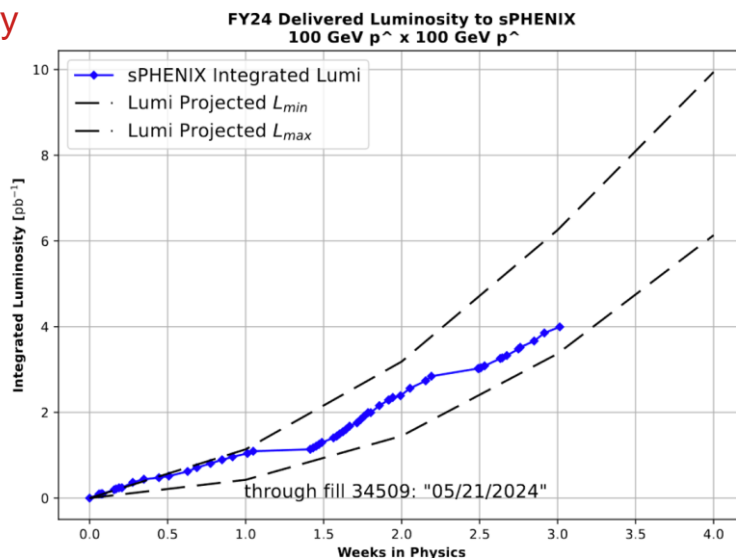
sPHENIX ZDCNS (coincidence) 2kHz -> 3-4kHz at start of physics

Increased number of bunches per beam: 84x84, 111x111

Reduced emittance since Saturday.

Luminosity is most important to sPHENIX,

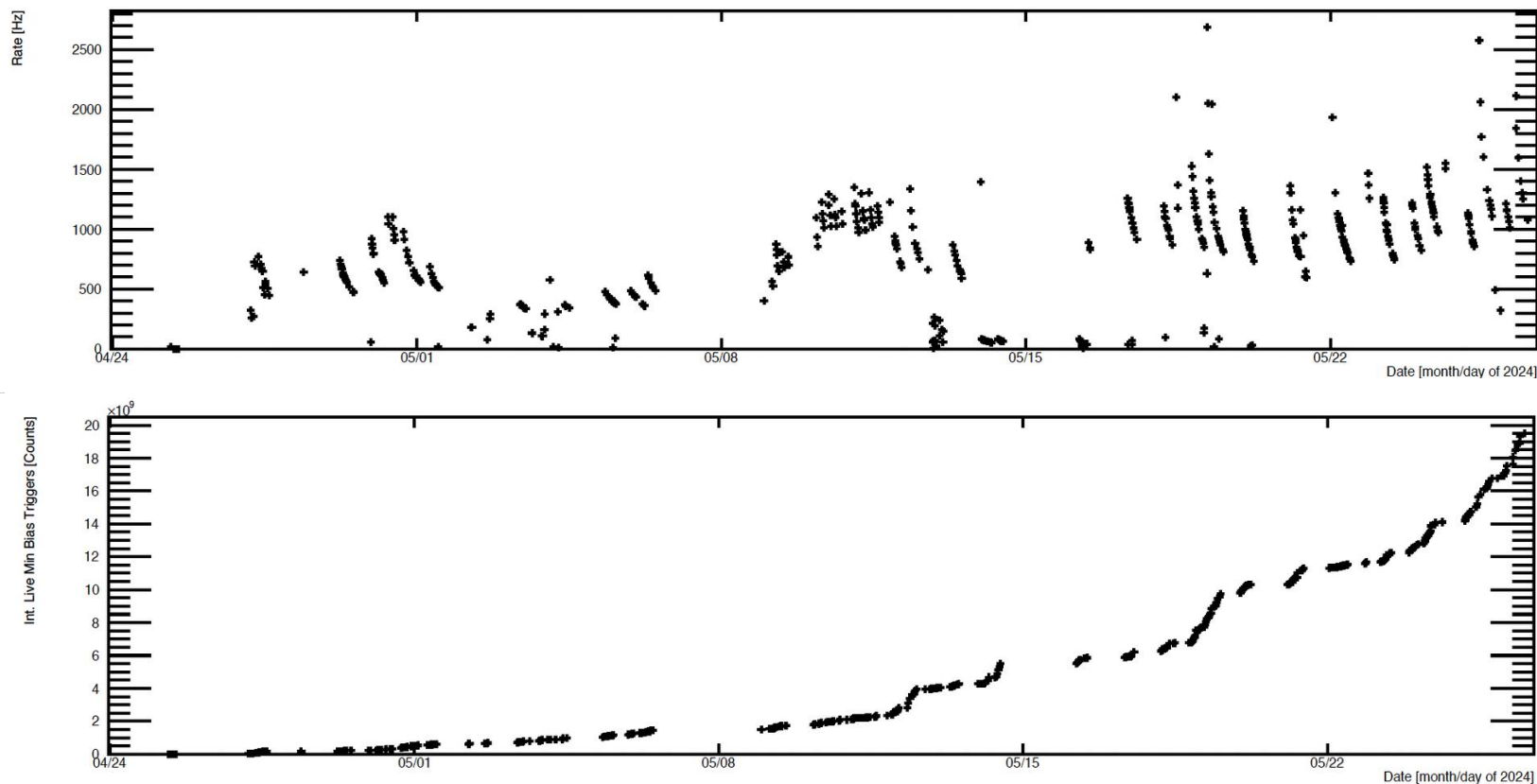
Polarization is secondary



Recorded luminosity for Minimum Bias



20 Billions Minimum Bias collisions recorded since April 24



Rare triggers (1)

