p-A run plans

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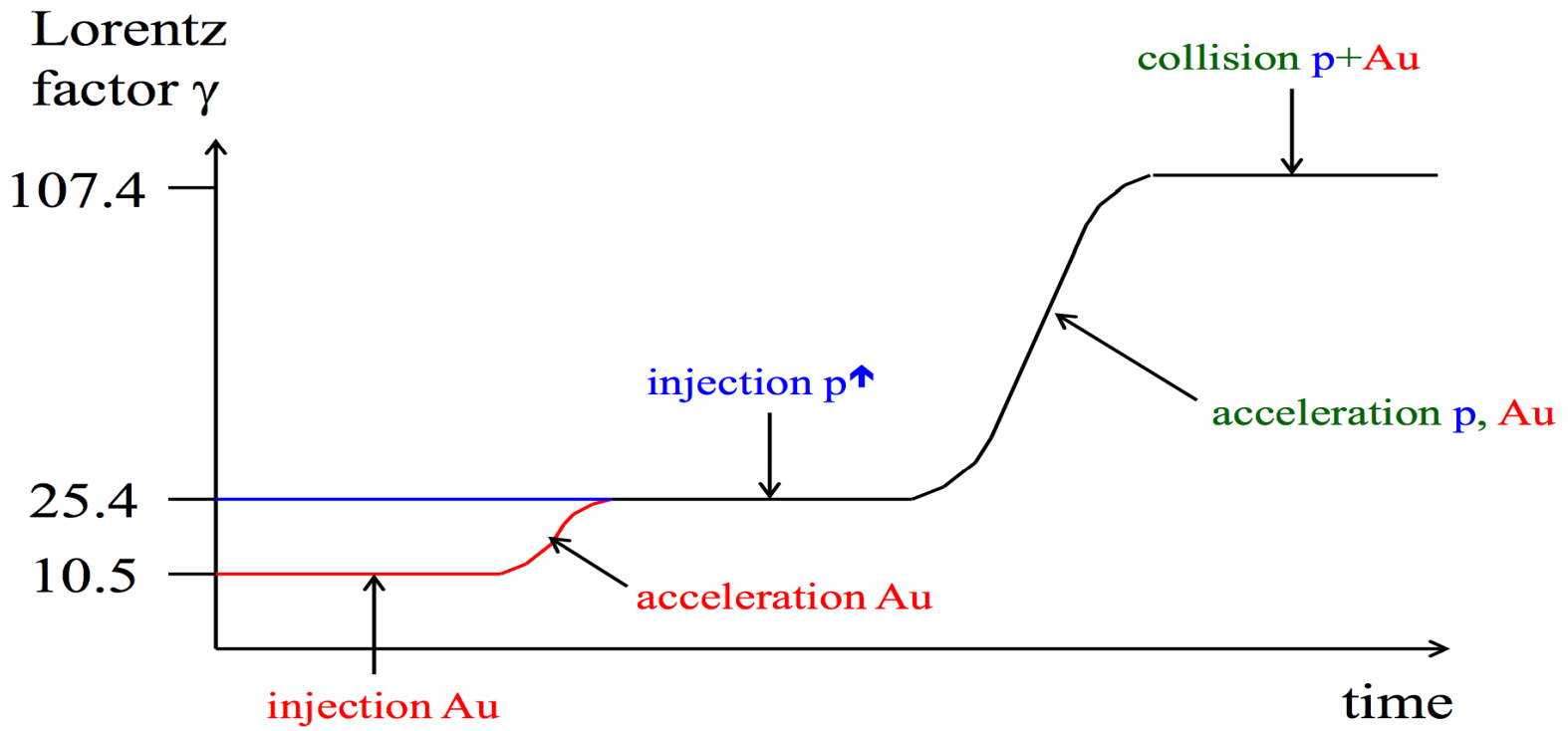
Outlines

