To: HYSPEC, Helen.Kerch@science.doe.gov,kristin.bennett@science.doe.gov, naglerse@ornl.gov, fernandezbja@ornl.gov ,zarestkyjl@ornl.gov,winnbl@ornl.gov,pricedl@ornl.gov,andersonian@ornl.gov,crawfordrk@ornl.gov,hainesjr@ornl.gov,granrothge@ornl.gov,herwigkw@ornl.gov,leewt@ornl.gov,santodonatol@ornl.gov,iversoneb@ornl.gov,riedelra@ornl.gov,cooperrg@ornl.gov, williamsdm@ornl.gov,HERRMAN@alan.ameslab.gov,harper@ameslab.gov
From: "Stephen M. Shapiro" <shapiro@bnl.gov>
Subject: HYSPEC IDT meeting
Cc:
Bcc:

Folks,

Attached is a report of the HYSPEC IDT meeting held last month, with a link to tall the presentations. We thank everyone for attending and providing their input to important design concerns of HYSPEC.

Steve

ATTACHMENT:

Report HYSPEC of IDT Meeting - September 10, 2004:

The HYSPEC IDT meeting was held on September 10, 2004 at the central lab and office (CLO) building at the SNS site and attended by approximately 40 people including IDT members, SNS staff, a DOE representative, and members of the Neutron Group at HFIR. The Agenda is attached.

Below is a brief summary of the presentations. More details can be found by referring to the Power Point presentations available on the HYSPEC home page under Publications and Technical Reports: http://neutrons.phy.bnl.gov/CNS/hyspec/index.htm

The meeting opened with a welcome by Steve Shapiro, co-PI of HYSPEC. He presented a rationale and history of the HYSPEC. He demonstrated that HYSPEC satisfies the recommendation of the SNS Inelastic Scattering Workshop of 1999 by providing an instrument with high flux on a small sample with low background, capable of measuring inelastic scattering in three-dimensional Q space. Importantly it will be the only instrument capable of fully polarized beam studies at the SNS.

Kent Crawford then gave a overview of the status of the SNS construction and the progress on the instrumentation.

John Haines is the project manager of SING (Scattering Instruments – New Generation), which is one construction project for 5 instruments:

- SEQUOIA (high resolution inelastic instrument for energy range 10-1000 meV)
- SCD (Single crystal diffractometer)
- SNAP (Diffraction studies under high pressure)

• NOMAD (Diffuse scattering instrument)
• HYSPEC

He discussed the funding profile and schedule for the five instruments.

Mark Hagen, the Instrument Scientist for HYSPEC, discussed the beam layout and the various components of HYSPEC. He presented the various options for the placement of HYSPEC, either inside the experimental hall or outside in an added building. He also presented a preliminary cost estimate of the two options.

Next, Vinita Ghosh presented Monte Carlo calculations on the shielding and performance of the instrument for the various configurations. These calculations are used for the design of the instrument. It is necessary to adhere to the radiation levels set by the SNS project and to have a low background count rate at the detector. She showed that for a curved long guide which placed HYSPEC in an external building the minimum radiation levels and low background rates can easily be achieved.

Bill Leonhardt, the SNS engineer, presented drawing showing the various configurations of the instrument inside the building and in an external building with a 4.5 and 6.0 m sample-to-detector distance.

Igor Zaliznyak, co-PI of HYSPEC, then presented a discussion of the polarization capabilities of HYSPEC. A Heusler crystal will be used to produce a polarized neutron beam and a series of supermirror benders will be used to analyze the scattered beam. The performance of HYSPEC in the polarized beam mode was discussed and it was shown that both the spin 'up' and spin 'down' polarizations can be measured at the same time.

The next two talks by members of the SNS Experimental Facilities Division were about general policies at the SNS, applicable to all instruments.

Hal Lee described the effort of SNS to put restrictions of stray magnetic fields at the outset in order that future interference of different instruments will be minimized. A field limit of x mG at xm from the sample area is proposed.

Lou Sontodonato then described the SNS plan for providing ancillary equipment for all the IDT's.

Following the lunch there was an open discussion led by Shapiro. He requested that the IDT provide feedback as to the location of the instrument based upon performance calculations discussed in the morning's talks. The options are:

1) Inside the experimental hall with 4.5 m sample-to-detector distance
2) Outside the experimental hall with 4.5 m sample-to-detector distance
3) Outside the experimental hall with 6.0 m sample-to-detector distance

Placing the instrument in an added building outside of the experimental hall will

increase the cost essentially by the extra cost of the building. Kent Crawford stated that the funding for SING is adequate to cover the cost of the instrument as well as the cost of the external building. He stated that HYSPEC is important to the overall SNS instrument suite and they will ensure that the instrument will be built. Bruce Gaulin believed that being outside the building would reduce the field restrictions and be a distinct advantage. However, it was suggested that with a future 20T magnet there will still be interference with instruments inside the hall. Since moving the instrument further from the source will reduce the flux on the sample, it was suggested that the flux on sample could be increased by using tapered guides. However calculations show that this will also increase the background. Shapiro asked for a vote on the IDT's preference for inside or outside of the experimental hall. It was a unanimous vote in favor of placing the instrument outside the hall into a separate building.

