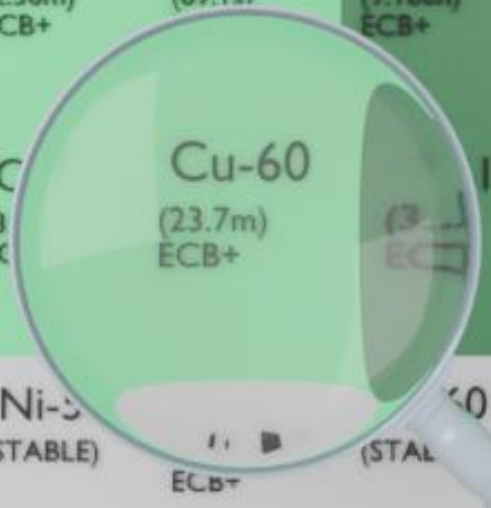




		Zn-60 (2.38m) ECB+	Zn-61 (89.1s) ECB+	Zn-62 (9.186h) ECB+	Zn-63 (38.47m) ECB+	Zn-64 (STABLE)	Zn-65 (244.06d) ECB+
Cu-57 (0.1963s) ECB+	Cu-58 (8.02m) ECB+	Cu-59 (8.02m) ECB+	Cu-60 (23.7m) ECB+	Cu-61 (3.32h) ECB+	Cu-62 (9.673m) ECB+	Cu-63 (STABLE)	Cu-64 (12.700h) ECB+B-
Ni-56 (6.075d) ECB+	Ni-57 (35.60h) ECB+	Ni-58 (STABLE)	Ni-59 (5.43h) ECB+	Ni-60 (STABLE)	Ni-61 (STABLE)	Ni-62 (STABLE)	Ni-63 (100.1y) B-

COPPER-60

SUMMARY DATA

GENERAL

CLASSIFICATION

Isotope: Cu-60
Atomic number (Z): 29
Mass number (A): 60
Neutron number (N): 31

RADIOACTIVE DECAY

Decay modes: β^+ , Electron capture
Half-life: 23.7 [m]
Decay constant: 4.8745e-04 [1/s]
Daughters: Ni-60 (100.0%)
Radioactive daughters: None

DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]
Mean electron energy: 0.89751 [MeV]
Mean photon energy: 3.91114 [MeV]
Air kerma rate constant, Γ_{10} : 9.487e-17 [Gy·m²/Bq·s]
Air kerma coefficient, K_{air} : 1.305e-16 [Gy·m²/Bq·s]
Equilibrium dose constant for weakly-penetrating radiations (α and/or electrons), Δ_{wp} : 1.438e-13 [Gy·kg/Bq·s]
Equilibrium dose constant for alphas, Δ_{α} : 0.000e+00 [Gy·kg/Bq·s]

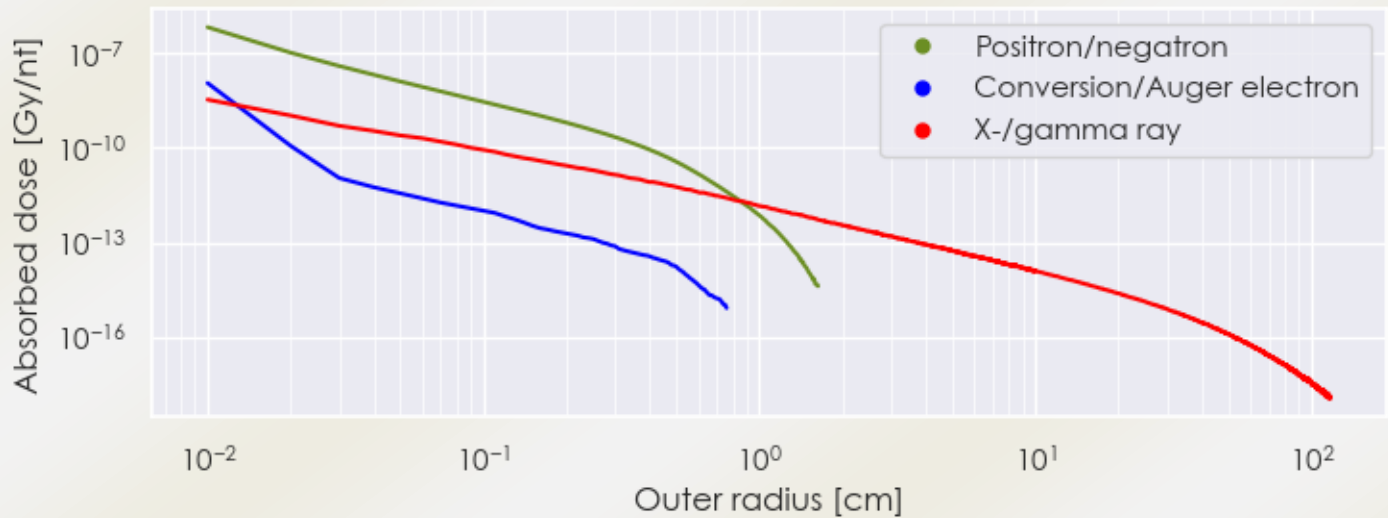
Equilibrium dose constant for betas/electrons, $\Delta_{\beta,\beta^+,e^-}$: $1.438\text{e-}13$ [Gy·kg/Bq·s]

