

## 6 - 31 Progress of Cryogenic System in 2014

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During the year of 2014, the work of cryogenic group was mainly focused on operation of refrigerator system, test of TCM1, design and machining of HCM6. At the end of 2014 refrigerator system has achieved closed-loop operation and recycle of helium gas, which did great contribution to superconducting cavity and superconducting magnet test. Since the refrigerator was put into use(Fig. 1), it has operated continuously and reliably for more than 5 110 h, reached helium liquefied capacity 270 L/h at 850 W.



Fig. 1 (color online) Main parts of helium refrigerator system.

TCM1 provides required extremely low temperature for superconducting magnet and superconducting cavity. It is a very important part of ADS intense superconducting proton linac injector prototype II. As liquid level of helium vessel and pressure of superconducting cavity are the most important parameters, we developed procedures to control these two and other parameters. Now we can ensure the cavity pressure at  $(1.05 \times 10^5 \pm 150)\text{Pa}$ , liquid level at 210 mm with little fluctuation. Based on these works, the superconducting cavities worked stably and accelerate the proton beam to 2.55 MeV(Fig. 2).

ADS superconducting linac injector II includes two HCM6 and two SCM6. At present stage, our main work is design and manufacture of HCM6, as shown in Fig. 3. It consists of cold mass parts cooling circuit system vacuum chamber and magnetic shielding. After the final assembly, leak detection, cold shock test and acceptance with the help of manufacturers, the cryomodule will be installed in recent months.

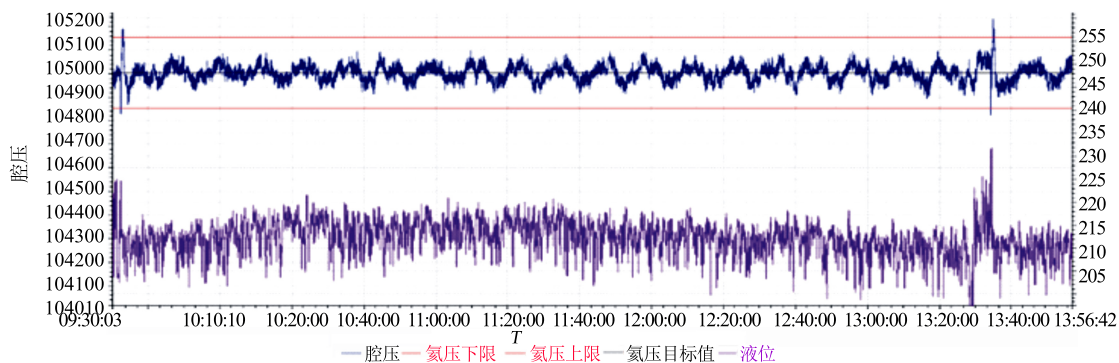


Fig. 2 (color online) Liquid level and cavity pressure of TCM1.

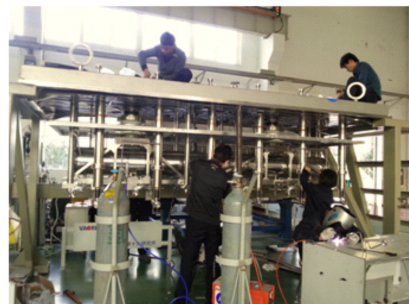
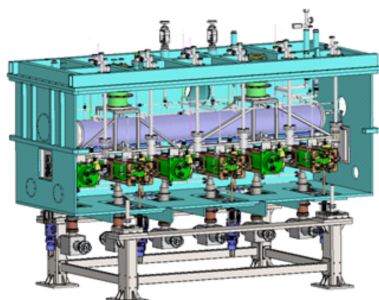


Fig. 3 (color online) Scheme and reality of HCM6.

In 2015, we should ensure the refrigerator system running in good state with daily maintenance. To meet the demands of ADS, the first CM6 should be on-line operation to replace TCM1, beyond that design and manufacture of new cryomodule must be carried out.