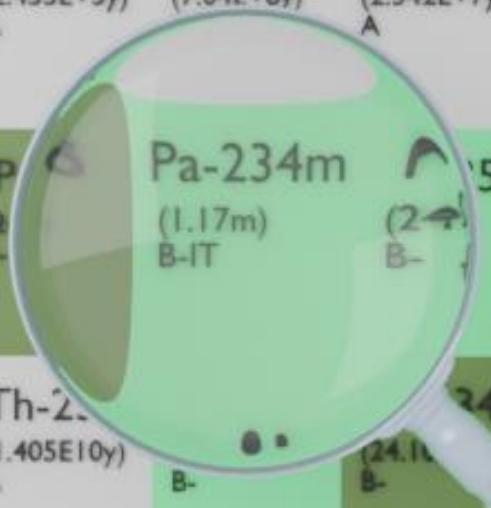




U-231 (4.2d) CA	U-232 (68.9y) A	U-233 (1.592E+5y) A	U-234 (2.455E+5y) A	U-235 (7.04E+8y) A	U-236 (2.342E+7y) A	U-237 (6.75d) B-	U-238 (4.468E+9y) A SF	U-239 (23.45m) B-
Pa-230 (17.4d) CB-A	Pa-231 (3.276E+4y) A	Pa-232 (1.31d) B-EC	Pa-233 (27d) B-	Pa-234m (1.17m) B-IT	Pa-235 (2.7y) B-	Pa-236 (9.1m) B-	Pa-237 (8.7m) B-	
Th-229 (7.34E+3y) A	Th-230 (7.538E+4y) A	Th-231 (25.52h) B-	Th-232 (1.405E10y) A	Th-233 (22m) B-	Th-234 (24.1d) B-	Th-235 (7.1m) B-	Th-236 (37.5m) B-	

PROTACTINIUM-234M

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Pa-234m
Atomic number (Z): 91
Mass number (A): 234
Neutron number (N): 143

RADIOACTIVE DECAY

Decay modes: β^- , Internal transition
Half-life: 1.17 [m]
Decay constant: 9.8739e-03 [1/s]
Daughters: U-234 (99.8%), Pa-234 (0.16%)
Radioactive daughters: U-234, Pa-234

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.81712 [MeV]
Mean photon energy: 0.01623 [MeV]
Air kerma rate constant, Γ_{10} : 7.374e-19 [Gy·m²/Bq·s]
Air kerma coefficient, K_{air} : 7.374e-19 [Gy·m²/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 1.309e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy·kg/Bq·s]

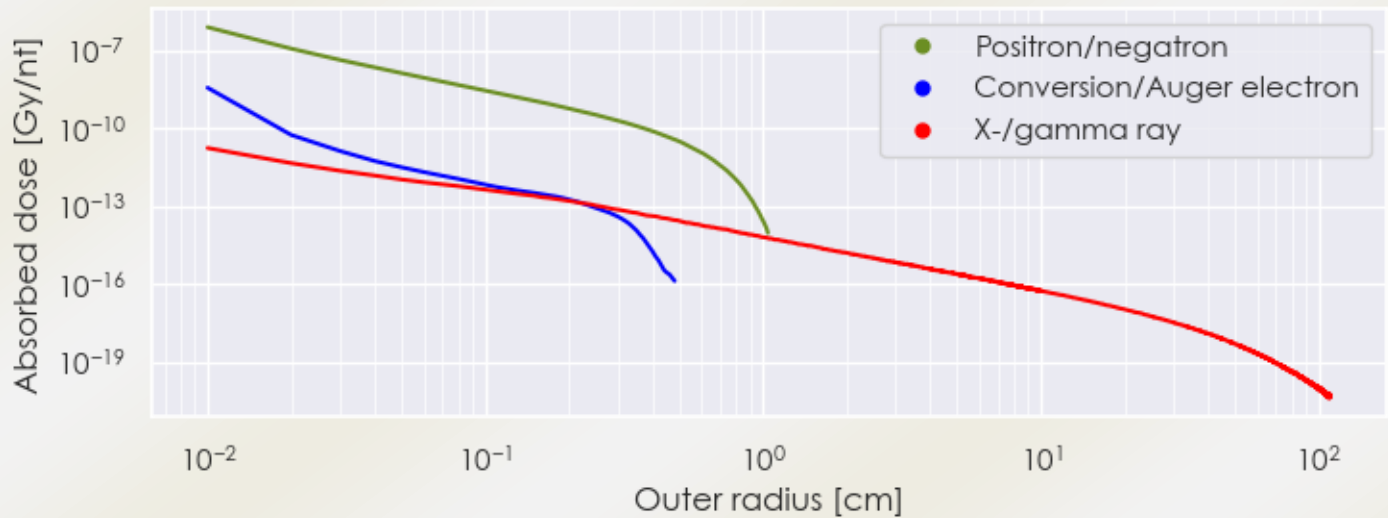
Equilibrium dose constant for betas/electrons, $\Delta_{\beta, \beta+, e-}$: 1.309e-13 [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : 2.600e-15 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

