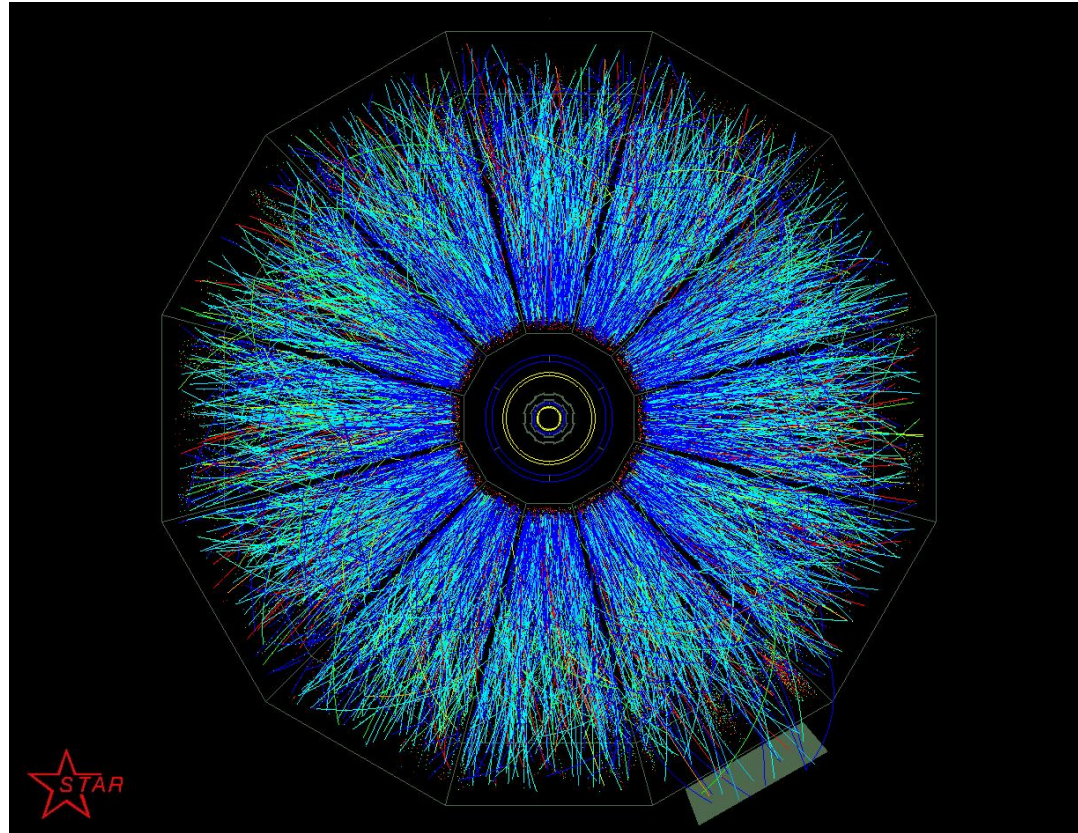


STAR Goals for Run 9



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Executive Summary of Goals

- Commission major detector upgrades
- Physics and preparation for the future at 500 GeV
 - Establish local polarimetry of transverse components
 - W cross-section
 - $W A_L$: 10 pb^{-1} sampled, Longitudinal polarization 50%
- If the run is extended: highest priority 200 GeV p+p
 - BUR: 50 pb^{-1} sampled, 60% Polarization: FOM $P^4_{\mathcal{L}} = 6.5 \text{ pb}^{-1}$
 - Needs ~ 11 weeks for full goal
 - $\frac{1}{2}$ week pp2pp for complete transverse program

