Recent dosimetry activities at NMIJ/AIST

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1. Air kerma standards for gamma rays

Air kerma standards for ^{60}Co and ^{137}Cs gamma rays at NMIJ was peer-reviewed on December 2003 and ISO17025 quality system was established on 2004. The range of air kerma rate is from 9.7×10^{-10} to 0.15 Gy/s for ^{60}Co gamma rays and from 2.8×10^{-10} to 6.6×10^{-4} Gy/s for ^{137}Cs gamma rays. Calibration and measurement capability (k=2) is 0.72 % at 1.3×10^{-2} Gy/s for ^{60}Co gamma rays and 0.54 % at 6.6×10^{-4} Gy/s for ^{137}Cs gamma rays.

2. Air kerma standards for medium and low energy X-rays

The X-ray tube voltage is 40-250 kV for medium-energy X-rays and 10 to 50 kV for low-energy X-rays. We have re-evaluated the correction factors and the uncertainties for the medium-energy and low-energy X-ray standards since 2003. We took peer-review for X-ray standards on February 2005, and the quality system was established on April 2005. The range of air kerma rate is from 9.0×10^{-9} to 2.0×10^{-3} Gy/s for medium-energy X-rays and from 2.5×10^{-6} to 1.0×10^{-2} Gy/s for low-energy X-rays. Calibration and measurement capability (k=2) is 1.2 % at 2.7×10^{-4} Gy/s for medium-energy X-rays and 0.7 % at 4.4×10^{-5} Gy/s for low-energy X-rays. The qualities of X-rays are BIPM quality and Japanese QI (quality index, E_{eff}/E_{max}), where E_{eff} is the effective X-ray energy and E_{max} the maximum X-ray energy. We are now preparing air kerma standards for the X-ray quality of ISO 4037.

We performed bilateral mutual comparison with BIPM for low energy X-rays on November 2004. We are preparing the report of this comparison.

We performed Monte Carlo calculations using EGS4 to obtain the correction factors for the ion charge generated by X-rays scattered in the ionization chamber and the charge losses due to the collision of secondary electrons to the electrodes. We also performed Monte Carlo calculations using MCNP to obtain correction factors for the contribution of X-rays scattered from the aperture and penetration X-rays through the aperture edge.

3. Absorbed dose standards for beta radiation

We are developing absorbed dose standards for beta radiation from 2004 based ISO6980-2. We made an ionization chamber for beta radiation last year. Three beta isotopes of ^{147}Pm, ^{85}Kr, and ^{90}Sr/^{90}Y are prepared. In the beginning of 2006, we will start calibration service for beta radiation.

4. Synchrotron radiation

We start calibration service of photon intensity (photons/s) or power (W) of monochromatized soft X-rays (0.1-1 keV) using a multi-electrode ionization chamber with low pressure. The intensity measured by the ionization chamber was compared with a result by cryogenic substitution radiometer. The measured intensities disagreed about 5%. We investigate the reason of this discrepancy. We plan to extend the photon energy range up to 10 keV.