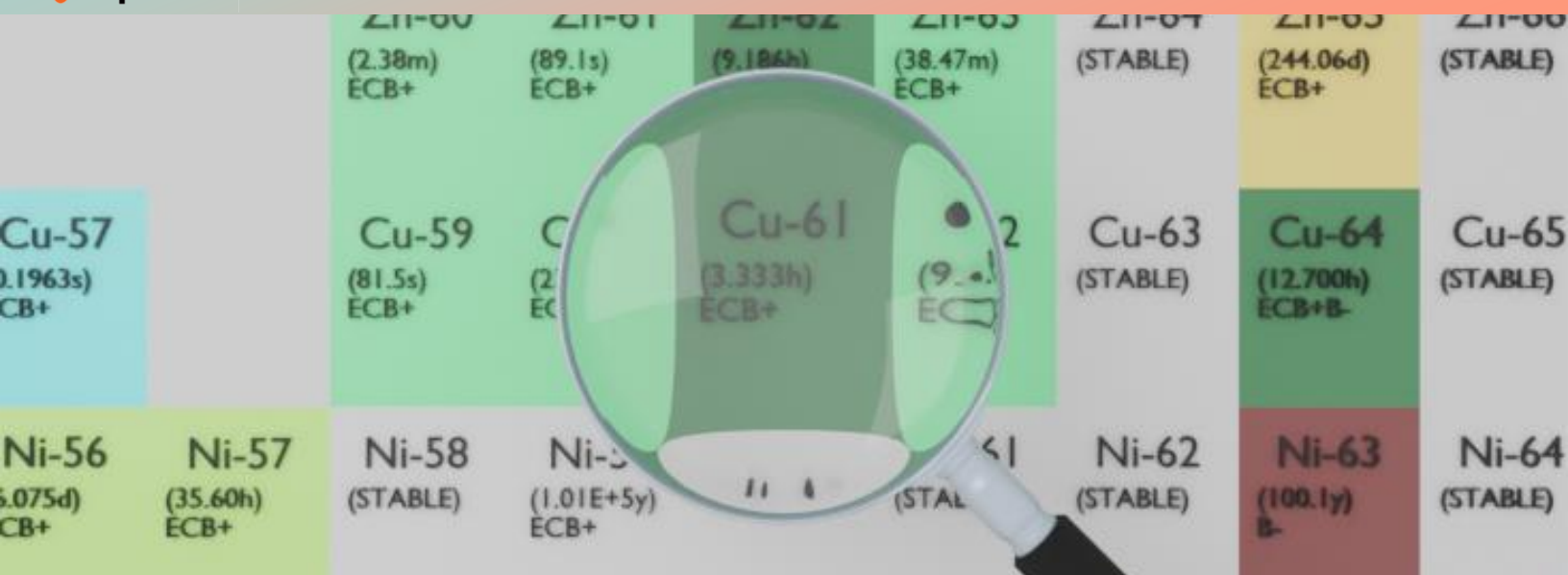




|                           |                           |                           |                             |                              |                   |
|---------------------------|---------------------------|---------------------------|-----------------------------|------------------------------|-------------------|
| Cu-57<br>(0.1963s)<br>CB+ | Cu-59<br>(81.5s)<br>ECB+  | Cu-61<br>(3.333h)<br>ECB+ | Cu-63<br>(STABLE)           | Cu-64<br>(12.700h)<br>ECB+B- | Cu-65<br>(STABLE) |
| Ni-56<br>(6.075d)<br>CB+  | Ni-57<br>(35.60h)<br>ECB+ | Ni-58<br>(STABLE)         | Ni-60<br>(1.01E+5y)<br>ECB+ | Ni-62<br>(STABLE)            | Ni-64<br>(STABLE) |

# COPPER-61

## SUMMARY DATA

### GENERAL

### CLASSIFICATION

Isotope: Cu-61  
 Atomic number (Z): 29  
 Mass number (A): 61  
 Neutron number (N): 32

### RADIOACTIVE DECAY

Decay modes:  $\beta^+$ , Electron capture  
 Half-life: 3.333 [h]  
 Decay constant:  $5.7768 \times 10^{-5}$  [1/s]  
 Daughters: Ni-61 (100.0%)  
 Radioactive daughters: None

### DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0 [MeV]  
 Mean electron energy: 0.30902 [MeV]  
 Mean photon energy: 0.82369 [MeV]  
 Air kerma rate constant,  $\Gamma_{10}$ :  $7.065 \times 10^{-18}$  [Gy  $\cdot$  m<sup>2</sup>/Bq  $\cdot$  s]  
 Air kerma coefficient,  $K_{\text{air}}$ :  $3.085 \times 10^{-17}$  [Gy  $\cdot$  m<sup>2</sup>/Bq  $\cdot$  s]  
 Equilibrium dose constant for weakly-penetrating radiations ( $\alpha$  and/or electrons),  $\Delta_{\text{wp}}$ :  $4.951 \times 10^{-14}$  [Gy  $\cdot$  kg/Bq  $\cdot$  s]  
 Equilibrium dose constant for alphas,  $\Delta_{\alpha}$ :  $0.000 \times 10^0$  [Gy  $\cdot$  kg/Bq  $\cdot$  s]

Equilibrium dose constant for betas/electrons,  $\Delta_{\beta-, \beta+, e-}$ :  $4.951 \times 10^{-14}$  [Gy·kg/Bq·s]

Equilibrium dose constant for photons,  $\Delta_p$ :  $1.320 \times 10^{-13}$  [Gy·kg/Bq·s]

### DOSE POINT KERNELS (PLOT)

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

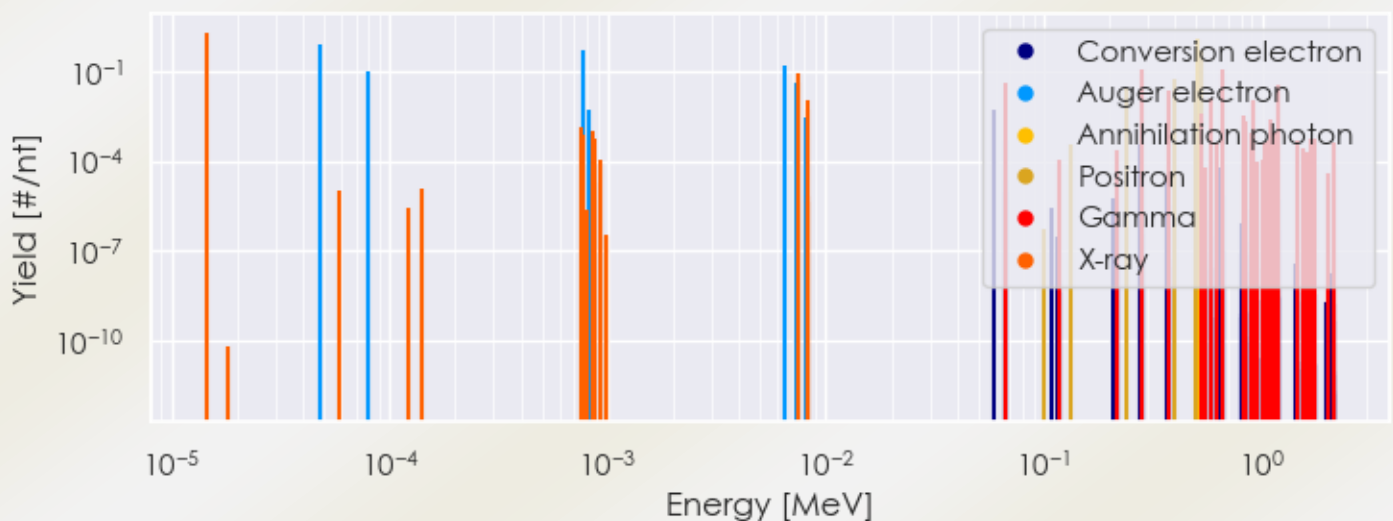
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: [www.mirdsoft.org/products/MIRDspecs/Cu-61 DPK.csv](http://www.mirdsoft.org/products/MIRDspecs/Cu-61 DPK.csv)

