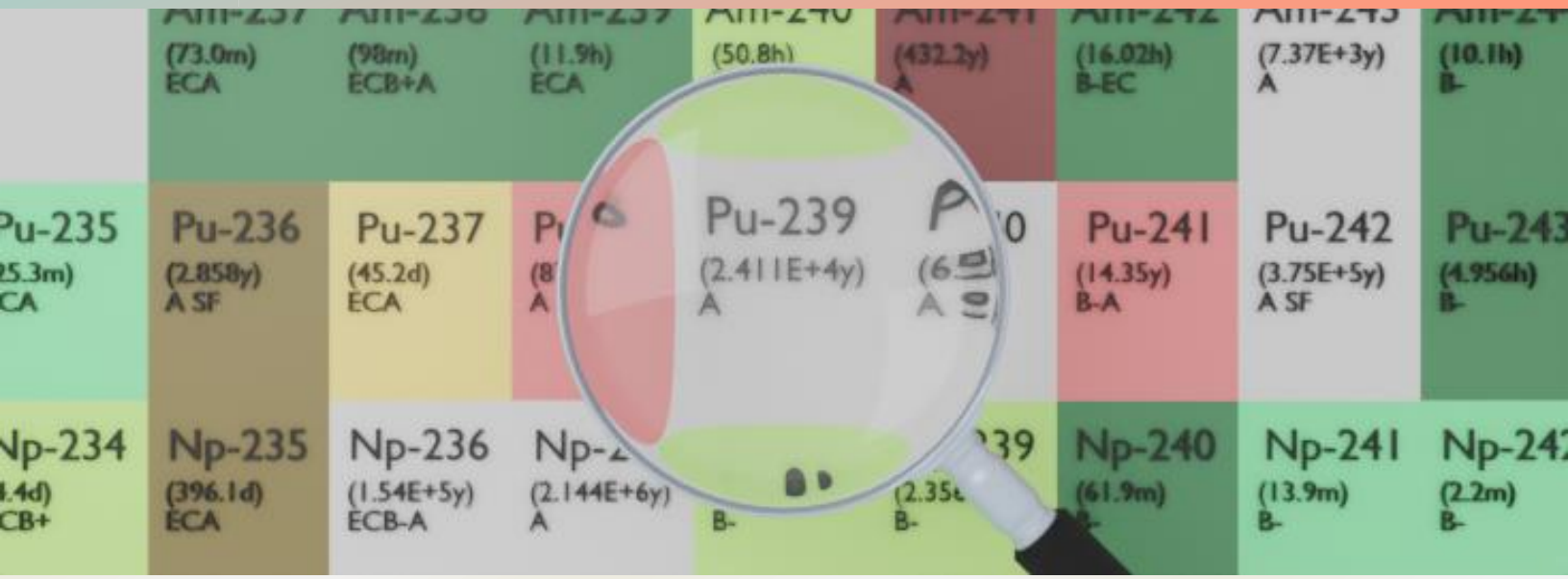


PLUTONIUM-239

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Pu-239
Atomic number (Z): 94
Mass number (A): 239
Neutron number (N): 145

RADIOACTIVE DECAY

Decay modes: a
Half-life: 24110.0 [y]
Decay constant: 9.1103e-13 [1/s]
Daughters: U-235m (99.9%), U-235 (0.06%)
Radioactive daughters: U-235m, U-235

DOSIMETRIC CONSTANTS

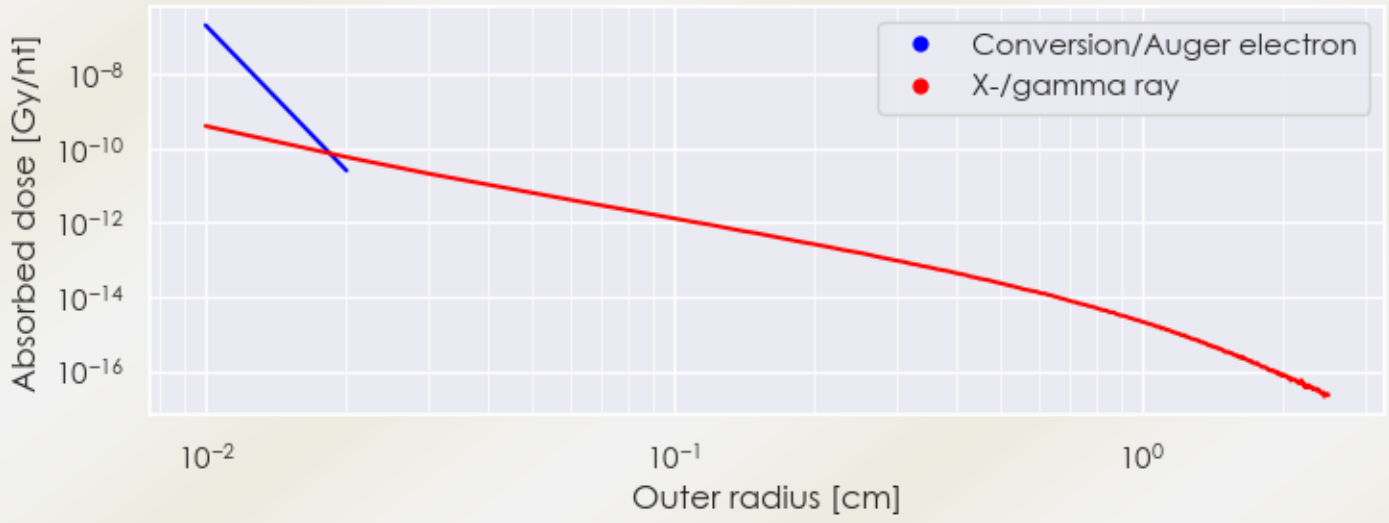
Mean alpha energy: 5.2357 [MeV]
Mean electron energy: 0.00745 [MeV]
Mean photon energy: 0.00107 [MeV]
Air kerma rate constant, Γ_{10}*:* 1.113e-18 [Gy·m^2/Bq·s]
Air kerma coefficient, K_{air}*:* 1.113e-18 [Gy·m^2/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (a and/or electrons), Δ_{wp}*:* 8.400e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{a}*:* 8.389e-13 [Gy·kg/Bq·s]