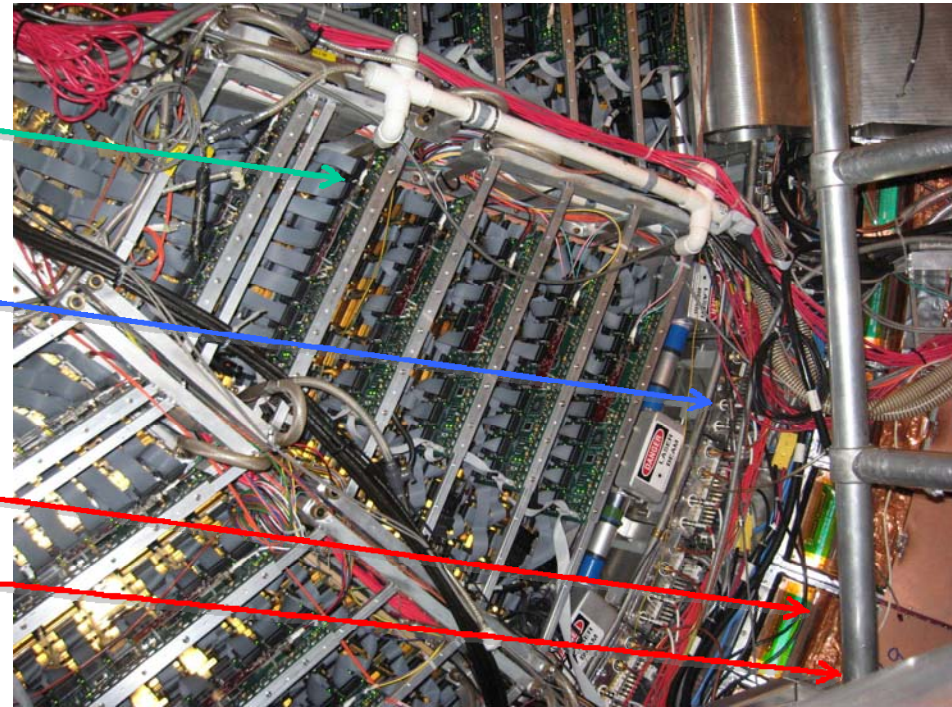
First things first: Commissioning

- **Major** changes in the detector: will need to be commissioned

Time Projection Chamber DAQ1000:
replacement of entire electronics chain

Time of Flight: 75% of trays in place
First run with more than ~few trays

Electromagnetic Calorimeter:
Shower Max: modification of
electronics to decrease deadtime
Towers: rewire trigger to increase
jet efficiency



Trigger: New electronics (QT boards) for basic detector systems (BBC, ZDC, etc.)
New Trigger Control Unit for greater flexibility

Overall goal: increase sampled/delivered ratio by lowering deadtime

While there have been prototypes, and some commissioning can be done w/o beam, need 1-2 weeks to shake down with stable beam

