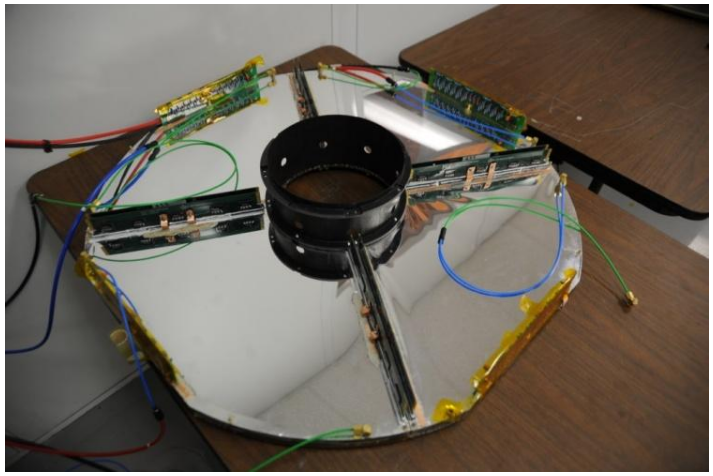
STAR Status and Run Request for 21 wk Cryo Scenarios

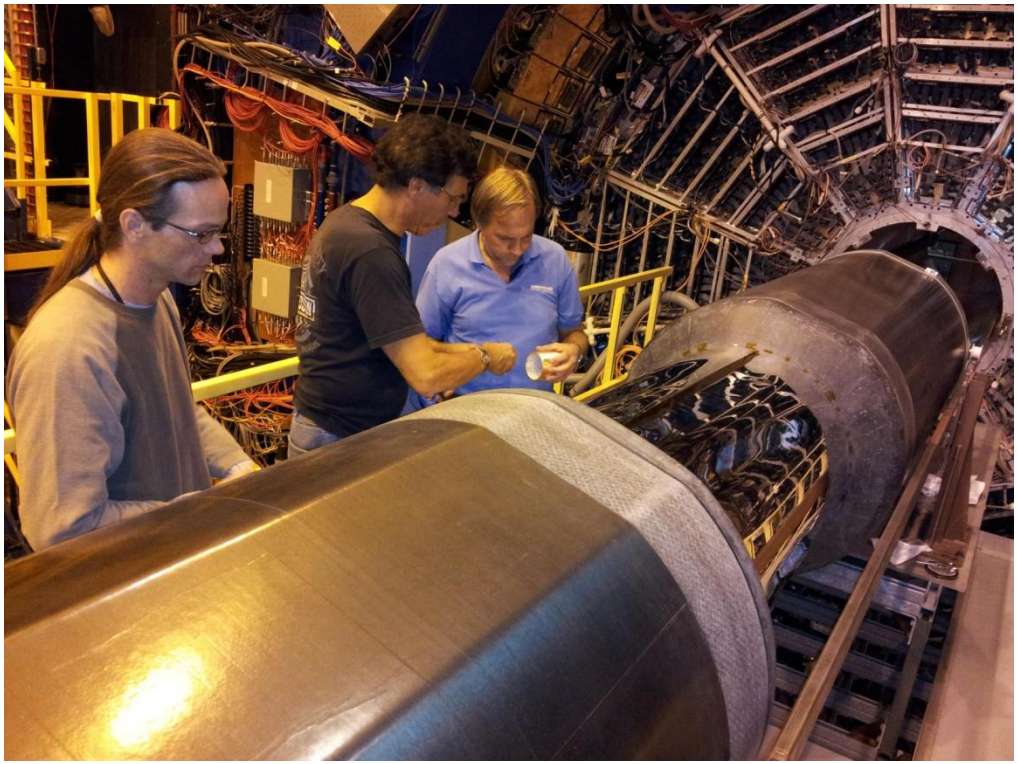
January 3, 2012

Bill Christie for the STAR Collaboration

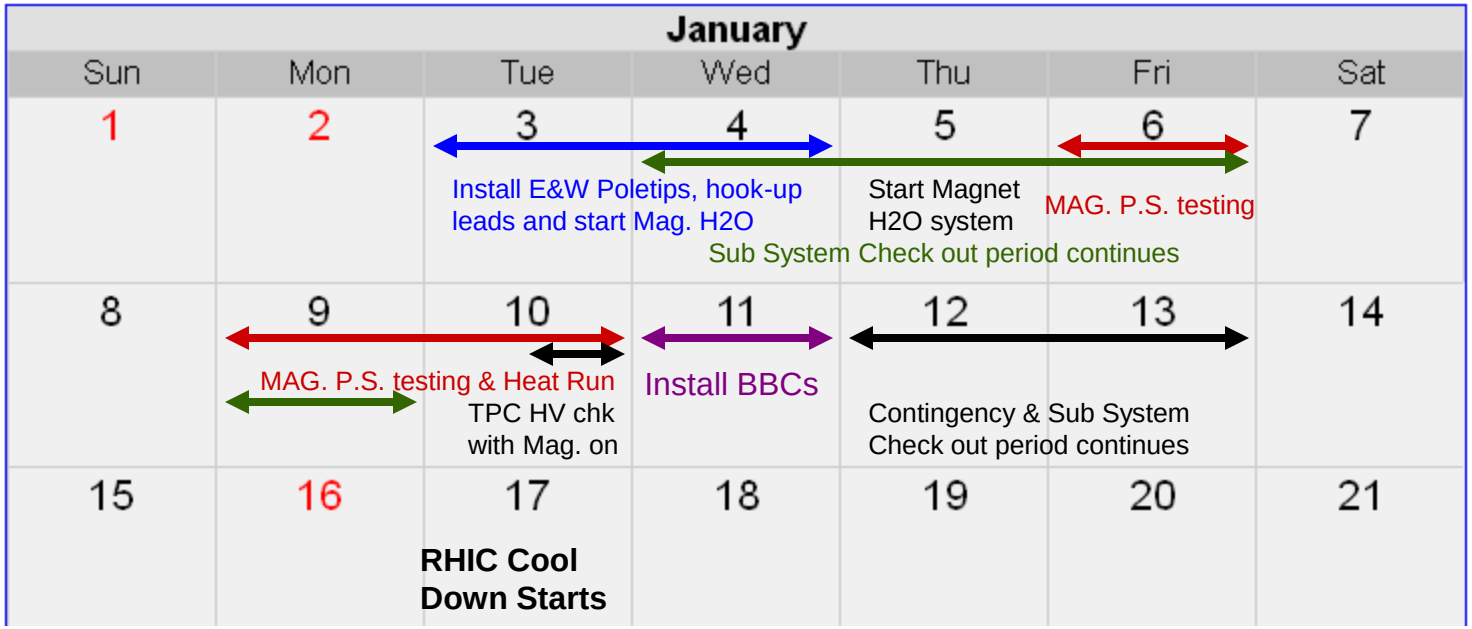
Outline

- Current STAR Status and Schedule
- 21 Cryo week run scenario
- Physics Programs
- Summary





Calendar for January 2012 (United States)



- STAR is still on the schedule that we revised back in mid-October
- The East Poletip is getting installed today, and this will be followed by getting the magnet water on/buffed and a Full power Magnet test next week.
- STAR will be ready for the proposed January 17th RHIC Cool Down start.

STAR's Proposed Run Scenario for Run 12

Preferred order (if additional overhead negligible):