### SUMMARY SPECTRA (PLOT)

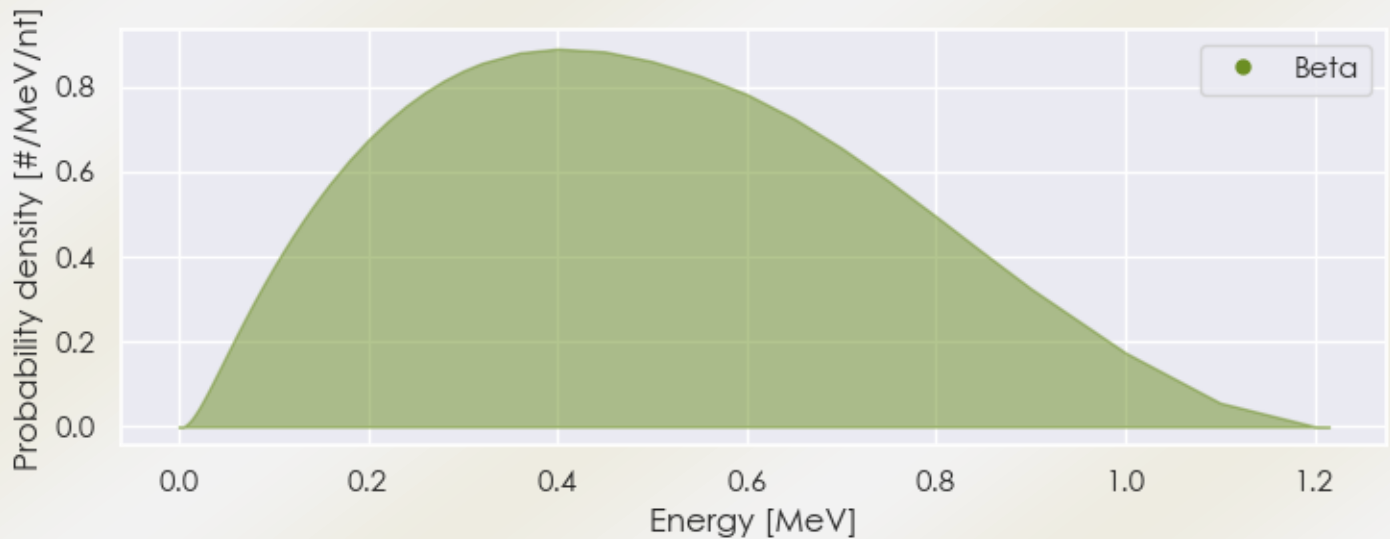
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: [www.mirdsoft.org/products/MIRDspecs/Cu-61 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Cu-61 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-61 Beta Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Cu-61 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-61 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/Cu-61 Summary Spectrum.csv)

| Energy [MeV] | Yield [# / nt] if > 0.01 | Radiation type      |
|--------------|--------------------------|---------------------|
| 1.44989e-05  | 2.017e+00                | X-ray               |
| 7.41782e-03  | 4.206e-02                | X-ray               |
| 7.43578e-03  | 8.213e-02                | X-ray               |
| 8.22459e-03  | 1.009e-02                | X-ray               |
| 6.74120e-02  | 4.233e-02                | Gamma               |
| 2.82956e-01  | 1.220e-01                | Gamma               |
| 3.73050e-01  | 2.147e-02                | Gamma               |
| 5.11000e-01  | 1.229e+00                | Annihilation photon |
| 5.88605e-01  | 1.168e-02                | Gamma               |
| 6.56008e-01  | 1.077e-01                | Gamma               |

|             |           |                |
|-------------|-----------|----------------|
| 9.08631e-01 | 1.102e-02 | Gamma          |
| 1.18523e+00 | 3.747e-02 | Gamma          |
| 2.38312e-01 | 2.600e-02 | Positron       |
| 3.98763e-01 | 5.501e-02 | Positron       |
| 4.93698e-01 | 2.300e-02 | Positron       |
| 5.23683e-01 | 5.101e-01 | Positron       |
| 4.78744e-05 | 7.886e-01 | Auger electron |
| 7.88409e-05 | 1.003e-01 | Auger electron |
| 7.72708e-04 | 5.226e-01 | Auger electron |
| 6.49788e-03 | 1.642e-01 | Auger electron |
| 7.31362e-03 | 4.106e-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](https://sites.snmmi.org/SNMMI-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6)