

Quantities<sup>1</sup> of licensed material requiring labeling.

Radionuclide	Quantity ( $\mu$ Ci)*	Radionuclide	Quantity ( $\mu$ Ci)*
Hydrogen-3	1,000	Vanadium 47	1,000
Beryllium-7	1,000	Vanadium-48	100
Beryllium-10	1	Vanadium-49	1,000
Carbon-11	1,000	Chromium-48	1,000
Carbon-14	1,000	Chromium-49	1,000
Fluorine-18	1,000	Chromium-51	1,000
Sodium-22	10	Manganese-51	1,000
Sodium-24	100	Manganese-52m	1,000
Magnesium-28	100	Manganese-52	100
Aluminum-26	10	Manganese-53	1,000
Silicon-31	1,000	Manganese-54	100
Silicon-32	1	Manganese-56	1,000
Phosphorus-32	10	Iron-52	100
Phosphorus-33	100	Iron-55	100
Sulfur-35	100	Iron-59	10
Chlorine-36	10	Iron-60	1
Chlorine-38	1,000	Cobalt-55	100
Chlorine-39	1,000	Cobalt-56	10
Argon-39	1,000	Cobalt-57	100
Argon-41	1,000	Cobalt-58m	1,000
Potassium-40	100	Cobalt-58	100
Potassium-42	1,000	Cobalt-60m	1,000
Potassium-43	1,000	Cobalt-60	1
Potassium-44	1,000	Cobalt-61	1,000
Potassium-45	1,000	Cobalt-62m	1,000
Calcium-41	100	Nickel-56	100
Calcium-45	100	Nickel-57	100
Calcium-47	100	Nickel-59	100
Scandium-43	1,000	Nickel-63	100
Scandium-44m	100	Nickel-65	1,000
Scandium-44	100	Nickel-66	10
Scandium-46	10	Copper-60	1,000
Scandium-47	100	Copper-61	1,000
Scandium-48	100	Copper-64	1,000
Scandium-49	1,000	Copper-67	1,000
Titanium-44	1	Zinc-62	100
Titanium-45	1,000	Zinc-63	1,000

Zinc-65	10	Bromine-74m	1,000
Zinc-69m	100	Bromine-74	1,000
Zinc-69	1,000	Bromine-75	1,000
Zinc-71m	1,000	Bromine-76	100
Zinc-72	100	Bromine-77	1,000
Gallium-65	1,000	Bromine-80m	1,000
Gallium-66	100	Bromine-80	1,000
Gallium-67	1,000	Bromine-82	100
Gallium-68	1,000	Bromine-83	1,000
Gallium-70	1,000	Bromine-84	1,000
Gallium-72	100	Krypton-74	1,000
Gallium-73	1,000	Krypton-85	1,000
Germanium-66	1,000	Krypton-87	1,000
Germanium-67	1,000	Krypton-88	1,000
Germanium-68	10	Rubidium-79	1,000
Germanium-69	1,000	Rubidium-81m	1,000
Germanium-71	1,000	Rubidium-81	1,000
Germanium-75	1,000	Rubidium-82m	1,000
Germanium-77	1,000	Rubidium-83	100
Germanium-78	1,000	Rubidium-84	100
Arsenic-69	1,000	Rubidium-86	100
Arsenic-70	1,000	Rubidium-87	100
Arsenic-71	100	Rubidium-88	1,000
Arsenic-72	100	Rubidium-89	1,000
Arsenic-73	100	Strontium-80	100
Arsenic-74	100	Strontium-81	1,000
Arsenic-76	100	Strontium-83	100
Arsenic-77	100	Strontium-85m	1,000
Arsenic-78	1,000	Strontium-85	100
Selenium-70	1,000	Strontium-87m	1,000
Selenium-73m	1,000	Strontium-89	10
Selenium-73	100	Strontium-90	0.1
Selenium-75	100	Strontium-91	100
Selenium-79	100	Strontium-92	100
Selenium-81m	1,000	Yttrium-86m	1,000
Selenium-81	1,000	Yttrium-86	100
Selenium-83	1,000	Yttrium-87	100

