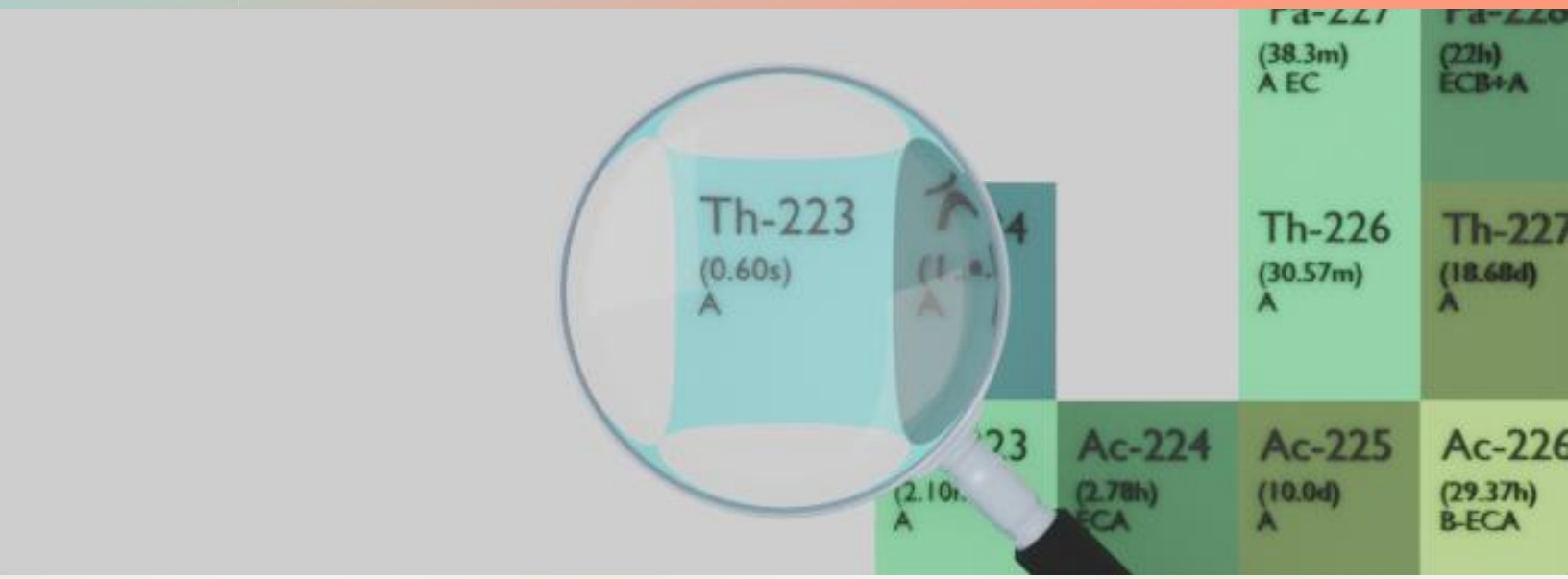


THORIUM-223

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Th-223
Atomic number (Z): 90
Mass number (A): 223
Neutron number (N): 133

RADIOACTIVE DECAY

Decay modes: α
Half-life: 0.6 [s]
Decay constant: 1.1552e+00 [1/s]
Daughters: Ra-219 (100.0%)
Radioactive daughters: Ra-219

