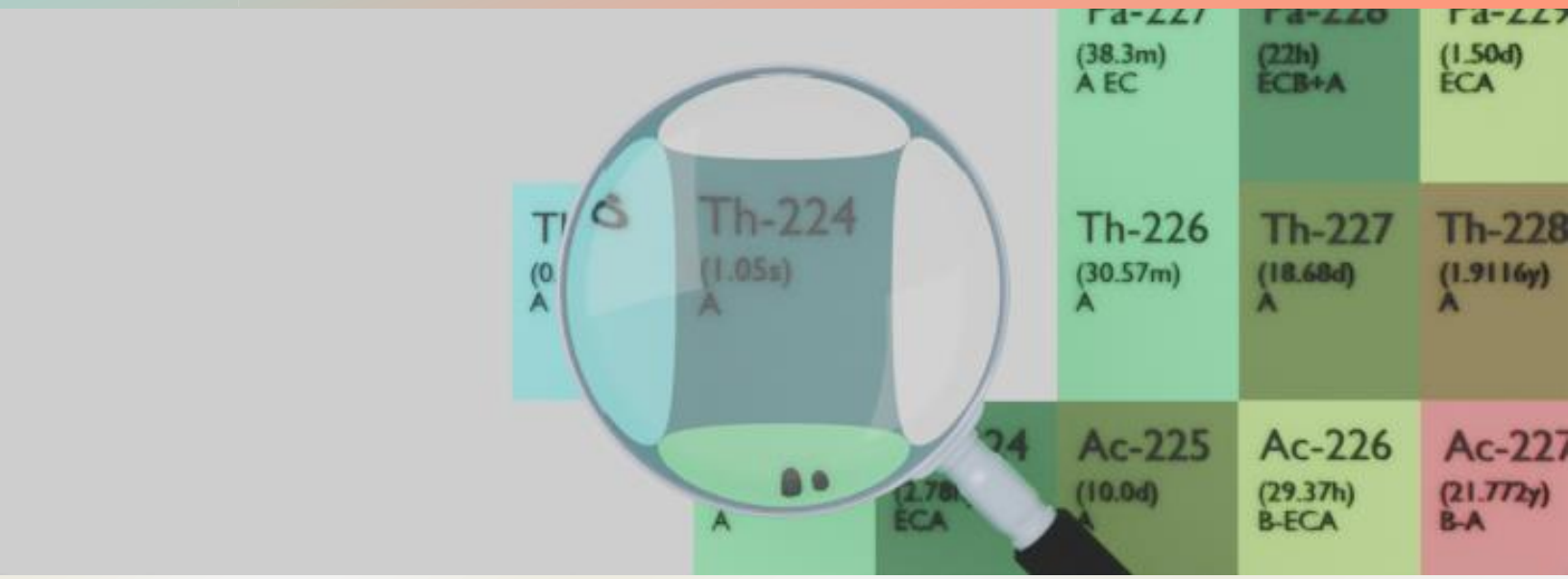


THORIUM-224

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Th-224
Atomic number (Z): 90
Mass number (A): 224
Neutron number (N): 134

RADIOACTIVE DECAY

Decay modes: a
Half-life: 1.05 [s]
Decay constant: 6.6014e-01 [1/s]
Daughters: Ra-220 (100.0%)
Radioactive daughters: Ra-220

DOSIMETRIC CONSTANTS

Mean alpha energy: 7.2635 [MeV]
Mean electron energy: 0.0129 [MeV]
Mean photon energy: 0.02318 [MeV]
Air kerma rate constant, Γ_{10}: 1.658e-18 [Gy·m^2/Bq·s]
Air kerma coefficient, K_{air}: 1.658e-18 [Gy·m^2/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (a and/or electrons), Δ_{wp}: 1.166e-12 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_a: 1.164e-12 [Gy·kg/Bq·s]

