SBS Newsletter #1

March 12th, 2010

Letter from the Editor

This is the first SBS newsletter. The idea is to have an additional forum for sharing information on the SBS detectors and proposals. The SBS CDR is the main repository for information on the SBS detectors. Collaborators are encouraged to keep the SBS CDR updated with the latest information. For this newsletter, John Annand has written a report on preliminary ideas for a neutron polarimeter to measure neutron G_E/G_M. In addition, reports on PAC35, the recent SBS Technical Review, SBS magnet status and the SBS Front Tracker are given.

The upcoming SBS meeting is on March 19 2010. Ole Hansen is giving a SBS overview talk at MENU2010. For the Exclusive 2010 Workshop at JLab, we would like to organize a series of presentations on experiments using the SBS. If you are willing to make a presentation, please let everyone know at the weekly Wed. SBS meetings.

Upcoming Conferences:

- Exclusive Reactions at High Momentum Transfers IV, May 18-21, 2010, Newport News, VA, US . Early registration deadline April 15th.
- 12th International Conference on Meson-Nucleon Physics and the Structure of the Nucleon (MENU2010), May 31-June 4, 2010, Williamsburg, VA, US. Deadline Mar 5th
- International Nuclear Physics Conference 2010 (INPC2010), Vancouver, Canada 7/4/10- 7/9/10. Abstract deadline March 15.
- Gordon Conference on Photonuclear Reactions, August 1-6, 2010, Tilton, NH, US .

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Report on PAC35 (M. Jones)

PAC35 was held Jan 25-29th 2010 . You can see the PAC report for details. Here, I present a summary. In addition to the usual review of submitted 12 GeV proposals, the PAC assigned a grade and allocated time to approved experiments in the "transverse structure of the hadrons" category (basically elastic and transition form factor measurements). There were a total of 8 experiments in this category with 3 SBS experiments. The grades and allocated times for the SBS experiments are given in the table below.

Exp #	Title	Requested PAC days	Grade	Allocated PAC days
12-07-109	Large Acceptance Proton Form Factor Ratio Measurements at 13 and 15 $(GeV/c)^2$ Using Recoil Polarization Method	60	A^-	45
12-09-016	Measurement of the Neutron Electromagnetic For Factor Ratio G_{En}/G_{Mn} at High Q^2	58	A^-	50
12-09-019	Precision Measurement of the Neutron Magnetic Form Factor up to Q2 = 18 (GeV/c)2 by the Ratio Method	48	B^+	25

The PAC recommended that E12-07-109 (proton G_E/G_M) shift the highest Q^2 point from 14.5 to 12 GeV^2 and reduced the allocated time to 45 days. Similarly, the PAC recommended that E12-09-016 (neutron G_E/G_M) shift the highest Q^2 point from 10.2 to 8 GeV^2 and reduced the allocated time to 50 days. For E12-09-019 (neutron G_M), the PAC deferred the $Q^2 = 16$ and 18 $(GeV/c)^2$ part of the experiment (which was presented as a regular PAC proposal 10-005) and allocated 25 days for the low Q^2 measurements. With the change in the proposal to use the hadron calorimeter, the time requested was reduced from 32.5 to 25 days for the lower Q^2 points.

Neutron Polarimetry for 11-GeV Hall-A Experiments

John R.M. Annand, University of Glasgow, Scotland UK.

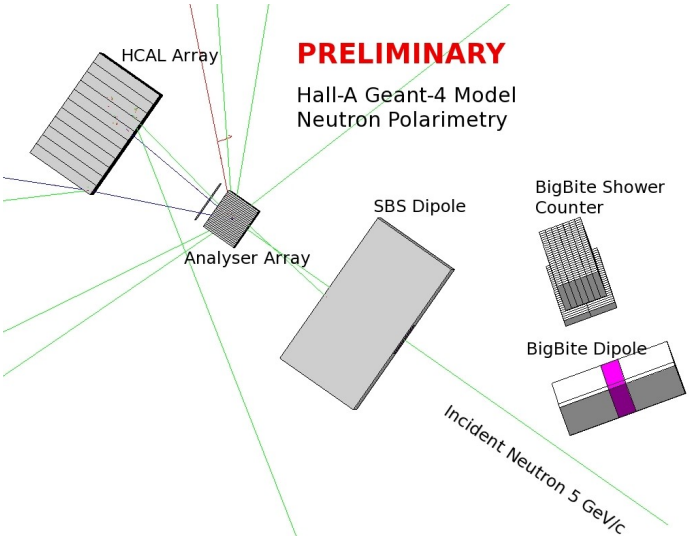

Fig. 1 : *Preliminary layout of the neutron polarimeter showing tracks from a single neutron interaction in the analyser array and HCAL calorimeter.*

The determination of nucleon elastic form factors at high Q^2, by measurement of double polarization observables, is one of the central pillars of the SBS physics programme. With a longitudinally polarized electron beam the ratio of neutron electric to magnetic form factors G_{En}/G_{Mn} may be accessed, either using a polarized ^{3}He target, or by employing recoil neutron polarimetry (with an unpolarized ^{2}H target) . Given the uncertainties inherent in having to use quasi-free *(e,e'n)* for neutrons, it is highly desirable to have both experimental methods, which have different systematic distortions.

