Science and Technology Facilities Council

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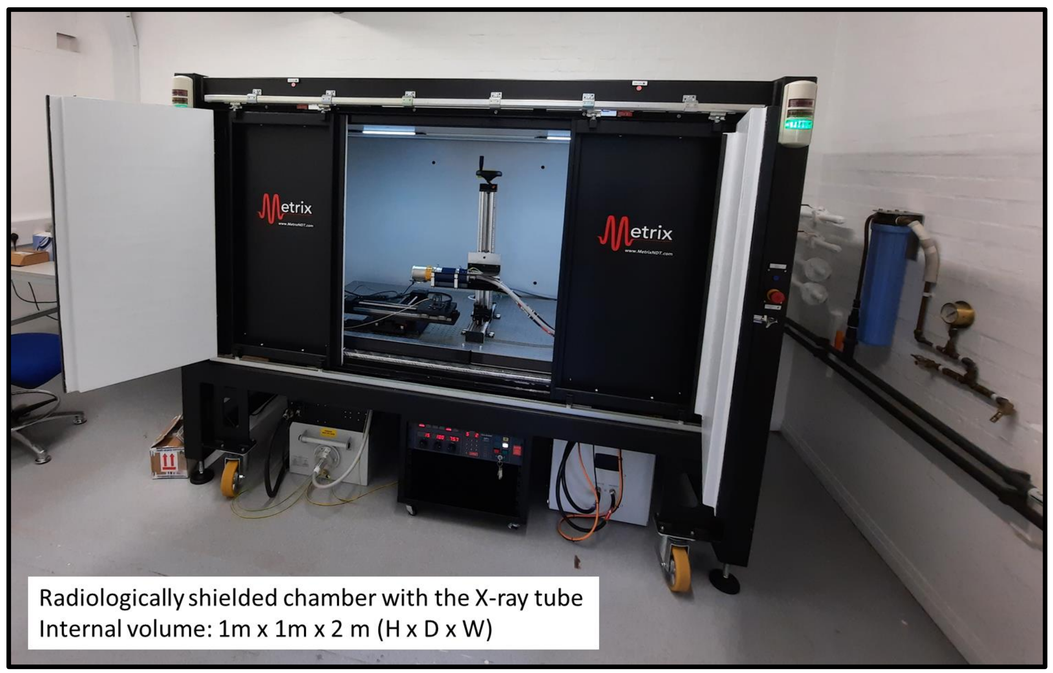
X-Ray Irradiation Facility



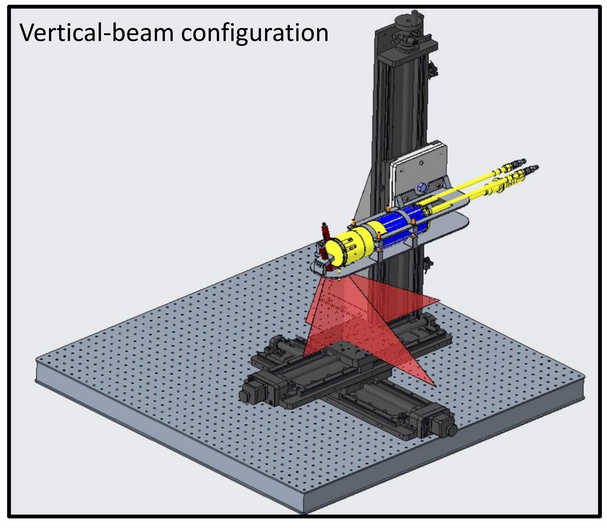
Radiologically shielded chamber with the X-ray tube
Internal volume: 1m x 1m x 2 m (H x D x W)

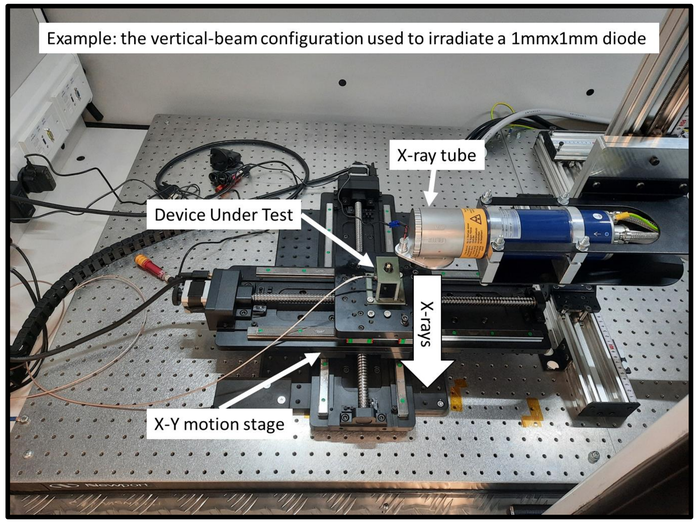
Electronic circuits used in many space, military, nuclear power systems and scientific particle-collider experiments may be exposed to various levels of ionizing radiation dose.

