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A compact device for measuring and monitoring the energy of accelerated particle beams

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A Beam Energy Monitor (BEM) was developed for the cyclotron of the HUN-REN ATOMKI, using TOF measurements on a short flight path. The sensor unit uses two capacitive probes at a distance of 20 cm, the entire geometry is about 40 cm long. The compact size allowed the unit to be installed in the main beamline, making it possible to measure and monitor the beam energy independently of the beamline actually used. The probe signals are acquired by a digital oscilloscope and the time difference between the pulses generated by a beam bunch on the probes is determined by digital signal processing algorithms. The unique* design of the sensor unit and the signal processing hardware and software combine to provide accurate beam energy measurement despite the short flight path. Accuracy in practical operation was investigated by neutron threshold reactons. They showed that the measurement accuracy is at least one order of magnitude better than the accuracy of the energy value calculated from the cyclotron settings. The accuracy of the signal processing shows that the beam energy can be scaled up to several hundred MeV while maintaining the measurement accuracy at the tenth of a percent level.

Footnotes

*Z. Kormány, patent pending (PCT/HU2025/050012)

Funding Agency

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Yes

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