- Acceleration ramp
- DX magnets move
- Others

P-Au ramp

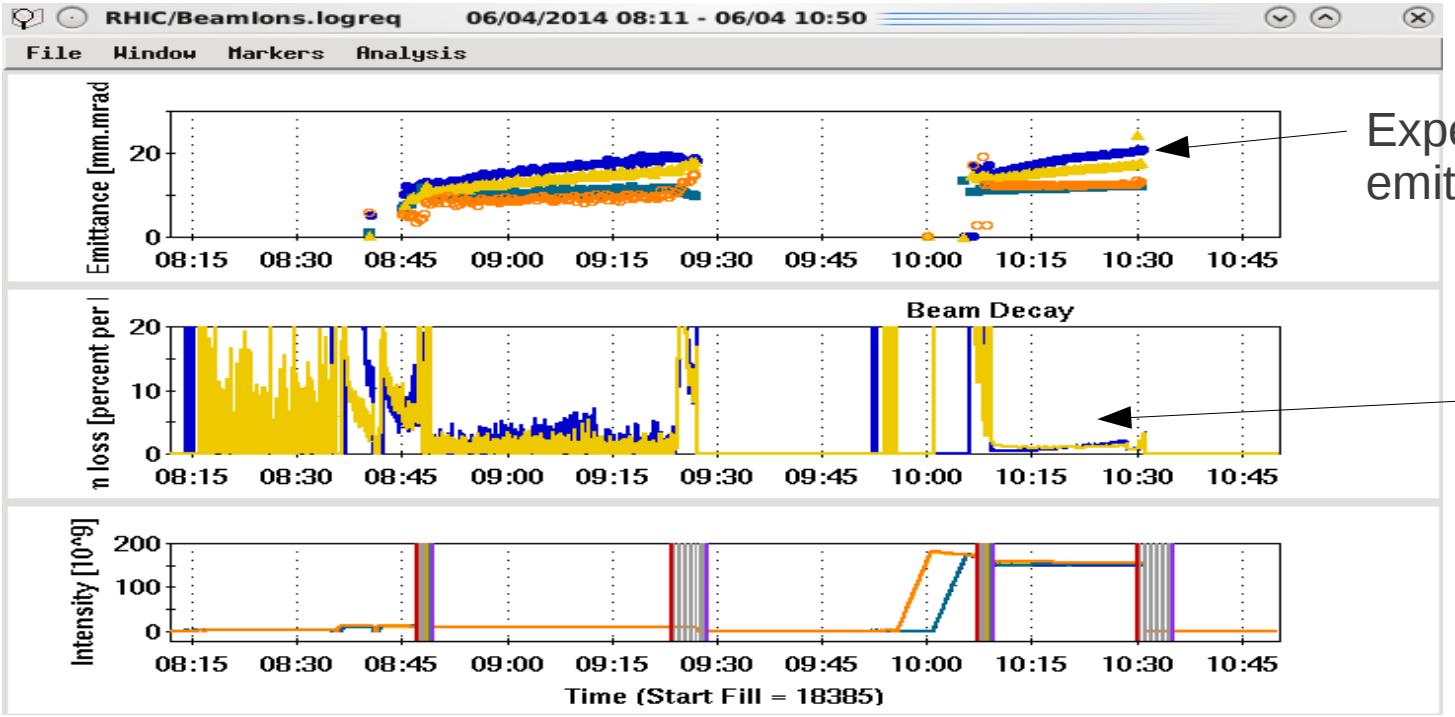
In 2003 d-Au, ran into difficulties when accelerating beams with different rev frequencies. In order to enforce same frequencies for proton and Au beam on the ramp, one needs to either raise Au injection energy or reduce proton injection energy. Magnets behavior at low proton injection energy and proton crossing transition in RHIC are two concerns. Injection kicker strength limits the ability of raising Au injection energy.

Therefore, M. Blaskiewicz came up with the idea of mini-ramp for Au.



P-Au test

C. Montag et al demonstrated the ramp successfully in APEX, the fill # are 18385, 18386. Ramps: Au14-gammat, Au14-gammat2.