Neutron polarimetry to obtain G_{En}/G_{Mn} , which exploits the spin-orbit dependence of nucleon-nucleus scattering, has been performed successfully at Mainz and Hall-C. However, extension to Q^2 values of several $(GeV/c)^2$ implies neutron momenta in the several GeV/c range, where the analysing powers of quasi-elastic reactions are poorly known. Although G_{En}/G_{Mn} may be obtained without an absolute knowledge of a polarimeter's effective analysing power, it is vital to know that this quantity is sufficiently large that sufficient precision in azimuthal scattering asymmetry can be reached in reasonable time. Even before any major effort is made to extend our knowledge of effective analysing powers at high momenta, it is extremely important to understand how polarimeter geometry and multiple scattering effects will affect this.

A Geant-4 based model of the neutron polarimeter is being developed (see Fig. 1). The preliminary layout has an analyser comprised of 1536 25x25x250 mm^3 plastic-scintillator bars, with HCAL (11x22 of 150x150x1000 mm^3 Fe-plastic modules) as the azimuthal asymmetry detector. The SBS dipole sweeps low momentum charged background and provides neutron spin precession. As in the polarized ^{3}He target G_{En}/G_{Mn} measurement, BigBite would detect scattered electrons. Polarized nucleon scattering is not part of the standard Geant-4 tool kit and its inclusion is based on previous work (D. Glazier, Ph.D. Thesis, University of Glasgow, 2004; http://www.nuclear.gla.ac.uk/npe-theses) performed at Mainz. Development of the model is now sufficiently far advanced that realistic estimates of reconstructed azimuthal distributions in HCAL can proceed.

Report on the SBS technical review

The SuperBigBite project in Hall A has been reviewed on Jan 22, 2010 and a report delivered. The talks are available. Below is an extract from the report.

"The Technical Review Committee is impressed by the broad scope of the physics program and the anticipated performance of the spectrometer.

The SBS project is aiming at the combination of large solid angle coverage at forward angles with the highest luminosity achievable with the upgraded 12 GeV CEBAF. The SBS consists of a transverse field dipole magnet equipped with high-rate GEM tracking detectors. Calorimeters and Cerenkov counters will be used for triggering and particle identification.

The initial experimental program consists of three nucleon form factor experiments that have been approved by the JLab PAC. It is obvious to the Committee that the SBS will become the instrument of choice for a large variety of other important physics problems requiring small-angle coverage, high luminosity, and modest resolution.

The Committee finds that the SBS experimental design has a very high probability of meeting the experimental requirements. The high rate and high resolution capability of the GEM detectors make them the ideal solution for this application. The SBS Collaboration has the required expertise to carry out the project within the time schedule presented.

Remaining uncertainties in background rates and electronics performance can be reduced by performing experimental tests under similar conditions. This should be done as soon as possible since the results could lead to modifications of the segmentation scheme and the readout rates which need to be known before the start of mass production."

Update on SBS Magnet (by John LeRose)

The detailed work needed for the transfer of the magnet(s) from Brookhaven to JLab has begun. We have sent inquiries for detailed information to Phil Pile at BNL regarding the magnet (s) and any possible attendant hardware like power supplies and such. The age and status of any such power supplies and our potential ability to get replacement parts if necessary being a large part of what we're interested in. Once we get more information, Paul Brindza and I will likely take a trip up to Brookhaven to inspect the equipment and talk with people who have worked with it. After the inspection, assuming there is money available for it, we'll initiate the property transfer.

Status of the SBS Front Tracker Project

Date: 09 March 2010
Author: E. Cisbani

First full size 40x50 cm^2 module prototype

(Rome: 1 physicist + 2 techs, CT: 1 mechanical engineer, + CERN support)

1. GEM foils: design completed, CERN production under scheduling
2. Mechanical Frame: design completed, order completed, detailed drawings for production under final revision
3. Support Frame: design in progress

Electronics

(GE – 1 electronics engineer + 1 tech)

1. Front end card: 5 prototypes with APV25 under test lab test
2. VME64 ADC/Controller: design completed, 2 prototypes in production

Ancillary components

(BA: 1 physicist + 1 tech)

1. HV system: candidate modules identified; 2 samples ordered
2. LV system: none done yet
3. Gas System: work in progress

Infrastructure

(Rome: 1 tech, CT: 1 physicist + 1 tech)

1. Clean room: 2 available (1 dedicated to production)
2. Foil stretcher: in production
3. Assembling procedure: first draft version

Montecarlo

(Rome: 2 physicist, CT: 1 PostDoc)

1. Simulation: working GEANT4 based code under revision/improvement
2. Digitization: overall design defined, implementation underway (interface to simulation and reconstruction basically defined)
3. Reconstruction: very preliminary Chi^2 based root code available

Prototype tests

(Rome: 2 physicist + 2 techs, 1 PhD, CT: 1 physicist, LE: 1 physicist)

1. Test beam: first beam test done, analysis underway
2. PREX experiment: installation of 2 10x10 cm^2 chamber prototypes with Gassiplex electronics.

BA=Bari
CT=Catania
LE=Lecce
GE=Genoa