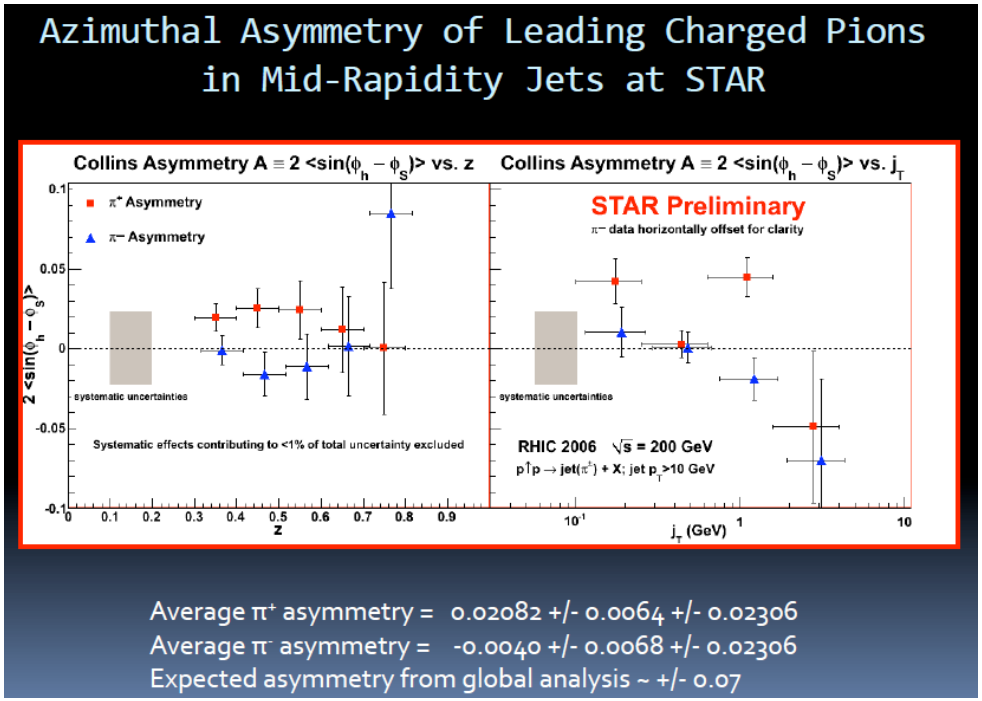
- Four weeks of 200 GeV pp
- Four weeks of 193 GeV UU
- Seven weeks of 500 GeV pp

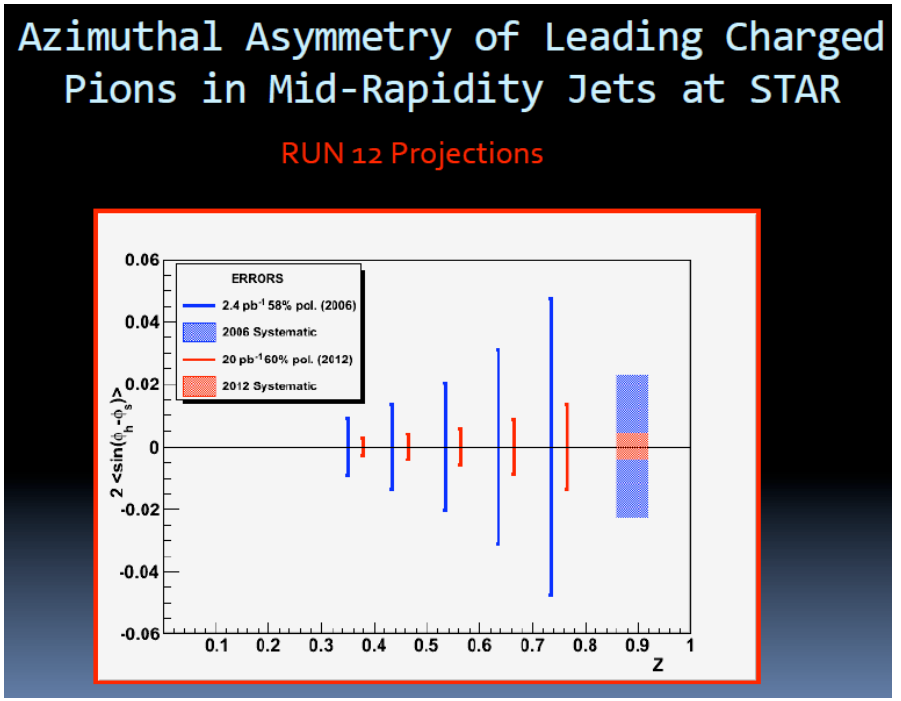
If additional overhead of interspersing UU between pp is not negligible:

- Four weeks of 200 GeV pp
- Seven weeks of 500 GeV pp
- Four weeks of 193 GeV UU

200 GeV pp Tranverse Physics Goals

Mid rapidity pion Collins asymmetry.