Photons and Jet triggers in place

Running 4 photon and 4 jet triggers with increasing threshold

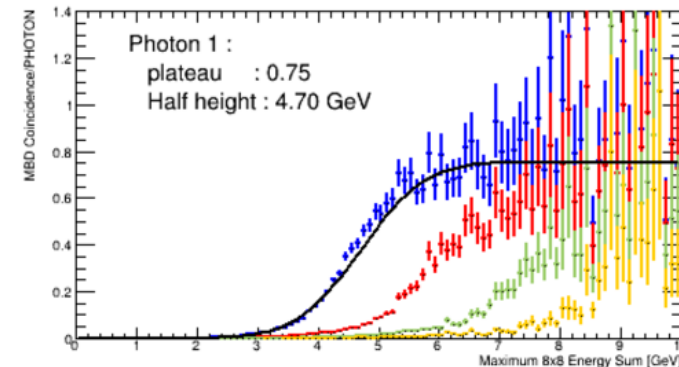
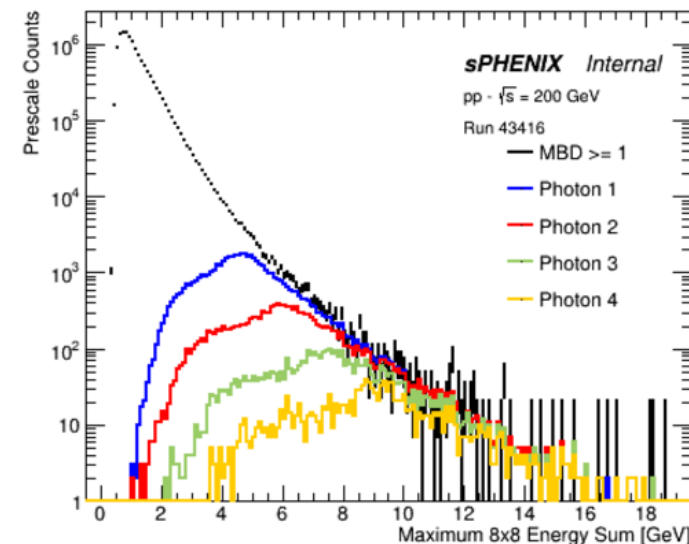
Turning curve good for now, but need to push the threshold down for Upsilon physics, when all tracking detectors are ready

Rejections need work based on hot towers / calibration.

Multi Event Buffering disabled during the week-end because of causing DAQ instabilities

Under investigation

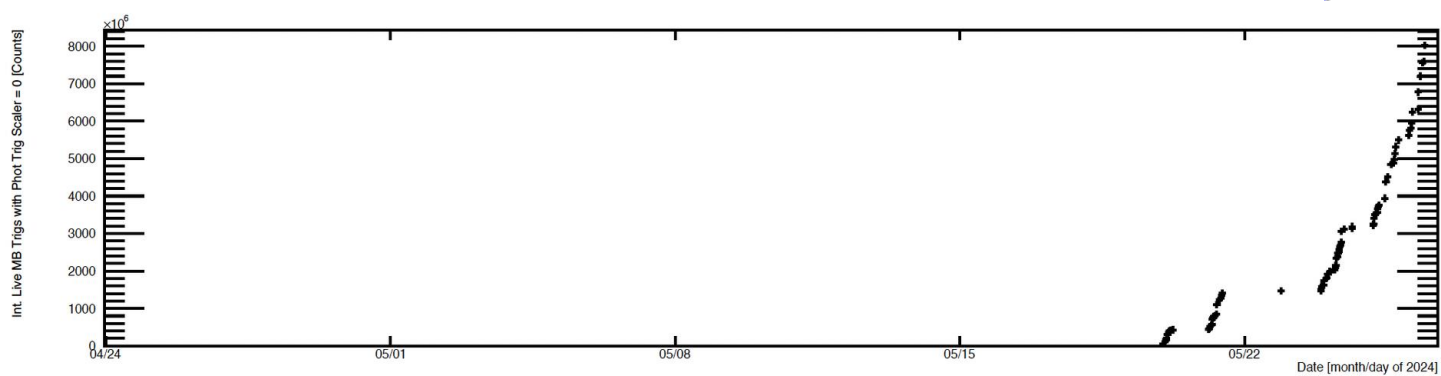
Compensated by downscaling MB trigger to keep rare triggers live time high, at 80-90% live time



Rare triggers (2)

