8th Summary of Meeting for S1-Global module design, Cryomodule and Cryogenics (20090224)

Date: 2009/02/24

Time: 23:00-00:20 (Japan Time)

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

Agenda

1. Heat loads in the cryomodule-HOM power (Norihito Ohuchi)
2. Sensors assembled in the S1-G cryomodule (Norihito Ohuchi)
3. Preparation status of STF module-B cold test (Norihito Ohuchi)
4. Date and discussions at the next meeting (All)

Discussion

(1) Heat loads in the cryomodule-HOM power (Norihito)

・ Heat loads in the cryomodule shown in the RDR were described and the major sources of the heat loads were pointed in the S1-G modules. For these heat loads, the measurement methods were briefly described.

・ Power going through HOM coupler of ILC cavity was estimated by Kiyoshi Kubo, and the value was estimated to be 4.1 W/cavity in case that the duty cycle of ILC was about 1%.

・ For the KEK RF cable for HOM couplers (SUCOFLEX103), thermal calculation was performed. By comparison between the heat loads in KEK cable and the heat loads in the RDR, there exist big differences in the static loads.

・ The proposal of study for the design and specification of the RF cables was performed to the cavity group (Hitoshi Hayano).

Q: Where these RF cables emerge from the cryomodule? In case that the RF cables gather to one port, the cables have long length.

A: In KEK case, the RF cables go through from the port near the coupler port for each cavity. If the RF cable become longer, the RF loss in the cable is larger.

Q: For each cavity, is there the big thermal anchor for RF cable?

A: For the KEK cavity, the thermal anchor copper block for each cavity is planed.

C: The study of the uncertainty of the RF loss in the cable should be included in the proposal to the cavity group. The values are required to study the uncertainty effect of the cryogenic system.

C: For the KEK design RF cable, the static loss is much higher. For this, the big thermal anchor (copper block) is required which is shown in the module-B test. This increases the cost of the cryomodule.

C: Thermal anchoring of the RF cable with Al tape on the thermal radiation shields is considered to be not good for the mass-production and mass-assembly.

C: There was no measurement of the dynamic HOM loss in TTF, but the static 5K heat load was measured at TTF. The static heat load at 5K was quite close to the predicted value. The heat loads by TTF in the list was for the TTF cable.

C: We try to get the cable information from DESY. (The cable information has been gotten by Paolo from Thorsten Buettner in DESY. The information will be summed up and spread to the full S1-G list.)

C: In the original TTF design report 1995, the prediction of cable heat load was a little bit higher. During the design of TTF, there was iteration to try to optimize the cable.

C: Static loss in the RF cable is almost negligible, and that is the common sense. The static loss must be lower than the dynamic loss.

(2)Sensors assembled in the S1-G cryomodule (Norihito)

・The types and locations of the temperature sensors in Module-A were listed. The planed sensors were CERNOX thermometers from 1.5 K to 100 K, Pt-Co thermometers from 4K to 300K, and CC thermocouples from 70K to 300K. The numbers of CERNOX, Pt-Co and CC were 39, 28 and 37, respectively.

・The same types of thermometers, numbers and locations were proposed for Module-C, and the details of these sensors will be discussed from now.

・The numbers and locations of the Wire Position Monitors (WPM) for the Module-A and the Module–C were listed.

・For completing the heat load measurement, the pressure sensors, the mass flow meters and the other sensors were listed.

Q: Are there sensors which need to be fabricated during the preassembly of the cold mass before the transportation to KEK?

A: The temperature sensors on GRP, the upper shield and support posts need to be fabricated during the preassembly in the factory.

C: The issues who will prepare and fabricate these sensors should be described clearly between KEK, INFN and Zanon.

C: The 2K heat load measurement by the boil-off rate of the liquid helium is a little bit difficult because the measurement system has flowing helium through the GRP and 2K cold box. The measurement by the temperature rise is more precise method.

(3) Preparation status of STF module-B cold test (Norihito)

・In April, the cryomodule test will be done. The measurement items are deformation in GRP during cool-down with WPMs, laser position monitors and optical instruments, thermal anchor performance for RF cables and magnetic shield performance at low temperature.

・The status of the preparation of the module-B was described.

・Feb. 28, the cold mass will be inserted into the vacuum vessel.

・March 4, the installation of the module-B in the STF tunnel will start.

・April 1, the cool-down of the module-B will start.

Next meeting date

Meeting Date: 10 March 2009 23:00 (Japan time), 8:00 (FNAL), 15:00 (INFN and DESY)

Discussion items

・Cold test of FNAL-CM1 (Tom Peterson)

・Calculation of thermal behavior of S1-G cryomodule (Serena Barbanotti)

・S1-G cryomodule design by Zanon