Minutes of April 20, 2004 MACS Monochromator Cask Meeting

Location: NIST Center for Neutron Research big conference room.
Time: April 20, 2004 1:30 pm to 4:40 pm
Participants: George Baltic, Paul Brand, Collin Broholm, Mark English, Peter Hundertmark, Jim LaRock, Nick Maliszewskyj, Jim Moyer, Joe Orndorff, Don Pierce, Timothy Pike, Gregg Scharfstein, Stephen Smee.
PPT: http://www.pha.jhu.edu/~broholm/MACS/documents/Presentation_20april2004.ppt
Minutes: prepared by Collin Broholm

Introduction (Collin Broholm):
Collin welcomed participants stating two main goals of the meeting: (1) Ensure that the cask subsystem will fit and function with the rest of the instrument and that it will be maintainable by the NCNR. (2) Expose the designs to a broader group of individuals so best technical solutions are implemented.

Overview of Cask Slide 1 (Stephen Smee):
Stephen Smee stated that the cask design is now relatively mature. The IDG is making detailed drawings and procurements are underway. Input and ideas are wanted. Stephen pointed out the major parts of the cask and then introduced Gregg Scharfstein to describe the monochromator translation stage (DTS).

Monochromator Translation Stage (DTS) Slides 2-22 (Gregg Scharfstein):
DTS is the main body in the cask. He showed that the design choices will satisfy top level specifications.

Collin requested a determination of the time needed for a small (10-100 mm) translation of the monochromator considering acceleration and deceleration. Gregg will report back on this.

Cable Management Slides 8-13:
Cables from the VBA are brought to the common bulkhead in a groove along the sample side of the DTS. Cable management for the DFM is more complex as it translates and rotates. Two Aluminum Gortrac's are used for the top and bottom cable bundles.

Peter Hundertmark suggested a central post on top of the monochromator to help guide the top cables from their attachment point on the DFM to the top Gortrac. Gregg mentioned that cable management is something that will be extensively tested and that is difficult to understand all that is needed in advance.

Jim LaRock requested clear marking on top of the DFM to indicate the correct placement of cables for installation/re-installation of the DFM.

Peter Hundertmark suggested rolling over the edge of the rotary cable guide on the bottom of the monochromator to prevent cable abrasion. Gregg will do this and he will

test cable management system and inspect nylon and capton insulation for signs of stress after running it many times.

Gregg mentioned that motor power and telemetry cables are kept separate when possible to reduce noise trouble. Some problems were found and corrected during tests.

Gregg mentioned that the bulk head connector has still to be designed. It is likely that there will be a top and a bottom connector though that has still to be determined. When it is the details will be passed on to Don Pierce so appropriate cable chases can be installed at the receiving end.

Peter noted that it will be necessary to restrain VBA cables in the groove along the side of the DTS. Gregg has plans to do this.

Alignment and Removal Slides 14-21:
All instruments in the cask must be removed before the DTS can be lifted out. The alignment pads remain in place so that the DTS can be reinstalled without a need for realignment.

Gregg showed the attachment long attachment rods that can be attached from above without hands needing to enter the cask. This is consistent with specifications. A spreader is attached to the rods, which is then attached with slings to the crane hook.

Peter noted that there is a possibility of landing the DTS on the way out to attach shorter rods and thus gain more crane clearance.

There was discussion of the fact that the Center of Gravity can shift as the location of the DFM trolley moves along the track. Gregg explained that there is a standard location for this but also noted that if there is a need to remove the DTS then it might be that there is trouble with the translation system so that the correct location cannot be guaranteed. The shift of the CG is however not large and there is provision for shifting the crane points so compensate for this.

Paul Brand mentioned the possibility of attaching compensating weights to maintain a nominal CG.

Jim LaRock mentioned that he has a design for solving this type of problem for a high field magnet system that has a variable CG due to varying amounts of cryogenic fluids. He will share the details of his design with Gregg off line.

Gregg mentioned that the location of the stanchion attachment threads in the DTS were chosen to be readily accessible from above. Peter noted that it would be prudent to make numerous threads in the DTS so several options are available for attaching the stanchion rods.

George Baltic mentioned that the bridge of the crane in C-100 can interfere with large items preventing lift to the full crane height. However, he did not think that this would be a significant problem for the DTS removal. However, this tricky aspect of crane clearance should be kept in mind.

It was decided that Gregg, J. LaRock, Don, and George should get together to decide what would be the best way to lift out the DTS and deal with the potentially variable Center of Gravity.

Miscellaneous Slides 2-22:
Tim, Paul Brand, and others noted that Boron loaded poly-ethylene shielding should be fully encased. This is to avoid disintegration under irradiation of the highly abrasive material which in turn could damage moving parts.

Several in the audience noted that the top of the monochromator should be marked with instructions of how to remove it. In particular the blind mate connector as presently designed must be detached before the monochromator can be hoisted out. Gregg will continue to look into options for making this a failsafe process.

