ENTRY NO. 83

NAME OF MACHINE: The Edinburgh Cyclotron
INSTITUTION: Medical Research Council, Cyclotron Unit
ADDRESS: Western General Hospital, Crewe Road South, Edinburgh, Scotland
TEL: 031-332 2525 TELEX: –
IN CHARGE: J R Williams REPORTED BY: D B Mackay

Commercial Desigh:-
The Cyclotron Corporation, Model CS-30 to standard specification

HISTORY AND STATUS

DESIGN, date: – Model tests: –
ENG DESIGN, date: –
CONSTRUCTION, date: –
FIRST BEAM, date (or goal): 1976
MAJOR ALTERATIONS: –

COST, ACCELERATOR: $ 850,000
COST, FACILITY, total: $2,400,000
FUNDED BY: MRC, Cancer Research Co., SHHD

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS: 2 ENGINEERS: 2
TECHNICIANS: 1 CRAFTS: 1
GRAD STUDENTS involved during year: –
OPERATED BY: 3 Research staff or: – Operators
OPERATION: 40 hr/wk. On target: 15 hr/wk
TIME DISTR. in house: 100 %, outside: – %
BUDGET, op & dev: –
FUNDED BY: Medical Research Council

RESEARCH STAFF, not included above

USERS, in house: 4 outside: –
GRAD STUDENTS involved during year: 1
RESEARCH BUDGET, in house: –
FUNDED BY: –

MAGNET

POLE FACE, diameter (compact): 95 cm, R-extraction: 40 cm
R injection: – cm
GAP, min: 5 cm, Field: 22.5 kG
max: 10 cm, Field: 14.4 kG } at 2 × 10^5 Ampere turns
AVERAGE FIELD at R ext: kG
B max/<B>:
NUMBER OF SECTORS: compact 3, separated: Spiral, max: deg
SECTOR ANGLE (SSC): deg
TRIMMING COILS: 3 at 120° azimuth increments, centred at 12.5 cm radius
CONDUCTOR, material and type:
STORED ENERGY (cryogenic): – MJ
POWER: main coils: 58 max kW: current stability 3×10^{-4} I Max
trimming coils: 0.5 max kW: current stability:
WEIGHT: Fe: 20 tons: coils: tons
COOLING system: Water – chilled, recirculated
ION ENERGY (Bending limit) E/A = q^2/A^2 MeV/amu
(Focusing limit) E/A = q/A MeV/amu

ACCELERATION SYSTEM

DEES, number: 2 angle: deg
BEAM APERTURE: cm; DC Bias: 1 kV
TUNED by, coarse: Mechanical strafne Variable vacuum capacitors
RF: 12 to 26.6 MHz, stable ± 1×10^{-4}
Orb F: to MHz
HARMONICS, RF/Orb F, used:
DEE–Gnd, max: 12 kV, min gap: cm
STABILITY, (pk-pk noise)/(pk RF volt):
ENERGY GAIN, max: kV/turn
RF PHASE, stable to ±: deg
RF POWER input, max.: 2 kW
FREQUENCY MODULATION, rate: – /s
modulator, type: –
beam pulse, width: –

VACUUM SYSTEM

OPERATING PRESSURE: 2×10^{-5} torr Torr or mbar
PUMPS, No, Type, Size: 1 × NRC HS.2

ION SOURCES

P.I.G. source

INJECTION SYSTEM

–

EXTRACTION SYSTEM

Electrostatic deflector with pre-septum. mag channel,

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed: 80 m^2; movable: – m^2
TARGET STATIONS: 2 in 2 rooms rooms
STATIONS served at same time, max: 1
MAG SPECTROGRAPH, type: –
COMPUTER model: –
OTHER FACILITIES: (1) Gas target line for short-lived isotope prod; (2) solid target line
(3) 2 neutron therapy beams

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
deuteron		15	140 at r_{ext}	70
alpha		30	70 at r_{ext}	35
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS
PULSE WIDTH	RF deg	pμA of MeV ions
PHASE EXC. max	RF deg	pμA of MeV ions
EXTRACT eff	%	pμA of MeV ions
RESOL ΔE/E	%	pμA of MeV ions
EMITTANCE (π mm-mrad)	axial	pμA of MeV
	rad	

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS: – SOLID STATES PHYSICS: –
BIOMEDICAL APPLICAT.: 80% ISOTOPE PRODUCTIONS: 20%

REFERENCES/NOTES

1)
2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

Used for Fast Neutron Therapy
Two beams into separate treatment rooms
One beam fixed horizontal, with/beryllium target
One beam Isocentric, with beryllium target in rotating gantry

Target - Patient distance 125 cm

Patient dose rate 25 rads/min

Gas and solid target lines located in vault

Neutron activation takes place in FHB Room.