OXIRIS: Advanced Theranostic Technology in a Convergent Photon Beam

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Abstract

Recent advances in methodologies for the diagnosis and treatment of neoplastic conditions, among others, have focused its attention on theranostic techniques that integrate radio diagnostic processes, both *online* and *offline*, with therapeutic methods applied in situ. This integration facilitates the detection and management of pathologies, offering greater comfort for the patient, the possibility of early or precocious management, and optimal correlation between the diagnosis and localization methodology and the treatment technique.
In this context, OXIRIS (Orthovoltage X-Ray-Induced Radiation System) [1,2] represents a revolutionary proposal dedicated to theranostic by means of a converging photon beam, whose spatial resolution is inherent to its physical properties. In addition, OXIRIS allows functional-metabolic information to be obtained thanks to the incorporation of biomarkers infused with high atomic number nanoparticles, whose fluorescent emission can be correlated with the spatio-temporal localization of specific tissues by means of a specially adapted technique based on detection of energy dispersive X-ray fluorescence (EDXRF) [2]. Once the location of the treatment target has been determined *in situ*, the same converging photon beam or another similar beam can be used to deliver the dose distribution required for the therapeutic objective at the predetermined location.
This description briefly reports the basic conceptual and operational principles of the OXIRIS system together with the main characteristics of the preliminary operational prototype at the *Centro de Excelencia de Física e Ingeniería en Salud* (CFIS) of the *Universidad de La Frontera*. Likewise, the dosimetric performance will be presented together with a quantitative comparison with respect to traditional techniques in nuclear medicine, demonstrating the viability and convenience of the OXIRIS system.

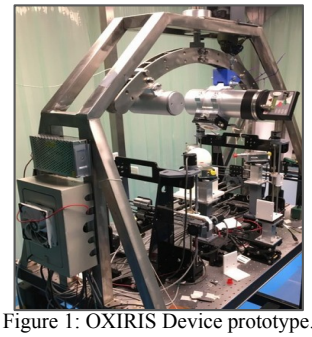

Figure 1: OXIRIS Device prototype.

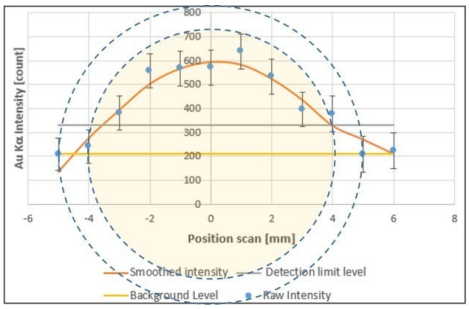

Figure 2: Au Kα Fluorescence counts for a linear sweep on a 1cm diameter target located inside of a 10 cm diameter sphere filled with water.

References

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