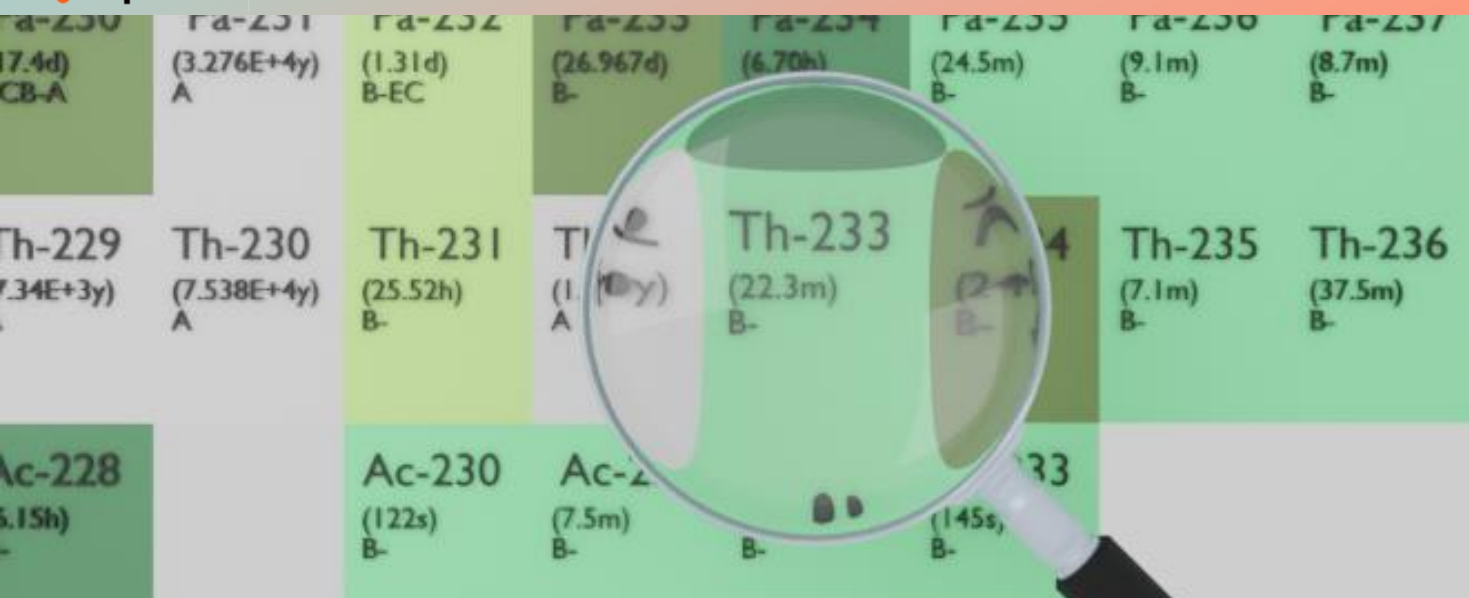




THORIUM-233

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Th-233
Atomic number (Z): 90
Mass number (A): 233
Neutron number (N): 143

RADIOACTIVE DECAY

Decay modes: β^-
Half-life: 22.3 [m]
Decay constant: 5.1805×10^{-4} [1/s]
Daughters: Pa-233 (100.0%)
Radioactive daughters: Pa-233

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.41398 [MeV]
Mean photon energy: 0.03748 [MeV]
Air kerma rate constant, Γ_{10} : 3.750×10^{-18} [Gy $\cdot$ m²/Bq $\cdot$ s]
Air kerma coefficient, K_{air} : 3.750×10^{-18} [Gy $\cdot$ m²/Bq $\cdot$ s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 6.633×10^{-14} [Gy $\cdot$ kg/Bq $\cdot$ s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy $\cdot$ kg/Bq $\cdot$ s]

