Physikalisch-Technische Bundesanstalt
National Metrology Institute

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Beta irradiation facility BSS 2: an update

Beta Secondary Standard (BSS) traceable to PTB's beta primary standard

Radiation sources

^{147}Pm, ^{85}Kr, ^{90}Sr/^{90}Y, and ^{106}Ru/^{106}Rh (on request)

^{90}Sr/^{90}Y & 4 mm PMMA since 2025

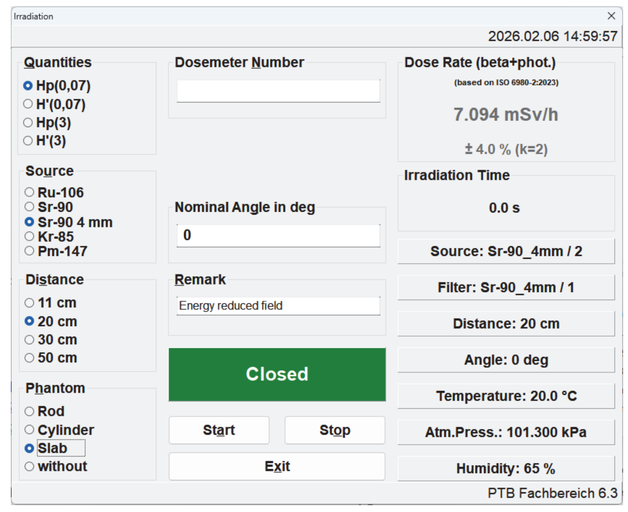
Quantities

Dose and dose rate of

- $H_p(0.07)$ on slab or rod
- $H'(0.07)$
- $H_p(3)$ and $H'(3)$ for ^{90}Sr/^{90}Y and ^{106}Ru/^{106}Rh

Technical details

- Dose pre-selectable
- Dose corrected for radioactive decay and ambient conditions
- All parameters sensor-monitored (quality assured)
- Safe source handling (shielded)
- Beam flattening filter for homogenous radiation fields
- Control unit with embedded mini-PC

