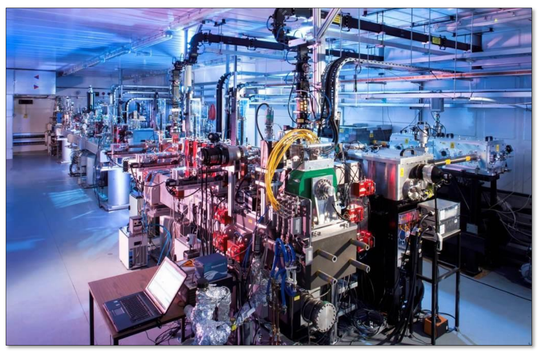
Technology Infrastructure - STFC (UK)

Science & Technology Facilities Council

The Science and Technology Facilities Council (STFC) is a centre of excellence for particle accelerators, offering expertise in areas ranging from theoretical modelling and conceptual design through to construction and operation of international-scale user facilities. STFC's unique test environment supports research and development in key sub-component technologies such as vacuum, magnets and RF, and enables complete accelerator system validation. STFC delivers technological advancements for particle accelerators and beyond through extensive collaborations with international laboratories, academia and industry. For further information please contact amici@stfc.ac.uk.

Versatile Electron Linear Accelerator



Specifications

- Beam energy: 4.0 – 5.5 MeV
- Bunch charge: 10 – 250 pC
- Bunch length (s t,rms): 80 – 3 ps
- Normalised emittance: 0.1 – 2.0 mm
- Beam size (s x,y,rms): 0.1 – 3.5 mm
- Energy spread (s e,rms): 0.1 – 5 %
- Bunch repetition rate: 1 – 10 Hz

VELA – Versatile Electron Linear Accelerator - is a high performance, modular linear accelerator capable of delivering a high quality electron beam to a series of test enclosures. VELA has the potential to help revolutionise the use of accelerators in priority areas such as healthcare, security, energy, industrial processing and the environment.

This test facility delivers a capability for the cutting edge development and qualification of advanced accelerator systems, enabling industry to expedite their technology development from prototypes to market ready products.

Vacuum and Surface Science Laboratory

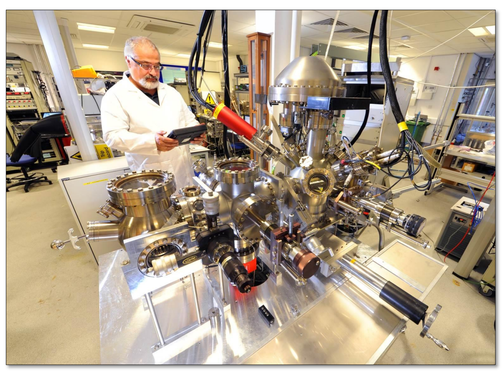
Surface Science Facilities

Thin films and multilayer coatings:

- Physical Vapour Deposition
- Chemical Vapour Deposition
- Molecular Beam Epitaxy
- Atomic Layer Deposition

Analysis techniques:

- Rutherford Backscattering
- Nuclear Reaction Analysis
- Medium and Low Energy Ion Scattering
- Auger Electron Spectroscopy
- X-Ray Photoelectron Spectroscopy
- Secondary Ion Mass Spectroscopy
- Scanning Electron Microscopy
- Tunnelling Electron Microscopy



Vacuum Science Expertise

- Advanced modelling of gas flow in vacuum systems
- Vacuum system design
- Extreme High Vacuum (XHV) techniques and applications
- Instrumentation and vacuum metrology
- Leading ultra-high vacuum levels
- Full solution including modelling, cleaning, processing and validation

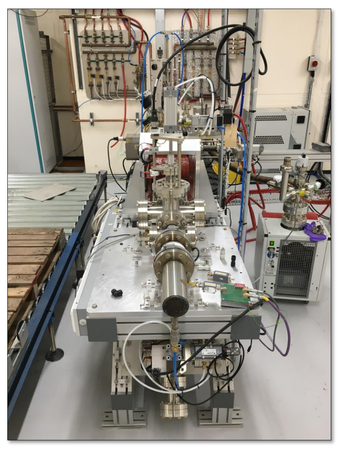
Cryogenics Test Laboratory

A purpose built cryogenics laboratory has been developed to bring surface science, RF-technology, superconductivity and cryogenics together for developing underpinning technologies, and in particular to exploit SRF technology.

