

# National Bureau of Standards Certificate Standard Reference Material 4215 Mixed Radionuclide Gamma-Ray Emission-Rate Point-Source Standard

This standard consists of cobalt-57, cobalt-60, strontium-85, yttrium-88, cadmium-109, tin-113-indium-113m, cesium-137-barium-137m, cerium-139, and mercury-203, deposited as the chlorides and sulfides, on polyester tape approximately 0.006-centimeter thick and covered by another layer of the same tape.

The point source was prepared by depositing a weighed aliquot of a calibrated radionuclide mixture on the tape and exposing it to hydrogen sulfide gas to precipitate the mercuric sulfide.

The gamma-ray emission rates of the solutions used to prepare the radionuclide mixture were determined by means of the NBS calibrated "4πγ"-ionization chamber, using, where necessary, assumed nuclear decay parameters.

The nuclear gamma-ray emission rates at 1200 EST June 1, 1973 are shown in the table below (reverse).

The cobalt-57 contains cobalt-56 and cobalt-58 as impurities. The activity ratios,  $^{56}\text{Co}/^{57}\text{Co}$  and  $^{58}\text{Co}/^{57}\text{Co}$ , were approximately  $7.7 \times 10^{-4}$  and  $4.5 \times 10^{-4}$ , respectively, at 1200 EST June 1, 1973. The cesium-137-barium-137m contains cesium-134 as an impurity. The activity ratio,  $^{134}\text{Cs}/^{137}\text{Cs}$ , was approximately  $1.3 \times 10^{-4}$  at 1200 EST June 1, 1973. The gamma-ray spectrum of each component was examined using a Ge(Li) detector and no other impurities were found.

This standard was prepared in the NBS Center for Radiation Research, Radioactivity Section, W. B. Mann, Chief.

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Washington, D. C. 20234

J. Paul Cali, Chief  
Office of Standard Reference Materials

(over)

Radionuclide	γ-Ray Energy (MeV) <sup>a</sup>	γ-Ray Intensity (%) <sup>a</sup>	Half-Life <sup>b</sup>	γ/s	Error %		
					Random	System	Total
<sup>109</sup> Cd	0.0877		1.2727y		0.1	2.7	2.8
<sup>57</sup> Co	0.122	85.6±0.2	271.41d		0.1	2.2	2.3
<sup>139</sup> Ce	0.166	79.9±0.3 <sup>b</sup>	137.87d		0.1	3.0	3.1
<sup>203</sup> Hg	0.279	81.5±0.2	46.61d		0.1	1.1	1.2
<sup>113</sup> Sn- <sup>113m</sup> In	0.392		115.31d		0.1	2.8	2.9
<sup>85</sup> Sr	0.514	99.28±0.01	64.86d		0.1	1.6	1.7
<sup>137</sup> Cs- <sup>137m</sup> Ba	0.662	85.0±0.3 <sup>c</sup>	30y		0.1	2.0	2.1
<sup>60</sup> Co	1.173	99.88±0.02	5.261y		0.1	1.3	1.4
	1.333	100			0.1	1.3	1
<sup>88</sup> Y	0.898	93.4±0.7	106.63d		0.1	2.9	3
	1.836	99.37±0.02			0.1	2.2	2.3

<sup>a</sup>Nuclear Data Tables, A8, Nos. 1-2 (Oct. 1970).

<sup>b</sup>NBS measured values.

<sup>c</sup>The latest recommended value for this intensity was obtained from Dr. Murray Martin, Oak Ridge National Laboratory.