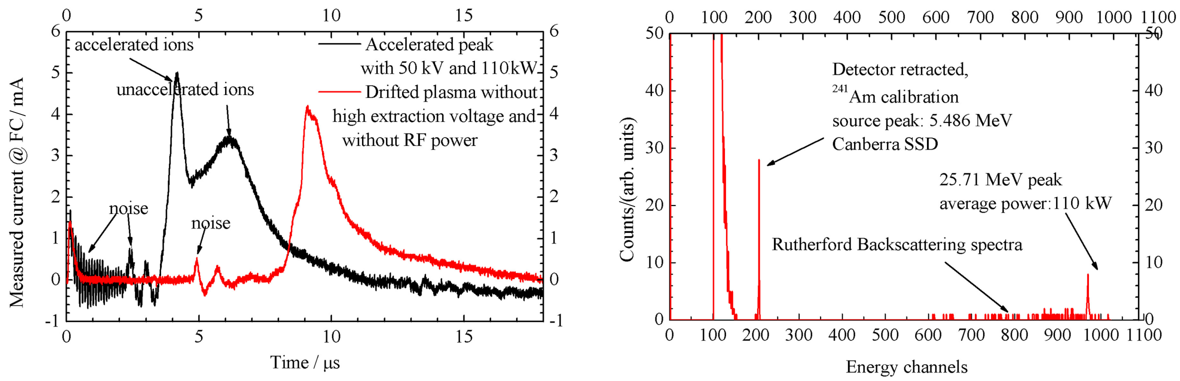

Fig. 2 (color online) Measured signals from FC and the SSDs.

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6 - 11 Mechanical Design of the Bead-Pull and Tuning Test Device for the CH Cavity at IMP

Wang Fengfeng, Zhang Bin, Xu Mengxin, He Yuan and Zhang Shenghu

The copper model CH cavity was designed and fabricated at IMP for Injector II of CIADS project operating at frequency 162.5 MHz, β=0.065[1]. To research the electromagnetic mode evaluated by the electric field distribution and the tuning properties of the CH cavity the bead-pull and tuning test device was set up. It included two parts, the beadpull mode and the tuning test mode. A brief description of the equipment design is shown in Fig. 1

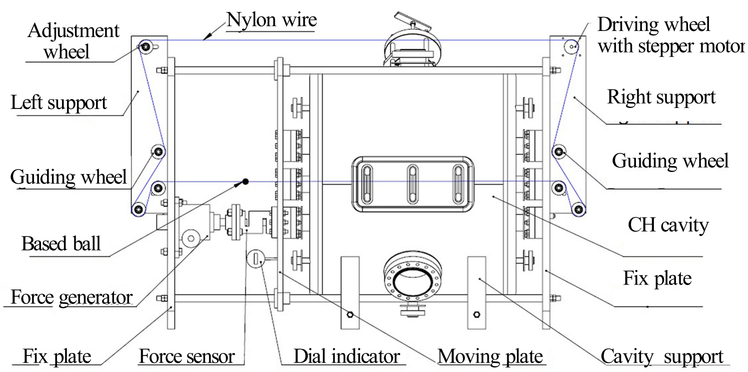

Fig. 1 The detail of the bead-pull and tuning test device.

The bead-pull mode measures the field distribution along the axial by the perturbation method, which consists of the pulley system, a Network Analyzer, and other tiny parts such as an Aluminum bead[2]. The pulley system was composed of a driving wheel with stepper motor, adjustment wheel and several guiding wheels. When the pulley system guided the motion of the bead through CH cavity via the nylon wire, a Network Analyzer is used to take the RF measurements. Fig. 2 shows the comparison between the measured electric field along the axis and 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.

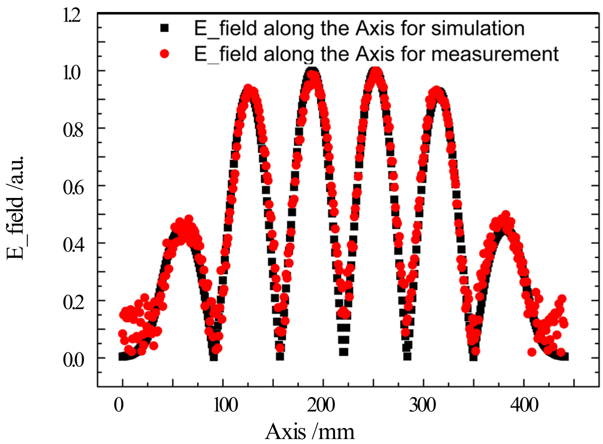

Fig. 2 (color online) The comparison of the electric field along the axis between measurement and the simulation in the copper model CH cavity.

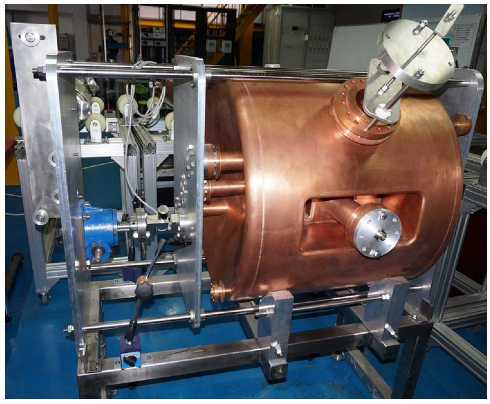

Fig. 3 (color online) Overall setup for the bead-pull and tuning test device.

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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.