Trigger Control		Raw	Live	Scaled	Lifetime	
LL1 Server OK						
ZDCN+ZDCSj/ZDC Coinc: 33.38						
MBD N+S >= 1/ZDC Coinc: 79.80						
0: Clock						
off	Modify	9383000.32 Hz	7957432.22 Hz	0.00 Hz	84.81%	
off	Modify	18495.31 Hz	15637.67 Hz	0.00 Hz	84.55%	
off	Modify	15893.24 Hz	13436.39 Hz	0.00 Hz	84.54%	
off	Modify	1021.32 Hz	848.59 Hz	0.00 Hz	83.09%	
off	Modify	0.00 Hz	0.00 Hz	0.00 Hz	N/A	
off	Modify	9382939.23 Hz	7957371.45 Hz	0.00 Hz	84.81%	
off	Modify	172658.58 Hz	146001.71 Hz	0.00 Hz	84.56%	
off	Modify	132913.01 Hz	112654.31 Hz	0.00 Hz	84.76%	
50	Modify	82412.12 Hz	69870.06 Hz	1369.96 Hz	84.78%	
off	Modify	41236.45 Hz	34942.55 Hz	0.00 Hz	84.74%	
< T1	off	Modify	22885.08 Hz	19383.24 Hz	0.00 Hz	84.70%
off	Modify	53328.14 Hz	45194.08 Hz	0.00 Hz	84.75%	
x < T3	off	Modify	77629.88 Hz	65835.01 Hz	0.00 Hz	84.81%
IBD NS >= 1	off	Modify	12950.20 Hz	10963.87 Hz	0.00 Hz	84.66%
= 1	off	Modify	34.54 Hz	28.15 Hz	0.00 Hz	81.48%
= 1	off	Modify	8.64 Hz	7.04 Hz	0.00 Hz	81.48%
= 1	off	Modify	2.88 Hz	2.56 Hz	0.00 Hz	88.89%
= 1	off	Modify	0.96 Hz	0.96 Hz	0.00 Hz	100.00%
off	Modify	245.65 Hz	106.83 Hz	0.00 Hz	43.49%	
off	Modify	75.49 Hz	31.99 Hz	0.00 Hz	42.37%	
off	Modify	26.23 Hz	11.51 Hz	0.00 Hz	43.90%	
off	Modify	12.79 Hz	6.08 Hz	0.00 Hz	47.50%	
eS >= 1	0	Modify	617.65 Hz	518.17 Hz	518.17 Hz	83.89%
25: Photon 2 + MBD NS >= 1	0	Modify	184.56 Hz	151.93 Hz	151.93 Hz	82.32%
26: Photon 3 + MBD NS >= 1	0	Modify	58.21 Hz	47.98 Hz	47.98 Hz	82.42%
27: Photon 4 + MBD NS >= 1	0	Modify	21.43 Hz	17.91 Hz	17.91 Hz	83.58%
28: Photon 1	0	Modify	3165.34 Hz	1345.33 Hz	1345.33 Hz	42.50%
29: Photon 2	0	Modify	1038.91 Hz	441.09 Hz	441.09 Hz	42.46%
30: Photon 3	0	Modify	378.08 Hz	160.89 Hz	160.89 Hz	42.55%
31: Photon 4	0	Modify	175.92 Hz	76.13 Hz	76.13 Hz	43.27%

10: MBD N&S >= 1	50	Modify	82412.12 Hz	69870.06 Hz	1369.96 Hz	84.78%
24: Photon 1 + MBD NS >= 1	0	Modify	617.65 Hz	518.17 Hz	518.17 Hz	83.89%
25: Photon 2 + MBD NS >= 1	0	Modify	184.56 Hz	151.93 Hz	151.93 Hz	82.32%
26: Photon 3 + MBD NS >= 1	0	Modify	58.21 Hz	47.98 Hz	47.98 Hz	82.42%
27: Photon 4 + MBD NS >= 1	0	Modify	21.43 Hz	17.91 Hz	17.91 Hz	83.58%



Sampled luminosity (events) for photon triggers (scale-down = 0), since May 20.

Physics data taking

Updated instructions at begin of store, when PHYSICS is declared to go into routine data taking more rapidly
 First run with minimum set of subsystem to check

- ZDC/MBD trigger rates
 - vertex positioning, while other detectors still ramping up.
- Then start big partition runs with all subsystems

Actions	DAQ operator	Monitoring operator	Detector operator	Shift leader	Notes
Turn on MBD HV			Turn on MBD HV		
Run with only GL1 + MBD + ZDC/sEPD	Select subsystems / Begin run		Keep turning on other subsystems		
Check trigger rates & timing	Check ZDC & MBD trigger rates	Check MBD / ZDC timing			If any checks fail Call DAQ/Trigger experts
Check MBD z-vertex		Check MBD z-vertex		Call MCR if the $ v_z > 2\text{cm}$	
ONLY AFTER THE ABOVE CHECKS ARE VERIFIED : Go to the next step for big partition physics running					
Big Partition running	Select subsystems / Begin run		Check the subsystems for big partition are ready for data taking	Check SCM which subsystems to include	
After run started / during the run	Check trigger rates / Counter Status	Check MBD & DAQ monitoring ----- Begin monitoring other subsystems	Start regular monitoring of detectors		If MBD or DAQ checks fail → Need to end the run and take further actions