Yttrium-88	10	Technitium-96m	1,000
Yttrium-90m	1,000	Technitium-96	100
Yttrium-90	10	Technitium-97m	100
Yttrium-91m	1,000	Technitium-97	1,000
Yttrium-91	10	Technitium-98	10
Yttrium-92	100	Technitium-99m	1,000
Yttrium-93	100	Technitium-99	100
Yttrium-94	1,000	Technitium-101	1,000
Yttrium-95	1,000	Technitium-104	1,000
Zirconium-86	100	Ruthenium-94	1,000
Zirconium-88	10	Ruthenium-97	1,000
Zirconium-89	100	Ruthenium-103	100
Zirconium-93	1	Ruthenium-105	1,000
Zirconium-95	10	Ruthenium-106	1
Zirconium-97	100	Rhodium-99m	1,000
Niobium-88	1,000	Rhodium-99	100
Krypton-76	1,000	Rhodium-100	100
Krypton-77	1,000	Rhodium-101m	1,000
Krypton-79	1,000	Rhodium-101	10
Krypton-81	1,000	Rhodium-102m	10
Krypton-83m	1,000	Rhodium-102	10
Krypton-85m	1,000	Niobium-89	
Niobium-94	1	(66 min)	1,000
Niobium-95m	100	Niobium-89	
Niobium-85	100	(122 min)	1,000
Niobium-96	100	Niobium-90	100
Niobium-97	1,000	Niobium-93m	10
Niobium-98	1,000	Silver-104	1,000
Molybdenum-90	100	Silver-105	100
Molybdenum-93m	100	Silver-106m	100
Molybdenum-93	10	Silver-106	1,000
Molybdenum-99	100	Silver-108m	1
Molybdenum-101	1,000	Silver-110m	10
Technitium-93m	1,000	Silver-111	100
Technitium-93	1,000	Silver-112	100
Technitium-94m	1,000	Silver-115	1,000
Technitium-94	1,000	Cadmium-104	1,000

Cadmium-107	1,000	Silver-104m	1,000
Cadmium-109	1	Antimony-116	1,000
Cadmium-113m	0.1	Antimony-117	1,000
Cadmium-113	100	Antimony-118m	1,000
Cadmium-115m	10	Antimony-119	1,000
Cadmium-115	100	Antimony-120	
Cadmium-117m	1,000	(16m)	1,000
Cadmium-117	1,000	Antimony-120	
Indium-109	1,000	(5.76d)	100
Indium-110m		Antimony-122	100
(69.1m)	1,000	Antimony-124m	1,000
Indium-110m		Antimony-124	10
(4.9h)	1,000	Antimony-125	100
Indium-111	100	Antimony-126m	1,000
Indium-112	1,000	Antimony-126	100
Indium-113m	1,000	Antimony-127	100
Indium-114m	10	Antimony-128	
Indium-115m	1,000	(10.4m)	1,000
Indium-115	100	Antimony-128	
Indium-116m	1,000	(9.01h)	100
Indium-117m	1,000	Antimony-129	100
Indium-117	1,000	Antimony-130	1,000
Indium-119m	1,000	Antimony-131	1,000
Tin-110	100	Tellurium-116	1,000
Tin-111	1,000	Tellurium-121m	10
Tin-113	100	Tellurium-121	100
Rhodium-103m	1,000	Tellurium-123m	10
Rhodium-105	100	Tellurium-123	100
Rhodium-106m	1,000	Tellurium-125m	10
Rhodium-107	1,000	Tellurium-127m	10
Palladium-100	100	Tellurium-127	1,000
Palladium-101	1,000	Tellurium-129m	10
Palladium-103	100	Tin-117m	100
Palladium-107	10	Tin-119m	100
Palladium-109	100	Tin-121m	100
Silver-102	1,000	Tin-121	1,000
Silver-103	1,000	Tin-123m	1,000