In addition to the conventional apparatus for measuring electrical resistivity and thermal conductivity, a couple of state of the art experiments have been introduced for the measurement of surface resistance at radio frequencies and measurement of penetrating or trapped magnetic fields in superconducting materials.

The laboratory is equipped with a range of closed cycle refrigerators and a number of liquid helium cryostats for conducting experiments at temperatures as low as 1.5 K in magnetic fields up to 2 Tesla.

Compact Linac



The Compact Linac is an innovative and highly compact electron beam and X-ray source. It has been developed to investigate the potential for small, low-energy linear accelerators to be utilised in application areas such as security, non-destructive testing and wastewater treatment.

The highly characterised electron beam can be utilised horizontally, or deflected through 45 degrees for use with liquid samples. The system is housed in a fully shielded test facility with client access to a flexible experimental area.

Specifications

- Electron beam energy range between 2 MeV and 4 MeV
- Pulse widths down to 500 ns
- Pulse repetition rates in the range 1 to 400 Hz

Note: Expected system performance following re-commissioning taking place in 2017.

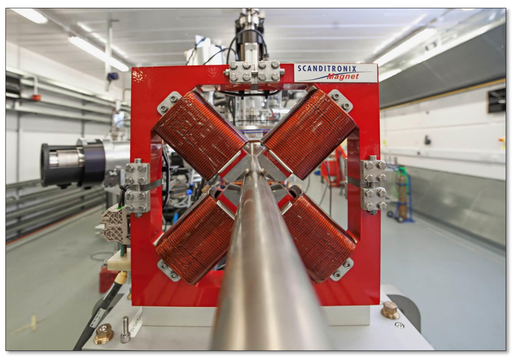
Magnet Test Laboratory

The magnet test laboratory offers a full suite of magnet measurement and validation facilities.

Hall Probe Measurement Bench: Enables point-by-point measurement of magnetic fields produced by insertion devices and magnets. A selection of different Hall probes are movable in three axes, with a position resolution of 1µm.

Flipping Coil Bench: Used to characterise the integrated field of long insertion devices with greater accuracy than typically achievable with a Hall probe. The two ends of the flipping coil are mounted on horizontal and vertical movement stages, with a resolution of 1µm.

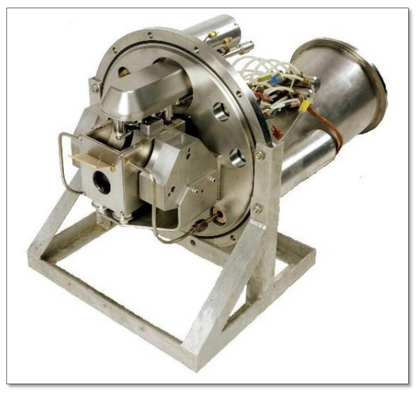
Pulsed-Wire Bench: The pulsed-wire technique involves passing a pulse of current along a single wire through an insertion device. The magnetic field of the device induces a small transverse movement in the wire, which can be picked up using a laser/photodiode pair.



Helmholtz Coils: The lab has a pair of Helmholtz coils for permanent magnet characterisation. Using this setup, the strength in all three directions can be characterised, allowing for accurate 'sorting' of PM blocks within an ID array.

Calibration Magnet: A large dipole magnet and stable power supply are used to provide an absolute calibration of the Hall probes used in the lab. The PSU supplies up to 140A/76V with a stability of 10ppm, giving a maximum field in the dipole of 3.5T. The central field in the dipole is uniform over a wide area. An NMR teslameter is used to give an absolute field reading to an accuracy of 5µT.

Front End Test Stand (FETS)



FETS is a multi-purpose test stand for high power proton accelerator front end technologies. Applications include, but are not limited to, ISIS upgrades, future Spallation Neutron Sources, a Neutrino Factory, Muon Collider, Accelerator Driven Sub-critical Systems as well as exploitation of the low energy beam. FETS consists of an H- ion source, magnetic low energy beam transport (LEBT), 324 MHz 4-vane Radio Frequency Quadrupole accelerator (RFQ), medium energy beam transport and chopper line (MEBT) and comprehensive diagnostics.