

	Nb-87 (1.75m) ECB+	Nb-88 (14.5m) ECB+	Nb-89 (2.03h) ECB+	Nb-90 (60.86d) ITECB+	Nb-91 (3.1E+3y) ECB+	Nb-92 (STABLE)	Nb-93 (STABLE)	Nb-94 (2.03E+4y) B-	Nb-95 (34.991d) B-
Zr-86 (16.5h) ECB+	Zr-87 (1.68h) ECB+	Zr-88 (83.4d) EC	Zr-89 (78.41h) ECB+	Zr-90 (STABLE)	Zr-91 (STABLE)	Zr-92 (STABLE)	Zr-93 (1.53E+6y) B-	Zr-94 (STABLE)	

NIOBIUM-91M

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Nb-91m
Atomic number (Z): 41
Mass number (A): 91
Neutron number (N): 50

RADIOACTIVE DECAY

Decay modes: β^+ , Electron capture, Internal transition
Half-life: 60.86 [d]
Decay constant: 1.3182e-07 [1/s]
Daughters: Nb-91 (96.6%), Zr-91 (3.4%)
Radioactive daughters: Nb-91

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.0963 [MeV]
Mean photon energy: 0.03399 [MeV]
Air kerma rate constant, Γ_{10} : 1.144e-17 [Gy · m²/Bq · s]
Air kerma coefficient, K_{air} : 1.144e-17 [Gy · m²/Bq · s]
Equilibrium dose constant for weakly-penetrating radiations (a and/or electrons), Δ_{wp} : 1.543e-14 [Gy · kg/Bq · s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy · kg/Bq · s]

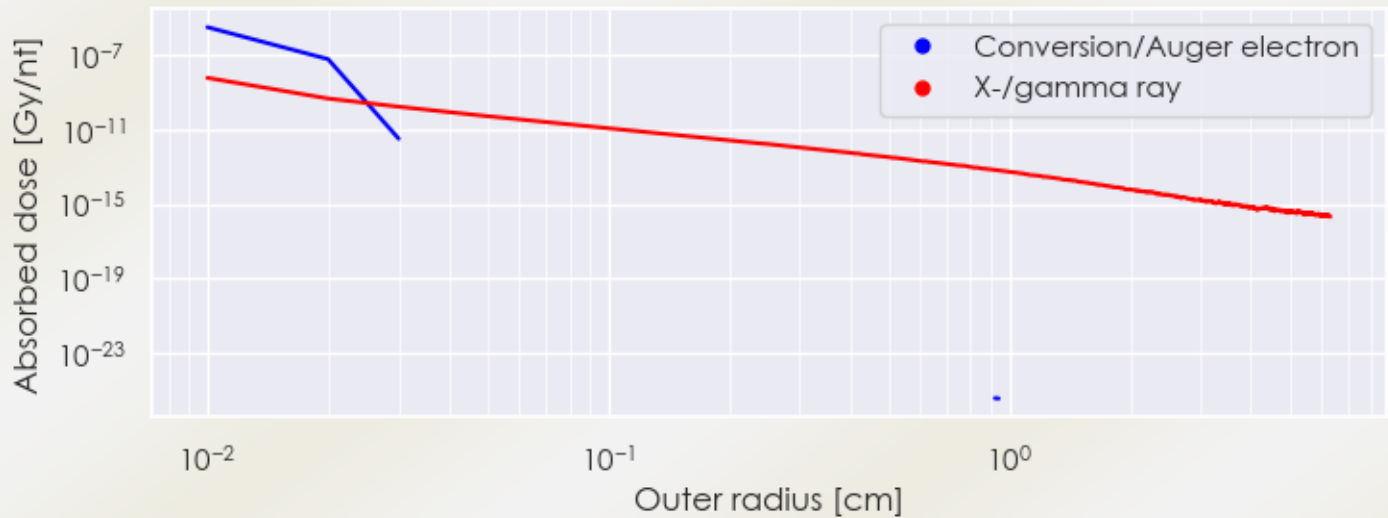
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: $1.543\text{e-}14$ [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : $5.446\text{e-}15$ [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

