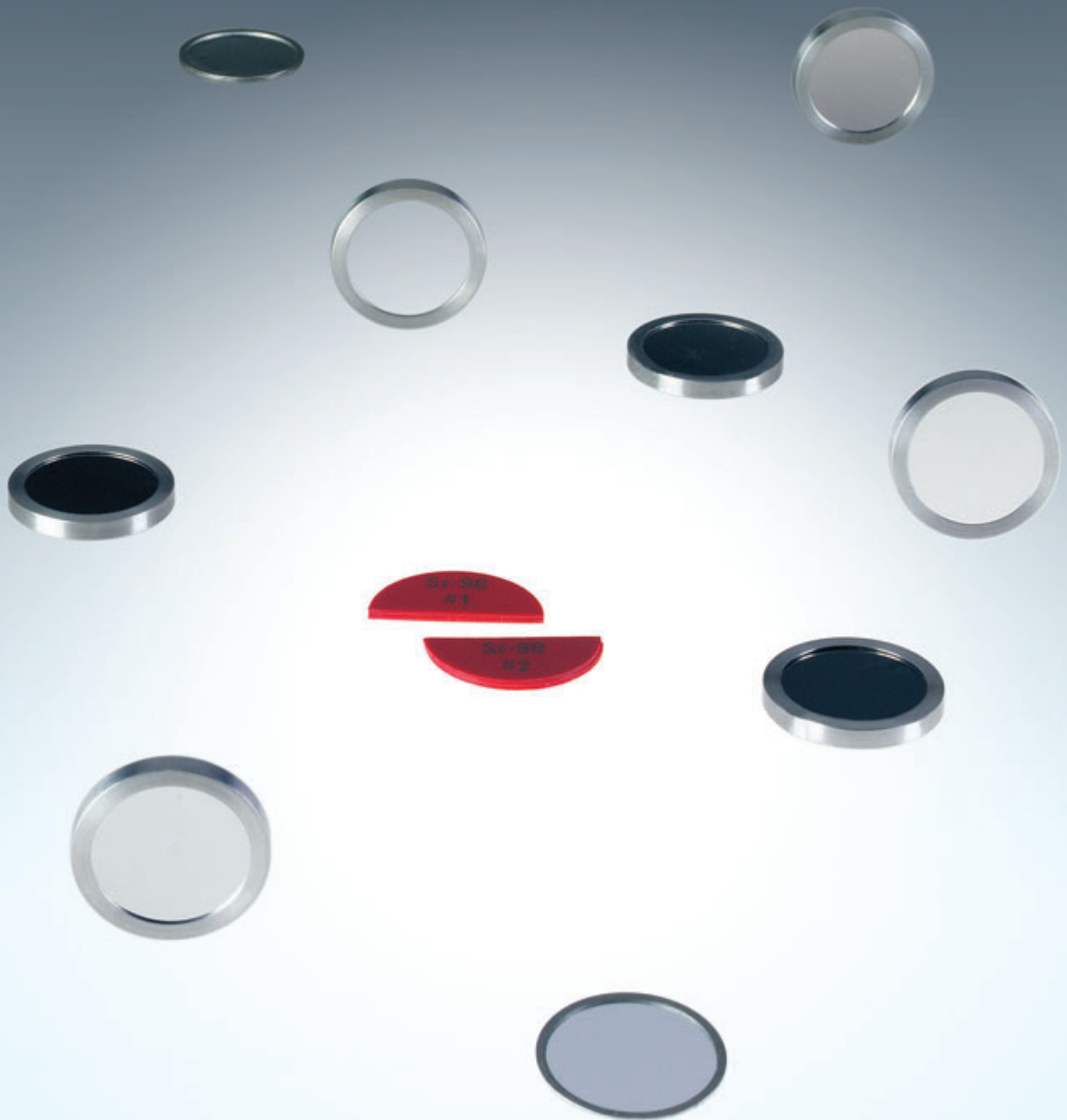


Beta Particle Standards



A wide range of beta emitting nuclides are offered for counting and educational uses. Certification of all BF Series sources includes both contained activity and 2π emission rate. Sources are traceable to NIST with ±2% to ±5% accuracy at the 99% confidence level. Source configurations are surface conductive on all surfaces to enable their use in windowless proportional counters.