Tin-123	10	Cesium-137	10
Tin-125	10	Tellurium-129	1,000
Tin-126	10	Tellurium-131m	10
Tin-127	1,000	Tellurium-131	100
Tin-128	1,000	Tellurium-132	10
Antimony-115	1,000	Tellurium-133m	100
Antimony-116m	1,000	Tellurium-133	1,000
Iodine-131	1	Tellurium-134	1,000
Iodine-132m	100	Iodine-120m	1,000
Iodine-132	100	Iodine-120	100
Iodine-133	10	Iodine-121	1,000
Iodine-134	1,000	Iodine-123	100
Iodine-135	100	Iodine-124	10
Xenon-120	1,000	Iodine-125	1
Xenon-121	1,000	Iodine-126	1
Xenon-122	1,000	Iodine-128	1,000
Xenon-123	1,000	Iodine-129	1
Xenon-125	1,000	Iodine-130	10
Xenon-127	1,000	Lanthanum-140	100
Xenon-129m	1,000	Lanthanum-141	100
Xenon-131m	1,000	Lanthanum-142	1,000
Xenon-133m	1,000	Lanthanum-143	1,000
Xenon-133	1,000	Cerium-134	100
Xenon-135m	1,000	Cerium-135	100
Xenon-135	1,000	Cerium-137m	100
Xenon-138	1,000	Cerium-137	1,000
Cesium-125	1,000	Cerium-139	100
Cesium-127	1,000	Cerium-141	100
Cesium-129	1,000	Cerium-143	100
Cesium-130	1,000	Cerium-144	1
Cesium-131	1,000	Praseodymium-136	1,000
Cesium-132	100	Praseodymium-137	1,000
Cesium-134m	1,000	Praseodymium-138m	1,000
Cesium-134	10	Praseodymium-139	1,000
Cesium-135m	1,000	Praseodymium-142m	1,000
Cesium-135	100	Praseodymium-142	100
Cesium-136	10	Praseodymium-143	100

Praseodymium-144	1,000	Europium-152	1
Praseodymium-145	100	Europium-154	1
Praseodymium-147	1,000	Europium-155	10
Neodymium-136	1,000	Europium-156	100
Neodymium-138	100	Europium-157	100
Neodymium-139m	1,000	Europium-158	1,000
Neodymium-139	1,000	Gadolinium-145	1,000
Cesium-138	1,000	Gadolinium-146	10
Barium-126	1,000	Gadolinium-147	100
Barium-128	100	Gadolinium-148	0.001
Barium-131m	1,000	Gadolinium-149	100
Barium-131	100	Gadolinium-151	10
Barium-133m	100	Gadolinium-152	100
Barium-133	100	Neodymium-141	1,000
Barium-135m	100	Neodymium-147	100
Barium-139	1,000	Neodymium-149	1,000
Barium-140	100	Neodymium-151	1,000
Barium-141	1,000	Promethium-141	1,000
Barium-142	1,000	Promethium-143	100
Lanthanum-131	1,000	Promethium-144	10
Lanthanum-132	100	Promethium-145	10
Lanthanum-135	1,000	Promethium-146	1
Lanthanum-137	10	Promethium-147	10
Lanthanum-138	100	Promethium-148m	10
Samarium-153	100	Promethium-148	10
Samarium-155	1,000	Promethium-149	100
Samarium-156	1,000	Promethium-150	1,000
Europium-145	100	Promethium-151	100
Europium-146	100	Samarium-141m	1,000
Europium-147	100	Samarium-141	1,000
Europium-148	10	Samarium-142	1,000
Europium-149	100	Samarium-145	100
Europium-150		Samarium-146	1
(12.62h)	100	Samarium-147	100
Europium-150		Samarium-151	10
(34.2y)	1	Dysprosium-166	100
Europium-152m	100	Holmium-1155	1,000

Holmium-157	1,000	Dysprosium-155	1,000
Holmium-159	1,000	Dysprosium-157	1,000
Holmium-161	1,000	Dysprosium-159	100
Holmium-162m	1,000	Dysprosium-165	1,000
Holmium-162	1,000	Hafnium-173	1,000
Holmium-164m	1,000	Hafnium-175	100
Holmium-164	1,000	Hafnium-177m	1,000
Holmium-166m	1	Hafnium-178m	0.1
Holmium-166	100	Hafnium-179m	10
Holmium-167	1,000	Hafnium-180m	1,000
Erbium-161	1,000	Hafnium-181	10
Erbium-165	1,000	Hafnium-182m	1,000
Erbium-169	100	Hafnium-182	0.1
Erbium-171	100	Hafnium-183	1,000
Erbium-172	100	Hafnium-184	100
Thulium-162	1,000	Tantalum-172	1,000
Thulium-166	100	Tantalum-173	1,000
Thulium-167	100	Tantalum-174	1,000
Thulium-170	10	Tantalum-175	1,000
Gadolinium-153	10	Tantalum-176	100
Gadolinium-159	100	Tantalum-177	1,000
Terbium-147	1,000	Tantalum-178	1,000
Terbium-149	100	Tantalum-179	100
Terbium-150	1,000	Tantalum-180m	1,000
Terbium-151	100	Tantalum-180	100
Terbium-153	1,000	Thulium-171	10
Terbium-154	100	Thulium-172	100
Terbium-155	1,000	Thulium-173	100
Terbium-156m		Thulium-175	1,000
(5.0h)	1,000	Ytterbium-162	1,000
Terbium-156m		Ytterbium-166	100
(24.4h)	1,000	Ytterbium-167	1,000
Terbium-156	100	Ytterbium-169	100
Terbium-157	10	Ytterbium-175	100
Terbium-158	1	Ytterbium-177	1,000
Terbium-160	10	Ytterbium-178	1,000
Terbium-161	100	Lutetium-169	100

