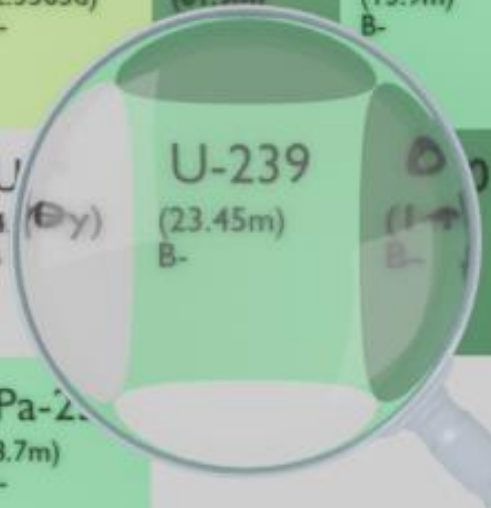




Np-236 (1.54E+5y) CB-A	Np-237 (2.144E+6y) A	Np-238 (2.117d) B-	Np-239 (2.3565d) B-	Np-240 (61.9m) B-	Np-241 (13.9m) B-	Np-242 (2.2m) B-
U-235 (7.04E+8y) A	U-236 (2.342E+7y) A	U-237 (6.75d) B-	U-238 (4.468E+9y) A	U-239 (23.45m) B-	U-240 (14.1m) B-	U-242 (16.8m) B-
Pa-234 (6.70h) B-	Pa-235 (24.5m) B-	Pa-236 (9.1m) B-	Pa-237 (8.7m) B-	Pa-238 (3.02m) B-	Pa-239 (1.43m) B-	Pa-240 (1.15m) B-

URANIUM-239

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: U-239

Atomic number (Z): 92

Mass number (A): 239

Neutron number (N): 147

RADIOACTIVE DECAY

Decay modes: β^-

Half-life: 23.45 [m]

Decay constant: 4.9264e-04 [1/s]

Daughters: Np-239 (100.0%)

Radioactive daughters: Np-239

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]

Mean electron energy: 0.41079 [MeV]

Mean photon energy: 0.05185 [MeV]

Air kerma rate constant, Γ_{10} : 4.958e-18 [Gy·m²/Bq·s]

Air kerma coefficient, K_{air} : 4.958e-18 [Gy·m²/Bq·s]

Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 6.582e-14 [Gy·kg/Bq·s]

Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy·kg/Bq·s]

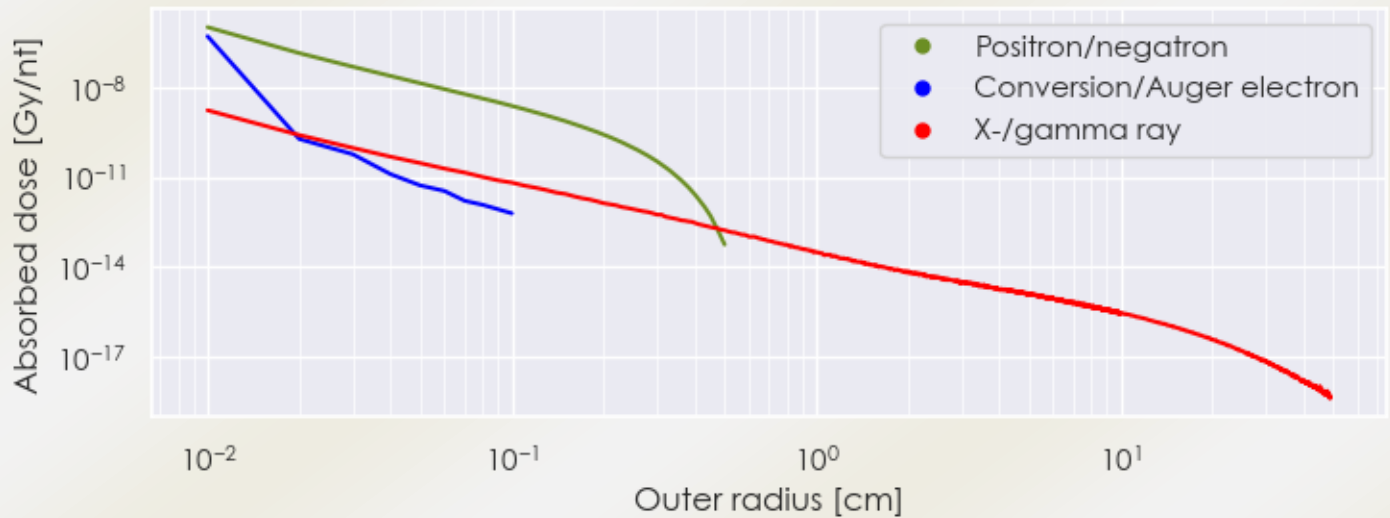
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: 6.582×10^{-14} [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : 8.307×10^{-15} [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

