

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 $20\ \mu\text{m}$. 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 $0.005\ \text{mm}$ and the maximum stress is $8.6\ \text{MPa}$.

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 $5.0 \times 10^{-8}\ \text{Pa} \cdot \text{l/s}$ of the prototype can satisfy the design requirements.

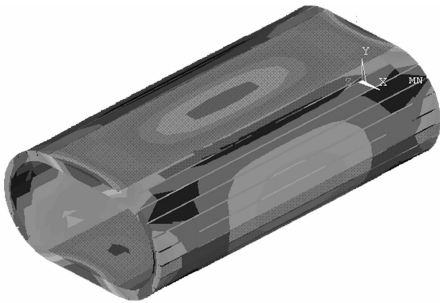


Fig. 1

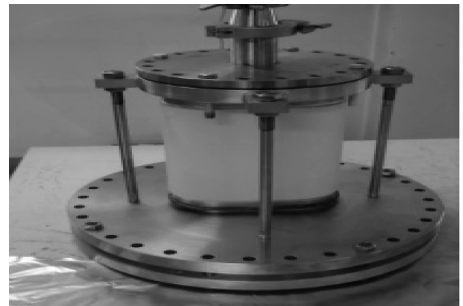


Fig. 2

6 - 4 Test Cryomodule Design

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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 $1490\ \text{mm}$.

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 assemble from top to bottom.