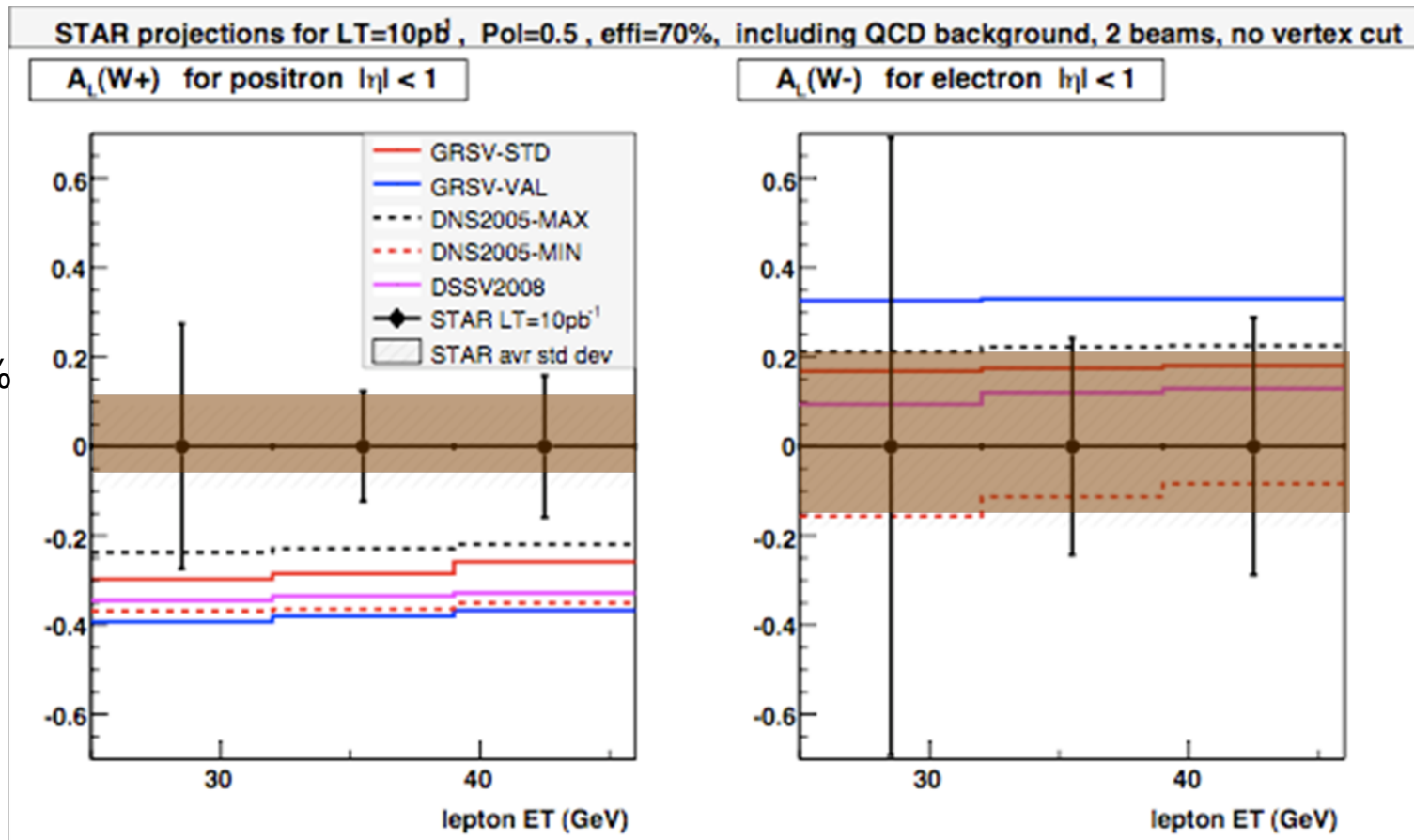
Primary goals at 500 GeV

- Plan to start with transverse polarization
 - Likely needs ~1 week after commissioning, but still in discussion
- Establish local polarimetry
 - At 200 GeV: used BBC, does the A_N persist to 500 GeV?
 - Investigating other methods: ZDC Shower Max, VPD, ...
 - Need to measure sizeable asymmetry before rotating to longitudinal as part of establishing local polarimetry
 - Low backgrounds necessary for interpretability
 - Important for the future: need to know what we need
- Primary physics goal: W
 - Observe decay signal, cross-section, aim to separate by charge
 - First measurement of A_L

Primary Goal at 500 GeV: W physics

Goal 1: First W cross-section in STAR (using mid-rapidity e)

