HYSPEC NEWS 07.1

Folks,

A lot of progress has been made since our last newsletter, which we describe below.

POLARIZED INELASTIC NEUTRON SCATTERING (PINS) WORKSHOP AND IDT MEETING (April 2006)

Following the suggestion of the Lehman review committee meeting in September, 2005, a PINS workshop was held at Brookhaven on April 6-7, 2006 to discuss the latest developments in polarized beams for inelastic neutron scattering. About 30 worldwide experts in polarized neutron scattering attended the workshop. Presentations covered some of the current science using polarized neutrons along with the latest developments in producing and analyzing polarized neutron beams. Latest advances in improving the performance of polarizing supermirrors and transmission ^{3}He polarization analyzers and of the Heusler crystals for producing polarized neutrons were discussed. Overall, the workshop was timely and very successful. It gave an opportunity for, both, the interaction with experts in the field of polarized neutron scattering from around the world, and the HYSPEC IDT with up-to-date information on the status, recent progress, and near-term perspectives of different technologies for neutron beam polarization and polarization analysis. All of the presentations are posted on the HYSPEC website: http://neutrons.phy.bnl.gov/HYSPEC/PINS_IDT_2006.shtm

IDT MEETING

Following the PINS workshop, an IDT meeting was held on April 7, 2006. Since the baseline for HYSPEC included magnetic supermirrors for analyzing the polarization of the scattered neutron beam, there was considerable discussion over the relative merits of supermirrors and polarized ^{3}He technology. Scientists from the Paul Scherrer Institute (PSI) attending the PINS workshop expressed strong interest in joining the HYSPEC IDT. In exchange, they proposed to build the supermirror assembly at no cost to the HYSPEC instrument, naturally bringing in the PSI's strong expertise in the field of supermirror neutron optics. This would allow for HYSPEC to include a ^{3}He system as part of the baseline budget. Thus, HYSPEC could have a supermirror assembly for polarization analysis in the low energy regime (E_f< 20meV) and a ^{3}He polarization filter for the higher energies (<20 E_f<90 meV). In exchange, PSI would be granted a percentage of the IDT beam time in proportion to the ratio of the cost of the supermirrors to the total cost of the instrument. Presently, this is estimated to be 8% of the IDT beam time. In addition, PSI will have a member on the Executive Committee of the HYSPEC IDT. The IDT members present at the meeting agreed with this proposal. It was later agreed that Peter Allenspach would represent PSI on the IDT and the Executive Committee. These changes will be formalized in the Memorandum of Understanding (MOU) between PSI and the IDT, which is currently being prepared.

Another issue raised at the IDT meeting was the contribution to the background from scattering by the argon gas in the detector vessel. It was agreed upon that simulations would be done to estimate the background/contamination levels (see below).

HYSPEC PRIMARY BEAMLINE DESIGN REVIEW

On July 25, 2006, there was a primary beamline design review to evaluate if the HYSPEC designs meets and satisfies the SNS engineering criteria and to identify any issues with the design that need to be addressed before procurement. The panel consisted of staff members of SNS and HFIR along with HYSPEC's co-PI, Igor Zaliznyak, of BNL. This review focused on the design of the guides, the choppers and the shutter inserts. While no major issues were discovered, the panel came up with a number of suggestions for small modifications optimizing the primary guide design to improve its performance. Wherever possible, these suggestions were implemented in the design of the primary beamline, which the panel approved.

DOE-LEHMAN REVIEW OF SING-I AND HYSPEC.

On Aug. 15 -16, 2006 an important Lehman review of HYSPEC and the other SING-I instruments was held at the SNS. The panel reviewed the technical cost, schedule, management, environment, safety and health issues of HYSPEC, as well as determining the readiness to commence hardware procurement for HYSPEC. In DOE parlance this is called Critical Decision-3 (CD-3). HYSPEC's instrument scientist, Mark Hagen, presented an overview of HYSPEC and then there were more one-on-one discussions with a subcommittee and Mark, Bill Leonhardt, HYSPEC's principal engineer, and co-PI Igor. The panel recommended an accelerated schedule, which would make the instrument available to the user community 15 months ahead of the current schedule. This means completion in FY2009, rather than in FY2011. The panel was concerned about the cost and contingency of the external building, which is being addressed by SNS. The panel also recommended immediate procurement of the T0 chopper since this produced substantial cost savings by coordinating the purchase with ARCS and SEQUOIA. As a result of this review, Pat Dehmer granted CD3 to HYSPEC at the end of August and construction and procurement have now started.

ARGON SCATTERING IN THE DETECTOR VESSEL

At the IDT meeting in April there was concern about the scattered beam contamination and the background generated by the argon in the detector vessel. The concern was that Bragg scattered neutrons from the sample will also be scattered by the argon and generate a time dependent background/contamination over the entire detector array. Vinita and Larry performed MCNPX simulations of the argon filled detector bank to estimate the contribution from Ar scattering to background and the complete report is available on the HYSPEC web page (http://neutrons.phy.bnl.gov/HYSPEC/index.shtm) under Publications and Technical Reports. The time-integrated flux due to the argon scattering in the non-Bragg peak detector cells is a few times 10^{-5} of the flux in the Bragg peak. It decreases to ~10^{-6} with increasing distance from the Bragg peak detector. Whether this is a significant contamination to the inelastic scattering will depend upon the particular experiment.

