

## 10th Summary of Meeting for S1-Global module design, Cryomodule and Cryogenics (20090323)

Date: 2009/03/23

Time: 22:00-23:00 (Japan Time)

Attendant: Tom Peterson, Tug Arkan, Paolo Pierini, Serena Barbanotti, Prashant Khare, Akira Yamamoto, Hitoshi Hayano, Tetsuo Shidara, Hirotaka Nakai, Norihito Ohuchi

### Agenda

1. Subjects of the cryomodule/cryogenics parallel session in TILC09 (All)
2. Brief report of KEK cavities for Module-A (Norihito Ohuchi)
3. Material study in the cavity vessel (Hirotaka Nakai)
4. S1-G Module-C drawings by Zanon (Serena Barbanotti and Paolo Pierini)

### Discussion

#### (1) Subjects of the cryomodule/cryogenics parallel session in TILC09 (All)

• The time slot of the cryomodule/cryogenics/S1-G module parallel sessions in TILC09 is scheduled at 9:00~12:30 on April 20.

• The conveners for this session are Don, Paolo and Norihito.

• The proposed program for this session:

9:00-9:25	FNAL cryomodule development and NML	Don
9:25-9:40	Schedule/Design of S1-G cryomodules	Norihito
9:40-10:10	Components and responsible institutes of S1-G	All
10:10-10:30	Thermal analysis works of S1-G cryomodules	Paolo/Serena
10:30-10:50	Coffee Break	
10:50-11:40	Measurements	
	Measurement items and methods (20 min.)	Tom via Webex
	Thermal sensors (20 min.)	Norihito
	WPMs (10 min.)	Hitoshi
11:40-12:30	Assembly and alignment procedures and tools	
	FNAL and DESY cavities (20 min.)	Tug via Webex
	KEK cavities (20 min.)	Eiji Kako/Norihito

• In the discussion of the components and responsible institute for the S1-G cryomodule, the supplier of the components in the Module-C should be defined including the drawings.

• For comparison between the thermal analysis of S1-G modules and the experimental data, the STF experimental data will be supplied, and the analysis will be discussed via e-mail with the participants to the meeting.

• The experimental WPM data, which will be able to be measured in a few weeks, and the plan of the revised system and installation for S1-G cryomodules will be presented by Hitoshi.

C: Alignment of 9 cavities in the clean room before attaching the GRP should be discussed carefully in the group. The present fixture for aligning 9 cavities in the clean room can be improved by introducing more stiff alignment surface and the procedures should be simplified for the future ILC cavity assembly.

C: Tom will do the presentation and attend the whole sessions via Webex from 9:00 to 12:30.

C: The Webex communication can be available in every room for the parallel sessions. Tetsuo will arrange the Webex.

Q: How do we proceed the discussion of components for the S1-G cryomodules in the GDE meeting? The list of the components should be distributed ahead of the GDE meeting for better discussion.

A: Norihito will make the list of the components and show it in the next S1-G Webex meeting.

#### (2) Brief report of KEK cavities for Module-A (Norihito)

• For the module-A at S1-G, KEK is now constructing the five Tesla-like cavities.

• In five cavities, three cavities (shown as an A-type) have the tuner in the middle of the He jackets and between the support lugs. The distance between the support lugs is 750 mm. The A-type is the plug compatible model which was proposed in the Chicago GDE meeting.

• Two cavities (shown as a B-type) have the tuner out side of the support lugs and on the opposite side of the input coupler. The distance between support lugs is 650 mm.

• For S1-G, four better cavities will be selected from them.

• The distance between the cavity flanges is designed to be 1247.8 mm while 1258.6 mm for the old design.

Q: In order to accommodate the different position tuner, the vacuum vessel of the module-A should be modified?

A: The vacuum vessel will be modified by making holes for the motor driver shafts.

C: The type-A cavity is the plug compatible standard model which was proposed in Chicago GDE meeting last year. KEK cavity group prefers to locate the tuner in the out side of the support lugs from the experimental data of stick slide action.

C: INFN group plans to do the blade tuner tests in BESSY in April in order to confirm the evidence of the stick motion of tuner by the piezo in the condition of hanging the cavity package in the cryomodule. Unfortunately, INFN group will not have the experimental data at TILC09, but INFN can report the test plan shortly in BESSY at TILC09.

C: In the FNAL horizontal test stand, which has a slightly different support system from Module-A, FNAL will be able to measure the stick slide motion in the tuning for the blade tuner in the middle of helium jacket. The other features of the dressed cavity are the magnetic shielding outer the helium vessel for the centered tuner bellows in the jacket, and the position of the helium supply pipe on the stationary side or the moving side of the jacket. They will make a difference in the tuner motion.

C: KEK measured the tuner motion, and the results will be discussed including the tuner position at TILC09. The FNAL and INFN activities should be summarized in the session, too.

### (3) Material study in the cavity vessel (Hirotaka)

• See the good presentation file by Hirotaka. [All files in the Webex meetings are uploaded in the Indico page of <http://ilcagenda.linearcollider.org/confereceDisplay.py?confID=3493>]

• Test results of the tensile and impact tests of HIP material between SUS and Nb were reported and discussed.

• The test HIP samples were supplied by two different companies, with same procedure and same material, in order to observe if the different test results would occur between these specimens.

• Overview of test results

Tensile tests

All specimens cut in the Nb part, not in the Cu part.

Impact tests

Most specimens with notches in copper part (center of interlayer metal).

Some with notches in boundaries between Nb and Cu, and between SUS and Cu.

All specimens cut at notch positions.

• Summary of HIP specimen's tests

Tensile tests

A linear region in stress-strain relation is unclear.

Yield strength and modulus of elasticity are not well defined.

Strength was degraded at low temperature.

Elongation contains some gaps between broken parts.

Impact tests

There was no difference of impact strength between the specimens from two companies.

There was no clear difference of impact strength by notch positions.

Impact strength (absorbed energy) degraded at low temperatures comparing with oxygen-free Cu data.

Q: The conclusion looks me like that the HIP material is a little difficult for approval as the pressure vessel material, is that correct? The data do not look like encouraging.

A: From the figures, I can conclude that the HIP material is not suitable to pass the high pressure regulation. So far, the reason of degradation of Nb and Cu strength is not well understood.

C: Photos of samples and materials will be distributed with the presentation file.

### (4) Module-C drawings by Zanon (Serena and Paolo)

• A whole set of drawings was already transferred from Zanon to INFN.

• The drawing will be internally and carefully reviewed by INFN. For this review, it will require a few days before transferring these data to KEK.

Q: Drawings of the components have been completed while the review of the data should be

done. How about the material preparation for manufacturing the components?

A: The procurement of the material is almost finished. The materials are almost stocked.

Q: At the beginning of thermal shield discussion, we talked about the cooling pipe dimension. Which size of the cooling pipe will you use?

A: The cooling pipe is the same size as the TESLA III.

Next meeting date

Meeting Date: 7 April 2009 22:00 (Japan time), 8:00 (FNAL), 15:00 (INFN and DESY)

Discussion items

- Presentation of cryomodule for AAP in TILC09 (Norihito Ohuchi)
- List of the components and the responsible institutes (All)