



THORIUM-227

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Th-227
Atomic number (Z): 90
Mass number (A): 227
Neutron number (N): 137

RADIOACTIVE DECAY

Decay modes: α
Half-life: 18.68 [d]
Decay constant: 4.2947×10^{-7} [1/s]
Daughters: Ra-223 (100.0%)
Radioactive daughters: Ra-223

DOSIMETRIC CONSTANTS

Mean alpha energy: 5.9882 [MeV]
Mean electron energy: 0.07547 [MeV]
Mean photon energy: 0.13174 [MeV]
Air kerma rate constant, Γ_{10} : 2.110×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Air kerma coefficient, K_{air} : 2.110×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 9.715×10^{-13} [Gy $\cdot$ kg/Bq $\cdot$ s]
Equilibrium dose constant for alphas, Δ_{α} : 9.594×10^{-13} [Gy $\cdot$ kg/Bq $\cdot$ s]

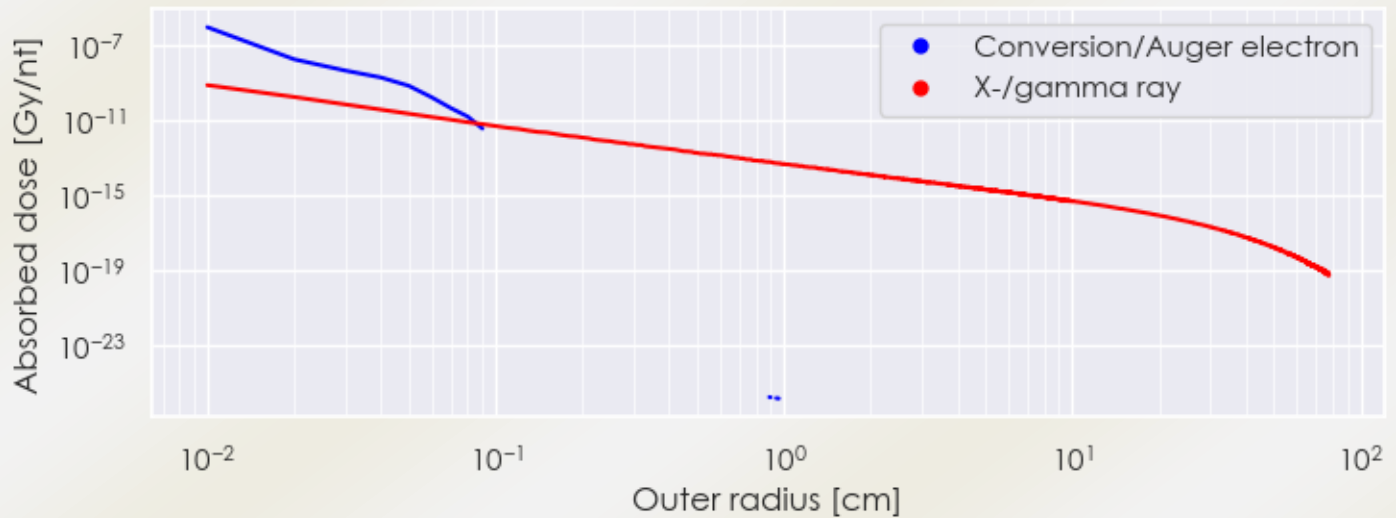
Equilibrium dose constant for betas/electrons, $\Delta_{\beta, \beta^+, e^-}$: 1.209×10^{-14} [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : 2.111×10^{-14} [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

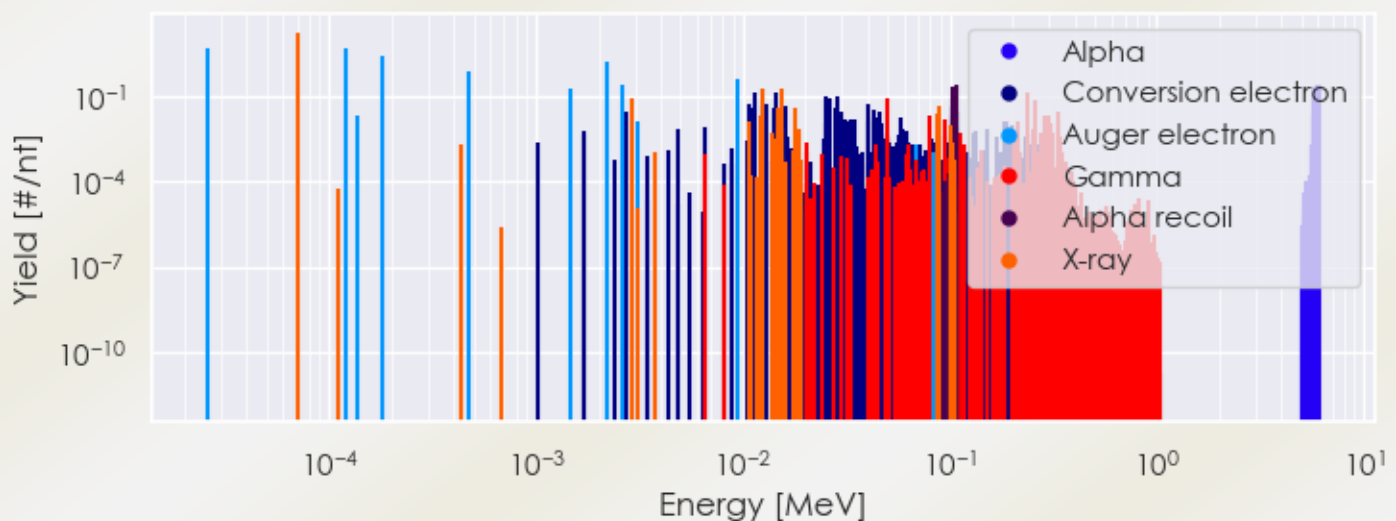
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Th-227 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-227 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-227 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Th-227%20Summary%20Spectrum.csv)

