

IONIZATION CHAMBER OF THE RESPONSE INDEPENDENT
OF GAMMA RADIATION ENERGY

D. Novković and R. Tasić

Institute of Nuclear Sciences "Boris Kidrič", Beograd

An important problem in gamma radiation dosimetry is the construction of a chamber of the response independent of gamma radiation energy which would serve as a secondary standard of exposure.

For this purpose the experiments were performed with one cylindrical graphite chamber (\varnothing 26 x 20 mm, wall thickness 3.4 kg/m²) coated on the inside by a 0,5 kg/m² layer of an air-equivalent material of the following composition: 0.3578 polystyrene, 0,4772 graphite, 0,1402 Al₂O₃ and 0,0248 Al. At gamma radiation energies below 200 KeV the ionization was determined only by the air in the chamber cavity and by the air-equivalent layer since the electrons generated by gamma radiation in graphite were not capable of reaching the cavity since their range was smaller than 0,5 kg/m². Gamma radiations above 200 KeV generated in graphite electrons of the range exceeding 0,5 kg/m² so that at these energies graphite also affected the ionization in the chamber. However, for gamma radiation energies above 200 KeV the mass energy absorption coefficient of graphite was equivalent to that of the air so that it could be treated as air-equivalent at these energies.

The attenuation of gamma radiation, determined by graphite was less than that of the air-equivalent material of the same thickness. The chamber was calibrated by the primary standards of exposure of the National Bureau for Measures in Budapest^[1]. In the energy range from 35 to 1250 KeV the chamber response was independent of gamma radiation energy within $\pm 3\%$.

References

- [1] Bozóky, L., Zsdansky, K., Hizó, J. (1975), Biomedical Dosimetry, p.405 - IAEA-SM - 193/25.