

National Bureau of Standards

Certificate

Standard Reference Material 4214-B

Radioactivity Standard

Radionuclide	Cobalt-57
Source identification	4214-B-
Source description	Point source (1)*
Activity	Bq
Reference time	1200 EST February 1, 1985
Overall uncertainty	0.78 percent (2)
Photon-emitting impurities (Activity ratios at reference time)	$^{56}\text{Co}/^{57}\text{Co}: (4.64 \pm 0.23) \times 10^{-4}$ (3) $^{58}\text{Co}/^{57}\text{Co}: (6.88 \pm 0.69) \times 10^{-5}$ $^{65}\text{Zn}/^{57}\text{Co}: (6.0 \pm 5.4) \times 10^{-6}$
Half life	271.9 ± 0.2 days (4)
Measuring instrument	NBS pressurized 4π - γ ionization chamber calibrated by $4\pi(e, x)$ - 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
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NOTES

(1) The point-source support is a 5.4-cm diameter x 0.5-mm thick aluminum annulus supporting a 0.006-cm thick layer of polyester tape. The active source is approximately 6-mm diameter dried deposit of cobalt-57 as the chloride, on cation-exchange paper, covered with another layer of the same tape.

(2) 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) 40 ionization-chamber measurements	0.01 percent
b) photon-emitting impurities	0.14 percent
c) standard deviation of the mean of eight coincidence measurements	0.02 percent
d) dead time	0.05 percent
e) resolving time	0.03 percent
f) background	0.03 percent
g) half life	0.01 percent
h) gravimetric measurements	0.05 percent
i) standard deviation of the mean of the original ionization-chamber measurements	0.03 percent
j) efficiency extrapolation	0.20 percent

(3) Limits of detection as a percentage of the gamma-ray-emission rate of the 122.063-keV gamma rays emitted in the decay of cobalt-57 are

0.1 percent between 12 and 131 keV
0.01 percent between 141 and 1900 keV,

provided that the impurity photons are separated in energy by five keV or more from photons emitted in the decay of cobalt-57.

(4) NBS-measured half-life value. The Handbook of Radioactivity Measurements Procedures, NCRP Report No. 58, 2nd edition, 1985, lists a half-life value of 271.7 ± 0.2 days.