CHAPTER 6

Conclusion

The inner chamber has eight cylindrical axial layers consisting of one superlayer, a group of six layers, and two additional innermost layers that contain active guard wires. Even though the high occupancy from beam backgrounds and the wall effect compromise the performance of these two layers, the remaining six layers ensure that the innermost superlayer performs as well as the others.

The small-cell chamber consist of conical aluminum endplates, the carbon fiber reinforced plastic (CFRP) inner cylinder and eight axial wire layers. Each layer contains 160 drift cells that the minimum azimuthal cell size is only 7mm. The gold plated tungsten wires with 30 μm diameter are used as the sense wires with 50 g tension. The 126μm diameter aluminum field wires, without plated for avoiding unnecessary material, are used with 80 g tension.

The core structure assembling of the inner chamber was finished in March, 2013. The results from tension load applied on the core structure before wire stringing show that it can support the whole wire tension which was 371.2 kg. The wire stringing was completed in June 2013,

After that, several basic tests consist of wire tension measurement, wire isolation and leak current check were performed. Then, the chamber was inserted into the temporary aluminum cylindrical cover for the gas leak check and gas leak rate improvement.

To test the chamber by cosmic ray detection with a readout electronic RECBE prototype, a plastic scintillator counter was set up to provide the trigger signal. The analog signal shows the chamber was working well. The analysis of the data from cosmic ray events for check the system is established consist of the FADC summation distribution and pedestal subtraction, drift time distribution and $T1$ subtraction, data screening and the

X-T function relation. Although, the distributions of the FADC summation has the Landau shape, the distribution of the innermost layer and the outermost layer still large. It is caused by the distortion of the electric field near the covers. From the drift time data, the X-T function was provided from the fifth polynomial fitting with self-consistence method. After the reconstruction of the cosmic ray track, the spatial resolution was estimated. The overall spatial resolution approximation, about 90 μm.

In 2012, the spatial resolution of a test chamber with this readout electronics was estimated by the beam test . The 15 mm × 15 mm cell size test chamber was tested in the electron beam with a momentum of 1 GeV/c. The typical value of spatial resolution as small as 120 μm was obtained [14]. According to the beam test result, the cosmic ray test in this study provided the lower overall spatial resolution due to the smaller drift cell size of the inner chamber. However, the resolution from this cosmic ray detection was approximated from too small amount of data of only 259 events following the selection conditions. Moreover, the X-T function fitting method was also different to the typical method, which is obtain by using the fitting with the fifth order polynomial and the linear function depending on the time region.