

Minutes

EN/MME meeting for HL-LHC CRAB CAVITIES

Monday, the 17th March 2014

Room112/2-023

Regular meeting for the HL-LHC CRAB CAVITIES (WP4) project at EN/MME.

Attendees: Luis Alberty, Ofelia Capatina, Norbert Kuder, Raphael Leuxe, HyeKyoung Park (JLAB),
Thierry Renaglia;

General

The effort of unifying the design of the three cryomodules (UK, BNL & ODU) is giving positive results – the vacuum vessels have now similar envelopes, only the UK design is about 20 cm larger (Ofelia).

BNL Cavity

Norbert presented the latest results on the structural calculations of the DQW cavity & helium vessel, now modelled with a free pick-up and 1.8 bar internal pressure. Results show a helium vessel significantly deformed, despite its thickness (12mm). Reinforcements will be added in order to allow minimising this effect (Action-> Raphael, Norbert).

Federico is calculating the thermal behaviour of the FPC hook by scaling down the thermal losses from 500W to 200W (possible by offsetting the hook from the strongest field region). Raphael is going to discuss with Said A. the welding details for the helium vessel.

The tuning system is being redesigned; however, priority is to be given to ODU's tuning system, which is being developed by Giuseppe F. Once the prototype finished, Norbert has been asked to perform its structural assessment.

ODU Cavity/cryomodule

Priority is given to the structural assessment of the supporting system of the dressed cavities inside the RF Dipole cryomodule. It has been concluded that two supports are not enough, and so, a third support is to be added. Norbert will perform calculation (Action-> Norbert). It has been discussed the need of thermalising this support, and it was concluded that this would be desirable, in view of ensuring the repeatability of alignment from room temperature to cold. The possibility of adding a mass in order to compensate the lack of support was suggested, but seems unlikely that such a solution is adopted.

A brief discussion of welding details for the RF Dipole helium vessel took place at the central workshop with Said A. And Tom N. (Fermilab). The actuation concept of the tuning system has been discussed: about 600kHz/mm is the sensitivity of the cavity with a force feedback frame around made out of titanium. The tuning range expected is of the order of 200kHz, with a sensitivity goal of

200Hz. This would mean a minimum mechanical step resolution of 30nm. The stepper motor is expected to be within the 0.1um range.

HyeKyoung Park (JLAB) will check these figures, as Norbert will be calculating the mechanical aspects.

The actuation system relies on coaxial two-tubes assembly (differential movement). Due to thermal losses, the thickness will be reduced from 1.5mm to 1.0mm. Once under compression, the risk of buckling is to be assessed. (Action-> Norbert). If a low safety factor is found by the eigen-mode analysis, non-linear buckling assessment is to be performed.

Results of thermal calculations performed by Federico C. Show that for a heat-intercepted (80K) thin-walled stainless steel tube, with an equivalent length of 200mm, power losses are in the order of 0.5W. These calculations are now to be performed with titanium, 1mm in thickness, 150mm long tube.

Minutes taken by Luis Alberty