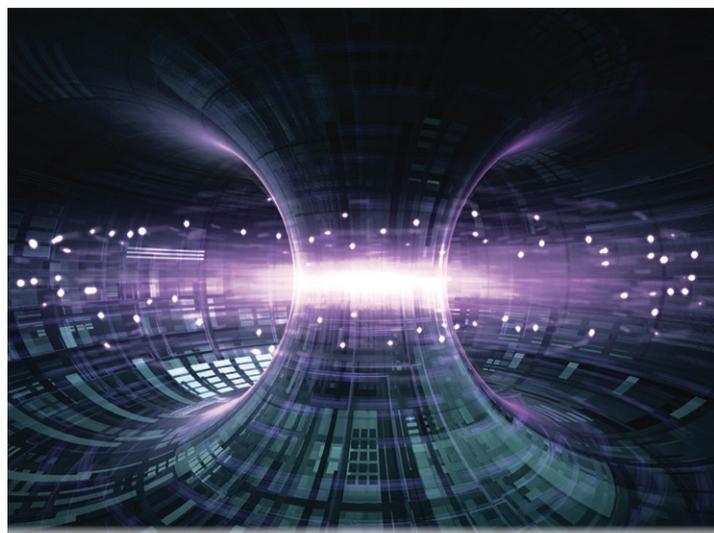




# Radiation Testing and Support



- ⚡ Total dose (TID) and Single Event Effects (SEE) testing
- ⚡ Materials and component testing services
- ⚡ Experts in radiation effects
- ⚡ ISO 9001 and DLA laboratory suitability

[www.radtest.co.uk](http://www.radtest.co.uk)

# Comprehensive radiation effects testing and support

Since our launch at Harwell in 2013, our comprehensive offering of radiation testing services and radiation effects advice has become established in the European marketplace. The range of capability for customers in the space and HiRel sectors is complemented by our expertise in the civil nuclear market, covering the effects of very high doses of radiation on materials and components for routine power station operations, fuel handling and decommissioning activities. Our location in the heart of the UK space cluster at Harwell demonstrates that space is central to our business and I look forward to strengthening that position further in the years to come.

*Richard Sharp, CEO, Radtest Ltd*

## Experts in radiation effects

**Radtest** has knowledge and experience in the following areas:

- 🌀 Pre-irradiation assessments
- 🌀 Electronic circuit simulation
- 🌀 Materials selection
- 🌀 Component selection
- 🌀 Cobalt-60 gamma irradiation facilities
- 🌀 Electron beam irradiation facilities
- 🌀 Ion beam irradiation facilities
- 🌀 Database of published data on radiation effects
- 🌀 Shielding/penetration calculations
- 🌀 Radiation and environmental testing

## Standard test routines

A number of standard test routines have been developed for common equipment, materials and components. Examples include:

- 🌀 Electronic components (ESA/ESCC-22900, Mil-Std-750/883 test method 1019, RLAT, ELDRS)
- 🌀 CCTV cameras
- 🌀 Oils and greases (ISO 2137, IP50, IP32, ASTM)
- 🌀 Proximity detectors (BS EN 60947)
- 🌀 Certificated to ISO 9001
- 🌀 DLA laboratory suitability for Mil-Std-750/883 test method 1019 and all test conditions

## Radtest facility

The assessment of radiation effects on materials and components normally considers several aspects of the radiation environment in turn. **Radtest** offers test facilities for total dose, electrons, protons and single event effects as follows:

- 🌀 Total integrated dose: gamma radiation from cobalt-60 sources; dose rates from background to several kGy/hr; in-situ monitoring; temperature control
- 🌀 Electron irradiation: from 30 keV to 20 MeV; doses from tens of Gy to MGy; in-situ monitoring; temperature control; sample handling by conveyor or static positioning under the beam
- 🌀 Proton irradiation: displacement damage testing from 0.5 to 10 MeV and SEE testing to 250 MeV; irradiation in vacuum or air; in-situ monitoring; temperature control
- 🌀 Helium ion (alpha) irradiation: from 0.5 to 15 MeV; irradiation in vacuum or air; in-situ monitoring; temperature control
- 🌀 Heavy ions: SEE testing via third party cyclotrons and accelerators
- 🌀 Atmospheric neutrons: SEE testing for avionics and other electronics
- 🌀 ISO Class 7 (class 10,000) cleanroom available

The synergistic effect of irradiation and other factors can lead to more rapid degradation than the sum of the individual effects would indicate. **Radtest** offers the possibility to irradiate in a range of gaseous environments and vacuum, with heating or cooling, with or without electrical stress and, e.g. for solar cells, under illumination.

## Capability statement

### Component testing:

- ⚡ Automatic DC and AC characterisation of semiconductor components
- ⚡ In-situ measurement available

### Computer simulation of electronic circuits:

- ⚡ Before, during and after irradiation

### Component selection:

- ⚡ From our own database of test data
- ⚡ Online access to NASA, JPL, MoD, ESA, etc. data

### Materials selection:

- ⚡ Access to manufacturers' data
- ⚡ Cross-reference of trade names against polymer types
- ⚡ Comprehensive database of test data

### Irradiation facilities:

- ⚡ Cobalt-60 cells
- ⚡ Electron beam accelerators
- ⚡ Heavy and light ion accelerators
- ⚡ Neutron generators

### Equipment assessments:

- ⚡ Based on collated test data and literature

### Sub-system testing:

- ⚡ In-situ monitoring during irradiation
- ⚡ Custom-built rigs for transducers, etc.