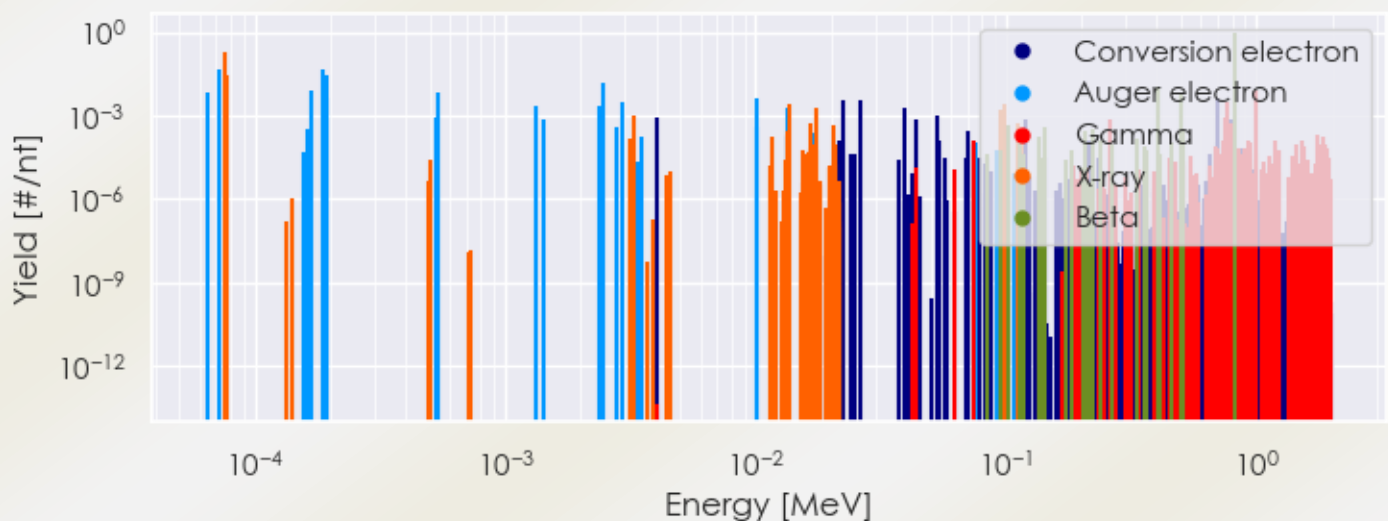
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Pa-234m DPK.csv

SUMMARY SPECTRA (PLOT)

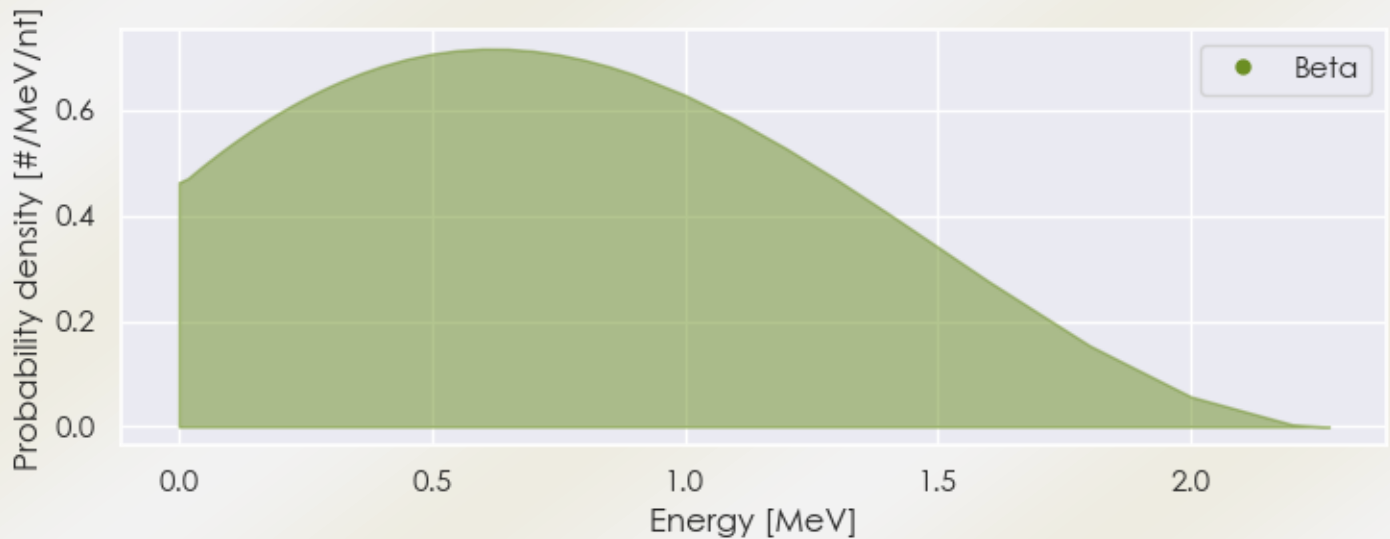
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Pa-234m 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/Pa-234m 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/Pa-234m Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
7.54941e-05	1.749e-01	X-ray
7.66335e-05	2.833e-02	X-ray
4.07074e-01	1.003e-02	Beta
8.22029e-01	9.785e-01	Beta
7.22036e-05	4.709e-02	Auger electron
1.85783e-04	4.614e-02	Auger electron
1.92276e-04	2.638e-02	Auger electron
2.43694e-03	1.526e-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