

Internship in nuclear instrumentation

3-dimensional scintillation dosimetry for small irradiation fields control in protontherapy

Radiotherapy is an important modality in treatment cancer. In this domain, proton beams have ballistic superiority against photon beams. Nevertheless, the use of protontherapy to treat small volume tumours (typically less than 27 cm³) is limited because of the lack of well adapted dosimetry tools for small irradiation fields quality assurance. To answer this issue, an innovative dosimetry system has been developed. It is based on a scintillating block of 10 × 10 × 10 cm³ and two ultra-fast cameras recording the scintillation from different points of view to reconstruct 3-dimensional dose maps.

The objective of this training will be to study a prototype developed by the GANIL and the LPC Caen.

In a first step, he/she will perform measurements to determine and correct optical deformations from images, and will implement images analysis to reconstruct dose distributions from scintillation measurements.

He/She will then perform measurements with proton beams to determine the scintillation yield as a function of energy and to evaluate the production of parasitic light such as Čerenkov radiation.

He/She will finally perform Monte Carlo simulations to study and correct the effect of scintillation quenching on dose measurement.

Expected skills: The student must have a formation in nuclear physics with a good knowledge of the detection of radiations and their interactions with matter. Knowledge in radiotherapy and dosimetry would be a plus.

The student will perform experimental measurements as well as Monte Carlo simulations. Thus the candidate must have an interest for experimentation as well as simulation and will have to develop skills in instrumentation, image analysis and Monte Carlo simulations.

This work can be pursued by the PhD-thesis entitled *3-dimensional scintillation dosimetry for small irradiation fields control in proton therapy*.

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