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Design of the high voltage supply module of a prototype energy spectrometer for solar wind plasma measurement

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A prototype energy spectrometer is being developed for space missions aiming at observing solar wind plasma activity. This detector mainly consists of three sections: entrance section, particle detection section and read-out electronics. The entrance section is implemented by a symmetrical quadrispherical Electrostatic analyzer (ESA) with top hat, which selects incident particles with their incoming direction and by their energy-per-charge (E/Q) value. And the detection section is composed of two microchannel plate (MCP) electron multipliers and position encoding discrete anodes.
A fast sweeping high voltage with 32 steps in 62.5 ms and sweep range from -2300 V to -5V for ESA, and a fixed high voltage at -2500 V to -2300V for MCP, is needed by this detector. In order to meet the requirement of high voltage supply of ESA and MCP, a high voltage supply module is designed in this paper. Firstly a high voltage block is employed to generate a -3000 V fixed output, which is divided by a resistor network to get a fixed high voltage. Meanwhile, it is sent to a fast high voltage photoelectric coupler to generate sweeping high voltage.
Test results showed that less than 0.8% relative precision for fixed high voltage, 0.08% non-linearity with fast enough slew rate for sweep high voltage, were attained, which indicated that the high voltage supply module meets the design requirements. The module has been successfully assembled with the prototype detector for ground-based vacuum test.

Collaboration

– not specified –

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