



# ASTATINE-210

## SUMMARY DATA

### GENERAL

### CLASSIFICATION

Isotope: At-210  
Atomic number (Z): 85  
Mass number (A): 210  
Neutron number (N): 125

### RADIOACTIVE DECAY

Decay modes:  $\alpha$ ,  $\beta^+$ , Electron capture  
Half-life: 8.1 [h]  
Decay constant:  $2.3770 \times 10^{-5}$  [1/s]  
Daughters: Po-210 (99.8%), Bi-206 (0.175%)  
Radioactive daughters: Po-210, Bi-206

### DOSIMETRIC CONSTANTS

Mean alpha energy: 0.0097 [MeV]  
Mean electron energy: 0.07962 [MeV]  
Mean photon energy: 2.96215 [MeV]  
Air kerma rate constant,  $\Gamma_{10}$ :  $1.190 \times 10^{-16}$  [Gy  $\cdot$  m<sup>2</sup>/Bq  $\cdot$  s]  
Air kerma coefficient,  $K_{\text{air}}$ :  $1.191 \times 10^{-16}$  [Gy  $\cdot$  m<sup>2</sup>/Bq  $\cdot$  s]  
Equilibrium dose constant for weakly-penetrating radiations ( $\alpha$  and/or electrons),  $\Delta_{\text{wp}}$ :  $1.431 \times 10^{-14}$  [Gy  $\cdot$  kg/Bq  $\cdot$  s]  
Equilibrium dose constant for alphas,  $\Delta_{\alpha}$ :  $1.554 \times 10^{-15}$  [Gy  $\cdot$  kg/Bq  $\cdot$  s]

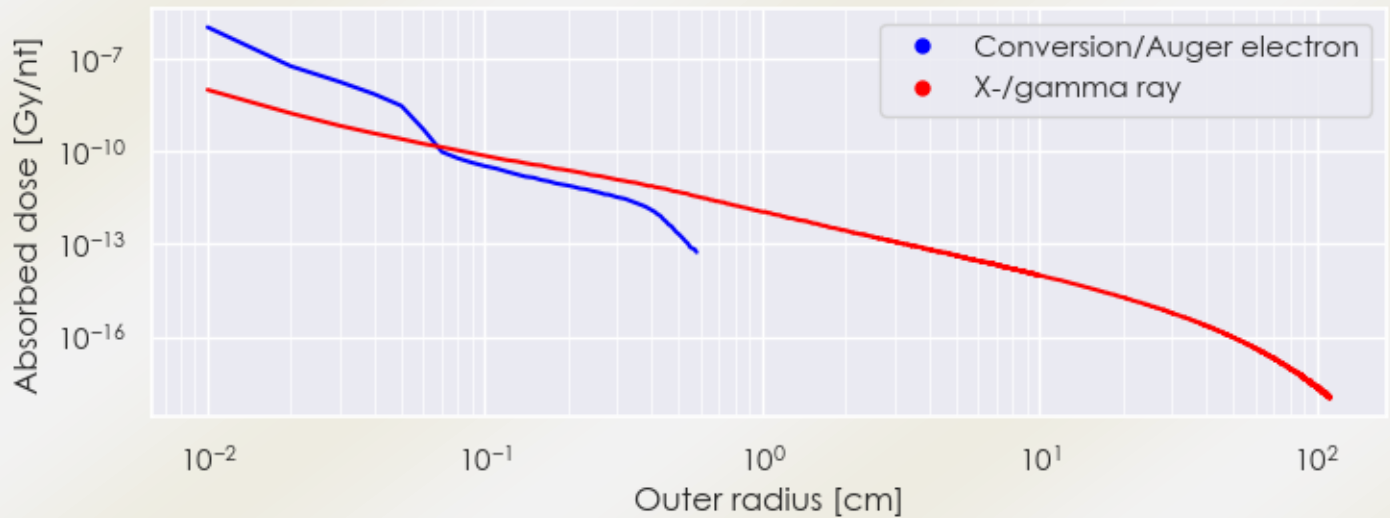
Equilibrium dose constant for betas/electrons,  $\Delta_{\beta, \beta^+, e^-}$ :  $1.276 \times 10^{-14}$  [Gy·kg/Bq·s]

Equilibrium dose constant for photons,  $\Delta_p$ :  $4.746 \times 10^{-13}$  [Gy·kg/Bq·s]