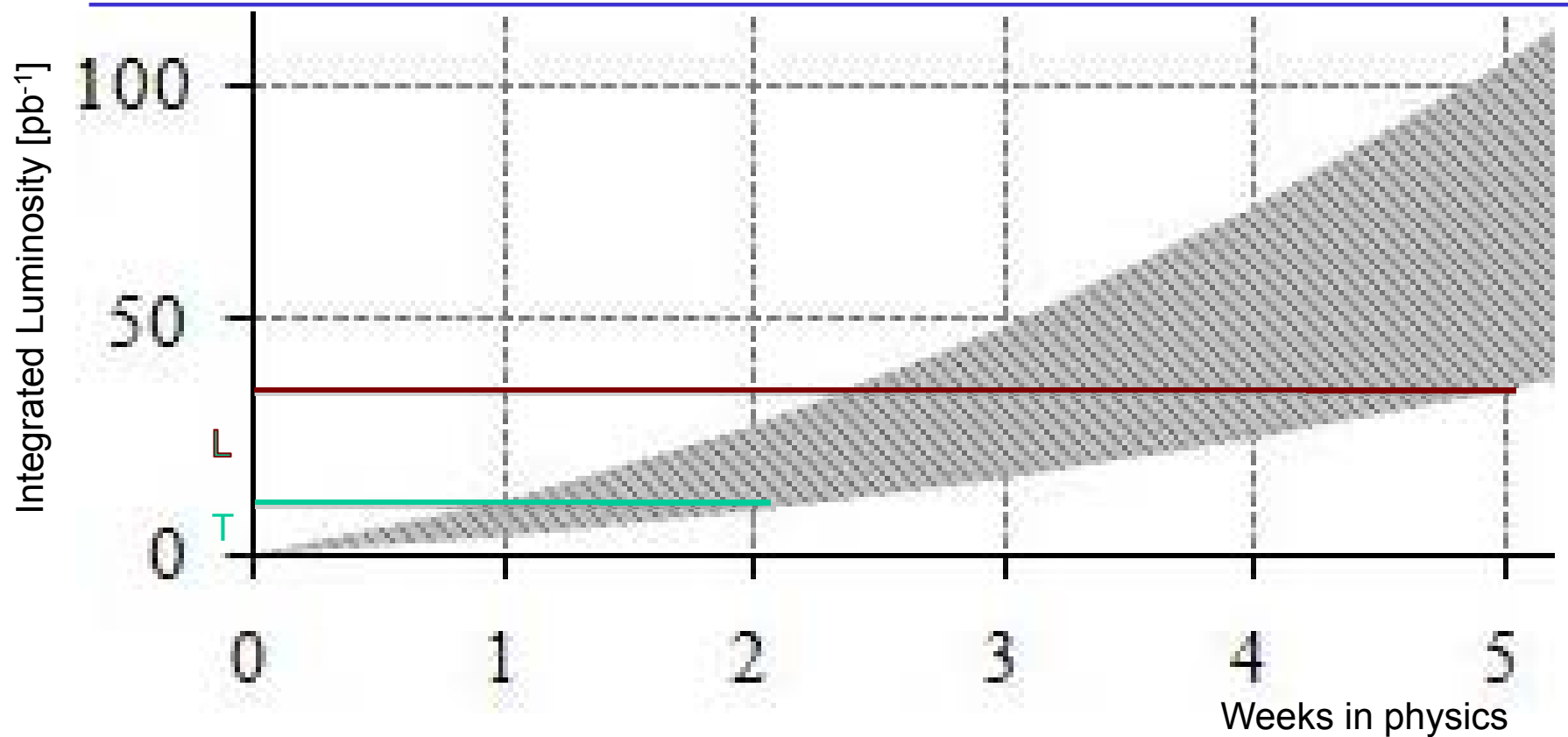
Effective signal ~ 250 (W^+) ~ 60 (W^-) with 10 pb^{-1}