- C-AD mid-point projection for 4 physics weeks is 16 pb-1.
- Statistical error estimate shown in right plot is for 20 pb-1, therefore error bars projected to be ~10% larger than shown.

Additional physics goal for 200 GeV pp is to accumulate reference data for the Heavy Ion Program

200 GeV pp Tranverse Physics Goals

Forward Photon A_N

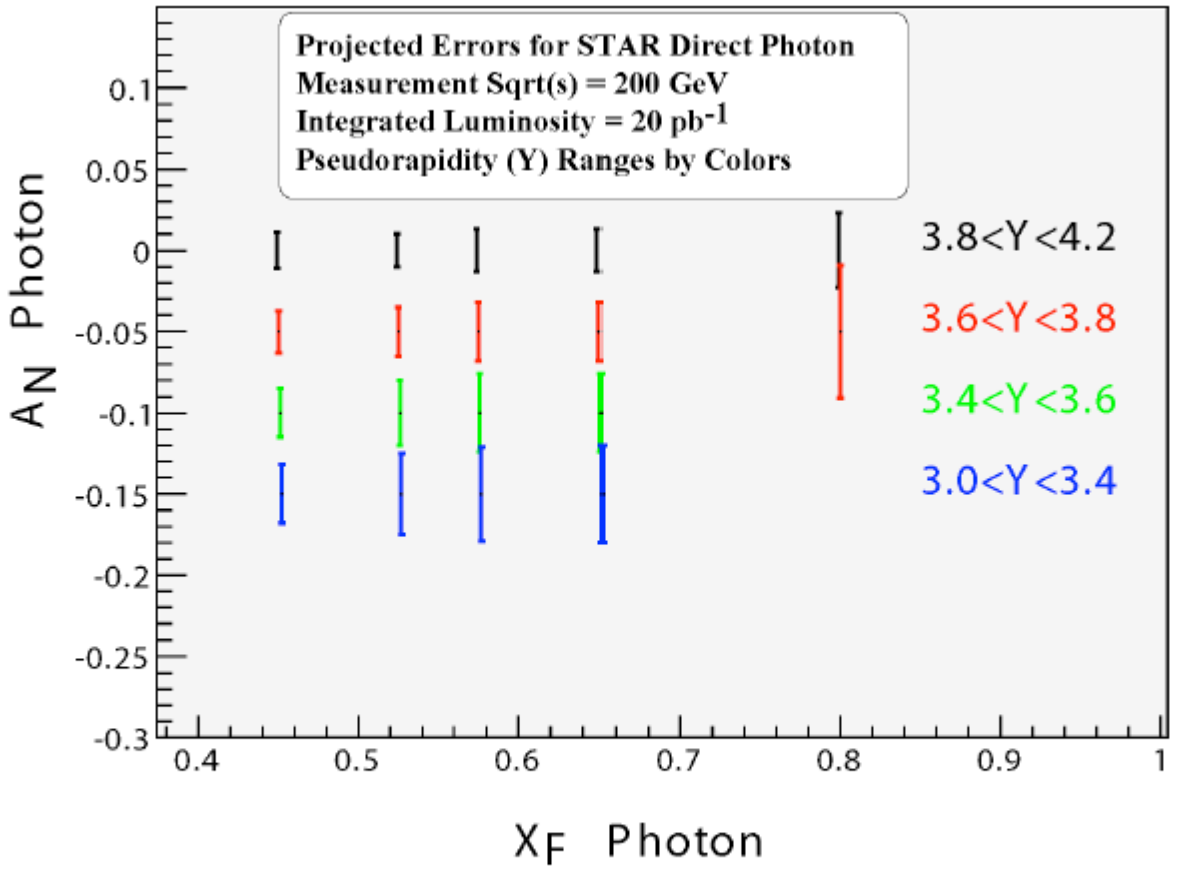
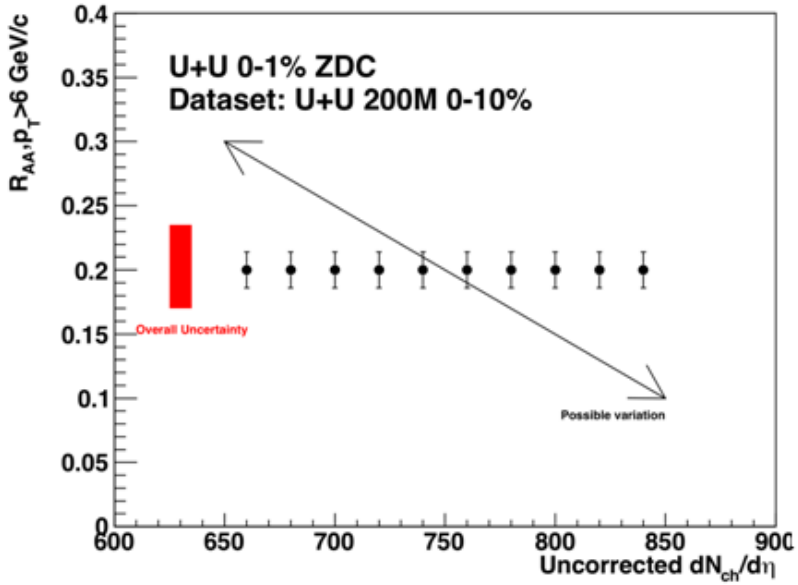