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
7.12272e-05	1.763e+01	X-ray
2.88731e-03	8.987e-02	X-ray
1.06609e-02	1.313e-02	X-ray
1.21973e-02	2.235e-02	X-ray
1.23447e-02	1.966e-01	X-ray
1.48529e-02	3.993e-02	X-ray
1.53013e-02	1.821e-01	X-ray
1.79232e-02	3.965e-02	X-ray
5.01300e-02	8.385e-02	Gamma
7.96900e-02	1.948e-02	Gamma
8.57602e-02	2.613e-02	X-ray
8.88641e-02	4.268e-02	X-ray
9.38800e-02	1.511e-02	Gamma
2.10620e-01	1.251e-02	Gamma
2.35960e-01	1.290e-01	Gamma
2.56230e-01	7.005e-02	Gamma
2.86090e-01	1.741e-02	Gamma
2.89590e-01	1.935e-02	Gamma
2.99980e-01	2.206e-02	Gamma
3.04500e-01	1.148e-02	Gamma
3.29850e-01	2.941e-02	Gamma
3.34370e-01	1.135e-02	Gamma
2.56800e-05	4.850e+00	Auger electron
1.20625e-04	4.901e+00	Auger electron
1.35431e-04	2.149e-02	Auger electron
1.81389e-04	2.775e+00	Auger electron
4.71973e-04	7.105e-01	Auger electron

1.46488e-03	1.933e-01	Auger electron
2.22033e-03	1.553e+00	Auger electron
2.59290e-03	2.499e-01	Auger electron
2.72630e-03	2.870e-02	Conversion electron
3.12076e-03	1.401e-02	Auger electron
9.42461e-03	4.057e-01	Auger electron
1.06280e-02	5.512e-02	Conversion electron
1.10400e-02	4.097e-02	Conversion electron
1.13000e-02	1.374e-01	Conversion electron
1.23480e-02	4.361e-02	Conversion electron
1.23569e-02	1.967e-01	Auger electron
1.30200e-02	5.004e-02	Conversion electron
1.41440e-02	4.136e-02	Conversion electron
1.44040e-02	1.341e-01	Conversion electron
1.53240e-02	2.260e-02	Auger electron
1.61240e-02	4.614e-02	Conversion electron
2.49880e-02	1.085e-02	Conversion electron
2.52400e-02	1.058e-01	Conversion electron
2.56600e-02	2.158e-02	Conversion electron
2.58263e-02	2.283e-02	Conversion electron
2.60863e-02	8.619e-02	Conversion electron
2.78063e-02	3.624e-02	Conversion electron
2.83440e-02	9.925e-02	Conversion electron
2.87640e-02	1.928e-02	Conversion electron
2.97400e-02	1.698e-02	Conversion electron
2.98600e-02	2.905e-02	Conversion electron
3.08980e-02	1.563e-02	Conversion electron
3.15700e-02	1.384e-02	Conversion electron
3.15800e-02	1.229e-02	Conversion electron
3.28440e-02	1.556e-02	Conversion electron
3.46740e-02	1.532e-02	Conversion electron
4.00263e-02	5.631e-02	Conversion electron
4.04463e-02	1.364e-02	Conversion electron
4.28810e-02	3.468e-02	Conversion electron
4.32180e-02	1.686e-02	Conversion electron
4.38000e-02	1.887e-02	Conversion electron
4.59850e-02	2.967e-02	Conversion electron
4.63563e-02	1.101e-02	Conversion electron

5.76673e-02	1.779e-02	Conversion electron
1.81770e-01	1.214e-02	Conversion electron
1.85270e-01	1.305e-02	Conversion electron
2.00180e-01	1.012e-02	Conversion electron
5.66839e+00	2.054e-02	Alpha
5.69370e+00	1.495e-02	Alpha
5.70151e+00	3.619e-02	Alpha
5.70958e+00	8.274e-02	Alpha
5.71401e+00	4.875e-02	Alpha
5.75701e+00	2.034e-01	Alpha
5.80734e+00	1.266e-02	Alpha
5.86656e+00	2.412e-02	Alpha
5.95975e+00	2.991e-02	Alpha
5.97771e+00	2.343e-01	Alpha
6.00872e+00	2.891e-02	Alpha
6.03805e+00	2.412e-01	Alpha
1.01741e-01	2.054e-02	Alpha recoil
1.02196e-01	1.495e-02	Alpha recoil
1.02336e-01	3.619e-02	Alpha recoil
1.02481e-01	8.274e-02	Alpha recoil
1.02560e-01	4.875e-02	Alpha recoil
1.03332e-01	2.034e-01	Alpha recoil
1.04235e-01	1.266e-02	Alpha recoil
1.05298e-01	2.412e-02	Alpha recoil
1.06971e-01	2.991e-02	Alpha recoil
1.07293e-01	2.343e-01	Alpha recoil
1.07850e-01	2.891e-02	Alpha recoil
1.08376e-01	2.412e-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