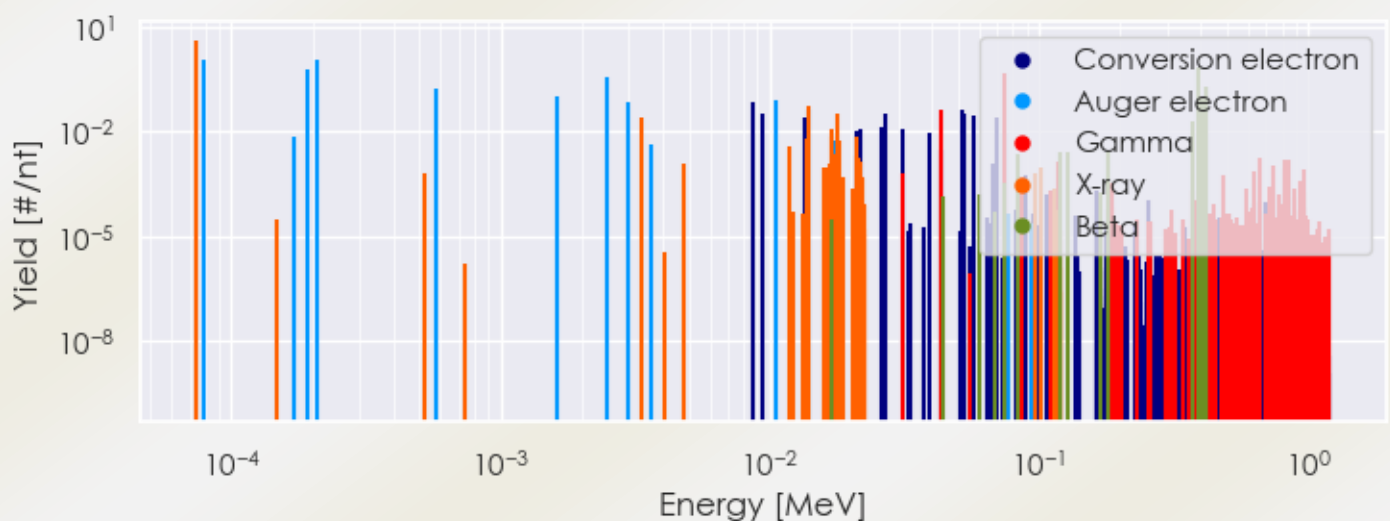
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/U-239 DPK.csv

SUMMARY SPECTRA (PLOT)

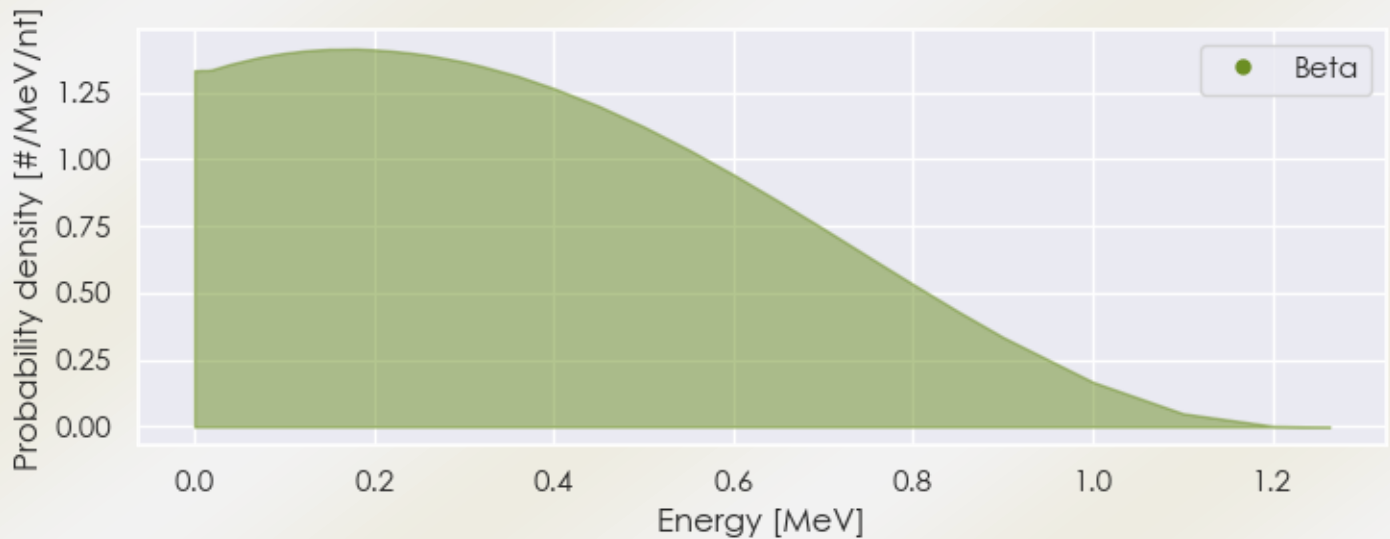
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/U-239 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/U-239 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/U-239 Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
7.44325e-05	4.247e+00	X-ray
3.35021e-03	2.658e-02	X-ray
1.39579e-02	5.351e-02	X-ray
1.68587e-02	1.130e-02	X-ray
1.78428e-02	3.136e-02	X-ray
4.35330e-02	4.069e-02	Gamma
7.46640e-02	4.920e-01	Gamma
3.74797e-01	1.957e-02	Beta
3.91006e-01	6.890e-01	Beta
4.07481e-01	9.386e-02	Beta

4.19314e-01	1.867e-01	Beta
7.89764e-05	1.244e+00	Auger electron
1.90773e-04	6.461e-01	Auger electron
2.09435e-04	1.116e+00	Auger electron
5.78291e-04	1.797e-01	Auger electron
1.62656e-03	1.049e-01	Auger electron
2.49133e-03	3.633e-01	Auger electron
2.99258e-03	7.113e-02	Auger electron
8.69100e-03	7.169e-02	Conversion electron
9.42900e-03	3.448e-02	Conversion electron
1.05058e-02	8.506e-02	Auger electron
1.35050e-02	2.579e-02	Conversion electron
1.39527e-02	4.370e-02	Auger electron
2.18310e-02	1.203e-02	Conversion electron
2.59070e-02	1.334e-02	Conversion electron
2.67094e-02	3.398e-02	Conversion electron
3.11310e-02	1.220e-02	Conversion electron
5.22240e-02	4.175e-02	Conversion electron
5.29620e-02	3.196e-02	Conversion electron
5.70380e-02	3.002e-02	Conversion electron
7.02424e-02	2.570e-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/SNMMI-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6