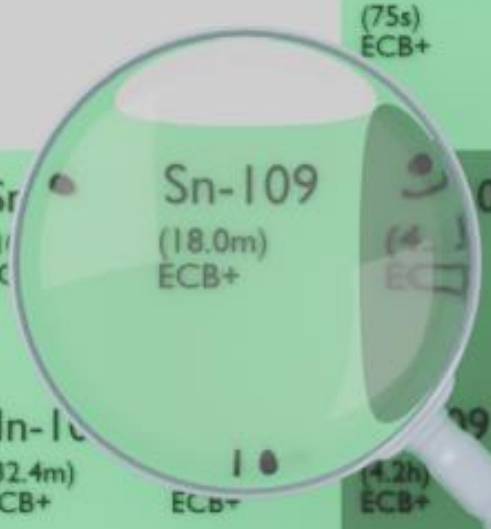




SD-111 (75s) ECB+			SD-113 (6.67m) ECB+		SD-115 (3.49m) ECB+
Sn-106 (1.92m) ECB+	Sr-106 (10.6m) ECB+	Sn-109 (18.0m) ECB+	Sn-110 (35.3m) ECB+	Sn-112 (STABLE)	Sn-113 (115.09d) EC
In-105 (5.07m) ECB+	In-106 (6.2m) ECB+	In-107 (32.4m) ECB+	In-109 (4.2h) ECB+	In-110 (4.9h) ECB+	In-111 (2.8047d) EC
					In-112 (14.97m) ECB+B-

TIN-109

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Sn-109
Atomic number (Z): 50
Mass number (A): 109
Neutron number (N): 59

RADIOACTIVE DECAY

Decay modes: β^+ , Electron capture
Half-life: 18.0 [m]
Decay constant: 6.4180×10^{-4} [1/s]
Daughters: In-109 (71.7%), In-109m (28.3%)
Radioactive daughters: In-109, In-109m

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.0571 [MeV]
Mean photon energy: 2.2063 [MeV]
Air kerma rate constant, Γ_{10} : 7.543×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Air kerma coefficient, K_{air} : 7.845×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 9.148×10^{-15} [Gy $\cdot$ kg/Bq $\cdot$ s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy $\cdot$ kg/Bq $\cdot$ s]

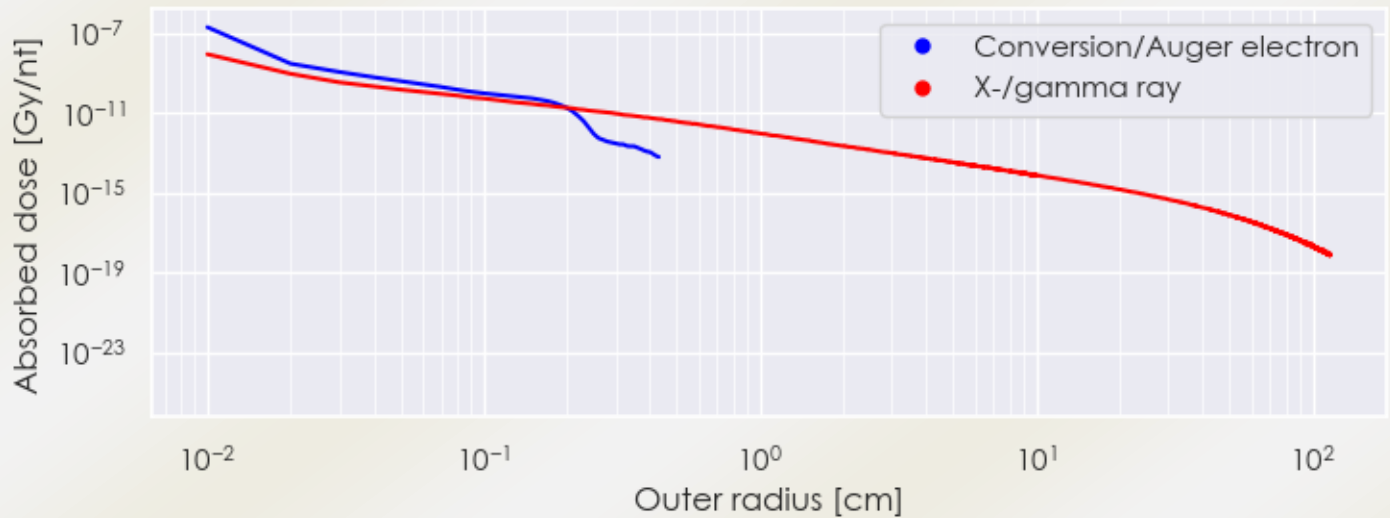
Equilibrium dose constant for betas/electrons, $\Delta_{\beta-, \beta+, e-}$: 9.148×10^{-15} [Gy · kg/Bq · s]

