

Development of a multi-channel discrete MCP anode with on-board analog ASIC charge sensitive amplifier

Miho Saito[1]; Yoshifumi Saito[2]; Toshifumi Mukai[3]; Kazushi Asamura[2]

[1] Earth and Planetary Sci, Tokyo Univ; [2] ISAS; [3] ISAS/JAXA

We report the experimental results and performance of a newly developed multi-channel discrete MCP (micro-channel plate) anode (multi-anode in short) which will be used as a charged particle detector for electrostatic energy analyzers. In order to realize high time resolution measurements of low energy electrons and ions, the development of a charged particle detector which will not saturate under high count rate is necessary. A multi-anode is the most suitable anode for detecting charged particles at high count rate of all the other position sensitive anodes. Since a multi-anode requires charge sensitive amplifiers for each channel, the total power consumption of the charged particle position detecting system using MCP and multi-anode was usually large. In order to reduce the power consumption, we have developed a new multi-anode with on-board small low power analog ASIC (application specific integrated circuits) chips which include multi-channel amplifiers, discriminators and counters. An annular conductor pattern with an inner diameter of 40mm and an outer diameter of 70mm is formed on a ceramic substrate. The annular region is equally divided into 64 anodes each of which has 5.6 degree angular resolution. We have used two small ASIC chips which have dimensions of 6mm by 4mm. One of the two chips includes 128 channel charge sensitive amplifiers and the other chip includes 128 channel discriminators and counters. Since anode is biased to positive high voltage in detecting electrons, decoupling capacitor is necessary for leading the output signal into the charge sensitive amplifier. We used the capacitances between the front side pattern and the back side pattern of the anode instead of installing large high voltage capacitors.