## DOSE POINT KERNELS (PLOT)

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

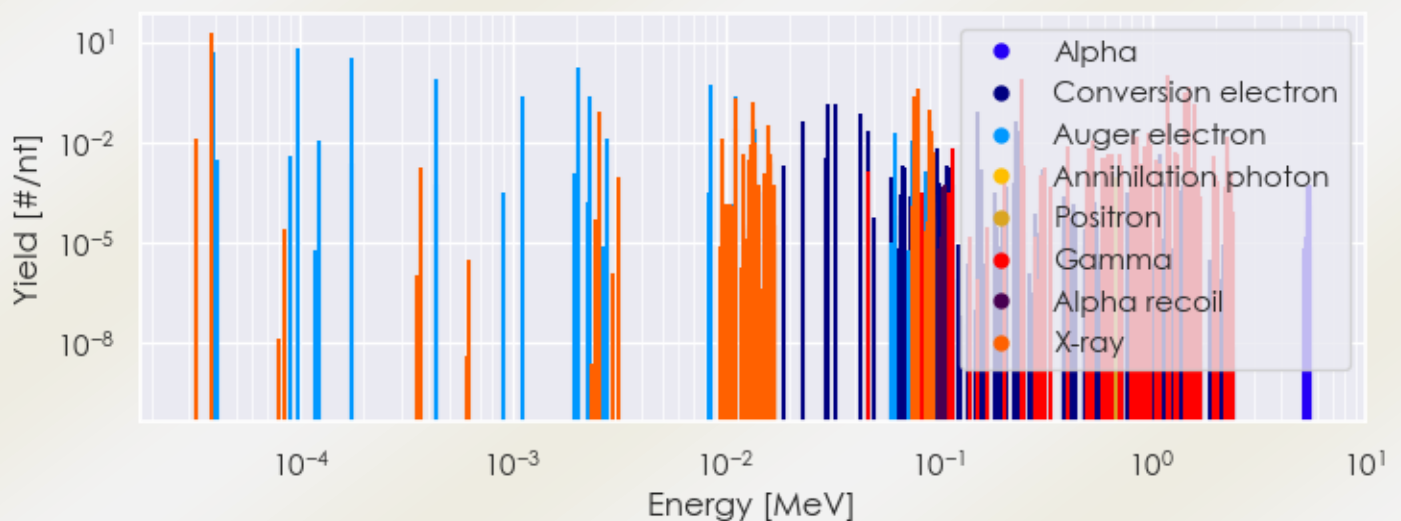
Note: Bins are spaced every 0.1 mm until a radius of 10 cm, and every 1 mm until a radius of 2 m.



Download tabulated dose point kernel file here: [www.mirdsoft.org/products/MIRDspecs/At-210 DPK.csv](http://www.mirdsoft.org/products/MIRDspecs/At-210 DPK.csv)

## SUMMARY SPECTRA (PLOT)

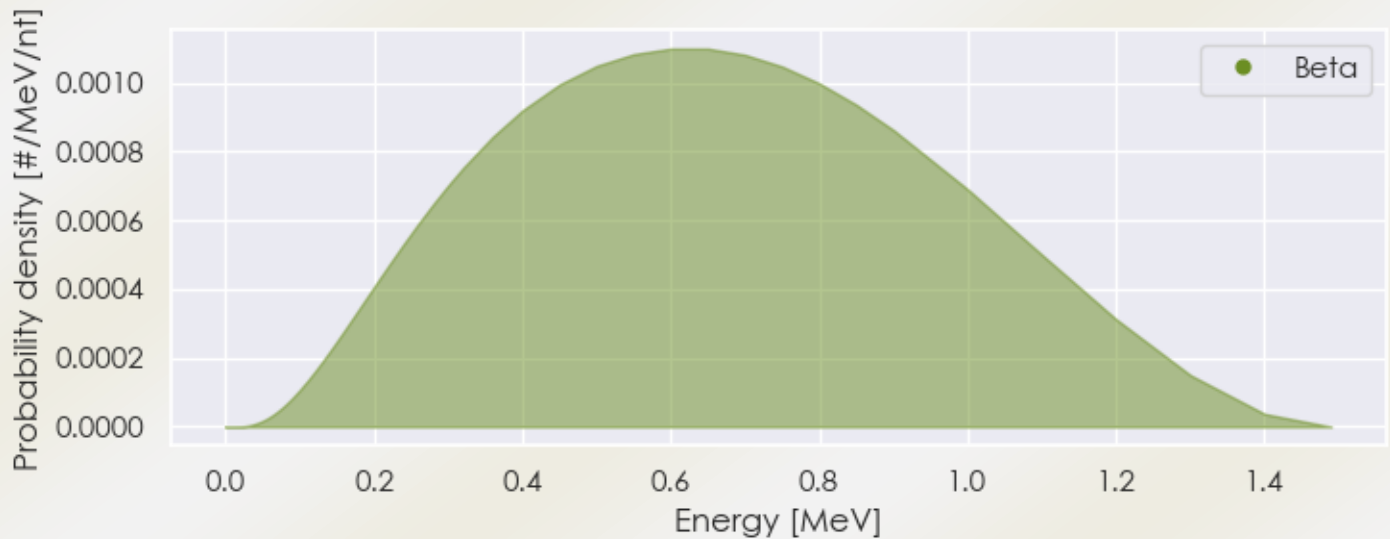
Spectra source: **ICRP Publication 107: Nuclear Decay Data for Dosimetric Calculations. Ann. ICRP 2008, 38 (3).**