- FOM = 2.5 pb^{-1}
- Polarization = 50%
- Longitudinal
- Luminosity: 10pb^{-1}

Goal 2: First measurement of A_L for W

Worst Case Luminosity Projections



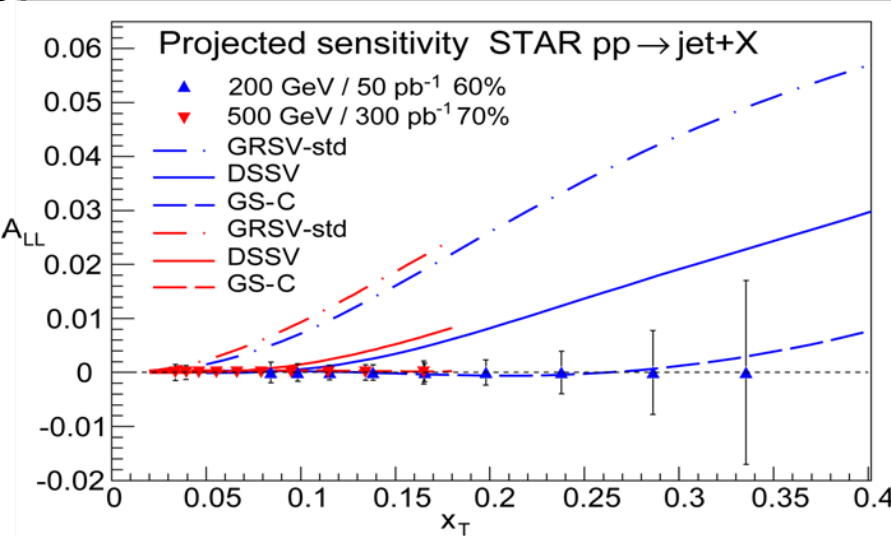
Lose ~ 10 in first weeks, delivered ~ 40 after 5 weeks = 30 pb^{-1}

