

# 1<sup>st</sup> Experimenter's Meeting Run 13.




V. Ranjbar

# Outline

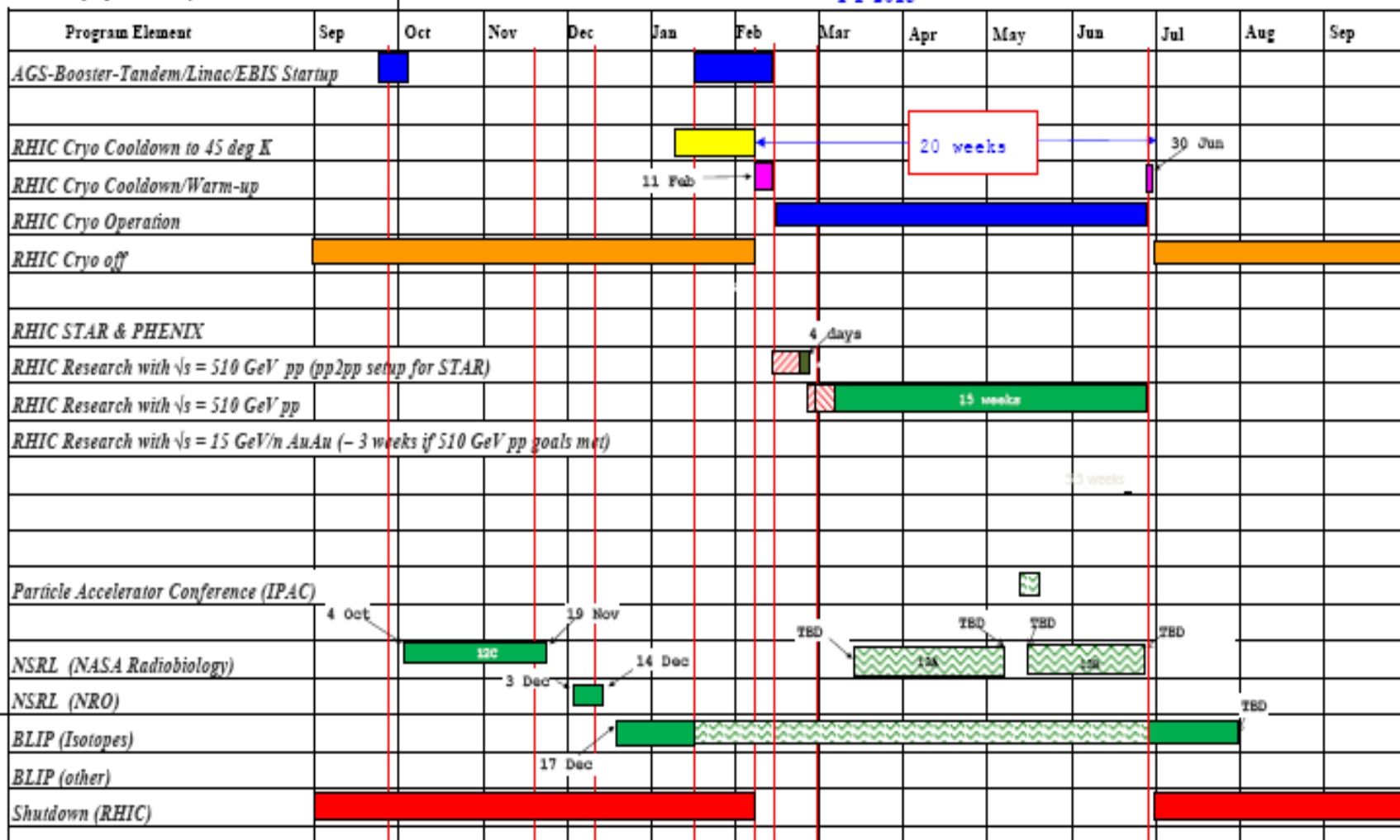
- Overview of Schedule as it Stands
- Upgrades and their current status
- Lattice development
- PP2PP Mode Status

# C-A Operations-FY13

*planned, budget permitting, Preliminary*

-  concurrent with RHIC
-  setup with beams
-  ramp up luminosity

FY 2013



# Schedule

- 1 week from 4K wave to be cold in both ring.
- First 2 weeks after being cool down: set-up for pp 255 GeV with goal to achieve collisions (E-lens Lattice)
- Third week: Machine Ramp Up with 8hrs/night for Experiments.
- After first three weeks stable machine operations are expected.
- At some point during the run we will switch to pp2pp mode. This will cost 4 days of operation.

