

ENTRY No. 87

NAME OF MACHINE The Edinburgh Cyclotron DATE
INSTITUTION Medical Research Council, Cyclotron Unit
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IN CHARGE J. B. Williams REPORTED BY D. B. Mackay

Commercial Design:-
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 \$ 350,000
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 4 hr/wk, On target hr/wk
TIME DISTR. in house %, Outside %

BUDGET, op & dev
FUNDED BY
RESEARCH STAFF, not included above

USERS, in house outside
GRAD STUDENTS involved during year
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 x 10^5
AVERAGE FIELD at R ext kG } Ampere turns
B max/ <B>

NUMBER OF SECTORS { compact 3 } Spiral, max deg
{ separated } deg

SECTOR ANGLE (SSC) deg
TRIMMING COILS 3 at 120 degree 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 x 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^2/a^2 MeV/amu

ACCELERATION SYSTEM
DEES, number 2; angle deg
BEAM APERTURE cm; DC Bias 1 kV
TUNED by, coarse Mechanical struts 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 2 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 x 10^-5 torr Torr or mbar
PUMPS, No, Type, Size 1 x NRC HS 2

ION SOURCES
PIG 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
STATIONS served at same time, max 1

MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES (1) Gas target line for short-lived
(2) solid target line
(3) 2 neutron therapy beams

CHARACTERISTIC BEAMS
PARTICLE ENERGY (MeV) CURRENT (pA)
Goal Achieved Internal External

deuteron 15 140 at 70
alpha 30 70 at 35

SECONDARY (part/s)

BEAM PROPERTIES
MEASURED CONDITIONS
PULSE WIDTH RF deg pA of MeV ions
PHASE EXC, max RF deg pA of MeV ions

EXTRACT eff % pA of MeV ions
RESOL delta E/E % pA of MeV ions
EMITTANCE
(pi mm. mrad) { axial } pA of MeV ions
{ rad }

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 80% ISOTOPE PRODUCTIONS 20%

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS
Used for Fast Neutron Therapy
Two beams into separate treatment rooms fixed
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.