



Pd-98 (22s) CB+	Pd-97 (3.10m) ECB+	Pd-96 (17.7m) ECB+	Pd-95 (21.4m) ECB+	Pd-100 (3.63d) ECB+	Pd-101 (8.47h) ECB+	Pd-102 (STABLE)	Pd-103 (16.991d) EC	Pd-104 (STABLE)
Rh-95 (5.02m) CB+	Rh-96 (9.90m) ECB+	Rh-97 (30.7m) ECB+	Rh-98 (8.47h) ECB+	Rh-99 (16.1d) ECB+	Rh-100 (10.5h) ECB+	Rh-101 (3.3y) EC	Rh-102 (207d) ECB+B-	Rh-103 (STABLE)
Ru-94 (51.8m) CB+	Ru-95 (1.643h) ECB+	Ru-96 (STABLE)	Ru-97 (2.9d) EC	Ru-98 (1.5h) EC	Ru-99 (1.5h) EC	Ru-100 (STABLE)	Ru-101 (STABLE)	Ru-102 (STABLE)

RHODIUM-99

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Rh-99
Atomic number (Z): 45
Mass number (A): 99
Neutron number (N): 54

RADIOACTIVE DECAY

Decay modes: β^+ , Electron capture
Half-life: 16.1 [d]
Decay constant: 4.9829×10^{-7} [1/s]
Daughters: Ru-99 (100.0%)
Radioactive daughters: None

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.06114 [MeV]
Mean photon energy: 0.56269 [MeV]
Air kerma rate constant, Γ_{10} : 3.244×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Air kerma coefficient, K_{air} : 3.401×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 9.796×10^{-15} [Gy $\cdot$ kg/Bq $\cdot$ s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy $\cdot$ kg/Bq $\cdot$ s]

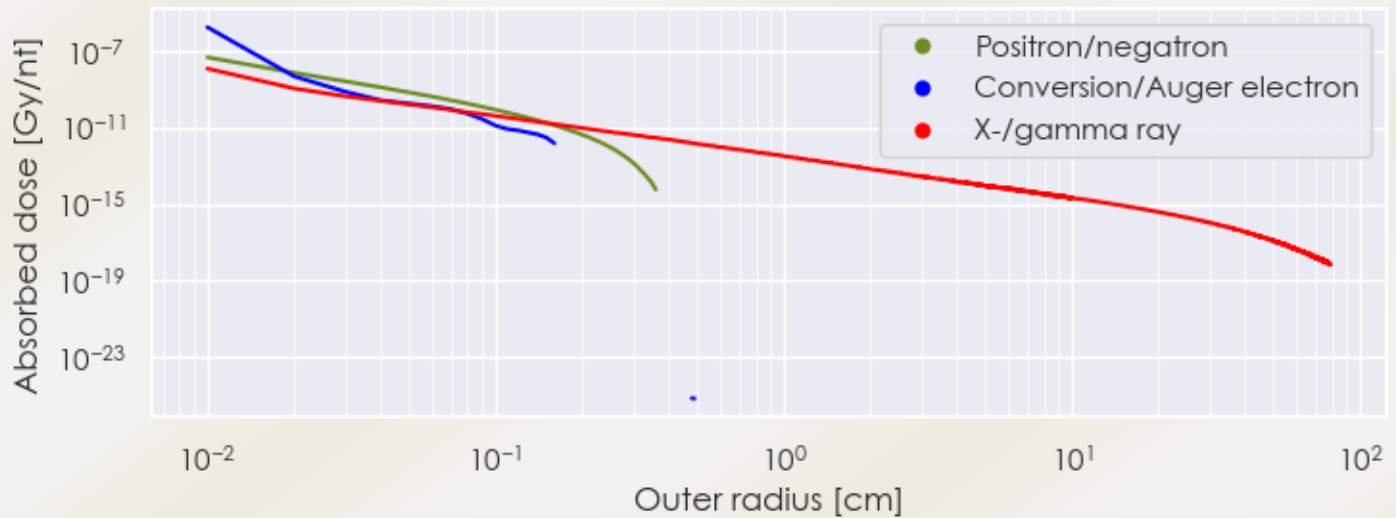
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: 9.796×10^{-15} [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : 9.015×10^{-14} [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

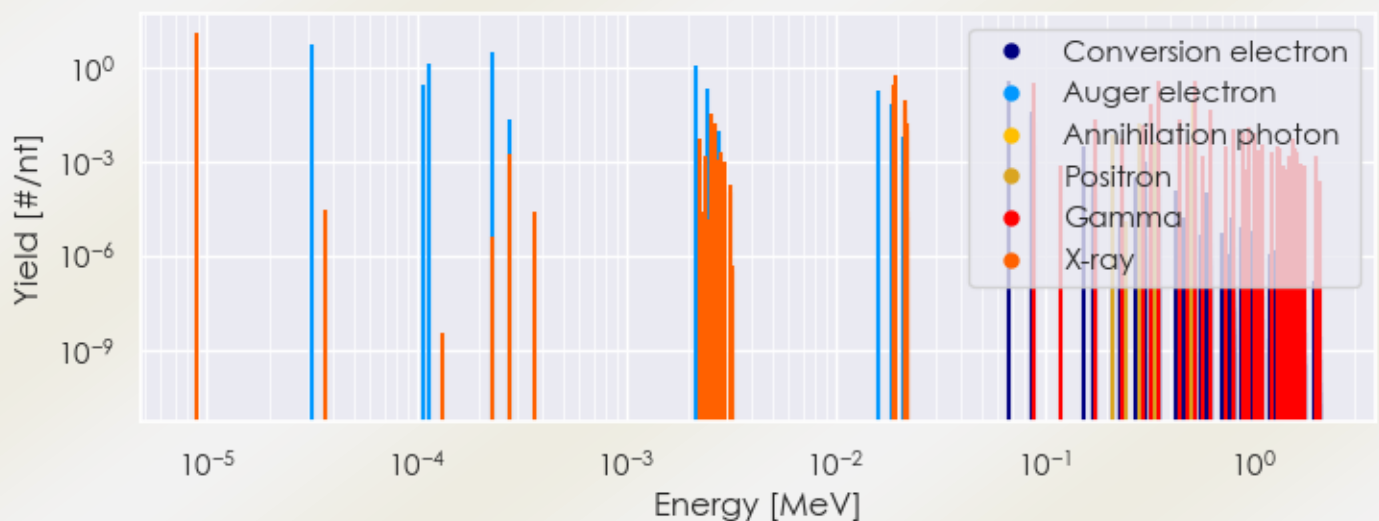
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Rh-99 DPK.csv