10 pb^{-1} sampled should be achievable during longitudinal running

Would appreciate more if things go well

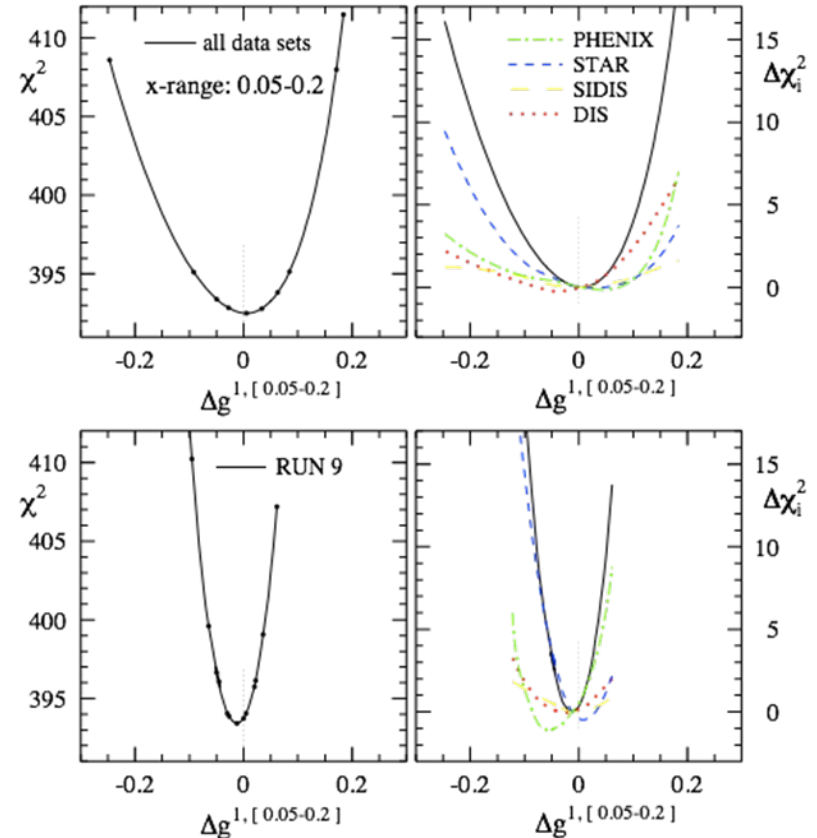
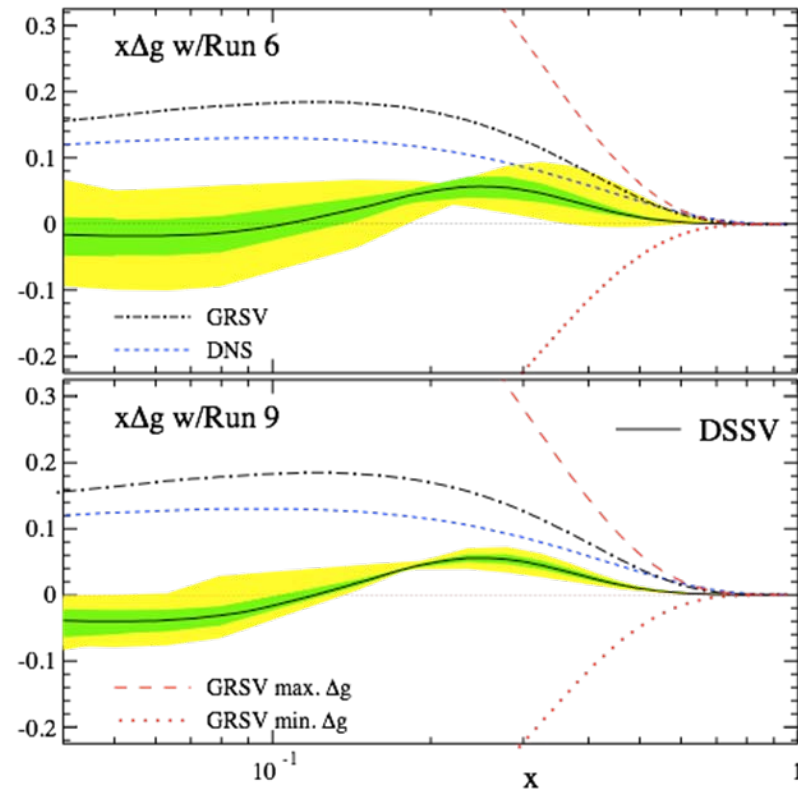
Other opportunities at 500 GeV

