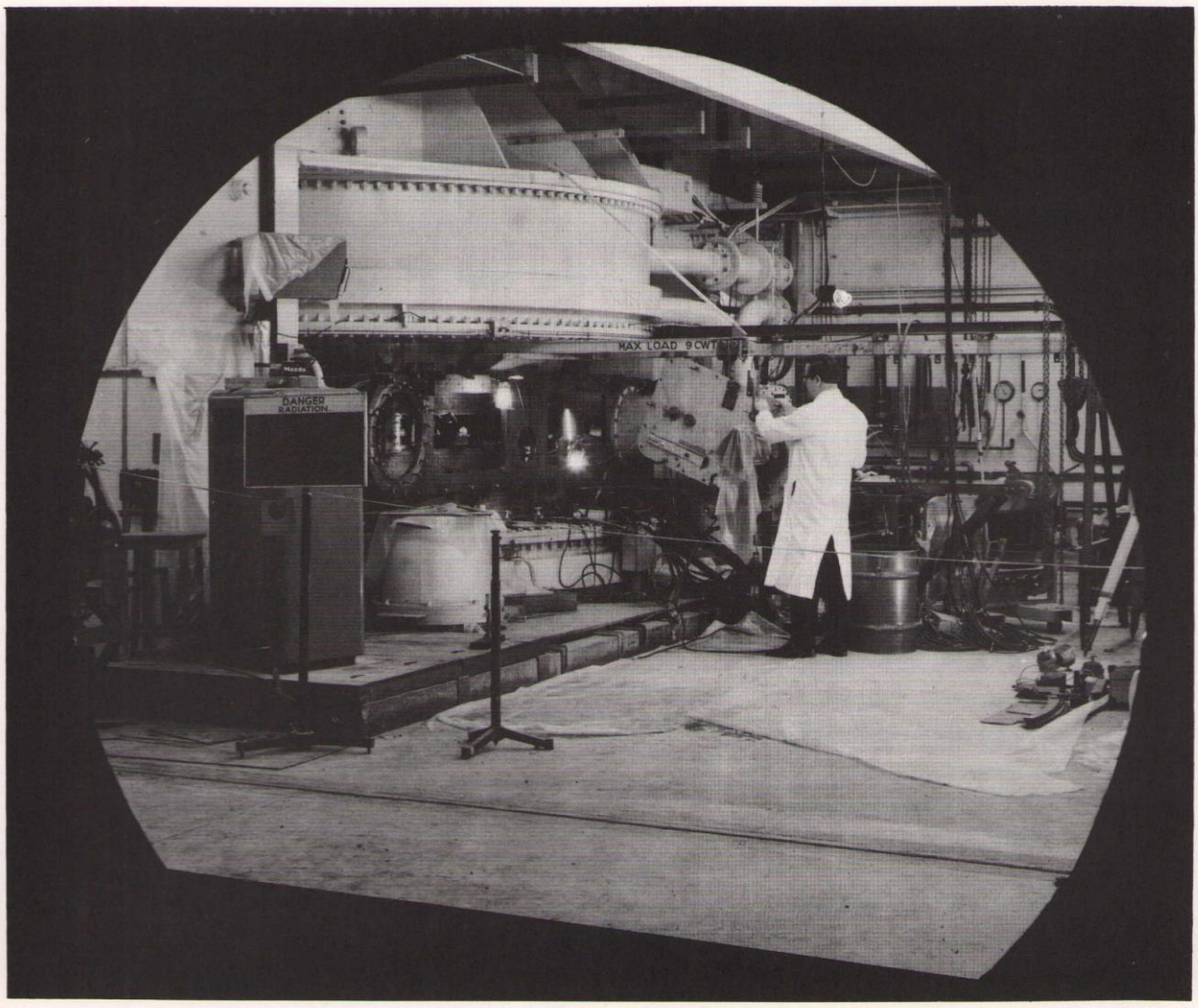
Harwell Synchrocyclotron

This machine provides beams of protons, of 160 MeV and internal current of 5 μA. Such beams have great penetrating power and can go through about an inch of steel.
Beams of deuterons and He are also available. With appropriate internal targets the machine provides a very intense pulsed source of neutrons suitable for time-of-flight spectroscopy.



Charged particle beams

This is basically a light-ion accelerator, the energies and beam currents available are listed right:

The full width energy spread of the extracted beams is less than 2%. The beams can be focussed down to a 1 cm diameter spot, or spread uniformly over an area of 10 x 10 cm. Three beam lines are available and two experimental areas.

Particle	Energy	Internal beam	External beam
Protons	160 MeV	5μA	260nA
Deuterons	85 MeV	under modification	
^{3}He	222 MeV	1μA	3nA
^{4}He	170 MeV	under modification	

Neutron beams

These are produced by the proton beam striking an internal target. Suitable choice of target material enables either a high energy beam (up to 150 MeV) or a low energy beam with a nuclear boil-off spectrum. Three neutron beam lines are available as follows:

(i) 100m flight path, with stations at 50m and 100m.

(ii) 50m flight path, with stations at 8m, 27m and 50m.

(iii) 15m flight path, leading into one of the charged particle experi mental areas. Stations at the end of the 100m and 50m flight paths are particularly well shielded, being at the end of the underground tunnels. The beams can be operated in either in slow-spill (100μ sec pulse width) or fast-spill (4 ns pulse width) modes. The energy resolution obtained by using the 100m flight path with the fast-spill mode makes the synchro-cyclotron one of the best neutron spectrometers in the world, with a resolution at 1 MeV of the order of one kilovolt.

Ancillary facilities

(i) Four fully equipped counting rooms are available. These are cabled up to the experimental areas such that an experiment in any area can be run from any counting room.

(ii) A DDP-516 computer is available for on-line use. The system contains 32K of store, three tape drives and a disc. Connection is made to each counting room via CAMAC and teletypes.

(iii) There are two $20^{o}K$ cryogen-erator systems for incorporation into liquid hydrogen targets.

(iv) An externally operated probe exists for in-tank irradiation, e.g. for isotope production.

(v) We have a large spherical vacuum chamber of roughly 8-ft diameter with 6-ft. diameter door. This can be put to a number of uses, e.g. as a scattering chamber, for irradiation of large specimens in vacuo, and has been used as part of an aluminising plant.

(vi) There is a comprehensive suite of beam handling magnets associated with the synchrocyclotron, including bending magnets, quadrupoles and precession solenoids.

Enquiries regarding the use of the synchrocyclotron should be addressed to:—

Dr. C. Whitehead
Building 7.21,
A.E.R.E., Harwell,
Oxfordshire

Telephone: Abingdon (0235) 24141 Ext. 3254

Harwell Design Studio 29/1974