

Tb-162 (18.87m) ECB+	Tb-163 (11.05m) ECB+	Tb-164 (75.8m) EC	Tb-165 (9.9m) EC	Tb-166 (56.7h) EC	Tb-167 (17.5m) ECB+	Tb-168 (STABLE)	Tb-169 (32.026d) EC	
Tm-161 (30.2m) ECB+	Tm-162 (21.70m) ECB+	Tm-163 (1.17m) ECB+	Tm-164 (2.0m) ECB+	Tm-165 (30.1d) EC	Tm-166 (7.70h) ECB+	Tm-167 (9.25d) EC	Tm-168 (93.1d) ECB+B-	
Er-159 (13.8m) ECB+	Er-160 (6.7h) ECB+	Er-161 (3.21h) ECB+	Er-162 (1.27h) ECB+	Er-163 (1.43h) ECB+	Er-164 (13.1h) ECB+	Er-165 (10.36h) EC	Er-166 (STABLE)	Er-167 (STABLE)

THULIUM-164

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Tm-164
Atomic number (Z): 69
Mass number (A): 164
Neutron number (N): 95

RADIOACTIVE DECAY

Decay modes: β^+ , Electron capture
Half-life: 2.0 [m]
Decay constant: 5.7762×10^{-3} [1/s]
Daughters: Er-164 (100.0%)
Radioactive daughters: None

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.59935 [MeV]
Mean photon energy: 0.77604 [MeV]
Air kerma rate constant, Γ_{10} : 1.167×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Air kerma coefficient, K_{air} : 2.804×10^{-17} [Gy $\cdot$ m²/Bq $\cdot$ s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 9.603×10^{-14} [Gy $\cdot$ kg/Bq $\cdot$ s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy $\cdot$ kg/Bq $\cdot$ s]

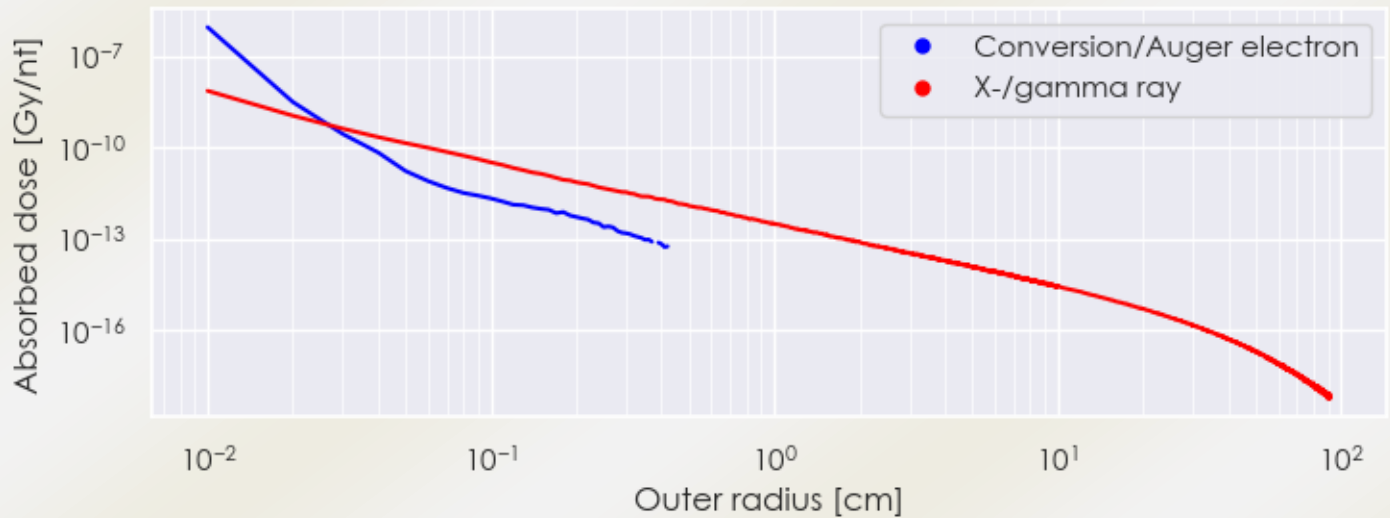
Equilibrium dose constant for betas/electrons, $\Delta_{\beta, \beta^+, e^-}$: 9.603×10^{-14} [Gy · kg/Bq · s]

Equilibrium dose constant for photons, Δ_p : 1.243×10^{-13} [Gy · kg/Bq · s]

DOSE POINT KERNELS (PLOT)

