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Optimal Design of Co-60 Single Source Radiation Facility with Monte Carlo Method

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Reference radiation field is necessary for calibration of radiation dose monitoring meters, and Co-60 single source radiation facility is an important equipment to produce reference radiation field. Uniformity and scattered photons are the most important criterions for reference radiation field. Monte Carlo method was used to calculate the uniformity and scattered radiation of the reference radiation field which was produced by Co-60 single source radiation facility. A close-to-reality simulation model of the facility was used for calculation scattered air-kerma along the whole range of source-detector-distance (SDD) along the central beam and air-kerma off-axis beam profiles at 1m source-detector-distance (SDD). Other characteristics such as the individual contributions of photons scattered in collimator, floor, walls, mobile platform and other parts of the radiation halls to the total air kerma rate on the beam axis were calculated. Optimal design of Co-60 single source radiation facility was accomplished according to the simulation results. PTW ionization chamber was used to measure the radiation field produced by Co-60 single source radiation facility, measured results show that the scattered radiation and uniformity of the radiation field are in good agreement with the simulation results. The total scattered contribution is less than 4.0%, fulfills the ISO 4037-1 requirement of a maximum scatter of 5%. The Co-60 single source radiation facility performances meet the design requirements.

Country/Organization invited to participate

China

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