Beam monitoring in Hadrontherapy

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Abstract

Radiation therapy has been used since 1896 as a mean to treat cancer thanks to the discovery of x-rays by Wilhelm R´ontgen one year earlier. It has become one of the three main tools for cancer therapy along with surgery and chemotherapy. The principle of Radiation therapy is relatively simple, when high energy photons path through matter they leave some of their energy (or dose) behind. Therefore if photon beams are correctly focalized on a tumor, the delivered dose will sterilize the cells. One of the main drawback of Radiation therapy is that photon get through healthy tissues before reaching the tumor and therefore give dose to those tissues.

Hadrontherapy is a specific kind of Radiation therapy using particles as protons or carbon ions instead of photons. The main advantage is that most of the particle energy is deposited as a specific depth in the tissue and this depth is a function of the particle energy and therefore can be chosen so that it coincides with the position of the tumor enabling to spare healthy tissues.

Caen is hosting a project of Hadrontherapy Research Center named ARCHADE which is supposed to open in the next few years. In this context my PhD thesis is organized around the simulation and the development of a beam monitoring devices for high flux proton beam. Indeed, as in conventional Radiation therapy, every Particletherapy center has to be equipped with monitoring devices to ensure that the radiation dose prescribed by the physician and the one delivered to the patient are the same.

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