Lutetium-170	100	Tungsten-176	1,000
Lutetium-171	100	Tungsten-177	1,000
Lutetium-172	100	Tungsten-178	1,000
Lutetium-173	10	Tungsten-179	1,000
Lutetium-174m	10	Tungsten-181	1,000
Lutetium-174	10	Tungsten-185	100
Lutetium-176m	1,000	Tungsten-187	100
Lutetium-176	100	Tungsten-188	10
Lutetium-177m	10	Rhenium-177	1,000
Lutetium-177	100	Rhenium-178	1,000
Lutetium-178m	1,000	Rhenium-181	1,000
Lutetium-178	1,000	Rhenium-182	
Lutetium-179	1,000	(12.7h)	1,000
Hafnium-170	100	Rhenium-182	
Hafnium-172	1	(64.0h)	100
Rhenium-188	100	Rhenium-184m	10
Rhenium-189	100	Rhenium-184	100
Osmium-180	1,000	Rhenium-186m	10
Osmium-181	1,000	Rhenium-186	100
Osmium-182	100	Rhenium-187	1,000
Osmium-185	100	Rhenium-188m	1,000
Osmium-189m	1,000	Mercury-194	1
Osmium-191m	1,000	Mercury-195m	100
Osmium-191	100	Mercury-195	1,000
Osmium-193	100	Mercury-197m	100
Osmium-194	100	Mercury-197	1,000
Iridium-182	1,000	Mercury-199m	1,000
Iridium-184	1,000	Mercury-203	100
Iridium-185	1,000	Thallium-194m	1,000
Iridium-186	100	Thallium-194	1,000
Iridium-187	1,000	Thallium-195	1,000
Tantalum-182m	1,000	Thallium-197	1,000
Tantalum-182	10	Thallium-198m	1,000
Tantalum-183	100	Thallium-198	1,000
Tantalum-184	100	Thallium-199	1,000
Tantalum-185	1,000	Thallium-200	1,000
Tantalum-186	1,000	Thallium-201	1,000



Iridium-188	100	Francium-223	100
Iridium-189	100	Radium-223	0.1
Iridium-190m	1,000	Radium-224	0.1
Iridium-190	100	Radium-225	0.1
Iridium-192m	1	Radium-226	0.1
Iridium-192	10	Radium-227	1,000
Iridium-194m	10	Thallium-202	100
Iridium-194	100	Thallium-204	100
Iridium-195m	1,000	Lead-195m	1,000
Iridium-195	1,000	Lead-198	1,000
Platinum-186	1,000	Lead-199	1,000
Platinum-188	100	Lead-200	100
Platinum-189	1,000	Lead-201	1,000
Platinum-191	100	Lead-202m	1,000
Platinum-193m	100	Lead-202	10
Platinum-193	1,000	Lead-203	1,000
Platinum-195m	100	Lead-205	100
Platinum-197m	1,000	Lead-209	1,000
Platinum-197	100	Lead-210	0.01
Platinum-199	1,000	Lead-211	100
Platinum-200	100	Lead-212	1
Gold-193	1,000	Lead-214	100
Gold-194	100	Bismuth-200	1,000
Gold-195	10	Bismuth-201	1,000
Gold-198m	100	Bismuth-202	1,000
Gold-198	100	Bismuth-203	100
Gold-199	100	Bismuth-205	100
Gold-200m	100	Bismuth-206	100
Gold-200	1,000	Bismuth-207	10
Gold-201	1,000	Bismuth-210m	0.1
Mercury-193m	100	Bismuth-210	1
Mercury-193	1,000	Bismuth-212	10
Astatine-207	100	Bismuth-213	10
Astatine-211	10	Bismuth-214	100
Radon-220	1	Polonium-203	1,000
Radon-222	1	Polonium-205	1,000
Francium-222	100	Polonium-207	1,000