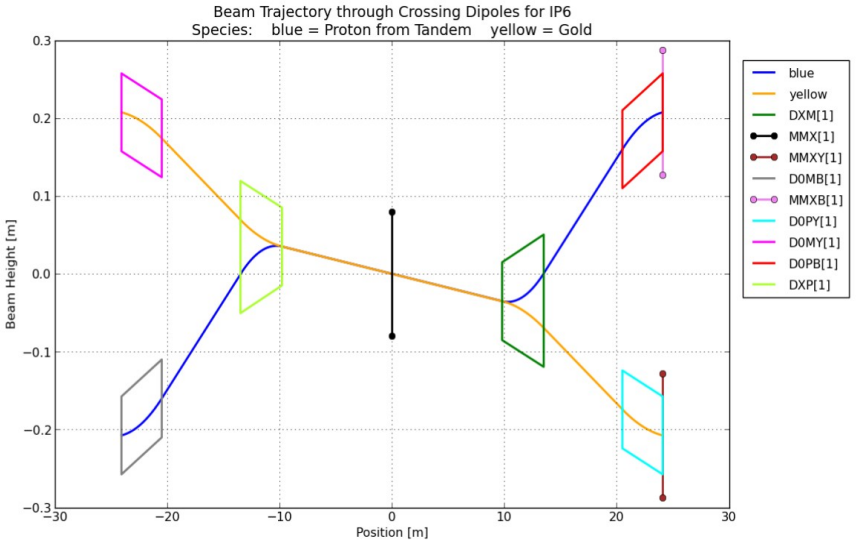


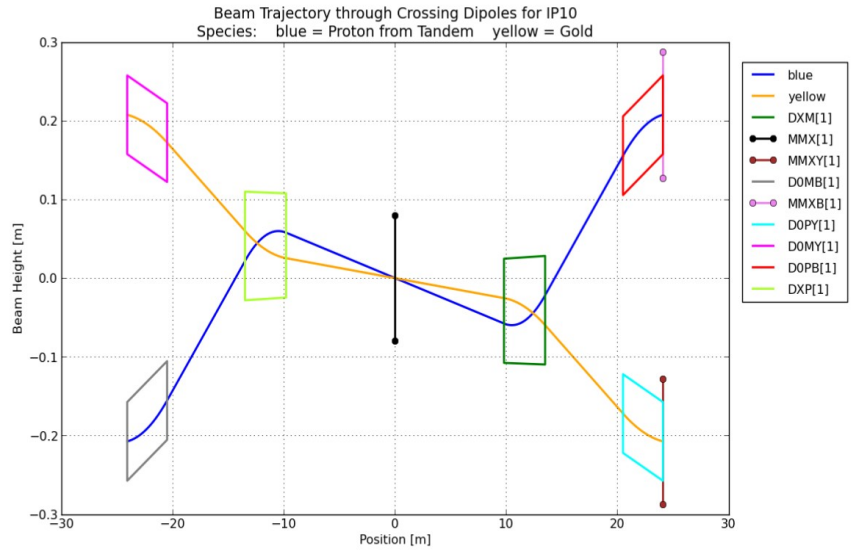
Expected H emittance growth

Low loss

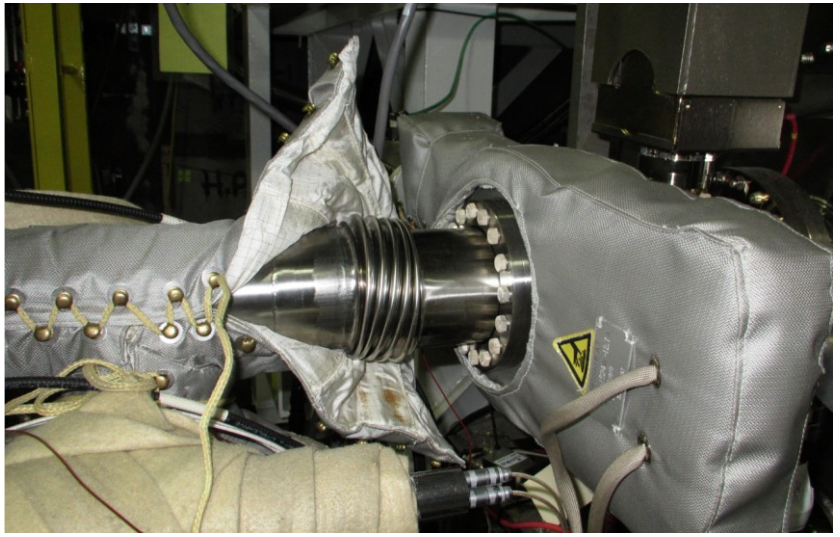
DX magnet move

- P, Au are of different rigidities when the rev frequencies are equal. The resulting different bending from DX shift the beam trajectories towards Yellow beam line. DX to be shifted to accommodate beams.
- Try to avoid beam offset in D0, which is a trick to alleviate aperture limit.
- Beam crossing angles for non-colliding IR, a preferable trick to work with aperture limit.
- Colliding IR DX magnets to be moved by 25 mm; non-colliding IR DX by 20mm.
- Move IR2 & 4 DX before pp, move the others after pp.
- Whether to move DX-D0 chamber is under study. (M. Mapes, Sumanta, S. Tepikian, Guillaume)

