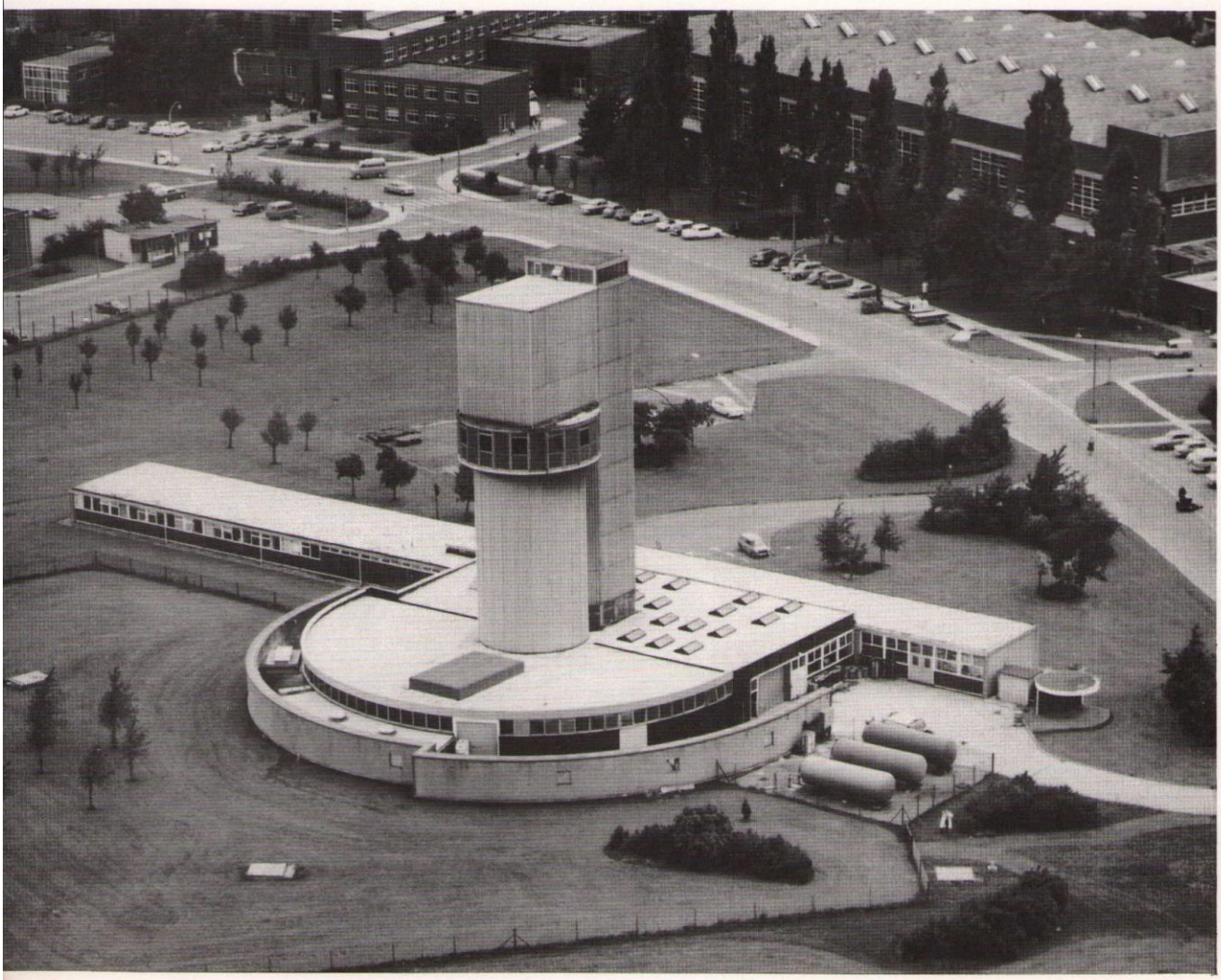
Harwell Tandem Generator

The Tandem Generator is a particle accelerator of the Electrostatic Generator type. Its distinctive features are its high energy resolution and its variability of energy and ion-species.

Particles that are accelerated by the Tandem Generator have an energy range of 2 - 60 MeV and beam intensities of up to 8 micro-amperes. Beams at present available are p.d. ^{3}He, ^{4}He, O, F, S, Cl, Al, Ni, Fe, Li, Zr, C, the beam intensities and maximum energies vary with ion-species. Uses of the Tandem Generator include fundamental research, reactor physics, metallurgical damage studies, irradiations for medical research and a variety of industrial and other applied purposes.



High charge states of Fe, with energies up to 70 MeV, have been observed in smaller intensities.

Other metal ions including some heavier than Fe can also be produced if required.

Focused beam spots 3mm dia with max. current. If required, the beam spot can be spread uniformly over 2–3 cm by a double saw-tooth deflection system, or it can be further spread by scattering from a foil, to allow irradiations for metallurgical, biological and other applications.

Pure metal beams of such elements as iron without oxide contamination can be produced. This feature is important in cases where the total (multi-energy) accelerated beam is used without magnetic analysis, for metallurgical damage studies.

1. Beam facilities presently available

Ion beam	Energy Range (MeV)	Max. analysed beam (uA)	Equivalent particle/ sec.
p	2–14	8	5×10^{13}
d	2–13	7	4×10^{13}
^{3}He, ^{4}He	5–19	2.5	8×10^{12}
O	10–42	3*	4×10^{12}
F	10–42	0.5	6×10^{11}
S	15–42	0.5	5×10^{11}
Cl	15–42	2*	2×10^{12}
Al	20–45	0.3	3×10^{11}
Ni, Fe	25–50	0.1	1×10^{11}
Li	8–24	0.2	4×10^{11}
Zr	25–60	0.05	0.5×10^{11}
C	8–42	0.4	6×10^{11}

*max.intensity at 25 MeV (machine loading restricts intensity at higher energies).

2. Ten beam lines with quadrupole focusing are available. Special target-area facilities include:

(i) A single-gap broad-range magnetic spectrograph which can be used for high resolution charged particle reaction products, either with photographic plate detection or with a set of four position sensitive detectors in the focal plane providing prompt spectra with particle discrimination. These are connected on-line to the computer.

(ii) A-24 gap broad-range multigap spectrograph with photographic plate detection. A new optical system in the beam line provides a ½ x 1½ mm beam spot at the target without the problem of slit-scattering.

(iii) A mechanical beam chopper and automatic timing system allowing the study of decay properties of radioactive isotopes in the 0.1 to 100 sec half-life range.

(iv) Scattering chambers.

(v) A facility to use the total down beam (i.e. unanalysed) if required.

(vi) A goniometer for accurate crystal alignment in channelling studies.

3. A DDP516 Honeywell computer is installed in the tandem building, and can be used for a variety of on-line applications.

Enquiries regarding the use of this accelerator should be made to
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