6 - 3 Development of Prototype of BUMP Ceramic Chamber for HIMM

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According to the physical design requirements, Al_2O_3 ceramic (95%) should be used for the BUMP chamber and the cross-section of the chamber should be track-type. The inner surface of ceramic chamber should be metalized and the thickness of metallic coating should be less than 20 μm. Both the inner and outside surface of the ceramics should be polished to meet the requirement of size and roughness. The large non-circular cross-section welding between metal and ceramic is a challenge based on the domestic ceramic process level. Now the first prototype has been developed successfully through the discussion and structure optimization.

The stress analysis of BUMP ceramic chamber by the finite element method is shown in Fig. 1, the deformation and stress of the vacuum chamber is very small, the maximum deformation is only 0.005 mm and the maximum stress is 8.6 MPa.

The leak test for the prototype of BUMP ceramic chamber. completed is shown in Fig. 2. After testing, the size, geometric tolerance, metallization uniformity and leakage less than 5.0×10^{-8} Pa • l/s of the prototype can satisfy the design requirements.

Fig. 1

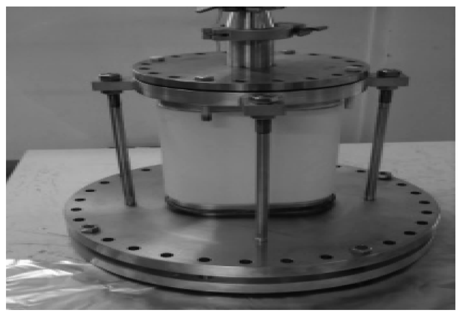

Fig. 2

6 - 4 Test Cryomodule Design

Wan Yuqin, Zhang Junhui, Han Yanning and Zhang Peng

The linac accelerator of ADS injector Ⅱ contains several cryomodules. Now the test cryomodule (TCM1) had been designed and manufactured. TCM1 has one HWR cavity, two superconduct solenoids and one cold BPM. The total length is 1490 mm.

Titanium frame is the main support system and cold mass will hang on it. Copper thermal shield and copper cooling pipe are welding each other with stainless steel frame in it. Vacuum chamber is made of-stainless steel and weigh too much, and its strength will weaken. So there must have some stiffeners on vacuum chamber. Top plate of vacuum chamber is weld with cooling pipes, including LHe cooling pipe , LN2 cooling pipe, level meter pipes, relief valve pipe, burst disk pipe, GHe return pipe, GN2 return pipe and so on.

Up to now, drawings has been finished and components are manufacturing. Construction sequence is important. At first, the cold mass will assemble in clean lab which are cavity, solenoids, BPM and bellows. Second, Titanium frame and He vessel should be assembled, and then the cold mass can be assembled on it from bottom. Next is cooling pipes with top plate and thermal shield. TCM1 end gate is trapezoidal framesocomponents can assemblefrom top to bottom.

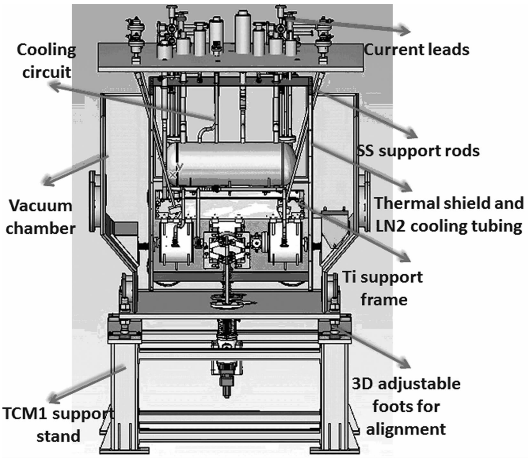

Fig. 1

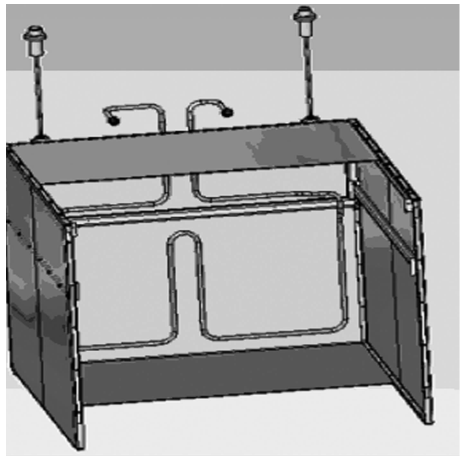

Fig. 2

6 - 5 Vertical Test Dewar Design

Hu Chuanfei and Zhang Junhui

In the project of ADS, superconducting cavity device must be made an experiment of the performance in the vertical position at liquid helium temperature in dewar before assembling in the cryostat, so vertical test dewar is an essential device. So far, its designing and drawings have been accomplished.

Vertical test dewar is consisted of flanges, internal cavity, copper thermal shield and external cavity. Flanges is used to hang superconducting cavity and so on; thermal shield can reduce radiational heat leakage effectively; external cavity is used to post flanges, internal cavity and copper thermal shield, it can also offer vacuum environment. According to theoretical calculation and computer simulation, for example, Fig. 2 shows the mechanical analysis result of the external cavity. Fig. 3 shows the thermal analysis result of the thermal shield. This scheme can meet the mechanical and thermal requirements.

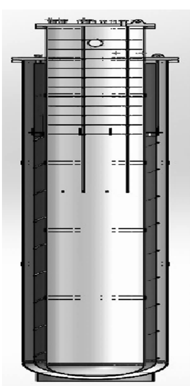

Fig. 1

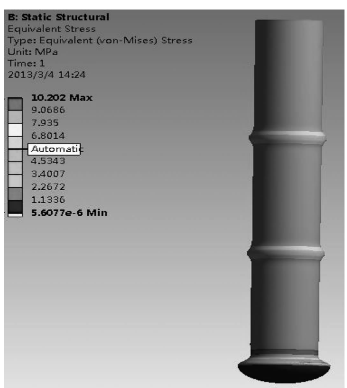

Fig. 2

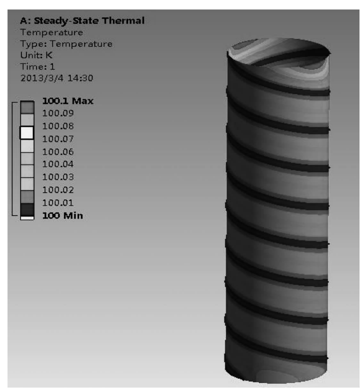

Fig. 3

Total height of the dewar is 5402 mm, the out diameter is 1166 mm, and the heat load is less than 10 W in theory. The manufacturing and assembling work will be finished in June this year.