DOSIMETRIC CONSTANTS

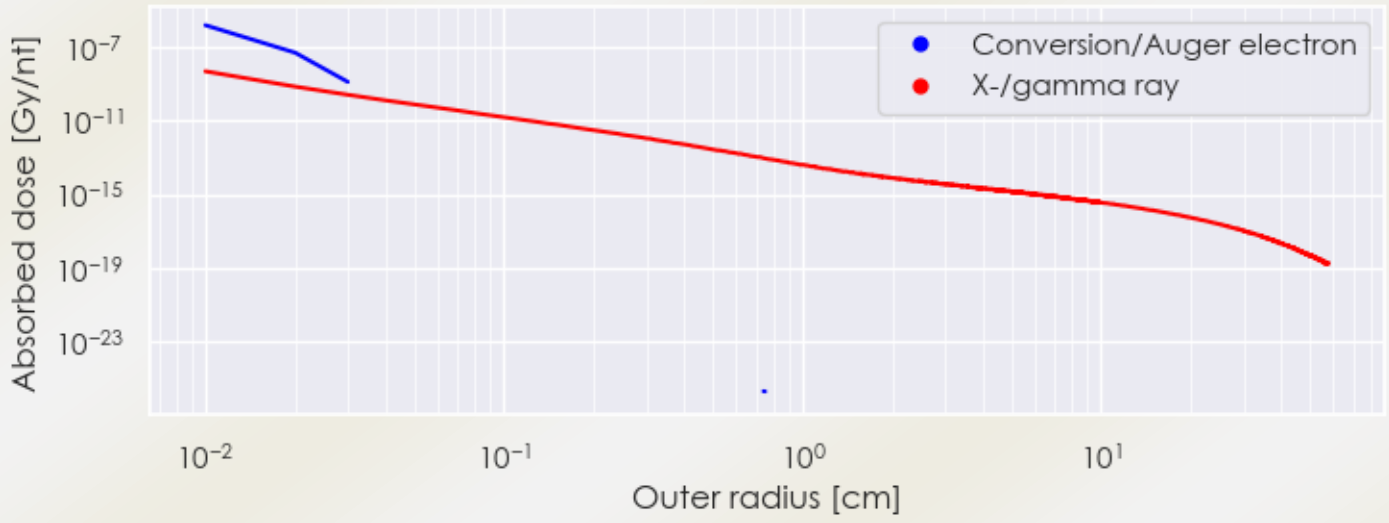
Mean alpha energy: 7.4133 [MeV]
Mean electron energy: 0.05753 [MeV]
Mean photon energy: 0.07541 [MeV]
Air kerma rate constant, Γ_{10}: 1.310e-17 [Gy·m²/Bq·s]
Air kerma coefficient, K_{air}: 1.310e-17 [Gy·m²/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp}: 1.197e-12 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{α}: 1.188e-12 [Gy·kg/Bq·s]

Equilibrium dose constant for betas/electrons, $\Delta_{\beta-,\beta+,e-}$: 9.217e-15 [Gy·kg/Bq·s]
Equilibrium dose constant for photons, Δ_{p}: 1.208e-14 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

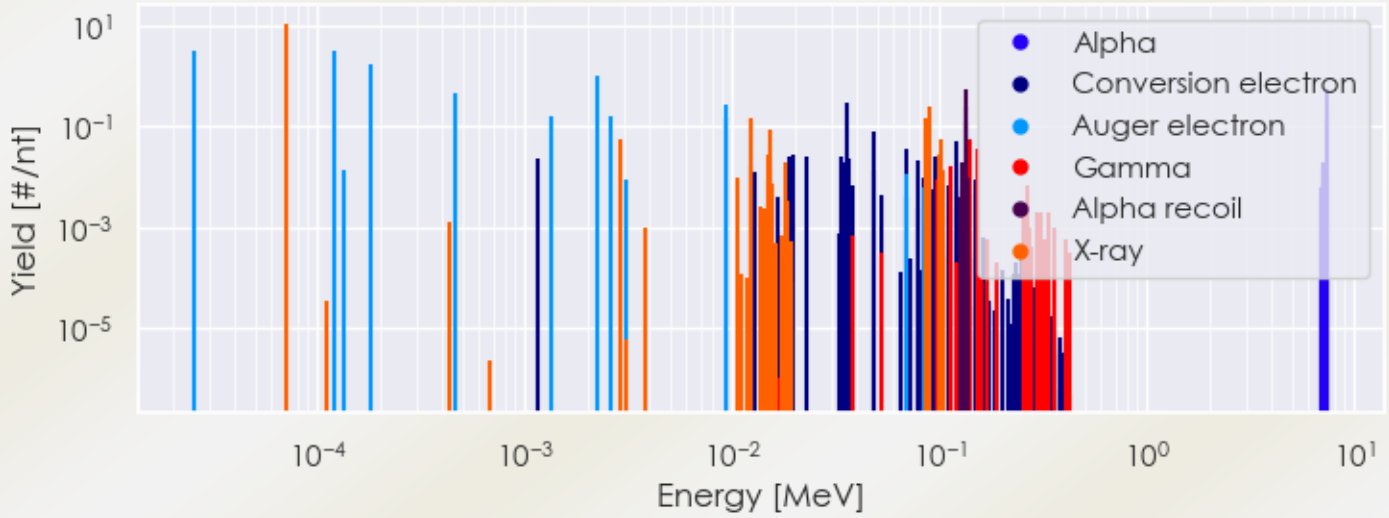
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Th-223 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-223 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-223 Summary Spectrum.csv