# Machine Upgrades Status

- Source Upgrade:
  - New RF bunch structure for Booster and AGS
  - Change in bunch spin pattern
- E-lens :
  - New Lattice at new integer tune values
  - Change in abort gap location or adding gap in bunch train
- RF Upgrades:
  - Vector Sum (real bunch-to-bucket phase measurement)
  - I/Q feedback on bouncers for amplitude and phase accuracy
  - New landau cavities this year
    - harmonic this year (FY13) =  $21 \frac{1}{2} \times 9$  MHz (not storage cavity)
    - Improve beam loading, enabling lower voltage at injection
  - New dipole mode longitudinal damper (already tested past run. Still needs work)
- AGS Status
  - Repair : We expect the motor rotor to leave BNL this week, and be back before Xmas.

# Source Upgrade

## OPPIS Improvements:

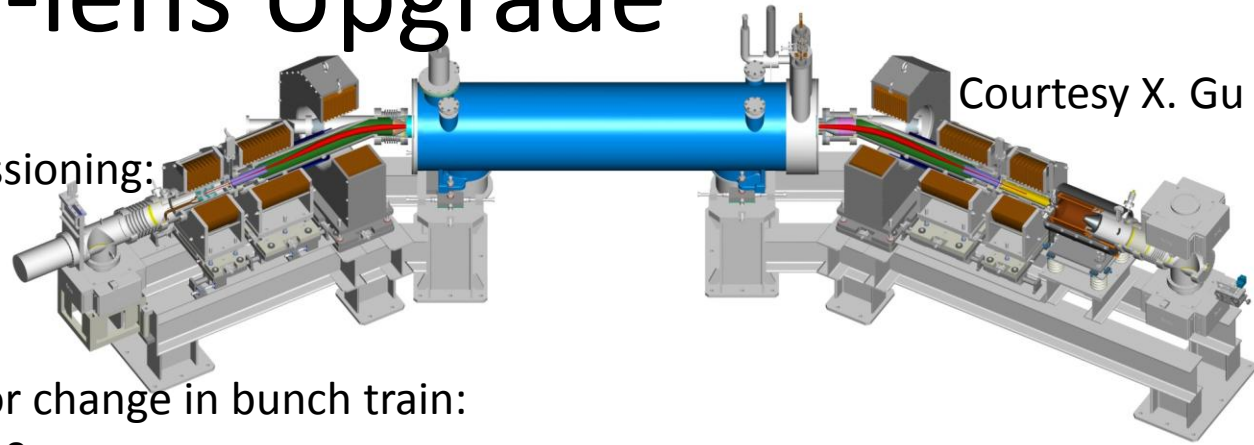
- Increase from 0.5 mA to 4 mA at the Linac from the source: almost a factor of **10 higher**

## Current Status:

- The outstanding question is if high polarization can be maintained has been answered, with the measurement of polarization with the Lamb-shift polarimeter comparable to the old source.
- Still outstanding is the tuning of the Sona transition, for which the ECR source is needed (better pulse-to-pulse stability than the ABS source). We cannot say yet whether we will run with the ABS source, which will give 10x more intensity.



# E-lens Upgrade



- Requires new Lattice Commissioning:
  - Yellow  $\rightarrow$  29.685 30.675
  - Blue  $\rightarrow$  27.685 29.675
- Change in abort gap timing or change in bunch train:
  - Move from IP2/8  $\rightarrow$  IP4/10
  - I. This to permit the instrumentation for the E-lens to “see” the beam signal without being swamped by the proton beam.
  - II. This reduces number of collisions from 107  $\rightarrow$  102We can also make a 2-3 bunch hole in the bunch train (smaller loss of luminosity but experiments may not like the discontinuity)
- **Current Status:**
  - We plan to install 1 lens with one of newly manufactured sc solenoids. For the other lens we will use a different magnet, most likely EBIS spare, so that the electron beam can propagate from the gun to the collector.
  - Thanks to Xiaofeng, Sasha, Yun, and Mei we have now determined that the EBIS spare is acceptable for both electron transport and spin in RHIC with an integrated strength as high as 2Tm.