**Beta Particle Standards—
Type A and Type MF2**

See the following pages 42 and 43 for descriptions.

**Split Source Set—
BF-090SPLIT**

This source is for use in determining coincidence corrections for G.M. counters. It consists of two plastic half disks with a total overall diameter of 1" (25.4 mm). Each half-source contains a nominal 0.1 μCi (3.7 kBq) of Sr-90/Y-90.

**Beta Standards Set—
BF-200**

This set consists of six nuclides covering the energy range 156-2282 keV (maximum): C-14, Tc-99, Cl-36, Pb-210/Bi-210, Pm-147 and Sr-90/Y-90. This set can be ordered without Lead-210. The C-14 source contains 0.1 μCi (3.7 kBq). The other nuclides contain 0.01 μCi (370 Bq). The sources are Type A or Type MF2, 1" (25.4 mm) overall diameter and 0.125" (3.18 mm) thick. Customer will specify source type. Please note that Pb-210 is not offered in the MF2 configuration. Included in each set is an empty mount, one 0.9 mg/cm² aluminized Mylar window, one stainless steel disk, aluminum plug, aluminum support ring, and a Model BF-090SPLIT split source.

Sr-90 Sources

Sr-90 sources produced by EZIP are certified as to the contained activity of the Sr-90 only. Sr-90, a beta emitter, is in equilibrium with the Y-90 daughter. Thus, a 1 μCi (37 kBq) Sr-90 source also contains 1 μCi (37 kBq) of Y-90. When comparing sources in similar geometries (i.e., similar backing, cover and source detector distance) good results should be obtained. Sr-90 has an average beta energy of 196 keV and Y-90 has an average beta energy of 934 keV, thus care must be taken when comparing sources of substantially different geometries since effects such as backscatter and window absorption must be considered.

Beta Source Sets					
Catalog Number	Overall Dimensions (OD x Height)	Active Diameter	Nature of Active Material	Window	Set Consists Of
BF-200	1" x 0.125" 25.4 mm x 3.18 mm	0.805" 20.4 mm	Evaporative Salts on Mylar	0.9 mg/cm ² Mylar	C-14 (0.1 μCi/3.7 kBq), Tc-99, Cl-36, Pb-210/Bi-210, Sr-90/Y-90, Pm-147 (0.01 μCi/370 Bq each), Type A or MF2 Disc, NIST Traceable, Nominal Split Source
BF-0200E	1" x 0.125" 25.4 mm x 3.18 mm	0.805" 20.4 mm	Evaporative Salts on Mylar	0.9 mg/cm ² Mylar	C-14 (0.1 μCi/3.7 kBq), Tc-99, Cl-36, Pb-210/Bi-210, Sr-90/Y-90, Pm-147 (0.01 μCi/370 Bq each), Type A or MF2 Disc, Exempt Source, NIST Traceable, Nominal split source
BF-0200CK	1" x 0.125" 25.4 mm x 3.18 mm	0.805" 20.4 mm	Evaporative Salts on Mylar	0.9 mg/cm ² Mylar	C-14 (0.1 μCi/3.7 kBq), Tc-99, Cl-36, Pb-210/Bi-210, Sr-90/Y-90, Pm-147 (0.01 μCi/370 Bq each), Type A or MF2 Disc, Non-Exempt Source, Nominal, Nominal Split Source
BF-0200CKE	1" x 0.125" 25.4 mm x 3.18 mm	0.805" 20.4 mm	Evaporative Salts on Mylar	0.9 mg/cm ² Mylar	C-14 (0.1 μCi/3.7 kBq), Tc-99, Cl-36, Pb-210/Bi-210, Sr-90/Y-90, Pm-147 (0.01 μCi/370 Bq each), Type A or MF2 Disc, Exempt Source, Nominal, Nominal Split Source

