



Contribution ID: 279 Contribution code: WEP72

Type: **Poster Presentation**

Compact semiconductor sensor for monitoring of energy distribution in heavy ion beams

Wednesday, 11 September 2024 14:20 (1h 30m)

During experiments in particle accelerators online monitoring of energy distribution in particle beam is useful for correction of the accelerator setting and parameters. Time of flight (ToF) technique for energy monitoring is well known and approved method, which is used widely. Nevertheless ToF technique requires long flight bases especially for high energy particles and can't be used to estimate spatial heterogeneity of the particle beam. Semiconductor energy sensors are compact and can be successfully used for these applications. Diodes with p-i-n structure are used for energy monitoring of particles with ranges less than thickness of sensitive volume. High energy particles have long ranges in semiconductor materials. For online monitoring of high energy beams in this work we propose and experimentally verified a technique based on determination of linear energy transfer (LET) values of particles using diode structures with p-n junctions. Experimentally obtained LET value enables us to calculate energy if the particle type and diode semiconductor material are known. Proposed technique was successfully experimentally verified.

Footnotes

Funding Agency

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Yes

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Session Classification: WEP: Wednesday Poster Session

Track Classification: MC7: Data Acquisition and Processing Platforms