

## AbstractID: 5122 Title: Evaluation of different ways to describe an x-ray spectrum and the implications in the absorbed energy in a head voxel model

**Purpose:** To evaluate the behavior in absorbed energy due by approximation in irradiation energy spectra description to Monte Carlo simulation

**Method and Materials:** A head voxel model was coupled to GEANT4.7 program to obtain the absorbed energy distribution in anatomical structures of the model. Three simulations were realized, using an x-ray beam parallel to the left side of the model, with an isotropic beam distribution. First the energy beam was defined according to "Catalogue of Diagnostic X-ray Spectra and Other Data", using 70.0 kVp of tube tension, with 17° target angle, W as target material, without ripple and with 1.0 mm Al of add filtration. After that the beam was defined as monoenergetic at 30.5 keV, representing the mean energy of the cataloged spectrum. Other monoenergetic beam of 29.5 keV was used, representing the first HVL energy according the catalogued spectrum.

**Results:** The simulation using the catalogued spectrum was defined as reference. The simulation, using the 30.5 keV monoenergetic beam, shows twenty structures (71%) with differences larger than 10%, when compared to the reference data, including five structures (18%) that presented differences upper than 20%. In the simulation using monoenergetic beam corresponding to the first HVL energy, fourteen structures (50%) presented differences larger that 10%, compared to the reference data, including four structures (14%) showing differences upper than 20%. To both simulations total absorbed energy showed difference down to 7%, compared to the reference.

**Conclusion:** The absorbed energy is dependent on the x-ray spectra description; it means that the configurations of the spectra (photon flux, mean energy and HVL energy) significantly interfere in absorbed energy distribution. This kind of approximation must be avoided, when we try to describe the absorbed energy accurately, especially in simulations used in radiological protection applied to radiological area.