Contribution ID: **41**

Type: **contributed talk**

Hybrid LGAD-based detector design for microdosimetry applications

Tuesday, 18 February 2020 16:40 (20 minutes)

Radiotherapy with ions has become a diffuse tool for curing cancer. Despite scientific and technological advances to improve the treatment efficacy, several critical issues have yet to be addressed. In order to fully understand the biological effect of ions, a complete characterization of the radiation field is needed.
Microdosimetry has been identified as a powerful tool to tackle this challenge, providing single-event energy spectra that relate the absorption of ionizing radiation in matter to the microscopic size of biological targets.
Among the existing microdosimeters, the tissue equivalent proportional counter (TEPC) is the only one that can directly provide the energy deposition in tissue at the micron scale. Currently, to assess the lineal energy y (the microdosimetric equivalent of the LET), the energy deposited by each particle is divided by the mean track length, which represents the most probable path traversed and thus depends on the detector geometry.
In order to have a more accurate spectrum, we propose an innovative design for a two-stage hybrid microdosimeter, consisting on a TEPC followed by four thin low-gain avalanche detectors (LGAD).
This setup provides both the energy deposited in tissue-equivalent and the exact track length event-by-event. The y values can thus be corrected by the actual path length travelled by the particles inside the TEPC instead of using an average value.
Furthermore, the possibility of using the energy deposition in the LGAD for particle identification is also being investigated.
We will present a full description of the detector geometry and of the performances assessed with GEANT4 Monte Carlo toolkit.

Primary authors: Mrs MISSIAGGIA, Marta (University of Trento); Mr CASTELLUZZO, Michele (University of Trento); Mr PIEROBON, Enrico (University of Trento); Dr CENTIS VIGNALI , Matteo (FBK); Dr SCIFONI, Emanuele (TIFPA); Dr TOMMASINO, Francesco (University of Trento); Prof. RICCI, Leonardo (University of Trento); Prof. MONACO, Vincenzo (University of Turin); Mr BOSCARDIN, Maurizio (FBK); Prof. LA TESSA, Chiara (University of Trento)

Presenter: Mrs MISSIAGGIA, Marta (University of Trento)

Session Classification: LGAD and Timing

Track Classification: non-HEP applications