Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

RHIC Status

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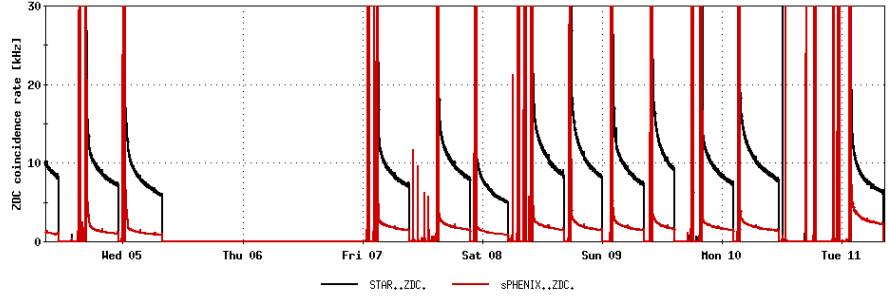
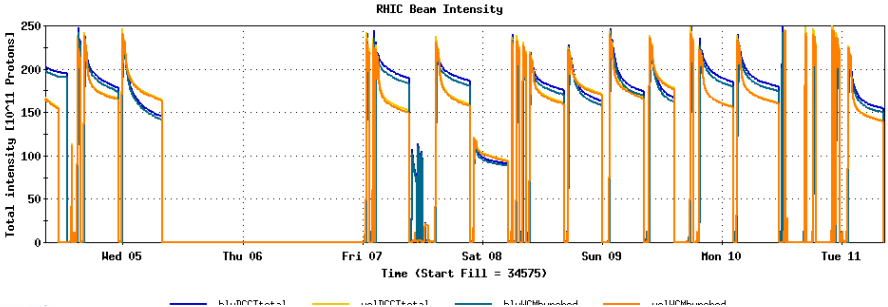
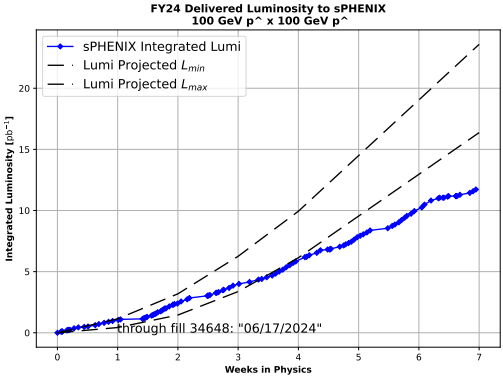
Last Week at RHIC

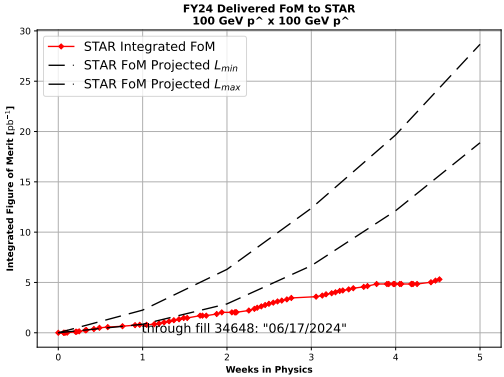




RHIC status and Lumi Projections

111x111 physics running since 4/30. Preliminary luminosity accounting





RHIC Status

physics running with up to 2.0e11/bunch at store

RHIC has been ODH1 for the last week, requiring additional work planning and PPE for entrance

Maintenance Thursday, 6/20

cold snake has increase heat load

- unpolarized protons used Wednesday-Saturday.
- limited polarization optimizations to maintain helium reserves

Friday

QLI from y12-dh0-ps voltage dip caused QLI, rezeroed 12a-qd2 quench bucket

y6-q89-ps replacement

y10-qd-psw, AC-DC converted for main contactor replaced

Saturday high beam losses on b6-lm3.2

H-jet bump collapse timing change resulted in collisions at IP12 from orbit overshoot when going to goal

