

RESPONSE CHARACTERISTICS OF A TANDEM SYSTEM OF IONIZATION CHAMBERS IN X-RAY BEAMS, RADIOPROTECTION LEVEL

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The need to check the performance of standard dosimetric equipment is essential to assure that the dose measurements are accurate. It is very important to know the performance of the dosimetric equipment (as ionization chambers) and the characteristics of the X-ray qualities (radioprotection level) utilized in calibration laboratories. Since 1963, thermoluminescent tandem systems^[1] have been used to verify the constancy of the X-ray beams. This tandem system consists of two individual dosimeters with different energy dependence that allows the determination of characteristics as effective energy, exposure and air kerma rate of unknown X-ray beams. The tandem system is a very easy measurement system: it is only necessary to use the ratio of the responses of the dosimeters obtained in X-ray beams to verify their constancy. Studies have been realized at the Calibration Laboratory of Instituto de Pesquisas Energéticas e Nucleares, including tandem systems composed by different ionization chambers^[2]. This kind of tandem system consists of two individual ionization chambers with different energy dependences, which allows the confirmation of the half-value layers or effective energies in X-radiation beams, previously determined by the conventional method using well known absorbers layers. The response characteristics of two plane parallel ionization chambers, designed for measurements of personal dose equivalent Hp (10) inside phantoms, were studied in standard X-ray radiation qualities, radioprotection level, at the Calibration Laboratory of IPEN. A quality control program of X-ray equipment used in radioprotection is required for the periodic verification of the X-ray beams constancy. One ionization chamber was developed with inner graphite electrode and the other with inner aluminum electrode. The two ionization chambers can be used as a tandem system. The different energy response of the two ionization chambers allowed the development of the tandem system that is very useful for the checking of the constancy of beam qualities. The ionization chambers presented good results for the operational tests (saturation, ionic recombination, polarity effects, etc.) as recommended by the IEC 60731^[3] standard.

References

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