the simulation. Both ends of the curve didn't fit well. It's contributed by the vibration of the bead which could be fixed by tightening the wire, and the transformation of two end covers of the cavity. The result confirmed that the electromagnetic mode in the cavity matched the designed field.

The tuning test mode was used to simulate the tuning process by squeezing or extruding the two end CH cavity covers. The fix plates, moving plate, CH cavity and the cavity support comprised the frame of tuning test mode, as shown in Fig. 1. When the force generator moved forward or backward, the cavity was compressed or stretched It's measured by a load cell for force a dial indicator for displacement and a Network Analyzer for frequency. The frequency sensitivity is determined by the cavity's characteristic. A lower sensitivity means higher ability to resist interference, and less difficulty for the tuner system. The tuning sensitivity of the CH cavity was 5.9 KHz/mm, which was a small value for this type of cavities. Fig. 3 shows the real object assembly of the bead-pull and tuning test device.

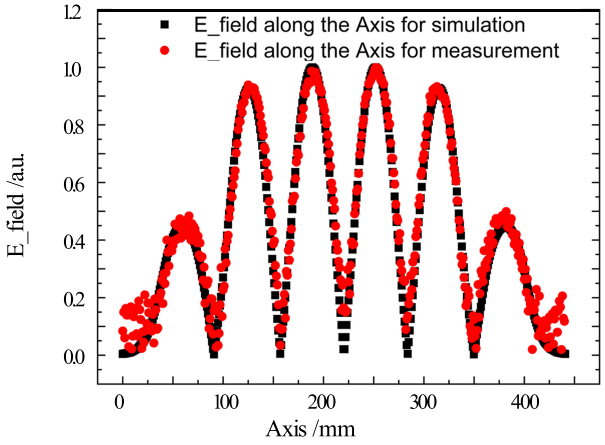

Fig. 2 (color online) The comparison of the electric field along the axis between measurement and the simulation in the copper model CH cavity.

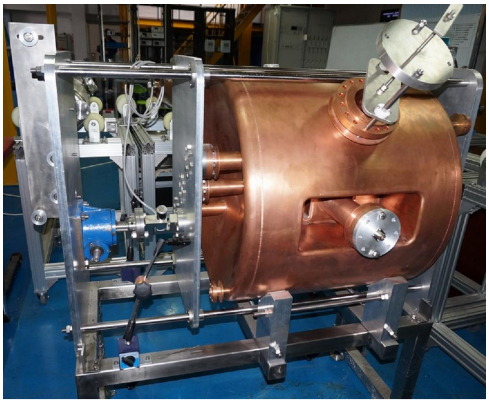

Fig. 3 (color online) Overall setup for the bead-pull and tuning test device.

References

[1] M. X. Xu, Y. He, et al., Chinese Physics C, 39(2015).

[2] Edward L. Ginzton Microwave Measurements. (1957).

6 - 12 Study of IMP Superconducting CH Cavity*

Xu Mengxin, He Yuan and Zhang Shenghu

The cross bar H mode (CH) cavity is suitable to accelerate the low energy and medium energy proton. The operating mode in the CH cavity is H210. Compared with other low-beta superconducting cavities, the CH cavity with multi-cell structure has high real acceleration gradient. In superconducting CH cavity, the cross bar is helpful to rigidize the cavity mechanically. Since the year of 2011, IMP have involved into the research of superconducting CH cavity for the ADS project[1]. There are three CH cavity have been fabricated, one copper model CH cavity and two niobium superconducting CH cavity[2].

There are six cells in this CH cavity. The frequency of CH cavity is 162.5 MHz. The optimal β of CH cavity is 0.067. The fabrication of the niobium superconducting CH cavity is difficult because of its complex cavity structure and strict requirements. The superconducting cavity is usually welded by electron beam welding (EBW) to avoid contamination. However, EBW has strict requirements on the precision of the niobium parts, and then machining is essential too. Additionally, the appropriate process such as the buffer chemical polishing (BCP) is used for protecting the surface of niobium.

The first superconducting CH cavity was completed in October 2014. The vertical testing in 4k was finished. The results is shown in Fig. 1.