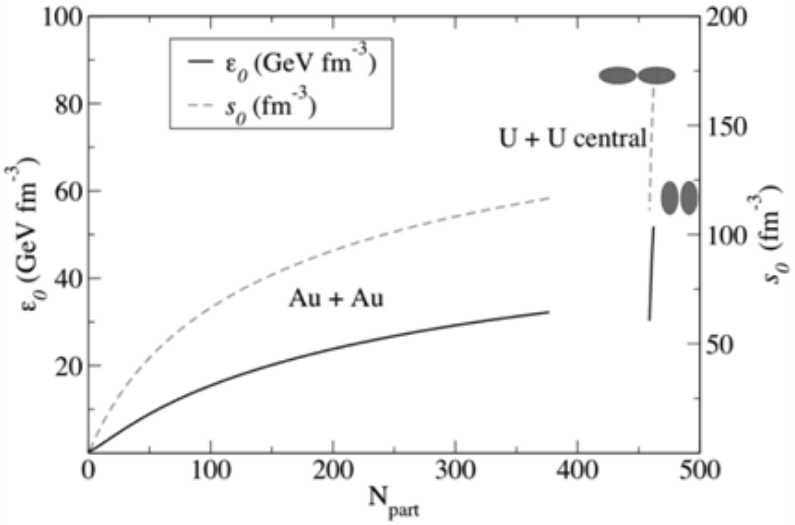
Figure 4.11: *Projected uncertainties for a STAR measurement of A_N for direct photon production with an integrated luminosity of 20 pb^{-1} and 60% polarization.*

- Statistical error estimate shown is for 20 pb-1, therefore error bars projected to be ~10% larger than shown.

Run 12 Request U+U Collisions



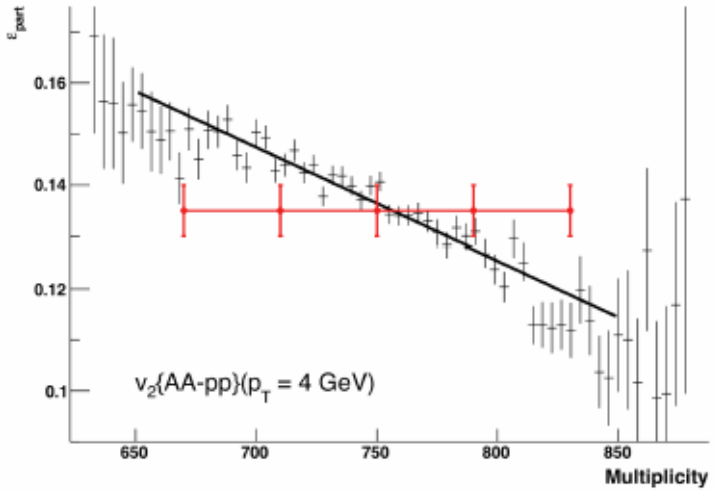
U. Heinz et al, PRL **94**, 132301(05)