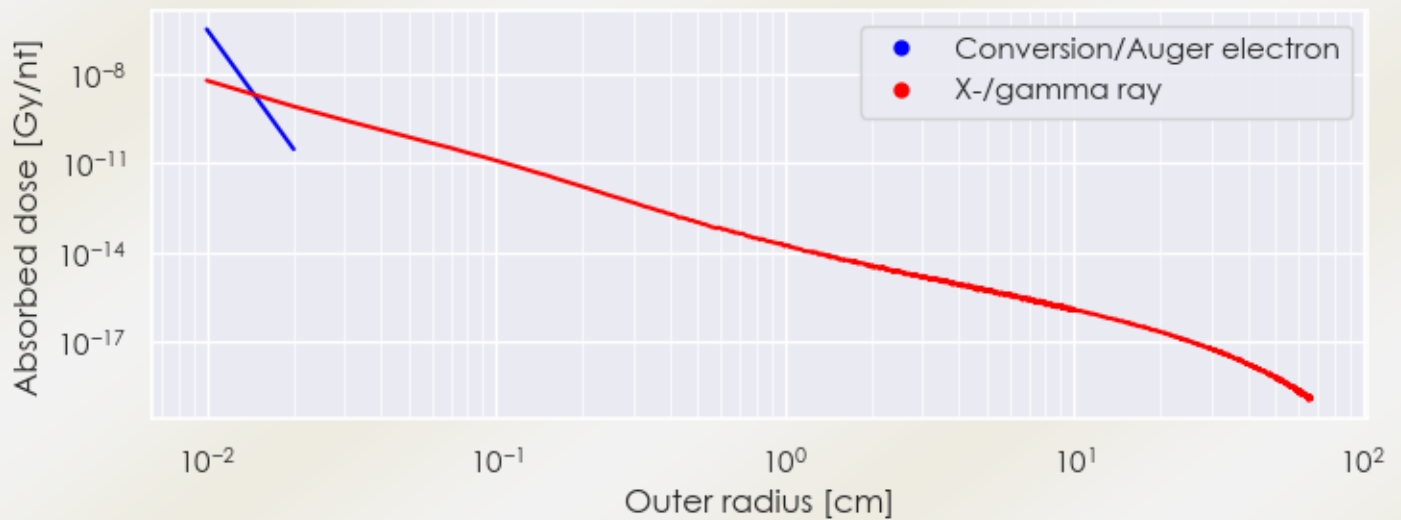
Equilibrium dose constant for betas/electrons, $\Delta_{\beta, \beta+, e-}$: 6.633×10^{-14} [Gy · kg/Bq · s]

Equilibrium dose constant for photons, Δ_p : 6.005×10^{-15} [Gy · kg/Bq · s]

DOSE POINT KERNELS (PLOT)

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

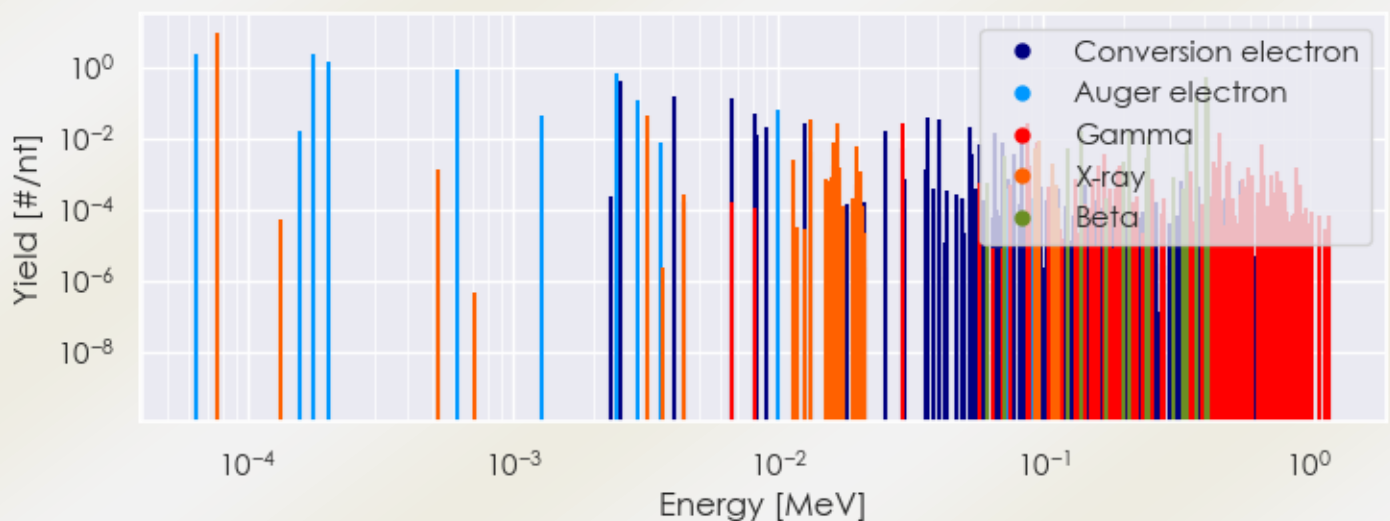
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Th-233 DPK.csv

