6th Summary of Meeting for S1-Global module design, Cryomodule and Cryogenics (20090120)

Date: 2009/01/20
Time: 23:00-00:00 (Japan Time)
Attendant: Jim Kerby, Tom Peterson, Paolo Pierini, Serena Barbanotti, Hitoshi Hayano, Tetsuo Shidara, Hirotaka Nakai, Norihito Ohuchi

Agenda
(1) WPs of the cryogenics (Tom Peterson)
(2) S1-global design: preliminary manufacture comments (Serena Barbanotti)

Discussion
(1) WPs of the cryogenics (Tom)

- RDR cryogenic system effort totaled less than 1 FTE for the duration of the RDR effort.
- Early EDR (now called TDR) work package development (2007) suggested tripling that to 3 FTE's (one from each region) for the duration of the TDR.
- For the past year (2008) we have had less ILC cryogenics effort than during the RDR. Result -- only a few minor updates to the ILC cryomodule heat load estimates and cryoplant size estimates have been done.
- The 2009 budget outlook indicates that we could get back up to about the RDR level 1 FTE (1/2 FTE in U.S. plus KEK effort on cryogenics, plus small effort in Europe from INFN and DESY).
- Heat load work of the cryomodule for Project X overlaps in some points. The data in detail are summarized in the spread sheet.
- Project X effort has begun with respect to tunnel arrangements, string lengths, segmentation, and maintenance scenarios which, although for a smaller system, will be relevant for ILC. Segmentation of the string of cryomodule has been discussed with the FNAL cryogenic people. Segmentation issues for the Project X are very similar to ILC, and the input will be provided for ILC.
- Summary of task for 2009
  - 1.4.1 Heat load (Peterson-FNAL, Ohuchi-KEK, Pierini-INFN, Petersen-DESY)
  - 1.4.2 Cryogenic process design, cryoplant design and surface impact (Klebaner-FNAL, Peterson-FNAL, Arenius-Jlab, Ganni-Jlab, Tavian-CERN) Jefferson Lab (Arenius, Ganni) will provide assistance.
  - 1.4.3 Venting pressure limits, and piping and vessel standards (Peterson-FNAL, Nakai-KEK, Hosoyama-KEK, Petersen-DESY)
  - 1.4.4 Tunnel cryogenic system design and integration with Main Linac Part of Project X cryogenic effort but relevant to ILC

Q: Project X has a different field gradient, and how about evaluation of the dynamic load?
A: Dynamic heat load is scaled for different pulse length, gradient, Q-value. Static heat load is more relevant one as the overlapped point. In the Project X, liquid nitrogen is used for 80K shield, and this point is significant different from ILC.
Q: Estimation of dynamic heat load in RF cable is difficult from the discussion with the cavity people, especially for the different field gradient.
A: The range of dynamic heat load by the RF cable is put in the table. For the design of cryogenic system, it was listed as the uncertainty factor in RDR
C: HOM issued are discussed by the beam dynamic group. We should contact with the group.
A(Tom) : Tom will contact with the beam dynamic people, and he will get the value

of the range from that group. He will report it later.

(2) S1-global design: preliminary manufacture comments (Serena)

・GRP design

The GRP total length is limited below 6 m because of the machine constraint.
Zanon will provide and install the 312-76.3mm welded transition.
The total length of the pipe with the reducer will be 6.8 m, with 0.5 m overlength from the vacuum vessel end flange.

・Thermal shield overlength

The maximum length of Al sheet for thermal shield is 3 meter, and then total shield length is below 6 meter.
Distance between the 4.5 K shield and the vacuum vessel flange is 100 mm.
Distance between the 70 K shield and the vacuum vessel flange is 50 mm.

・Module cross section and WPM

To simplify machining and assembly, INFN suggest rotating the WPM support.
KEK will provide the WPM support, defining its interface with the support plane welded on the GRP.
The WPM sensors will have to be delivered from KEK to Zanon before the final preassembly of the module.

・Vacuum vessel end flange and adaptor

The distance of 100 mm between the flanges is too short for clearance of clamps and bolts.
In order to avoid interference problems, INFN suggested using TTF design for the flange design.

・Longitudinal positions of coupler

KEK needs to analyze and fix the longitudinal position of one coupler port opening on the vessel. After this decision, using the nominal cavity distances the longitudinal positions of the cavity supports can be decided, taking account the warm-cold contraction of the invar rod.
Once the positioning of the coupler openings on the vacuum vessel with respect to the fixed post is defined, all other distances can be calculated.
INFN suggest using the TTF 3+ scheme for the invar rod fixture.

・Decision to be agreed between INFN-KEK-Zanon

GRP design; design concept with shorter pipe and longer reducer
Wall thickness of the pipe reducer
Thermal shield overlengths; INFN proposed values
Piping and module cross section
WPM; support rotation, support interfaces, supplier of the support
Vacuum vessel end flange and adaptor modifications
Coupler opening positions on VV and consequently spacing of cavities, positioning of shapes and invar rod

C: The length of 5.7 meter of the GRP conflicts with the locations of the supports of the gate valves for cavity beam pipes.
C1: Six meter is the maximum length for the machine process in Zanon.
A: In case of 6 meter GRP, it can accommodate the gate valve support, however, the length of 5.7 meter conflicts the locations of the supports.
Q: Which material for the GRP?
A: The material for the GRP is SUS-316-L.
C: The dimension of the adaptor flange will be defined after getting information of claw clamp.
Q: Before the final preassembly of the module, does KEK need to send the signal

cables of WPM and the feed-through?
A: Zanon people suggested that all the cables for WPMs are connected before the final preassembling.
C: Assembling the feed-through on the vacuum vessel is the job at KEK.
Q: In Zanon, is there alignment process for the WPMs?
A: There is no additional alignment process for assembling WPMs. The WPMs are assembled with the mechanical precision of the support. In the three cryomodules in DESY, the positions of WPMs were tuned concerning for the wire sagging.

Next meeting date

Meeting Date: 3 February 2009 23:00 (Japan time), 8:00 (FNAL), 15:00 (INFN and DESY)