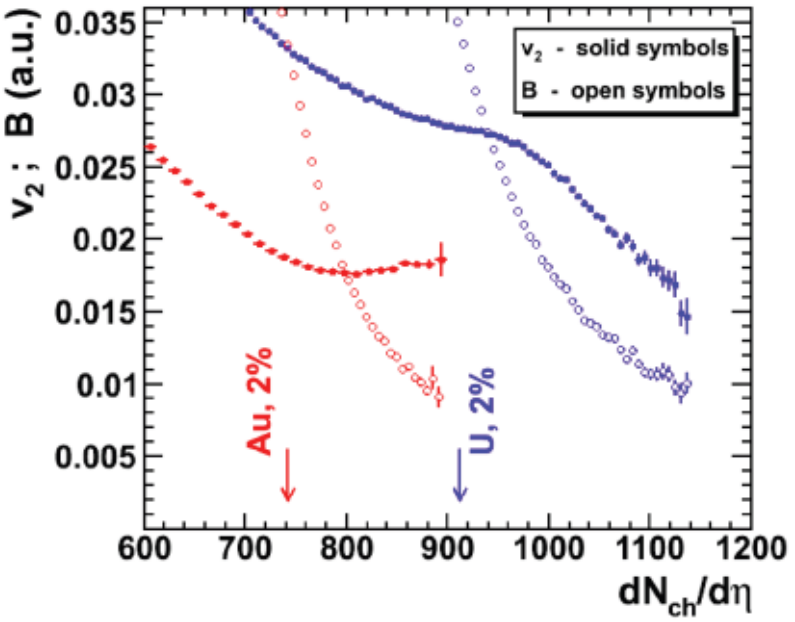


1) Significant increase in energy density for hydrodynamic studies
2) Prolate shape: path-length dependence of E_{loss} at much higher density

Run 12 request: 200M MB and 200M central U+U collisions.

200 Mevts of 0-10% Central 193 GeV UU





Left plot: **Black**: $<\varepsilon_{part}>$ as a function of measured mid-rapidity multiplicity in the most 1% central U+U collisions, as selected by the number of participants. **Red**: estimated uncertainties on v_2{AA-pp} for p_T=4 GeV/c for such events, as selected with the ZDCs.

Right plot*: v_2 and external B-field vs. mid-y multiplicity. Greater sensitivity seen in U+U central collisions for $dN_{ch}/d\eta > 1000$.

* S. Voloshin, PRL105, 172301(2010).

