

8 - 8 Field Tuning and RF Measurements of CiADS RFQ

Li Chenxing, Xin Yuqi, Zhang Zhouli, Jin Xiaofeng, Sun Guozhen, Wang Zhijun and He Yuan

The fabrication campaign of CiADS RFQ cavity was completed in 2022. After all of five modules of CiADS RFQ cavity was made, the modules were assembled and aligned on the support plate in a cleanroom. The field tuning and RF measurements were implemented in September. The RFQ cavity after assembly and alignment is shown in Fig. 1.



Fig. 1 (color online) The CiADS RFQ cavity Field under tuning and RF measurements.

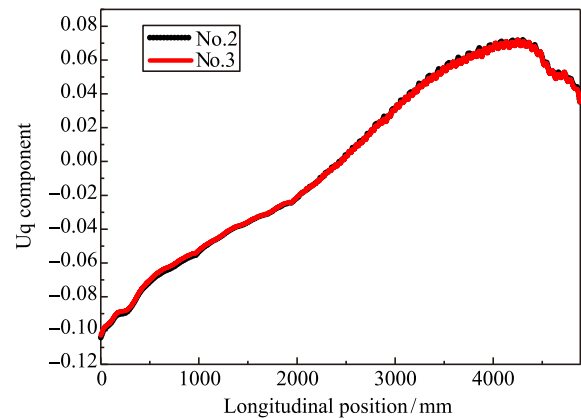


Fig. 2 (color online) Verification of repeatability of Uq component measurement.

Before the tuning of the RFQ cavity, the precision and repeatability of bead pull measurement need to be verified. In order to eliminate adjustment error of dummy aluminum tuners, all of them were not assembled. The results of two successive measurements were shown in Figs. 2 and 3. It is illustrated that the precision and repeatability of measurement is reliable.

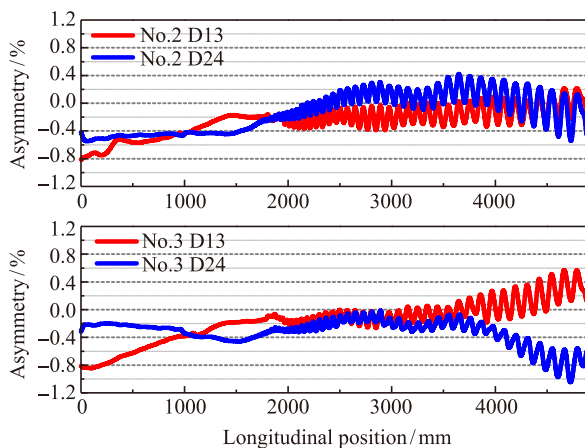


Fig. 3 (color online) Verification of repeatability of Ud component measurement.

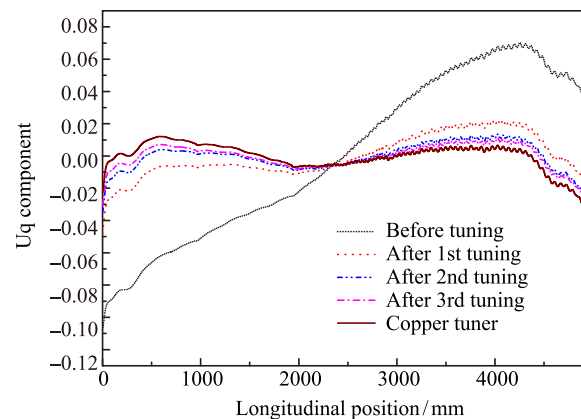


Fig. 4 (color online) Uq component during tuning.

Based on the RFQ tuning algorithm developed at the Institute of Modern Physics, CAS, 3 times of adjustment of dummy tuners were taken to reach the requirement of the frequency, unflatness and asymmetry of electrical field. As shown in Fig. 4, the unflatness was tuned from almost 10 % to 2%. The changes of tuner depth are shown in Fig. 5. The unflatness and asymmetry of field was shown in Fig. 6. After tuning, the frequency of cavity is 162.545 MHz and the Q value is 13 163, which is 91.7 % of the simulated one.

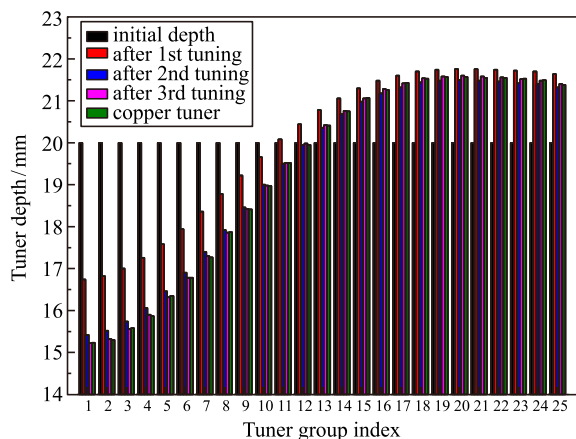


Fig. 5 (color online) Tuner depth of each group of tuners during tuning.

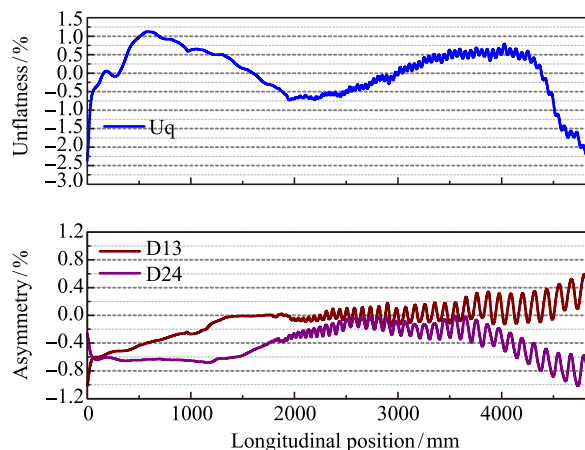


Fig. 6 (color online) Unflatness and Asymmetry of the field of CiADS RFQ cavity after assembly of copper tuners.

In November, the cavity was transported to Huizhou Area of the Institute of Modern Physics, CAS, where then the preliminary power test and beam test were implemented under the duty factor of 0.000 1 at the power level of 101.3 kW. In 2023, the high power conditioning will be carried out after the water cooling of cavity is in ready condition.

8 - 9 Cryomodule Development for CiADS and HIAF Project at IMP

Wan Yuqin

The projects of China initiative Accelerator Driven System (CiADS) and the High Intensity Heavy-ion Accelerator Facility (HIAF) are under construction in Huizhou City. All of the cryomodules are based on a modular bottom-supported design which is optimized for mass-production and efficient precision-assembly, which are designed and constructed by the cryogenic department at IMP. The cryomodules of CiADS and HIAF have the same design scheme, and all coldmass works at the temperature of 2 K which is cooled by superfluid helium.

CiADS linac uses 5 types of superconducting resonators which are located in 31 cryomodules. The design of cryomodule has been finished and a first prototype for low beta cavity is under manufacturing, as shown in Fig. 1. To meet the requirements of minimizing heat transfer and operational stability, the thermal design and performance of low beta cryomodules have been studied. The horizontal test of low beta cryomodule will be done later this year which consists of 9 HWR010 cavities and 9 solenoids.



Fig. 1 (color online) Vacuum vessel manufacturing for CiADS cryomodule prototype.