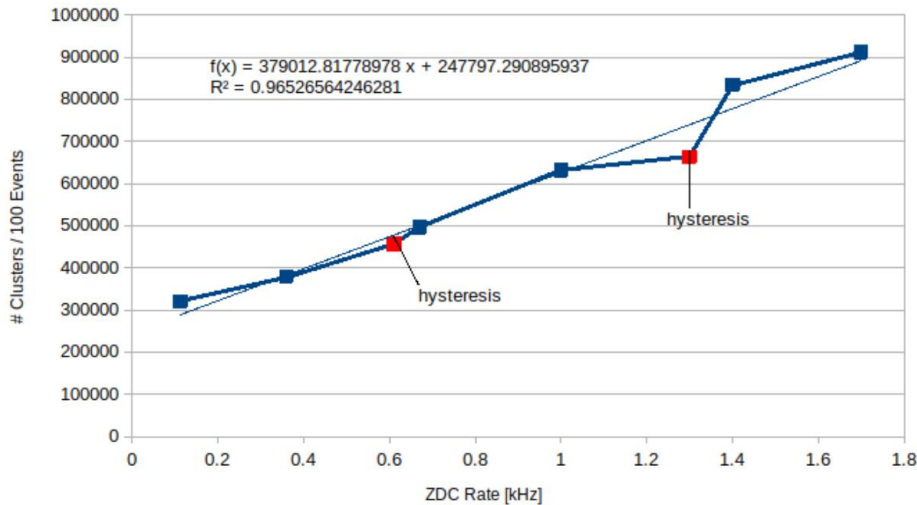
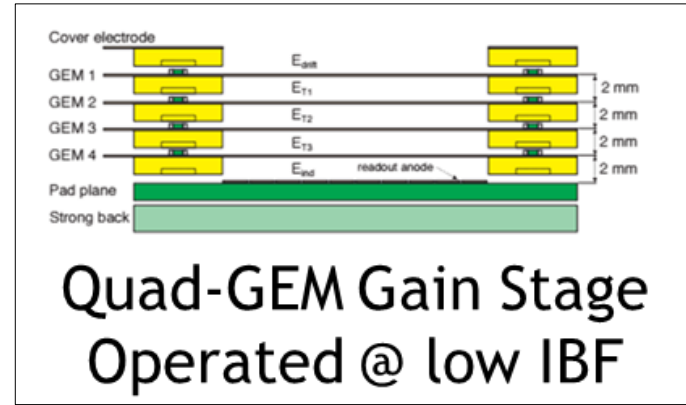
Also improved communication between shift crews at change of shift.

On Wednesday May 22 (maintenance day), swapped resistor chain back to original configuration, with larges gain on the bottom-most GEM, optimal for low Ion Back Flow (IBF), following mini-review on Monday

Transitioning toward having the shift crew handle High Voltage routinely

On Friday, beam displacement scan together with CA-D: distinguish whether TPC 'activity' scales with collisions or total beam (beam background)

Analysis ongoing



North Status

South Status

Shift: Expert

Cycle Between Operating and Standby Voltages

Ramp Up to Operate Voltage Set

Ramp Down to Standby Voltage Set

Standby

Setpoint differs from Operating for 76/76 readings.

Setpoint equals Standby

Shifter vs. Expert Mode Controls

Shifter Mode	Standby		Operate		Vset	Vmon	Imon	Imax
	Module	Membrane	Module	Membrane				
	3000	3000	3500	3500	3000.0	3000.0	80.22	81.152
	30000	30000	44300	44300	30000.0	29998.0		

Automated Cold Start

Percent	Ramp	VSetSec	VMonSec	IMonSec	Trip
0	100%	100%	100%	100%	100%
1	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%
4	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%
7	100%	100%	100%	100%	100%
8	100%	100%	100%	100%	100%