Equilibrium dose constant for betas/electrons, $\Delta_{\beta-,\beta+,e-}$: 1.194e-15 [Gy·kg/Bq·s]
Equilibrium dose constant for photons, Δ_{p}: 1.714e-16 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

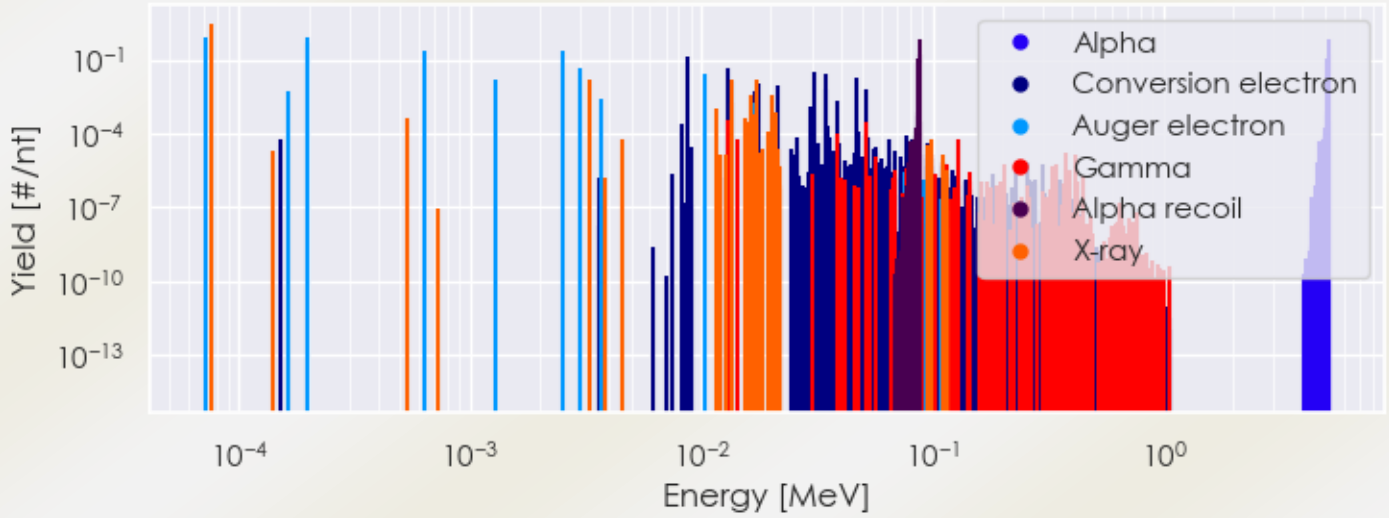
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Pu-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/Pu-239 Summary 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/Pu-239 Summary Spectrum.csv

Energy [MeV]	Yield [#/nt] if > 0.01	Radiation type
7.53950e-05	2.980e+00	X-ray
3.29991e-03	1.505e-02	X-ray
1.36268e-02	1.603e-02	X-ray
1.73072e-02	1.586e-02	X-ray
7.18315e-05	8.276e-01	Auger electron
1.96864e-04	7.710e-01	Auger electron
1.99282e-04	4.470e-01	Auger electron
6.37011e-04	2.233e-01	Auger electron
1.28695e-03	1.482e-02	Auger electron
2.49492e-03	2.142e-01	Auger electron
3.01009e-03	4.168e-02	Auger electron
8.68540e-03	1.351e-01	Conversion electron
1.02765e-02	2.706e-02	Auger electron
1.29750e-02	4.853e-02	Conversion electron
1.36090e-02	1.377e-02	Auger electron
3.05800e-02	3.340e-02	Conversion electron
3.44420e-02	2.842e-02	Conversion electron
4.73344e-02	1.746e-02	Conversion electron
5.10577e+00	1.193e-01	Alpha
5.14378e+00	1.710e-01	Alpha
5.15653e+00	7.072e-01	Alpha
8.69632e-02	1.193e-01	Alpha recoil
8.76106e-02	1.710e-01	Alpha recoil
8.78277e-02	7.072e-01	Alpha recoil

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