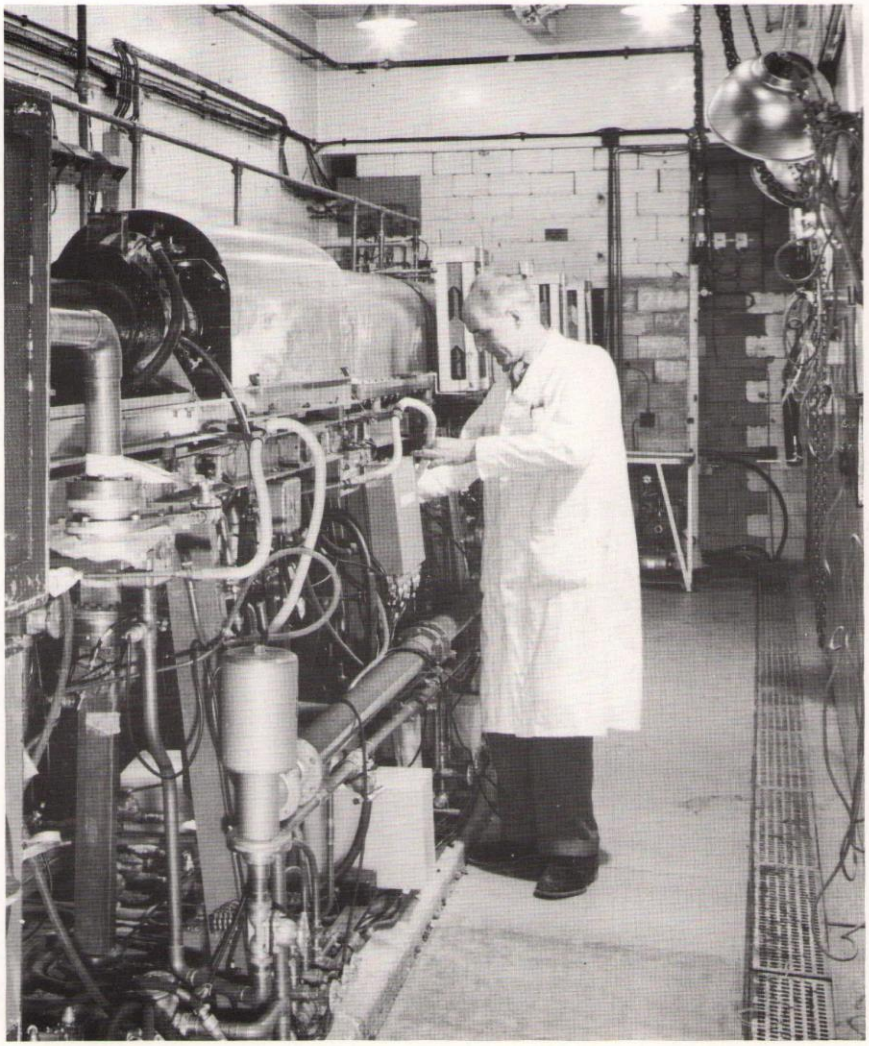
Harwell linear accelerator

This is an intense pulsed source of electrons whose energies can be varied from 20 to 55 MeV. Photon and neutron beams are produced by bombarding heavy target materials.

A new low energy facility allows electron beams to be extracted with energies from 5 to 15 MeV, opening up an important range for industrial irradiation, analytical chemistry and photo-nuclear physics.

There are 8 electron target positions, 3 of which can be used simultaneously. The beam facilities available are shown overleaf.



Electrons

Energy Range (MeV)	Pulse Length	Max. Current during pulse	Max. Pulse repetition rate
20–55 and 5–15	10ns–1·7 μs	1A	500 Hz

Beam Size The full beam current can be delivered to areas greater than 1·5 cm^2. Smaller beams can be defined at reduced currents.

Dose Rates Up to 5 X 10^{10} rad/s during the pulse and up to 2 x 10^7 rad/s mean.

Pulse Radiolysis This can be investigated in the nanosecond time region and there is a possibility of extension to the picosecond region.

Photons

Bremsstrahlung Target A true bremsstrahlung photon spectrum extending from zero energy up to the incident electron energy is produced. This is used for photonuclear studies.

Irradiation Target This is a high-yield target used mainly for gamma-activation analysis. A 'rabbit' facility is available for the analysis of short-lived activities. This position is also available for irradiation damage measurements and for isotope production.

Dose Rate Up to a mean rate of 2 X 10^2 rad/s at 1 m from the irradiation target.

Neutrons

Neutron Yields

Target	Pulse length	Output during pulse (neutrons/s)	Mean electron power	Mean output (neutrons/s)
Natural uranium	10 ns–1·7 μs	5X10^{16}	5 kW (max.)	1·5X10^{13} (max.)
Booster	100 ns–0·5 μs	5X10^{17}	(0·4–2) kW	(1–5)X10^{13}

Targets The main neutron producing target on the accelerator is the Neutron Booster; a multiplying assembly which produces a tenfold increase in neutron yield. A number of non-multiplying natural uranium targets are also available at several target positions.

Energy Spectrum With suitable moderation, the targets provide a continuous neutron energy spectrum extending from 10 MeV down to 10 meV.

Time-of-flight Spectrometry The pulsed nature of the source and the continuous energy spectrum allows use of the time-of-flight method to investigate neutron interactions over a very wide energy range. Eleven evacuated flight tubes 'look' at the Booster. Natural uranium targets can be used on 6 flight paths. Flight path lengths range from 5 to 300 m.

Irradiation Facilities The use of suitable filters allows the target neutron spectrum to be 'tailored' to simulate a required spectrum such as that in a fast reactor. Large samples can be irradiated in readily accessible positions in mean fluxes up to 10^{10} neutrons/cm^2/s.

Enquiries regarding the use of this accelerator
should be made to:

Dr. J.E. Lynn
Building 418
AERE Harwell Oxfordshire
Telephone: Abingdon (0235) 24141
Extension 4695

Harwell Design Studio 3/1975