Contribution ID: **416** Type: **Poster**

Axial Computed Tomography Phase-Space Source Model in the PenEasy/PENELOPE Monte Carlo System: Implementation and Validation

Wednesday, 26 April 2017 14:15 (2 hours)

The dosimetric quantities currently adopted by national regulations, or for standardization of dosimetric models adopted by manufacturers of CT equipment are based on a basic metric, introduced about thirty years ago: the Computed Tomography Dose Index (CTDI. This quantity, independent of its definition variations, represents the absorbed dose along the longitudinal axis (central and peripheral) of an acrylic phantom with known and well defined dimensions. Since the introduction of CTDI as appropriate metric for determining the dosimetric characteristics of CT procedures, and its acceptance in the scientific community and between equipment manufacturers, the technology modified significantly the architecture of these systems as well as the clinical procedures for their use. The introduction of CT cone beam systems, with enlargement of the dimensions of the radiation beams to accommodation in a small number of rotations of a larger region of interest, brought significant clinical advantages. However, this expansion of the dimensions of the x-ray beams used in CT scans and the use of helical techniques, started to make improper the use of CTDI. As a consequence, the correct assessment of the CTDI through the measurement of the dose profile along the central and peripheral cylindrical phantom axis has become a work of crucial importance. Several research groups around the world have been developed CT dosimetry tools based on the Monte Carlo method. The ImPACT group provides a CT dosimetry tool based on NRPB SR250 dose distribution data or the use of EGSnrc Monte Carlo system to assess the dose distribution in cylindrical and anthropomorphic phantoms. In this work, it will implement an axial computed tomography phase-space source model in the PenEasy/PENELOPE Monte Carlo system in order to assess the dose spread function along the z-axis and along a peripheral axis of a cylindrical phantom. The x-ray source model has been created for a GE Lightspeed CT family, and it considers the tilted anode, the heel effect and the x-ray spectrum self-attenuation. The phase-space file has been simulated after the CT collimator and the CT setup includes the construction of the shaper filter (bowtie filter). Previous result show the primary dose spread function affected by the tilted anode and by the anode self-attenuation as shown in Figure 1.
Finally, the phase-space source model will be used to simulate an axial and helical scan introducing the table displacement (pitch).

Country/Organization invited to participate

Brazil

Primary author: Mr LOPEZ GONZALES, Alejandro Heyner (Sao Paulo University, Brazil)

Co-authors: ROBAYO PUERTO, L P (Instituto de Física da Universidade de São Paulo, SP, Brazil); COSTA, P R (Instituto de Física da Universidade de São Paulo, SP, Brazil)

Presenter: Mr LOPEZ GONZALES, Alejandro Heyner (Sao Paulo University, Brazil)

Session Classification: P-B

Track Classification: RADIATION TECHNOLOGIES FOR MEASUREMENT