AbstractID: 5117 Title: Estimating conversion coefficient of KERMA free in air to glandular dose in mammography: a comparison between BR12 model and a realistic voxel model

Purpose: To compare conversion coefficient of KERMA free in air to glandular dose, in mammography, simulated to BR12 model and a realistic breast voxel model.

Method and Materials: We simulate the glandular dose (D_g) and KERMA free in air (K_{ai}), using the Monte Carlo program MCNP (version 4B) to estimate the conversion coefficient (c_g) of KERMA free in air at entrance skin in glandular dose. The computational universe generated to simulate a mammographic procedure mimics LORAD III mammographic equipment. The focal spot of molybdenum irradiates photons isotropically in a solid angle of 16.8^o. The bucky is 0.6190 m far from de focal spot. Above the model there is a PMMA compress paddle 0.002 m thicker. The add filtration (30 μm Mo thicker and 25 μm Rh thicker) was located at 0.050 m far from the focal spot. Tow spectra were used in voxel model simulations: 28 kVp with Mo add filtration and 30 kVp with Rh add filtration.

Results The c_g presented on Mo/Rh simulation was 1.5 times larger than the presented on Mo/Mo simulation. Comparing the voxel model to the BR12 model we have actually a super estimation on both simulated c_g values: 3.4 times considering the simulation with Mo/Mo target/filter combination, and 2.4 times considering the simulation with Mo/Rh target/filter combination.

Conclusion: The c_g values show a decrease of 58.7% considering the Mo/Rh target/filter combination and a decrease of 70.2% considering the Mo/Mo target/filter combination, to the realistic breast model as comparative pattern. These variation on c_g are probably caused by the definition of a non-anthropomorphic model composed by an homogeneous distribution of tissues as pattern, that makes unviable the observation of the absorbed energy by each tissue; and because this model do not consider the position of glandular tissue in the real breast geometry.