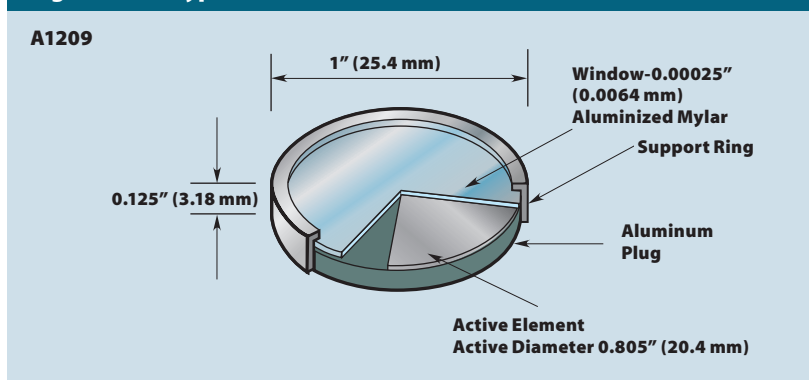
Beta Particle Standards

Beta Particle Standards—Type A

The active material is uniformly distributed over the surface of a 0.937" (23.8 mm) diameter foil and sealed in an aluminum mounting ring under a 0.9 mg/cm² aluminized Mylar window for most nuclides. The active diameter of the source is 0.805" (20.4 mm). Special absorbers may be included under the window to filter undesirable low energy radiation. This configuration is most useful for determining efficiencies of G.M. and windowless counters used for beta assaying evaporated liquid samples. The overall source diameter is 1" (25.4 mm) and 0.125" (3.18 mm) thick.



Figure 42-A: Type A-1 Disk



Overall Dimensions

Overall Diameter	Active Diameter	Height
1"	0.805"	0.125"
25.4 mm	20.4 mm	3.18 mm

Nature of Active Deposit	Available Activities
Evaporated Salts on 0.010" Stainless Steel	5 nCi -100 nCi (185 Bq - 3.7 kBq)

Exceptions
Bi-210 : 10 nCi - 100 nCi (370 Bq - 3.7 kBq)
Sr-90 : 2.5 nCi - 100 nCi (92.5 Bq - 3.7 kBq)

Beta Particle Standards—Type A

Catalog Number	Nuclide	Half-Life	Substrate	Significant Beta Energies (E _{max} keV)	Window
BF-210-A	Bismuth-210 (Pb-210 parent)	22.3 y	Stainless Steel	1160	6.9 mg/cm ² Aluminum
BF-014-A	Carbon-14	5730 y	Polymeric Membrane	156	0.9 mg/cm ² Aluminized Mylar
BF-137-A	Cesium-137	30.17 y	Stainless Steel	1175	0.9 mg/cm ² Aluminized Mylar
BF-036-A	Chlorine-36	3.01 x 10 ⁵ y	Stainless Steel	1142	0.9 mg/cm ² Aluminized Mylar
BF-060-A	Cobalt-60	5.272 y	Stainless Steel	1491	0.9 mg/cm ² Aluminized Mylar
BF-068-A	Germanium-68 (1)	270.8 d	Stainless Steel	2921 (β ⁺)	0.9 mg/cm ² Aluminized Mylar
BF-147-A	Promethium-147	2.6234 y	Stainless Steel	225	0.9 mg/cm ² Aluminized Mylar
BF-106-A	Ruthenium-106/Rhodium-106	1.020 y	Stainless Steel	39, 3540	0.9 mg/cm ² Aluminized Mylar
BF-032-A	Silicon-32/Phosphorus-32 (2)	104 y	Stainless Steel	225, 1710	13.7 mg/cm ² Aluminum
BF-022-A	Sodium-22	950.8 d	Stainless Steel	2842 (β ⁺)	0.9 mg/cm ² Aluminized Mylar
BF-090-A	Strontium-90/Yttrium-90 (3)	28.5 y	Stainless Steel	546, 2282	0.9 mg/cm ² Aluminized Mylar
BF-099-A	Technetium-99	2.13 x 10 ⁵ y	Stainless Steel	294	0.9 mg/cm ² Aluminized Mylar
BF-204-A	Thallium-204	3.78 y	Stainless Steel	763	0.9 mg/cm ² Aluminized Mylar
BF-113-A	Tin-113	115.1 d	Platinum Foil or Pt/Clad Ni	392	0.9 mg/cm ² Aluminized Mylar

1) Positron emission from Ga-68.

2) This long-lived P-32 standard is the beta emitting P-32 daughter of the long-lived Si-32 parent. The standard mounting for this source is the A capsule with a 0.002" (0.051 mm) Al window. This window will absorb more than 60% of the Si-32 225 keV betas and less than 5% of the P-32 betas. Standards are prepared with the P-32 in equilibrium with the parent Si-32.

3) See page 41 regarding Sr-90 sources.

