Rutherford Laboratory

Technical Leaflet

C6

VARIABLE ENERGY CYCLOTRON

This machine, designed by physicists and engineers of the Rutherford Laboratory, is being built for use at A.E.R.E. It will be used mainly to study the physical and chemical effects of radiation on the properties of materials, though some nuclear effects such as the fision process, will also be studied. Its purpose is therefore to provide basic support in the sort of problems encountered in the design of nuclear reactors, rather than to do fundamental studies of nuclear structure.

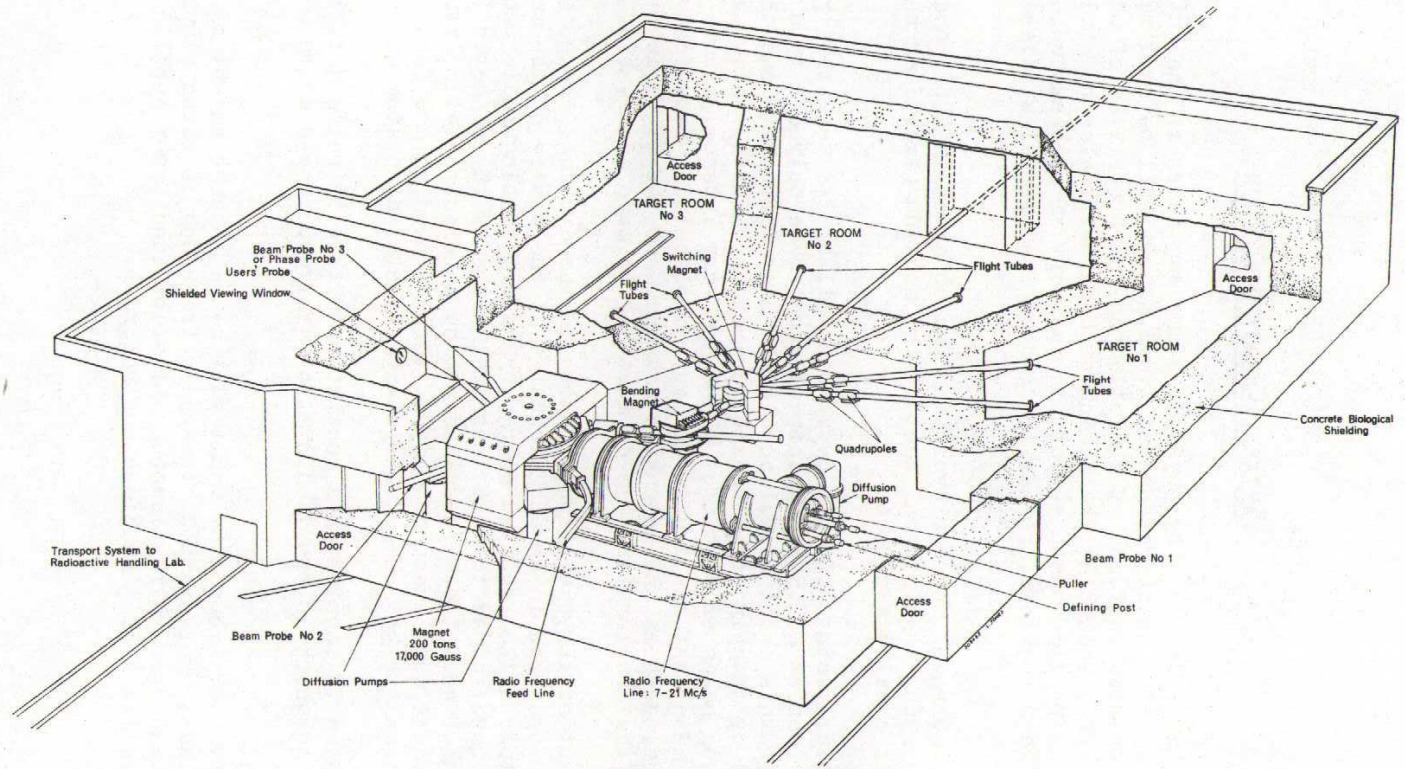
Treasury approval for the cyclotron was obtained in 1962, and it is expected to operate in 1965. The capital cost of the machine (excluding building) will be just over half a million pounds.

The special feature of this cyclotron will be its versatility. Many machines (such as the present A.E.R.E. cyclotron) accelerate only one type of particle to a fixed energy; this machine will accelerate many different ions to an energy which can be varied by changing the machine parameters. Furthermore, an attempt is being made to produce beams of particles which are very intense. These multiple requirements mean that the design is very complicated. Many features which are normally fixed, such as the intensity and shape of the magnetic field, and the frequency of the accelerating field, must all be made adjustable.

The layout of the cyclotron is shown in the drawing. Ions, of the type required, are produced in an arc discharge at the centre of the magnet gap. They are accelerated to the required energy by an alternating radiofrequency electric field, being constrained to move in spiral paths by the magnetic field. When they reach the magnet edge they are pulled out by an electrostatic extractor, after which they travel down evacuated pipes, through bending and focusing magnets into one of the three "target rooms" where experimental apparatus will be set up.

The machine is located in a concrete vault, with walls 8ft. thick and a 6ft. roof, access to which is provided by two massive concrete doors mounted on bogies.

Ancillary rooms round the vault will house a large amount of electrical and mechanical plant. For example, the radio frequency is being provided by a radio transmitter, and some thirty independent stabilized power supplies are needed. All will be controlled from a spacious control room.



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