

National Bureau of Standards

Certificate

Standard Reference Material 4416L-F

Radioactivity Standard

Radionuclide	Gallium-67
Source identification	4416L-F-
Source description	Liquid in NBS borosilicate-glass ampoule (1)*
Solution composition	Approximately 110 micrograms of GaCl ₃ per gram of 2 molar hydrochloric acid (2)
Mass	grams
Radioactivity concentration	3.922×10^6 Bq g ⁻¹
Reference time	1500 EST April 23, 1985
Overall uncertainty	0.80 percent (3)
Photon-emitting impurities	None observed (4)
Half life	3.261 ± 0.001 days (5)
Measuring instrument	NBS pressurized ⁴ π ⁺ γ ionization chamber calibrated by 4π(e,x)-γ coincidence efficiency-extrapolation technique

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

Gaithersburg, MD 20899
May 1985

Stanley D. Rasberry, Chief
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*Notes on back

NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

- (2) Solution density 1.032 ± 0.002 g/mL at 22.6°C.

- (3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) 18 coincidence measurements	0.08 percent
b) 18 ionization-chamber measurements	0.01 percent
c) dead time	0.08 percent
d) resolving time	0.10 percent
e) backgrounds	0.11 percent
f) gravimetric measurements	0.05 percent
g) original ionization-chamber measurements	0.02 percent
h) efficiency extrapolation	0.10 percent
i) half life	0.10 percent
j) solution composition and density	0.05 percent
k) radium 100 to radium 20 reference sources ratio	0.03 percent
l) radium reference source positioning	0.10 percent

- (4) Limits of detection as a percentage of the gamma-ray-emission rate of the 93-keV gamma rays emitted in the decay of gallium-67 are

0.1 percent between 90 and 388 keV

0.01 percent between 398 and 1900 keV,

provided that the impurity photons are separated in energy by five keV or more from photons emitted in the decay of gallium-67.

- (5) NCRP Report No. 58, 2nd edition (1985), p. 390.