Download tabulated summary spectra file here: [www.mirdsoft.org/products/MIRDspecs/At-210 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/At-210 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/At-210 Beta Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/At-210 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/At-210 Summary Spectrum.csv](http://www.mirdsoft.org/products/MIRDspecs/At-210 Summary Spectrum.csv)

| Energy [MeV] | Yield [# / nt] if > 0.01 | Radiation type |
|--------------|--------------------------|----------------|
| 3.24771e-05  | 1.295e-02                | X-ray          |
| 3.84145e-05  | 1.906e+01                | X-ray          |
| 2.54406e-03  | 8.055e-02                | X-ray          |
| 9.68941e-03  | 1.334e-02                | X-ray          |
| 1.10135e-02  | 2.332e-02                | X-ray          |
| 1.11319e-02  | 2.052e-01                | X-ray          |
| 1.33474e-02  | 4.024e-02                | X-ray          |
| 1.34935e-02  | 1.568e-01                | X-ray          |
| 1.58015e-02  | 3.273e-02                | X-ray          |
| 7.71271e-02  | 2.413e-01                | X-ray          |

|             |           |                     |
|-------------|-----------|---------------------|
| 7.96070e-02 | 4.016e-01 | X-ray               |
| 8.95836e-02 | 4.508e-02 | X-ray               |
| 9.01425e-02 | 8.748e-02 | X-ray               |
| 9.25794e-02 | 1.087e-02 | X-ray               |
| 9.27190e-02 | 2.146e-02 | X-ray               |
| 2.45300e-01 | 7.946e-01 | Gamma               |
| 5.27600e-01 | 1.142e-02 | Gamma               |
| 8.17200e-01 | 1.708e-02 | Gamma               |
| 8.52700e-01 | 1.381e-02 | Gamma               |
| 9.55800e-01 | 1.798e-02 | Gamma               |
| 1.18140e+00 | 9.933e-01 | Gamma               |
| 1.43670e+00 | 2.900e-01 | Gamma               |
| 1.48330e+00 | 4.648e-01 | Gamma               |
| 1.59950e+00 | 1.341e-01 | Gamma               |
| 2.25400e+00 | 1.520e-02 | Gamma               |
| 3.94812e-05 | 4.557e+00 | Auger electron      |
| 9.72895e-05 | 5.937e+00 | Auger electron      |
| 1.22169e-04 | 1.155e-02 | Auger electron      |
| 1.74890e-04 | 3.200e+00 | Auger electron      |
| 4.37891e-04 | 7.485e-01 | Auger electron      |
| 1.12088e-03 | 2.358e-01 | Auger electron      |
| 2.01704e-03 | 1.725e+00 | Auger electron      |
| 2.31154e-03 | 2.376e-01 | Auger electron      |
| 2.74224e-03 | 1.240e-02 | Auger electron      |
| 8.51411e-03 | 4.927e-01 | Auger electron      |
| 1.10686e-02 | 2.252e-01 | Auger electron      |
| 1.36532e-02 | 2.455e-02 | Auger electron      |
| 2.27760e-02 | 4.028e-02 | Conversion electron |
| 3.01830e-02 | 1.327e-01 | Conversion electron |
| 3.26630e-02 | 1.287e-01 | Conversion electron |
| 4.31985e-02 | 7.018e-02 | Conversion electron |
| 4.64800e-02 | 2.228e-02 | Conversion electron |
| 6.18768e-02 | 1.957e-02 | Auger electron      |
| 7.46184e-02 | 1.081e-02 | Auger electron      |
| 1.51876e-01 | 8.414e-02 | Conversion electron |
| 2.28382e-01 | 1.279e-02 | Conversion electron |
| 2.29003e-01 | 4.332e-02 | Conversion electron |
| 2.31483e-01 | 2.255e-02 | Conversion electron |

2.42019e-01

2.069e-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](https://sites.snmmi.org/SNMML-MAIN/iCore/Store/StoreLayouts/Item_Detail.aspx?iProductCode=0-932004-80-6)