500 GeV pp Longitudinal Physics Goals

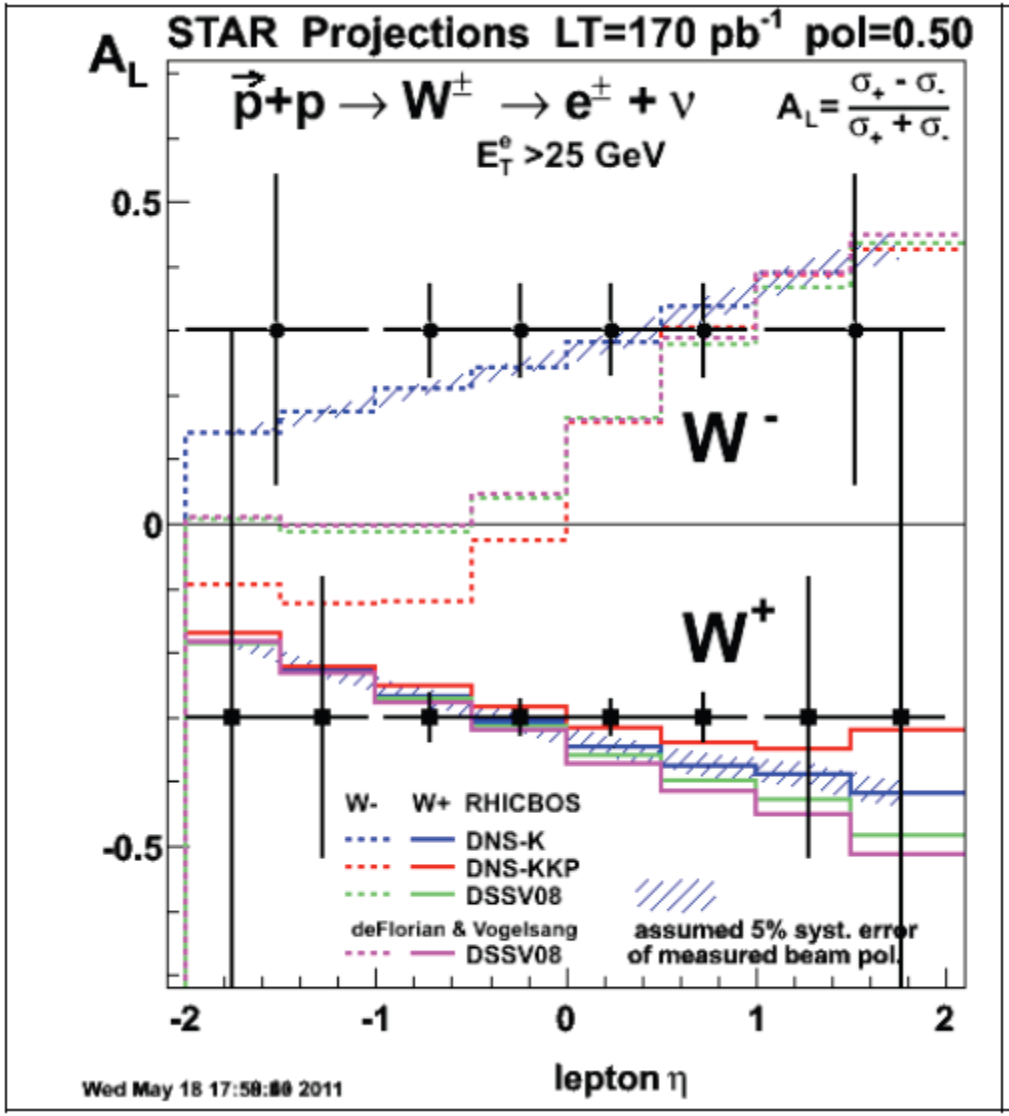