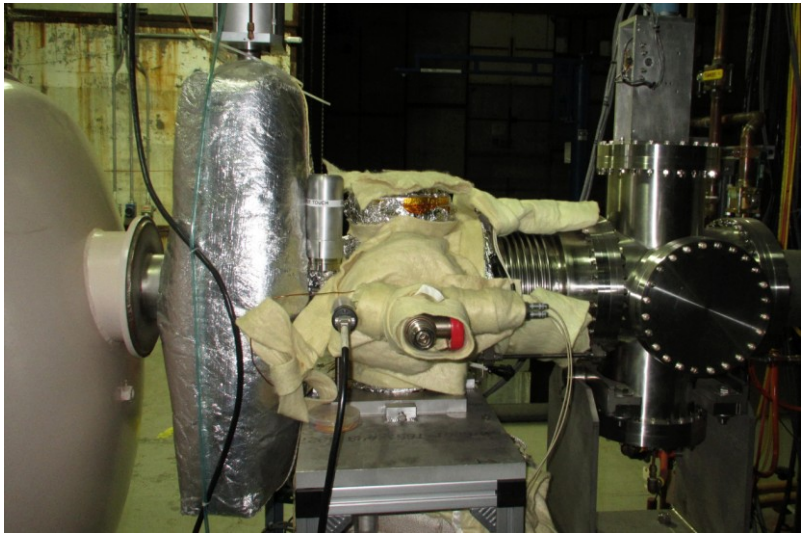




IR4 DX



Sector-3 DX magnet



Sector-4 DX magnet

M. Mapes

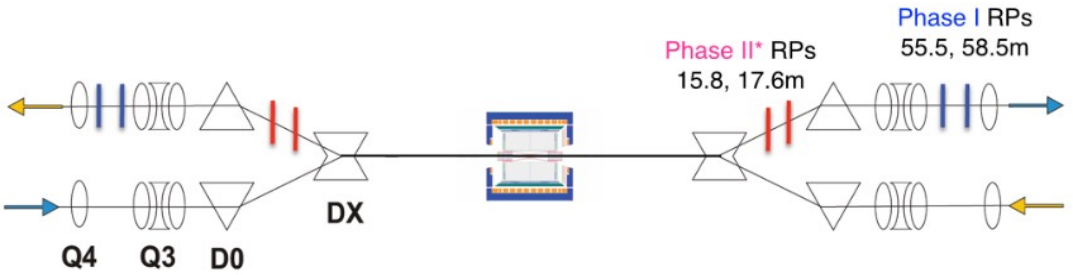
1. Sector-3 56 MHz cavity bellows need modification, not hard according to Mapes.
2. How much DX move the 9 MHz cavity can take is not clear. Detail plan for moving DX at this end is under discussion.

ZDCs

- Forward Neutron is 6.5 cm away from axis, ZDC horizontal acceptance is +/-5 cm.
- STAR ZDCs can be laterally moved by ~2.5 cm together with DX-D0 chamber if we have to move the chamber, otherwise, the amount of movement is limited, +/- 1.3 cm.
- PHENIX ZDCs can be moved laterally by +/- 1.3 cm w/o mechanical change, or move downstream then laterally, or add ZDCs (Yousef).