Sunday

correctors in alcove 5c tripped due to a bad relay on blue interlock system

Comparison with previous runs

Run15 and Run12 scaled based off of emittances and calculated crossing angle

A factor of 2 improvement would put STAR at the projected Luminosity/day

sPHENIX needs 60% increase

Comparison with previous runs, Intensity

Comparison with previous runs, Intensity

Comparison with previous runs, Intensity

Intensity comparison

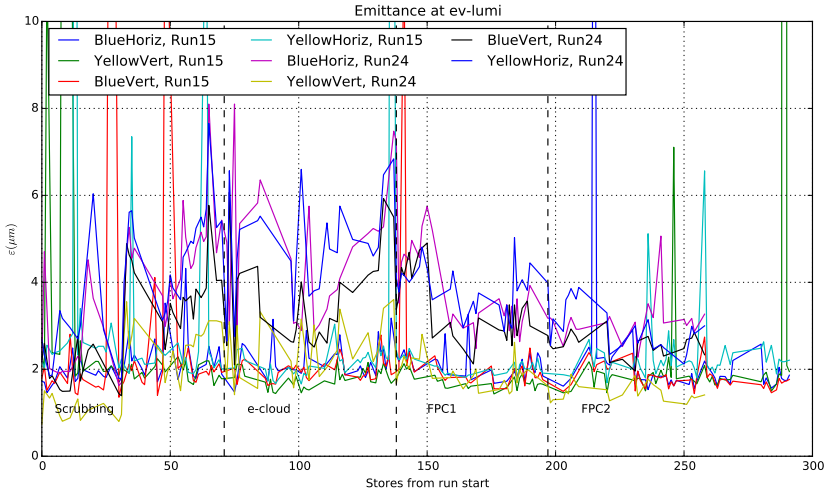
Current intensities are near Run15 levels, exceeding Run12 levels

Periods of low intensity to address different issues such as vacuum scrubbing, electron cloud formation

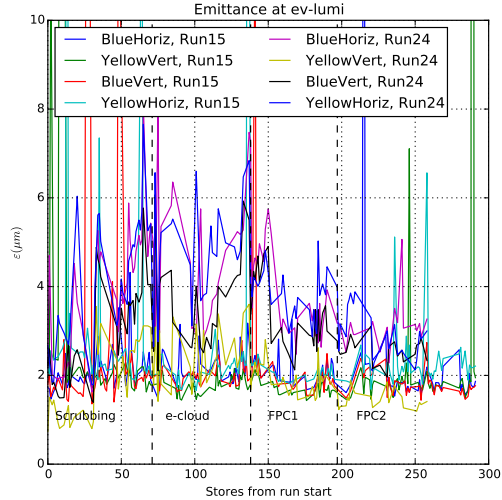
Current taper in intensity from blm at end of rotator ramp

Comparison with previous runs, Emittance

Comparison with previous runs, Emittance



Emittance comparison



A large intensity-dependent emittance growth was observed which has now been resolved

initially degraded vacuum due to newly installed components was suspected

- vacuum scrubbing reduced vacuum response from beam to nominal levels

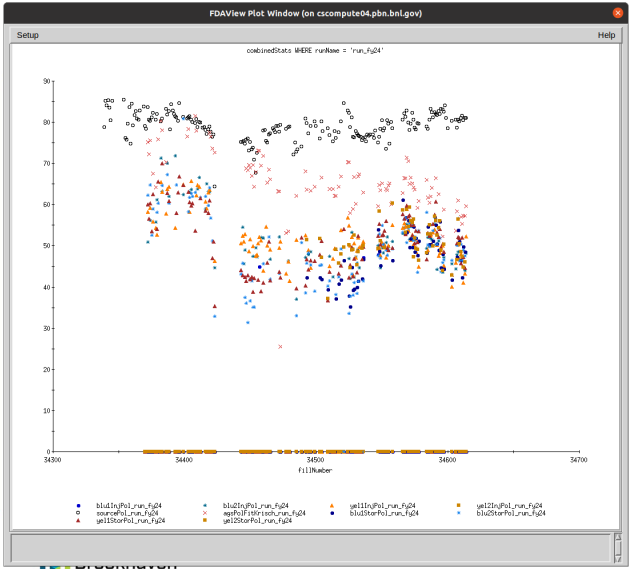
second, electron cloud formation as a result of non-coated pipes for newly installed components

- reduced number of bunches alleviated emittance growth, minimal other signatures of electron cloud formation

Beam driving higher order modes in the 56 MHz leading to transverse emittance growth

- FPC1+2 full inserted to provide maximum damping

Polarization Performance



Polarized source stability suffered early on due to contamination in the He cell

Large emittance-dependant drop in RHIC polarization transmission prior to resolution of 56 MHz

Current downward trend correlated with reduced polarization in the AGS

Following adjustments to the new blue snake, yellow:blue polarization now within 3%, previously 10%.

Performance for sPHENIX only, no polarization

Beam-beam parameter for 1 IP with a crossing angle of 2 mrad is approximately half of the head-on case.