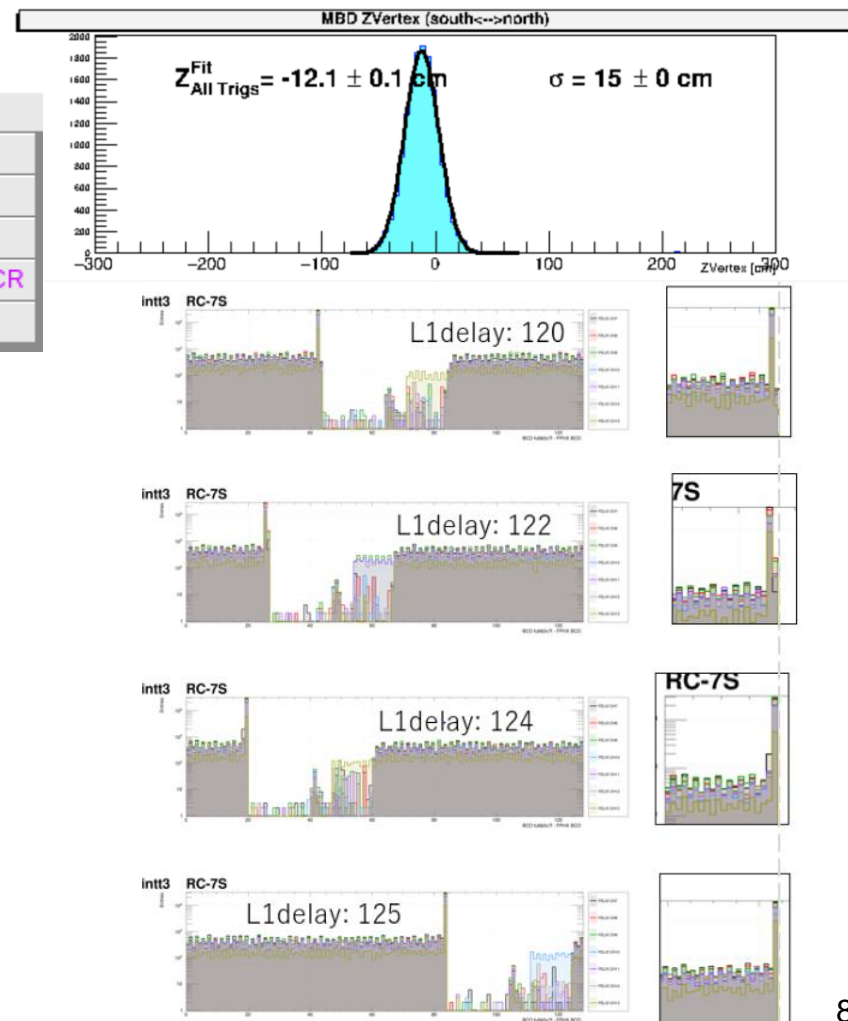
Automated Shutdown

Percent	Ramp	VSetSec	VMonSec	IMonSec	Trip
0	100%	100%	100%	100%	100%
1	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%
3	100%	100%	100%	100%	100%
4	100%	100%	100%	100%	100%
5	100%	100%	100%	100%	100%
6	100%	100%	100%	100%	100%
7	100%	100%	100%	100%	100%
8	100%	100%	100%	100%	100%

Module Setpoint Stable for 9960.0 seconds
 Module Voltage Stable for 9933.1 seconds
 Module Current Stable for 557.1 seconds

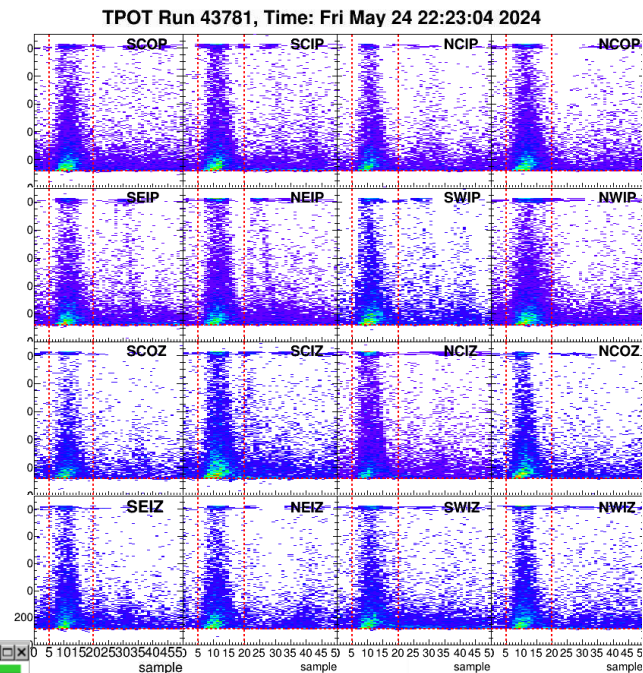
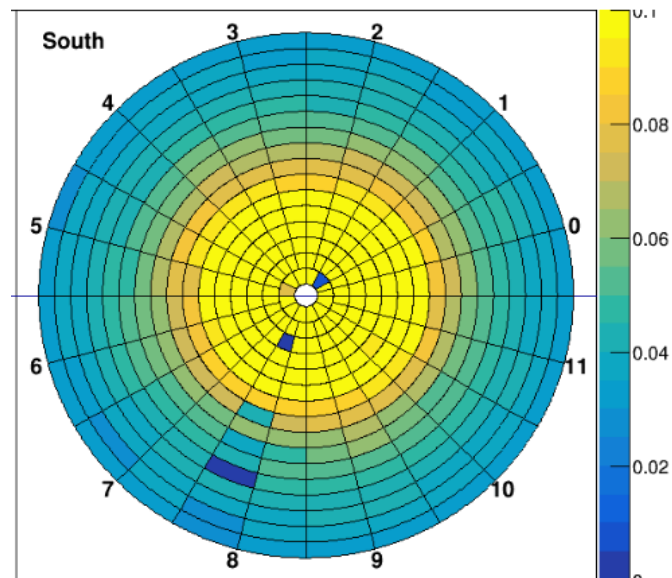
- Now sending vertex mean and RMS to CA-D routinely (operated by Shift Crew)
- Should start making use of this this week ?
- MVTX running with 10us strobe length
- INTT is timed in
- All Calorimeters run with Zero Suppression