- First measurement of A_N at 500 GeV with Forward Pion Detector and Forward Meson Spectrometer
- Jets and dijets: $\Delta g(x)$ to lower x , different parton subprocesses
 - With projected integrated luminosity A_{LL} and polarization: proof-of-principle
- Heavy flavor
 - Use the TOF, EMC, and reduced material to measure charm, non-photonic electrons, J/Ψ and Upsilon
 - Useful as check on theory
- Dileptons: first from STAR
 - Expect significant $\phi \rightarrow ee$ signal with $\sim 100M$ minbias events



If Run 9 is extended: 200 GeV

Goal in the BUR: $\mathcal{L} = 50 \text{ pb}^{-1}$, $P = 60\%$: FOM 6.5 pb^{-1}



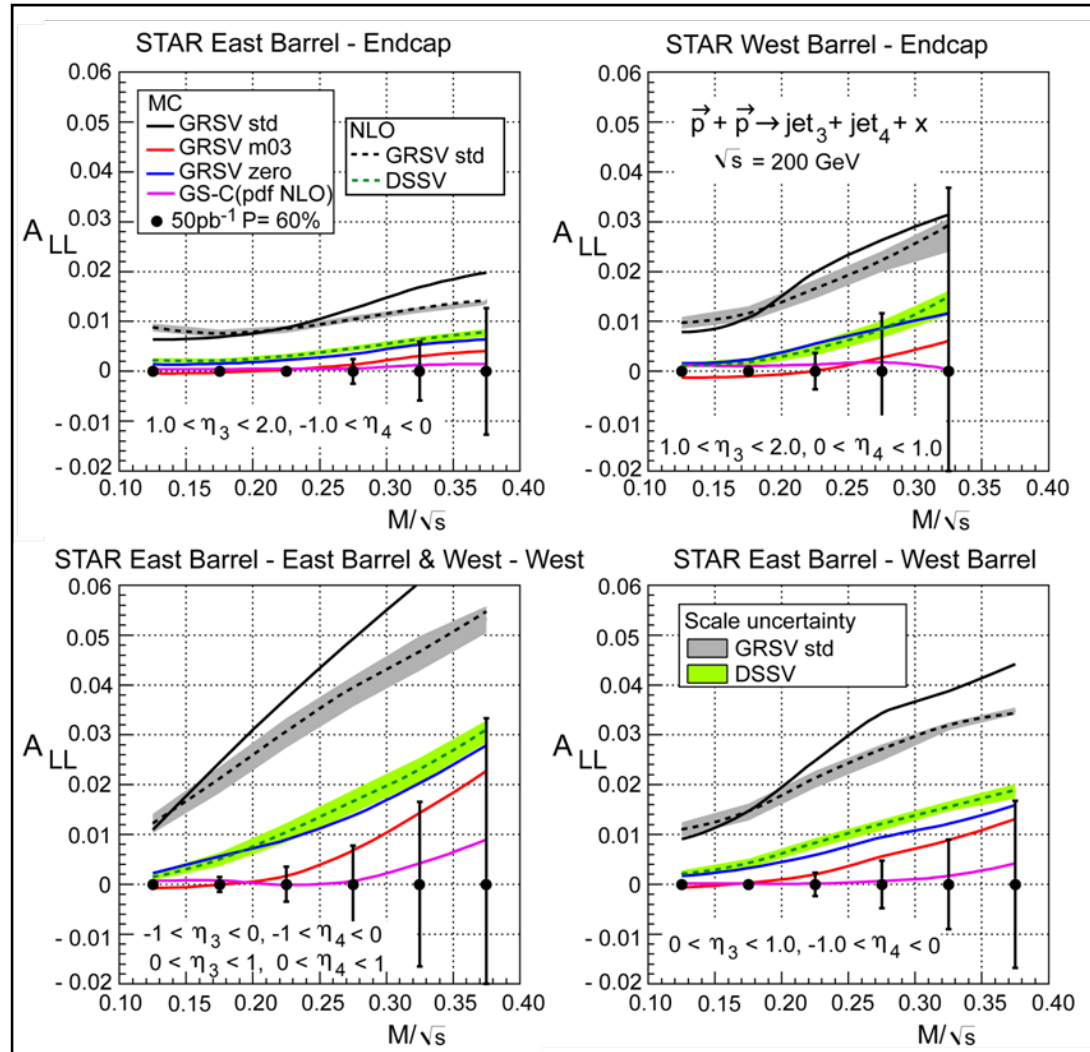
- Significant extension of precision in inclusive jets
- RHIC becomes the dominant constraint

Dijets at 200 GeV

Goal in the BUR: $\mathcal{L} = 50 \text{ pb}^{-1}$, $P = 60\%$: FOM 6.5 pb^{-1}

Shape of $\Delta g(x)$ not strongly constrained by RHIC inclusive data alone

Probe x dependence of $\Delta g(x)$ using kinematic constraints provided by dijets