- Operating sPHENIX at a crossing angle only and assuming we are currently operating near the beam-beam limit, 4e11 protons/bunch could be collided
- These intensities are not possible to deliver
- 3e11 protons/bunch would be a 2.3x increase to delivered luminosity
- For reliable running, RHIC needs to be well-tuned to avoid any losses

Pros of polarization

- Optimized polarization performance translates to better emittances and better luminosity

Cons of polarization

- More equipment that can fail
- frequent issues with OPPIS (earlier in the run) and ongoing issues with the cold snake require frequent switching between injector setups
- rotator ramp doubles store-to-store time

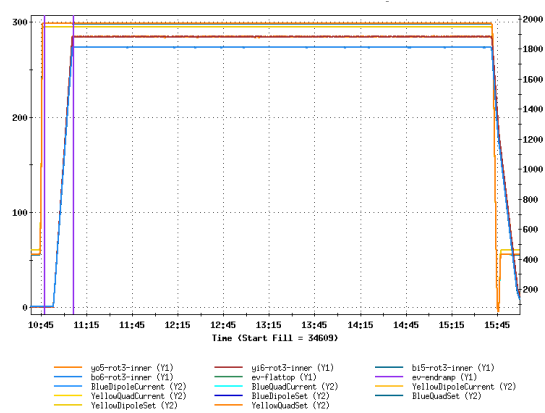
Performance for STAR only

STAR is already operating with head-on collisions

- Assuming current operation near the beam-beam limit, RHIC may be able to achieve 3e11, a 2.3x increase to delivered luminosity
- RHIC would need to be well-tuned to avoid any losses

Impact of the rotator ramp

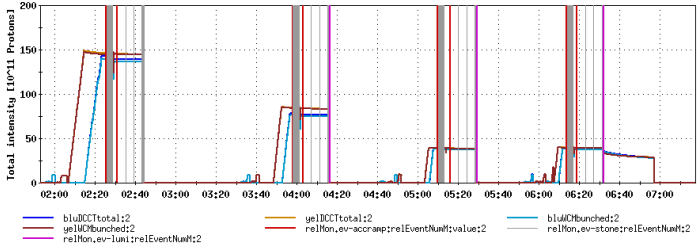
Process	Duration (minutes)
Filling RHIC	16.0
Energy Ramp	3.2
Rebucketing	1.0
Polarization Meas.	2.0
Rotator Ramp	13.1
Storage Ramp	0.5
Ramp to injection	6.3
Rotator Ramp down	19.0
Total w/ Rotators	54.3
Total w/o Rotators	29.0

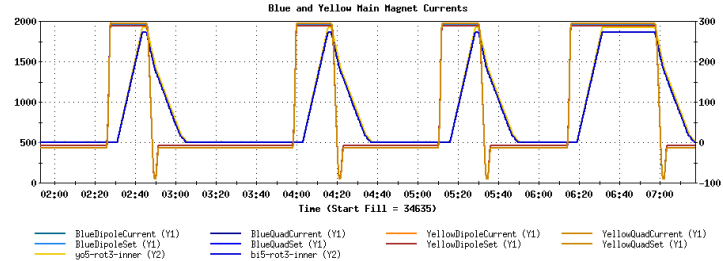


Rotators result in a 90% increase in store to store time

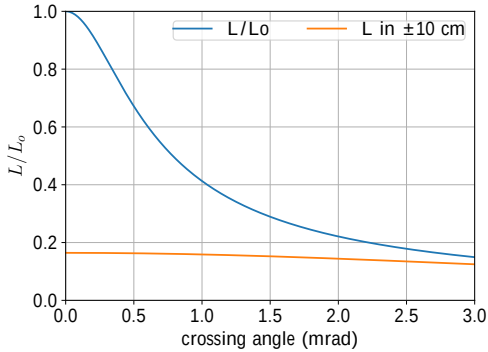
Impact of the rotator ramp, II

Impact on troubleshooting and diagnostics doubles with rotator ramps





sPHENIX without xing angle – what can we give STAR without impacting sPHENIX



sPHENIX crossing angle implemented for beam-beam suppression and to maximize collisions within 10 cm.

4.5x increase in luminosity if going to head-on and looking at the full luminosity distribution

IR8 D0 polarity will need to be switched back to nominal for head-on collisions (4 hours on maintenance day)

sPHENIX without xing angle – what can we give STAR without impacting sPHENIX, II

1. Current configuration but reversed with sPHENIX head-on and STAR with large crossing angle
2. sPHENIX in collisions at start of store, STAR at collisions for part of store

Machine development today to study effects from collisions at IP6 and IP8