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

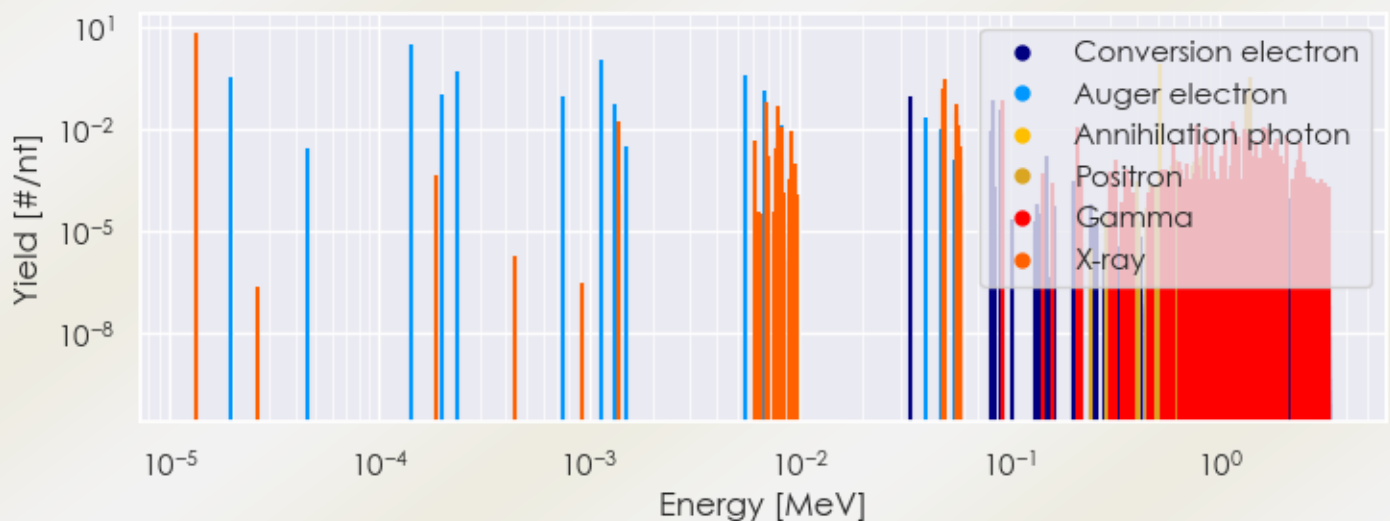
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Tm-164 DPK.csv

SUMMARY SPECTRA (PLOT)

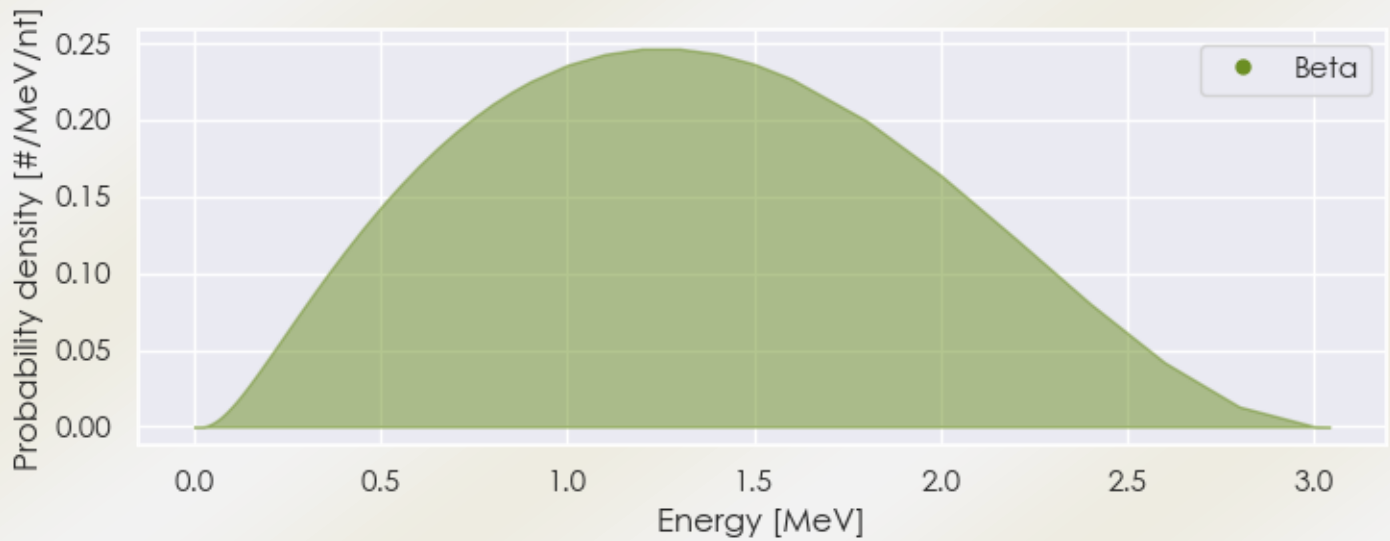
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Tm-164 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/Tm-164 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/Tm-164 Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
1.35477e-05	6.805e+00	X-ray
1.36753e-03	1.634e-02	X-ray
6.93540e-03	6.333e-02	X-ray
7.81980e-03	4.757e-02	X-ray
8.17512e-03	1.077e-02	X-ray
4.82994e-02	1.552e-01	X-ray
4.92265e-02	2.753e-01	X-ray
5.55822e-02	2.868e-02	X-ray
5.57777e-02	5.543e-02	X-ray
5.72611e-02	1.229e-02	X-ray

9.14100e-02	6.700e-02	Gamma
2.08040e-01	1.172e-02	Gamma
5.11000e-01	8.457e-01	Annihilation photon
7.68920e-01	1.340e-02	Gamma
8.60290e-01	1.119e-02	Gamma
1.15466e+00	1.655e-02	Gamma
1.61071e+00	1.065e-02	Gamma
1.67434e+00	1.039e-02	Gamma
1.33543e+00	1.009e-01	Positron
1.37730e+00	3.129e-01	Positron
1.98170e-05	3.303e-01	Auger electron
1.41537e-04	3.063e+00	Auger electron
2.00351e-04	1.086e-01	Auger electron
2.35237e-04	5.203e-01	Auger electron
7.41511e-04	9.441e-02	Auger electron
1.13419e-03	1.139e+00	Auger electron
1.30982e-03	5.661e-02	Auger electron
5.47788e-03	3.967e-01	Auger electron
6.85355e-03	1.414e-01	Auger electron
8.26148e-03	1.274e-02	Auger electron
3.38360e-02	8.757e-02	Conversion electron
3.94671e-02	2.046e-02	Auger electron
4.69039e-02	1.035e-02	Auger electron
8.21352e-02	7.028e-02	Conversion electron
8.30626e-02	6.998e-02	Conversion electron
8.96138e-02	3.625e-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