



MO-93 (STABLE)	MO-96 (STABLE)	MO-97 (STABLE)	MO-98 (STABLE)	MO-99 (65.94h)	MO-101 (14.61m) B-	MO-102 (11.3m) B-
Nb-94 (2.03E+4y) B-	Nb-95 (34.991d) B-	Nb-96 (23.35h) B-	Nb-97 (7.7d) B-	Nb-98m (51.3m) B-	Nb-99 (1.1m) B-	
Zr-93 (1.53E+6y) B-	Zr-94 (STABLE)	Zr-95 (64.032d) B-				

NIOBIUM-98M

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Nb-98m
Atomic number (Z): 41
Mass number (A): 98
Neutron number (N): 57

RADIOACTIVE DECAY

Decay modes: β^-
Half-life: 51.3 [m]
Decay constant: 2.2519e-04 [1/s]
Daughters: Mo-98 (100.0%)
Radioactive daughters: None

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.76358 [MeV]
Mean photon energy: 2.8177 [MeV]
Air kerma rate constant, Γ_{10} : 9.958e-17 [Gy·m²/Bq·s]
Air kerma coefficient, K_{air} : 9.958e-17 [Gy·m²/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 1.223e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy·kg/Bq·s]

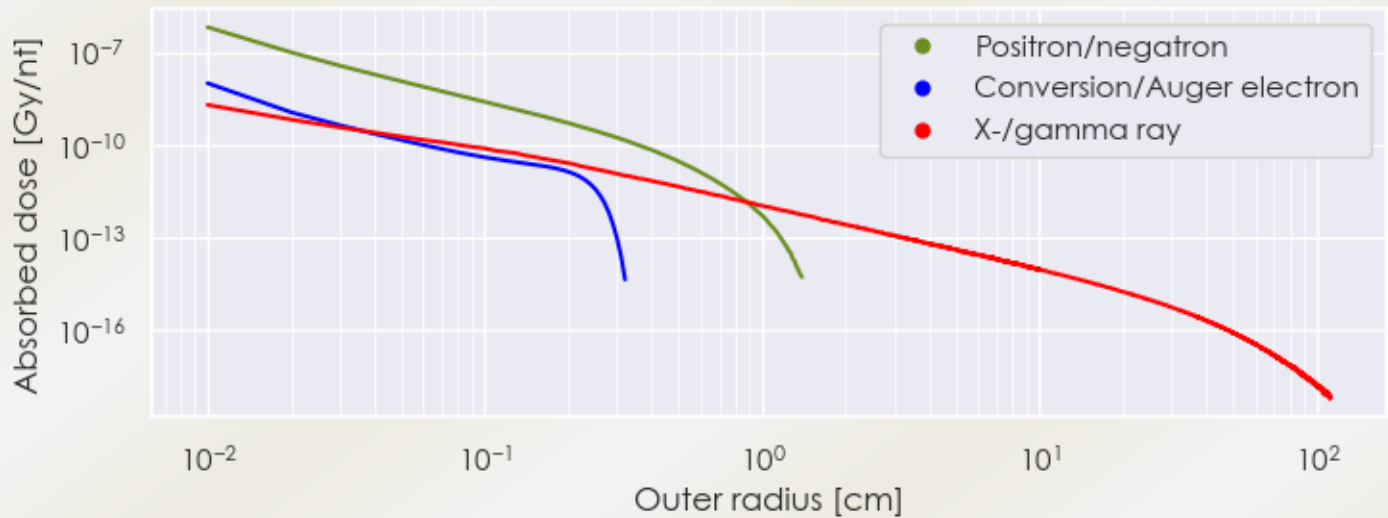
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: $1.223\text{e-}13$ [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : $4.514\text{e-}13$ [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

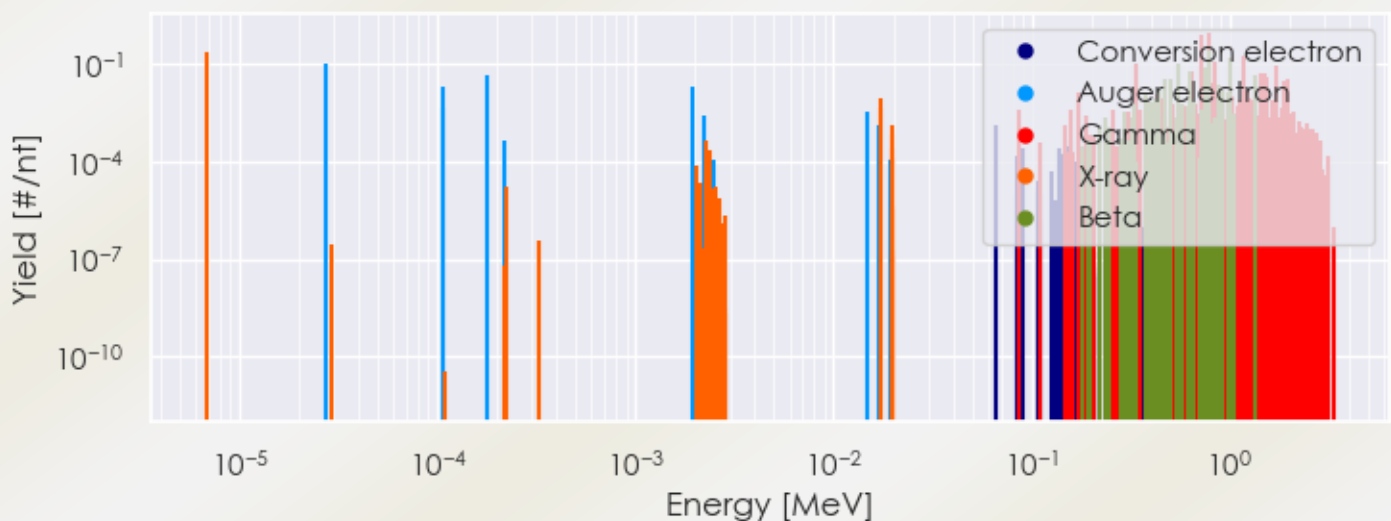
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Nb-98m DPK.csv

