The NPL electron linear accelerator offers a unique research facility, with great flexibility of operation and use. Electron and X-ray beams are available for calibrations of dosimetry systems and investigations of radiation-induced effects, over a wide range of dose rates, with applications including radiation hardness testing in the aerospace, defence and electronics industries, the sterilisation of medical products, radiation processing of plastics, rubbers and semiconductors, food irradiation, and radiotherapy.

Operating conditions and facilities

The mean electron energy from the accelerator can be set to any value in the range 4 MeV to 19 MeV, with energy resolution about 3% (but in detail dependent on energy). Electron pulse widths from 50 ns to 2 µs are available, with pulse repetition frequencies from 240 Hz down to single-pulse operation. The mean dose rate is adjustable over a very wide range, from industrial levels down to radiotherapy and protection levels.

There is one air-conditioned radiation area, with efficient extraction of ozone and temperature control to about ±0.5 K/hr. Entrance to this area is through ‘mazes’ 1.2 m wide. Direct access for cables (minimum length 8 m) is via floor-level ducts, 7 cm in diameter. Carriages are mounted on rails parallel to the beam axis, and an alignment telescope allows accurate setting-up on the beam axis.

FURTHER INFORMATION

Technical Advice
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Customer Measurement Services
Radiation Dosimetry Team
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Other facilities include compressed air, cooling water, an oven, and a darkroom for processing radiographic films.

Typically, (mean electron) dose rates as high as ~10 kGy min\(^{-1}\) can be produced (using the standard beam flattening filters). A variety of dosimetry techniques are available, including graphite calorimetry, diode and ion chamber dosimetry.

**Radiation Hardness Applications**

NPL’s electron linear accelerator is available for radiation hardness testing and research on new materials, components and instruments used in the aerospace, telecommunications, electronics and defence industries. For manufacturers and contractors seeking to demonstrate compliance with the requirements of appropriate standards, NPL’s linear accelerator offers irradiations tailored to meet your application needs.

Radiation in the space environment can be simulated, providing:

- Electron fluxes typical of the Van Allen Belts and geo-stationary orbits
- Testing of radiation detectors
- Testing of semiconductor devices for radiation hardness
- Confirmation of shielding calculations
- Irradiation of devices up to specified doses or flux levels

**Possibilities for use and hire**

Research and investigations can be carried out with this facility by NPL staff on a contract basis. The facility may be hired, together with a trained operator, on a daily or weekly basis. The hire fee includes use of a Perspex or water phantom if required. Other dosimetric equipment can also be hired in conjunction with the hire of the Linac itself.

Any dosimetry required can be made traceable back to National Standards of absorbed dose to water or graphite.

If technical assistance with dosimetric problems is required, this will be charged for on an hourly basis.