***Impact of multimodality imaging for $^{166}$Ho radioactive source distribution in a context of microbrachytherapy***

The Cancer Research Centre of Toulouse (Team 15) proposes a PhD research project (Autumn 2014).

This research project takes place in a context of development of a new microbrachyterapy approach using microparticles of radioactive holmium ($^{166}$Ho). Medical applications lie in the treatment of liver cancers and glioblastoma. The coverage of the entire tumour volume will be achieved by multiple injections, in situ, via a specific injector under development by an industrial partner of the project.

Follow-up dosimetry makes it possible to insure that the absorbed dose is homogeneous within the entire tumour volume.

Quantitative SPECT/CT imaging has a maximal spatial resolution of about a cm.

Electrons emitted by $^{166}$Ho have a maximum range of some mm.

The objective of this work is to assess the potential of alternate imaging modalities (CT, MRI) in complement to SPECT/CT, to increase the accuracy of radioactive source localisation and thereby that of absorbed dose delivered to the tumour.

This work aims at optimizing a dosimetry software developed in parallel of the project.

**This project will require:**

- Evaluating $^{166}$Ho SPECT/CT imaging approaches, initially on phantoms and specific test objects.
- Assessing relative performances of each imaging modality (SPECT, CT, MRI): sensitivity/resolution, but also practical (clinical) feasibility.
- Image fusion between multiple modalities in order to optimize the global dosimetric process,

This research project has an obvious industrial long/middle term aim.

**Applicant profile:**

This work will require competencies in:

- Multimodality imaging (mostly SPECT/CT and MRI)
- Inverse problem modelling

A good level of scientific programming is required.

**<u>Academic and industrial collaborations within the project</u>:**

- Industrial partners associated to the project: AAA, Keosys
- Academic partners associated to the project: IUCT, CHU Rangueil

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