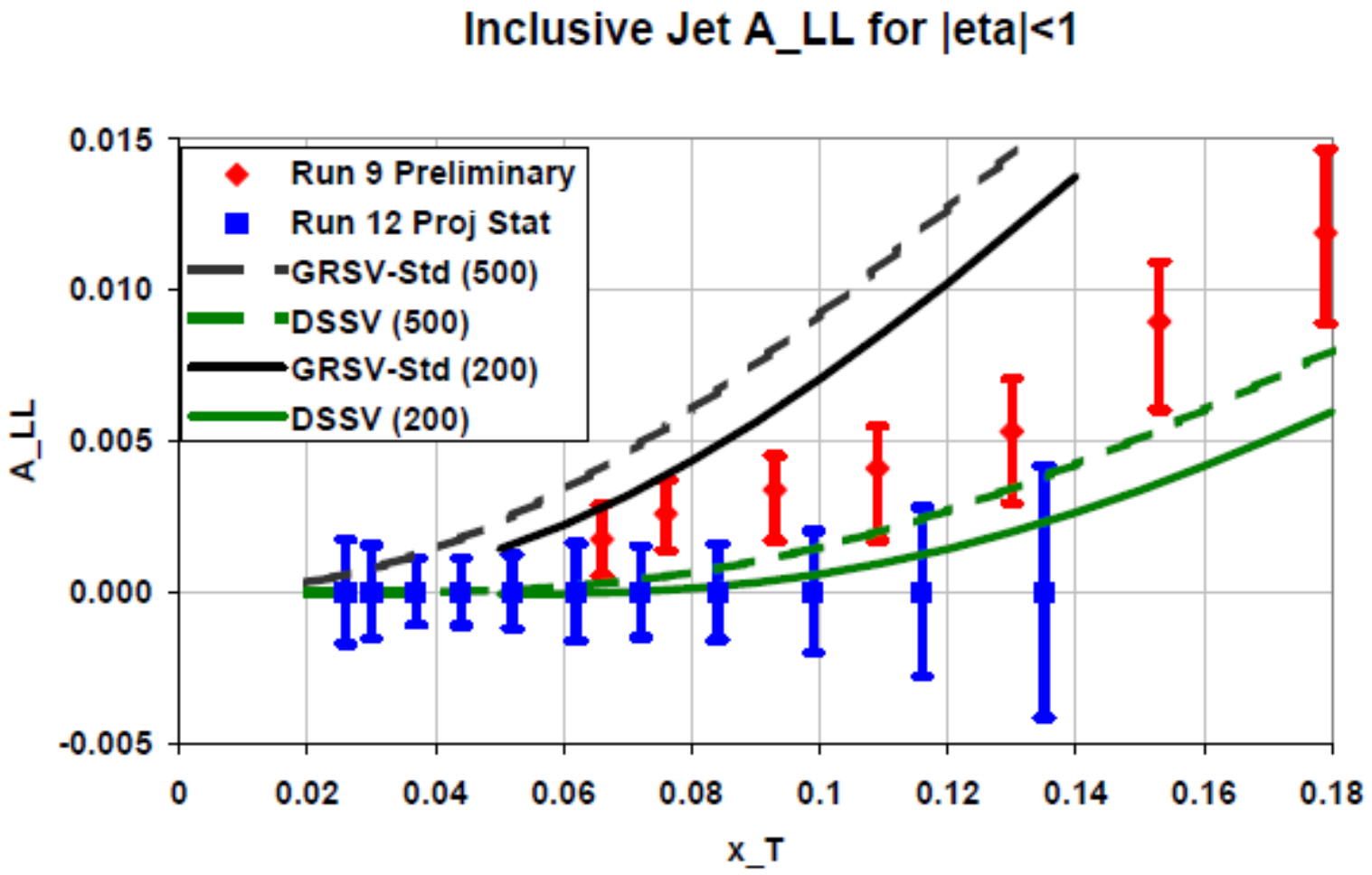