Beta Particle Standards—Type MF2

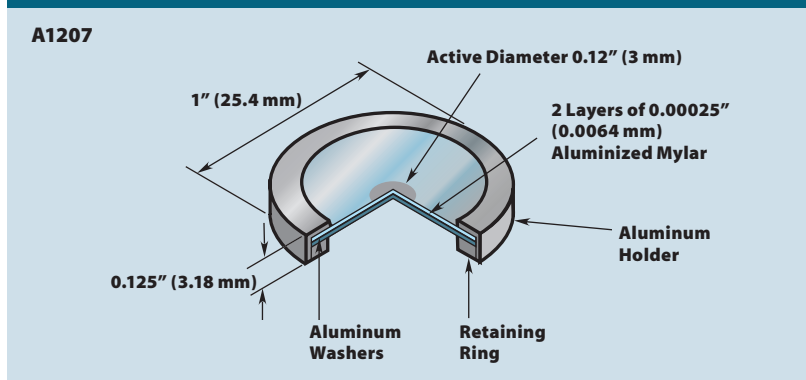
This is a “scatterless” configuration in which the activity is applied as a 0.12” (3 mm) spot centered between two laminated 0.9 mg/cm² aluminized Mylar foils. The source is supplied in a removable aluminum holder. In the holder the source has an overall diameter of 1” (25.4 mm) and a thickness of 0.125” (3.18 mm). Out of the holder the source is 0.937” (23.8 mm) in diameter with a thickness of approximately 0.030” (0.76 mm).

This configuration is most useful for the precise determination of G.M. and proportional counter efficiencies, and as an educational tool for the verification of the inverse square law, as well as demonstrating back-scatter phenomena.

Additional beta sources can be found on pages 55–65 including disk standards suitable for use with low background counting systems and 3.94” x 3.94” (100 mm x 100 mm) distributed beta sources for instrument calibration and dose assessments.



Figure 43-A: Type MF-2 Disk



Overall Dimensions

Overall Diameter	Active Diameter	Height
1"	0.12"	0.125"
25.4 mm	3 mm	3.18 mm

Nature of Active Deposit

Evaporated Salts on Mylar

Available Activities

5 nCi -100 nCi (185 Bq - 3.7 kBq)

Exceptions

Bi-210: 10 nCi - 100 nCi (370 Bq - 3.7 kBq)
Sr-90: 2.5 nCi - 100 nCi (92.5 Bq - 3.7 kBq)

Beta Particle Standards—Type MF2

Catalog Number	Nuclide	Half-Life	Substrate	Significant Beta Energies (E _{max} keV)	Window
BF-014-MF2	Carbon-14	5730 y	Polymeric Membrane	156	0.9 mg/cm ² Aluminized Mylar
BF-137-MF2	Cesium-137	30.17 y	Stainless Steel	1175	0.9 mg/cm ² Aluminized Mylar
BF-036-MF2	Chlorine-36	3.01 x 10 ⁵ y	Stainless Steel	1142	0.9 mg/cm ² Aluminized Mylar
BF-060-MF2	Cobalt-60	5.272 y	Stainless Steel	1491	0.9 mg/cm ² Aluminized Mylar
BF-068-MF2	Germanium-68 ⁽¹⁾	270.8 d	Stainless Steel	2921 (β ⁺)	0.9 mg/cm ² Aluminized Mylar
BF-147-MF2	Promethium-147	2.6234 y	Stainless Steel	225	0.9 mg/cm ² Aluminized Mylar
BF-106-MF2	Ruthenium-106/Rhodium-106	1.020 y	Stainless Steel	39, 3540	0.9 mg/cm ² Aluminized Mylar
BF-022-MF2	Sodium-22	950.8 d	Stainless Steel	2842 (β ⁺)	0.9 mg/cm ² Aluminized Mylar
BF-090-MF2	Strontium-90/Yttrium-90 ⁽²⁾	28.5 y	Stainless Steel	546, 2282	0.9 mg/cm ² Aluminized Mylar
BF-099-MF2	Technetium-99	2.13 x 10 ⁵ y	Stainless Steel	294	0.9 mg/cm ² Aluminized Mylar
BF-204-MF2	Thallium-204	3.78 y	Stainless Steel	763	0.9 mg/cm ² Aluminized Mylar