Some of the loss of flux due to the larger distance can be regained by increasing the burst width. The degradation of the resolution can be compensated for by having a longer sample-to-detector distance. A discussion of the 4.5 or 6 m options was held. The 6 m option will add to the cost due to the enlarged dimensions of the detector tank and the additional and larger counters needed to cover the same solid angles in horizontal and vertical directions. The costs presented earlier were for the 4.5m option. The increase in costs and the engineering feasibility for the 6 m detector options are being studied. Igor noted that the longer counters (160cm vs 120 cm) will be more expensive and they will not be compatible with the 120 cm detectors planned for SEQUOIA. This reduces the standardization of the instrument components.

It was pointed out that the neutron attenuation in the proposed Ar-gas filled counter would be higher for the larger detector distance. This induced discussion about using either He or vacuum inside the detector bank. A problem with He filled chamber is the high voltage for the He3 counters breaks down at a lower voltage in He than Ar. It was suggested the counters could be placed in a separate Ar filled chamber if He is used. It was also suggested that the detector vessel be evacuated. This raises problems with the size and thickness of the windows. The HYSPEC design team will study the various options.

The type of choppers was discussed next. It was suggested that instead of the double disc monochromating chopper, a Fermi chopper be used to monochromate the beam. It was thought that several slit packages would be needed to cover the desired energy range, but Ray Osborn pointed out that HET at the IPNS uses one slit package to cover a large energy range. An advantage of the Fermi chopper is that it has the same $\Delta E/E$ for a large energy range. The HYSPEC design team will compare the perfomance of a Fermi chopper with the disc chopper system.

A discussion of the software development ensued. For unpolarized neutrons, the software should essentially be the same as for ARCS and SEQUOIA, but HYSPEC will need specialized software for the polarized beam option.

A suggestion was made to use a He3 polarizer instead of the Heusler crystals. He3 is very sensitive to magnetic fields and still in a state of development. At ILL they have a He3 polarizing 'station' were cells are filled and then placed on the instrument. The SNS would have to develop such a facility. HYSPEC will be designed to accommodate He3 polarizers, but the current plan is to use Heusler monochromator and supermirror analyzer, since they are based upon established technology.

The question was raised whether the construction timeline for HYPSEC can be accelerated. Kent stated that this was dependent upon the funding profile for the SING instruments. If the engineering progresses significantly compared to some other SING instruments it would be possible to readjust the annual funding allocations to devote more resources to HYSPEC. A fixed boundary condition is that the total cost of the SING instruments cannot exceed the budgeted amount. Any change will require a SNS management review

Shapiro closed the meeting by thanking everyone for attending and noting that the IDT members made a strong scientific case for the HYSPEC instrument. In upcoming reviews we will most likely have to make the scientific case again and he asks the IDT members to be prepared to provide new and exciting scientific ideas.

HYSPEC I.D.T. Meeting Friday September 10th 2004

AGENDA

8:30am - Arrival/badging for those who need to be badged

8:50am - Welcome (S. Shapiro)
9:00am - Current status of the SNS/Instrument Systems (I. Anderson/ K. Crawford)
9:15am - The SING Project and HYSPEC (J. Haines)
9:30am - The Description of HYSPEC (S. Shapiro)
9:45am - The HYSPEC Instrument – current design (M. Hagen/ V. Ghosh/ W.J. Leonhardt)
- Beamline layout
- Choppers, focusing crystals, shielding
- Performance calculations

10:30am - Coffee break

10:45am - The HYSPEC instrument continued (M. Hagen/ V. Ghosh/ W.J. Leonhardt)
- Detector vessel
- Detectors
- Collimation

11:15am - Polarized neutron scattering with HYSPEC (I. Zaliznyak)
12:00pm - Using magnetic fields at the SNS (W.T. Lee)
12:15pm - Sample environment equipment at the SNS (L. Santodonato)

12:30pm - Lunch

1:30pm - IDT Feedback/Discussion (Chaired by M. Hagen)
- What does the IDT want/need out of HYSPEC/SNS
- What areas of science does the IDT see as fit for exploitation by HYSPEC
- Other issues the IDT wants to discuss or give feedback on

2:45pm - Wrap-up (S. Shapiro/ I. Zaliznyak/ I. Anderson/ K. Crawford)

3:15pm - Tea break

3:30pm - Tour of SNS target building

4:30pm - Depart for airport