SUMMARY SPECTRA (PLOT)

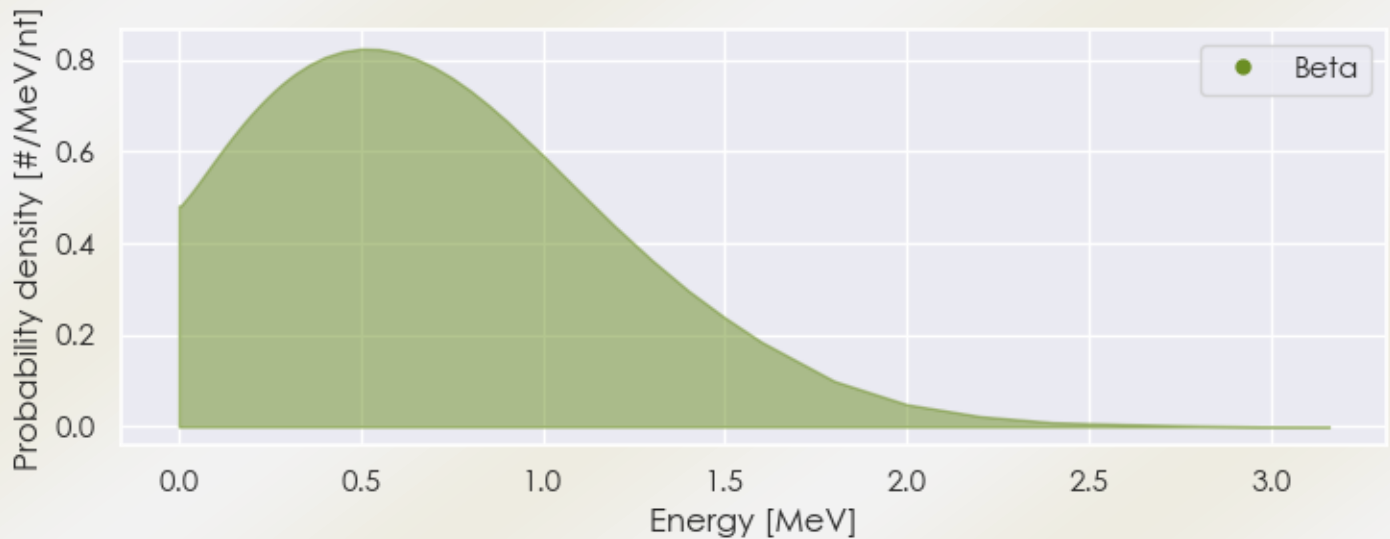
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Nb-98m 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/Nb-98m 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/Nb-98m Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
6.84804e-06	2.258e-01	X-ray
1.72950e-01	1.354e-02	Gamma
3.35258e-01	9.527e-02	Gamma
4.34260e-01	1.130e-02	Gamma
6.44847e-01	5.604e-02	Gamma
7.13817e-01	9.153e-02	Gamma
7.22626e-01	7.379e-01	Gamma
7.87363e-01	9.340e-01	Gamma
7.91646e-01	7.827e-02	Gamma

8.23390e-01	2.522e-02	Gamma
8.33556e-01	1.083e-01	Gamma
9.09670e-01	1.280e-02	Gamma
9.92880e-01	1.102e-02	Gamma
9.96300e-01	2.073e-02	Gamma
1.02370e+00	1.018e-02	Gamma
1.16883e+00	1.784e-01	Gamma
1.23015e+00	1.420e-02	Gamma
1.33545e+00	1.242e-02	Gamma
1.43218e+00	4.969e-02	Gamma
1.43642e+00	2.522e-02	Gamma
1.51168e+00	4.819e-02	Gamma
1.54092e+00	1.961e-02	Gamma
1.54603e+00	3.932e-02	Gamma
1.70150e+00	8.873e-02	Gamma
1.88440e+00	2.886e-02	Gamma
1.94501e+00	1.382e-02	Gamma
1.98017e+00	3.241e-02	Gamma
3.72155e-01	1.250e-02	Beta
4.43825e-01	1.703e-02	Beta
4.70030e-01	3.641e-02	Beta
4.99692e-01	3.248e-02	Beta
5.50178e-01	1.023e-01	Beta
6.21686e-01	2.362e-02	Beta
6.34789e-01	6.269e-02	Beta
7.49836e-01	7.578e-02	Beta
7.90429e-01	2.746e-01	Beta
8.75633e-01	2.362e-02	Beta
9.14897e-01	1.476e-02	Beta
9.71773e-01	1.279e-02	Beta
1.00090e+00	1.565e-01	Beta
1.33654e+00	4.330e-02	Beta
2.73633e-05	1.046e-01	Auger electron
1.06828e-04	1.989e-02	Auger electron
1.76202e-04	4.768e-02	Auger electron
1.95189e-03	1.907e-02	Auger electron
7.14775e-01	1.151e-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