SUMMARY SPECTRA (PLOT)

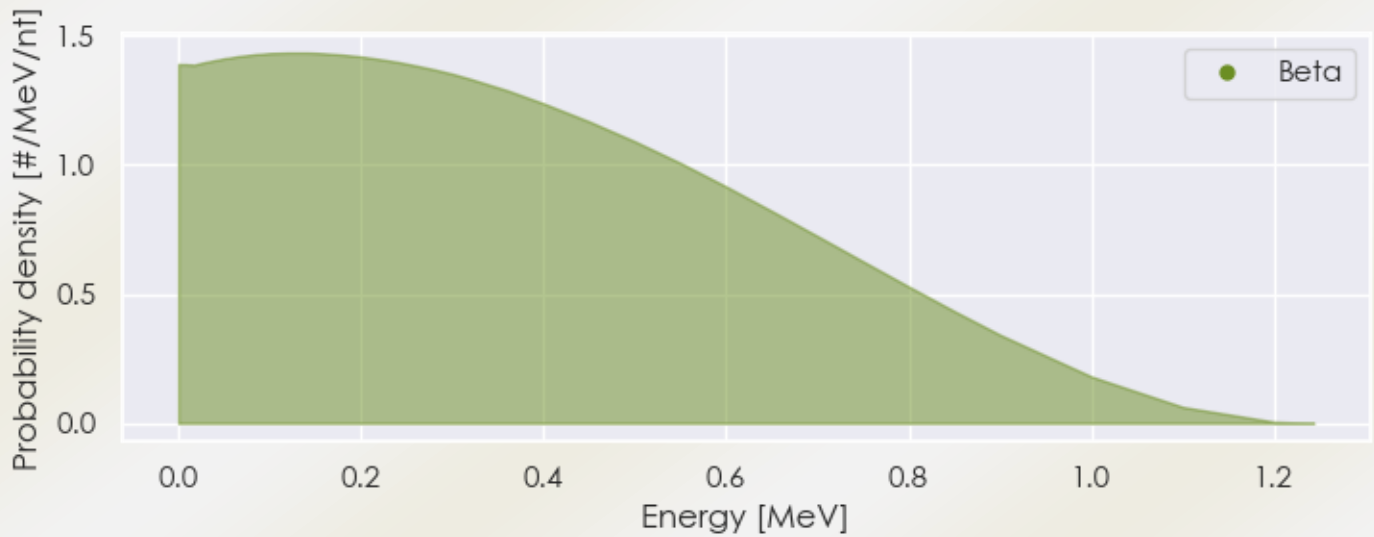
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Th-233 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/Th-233 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/Th-233 Summary Spectrum.csv

Energy [MeV]	Yield [# /nt] if > 0.01	Radiation type
7.64276e-05	9.439e+00	X-ray
3.21491e-03	4.331e-02	X-ray
1.32994e-02	3.466e-02	X-ray
1.67859e-02	2.631e-02	X-ray
2.93600e-02	2.497e-02	Gamma
8.64800e-02	2.757e-02	Gamma
4.59222e-01	1.372e-02	Gamma
1.39626e-01	1.535e-02	Beta
2.10594e-01	1.652e-02	Beta
2.47903e-01	1.147e-02	Beta

3.77828e-01	1.555e-01	Beta
4.11314e-01	4.859e-01	Beta
4.13859e-01	2.915e-01	Beta
6.41897e-05	2.385e+00	Auger electron
1.57147e-04	1.586e-02	Auger electron
1.77162e-04	2.437e+00	Auger electron
2.00725e-04	1.409e+00	Auger electron
6.11597e-04	8.158e-01	Auger electron
1.27424e-03	4.213e-02	Auger electron
2.44911e-03	6.452e-01	Auger electron
2.52060e-03	3.835e-01	Conversion electron
2.94787e-03	1.218e-01	Auger electron
4.06060e-03	1.398e-01	Conversion electron
6.68000e-03	1.363e-01	Conversion electron
8.22000e-03	5.009e-02	Conversion electron
8.24700e-03	1.243e-02	Conversion electron
8.95800e-03	2.016e-02	Conversion electron
9.96406e-03	5.837e-02	Auger electron
1.26170e-02	2.546e-02	Conversion electron
1.31886e-02	2.934e-02	Auger electron
2.52006e-02	1.497e-02	Conversion electron
3.67080e-02	3.751e-02	Conversion electron
4.03670e-02	3.149e-02	Conversion electron
5.29506e-02	1.941e-02	Conversion electron
6.53670e-02	1.333e-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