Equilibrium dose constant for photons, Δ_p : 3.535×10^{-13} [Gy · kg/Bq · s]

DOSE POINT KERNELS (PLOT)

Dose point kernel source: **Graves, et al. Medical Physics. 2019 Nov.; 46(11):5284-5293.**

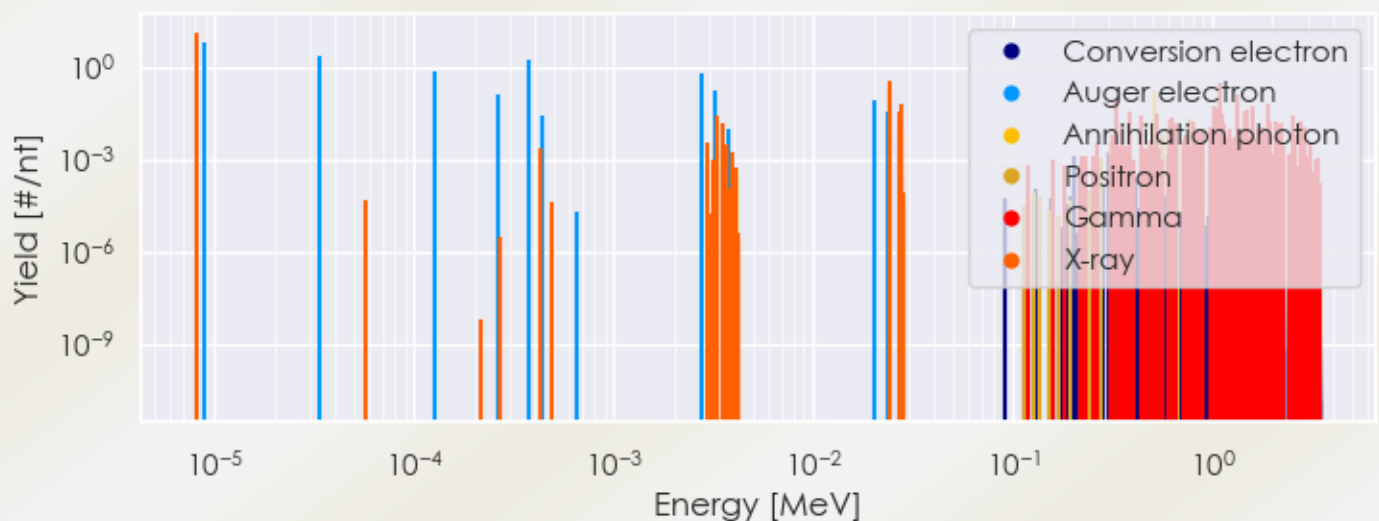
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Sn-109 DPK.csv

SUMMARY SPECTRA (PLOT)

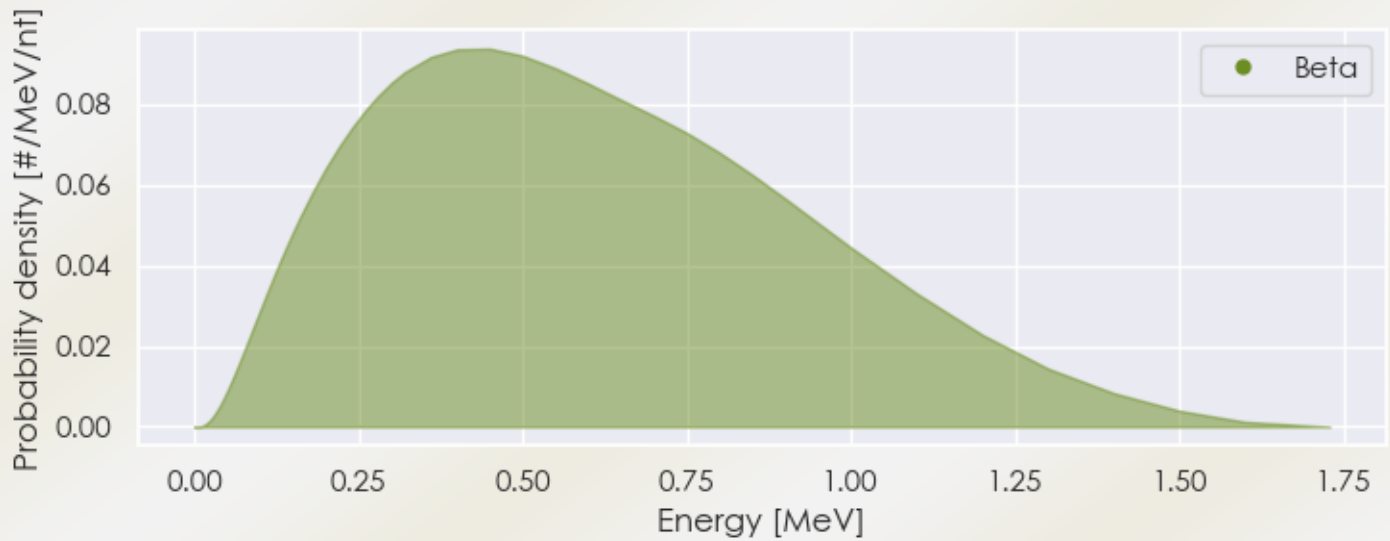
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Sn-109 Summary Spectrum.csv