MBD
MBD Vertex Monitor
MBD Timing Monitor
MBD Triggered Monitor
MBD TOGGLE VTX TO MCR
Save Plots

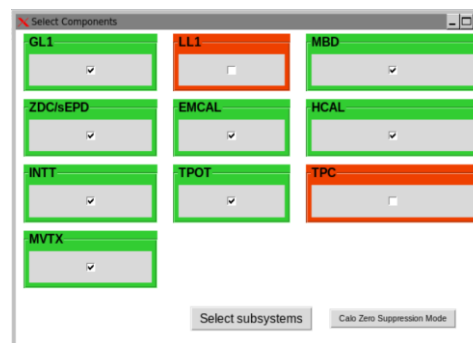


Others (2)

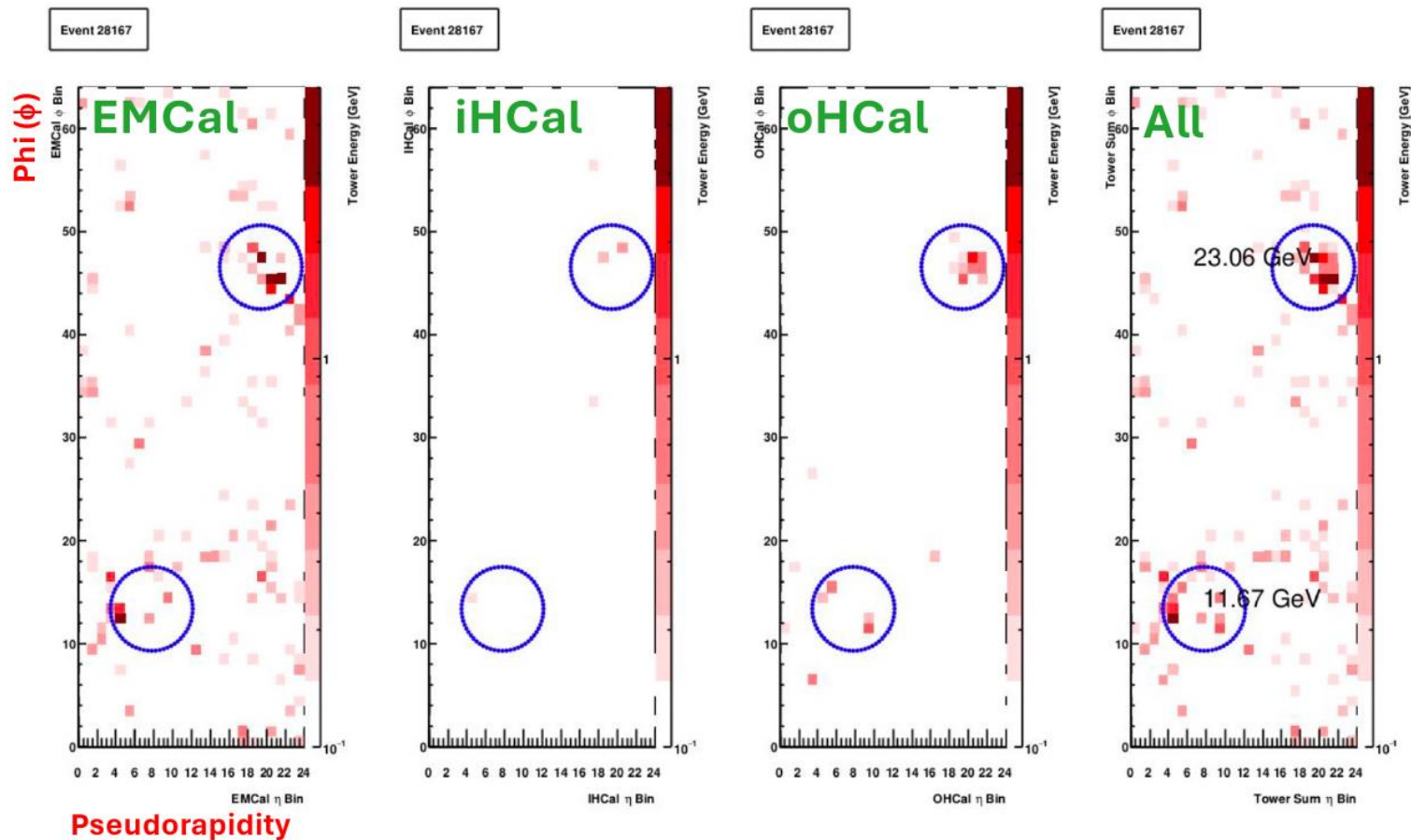
- sEPD bias adjustment is complete
- Zero Suppression tests ongoing for TPC, TPOT
- TPOT included in big partition