Polonium-210	0.1	Uranium-233	0.001
Neptunium-234	100	Uranium-234	0.001
Neptunium-235	100	Uranium-235	0.001
Neptunium-236 (1.15x10y)	0.001	Uranium-236	0.001
Neptunium-236 (22.5h)	1	Uranium-237	100
Neptunium-237	0.001	Uranium-238	100
Neptunium-238	10	Uranium-239	1,000
Neptunium-239	100	Uranium-240	100
Neptunium-240	1,000	Uranium-natural	100
Plutonium-234	10	Neptunium-232	100
Radium-228	0.1	Neptunium-233	1,000
Actinium-224	1	Berkelium-246	100
Actinium-225	0.01	Berkelium-247	0.001
Actinium-226	0.1	Berkelium-249	0.1
Actinium-227	0.001	Berkelium-250	10
Actinium-228	1	Californium-244	100
Thorium-226	10	Californium-246	1
Thorium-227	0.01	Californium-248	0.01
Thorium-228	0.001	Plutonium-235	1,000
Thorium-229	0.001	Plutonium-236	0.001
Thorium-230	0.001	Plutonium-237	100
Thorium-231	100	Plutonium-238	0.001
Thorium-232	100	Plutonium-239	0.001
Thorium-234	10	Plutonium-240	0.001
Thorium-natural	100	Plutonium-241	0.01
Protactinium-227	10	Plutonium-242	0.001
Protactinium-228	1	Plutonium-243	1,000
Protactinium-230	0.1	Plutonium-244	0.001
Protactinium-231	0.001	Plutonium-245	100
Protactinium-232	1	Americium-237	1,000
Protactinium-233	100	Americium-238	100
Protactinium-234	100	Americium-239	1,000
Uranium-230	0.01	Americium-240	100
Uranium-231	100	Americium-241	0.001
Uranium-232	0.001	Americium-242m	0.001
		Americium-242	10
		Americium-243	0.001

Americium-244m	100	Einsteinium-251	100
Americium-244	10	Einsteinium-253	0.1
Americium-245	1,000	Einsteinium-254m	1
Americium-246m	1,000	Einsteinium-254	0.01
Americium-246	1,000	Fermium-252	1
Curium-238	100	Fermium-253	1
Curium-240	0.1	Californium-249	0.001
Curium-241	1	Californium-250	0.001
Curium-242	0.01	Californium-251	0.001
Curium-243	0.001	Californium-252	0.001
Curium-244	0.001	Californium-253	0.1
Curium-245	0.001	Californium-254	0.001
Curium-246	0.001	Fermium-254	10
Curium-247	0.001	Fermium-255	1
Curium-248	0.001	Fermium-257	0.01
Curium-249	1,000	Mendelevium-257	10
Berkelium-245	100	Mendelevium-258	0.01
Einsteinium-250	100		

Any alpha-emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition

0.001

Any radionuclide other than alpha-emitting radionuclides not listed above, or mixtures of beta emitters of unknown composition

0.01

NOTE: For purposes of subsections (aa)(5), (dd)(1), and (ww)(1) of this section where there is involved a combination of radionuclides in known amounts, the limit for the combination should be derived as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide when not in combination. The sum of such ratios for all radionuclides in the combination may not exceed "1" -- that is, unity.

<sup>1</sup>The quantities listed above were derived by taking 1/10th of the most restrictive ALI listed in Columns 1 and 2 of Table I of paragraph (2)(F) of this subsection, rounding to the nearest factor of 10, and constraining the values listed between 0.001 and 1,000 microcuries (37 becquerels and 37 megabecquerels). Values of 100 microcuries (3.7 megabecquerels) have been assigned for radionuclides having a radioactive half-life in excess of E+9 years, except rhenium, 1,000 microcuries (37 megabecquerels), to take into account their low specific activity.

\* To convert microcurie ( $\mu\text{Ci}$ ) to kilobecquerel, multiply the microcurie value by 37.