

## **Main characteristics in S1-global cryomodule Update after 29/10 meeting**

1. 4 cavities instead of 8, two of the “new” FNAL design being developed and 2 standard DESY interface:
  - a. If this is confirmed we need to have the interfaces from FNAL “new” design, i.e. distance from coupler to lug, distance between lugs and position of the cooldown flange. All these probably are changed with respect to the DESY configuration, so we also need to know where the 2 different type of cavities are on the string. Until these information are received no detailed design of the module can be finalized.
  - b. Total length of the module: 5800 mm from end flange to end flange. Need probably to be increased to allow sliding of big VV bellow on Module C. Beam valve access to be verified
  - c. Different length of all pipes (included GRP): overlength of 500 mm from end flange.
  - d. Different position of the shapes (cavity design modifications mean shape position not independent of the type of cavity installed: FNAL or DESY)
  - e. Shorter invar rod.
  - f. Different position of the lifting lugs.
  - g. Different position of the vessel supports.
2. Cavity distance (i.e. coupler distance): 1384.15 mm
3. No reinforcing rings.
4. Two posts only, one fixed (on the left in the drawings), one sliding.
5. No bimetallic joint at the end of the Aluminum pipes.
6. No end bellow for the vacuum vessel.
7. No end bellow for the Gas Return Pipe.
8. No 2.2 K forward line.
9. Same cross section as cryomodule type 3+.
10. Aluminum finned pipes can be modified: both the shape and the diameter (minimum diameter 22 mm) can be different, but compatible with shields design.
11. If the vessel bellow need to slide over module C this is no longer true, the flange at the connection to module A need to be equipped with the sliding counterflange, the vessel should have a rail and probably, due to interference between the floor supports and the coupler positions, the module should be lengthened to accommodate the sliding bellow (Beam valve access to be verified).
12. 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. Longitudinal positions on the vessel need to be fixed by KEK.
13. No WPM system, but WPM supports on GRP are required. Position on the cross section need to be fixed by KEK compatibly with the module A and endcap/feedcap designs. KEK now requires a WPM line (supports) in the cavity area. To implement such a feature a region free of all horizontal penetrations need to be identified across the module A and C modules and in the end-cap feed-caps. Detailed discussions and evaluation of the three cavity packages and all components are needed to verify this possibility. Who will be in charge of this task?
14. Warm-up cool-down pipe design slightly modified with respect to cryomodule 3+. Again, sentence no longer true because the warm-up cool-down pipes will need to match the different positions of the FNAL and DESY cavities.

If all these considerations are implemented, we must understand fully that the INFN module C of S1-Global is no longer following a design for “plug compatibility”. If FNAL fails to deliver the 2 cavities, the DESY cavities will not be accommodated in the module.

Furthermore, the schedule is tight, and design cannot proceed at due speed until all the uncertainties outlined above are resolved.