



Contribution ID: 8

Type: not specified

A prototype detector array for measurements in laser accelerated charged particle beams

Monday, 3 September 2018 16:22 (20 minutes)

In-beam dose measurements are paramount for any application seeking to harness the effects of the radiation beam, so all the future applications of the laser accelerated beams (as generated in the ELI and CETAL projects) will need such measurements. The gold standard in dose measurement remain the ion chambers, but for the beams we intend to measure they do present some limitations given by the large number of corrections to be applied in order to calculate a correct dose from the measured charge. The ELIDOSE project is addressing these problems by proposing an array detector that would allow the simultaneous measurement of the recombination and polarity corrections, as well as of the dose. The prototype detector consists of 4 identical ion chambers mounted together in a PMMA frame and the project analyses its response to various charged particle beams and the reciprocal influences of the chambers on each other.

This reciprocal influences of the four chambers have been studied in well characterised therapy electron beams and conclusions regarding further developments have been drawn. The paper presents the results of the initial measurements in the 3 MeV and 18 MeV proton beams at the Tandetron and TR19 Cyclotron accelerators of the IFIN-HH and the comparison between the experimental results and the FLUKA based simulations, as well as the results obtained in the 6 to 19 MeV electron beams generated by a Siemens radiotherapy LINAC and how these results will be used to further improve the design of the array detector.

Selected session

Accelerators and instrumentation

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Session Classification: Accelerators and Instrumentation