

TC-91 (3.14m) ECB+	TC-92 (4.25m) ECB+	TC-93 (2.75h) ECB+	TC-94 (293m) EC	TC-95 (20.0h) EC	TC-96 (4.28d) EC	TC-97 (2.6E+6y) EC	TC-98 (4.2E+6y) B-
Mo-89 (2.11m) CB+	Mo-90 (5.56h) ECB+	Mo-91 (15.49m) ECB+	Mo-93 (4.0E+3y) EC	Mo-94 (STABLE)	Mo-95 (STABLE)	Mo-96 (STABLE)	Mo-97 (STABLE)
Nb-88 (4.5m) CB+	Nb-89 (2.03h) ECB+	Nb-90 (14.60h) ECB+	Nb-93 (680y) ECB+	Nb-94 (2.03E+4y) B-	Nb-95 (34.991d) B-	Nb-96 (23.35h) B-	

MOLYBDENUM-93

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Mo-93
Atomic number (Z): 42
Mass number (A): 93
Neutron number (N): 51

RADIOACTIVE DECAY

Decay modes: Electron capture
Half-life: 4000.0 [y]
Decay constant: $5.4912\text{e-}12$ [1/s]
Daughters: Nb-93m (88.0%), Nb-93 (12.0%)
Radioactive daughters: Nb-93m

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.00555 [MeV]
Mean photon energy: 0.0107 [MeV]
Air kerma rate constant, Γ_{10} : $1.248\text{e-}17$ [Gy·m²/Bq·s]
Air kerma coefficient, K_{air} : $1.248\text{e-}17$ [Gy·m²/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : $8.892\text{e-}16$ [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy·kg/Bq·s]

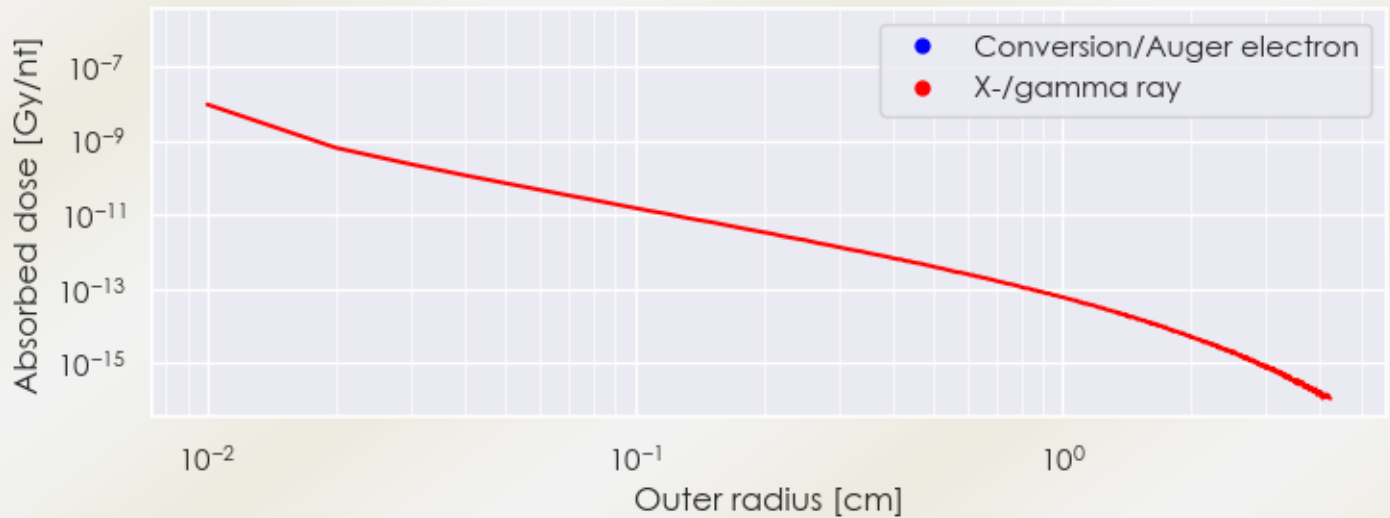
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: 8.892e-16 [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : 1.714e-15 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

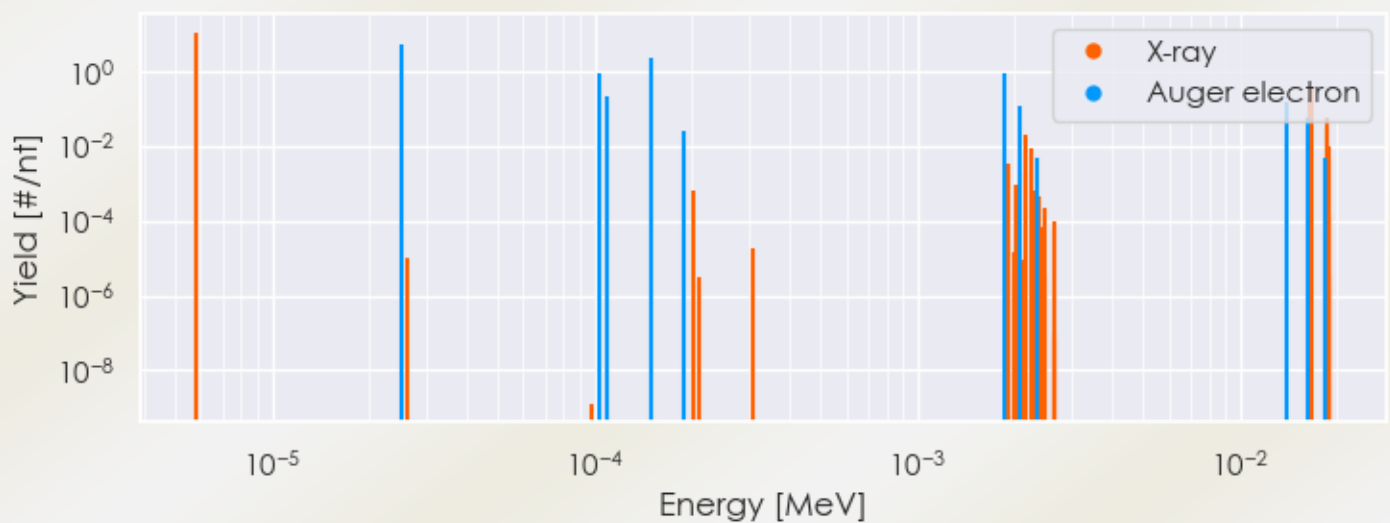
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Mo-93 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/Mo-93 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/Mo-93 Summary Spectrum.csv

Energy [MeV]	Yield [# /n _t] if > 0.01	Radiation type
5.83032e-06	1.087e+01	X-ray
2.15729e-03	1.937e-02	X-ray
1.64814e-02	1.819e-01	X-ray
1.65789e-02	3.474e-01	X-ray
1.85728e-02	2.785e-02	X-ray
1.85887e-02	5.423e-02	X-ray
2.53227e-05	5.352e+00	Auger electron
1.03340e-04	9.161e-01	Auger electron
1.08402e-04	2.090e-01	Auger electron
1.48994e-04	2.168e+00	Auger electron
1.89325e-04	2.388e-02	Auger electron
1.85287e-03	8.684e-01	Auger electron
2.07385e-03	1.112e-01	Auger electron
1.40095e-02	1.529e-01	Auger electron
1.61428e-02	5.549e-02	Auger 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/SNMMI-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6