Invitation à la soutenance publique de thèse de
Monsieur Sylvain DEFFET
Master ingénieur civil électricien
Pour l’obtention du grade de Docteur en sciences de l’ingénieur et technologie
« Proton radiography to reduce range uncertainty in proton therapy »
qui se déroulera
le mardi 27 novembre 2018 à 15h30
Salle Shannon (M-a105) - Bâtiment Maxwell
Place du Levant, 2
1348 Louvain-la-Neuve

Membres du jury :
Prof. Benoît Macq (UCLouvain), supervisor
Prof. Jean-Pierre Raskin (UCLouvain), chairperson
Prof. Denis Flandre (UCLouvain), secretary
Dr. Rudi Labarbe (IBA, Belgium)
Prof. Philippe Lambin (Maastricht University, The Netherlands)
Prof. John Lee (UCLouvain)
Prof. Edmond Sterpin (UCLouvain – KUL, Belgium)

Proton therapy is an advanced form of radiation therapy which is increasingly used worldwide. Unlike photons, protons deliver a sharp dose at a precise location corresponding to their range in the patient. Thanks to this physical property, proton therapy has the potential to spare healthy tissues better than conventional radiation therapy. However, a consequence of this dosimetric property is that the range of the protons inside the patient must be accurately predicted to deliver the dose as planned. Unfortunately, several uncertainties arising during treatment planning may significantly impact the range of the protons and hence jeopardize dose conformity. To better quantify and potentially reduce the uncertainties, the implementation of imaging techniques that would provide a direct information on the energy reduction of protons in the patient is highly desirable. In the present thesis, such a method is introduced: proton radiography. The system that we propose relies on the use of protons having an energy high enough for them to traverse the patient and stop inside a detector which measures their residual range. By comparing measured and predicted residual ranges, it is possible to quantify range uncertainties in the patient in clinical conditions. Although the principle of proton radiography is relatively straightforward, a clinical implementation of such a measurement device is a complex issue. This thesis aims at developing a proton radiography system and also at conceiving an acquisition process that could be conveniently implemented in clinics. The methodologies to correctly take advantage of proton radiography measurements are also discussed, in order to further optimize the dose delivered to the patient and improve de facto the treatment outcome.