Goals from p+p 200 GeV for heavy ion physics

Goal in the BUR: $\mathcal{L} = 50 \text{ pb}^{-1}$

- Reference for Au in RHIC II era: last chance for a few years

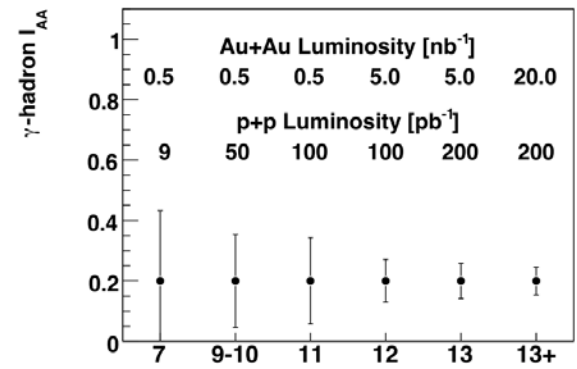
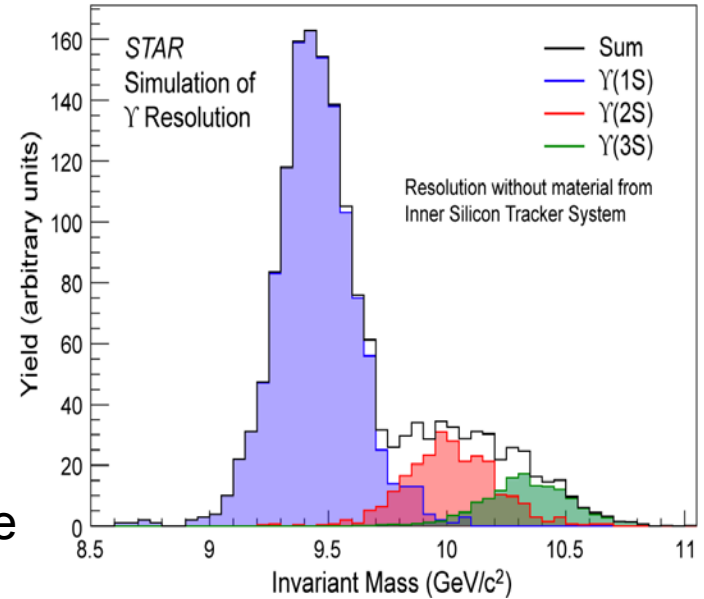
Factor 5x increase in \mathcal{L} for rare probes vs. run 6

- Non-photonic electrons: extend correlation signatures for B vs. D
- J/ Ψ : use TOF and EMC for precision
- Upsilon: 1st attempt to separate higher states
- γ -hadron: currently p+p is limit on I_{AA}

Large minbias dataset with DAQ1000: 300 M

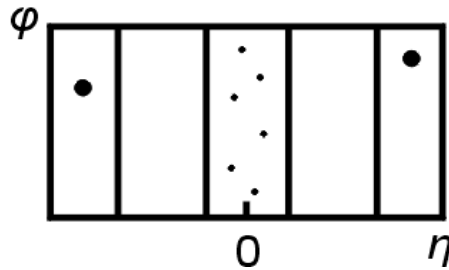
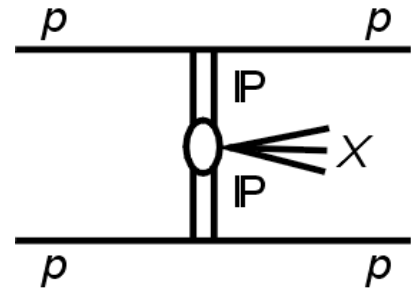
Has not been possible in previous years, due to DAQ limitations

Fundamental baseline for untriggerable probes: D, dileptons, hadrons

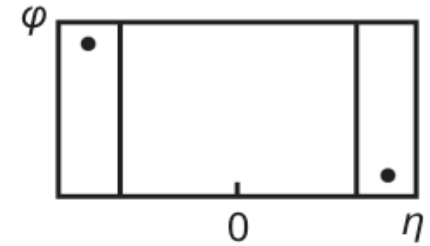
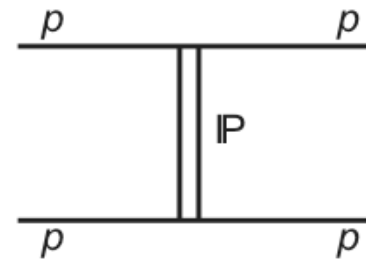


pp2pp goal at 200 GeV

Central Production



Elastic Scattering



- 3 1/2 days of running satisfies the transverse program
 - $\sqrt{s} = 200 \text{ GeV}$
 - Transverse polarization
 - Instantaneous $\mathcal{L} = 3 \cdot 10^{29} \text{ cm}^{-2} \text{ sec}^{-1}$
 - $\beta^* = 20 \text{ m}$
 - 40 hours data taking will achieve goal