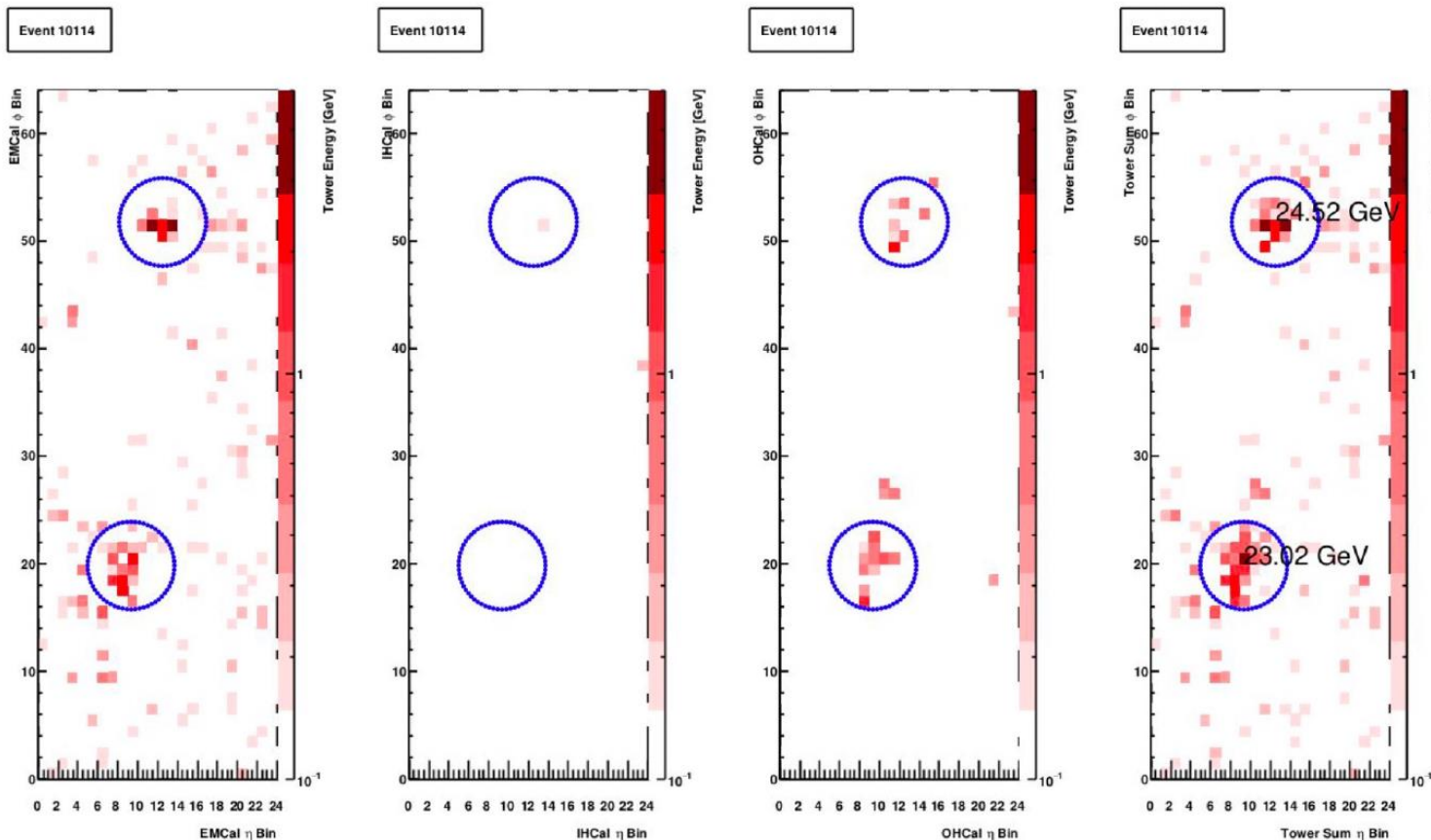
Very smooth running over the week-end
Entering second week of PHYSICS running for
Jet and Photon program



