FRANCIUM-222

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Fr-222
Atomic number (Z): 87
Mass number (A): 222
Neutron number (N): 135

RADIOACTIVE DECAY

Decay modes: β-
Half-life: 14.2 [m]
Decay constant: 8.1355e-04 [1/s]
Daughters: Ra-222 (100.0%)
Radioactive daughters: Ra-222

DOSIMETRIC CONSTANTS

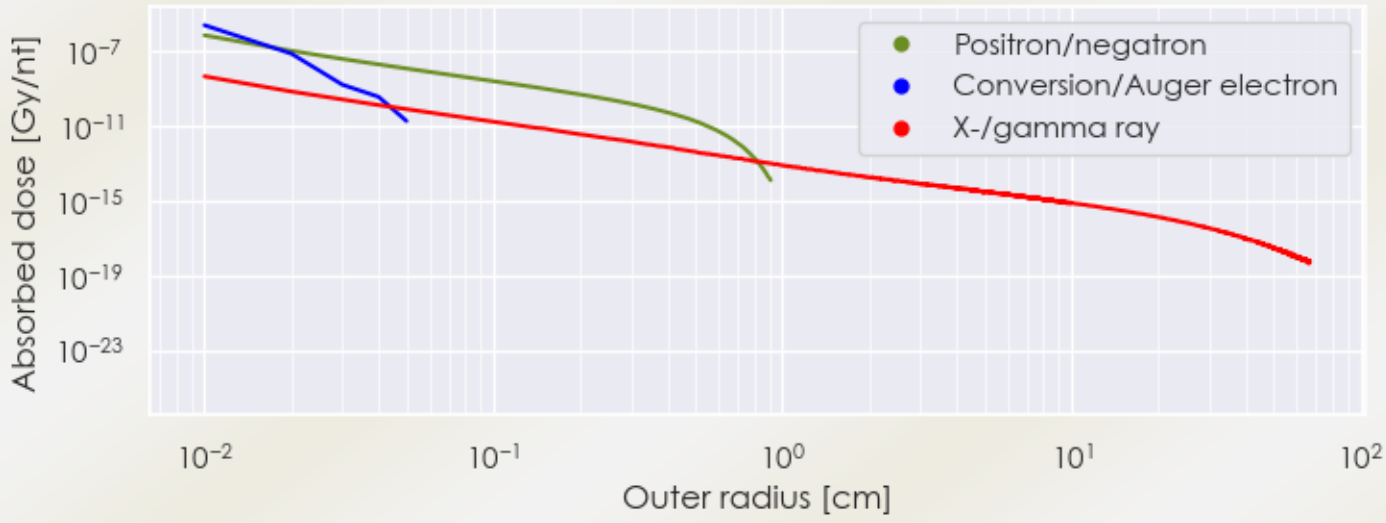
Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.71452 [MeV]
Mean photon energy: 0.18061 [MeV]
Air kerma rate constant, Γ_{10}: 1.506e-17 [Gy·m^2/Bq·s]
Air kerma coefficient, K_{air}: 1.506e-17 [Gy·m^2/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (a and/or electrons), Δ_{wp}: 1.145e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{a}: 0.000e+00 [Gy·kg/Bq·s]

Equilibrium dose constant for betas/electrons, $\Delta_{\beta-,\beta+,e-}$: 1.145e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for photons, Δ_{p}: 2.894e-14 [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

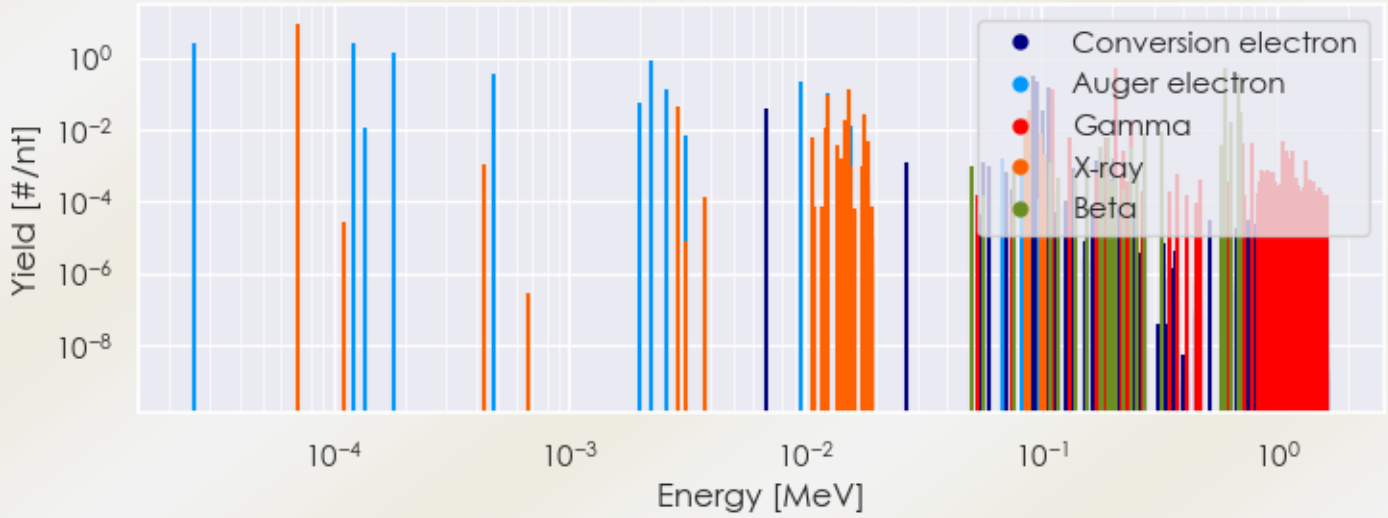
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Fr-222 DPK.csv

