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Profile measurement of beam for 230MeV proton therapy cyclotron using scanning wires

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For the 230MeV proton therapy cyclotron, the beam profile is crucial for the adaptation of the proton therapy planning system and an important basis for the commissioning of the beam line. At present, most of the proton therapy facilities use ionization chambers to measure beam profile, which has limited resolution, difficult manufacturing and high cost. China Institute of Atomic Energy (CIAE) designed the scanning wires diagnostic device for the proton therapy facility, which can realize high-resolution profile measurement. A readout electronic unit with fA resolution has been included to adapt to the low secondary electron emission rate of high-energy protons. The data acquisition part uses ZYNQ-7035 together with the 24-bit ADCs and transmits measurement results via MODBUS TCP protocol. The diagnostic electronics are placed close to the profile monitors to reduce the analog signal transmission distance. To adapt to the mode of the macro-pulse in the beam commissioning stage, a signal processing algorithm including a pulse detection method is designed, which can distinguish the frequency of macro-pulse. Besides that, A Butterworth filter and a Smooth filter have been used to filter measurement noise. The design of this wire scanning measurement system will be reviewed in this paper, together with several measurement results.

Footnotes

Funding Agency

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Yes

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