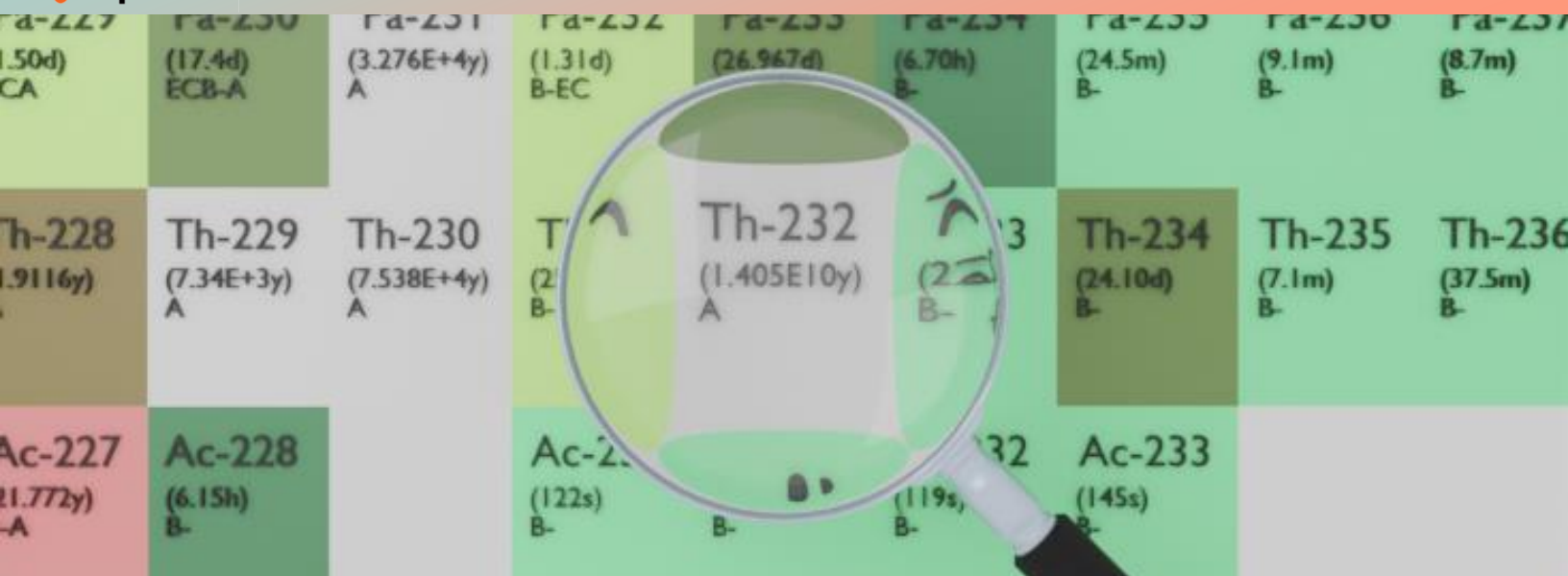




THORIUM-232

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Th-232
Atomic number (Z): 90
Mass number (A): 232
Neutron number (N): 142

RADIOACTIVE DECAY

Decay modes: α
Half-life: 14050000000.0 [y]
Decay constant: $1.5633\text{e-}18$ [1/s]
Daughters: Ra-228 (100.0%)
Radioactive daughters: Ra-228

DOSIMETRIC CONSTANTS

Mean alpha energy: 4.0688 [MeV]
Mean electron energy: 0.01261 [MeV]
Mean photon energy: 0.00148 [MeV]
Air kerma rate constant, Γ_{10} : $2.257\text{e-}18$ [$\text{Gy} \cdot \text{m}^2/\text{Bq} \cdot \text{s}$]
Air kerma coefficient, K_{air} : $2.257\text{e-}18$ [$\text{Gy} \cdot \text{m}^2/\text{Bq} \cdot \text{s}$]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : $6.539\text{e-}13$ [$\text{Gy} \cdot \text{kg}/\text{Bq} \cdot \text{s}$]
Equilibrium dose constant for alphas, Δ_{α} : $6.519\text{e-}13$ [$\text{Gy} \cdot \text{kg}/\text{Bq} \cdot \text{s}$]