SUMMARY SPECTRA (PLOT)

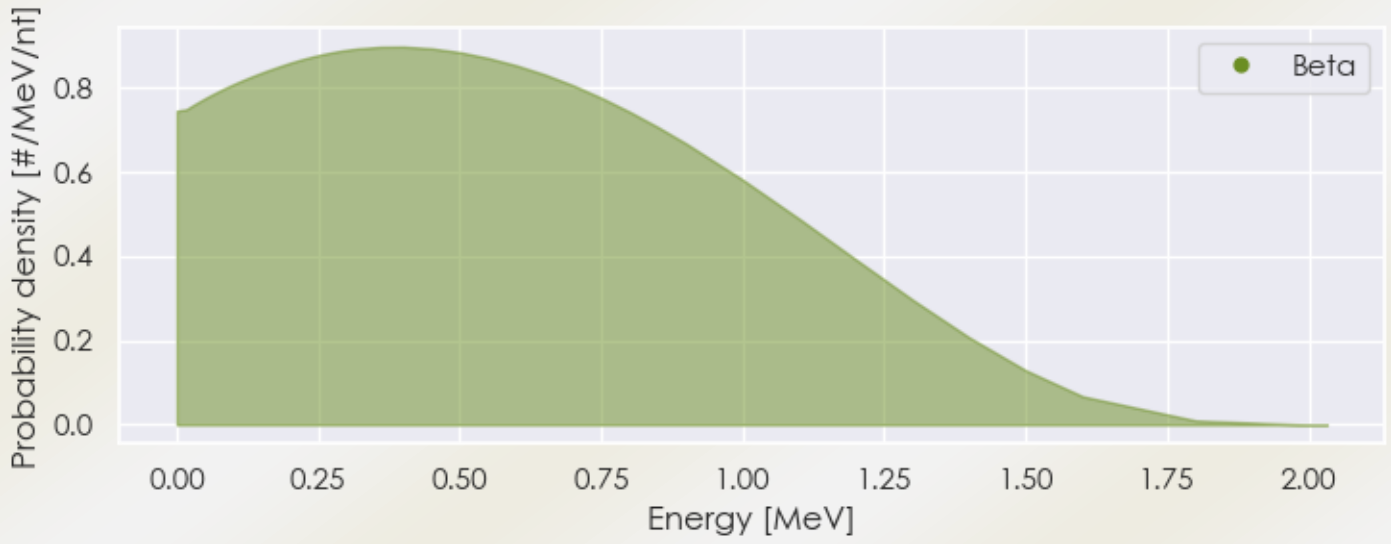
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Fr-222 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/Fr-222 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/Fr-222 Summary Spectrum.csv

Energy [MeV]	Yield [#/nt] if > 0.01	Radiation type
7.12314e-05	9.214e+00	X-ray
2.89239e-03	4.693e-02	X-ray
1.21973e-02	1.094e-02	X-ray
1.23447e-02	9.618e-02	X-ray
1.48529e-02	1.954e-02	X-ray
1.53013e-02	1.276e-01	X-ray
1.79232e-02	2.778e-02	X-ray
8.57602e-02	2.161e-02	X-ray
8.88641e-02	3.528e-02	X-ray
1.11110e-01	1.310e-01	Gamma

2.06170e-01	5.000e-01	Gamma
2.42110e-01	1.950e-02	Gamma
6.03747e-01	5.346e-01	Beta
6.34203e-01	1.683e-02	Beta
6.87598e-01	3.762e-01	Beta
7.03092e-01	2.970e-02	Beta
2.57917e-05	2.532e+00	Auger electron
1.20909e-04	2.564e+00	Auger electron
1.35472e-04	1.124e-02	Auger electron
1.81445e-04	1.461e+00	Auger electron
4.77233e-04	3.687e-01	Auger electron
1.97088e-03	5.368e-02	Auger electron
2.22725e-03	8.088e-01	Auger electron
2.60213e-03	1.305e-01	Auger electron
6.79001e-03	3.770e-02	Conversion electron
9.56704e-03	2.186e-01	Auger electron
1.25062e-02	1.062e-01	Auger electron
1.54821e-02	1.223e-02	Auger electron
9.18780e-02	1.775e-02	Conversion electron
9.25500e-02	3.272e-01	Conversion electron
9.56540e-02	2.284e-01	Conversion electron
1.01850e-01	3.372e-02	Conversion electron
1.07336e-01	1.564e-01	Conversion electron
1.11110e-01	5.284e-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