S. Department of Commerce
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Secretary

National Bureau of Standards
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National Bureau of Standards

Certificate

Standard Reference Material 4308-C

Gaseous Radioactivity Standard

Radionuclide	Krypton-85
Source identification	4308C-
Source description	Gas in a flame-sealed spherical borosilicate-glass container (1)*
Gas Composition	Krypton-85 and inactive krypton (2)
Activity	x 10^6 Bq
Reference time	1200 EST November 1, 1982
Random uncertainty	0.67 percent (3)
Systematic uncertainty	2.58 percent (4)
Total uncertainty (Random plus systematic)	3.25 percent
Photon-emitting impurities (Activity ratios at reference time)	None observed (5)
Half life	10.72 ± 0.01 years (6)
Measuring instrument	NBS pressurized "4π" γ ionization chamber B calibrated by internal gas-proportional counting

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
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George A. Uriano, Chief
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FOOTNOTES

(1) Approximate ampoule specifications:

volume	34 cm^3
outside diameter	4.5 cm
wall thickness	0.10 ± 0.02 cm

(2) Pressure - 9.7 kPa (79 Torr) ± 20%.

(3) Half the 99-percent confidence interval of the mean (2.662 times the standard deviation of the mean computed from 60 ionization-chamber measurements).

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

a) transfer of calibration from ionization chamber C to ionization chamber B, which is the linear sum of the estimated uncertainty limits due to:

1) half the 99-percent confidence interval of the mean of thirty-six sets of ionization-chamber measurements	0.57 percent
2) attenuation in walls of the aluminum ampoule holders	0.10 percent
3) gas transfer losses	0.10 percent

b) calibration of pressurized "4π"γ ionization chamber C, which is the linear sum of the estimated uncertainty limits due to:

1) half the 99-percent confidence interval of the mean of six series of gas-counting measurements	0.42 percent
2) gram-mole measurements	0.22 percent
3) extrapolation of the gas-counting data	0.20 percent
4) dilution of sources for gas counting	0.40 percent
5) half the 99-percent confidence interval of the mean of fifteen series of ionization-chamber measurements	0.07 percent
6) uncertainty in half life	0.10 percent
7) gas transfer losses	0.10 percent
8) attenuation in glass walls of containers	0.20 percent

c) attenuation in glass walls of spherical containers 0.10 percent

(5) Limits of detection as a percentage of the gamma-ray-emission rate of the 513.99-keV gamma rays emitted in the decay of krypton-85 are

0.1 percent between 40 keV and 509 keV
0.01 percent between 519 keV and 1900 keV,

provided that impurity photons are separated in energy by 5 keV or more from photons emitted in the decay of krypton-85.

(6) NCRP Report No. 58, 1978, p. 348.

Notes on the Use of Krypton-85 Gaseous Radioactivity Standard
SRM 4308-C

A half life of 10.72 ± 0.01 years and a gamma-ray probability per decay for the 513.99-keV gamma ray of 0.43 percent for krypton-85 are suggested (NCRP Report No. 58, p. 348, 1978).

When this source is used to measure the efficiency as a function of energy of a photon-spectrometer system, the attenuation in the glass walls of the 34 cm^3 ampoule must be considered. The attenuation, 2.9 percent, for the 513.99-keV gamma ray was determined using a Ge(Li)-spectrometer system with a resolution of 1.17-keV full width at half maximum at 514 keV. For a germanium-spectrometer system of poorer resolution, or a NaI(Tl)-spectrometer system, this attenuation would be a maximum value.