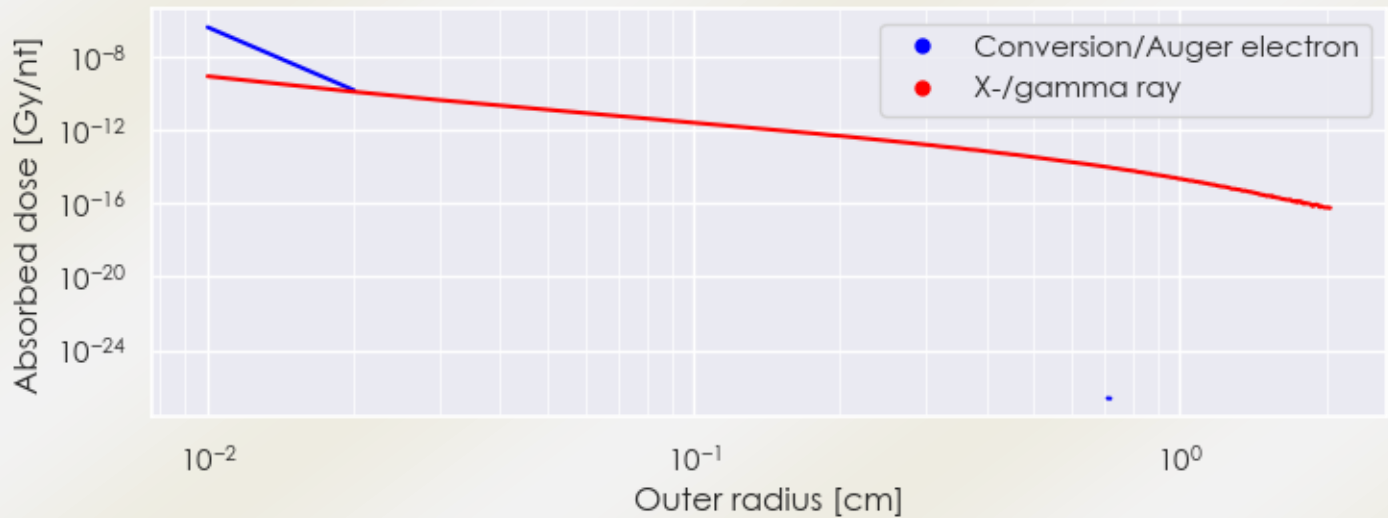
Equilibrium dose constant for betas/electrons, $\Delta_{\beta, \beta+, e-}$: 2.020×10^{-15} [Gy · kg/Bq · s]

Equilibrium dose constant for photons, Δ_p : 2.371×10^{-16} [Gy · kg/Bq · s]

DOSE POINT KERNELS (PLOT)

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

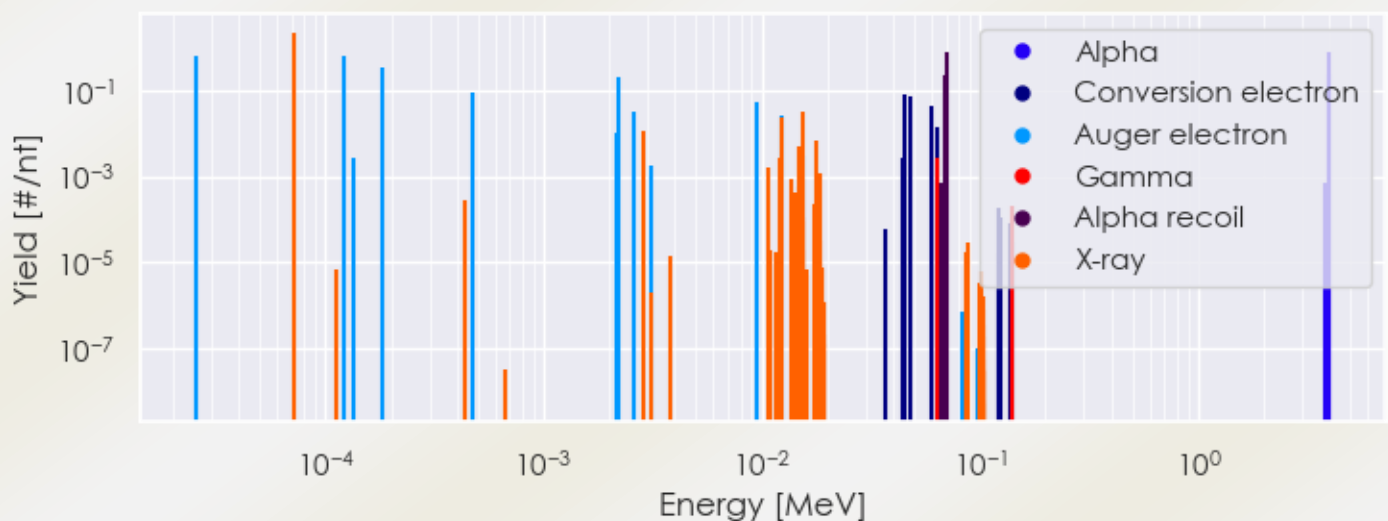
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Th-232 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-232 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/Th-232 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Th-232%20Summary%20Spectrum.csv)

Energy [MeV]	Yield [# / nT] if > 0.01	Radiation type
7.12319e-05	2.257e+00	X-ray
2.89132e-03	1.150e-02	X-ray
1.23447e-02	2.454e-02	X-ray
1.53013e-02	3.046e-02	X-ray
2.57692e-05	6.201e-01	Auger electron
1.20725e-04	6.279e-01	Auger electron
1.81331e-04	3.578e-01	Auger electron
4.72331e-04	8.993e-02	Auger electron
2.15783e-03	1.048e-02	Auger electron
2.22619e-03	1.985e-01	Auger electron
2.60079e-03	3.202e-02	Auger electron
9.51569e-03	5.402e-02	Auger electron
1.24509e-02	2.623e-02	Auger electron
4.52500e-02	8.460e-02	Conversion electron
4.83540e-02	7.152e-02	Conversion electron
6.00363e-02	4.320e-02	Conversion electron
6.38100e-02	1.453e-02	Conversion electron
3.94965e+00	2.171e-01	Alpha
4.01236e+00	7.822e-01	Alpha
6.93372e-02	2.171e-01	Alpha recoil
7.04381e-02	7.822e-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