AbstractID: 6484 Title: Workload Weighed Transmission Curves of Brazilian Shielding Materials: computer simulations

Purpose: Evaluation of attenuation properties of typical Brazilian shielding materials (Barite Concrete) used in diagnostic rooms from computer simulations and considering the local workload distribution.
Method and Materials: Computer simulations of X-ray spectra by using the modified TBC Model (Costa, P. R. et. al, Health Physics 92(1), 2007) were generated in the range of 60 to 150 kV. Elemental compositions of four commercial barite concretes used for shielding diagnostic facilities were obtained from fluorescence spectroscopy. The NIST X-COM software was used in order to obtaining the mass attenuation coefficient of each sample. Linear attenuation coefficients were obtained and used in order to simulate the transmission curve of each sample. Archer's equation (Med. Phys. 21(9), 1994) was used for obtaining a, b and g coefficients for each kV evaluated and for each shielding material. Moreover, workload spectra (Simpkin, Med. Phys. 23(4) 1996) of typical diagnostic rooms were obtained by observing 1060 patients. These data were combined following the method presented in NCRP 147.
Results: The workload weighed transmission curves were obtained considering the different workload spectra and shielding material manufacturer. Results shows that for a same attenuation factor, for example 0.001, the thicknesses of material required for shielding a conventional radiation room to primary radiation ranges from 5 to 9.1 cm depending on the material manufacturer. If the workload spectra are not considered, this range of thicknesses grows to 13.5 to 20 cm.
Conclusion: The new methods published in NCRP 147 for shielding calculation of diagnostic rooms incorporated a strong dependence on the quantities workload distribution and transmission through the shielding materials. The computer simulation method developed in the present work shows to be a practical tool for optimizing the composition of shielding materials. It can also be validated from experimental measurements of transmitted x-ray spectra and transmission measurement.