

Summary of Meeting for S1-Global module design Cryomodule and Cryogenics
(20081029)

Date: 29 October 2008

Time: 23:15-1:00 (Japan Time)

Attendant: Akira Yamamoto, Harry Carter, Hitoshi Hayano, Hirotaka Nakai, Paolo Pierini, Tetsuo Shidara, Tug Arkan, Tom Peterson, Norihito Ohuchi

(1) Subjects on the meeting

Proceeding the design of S1-Global between INFN, FNAL, DESY and KEK
Cryomodule and cryogenics R&D work (Work Packages of cryomodule and cryogenic groups)

(2) Scheduled time of the meeting

The meeting will be held every two weeks.

- One meeting might be scheduled after the ML-SCRF meeting by Akira Yamamoto.
- Another meeting will be scheduled at 22:00 (JPT), [FNAL 7:00 , Jlab 8:00, INFN and DESY 14:00]

The meeting time : 1.5 hours.

- The first half : S1-Global design
- The second half : Cryomodule and cryogenic study (Work Packages)

(3) Schedule of the S1-global cryomodule construction and operation (key time points)

Transportation of S1-global cryomodule components: end of Oct. 2009.

Transportation of FNAL and DESY cavity packages: end of Oct. 2009.

Assembly of S1-global cryomodule (Module-C) for FNAL and DESY cavities: end of Feb. 2010.

Assembly of cryomodule (Module-A) for four new KEK cavities: end of April 2010.

Operation of S1-global cryomodule: July - December 2010.

(4) Design work of S1-global cryomodules

Drawings of the cryomodules are described in the presentation.

Requirement of the design modification by changing the KEK cavity vessel;

- (a) KEK cavity group will change the tuner position to the opposite side of input coupler with respect to the cavity vessel and outer side of the holding lugs, and the length of the cavity vessel from 1258.6mm to 1247.6mm.
- (b) By this modification, the vacuum vessel of Module-A and the gas return pipe are required to modify the configuration in order to accommodate the KEK cavities.
- (c) The big vacuum bellows should move to the Module-C side because of the interference between the port of the motor driver shaft and the big vacuum bellows. Interference with the vessel supports and coupler port should be solved and possibly this could result in a vessel lengthening (Note added in draft: if we increase the vessel length to allow clearance for the sliding of the bellow, we should check the access to the beamline gate valve).

Discussion;

For KEK cavity vessel design change;

- (a) The modification of the input coupler positions in the Module-C is risky. Simply lengthening the Module-C vacuum vessel is the normal way in order to accommodate the big vacuum bellows on the Module-C (however, see previous comment about gate valve access).
- (b) Space of the STF tunnel is sufficient large to accommodate the change of the module length.

Proposal of design change in FNAL cavity vessel and discussion;

- (a) The blade tuner position will change from the center of the vessel to the end of the cavity vessel, and then support positions of the gas return pipe will be different from the present design. There are two cases in which FNAL supply two cavities to Module-C. One is the present designed cavities, and the other is the modified special cavities. At present, FNAL is heading to the special cavities which have the tuner outside of support lugs.
- (b) FNAL already has the design of the new cavity vessel on time. For the new cavity, the horizontal test stand is required to modify for the support system, and FNAL will check the sticking problem in the tuner. Comment from Paolo: The blade tuners with the tuner acting between the lugs have been operated in the superstructure module (with no fast action), with no evidence of sticking. Furthermore, in the horizontal tests at Chechia and

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Hobicat (BESSY) the slow and fast tuner action did not exhibit any behaviour that may be interpreted as the lugs sticking. In the KEK design the lugs are not on the cavity median plane, enhancing the leverage due to gravity forces. Also, the way the GRP is machined actually as foreseen by the current fabrication procedures guarantees that the proper tolerance to allow the sliding of the rolling needles on the lugs. Investigation should be performed to understand why and to which extent the sticking was observed in the KEK modules.

(c) When FNAL changes the support lug design for the new cavity vessel, the plug-compatible concept between FNAL and DESY cavities in Module-C will be lost as for the positions of the support lugs and the helium supply pipe.