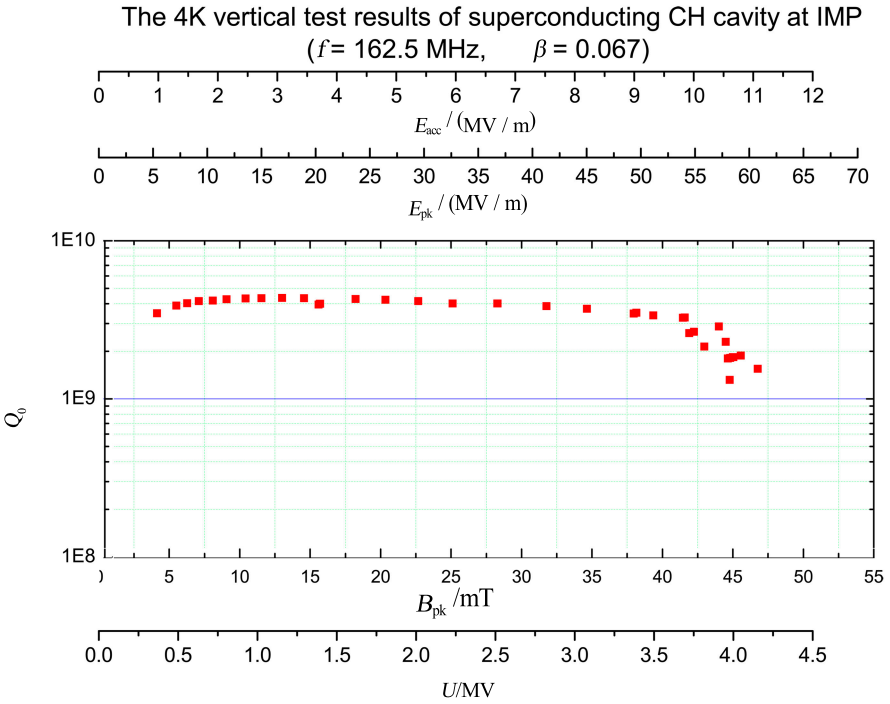

Fig. 1 (color online) The 4K vertical test results of superconducting CH cavity at IMP.

The maximum peak electric field of superconducting CH cavity have reached 61 MV/m. The accelerating gradient is 11 MV/m, corresponding quality factor Q_0 is better than 1.5×10^9. The accelerating voltage is 4.1 MV.

References

[1] Mengxin XU, Yuan He, et al., Chinese Physics C, 2(2015)027005.

[2] Mengxin Xu, Yuan He, Shenghu Zhang, et al., Chinese Physics C, 5(2015)057009.

* Foundation item: National Natural Science Foundation of China (91026001)

6 - 13 Channelfinder and Elasticsearch Benchmark

Hu Jianjun, Eric Berryman[1], Martin Konrad[1], Shen Guobao [2], Paul Chu[1], Liu Dong [1], Ralph Lange[3], KunalShroff [2] and Peng Sheng[1]

([1]Facility for Rare Isotope Beams, Michigan State University, Lansing48824, U.S.A. [2]Brookhaven National Lab, Newyork, 11973, U.S.A.; [3]Helmholtz-Zentrum Berlin, Berlin, 12489, Germany)

DISCS (Distributed Information Services of Control System)[1] is a collaborative effort between BNL, FRIB, Cosylab, IHEP, and ESS. It's a database-driven software services and applications that any experimental physics facility can easily configure, use, and extend for its commissioning, operation, and maintenance. Channelfinder and Elasticsearch are all the important components of DISCS. Channelfinder is a directory server, implemented as a REST style web service. Its intended use is within control systems, namely the EPICS Control system, for which it has been written. Elasticsearch is a distributed, open source search and analytics engine, designed for horizontal scalability, reliability, and easy management. It combines the speed of search with the power of analytics via a sophisticated, developer-friendly query language covering structured, unstructured, and time-series data. The Elasticsearch act as a search service in DISCS ecosystem. Although the Channelfinder and the Elasticsearch are different module of the DISCS, they all have data querying function. So we want to know which one is more faster in data querying.

Fig. 1 below shows the benchmark solution of Channelfinder and Elasticsearch. The Channelfinder and the Elasticsearch have their own Python Client API, so we developed the Python client application for testing. These two Python application are very similar, and their testing methods are the same. The data source of the benchmark consists of 100 thousands PVs. Each PV has about 260 properties and tags totally. The data structure for Channelfinder is the table of MySQL and the data structure for Elasticsearch is JSON. The Table 1 shows the test