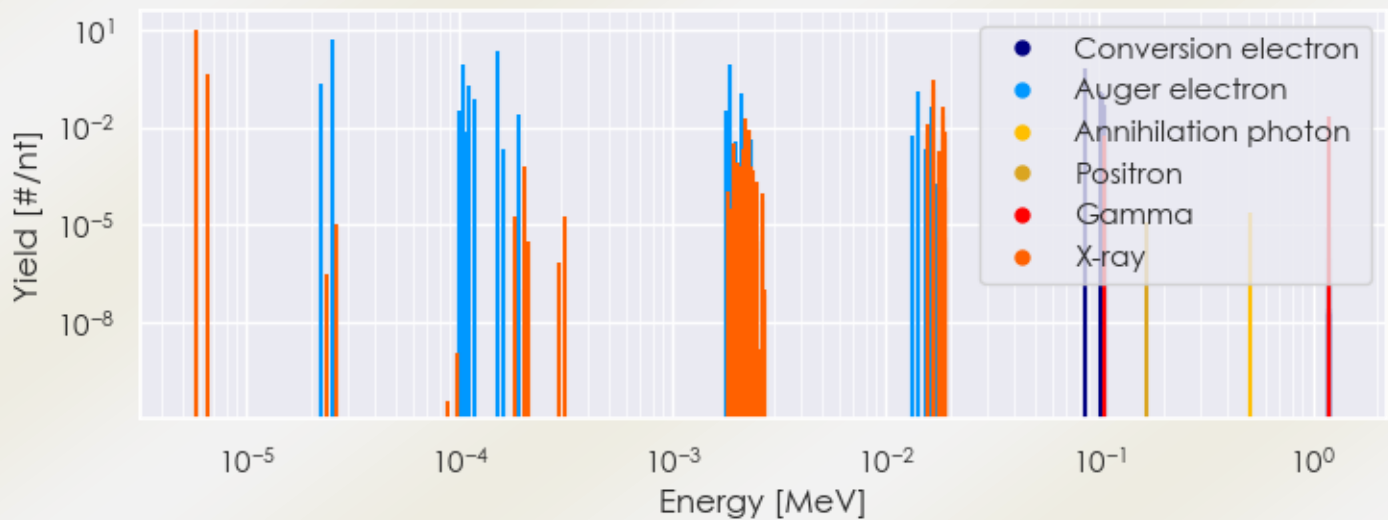
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Nb-91m DPK.csv

SUMMARY SPECTRA (PLOT)

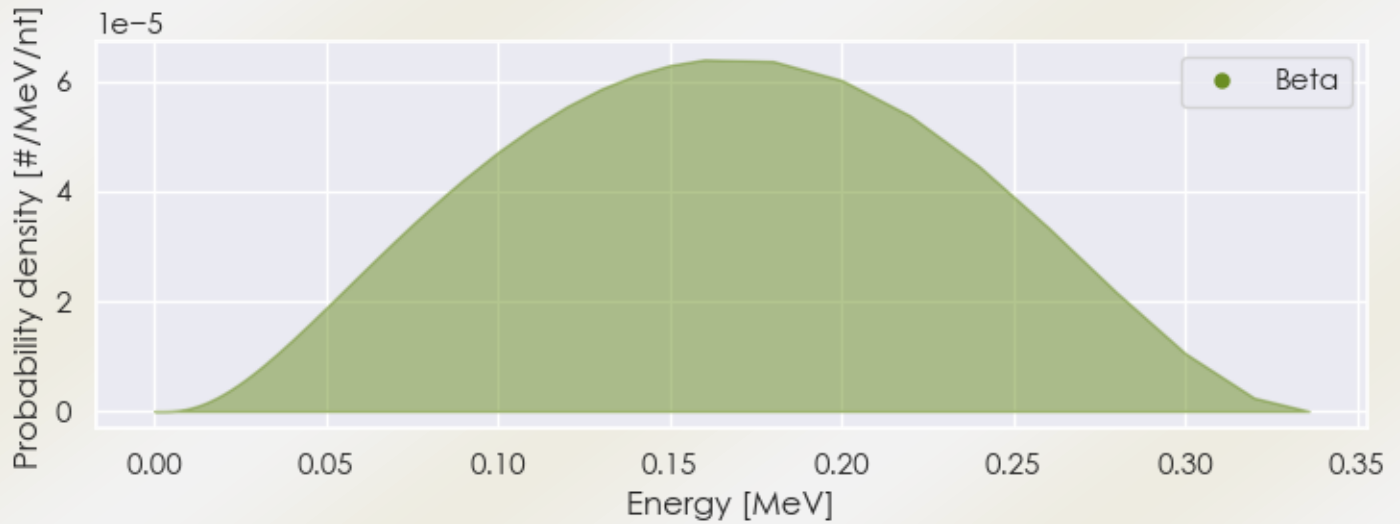
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Nb-91m 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-91m 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-91m Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
5.83022e-06	1.049e+01	X-ray
6.52411e-06	4.096e-01	X-ray
2.15729e-03	1.907e-02	X-ray
1.57372e-02	1.177e-02	X-ray
1.64814e-02	1.474e-01	X-ray
1.65789e-02	2.815e-01	X-ray
1.85728e-02	2.257e-02	X-ray
1.85887e-02	4.395e-02	X-ray
1.20467e+00	2.020e-02	Gamma

2.22340e-05	2.172e-01	Auger electron
2.53216e-05	5.169e+00	Auger electron
9.82224e-05	3.247e-02	Auger electron
1.03286e-04	8.866e-01	Auger electron
1.08895e-04	1.986e-01	Auger electron
1.17920e-04	7.436e-02	Auger electron
1.48991e-04	2.094e+00	Auger electron
1.89295e-04	2.307e-02	Auger electron
1.75408e-03	3.067e-02	Auger electron
1.85152e-03	8.372e-01	Auger electron
2.07243e-03	1.072e-01	Auger electron
1.40095e-02	1.240e-01	Auger electron
1.61428e-02	4.497e-02	Auger electron
8.56720e-02	6.802e-01	Conversion electron
1.01944e-01	1.277e-01	Conversion electron
1.02153e-01	2.711e-02	Conversion electron
1.02251e-01	1.073e-01	Conversion electron
1.04261e-01	5.107e-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/SNMMI-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6