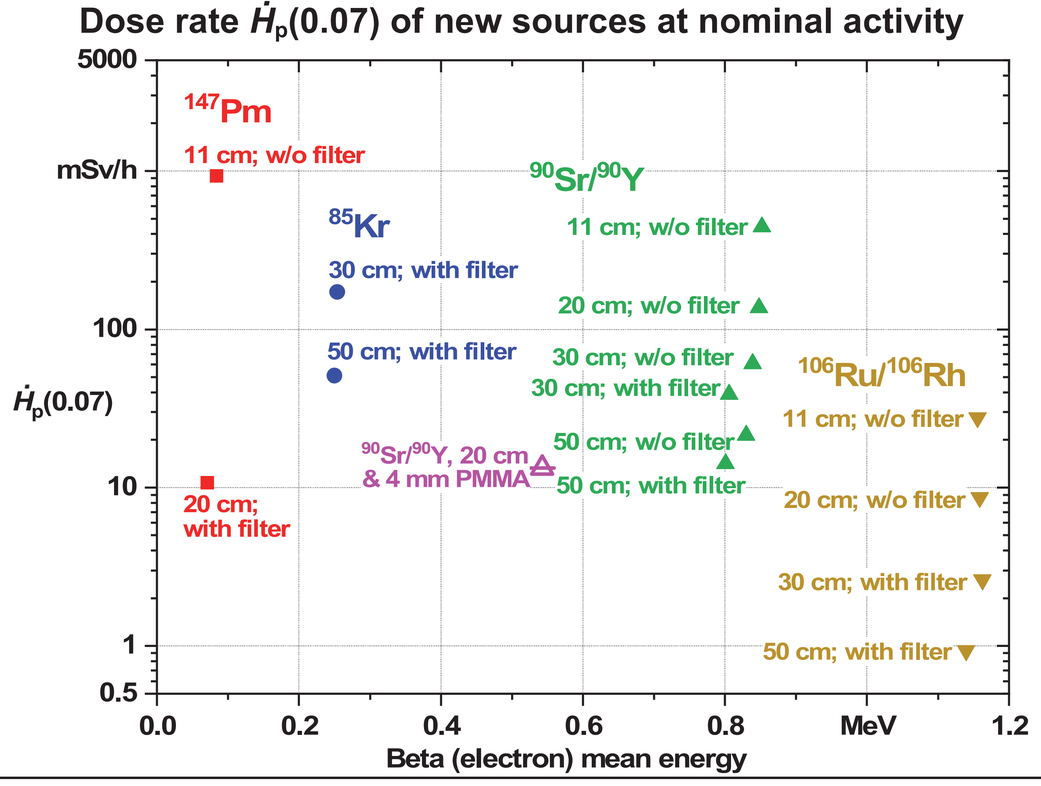


Details of the radiation fields – in line with ISO 6980:2023

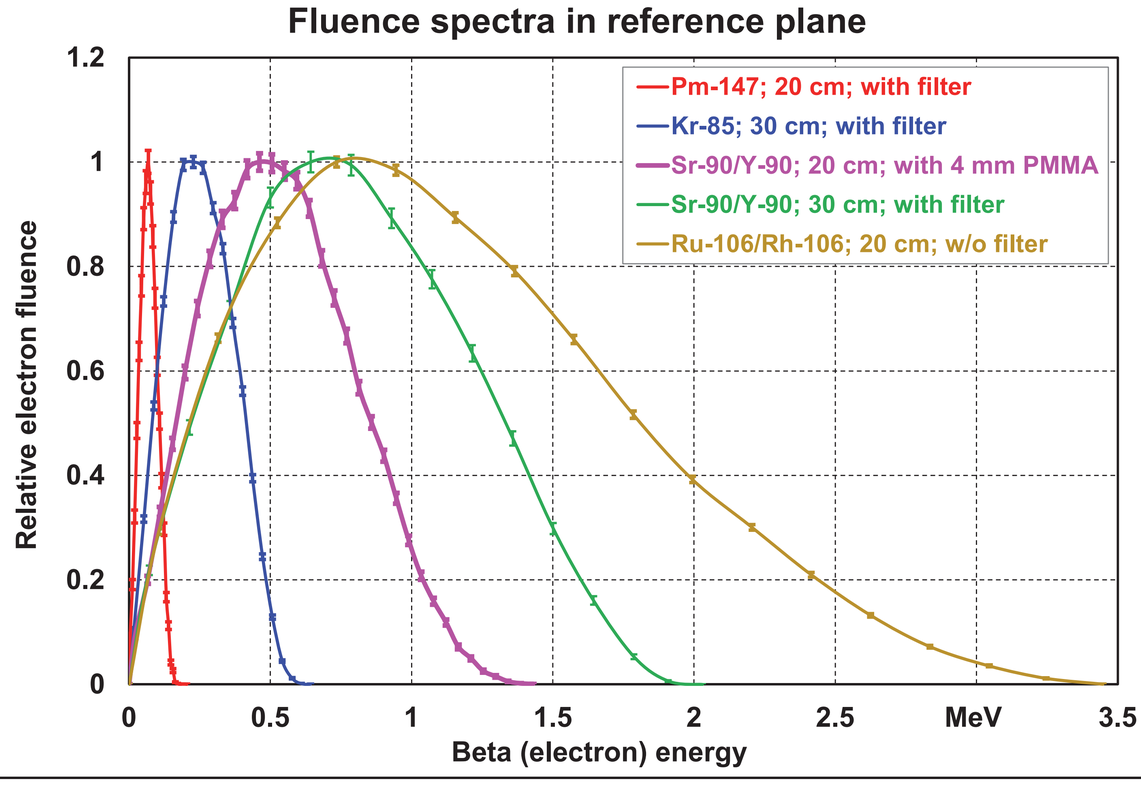
Radionuclide	Half-life	Beta mean energy	Nominal activity	$H_p(3)/H_p(0.07)$	Photon contr. to $H_p(0.07)$; $H_p(3)$
^{147}Pm	2.62 y	0.07 MeV	3.7 GBq	—	0.6 % (20 cm, w f) ; 100 % 0.01 % (11 cm, w/o f)
^{85}Kr	10.7 y	0.25 MeV	3.7 GBq	—	0.025 % ; 100 %
^{90}Sr/^{90}Y & 4 mm PMMA	28.8 y	0.54 MeV	0.46 GBq	0.083	0.31 % ; 3.7 %
^{90}Sr/^{90}Y	28.8 y	0.8 MeV	0.46 GBq	0.43 – 0.50 a)	0.05 % ; 0.10 %
^{106}Ru/^{106}Rh	1.02 y	1.2 MeV	0.02 GBq	0.72 – 0.77 a)	0.19 % ; 0.25 %

a) depending on distance and presence of beam flattening filter

Dose rate $\dot{H}_p(0.07)$ of new sources at nominal activity



Fluence spectra in reference plane



Distribution worldwide by Eckert & Ziegler (www.ezag.com): since 1978 more than 150 devices

● BSS1
Version 1
1978 - 1983

● BSS1
Version 2
1984 - 1996

● BSS2
1998 - 2017

● BSS2 Pi
since 2018

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BSS2 Basics: P. Ambrosi et al.: J. Instrum. **2** (2007) P11002
BSS2 Extensions: R. Behrens and G. Buchholz: J. Instrum. **6** (2011) P11007 & **7** (2012) E04001 & **7** (2012) A05001 & **20** (2025) A12001
BSS2 Simulations: R. Behrens: J. Instrum. **8** (2013) P02019 & **14** (2019) A07001
Energy reduced ^{90}Sr/^{90}Y field: R. Behrens: J. Instrum. **15** (2020) P05015 & J. Instrum. **19** (2024) P07003

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