# AGS Plans For Coming Run: (courtesy H. Huang)

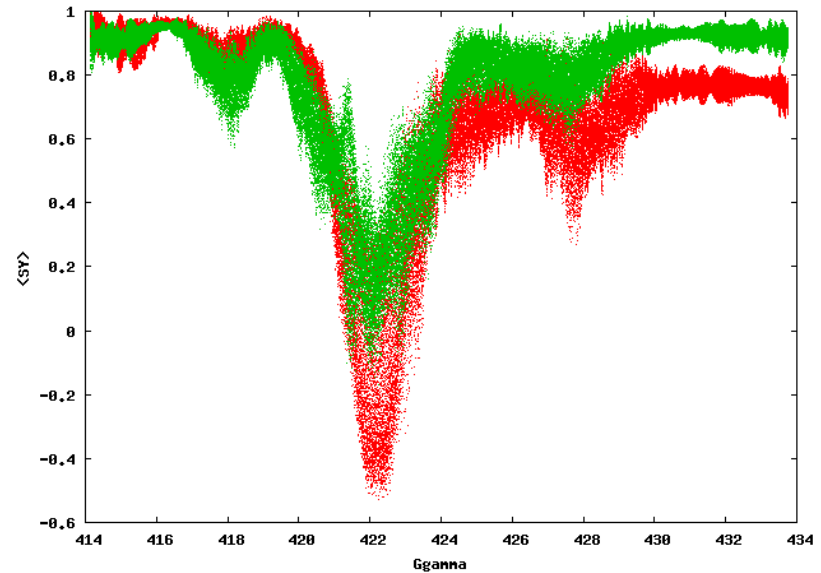
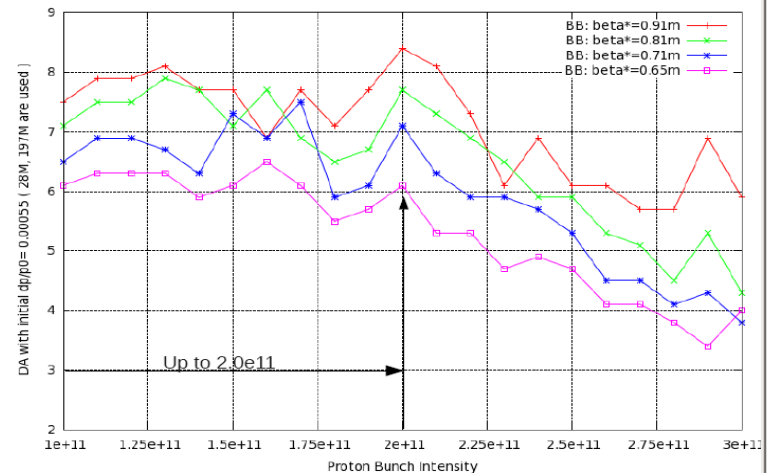
- Add RHIC type IPM into AGS (horizontal first), which can provide turn-by-turn emittance (critical for injection match) and does not have space charge problem. (on going)
- With higher input intensity from source next year, it is possible to capture at Booster with two or even three buckets. The direct benefit is smaller longitudinal emittance, which should allow higher intensity at RHIC rebucketing. We can fill yellow with two bunches (same sign pol) or even blue, if experiments agrees.
- AGS cycle shorter cycle: 4s. -> 3s. This is to reduce RHIC filling time to reduce emittance growth at RHIC injection. The jump quads LV PS needs modification. (JQ PS modifications are on going maybe get 3.3s if not 3 s )
- New C5 corrector for horizontal beta function measurement.
- Test of extraction-on-the-fly.
  - The feasibility with 9MHz cavity in RHIC has been verified.
  - The next step is for the pulsed power supply group to check the extraction bump power supply which has not been used in 10 years.
  - One issue is that in order to commission the new LLRF for AGS we will need extraction to remain the same during start-up later it can be switched. This pushes extraction-on-the-fly to a full fledged test costing two shifts and halting RHIC operation during this time.
  - Alternative is to try radial jump proposed by Brennan tested in 96 with a much slower acc ramp. However this may not be as good as the regular extraction-on-the-fly.
- AGS ZGOUBI model as (semi-) online model, behind optical control, IPM (on going F. Meot, Yann and Caitlyn)
- Automatic IPM beta function measurement.
- Automatic emittance correction (from space charge, dispersion-> requires longitudinal dimension measurement).
- Automatic chromaticity measurement.