Equilibrium dose constant for photons, Δ_p : $6.266\text{e-}13$ [Gy·kg/Bq·s]

DOSE POINT KERNELS (PLOT)

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

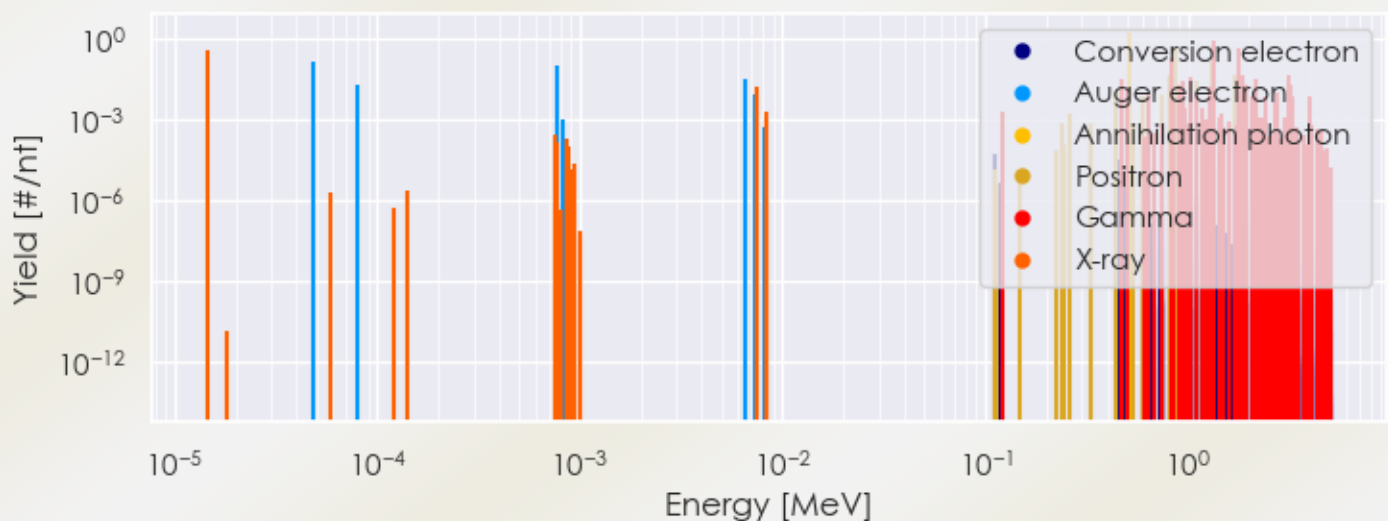
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: www.mirdsoft.org/products/MIRDspecs/Cu-60 DPK.csv

SUMMARY SPECTRA (PLOT)

