

# The Level of Doses Due to Unnecessary Irradiation of Tissues and Organs Outside the Target Volume During Common Radiotherapy Procedures.

Ibrahima Diallo<sup>\*1,2,3</sup>, Iannis Alziar<sup>1,2,3</sup>, Nathalie Perret<sup>1,2,3</sup>, André Bridier<sup>4</sup>, Guillaume Bonniaud<sup>4</sup>, Jean Chavaudra<sup>4</sup>, Jean-Bernard Ruaud<sup>5</sup>, Valérie Rousseau<sup>5</sup>, Hanna Kafrouni<sup>5</sup>, Dimitri Lefkopoulos<sup>5</sup>, Florent de Vathaire<sup>1,2,3</sup>

<sup>1</sup>Inserm U605, Villejuif, F-94805, France ;

<sup>2</sup>IFR69, Villejuif, F-94807, France ;

<sup>3</sup>Université Paris XI, Villejuif, F-94800, France ;

<sup>4</sup>Medical Physics Department, IGR, Villejuif, F-94805, France ;

<sup>5</sup>Dosisoft, Cachan, F-94230, France

## Abstract

Public Health Codes more and more require that any information relevant for the estimation of the high doses delivered within the target volumes and the low doses delivered outside should be recorded. In this context, the availability, for each radiotherapy patient, of the magnitude of the unavoidable low doses delivered outside the target-volumes, becomes an important issue. However, to date, Treatment Planning Systems (TPS) are not designed for this issue. We therefore have developed a new version of the ISOgray TPS, which can provide, in addition to the dose distributions within the target-volumes, the magnitude of the doses to distant healthy tissues in the course of common radiotherapy procedures.

Our strategy involves 3 modules: A library of adjustable whole-body patient models in treatment position, which allows different patient anatomies to be simulated; A multi-sources beam model, which allows the dosimetric data of the irradiation field to be extended to the whole body; A dose calculation program producing the dose distributions within the target-volumes and in any organ outside. This paper describes the principles of our approach and provides data on doses distributions to distant organs for various common radiotherapy procedures.

At this stage the software is under development. The calculations with this system are checked against experimental data from ionisation chamber and thermoluminescent dosimetry.

Although the development of our system is still in progress, the preliminary results are encouraging. Allowing whole-body dose evaluations for each patient at the time of the treatment planning, our approach should provide relevant information required for the patient radiation protection and radiation therapy benefit-risk management purposes. The systematic evaluation of the low doses delivered at distance of the target-volumes is a basic requirement for quality assurance of radiotherapy and prospective studies of long-term risks of modern radiotherapy procedures.

**KEYWORDS:** *Radiotherapy, peripheral dose, patient radiation protection.*

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\* Presenting author, E-mail: [ibrahim.diallo@igr.fr](mailto:ibrahim.diallo@igr.fr)