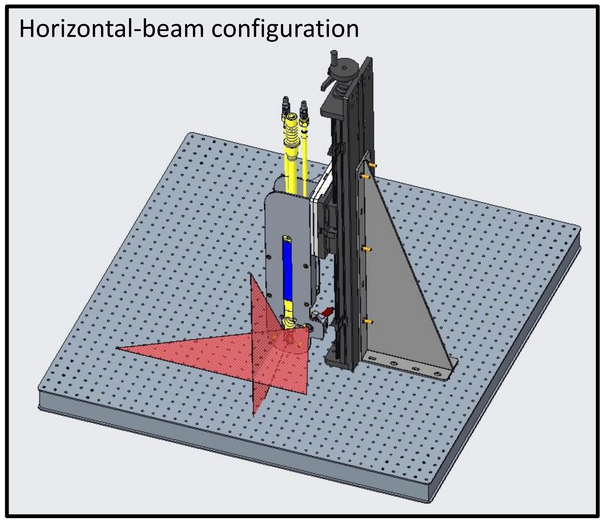
It is essential for the design and fabrication of such circuits that test methods are available to determine the vulnerability or hardness of electronics components to be used in such systems.

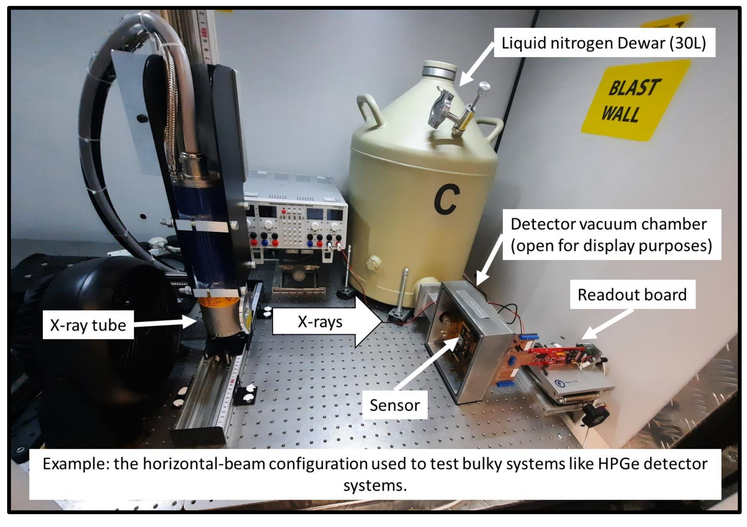
The X-ray generator has proven to be a useful ionizing radiation effects testing tool because:

- It offers a relatively high dose rate, in comparison to most cobalt-60 sources, thus offering reduced testing time.
- The radiation is of sufficiently low energy (≈10 keV) that it can be readily collimated. As a result, it is possible to irradiate a localised area in a device or on a wafer.



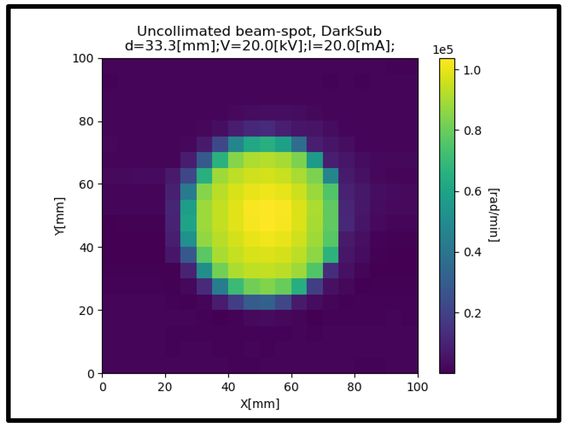






Example: the horizontal-beam configuration used to test bulky systems like HPGe detector systems.

Tungsten X-ray tube specifications	
Tube Voltage	0 – 60 kV
Tube Current	0 – 50 mA
Total power	3 kW
Beam divergence	40 deg
Inherent filtration	1mm Be
Additional filters	2mm Al; 4mm Pb
Further external collimation possible	



Reference irradiation settings used for existing internal projects:
peak dose rate ~100 krad/min;
dose rate uniform within ~3% over an area of ~1cm x 1cm around the peak value;