Figure 4.6: *Projected A_L sensitivity for a sampled luminosity of 170 pb^{-1} and 50% beam polarization.*

N.B. Mid-point projection for 7 weeks is ~75 pb-1. Therefore estimated statistical errors are ~50% larger than shown in plot.

The eventual precision that can be attained for $1 < \eta < 2$ will depend on how the FGT commissioning goes.

500 GeV pp Longitudinal Physics Goals



Run 12 error bars assume 75 pb^{-1} of sampled luminosity with a polarization of 50%.

Summary

- **STAR will be ready for the proposed January 17th start of RHIC Cool Down**
- **Our preferred running scenario is:**

  4 wks of 200 GeV pp, 4 wks of 193 GEV UU, 7 wks of 500 GeV pp

  Other running scenario option is:

  4 wks of 200 GeV pp, 7 wks of 500 GeV pp, 4 wks of 193 GeV UU
- **Primary Physics goals are:**
  - 200 GeV Transverse pp
    - Mid-rapidity pion Collins asymmetry measurement
    - Forward Photon A_N measurement
    - Heavy Ion Reference data
  - 500 GeV Longitudinal pp
    - W A_L Measurement
    - Inclusive Jet A_{LL} Measurement
  - 193 GeV UU
    - V_2 Measurements
    - R_{AA} Measurements
    - etc.