

⁵⁹Fe

Radioisotope Fact Sheet

Iron 59

Half life 44.5 days

Radiations emitted

Radiation	Energy (keV)	Yield (%)
Beta X-ray	273 – max 81 - average	45.2
Beta X-ray	466 – max 149 - average	53.1
Gamma ray	1099	56.5
Gamma ray	1292	43.2

Safety precautions

⁵⁹Fe is a high energy gamma emitter and a medium energy beta emitter. 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 3.7 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.

Substantial shielding (such as 50 mm lead bricks) is required for any quantity of wastes stored for decay in the laboratory.

Radiotoxicity data

⁵⁹Fe is classed as being of high hazard (Group 2) according to AS 2243.4. The Annual Limit on Intake by ingestion (ALI_{ing}) is 11 MBq and the most restrictive inhalation limit (ALI_{inhal}) is 5.7 MBq.

Dose rate

The gamma ray dose rate constant is 160 µSv/h/ GBq at 1 m

Dose rate to the basal skin cells from contamination of 1 kBq cm⁻²: 973 µSv/h
Dose rate from 1 kBq (0.05 ml) droplet on skin: 300 µSv/h

Shielding

Total absorption of beta radiation: 1.2 mm

Perspex

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

Tenth value layer (TVL) for X and gamma

Rays: 45 mm lead

Licensing requirements

Under the *Radiation Safety Regulation 2021*, a licence is required for the possession of ⁵⁹Fe sources with concentrations of greater than or equal to 10 Bq per gram and with activities of 1 MBq or greater. A user licence is also required for any persons who use such sources for research purposes.

Disposal data

The maximum concentration of ⁵⁹Fe in aqueous wastes released to a sewerage system is given in the *Regulation* as 761 kBq per m³ i.e. 761 Bq per litre.

The concentration of ⁵⁹Fe in solid wastes disposed of to either the general or pathology waste streams must be less than 5 Bq per gram (5 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	740 kBq
	Fume cupboard	7.4 MBq
Medium level	Bench	3.7 MBq
	Fume cupboard	37 MBq