

IHEP03 FABRICATION AND TESTING STATUS

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Abstract

IHEP is developing RF superconducting technology with different type of superconducting cavities. Tesla-like cavity which is designed by KEK is one of them. We have fabricated most parts of the cavity using Nb material from Ningxia. The cavity welding will be started soon. This paper will show the cavity fabrication procedures and measurement results.

INTRODUCTION

IHEP is developing RF superconducting technology for many years. In 2010, one 9-cell low-loss large grain niobium cavity was fabricated and tested. The cavity reached 20MV/m in the first vertical test at KEK [1]. While making the second 9-cell low-loss large grain niobium cavity (IHEP02) for the Superconducting Cryomodule, we started fabricating IHEP03 which is the Tesla-like shape.

FABRICATION

The IHEP03 is a new challenging for IHEP as we have few experiences on the shape and fine grain cavity fabrication. Fig. 1 is the drawing of IHEP03. The cavity is a 9-cell cavity with two HOM couplers and the total length is 1247.6mm. The equators of the half-cell are in two types and we call them as male and female. Male and female half-cells will be welded together into a dumbbell. Then male and female half-cells of different dumbbell will be welded together at the equator part to form the whole cavity.

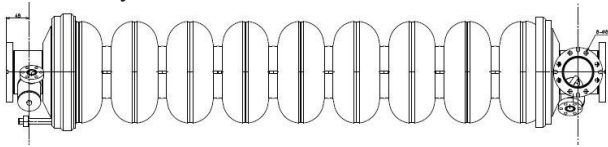


Figure1: IHEP03, KEK Tesla-like cavity.

The niobium sheet thickness is measured by ultrasonic thickness gauge. Eight points have been measured for each sheet as shown in Fig.2. Figure 3 shows the distribution of the niobium sheet thickness. The niobium material is from Ningxia.

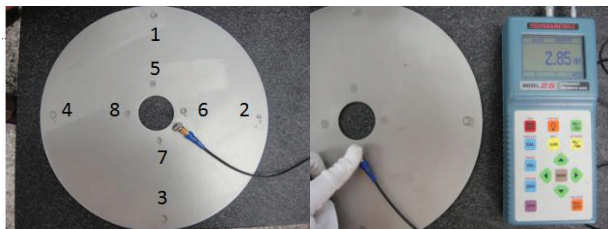


Figure 2: Niobium sheet thickness measurement.

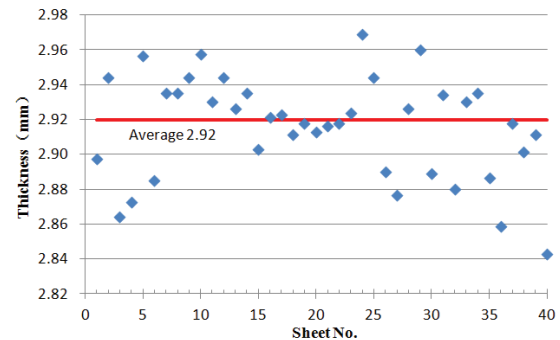


Figure 3: The distribution of the niobium sheet thickness.

We have fabricated two kinds of half-cell deep-drawing die, one for the center half-cell and the other for the end half-cell. The deep drawing procedures are shown in Fig. 4.



Figure 4: Deep drawing of the half-cell.



Figure 5: Half-cell dimension (up) and frequency (down) measurement.

After deep drawing, we trimmed the equator and the iris part of the half-cell. The dimension and the frequency of the half-cell have been measured. The frequency measurement results are shown in Fig. 6. The frequency measurement tool is composed of two plates and three screws. By tightening the two plates, the frequency of the half-cell can be easily measured by the network analyzer (see Fig. 5).

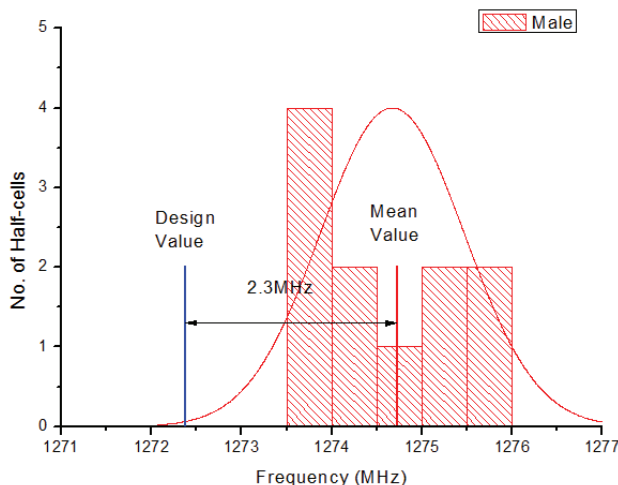
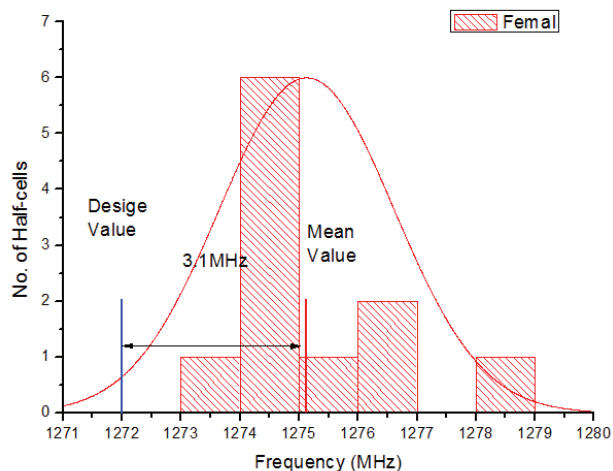


Figure 6: Half-cell frequency distribution.

The half-cell frequency is a little higher than the design value. For the female half-cell, the difference is 3.1MHz and for the male half-cell, the difference is 2.3MHz.

Figure 7 shows all the fabricated parts of the cavity. The pulling of the small port on the HOM coupler is a difficult job. We have tested many times and finally got the good result. The HOM coupler port is shown in Fig. 8.



Figure 7: All the fabricated parts for the cavity.



Figure 8: The HOM coupler for the cavity.

SUMMARY

IHEP03 is a 1.3 GHz Tesla-like fine grain 9-cell superconducting cavity. The cavity material is from Ningxia. We have measured the niobium sheet thickness, the half-cell dimension, and the half-cell frequency. The results show that the fabrication procedure is good. Now most of the parts for the whole cavity are done and the electron beam welding is in schedule.

ACKNOWLEDGEMENT

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REFERENCES

[1] J. Gao et al., Sci China Phys Mech Astron, 2011, 54 Suppl. 2: s154—s159.