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Intermediate stage amplifier electronics for HIAF ring beam diagnostic system

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This article introduces the intermediate stage amplifier electronics for the HIAF Ring beam diagnostic system, it has intermediate stage amplifier, high-impedance preamplifier gain switching control, self-check, fiber communication, and enthernet communication functions. The intermediate stage amplifier has 4 channels, each channel has three gain states: 20dB, 0dB, -20dB, combining with preamplifier which has 2 gain states (30dB and 0 dB), 6 gain states can be got to make the signal magnitude input to BPM electronics falls in optimal range for ADC sampling as possible. According to simulation result, the maximum voltage of BPM induction signal could exceed 40V with 50Ω impedance, so a low reflection low-pass filter is placed before amplifier to avoid the devices damage and signal reflection, the filter bandwidth is 10MHz and it can attenuate the peak voltage by half at shortest beam signal while S11 ＜-25dB. Electronics integrates two 8-pole LEMO connectors as control outputs to control the preamplifier gain state. The self-check signal is generated by an active crystal oscillator, and injected into 4 channels by 4 drivers. Optoelectronic converter, electro-optic converter and ethernet module are integrated to achieve remote communication. All control logic and communication is realized by an Actel FPGA chip.

Footnotes

Funding Agency

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