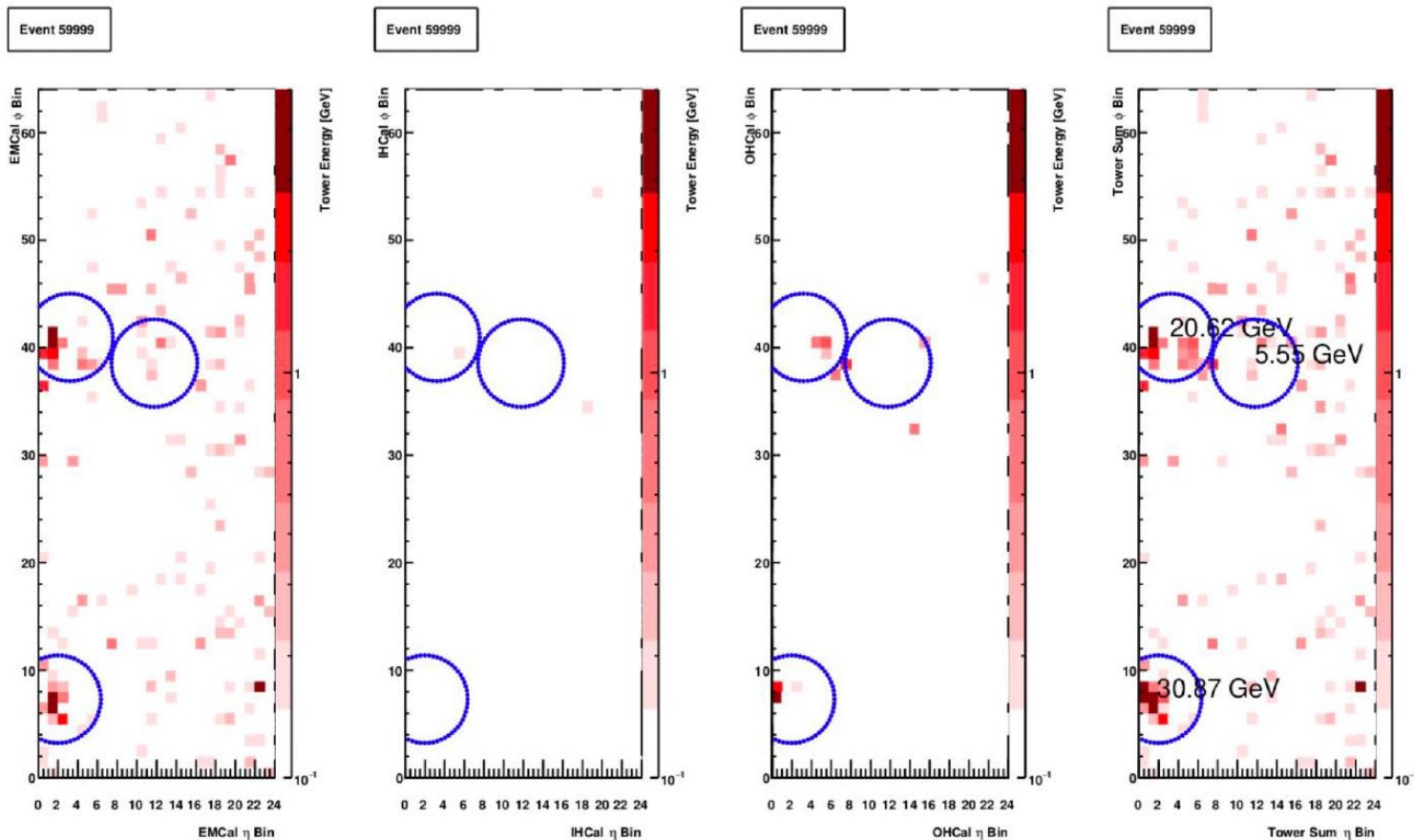
Bonus: Di-Jet events in calo system



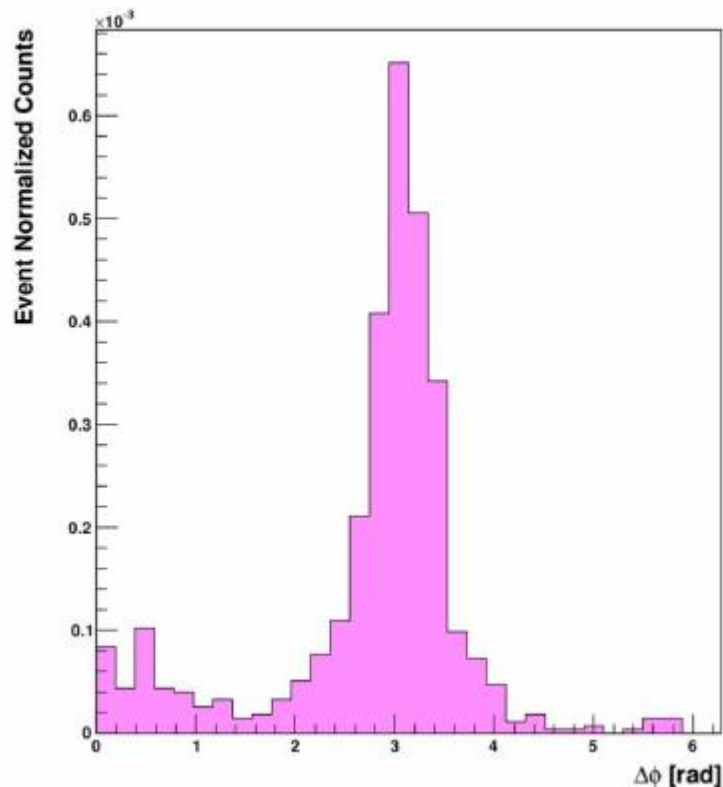
Bonus: Di-Jet events in calo system



Bonus: Di-Jet events in calo system



Dijets



Using FASTJET for jet reco ($R=0.4$)
events with two jets >5 GeV
Most of the time the two jets are back-
to-back in azimuth ($\Delta\phi = \pi$)

Thank you !