Equilibrium dose constant for betas/electrons, $\Delta_{\beta-,\beta+,e-}$: 2.067e-15 [Gy·kg/Bq·s]
Equilibrium dose constant for photons, Δ_{p}: 3.714e-15 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

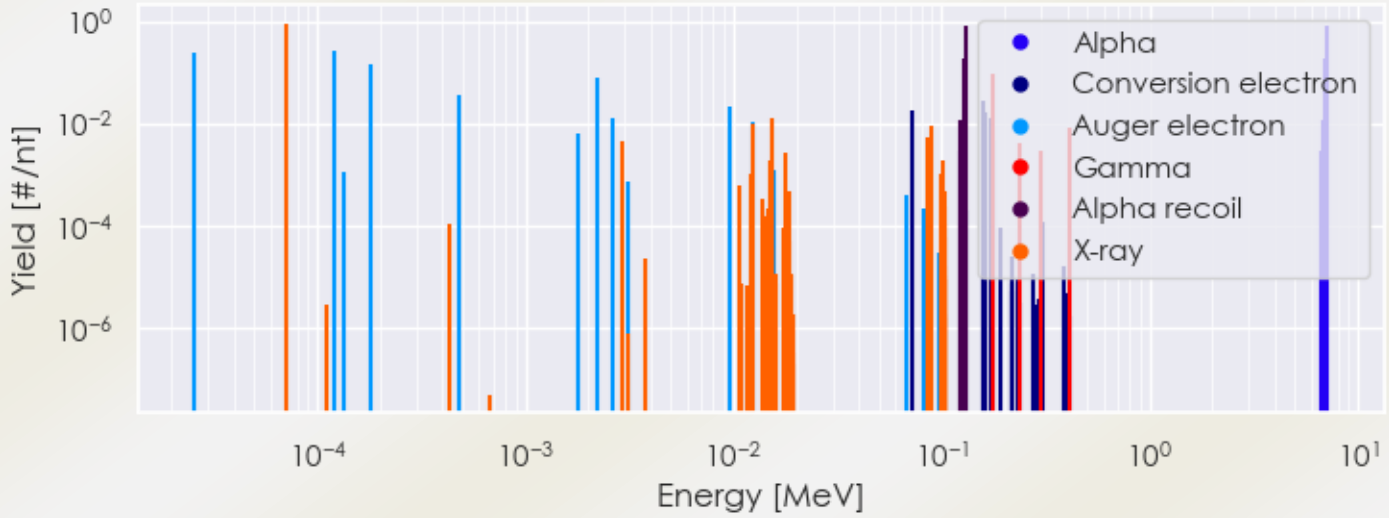
Dose point kernel source: **Graves, et al. Medical Physics. 2019 Nov.; 46(11):5284-5293.**

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-224 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-224 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-224 Summary Spectrum.csv

Energy [MeV]	Yield [#/nt] if > 0.01	Radiation type
7.12300e-05	9.072e-01	X-ray
1.53013e-02	1.230e-02	X-ray
1.77000e-01	9.000e-02	Gamma
2.57853e-05	2.493e-01	Auger electron
1.20936e-04	2.525e-01	Auger electron
1.81479e-04	1.436e-01	Auger electron
4.78782e-04	3.631e-02	Auger electron
2.22650e-03	7.967e-02	Auger electron
2.60098e-03	1.285e-02	Auger electron
9.56968e-03	2.149e-02	Auger electron
1.25097e-02	1.044e-02	Auger electron
7.26800e-02	1.826e-02	Conversion electron
1.58440e-01	2.843e-02	Conversion electron
1.61544e-01	1.618e-02	Conversion electron
1.73226e-01	1.314e-02	Conversion electron
6.76794e+00	1.206e-02	Alpha
6.99831e+00	1.910e-01	Alpha
7.17349e+00	7.940e-01	Alpha
1.23133e-01	1.206e-02	Alpha recoil
1.27325e-01	1.910e-01	Alpha recoil
1.30512e-01	7.940e-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