

RHIC Spin meeting minutes 4/21/2008

Unofficial notes taken when by Abhay when he was not asleep in today's meeting with zero edits. ;-) Any faults are his, but hope this is still useful. Thankfully, Gerry read the notes and has made some corrections (they are in Blue). If we got something grossly wrong or we missed something important, please do not hesitate to send comments and correct it in the final spin document.

Gerry Bunce:

Presented the charge and suggested a final document be ready by 5/16. Last meeting of RSC on this topic ~5/5.

Wolfram Fischer:

Luminosity upgrade ideas and sources of potential increase:

1. Beta-Star from 90 cm to 50 cm (increase 80%)
Primarily manpower; may be ready in 2009
2. Nonlinear chromaticity correction (30%)
3. Quadrupole jump in AGS (Polarization)
Done deal
4. Nine MHz Cavity (25% at Beta-star 1 m)
Testing
5. LEBT/MEBT + Booster injection modification (+20%)
6. Eliminate triplet modification (5-10%)
Design studies in progress, without this one can't have the half integer working point.
7. Near half integer working point (40%)
8. 56 Mhz cavity
9. Electron lense (100%)

We need about 3 times the present luminosity to make it to design.

Above list: leave out the electron lens, and we are still there (5.5 increase in the luminosity)

For luminosity goal in out years, we should put 70% as polarization goal, not 75% for now. This is with the understanding that the improvement could be further justified and defended with improved knowledge of the machine by the out years.

Intensity dependence of the polarization in AGS needs to be addressed in this document. Some plan/steps towards this study and elimination of it as a goal should be discussed.

If we are on continuing resolution, starting AGS early enough to prepare the polarization might be impossible. This should be clearly defined and mentioned in the 5 yr planning.

Gerry's comment:

We note that some of the gain factors may be correlated, and this should be revisited toward a clearer estimate of L in the future. Also, note the anti-correlation between L and P in the AGS, and that it is crucial that CAD get sufficient time to understand and hopefully resolve this. That there is not sufficient funds to start the AGS early, prior to a new budget, is a very serious concern. A (The?) major issue with the pp run in 2008 was the late budget and the inability to prepare the AGS ahead of time.

Delta-G Jim Sowinski

Run-9 estimate for luminosity raised discussion

STAR 4 times improved from Run-6

Estimates uncertainty improvement on Delta-G by DSSV assumed 4 times over all including PHENIX, which might not be the case.

Clearly comments associated with what happens if budget for Run-9 is not there can be made in the executive summary.

Direct photon data may be of questionable value now that we know the Delta-G is small. Say it so, and appropriately in the document. Perhaps no figures on this in the document.

Lower x gluon using:

1. higher center of mass
2. using existing forward detectors with various combinations of central/forward detectors

Low-x important for low x extrapolations of PDFs, which is better than nothing. Sensitivity to first moment.

500 GeV probes at same x but much higher p_T what was measured in 200 GeV operation. This cross check of applicability of pQCD is very important. Can not be underestimated.

a -hat at forward (γ -Jet) is 1. This should be emphasized.

Make clear what we know and what we expect to get from formalisms including semi-inclusive and exclusive measurements.

W Physics, Ralf Seidl

A better presentation of RHICBOS is necessary. Recent input to experimenters the uncertainty bands around the DSSV parameterization for various quark and anti-quark flavor distributions.

Forward Gem Trackers (FGT)

- Identifies the sign of the particle by looking at the track trajectories
- Installation in 2010, first polarized proton run with this will be 2011
- Technology well understood, previously used in COMPASS detector
- 60 micrometer resolution position resolution
- Exist simulations indicating how well this will be able to resolve the charged electron tracks
- Shower shape studies using the forward shower max detector
- Background reduction of 1000 (or so) is needed, and the above two will give 100.

PHENIX

- Existing EMCal and DC enough to look at e in central arms
 - W momentum resolution of 8-9 GeV
 - Charge reconstruction efficiency 95%
 - $10^{\{2\}}$ rejection looked for and is available beyond $p_T=25$ GeV
 - RHICBOS simulations exist for asymmetries, clearly measurable
 - Plots for what PHENIX can do in central arms with different
 - What luminosities needed for W physics measurement? The previous plots shown everywhere were based on what was delivered. However, this may not be required for the W physics. A much smaller number might be actually necessary.