### Materials testing including:

- ⚡ Lubricants
- ⚡ Adhesives
- ⚡ Cable insulation
- ⚡ Connector materials
- ⚡ Seals and gaskets
- ⚡ Paints and coatings

### Standard test routines:

- ⚡ Electronic components (ESA/ESCC-22900, Mil-Std-883)
- ⚡ CCTV cameras
- ⚡ Oils and greases (ISO 2137, IP50, IP32, ASTM)
- ⚡ Polymer and rubber samples (IEC-544, ASTM)
- ⚡ Fibre optics (EIA-455-49A)

*Dose rate and lifetime total dose calculations from health physics or other survey data*

### Shielding calculations:

- ⚡ For new facility design
- ⚡ For mission planning
- ⚡ For equipment selection



## Single Event Effects (SEE) testing

We have over 25 years' involvement in the field of Single Event Effects in electronics and extensive testing experience. This experience, combined with the many tests we have performed, has led to the development of a library of hardware and software techniques which help reduce the cost and time required successfully to complete a SEE test.

**Radtest** offers turnkey solutions for the efficient determination of heavy ion cross-sections for a given component or system, from diodes to FPGAs and DSPs. Our services include:

- ⚡ Design and development of test hardware and software
- ⚡ Optimised test planning and management for efficient use of the cyclotron
- ⚡ Comprehensive SEE test reports and data collection

Tests can be designed to evaluate:

- ⚡ Single Event Latch Up (SEL)
- ⚡ Single Event Upset (SEU)
- ⚡ Single Event Transients (SET)
- ⚡ Single Event Burnout (SEB)
- ⚡ Single Event Functional Interrupts (SEFI)
- ⚡ Single Event Gate Rupture (SEGR)
  - EIA/JESD 57
  - ASTM F1192

SEE testing of memory devices, including NAND, SDRAM and DDR, is performed efficiently using our FPGA based test solutions. The majority of SEE tests are conducted using cyclotrons at the University of Jyväskylä, Université Catholique de Louvain, Paul Scherrer Institute, LBNL and TAMU. We also use the Chiplr instrument at Harwell for atmospheric neutron SEE testing.

## SEREEL2 laser SEE test systems

Laser Single Event Effects (SEE) testing simulates the effects of space radiation by firing a laser beam at a semiconductor device and measuring the effect of each pulse.

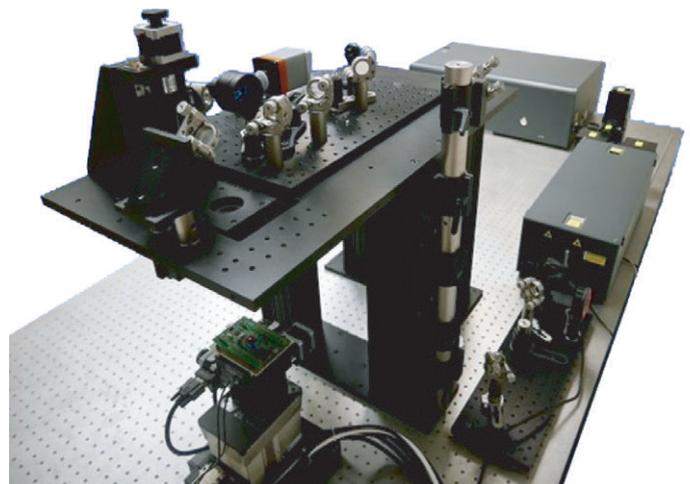
Companies can benefit from the SEREEL2 system to test large quantities of die for Single Event Effects (SEE) in their own facility, saving test, beam time and travel costs. Carry out the testing at the time you want to, not when the accelerator has time for you. Once good die are obtained, **Radtest** can assist companies with confirmation testing in our facilities or arrange for testing time. A full warranty and on-site training is included.

- SEREEL2 delivers large (>100,000) laser spot arrays under laser control
- Precise registration of upsets to die locations
- Applicable to SEE screening of large numbers of devices for space programmes
  - Autofocussing and levelling for speedy sample mounting
- SEREEL2 for Single Photon Absorption (SPA)
  - Simple operation, ideal for wire bonded devices, high throughput
- SEREEL2 for Two-Photo Absorption (TPA)
  - Suitable for flip chips, very high energy possible ( $\mu\text{J}$  and  $\text{mJ}$  ranges available), high throughput
- Raster Scanning
  - Basic scanning available for R&D testing or less speed-critical applications
- Spiral Scanning
  - Ultimate positional precision for high throughput screening of parts
- Maximum scanning range 200mm in x,y and z directions
- Positional accuracy better than 1 micron
- The sample orientation can be either horizontal or vertical
- Intuitive operating software and full warranty are provided

**Radtest** offers radiation testing services using test methods in full compliance with ESCC Basic Specification No. 22900 or MIL-STD-750/883. Our ELDRS facility can provide any dose rate from 1 to 100mrad[Si]/s to match the mission requirement.

### Key benefits:

- Typical four week cycle time for RLATS
- Full complement of test capabilities
  - Neutron
  - ELDRS
  - TID high dose
  - Electrical test
  - Legacy international mission support
  - Test hardware in place for most device types
- ISO 9001 and DLA laboratory suitability



# Radtest Ltd

For further information please contact:

Radtest Ltd, 168 Maxwell Avenue, Harwell, Oxfordshire, OX11 0QT, UK

+44-(0)1235-436620 info@radtest.co.uk

[www.radtest.co.uk](http://www.radtest.co.uk)