BETA SPECTRA (PLOT)

Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated beta spectra file here: [www.mirdsoft.org/products/MIRDspecs/Sn-109 Beta Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Sn-109%20Beta%20Spectrum.csv)

TABULATED DATA

SUMMARY SPECTRA (TABLE)

Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**

Note: Radiations with yield < 0.01 are excluded from the table, but are available in the linked *.csv data.

Download tabulated summary spectra file here: [www.mirdsoft.org/products/MIRDspecs/Sn-109 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Sn-109%20Summary%20Spectrum.csv)

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
8.12529e-06	1.311e+01	X-ray
3.27540e-03	2.651e-02	X-ray
3.48147e-03	1.501e-02	X-ray
2.39785e-02	1.960e-01	X-ray
2.41926e-02	3.677e-01	X-ray
2.72214e-02	3.281e-02	X-ray
2.72603e-02	6.370e-02	X-ray
2.78371e-02	1.304e-02	X-ray
3.31200e-01	9.692e-02	Gamma
3.53900e-01	1.023e-02	Gamma

3.84500e-01	3.311e-02	Gamma
4.37200e-01	2.589e-02	Gamma
4.37400e-01	2.589e-02	Gamma
5.11000e-01	1.558e-01	Annihilation photon
5.21900e-01	2.890e-02	Gamma
6.14100e-01	1.806e-02	Gamma
6.23400e-01	2.167e-02	Gamma
6.60100e-01	1.445e-02	Gamma
7.90900e-01	1.565e-02	Gamma
9.76300e-01	1.084e-02	Gamma
1.02640e+00	5.298e-02	Gamma
1.02640e+00	5.298e-02	Gamma
1.03900e+00	4.515e-02	Gamma
1.09920e+00	3.010e-01	Gamma
1.11920e+00	3.161e-02	Gamma
1.12820e+00	1.415e-02	Gamma
1.32130e+00	1.186e-01	Gamma
1.46200e+00	2.107e-02	Gamma
1.46360e+00	3.010e-02	Gamma
1.46420e+00	3.612e-02	Gamma
1.48870e+00	4.063e-02	Gamma
1.49240e+00	1.354e-02	Gamma
1.57440e+00	5.478e-02	Gamma
1.58070e+00	1.144e-02	Gamma
1.72220e+00	1.053e-02	Gamma
1.75950e+00	1.114e-02	Gamma
1.88980e+00	1.535e-02	Gamma
1.91110e+00	5.809e-02	Gamma
1.94350e+00	1.686e-02	Gamma
2.05520e+00	1.776e-02	Gamma
2.12590e+00	1.385e-02	Gamma
2.19560e+00	1.385e-02	Gamma
2.54180e+00	2.619e-02	Gamma
2.78540e+00	1.746e-02	Gamma
2.85860e+00	1.023e-02	Gamma
7.72438e-01	1.962e-02	Positron
8.85907e-06	6.501e+00	Auger electron
3.35255e-05	2.285e+00	Auger electron

1.25699e-04	7.119e-01	Auger electron
2.62869e-04	1.252e-01	Auger electron
3.70857e-04	1.609e+00	Auger electron
4.36990e-04	2.645e-02	Auger electron
2.73432e-03	6.374e-01	Auger electron
3.21463e-03	1.558e-01	Auger electron
2.00957e-02	8.009e-02	Auger electron
2.34091e-02	3.353e-02	Auger electron

USEFUL LINKS

Isotope decay characteristics are periodically updated as better measurements can be made - changes that may not be reflected on this page. Please see useful links:

National Nuclear Data Center (NNDC): <https://www.nndc.bnl.gov/nudat3/mird/>

International Atomic Energy Agency (IAEA) Livechart: <https://www-nds.iaea.org/relnsd/vcharthtml/VChartHTML.html>

REFERENCE LINKS

ICRP Report 107: <https://www.icrp.org/publication.asp?id=ICRP%20Publication%20107>

Graves et al. Dose Point Kernels: <https://doi.org/10.1002/mp.13789>

MIRD Decay Schemes 2nd Edition: https://sites.snmmi.org/SNMML-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6