S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate

Standard Reference Material 4260-C

Low-Energy Photon Standard

Radionuclide	Iron-55 (1)*
Source identification	4260-C-
K-x-ray emission rate	s^{-1} per steradian (2)
Reference time	1200 EST December 9, 1982
Random uncertainty	0.2 percent (3)
Systematic uncertainty	2.7 percent (4)
Total uncertainty (Random plus systematic)	2.9 percent
Photon-emitting impurities (Activity ratios at reference time)	$^{60}Co/^{55}Fe = 2.7 \times 10^{-5} \pm 30\%$ (5)
Half life	1009.0 ± 1.7 days (5)
Measuring instrument	Low-geometry NaI(Tl) x-ray detector (6)

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Washington, D.C. 20234
December, 1982

George A. Uriano, Chief
Office of Standard Reference Materials

*Notes on back

Information on the use of SRM 4260-C
Iron-55 Point Sources

Energies and Probability per Decay*

Transition,	Energy (keV)	Abundance
K_{α_2},	5.888	0.0762
K_{α_1},	5.899	0.1506
K_β	6.490	0.0303

Additional Information

The calibration of this standard is given in terms of N_O, the number of manganese K x rays per second per steradian emitted in the direction perpendicular to the surface of the source. For most counting geometries, the detector efficiency, ϵ, can be calculated from the observed count rate, N, by means of the following formula:

$$\epsilon = \frac{N}{4\pi N_O}$$

It is recommended that the sources be placed so that the outside edges of the detector subtend angles, relative to the perpendicular from the surface of the sources, of less than 20°. This precaution will insure that errors caused by increased absorption of K-x-rays emitted away from the perpendicular, by the film of lacquer are less than 0.2%.

For detectors of larger solid angle, such as 2π, corrections can be calculated using the total scatter cross section for the lacquer, $(10 \pm 1)\ cm^2/g$.

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*Calculated from data in the following references:

P.V. Rao, M.H. Chess, and B. Crasemann, Phys. Rev., A5, 997 (1972).

G.C. Nelson, B.G. Saunders and S.I. Salem, Atomic Data, 1, No. 4, November, 1970.

FOOTNOTES

(1) Iron-55 quantitatively deposited as the chloride on the lacquered surface of a 0.05-cm thick stainless steel disk which is 2.0 cm in diameter and covered with another layer of lacquer approximately 0.004 g cm^{-2} thick. The thin disk is then attached to another stainless steel disk 2.54 cm in diameter.

(2) Emitted perpendicular to the plane of the source mount. (Also see attached information sheet).

(3) Half the 99-percent confidence interval of the mean (3.25 times the standard error computed from 10 measurements).

(4) Linear sum of estimated uncertainty limits due to:

a) source positioning	0.1 percent
b) diaphragm diameter	0.1 percent
c) air absorption	0.1 percent
d) extrapolation	0.6 percent
e) absorption of Be, Al covers on NaI(Tl) crystal	0.5 percent
f) half-life correction	0.1 percent
g) statistical error in reference source calibration	1.2 percent

(5) NBS-measured half-life value. NBS Special Publication No. 626, January 1982, p. 120.

(6) The K-x-ray-emission rate was measured in the National Bureau of Standards low-geometry sodium-iodide x-ray-detector system, by intercomparison with an ^{55}Fe K-x-ray-emission rate primary standard.