SUMMARY SPECTRA (PLOT)

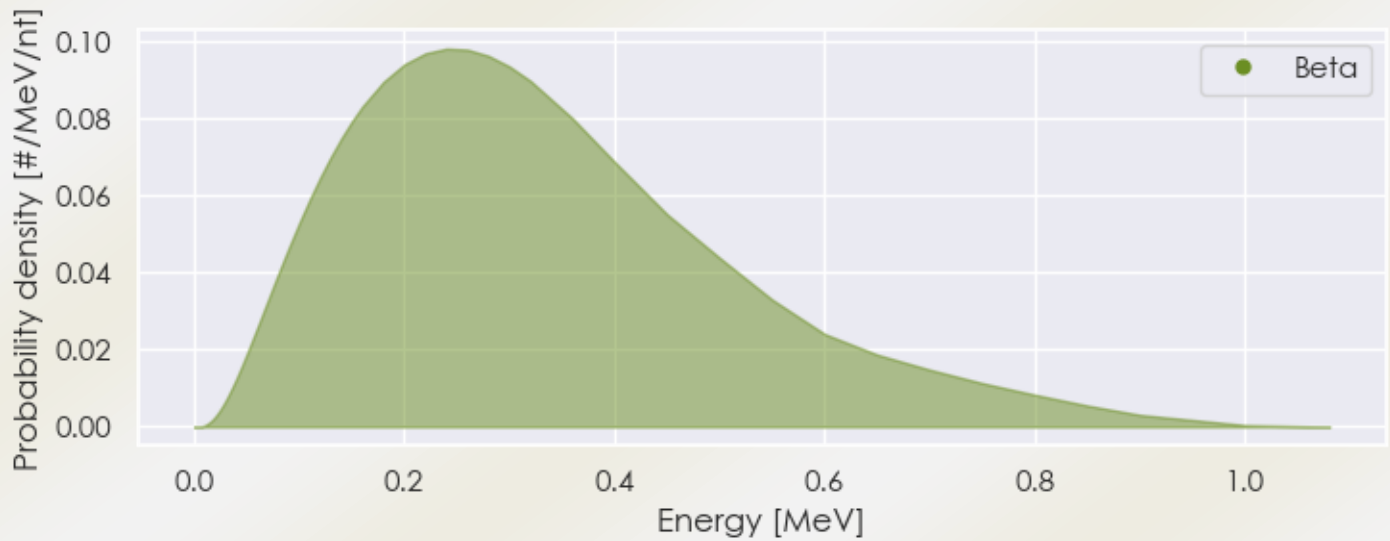
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Rh-99 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/Rh-99 Beta Spectrum.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/Rh-99 Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
8.90938e-06	1.292e+01	X-ray
2.54865e-03	3.443e-02	X-ray
2.67727e-03	1.648e-02	X-ray
1.91152e-02	2.818e-01	X-ray
1.92483e-02	5.345e-01	X-ray
2.16049e-02	4.485e-02	X-ray
2.16277e-02	8.724e-02	X-ray
2.20364e-02	1.691e-02	X-ray
8.97600e-02	3.344e-01	Gamma
1.75430e-01	2.014e-02	Gamma

2.95700e-01	1.330e-02	Gamma
3.22450e-01	6.232e-02	Gamma
3.53050e-01	3.458e-01	Gamma
4.42800e-01	2.242e-02	Gamma
5.11000e-01	8.077e-02	Annihilation photon
5.28240e-01	3.800e-01	Gamma
6.18130e-01	4.180e-02	Gamma
8.07250e-01	1.140e-02	Gamma
9.40400e-01	1.292e-02	Gamma
2.85192e-01	1.540e-02	Positron
4.39078e-01	1.100e-02	Positron
3.14576e-05	5.358e+00	Auger electron
1.07650e-04	2.663e-01	Auger electron
1.14366e-04	1.214e+00	Auger electron
2.31891e-04	2.967e+00	Auger electron
2.77181e-04	2.180e-02	Auger electron
2.15887e-03	1.162e+00	Auger electron
2.46827e-03	1.980e-01	Auger electron
1.61570e-02	1.777e-01	Auger electron
1.86981e-02	6.837e-02	Auger electron
6.76730e-02	3.888e-01	Conversion electron
8.65561e-02	3.612e-02	Conversion electron
8.67882e-02	2.336e-02	Conversion electron
8.69213e-02	3.010e-02	Conversion electron
8.93007e-02	1.696e-02	Conversion 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