

**Half life** 12.7 hours

### Radiations emitted

Radiation	Energy (keV)	Yield (%)
Positron	578 max, 278 avg	38
Beta ray	653 max, 190 avg	18
K $\alpha$ and K $\beta$ X-ray	~8	~15
Gamma ray	1346	0.5
Annihilation photon	511	~36

### Safety precautions

$^{64}\text{Cu}$  is a high energy electron and positron emitter with consequent production of penetrating 511 keV annihilation radiation. It presents both an internal and external hazard.

Handling tools and standard laboratory PPE (gloves, lab coat, safety glasses) should be used to minimise exposure.

Amounts of more than 100 MBq should only be manipulated behind lead bricks. A single thickness wall of two courses of 50 mm bricks should provide sufficient shielding while allowing good access.

In view of the short half-life substantial shielding will probably not be required for wastes stored for decay in the laboratory. However, the RSO should carefully monitor stored wastes to ensure that radiation levels in controlled areas do not exceed 40  $\mu\text{Sv}$  per week, and in areas accessible to non-radiation workers, 10  $\mu\text{Sv}$  per week.

### Radiotoxicity data

$^{64}\text{Cu}$  is classed as being of moderate hazard (Group 3) according to AS/NZS 2243.4.

The Annual Limit on Intake by ingestion ( $\text{ALI}_{\text{ing}}$ ) is 170 MBq and the most restrictive inhalation limit ( $\text{ALI}_{\text{inhal}}$ ) is 130 MBq.

### Dose rates

The gamma ray dose rate constant is 36  $\mu\text{Sv/h/GBq}$  at 1 m.

Dose rate to the basal skin cells from contamination of 1 kBq  $\text{cm}^{-2}$ : 1000  $\mu\text{Sv h}^{-1}$

Dose rate from a 1 kBq (0.05 ml) droplet on skin: 390  $\mu\text{Sv h}^{-1}$

### Shielding

Total absorption of beta radiation: 1.8 mm perspex

Half value layer (HVL) for X and gamma rays: 6 mm lead

Tenth value layer (TVL) for X and gamma rays: 17 mm lead

### Licensing requirements

Under the *Radiation Safety Regulation 2021*, a licence is required for the possession of  $^{64}\text{Cu}$  sources with concentrations of greater than or equal to 100 Bq per gram and with activities of 1 MBq or greater. A use licence is also required for any persons who use such sources for research purposes.

### Disposal data

The maximum concentration of  $^{64}\text{Cu}$  in aqueous wastes released to a sewerage system is given in the 1999 Radiation Safety Regulation as 11.4 MBq per  $\text{m}^3$  i.e. 11.4 kBq per litre.

The concentration of  $^{64}\text{Cu}$  in solid wastes disposed of to either the general or pathology waste streams must be less than 50 Bq per gram (50 kBq per kg) – i.e. half the concentration limit for licensing.

### Radiation detection and monitoring

Either a Geiger Muller tube or scintillation monitor is suitable for contamination control. For personal monitoring, TLD/OSL dosimeters are recommended for both whole body and extremity monitoring.

### Laboratory requirements

Indicative maximum activities:

Low level	Bench	1 MBq
	Fume cupboard	10 MBq
Medium level	Bench	3.7 MBq
	Fume cupboard	37 MBq