

Personel RHIC Spin Group

March, 2006

Gerry Bunce—Group Leader, RHIC Spin Group; Deputy Group Leader, RBRC Experiment Group (resident Group Leader); Spokesman, RHIC Spin Collaboration (RSC wrote spin proposals for STAR and PHENIX, umbrella group to promote and coordinate program); Chair, Research Plan for Spin Physics at RHIC (2005); polarimetry; PHENIX.

Les Bland—Leader for STAR spin in RHIC Spin Group; PI for Forward Pion Detector, FPD++ (2006), Forward Meson Spectrometer (2007); co-chair, STAR Spin Physics Group 1999-2004; developed case for Endcap Calorimeter at IU.

Sandro Bravar—Leader of RHIC polarimetry, including design and development of pC and pp polarimeters; built AGS polarimeter; advisor for COMPASS at CERN.

Akio Ogawa—STAR, co-chair STAR Spin Physics Group 2004-present; FPD, FPD++, FMS; organizer of RSC 2003-2005; Belle polarized quark fragmentation analysis (RBRC collab.)

Sasha Bazilevsky—PHENIX, calorimeter calibration, software, analysis; leads A_LL analysis group; $\sigma(\pi^0)$, E_T analysis; organizer of RSC 2005-present.

Ron Gill—Polarimetry; Physics Safety Officer

Group Leader: G. Bunce

Deputy Group Leader: L. Bland

Secretary: M. Echmalian (0.5 FTE)

STAR: L. Bland (Leader), A. Ogawa, A. Bravar (0.2 FTE)

PHENIX: G. Bunce (Leader), A. Bazilevsky

Polarimetry: A. Bravar (Leader), R. Gill (0.5 FTE), G. Bunce

Total FTEs: scientists 5.5, secretary 0.5

Scientific Accomplishments

1. Organized, provided information, coordinated development of RHIC spin program through meetings with experimenters, machine physicists, theorists. Includes review in Ann Rev. Nucl. Part. Physics "Prospects of RHIC Spin", accelerator proposal for spin program published in NIM, Research Plan for Spin Physics at RHIC, submitted to DOE in 2005.
2. Developed RHIC polarimetry (pC and pp jet). Includes waveform digitizer readout (supported development by Satish Dhawan at Yale, ITEP development of FPGA coding) from 2001, built AGS pC polarimeter in 2002/3.
3. Proposed and introduced beam-beam counters (BB) to STAR as minimum bias trigger; discovery of analyzing power and use as local polarimeter for longitudinal polarization.
4. Proposed and introduced FPD to STAR; discovered large forward π^0 transverse spin asymmetry, leading to modern era of transverse spin physics (with also results of Hermes and Belle); gluon saturation physics with FPD.
5. Proposed and introduced very forward neutron local polarimeter at PHENIX after group discovered neutron asymmetry in IP12 (with RBRC and others), provides measurement of vertical and radial polarization in collision, degree of longitudinal polarization.
6. Cross sections demonstrating applicability of pQCD for production of π^0 at mid-rapidity (PHENIX), forward (STAR), and production of direct photons at mid-rapidity (PHENIX).
7. Led A_{LL} measurements for π^0 , PHENIX.
8. Participated in A_{LL} measurements for jets, STAR.
9. Accepted proposals for muon trigger upgrade (PHENIX, NSF) and Forward Meson Spectrometer (STAR, DOE).

2008 DOE Milestone on gluon polarization: 1,2,3,5,6,7,8,9

2013 DOE Milestone on q, qbar polarization: 1,2,3,5,9

Developing World Focus on Transverse Spin: 1,2,3,4,5,6

Budget Adequacy, Issues, Justification

The present (FY 2006) level of support for the RHIC Spin Group is inadequate. The goal of the group is to develop and support the RHIC spin program through developing strong spin groups based at BNL for STAR and PHENIX, and through developing common required tools such as polarimetry. The original group outline, given to the Simons panel on Medium Energy in 2000, recommended 2 staff members in each area, 6 total. The panel and DOE instead recommended that strong groups be formed, rather than providing a skeleton representation for spin physics at BNL. The agreed upon group size was targeted at 4-5 in STAR and in PHENIX, with 2 in polarimetry, about 11 total.

On this basis, G. Bunce transferred from the AGS Department to Physics to lead and develop the new group. Also on this basis, L. Bland resigned his position as a tenured professor at Indiana to join the new group, to develop the new STAR spin group at BNL. (It was decided to have a single Medium Energy spin group, rather than separate groups for STAR and PHENIX.) The present group sizes are STAR—2, PHENIX—2, polarimetry—1.5. Note that we have had very adequate support for equipment through Medium Energy (polarimetry), through DOE Heavy Ion (STAR—BB, FPD, FPD++, FMS) (PHENIX—neutron local polarimeter, EMCal/RICH trigger, Global Level 1 Trigger for spin, and through NSF (PHENIX forward muon trigger).

The physics plan with the present group size is not sustainable, for the STAR forward physics initiative for helicity structure, for transverse spin, and for saturation physics; and for polarimetry. For PHENIX, RBRC and RIKEN have a large group of young scientists based at BNL on spin; however, we recommend one additional staff scientist to provide experienced leadership.

The FPD++ for STAR was built for the 2006 RHIC run using a large number of physics undergrads (N from Stony Brook, M from Texas A&M?, N from Penn State) with only local leadership from Bland and Ogawa. A planned additional staff member for this group, to replace Bernd Surrow (now MIT), was dropped due to the FY 2005 budget shortfall, after advertising and selecting Gunar Schnell of the HERMES experiment, an expert and leader on their important transverse spin work.

The RHIC polarimeters are now widely used for polarization and luminosity development, in addition to measurements every 1-2 hours during each store for the experiments. The experiments are now beginning to make precision measurements of physics asymmetries. In 2005, 1000 polarization measurements were made, with a full time staff on the polarimetry of 2. This has been inadequate and unsustainable. (We note that the SLAC SLD polarimetry was staffed with 10 Ph.D. scientist FTEs each year, for a polarimetry system no more exotic than RHIC's.)

We propose to add 2 physicists to STAR in 2006-7 (1 staff, 1 post-doc), 1 physicist to polarimetry in 2006-7 (post-doc), 1 physicist to PHENIX in 2008 (staff), 1 physicist to STAR in 2008 (post-doc). The proposed groups are then:

- > STAR—3 staff, 2 post-docs
- > PHENIX—3 staff
- > Polarimetry—1.5 staff, 1 post-doc

Total scientist FTEs: 10.5 (in 2008) (now 5.5)

We believe that the proposed, and planned, group size for STAR, with additional groups within STAR that have joined the spin effort, will support the ambitious and exciting program discussed in the RHIC Spin Plan. We believe that the proposed number of experienced physicists for PHENIX, with the RBRC and RIKEN young scientists, will sustain and drive the spin program.

We have initiated an effort in polarimetry to move operations to CAD, and to focus on developing and leading a sustainable analysis team from our group, STAR, and PHENIX. It is crucial that this group be led by a strong and experienced spin physicist (as it is by A. Bravar), and that it be based in the BNL Physics Department. With the additional post-doc for our group, and 2 rotating members of the polarimeter analysis group each from PHENIX and STAR, the total analysis FTEs will be about 6 to 7 during runs. Our goal, already in progress, is to perform the polarimeter offline analysis in real time, and then to normalize with the jet soon after the run is completed.