Roman pots

- The Yellow beam horizontal offsets are +16.447 mm, +9.398 mm at RPs, -3.916 mrad at RPs. (Not important, RP likes protons only.)
- The Blue beam horizontal offsets are -25.92 mm, -18.74 mm at RPs, angle +3.99 mrad at RPs.
- No vertical offset or angle, for now and ever.
- Insert RPs sideways? This way the detectors can follow the beam.



Spin

- Transverse polarization for p-A.
- Can we skip injection polarization measurement for p-A? Au stays at low energy the shorter the better.
- If IR2 & 4 DX to be moved before pp, then what's the impact on spin of pp? Vahid is doing an evaluation based on run-12 lattice.

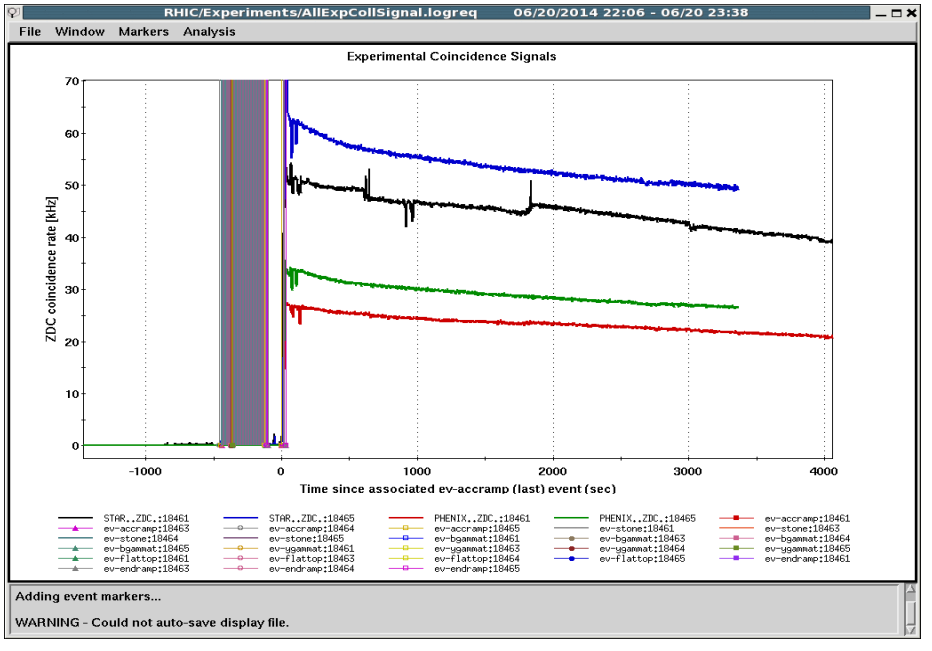
Intensity

- OPPIS provides higher bunch intensity, potentially high polarization with more scraping in Booster.
- LION + EBIS promise ~20% higher intensity

SC cooling

- Au emittance is expected to be ~20 um at store. SC cooling is critical for Au beam. K. Mernick has experience from Cu-Au, He3-Au run.
- In He3-Au, collision rate of injecting Au first never caught up with that for injecting Au second.

18461 vs 18465. 61 was a gold first fill, 65 was a blue first; pretty much the same intensities at injection. Blue emittances at store are basically the same, but yellow is much lower when filled last. rates speak volumes. (By Travis)



E-lens

- Beam-beam is expected smaller compared with pp case.
- Proton beam is at an angle of ~4 mrad at e-lens.

56 MHz

- Bellows change is needed to facilitate the sector-3 DX move.
- Beam is off center in the cavity. Not a concern for 56 MHz commissioning and operation.

Optics

- S. White designed a ATS optics for pp with e-lens. Guillaume will continue working. pp run will test the advantages of the optics. It will be the choice for p-Au as well.
- Beta star squeeze?