



NOME DA SEÇÃO OU DO LABORATÓRIO

Seção Técnica de Radiodiagnósticos

DOCUMENTO Nº

98LR10AR01

Nº DA FOLHA

1/2

DATA DE EMISSÃO

04-fev-98

EDIÇÃO/REVISÃO

**TÍTULO** DIAGNOSTIC X-RAY ROOM DESIGN USING PHOTON ATTENUATION AND SPECTRUM EVALUATION MODELS: SIMULATION AND PARTIAL RESULTS

**TITLE** DIAGNOSTIC X-RAY ROOM DESIGN USING PHOTON ATTENUATION AND SPECTRUM EVALUATION MODELS: SIMULATION AND PARTIAL RESULTS

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**Resumo:** Introduction An empirical model for photon attenuation and a semi-empirical model for evaluation of tungsten target x-ray spectra were combined in order to provide an optimized method for designing a shielding for diagnostic rooms. The proposed method allows for the evaluation the amount of shielding material to be used at X-ray rooms to meet radiation protection international requirements.

**Materials and Methods** A parametrical model for photon attenuation proposed by Archer et. al. (Archer model - Health Phys. 44:507, 1983) was combined to a semiempirical model for X-ray spectra generation (TBC model-Med. Phys.18:211, 1991) in order to evaluate the actual thickness of shielding material needed for the adequate protection of diagnostic rooms. The realistic workload obtained from typical diagnostic departments were considered. The TBC model was simulated using a Mathcad (Mathsoft Inc.) routine which provides the average radiation spectra from primary, scattered and leakage radiation reaching each structural barrier in an hypothetical room.

**Results** Typical primary and secondary spectra were generated considering an average behaviour of diagnostic departments. Primary and secondary X-ray spectra weighted by a workload amount typically obtained from a R&F room are presented in Figure 1. These spectra were used to calculate the thickness needed to protect each public and controlled area of an X-ray room. Comparison to a conventional shielding calculation showed a thickness reduction as large as 35% in lead when protecting the same area.

**Conclusion** The proposed method provides a most realistic shielding evaluation which results in economic advantages during diagnostic installations design and construction. The advantages of an easy computer implementation of this methodology and the