DESIGN AND CONSTRUCTION

HYSPEC Design and Construction Status

HYSPEC's design and construction activities have progressed well since our last newsletter. Our schedule is very much funding driven, therefore our focus is to complete individual design tasks as soon as possible so that we have drawings and specifications ready for procurement as funding arrives. Because of the potential for increased personnel radiation exposure when SNS is operating, early funding was available for the three beamline elements inside the SNS target's biological shield. These elements are the core vessel insert (CVI), shutter insert and the bulk shield insert (BSI). Last year we installed the CVI and, this past September, we installed the BSI. Some pictures of the BSI follow. Additional pictures of the construction are found on the HYSPEC web page: http://neutrons.phy.bnl.gov/HYSPEC/construction_photos.shtm

The shutter insert is yet to be installed. The design for this element is complete, however procurement has been postponed since its alignment is done off-line with little personnel exposure. It contains neutron guides, which will be procured as a bulk package with other guides at a later time.

During this past year, we completed the design of the HYSPEC primary beamline. This portion of the instrument transports neutrons from the moderator to the drum shield containing the focusing crystals. The elements for the primary beamline include the CVI, shutter insert, BSI, T0 chopper, T1a (Frame overlap) & T1b (order suppressor) disk choppers, Fermi chopper, beam monitors, secondary shutter, all beamguide elements, chopper vacuum boxes and the beamguide vacuum system. Design drawings for these elements have been generated and specifications prepared. These were presented at the primary beamline review held in July, 2006. The review action items have been addressed and these elements await procurement in early 2007.

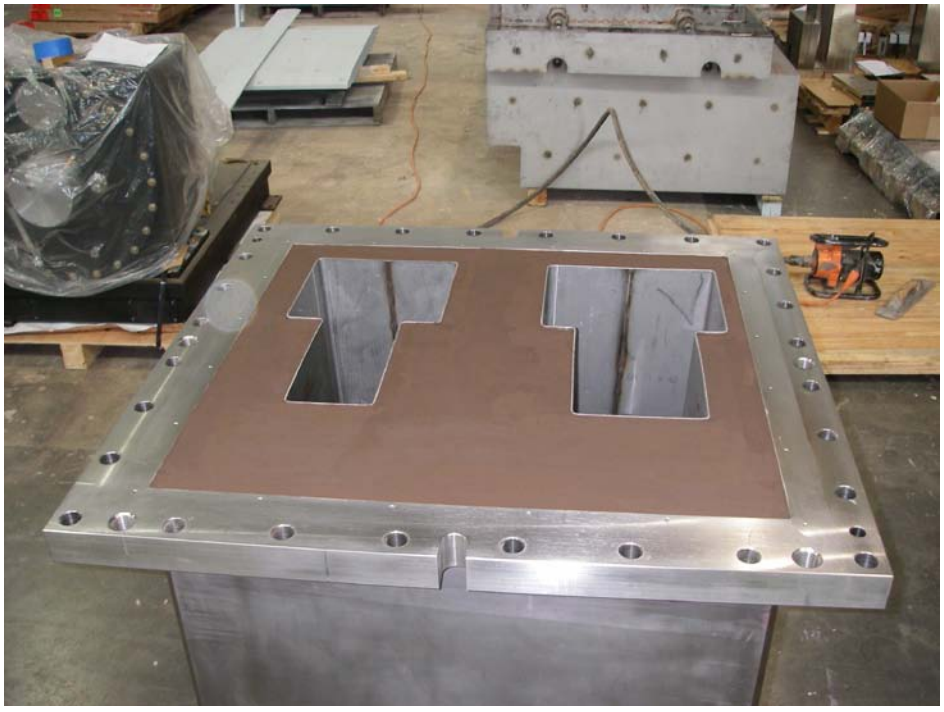
In December 2005, the MCNPX simulations for the HYSPEC primary and secondary beam line shielding were reviewed and approved by SNS neutronics personnel. The HYSPEC primary shielding is divided into three sections: 6-15m (distance from the moderator), 15-33m and external building shielding. Each of these sections has a poured-in-place (PIP) base and then stacked shielding on top. Currently, the designs for the 6-15m and external building shielding are virtually complete and the PIP portion of the 6-15m shielding is scheduled to be installed in December 2006.

Lastly, we are currently writing up the requirements document for the HYSPEC external building. We expect to procure the actual building design through an A/E firm beginning in the first half of 2007.

FUTURE PLANS:

Plans for FY07 will include an Executive Committee meeting, an IDT meeting and possibly a workshop on ^{3}He transmission polarizers. In closing, HYSPEC is now under construction with commissioning envisaged to begin 2009. It promises to be one of the most unique instruments at the SNS. Keep checking the web site for latest developments: http://neutrons.phy.bnl.gov/HYSPEC/index.shtm

Bulk Shield Insert – At machine shop



Bulk Shield Insert – Filled with high density concrete

Bulk Shield Insert- Upstream end showing windows

Bulk Shield Insert being installed

Bulk Shield Insert in place in HYSPEC (14) Beamline