Contribution ID: **251** Type: **Poster**

Theoretical and Monte Carlo simulation approaches for X-ray production in different anode geometries

The traditional scheme for X-ray production is based on the well known X-ray tube, an evolution in technology started from the experiments performed by Crookes and finally by X-rays discovery by W. Röntgen in 1895. As known, X-ray tubes are mainly based on the impact of accelerated electron onto high atomic number anodes in order to produce photons by means of Bremsstrahlung and characteristic X-rays. However, spectral and angular distributions of produced photons may not be strictly improved, or even worst, not adequate for specific applications. Actually, one of the main properties of traditional X-ray tubes regards its geometrical divergence, which necessary produces fluence reduction along beam trajectory. This inherent characteristic represents a strong limitation when high concentrated fluence is required, as happens in convergent techniques [1]. This work presents investigations about the effects of the different anode properties in combination with electron beam incidence in order to assess convenient X-ray tube designs to produce X-rays with different purposes, mainly focused on applications requiring photon fluence concentration. Dedicated Monte Carlo subroutines (PENELOPE [2] and FLUKA [3]) were developed aimed at describing interaction processes and X-ray production according to different combination of electron beam incidence and anode physical/geometrical properties. The obtained results confirm that suitable designs are capable of improving photon fluence at certain regions according to specific requirements.

1. Figueroa, F., Valente, M. (2015). Physical characterization of single convergent beam device for teletherapy: theoretical and Monte Carlo approach, Phys. Med. Biol. 60: 7191-206.
2. Salvat, F., Fernández-Varea, J., Sempau, J. (2008). PENELOPE Version 2008, NEA, France.
3. Battistoni, G., Muraro, S., Sala, P.R., Cerutti, F., Ferrari, A., Roesler, S., Fassó, A., Ranft, J. (2007). The FLUKA code: Description and benchmarking, AIP Conf. Proc. 896, 31-49.

Keywords: X-ray production; Convergent photon beam; Monte Carlo simulation.

Acknowledgments: This study was financed by FONDECYT (Chile) project 1171729

Authors: FIGUEROA, R. (Centro de Física e Ingeniería en Medicina & Departamento de Ciencias Físicas & Universidad de La Frontera, Chile.); GESER, F. (Instituto de Física E. Gaviola & Laboratorio de Investigación e Instrumentación en Física Aplicada a la Medicina e Imágenes por Rayos X & FaMAF, Universidad Nacional de Córdoba, Argentina.); MALANO, F. (Centro de Física e Ingeniería en Medicina, Universidad de La Frontera, Chile & Instituto de Física E. Gaviola & Laboratorio de Investigación e Instrumentación en Física Aplicada a la Medicina e Imágenes por Rayos X & FaMAF, Universidad Nacional de Córdoba, Argentina.); SANTIBÁÑEZ, M. (Centro de Física e Ingeniería en Medicina & Departamento de Ciencias Físicas & Universidad de La Frontera, Chile.); VALENTE, M. (Centro de Física e Ingeniería en Medicina, Universidad de La Frontera, Chile & Instituto de Física E. Gaviola & Laboratorio de Investigación e Instrumentación en Física Aplicada a la Medicina e Imágenes por Rayos X & FaMAF, Universidad Nacional de Córdoba, Argentina.)

Presenter: FIGUEROA, R. (Centro de Física e Ingeniería en Medicina & Departamento de Ciencias Físicas & Universidad de La Frontera, Chile.)

Session Classification: Poster Session - MP

Track Classification: Medical Physics