

This calibration was performed as a part of the Measurement-Assurance Program carried out for the University of Michigan School of Public Health.

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U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON, DC 20234

REPORT OF CALIBRATION

⁹⁰Sr Beta-particle Source

Isotope Products SK-308

Submitted by University of Michigan
Ann Arbor, MI 48109

Sr90-3284 (DOSAR # 25)

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Beta-particle sources are calibrated in terms of the absorbed-dose rate to water. Absorbed-dose rate is determined from current measurements with an extrapolation ionization chamber that has a tissue-equivalent-plastic collecting electrode. The water absorbed-dose rate is given by

$$\dot{D} = \frac{33.7 \times 1.111 \times S \times U}{1.197 \times A} \left(\frac{\Delta I}{\Delta d}\right)_0 \text{ Gy/s}$$

where $(\Delta I/\Delta d)_0$ is the rate of change of current (normalized to a reference temperature and pressure) with extrapolation chamber air-gap thickness as the thickness approaches zero, 33.7 is the mean energy expended per unit charge in air, 1.111 is the ratio of the mean stopping power of water to that of air, 1.197 is the density of air at the reference temperature and pressure (22°C and 1 standard atmosphere), S is a correction for scatter from the chamber supports and the shield, U is a correction for attenuation by the high-voltage electrode, and A is an area. S is a function of the distance between source and chamber, and both S and U are functions of the beta-particle energies. For calibrations at a distance from the source surface, or when the source has a larger area than that of the collecting electrode, A is the area of the collecting electrode. For calibrations at the surface of the source where the area is smaller than that of the collecting electrode, A is the active area of the source, defined as the area within the 50% isodose line at the source surface. The listed diameter is $2\sqrt{A/\pi}$.