# Lattice Development

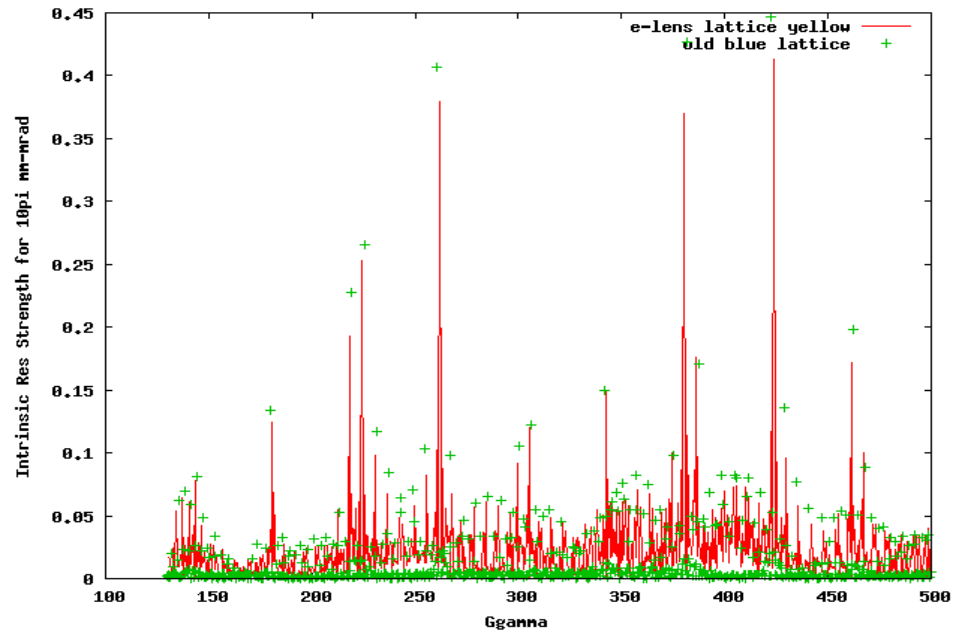
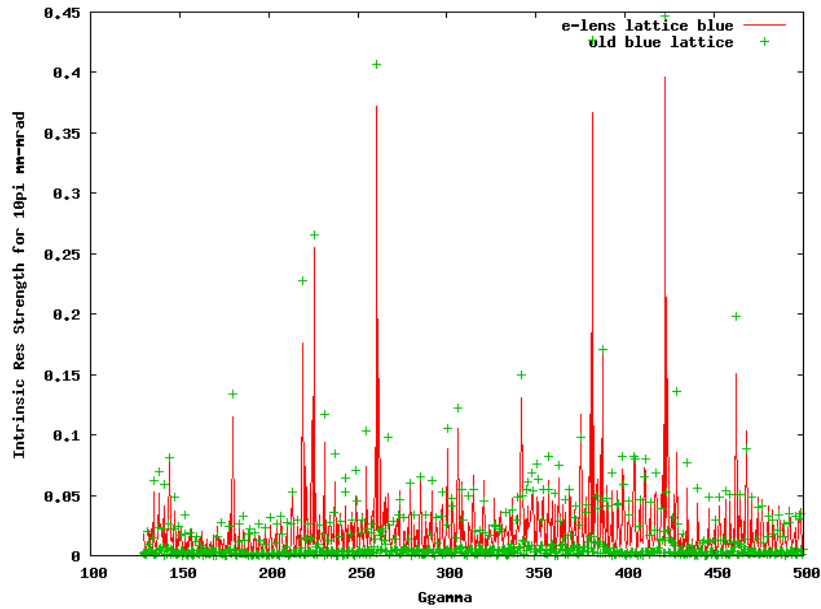
- E-lens:
  - Steve Tepikian has developed solutions which by Yun Lou's tracking shows we are at 6 sigma DA at our goal intensity. This appears good enough to run with.
  - Also large Amplitude Spin tracking for crossing the last strong intrinsic show good results. This is also confirmed by DEPOL calculations which show a reduction in intrinsic resonances by  $\sim 10\%$
  - Change in beta squeeze on ramp. To make the new lattice interface more easily with pp2pp mode we are ramping with fixed beta Star at 7.5 m to top energy. Then during rotator ramp we will perform the beta squeeze necessary for normal runs.
- Pp2pp:
  - We are developing a solution which would work with the e-lens ramped optics.

DA with BB at IP6 and IP8



Original Lattice with 0.08 Imp res Elens Blue lattice with 0.08 Imp res

# DEPOL calculations for new e-lens lattice



# PP2PP Mode

- For efficiency in ramp development we have moved pp2pp from the start up mode to occur later.
- Keep Ramped Optics same as with e-lens. Ramping with fixed 7.5 m Beta Star. We then will un-squeeze to 10 m after energy ramp.
- Dropped Stochastic cooling option since attainable cooling time too long and required optics very different.
- Transverse Polarization
- We are planning for 4 days of devoted to pp2pp with the goal of reaching 24 hours of 'good data taking' store time.

# Summary

- Start Up time delayed till Feb.
- Start Up mode changed from pp2pp to regular 255 GeV pp mode.
- Upgrades progressing well
  - OPPIS upgrade progressing well, expect at least 1 e-lens available for e-beam commissioning.
- E-lens Lattice development for Run now achieves good DA range and good polarization.