(d) If the tuner position of the FNAL cavity is changed, it is acceptable that the plug-compatibility for the Module-C is not expected. The Module-C should have a function to accommodate any risk for the cavity exchange. For example, there is a case that three DESY cavities might be installed in the Module-C. Note from Paolo: if the distance from coupler to first lug and the distance between the lugs are different between the DESY and FNAL cavities, this may be extremely hard to achieve (and Harry agreed during our discussion). We cannot easily conceive having two sets of supports at a single cavity position, since the tuner itself need clearance. In order to finalize the layout of the S1-global module we need to know the exactly cavity interfaces, and these cannot be easily changed without completely reworking all the HeGRP, as FNAL is planning to do for the CM2.

(e) At the next meeting, the FNAL group will show the new design of the cavity vessel and tuner.

(f) All attendants agreed the conditions that for the S1-global cryomodule the plug-compatibility is not required, and that FNAL chase the ILC cavity design close to the final design for ILC. These discussions should be informed in the ILC08-GDE meeting. Note from Paolo (after discussing also with Carlo on the phone): we are not convinced or even willing to give up the plug compatibility in the S1-Global. Indeed our main interest that deeply motivated our involvement in this effort was to move early towards the “plug-compatible” approach. The situation is now changing very drastically from our initial agreement plans about S1-Global. Due to the short schedule and the limited resources allowed for this work we need to examine the planning.

(5) Module-C characteristics confirmed between INFN and KEK (summarized by Serena)

Some points (underlined) should be modified by the design change of the KEKcavity.

- 4 cavities instead of 8:
 - Total length of the module: 5800 mm from end flange to end flange.
 - Different length of all pipes (included GRP): overlength of 500 mm from end flange.
 - Different position of the shapes.
 - Shorter invar rod.
 - Different position of the lifting lugs.
 - Different position of the vessel supports.
- Cavity distance (i.e. coupler distance): 1384.15 mm
- No reinforcing rings.
- Two posts only, one fixed (on the left in the drawings), one sliding.
- No bimetallic joint at the end of the Aluminum pipes.
- No end bellow for the vacuum vessel.
- No end bellow for the Gas Return Pipe.
- Same cross section as cryomodule type 3+.
- Aluminum finned pipes can be modified: both the shape and the diameter (minimum diameter 22 mm) can be different, but compatible with shields design.
- No sliding flange on the vessel (and no rail): on both side the end flange will be fixed and clamped.
- Three openings: one for pumping the inside of the cryomodule, the other two for the terminal flanges of signal cables. The inner diameters of the openings are 139.8 mm and the connection flanges are ISO 160F flanges.
- No WPM system, but WPM supports on GRP are required.
- Warm-up cool-down pipe design slightly modified with respect to cryomodule 3+; the same as

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CM2 for Fermilab.

This list is however out-of-date according to the previous points discussed in the previous points. At INFN we are producing a new list just to evaluate the implications of what we have discussed both on the technical and schedule aspects. Moreover, the tight schedule is presented in (3), and additional work would be needed now to finalize a revised design, analyze possible interferences due to all changes, and take the necessary precautions to guarantee success under any foreseen condition (e.g. different numbers of DESY and FNAL cavities...). I have only discussed briefly these aspects with Carlo over the phone and we need to discuss further all the consequences of these changes since he is indeed worried that these may risk to compromise INFN motivation and interest (and so also capabilities) in pursuing participation to the S1-Global.

(6) 5K shield

5 K shield test plan in KEK was introduced as the activity of WP with the present thermal test conditions at STF.

The test is scheduled at 2009, and test items should be discussed.

The results for heat loads of the components will be able to be compared with the values in RDR.

Next meeting date and discussion items

Meeting Date: 11 November 2008 22:00 (Japan time) 7:00 (FNAL) 14:00 (INFN and DESY)

Discussion items

- (1) New design of the FNAL cavity and interface with Module-C (Harry Carter)
- (2) Heat load in RDR (Tom Peterson)

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