RHIC Spin Plan

Gerry Bunce, RBRC and BNL

RHIC Spin Collaboration Meeting, Oct. 1, 2001

This presentation was an introduction to an excellent meeting, discussing the plans for the spin program, set to start next month.

The running plan starts with tuning the AGS for polarization, where we have a dedicated 2 weeks scheduled from the beginning of November. This work will occur during heavy ion fills in RHIC, and the goal is to reach 50% polarization at the RHIC injection energy. The heavy ion to pp changeover is scheduled for Nov. 19-23, and we discussed the work and required time during the presentations. The pp and polarized commissioning is scheduled for the 3 following weeks. Then the first polarized proton collision physics will start. Five weeks are scheduled for polarized collisions at 100 GeV x 100 Gev, P_{beam}=50%, luminosity 4 x 10^{30} $cm^{-2}s^{-1}$, 1.5 pb^{-1} per week. The agreed split is 1 week/1.5 pb^{-1} transverse spin, 4 weeks/6 pb^{-1} longitudinal spin.

The second transparency addresses the likely luminosity, listing a number of "real world" factors, compared to "design". The conclusion is that 0.5 pb^{-1}/week would be a more achievable (but perhaps still difficult) goal. The split transverse to longitudinal will need to be decided depending on success and circumstances.

The third transparency lists issues. Many of these items were addressed very positively at the meeting. The last item, preparations and plans for the future, will need to be the focus of a future meeting.

G. Bunce
1 Oct. 2001
RSC Meeting

RHIC Spin Plan

- AGS tuning for polarization
  - dedicated 2 weeks ~~Oct~~/Nov.
- Heavy ion → pp changeover
  - 4-5 days Nov. ~~12-16?~~ 19-23
- pp commissioning
  - 2 weeks
- p↑p↑ commissioning
  - 1 week
- p↑p↑ physics at 100 GeV × 100 GeV, $P_{beam} \gtrsim 50\%$, $L = 4 \times 10^{30}$, 1.5 pb^{-1}/wk*

* { - 1 week / 1.5 pb^{-1} transverse pol.
  - 4 weeks / 6 pb^{-1} longitudinal pol.

5 weeks physics for p↑p↑ and pp

Notes / Remarks

* on the 1.5 pb^{-1} / week

$L = 4\times10^{30}\,(8\times10^{31}/20) \times 1\,\text{week}$

$\times 100\%$ availability $= 2.4\ pb^{-1}$

– if average $\bar{L}$ / fill $= 2\times10^{30}$

RHIC up 40% $\Rightarrow$ $\boxed{0.5\ pb^{-1}/\text{week}}$

$$\frac{\text{Bunches}}{\text{Design}} \times \left(\frac{N_{\text{bunch}}^{(\text{protons})}}{N_{\text{spin design}}}\right)^2 \times \frac{\epsilon_{2001}}{\epsilon_{\text{design}}} \times \left(\frac{\beta^*_{2001}}{\beta^*_{\text{design}}}\right)^{-1} \times \frac{L_{avg}}{L_{max}}$$

$\uparrow$ Can be 1 if we use 120 bunches

$\times$ vertex cut

$$\frac{1}{4} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

$\times$?

$\Rightarrow$ lower than spin design by at least factor 32

$\rightarrow$ above a factor 40 is assumed

---

* on split between longitudinal / transverse pol.

– **not set in stone**

– actual split depends on amount of beam delivered and success in maintaining polarization while turning off one snake at 100 GeV

More to discuss – today and beyond

- prospects for $P \gtrsim 50\%$ at RHIC injection
  - AGS, AGS to RHIC (+ source!)
- control of tune/orbit in RHIC
  - **prospect to reach requirement?**
- prospects/plan for decellerating to carry polarimeter A_N to 100 GeV? A_N at injection?
- prospects/plan for spin flipping?
- experiments – readiness?
  - relative L_{++}/L_{+-}
  - redundancy, ability to measure $L(P)$? polarization sign
  - local deadtimes; bunch pattern?
  - rate/trigger capabilities
  - planned measurements
- theory for planned measurements!
- local polarimeters
- running conditions
  - ϕ-polarization bunches?
  - some radial polarization running?
  - pp2pp test with lower N_p?
  - any limit on N_p from silicon?
- future – beyond 2001/2
  - $\underbrace{\text{rotators; CNI for AGS}}_{2003}$; $\underbrace{\text{jet}\Uparrow}_{2004}$