Gregg noted and it was agreed that extra pinions for the DTS motor should be fabricated so that upon exchange the whole motor including pinion can be disposed of as these parts will become highly activated.

Peter and others noted that the DTS motor is rather close to beam height. Gregg noted that it is below the beam exclusion zone so that the design does satisfy specifications. Paul Brand and Steve Smee noted that there are many other such motors in the DFM though they are not visible. It was decided that the present motor position will be ok though it would be desirable to lower the motor a little if another appropriate gear can be identified.

Variable Beam Aperture Randy Hammond (Slides 23-36):
Randy went over the VBA design. A recent change is that the structural parts of the VBA will be made from aluminum consistent with the recent ECR regarding materials in the cask.

Randy mentioned that the images in the presentation show the down stream side of the VBA open. It will in fact be closed with a borated aluminum plate. In addition the inside of the VBA will to the greatest extent practical be backfilled with neutron shielding material. (Collin says preferably high boron content and high hydrogen content too). The way to do this has not yet to be determined. It was noted that this is more complex now that polymer based material will have to be encased. some form of inorganic matrix with Boron in it would be acceptable too)

Randy mentioned that the pedestal that attaches the VBA to the DTS is currently planned to be made from aluminum. Collin notes post factum that it would be desirable that this base piece is a neutron shielding element with the full width and depth of the VBA. The

shape of it could simply be an extension of the main frame of the VBA all the way to the DTS. The preferred material would be encased Boron loaded HDPE or some other form of Boron rich material. The external shape of the VBA is then a rectangle with just the cut out for the DTS telemetry at the bottom. The advantage is to further block upstream neutrons.

Randy described nylon brushes to retain grease for the various bearings. Several in the audience noted that nylon should be avoided as it will disintegrate over time in the high radiation area. Various lubricant free solutions were mentioned by Paul Brand, Tim and others. It was also noted that this was not a demanding application as speeds are low. Various dry lubricants were suggested as an option to avoid degradation of the lubricant. Randy now has lots of leads to avoid nylon.

Inline Collimator Exchanger (ICX) Stephen Smee (Slides 37-47):
Most of the discussion centered on the design of the pneumatic pistons.

Don welcomed the new approach where the pistons operate off the cask liner top. He asked why the pistons where extended in height with stand off tubes. Stephen answered that this so the attachment point is accessible above the cask and to reduce the dose level for the sensitive parts of the pneumatic system. It was agreed that one could consider reducing the length of the standoff tubes if clearance for removal is a problem.

Don and Tim pointed out that there could be a problem lifting off the top hat shielding that covers the pistons. The lift will have to be twice the height of the pistons above the base of the top hat. Stephen mentioned the possibility of a sandwiched top hat that can be lifted and then removed in parts sideways. For the CFX (Cryo Filter Exchanger) before the sample Tim mentioned that they chose to bend the travel of the pistons to overcome this problem. Collin pointed out that because the collimator are stowed below the beam it may not be necessary to do this for the ICX.

Peter offered to send floor, shielding, and crane drawings to Stephen so he can check whether there is a problem with this or not. Collin notes post factum that real estate is at a premium on top of MACS as this will be the experimental “floor”. Thus it would be desirable to minimize the protrusions above the flat level of the top of the shielding. This is clearly an area where careful system integration is needed. It was agreed that Stephen and Don will work closely together to find the right solution to this.

Tim mentioned that one can “break” the connecting piston with a polyethylene segment to moderate epi-thermal neutrons. Collin will look into whether this complication is actually needed given the additional top hat shielding.

Electrical System Stephen Smee and Joe Orndorff (slides 48-51):
There is agreement that the cask computer will be able to respond to high level commands as well as pass through individual motor move commands. Nick and Joe have worked together on that type of interface in the context of the BT7 monochromator and will continue to do so for the cask system.

There was some discussion about the placement of the electrical control cabinet for the cask. Tim and Peter are creating a to scale model of MACS that will help to decide on real estate allocation for MACS. It appears likely that the cabinet will be at ground level and hence its significant height will not be an issue.

Concluding Remarks:

Collin mentioned that Stephen will participate in Tuesday meetings via telecom for continued discussions on the crucial interface issues surrounding the cask.

It was agreed that there needs to be more frequent exchange of CAD drawings. Peter has mastered translation between the various file and software types that are in use. Stephen, Peter, Tim, and Don will devise a scheme (it was essentially in place) by which Stephen can receive drawings from design work carried out at the NCNR and the NCNR can receive design work from the IDG.

Paul Brand noted that it is important and not always easy to know the non-uniform maturity of the various parts of a design based on CAD drawings. It was agreed that some means of indicating where changes have occurred when new versions are exchanged is important. Collin mentioned the option of releasing parts of the design that are stable in a more simplified form (3D model) so interface verification can occur. Paul Brand asked that Stephen also use the NCNR release process to keep track of progress and alert colleagues of changes that affect the interface. The necessary document templates for this have been posted at http://www.pha.jhu.edu/~broholm/MACS/archive.htm under Management and Project Governance.