ENTRY NO. 70

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

HISTORY AND STATUS

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

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 ~~min~~ 10 cm, Field 14.4 kG } at 2 x 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) 0 deg

TRIMMING COILS 3 at 120° azimuth increments centred at 12.5 cm radius

CONDUCTOR, material and type copper

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 deg

BEAM APERTURE - cm; DC Bias 1 kV

TUNED by, coarse Mechanical strap fine Variable vacuum capacitors

RF 12 to 26.6 mHz, stable ± 1 x 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 ? 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 x NRC HS 2

ION SOURCES

P.I.G. source

INJECTION SYSTEM

-

EXTRACTION SYSTEM

Electrostatic deflector with pre-septum, mag channel,

FACILITIES FOR RESEARCH

harmonic coils

SHIELDED AREA, fixed 80 m²; movable - m²

TARGET STATIONS 2 in 2 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	pμ A of MeV ions
PHASE EXC. max	RF deg	pμ A of MeV ions
EXTRACT eff	%	pμ A of MeV ions
RESOL ΔE/E	%	pμ A of MeV ions
EMITTANCE (π mm. mrad)	axial / rad	pμ A of MeV

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.