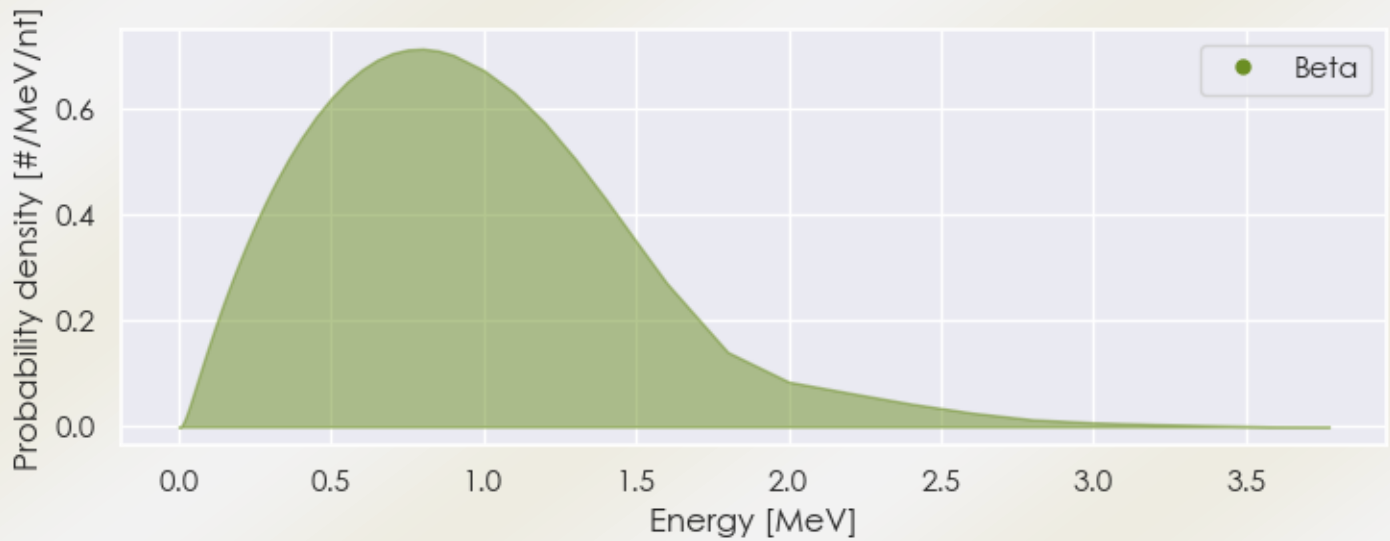
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: www.mirdsoft.org/products/MIRDspecs/Cu-60 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/Cu-60 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/Cu-60 Summary Spectrum.csv

Energy [MeV]	Yield [# / nt] if > 0.01	Radiation type
1.44989e-05	4.051e-01	X-ray
7.43578e-03	1.650e-02	X-ray
4.67300e-01	3.520e-02	Gamma
4.97900e-01	1.672e-02	Gamma
5.11000e-01	1.843e+00	Annihilation photon
8.26400e-01	2.174e-01	Gamma
9.09200e-01	2.024e-02	Gamma
9.52400e-01	2.728e-02	Gamma
1.03520e+00	3.696e-02	Gamma
1.11050e+00	1.056e-02	Gamma

1.29370e+00	1.848e-02	Gamma
1.33250e+00	8.800e-01	Gamma
1.79160e+00	4.541e-01	Gamma
1.86160e+00	4.752e-02	Gamma
1.93690e+00	2.200e-02	Gamma
2.15890e+00	3.344e-02	Gamma
2.74610e+00	1.056e-02	Gamma
3.12410e+00	4.752e-02	Gamma
3.19410e+00	2.024e-02	Gamma
4.39991e-01	1.165e-02	Positron
8.04720e-01	4.569e-02	Positron
8.39411e-01	1.155e-01	Positron
8.71755e-01	4.877e-01	Positron
1.10392e+00	2.787e-02	Positron
1.32414e+00	1.493e-01	Positron
1.71936e+00	4.977e-02	Positron
4.78737e-05	1.584e-01	Auger electron
7.88403e-05	2.014e-02	Auger electron
7.72706e-04	1.050e-01	Auger electron
6.49788e-03	3.299e-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