PHENIX Muon Upgrade

- Trigger needed to reduce the hadronic decays which dominate muon rates
 - W dominate only after 25 GeV
- Trigger FEE upgrade (mostly Japanese effort)

Time lines with various run scenarios for installation of various parts of this upgrade.

First full trigger FEE + RPC in summer of 2010. One arm FEE ready in 2009. Comments on RPC installation crucial to be discussed in this document, as this will dictate the time line for 500 GeV operation and the planning of shutdowns in the next few years.

Low pT hadrons decaying in the muon tracker fake a high pT muon background. Tighter cuts S/B improved to 1/3. Installation of 2-radiation length absorber after the central magnet yolk results in another improvement due loss of background. The resulting signal to background ratio then becomes 3/1.

Show simulations with Mu-Trigger and Trigger FEE what happens as a function of a particular cut. Plots indicating each step and the expected results might be of use in this document. Emphasize that an NLO analysis is needed to determine the x distribution of these measurements.

- Pavel N. has been asked to address this in the paragraph written on this, in the introduction.

Gerry's Comment:

For the W background for STAR, I believe that they think they have sufficient rejection with the factor of 100 that they quote?

I believe that the 300 pb⁻¹ will be about the needed integrated L to make an impact. This should be addressed--whether a smaller L would do. However, Pavel gave me independently a 300 pb⁻¹ minimum, based on physics.

Post lunch discussion on Luminosity delivered and acceptable for RHIC spin experiments at 500 GeV CM.

Major questions asked and need to clarify in this report:

1. Can the promised program be delivered with anticipated luminosity
 - a. Yes, we need to emphasize the stage 1 and stage 2 luminosity recorded numbers (300 and 1200 pb⁻¹) respectively. Stage 1 could be achieved by 2012/3, and stage 2 could come beyond.
2. Which detector upgrades are critical for W program? De-convolute the role of FVTS and NCC in the W physics base program. Clarify this.
 - a. FVTX and MuTrigger upgrade. Indicate a baseline and indicate how much better one can be
3. Can adequate hadronic background suppression be achieved? Make the argument based on realistic simulations.
 - a. A lot of these simulations have been performed and are adequate.
4. Is the tracking resolution for STAR adequate for discriminate between charges, and determination of x?
 - a. Yes to the first, but the second is confusing. X determination is not necessary, as an experimental observable but as a result of a NLO analysis.
5. Extraction of sea anti-quark polarization
6. Can one fit the funding profile 2013 with expectation of milestones

Gerry's Comment:

I think we agreed that we argue that only the trigger and tracker are needed for the W. Then we present that the other detectors will provide improvements.

Although x determination is unnecessary, it is important to develop a presentation that clearly shows how we access the physics.

Transverse Spin Physics with RHIC Spin (Les Bland)

Survey of existing results, emphasis on existing global analyses. Universal issues associated with these may/can be addressed.

No spin-physics milestone yet. Should we have it?

We should probably have a concrete transverse spin physics milestones.

Werner prepared a preliminary transverse spin milestone, he will forward it to the chapter contacts on this and they will produce some sentences associated with this goal. A demand on this might be that Glenn Young needs input on milestones within a week of today (4/21).

- Recommendation was: have a short term (5 yr) and a long-term (10 yr) milestone. The DY clearly falls in to the long term.
- Where as the transverse inclusive gamma-jet production measurement could begin now and be part of the first milestone.
- Other measurements in the first stage/milestone:
 - Di-hadron IFF both PHENIX and STAR can do it.
 - Collins function within a Jet can be performed in STAR
- Point out that presently no theory: global analysis etc. exist, they also need to be developed.

Running longitudinal and transverse at the same time. Gives transverse spin measurements for free, while at the same time no significant effect on longitudinal measurements. How significant is this? What are the effects of this operation on the systematic uncertainties of physics measurements (longitudinal as well as transverse).

Non-universality studies as a milestone.

These milestones should not require additional upgrades beyond the existing upgrade.

Spin Plan Document (Gerry Bunce)

Number of pages to be written:

Executive Summary 1

Introduction to physics 3

Accelerator 2

Delta-G 5

W physics 5

Transverse physics 5

Summary table 2

TOTAL: 23 pages

+ Appendices on the Web

Second draft to be ready by 5/5

RHIC Spin meeting on 5/6