Energy [MeV]	Yield [#/nt] if > 0.01	Radiation type
7.12213e-05	1.140e+01	X-ray
2.88266e-03	5.835e-02	X-ray
1.21973e-02	1.625e-02	X-ray
1.23447e-02	1.429e-01	X-ray
1.48529e-02	2.903e-02	X-ray
1.53013e-02	9.031e-02	X-ray
1.79232e-02	1.967e-02	X-ray
8.57602e-02	1.523e-01	X-ray
8.88641e-02	2.488e-01	X-ray
9.98380e-02	2.833e-02	X-ray
1.00546e-01	5.514e-02	X-ray
1.03453e-01	1.391e-02	X-ray
1.13700e-01	1.600e-02	Gamma
1.40000e-01	5.800e-02	Gamma
1.52000e-01	3.700e-02	Gamma
2.55858e-05	3.139e+00	Auger electron
1.20281e-04	3.170e+00	Auger electron
1.35380e-04	1.389e-02	Auger electron
1.81261e-04	1.785e+00	Auger electron
4.65988e-04	4.585e-01	Auger electron
1.14400e-03	2.429e-02	Conversion electron
1.32977e-03	1.616e-01	Auger electron
2.21417e-03	1.010e+00	Auger electron
2.58448e-03	1.622e-01	Auger electron
9.27675e-03	2.700e-01	Auger electron
9.38001e-03	1.499e-01	Conversion electron
1.22002e-02	1.307e-01	Auger electron

1.28263e-02	1.253e-02	Conversion electron
1.51545e-02	1.498e-02	Auger electron
1.89680e-02	2.468e-02	Conversion electron
1.96400e-02	2.774e-02	Conversion electron
2.27440e-02	2.459e-02	Conversion electron
3.34400e-02	2.530e-02	Conversion electron
3.44263e-02	1.998e-02	Conversion electron
3.56800e-02	3.001e-01	Conversion electron
3.65440e-02	2.272e-02	Conversion electron
4.76800e-02	8.048e-02	Conversion electron
4.82263e-02	1.323e-02	Conversion electron
6.84262e-02	1.137e-02	Auger electron
6.87680e-02	3.744e-02	Conversion electron
7.79680e-02	2.209e-02	Conversion electron
9.44680e-02	2.502e-02	Conversion electron
1.20768e-01	4.991e-02	Conversion electron
1.32768e-01	1.367e-02	Conversion electron
1.33440e-01	1.270e-02	Conversion electron
1.36226e-01	1.326e-02	Conversion electron
6.99417e+00	1.493e-02	Alpha
7.03371e+00	1.891e-02	Alpha
7.28193e+00	2.587e-01	Alpha
7.29369e+00	5.473e-01	Alpha
7.31951e+00	1.294e-01	Alpha
1.27830e-01	1.493e-02	Alpha recoil
1.28553e-01	1.891e-02	Alpha recoil
1.33090e-01	2.587e-01	Alpha recoil
1.33305e-01	5.473e-01	Alpha recoil
1.33777e-01	1.294e-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