

ENTRY No. CU79

NAME OF MACHINE CLATTERBRIDGE CYCLOTRON DATE 8TH MAY, 1989
INSTITUTION MEDICAL RESEARCH COUNCIL
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IN CHARGE T.B. SAXTON REPORTED BY T.B. SAXTON

HISTORY AND STATUS

DESIGN, date 1981/82 Model tests
ENG DESIGN, date 1981/82
CONSTRUCTION, date 1982/83
FIRST BEAM, date (or goal) FACTORY 1983, SITE 1984
MAJOR ALTERATIONS ADDITION OF PROTON THERAPY FACILITY, 1988
COST, ACCELERATOR £1.5M
COST, FACILITY, total £4.5M
FUNDED BY U.K. CANCER CHARITIES
ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS 2 ENGINEERS 3
TECHNICIANS 2 CRAFTS 1
GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION hr/wk, On target hr/wk
TIME DISTR. in house %, Outside %
BUDGET, op & dev
FUNDED BY MEDICAL RESEARCH COUNCIL
RESEARCH STAFF, not included above
USERS, in house 3 outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY IMPERIAL CANCER RESEARCH FUND

MAGNET

POLE FACE, diameter (compact) 160 cm, R extraction .64 cm
R Injection cm
GAP, min 12.3 cm, Field 20.7 kG
max 22.1 cm, Field 13.0 kG at 280,000
AVERAGE FIELD at R ext 17.7 kG Ampere turns
B max/ <B> 1.19

NUMBER OF SECTORS {compact 3, separated} Spiral, max 55 deg

SECTOR ANGLE (SSC) deg
TRIMMING COILS 4 SETS HARMONIC COILS
6 SETS CIRCULAR GRADIENT COILS

CONDUCTOR, material and type HOLLOW COPPER

STORED ENERGY (cryogenic) MJ

POWER: main coils 110 max, kW; current stability 1x10^-5
trimming coils 5 max, kW; current stability 1x10^-4

WEIGHT: Fe 120 tons; coils 4.9 tons

COOLING system

ION ENERGY (bending limit) E/A = .62 q^2/a^2 MeV/amu
(focusing limit) E/A = q^2/a^2 MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 80 deg
BEAM APERTURE 2.5 cm; DC Bias kV
TUNED by, coarse fine
RF 25 to MHz, stable +/- 1x10^-6
Orb F 25 to MHz
HARMONICS, RF/Orb F, used 1
DEE - Gnd, max 40 kV, min gap cm
STABILITY, (pk-pk noise)/(pk RF volt) <10^-3
ENERGY GAIN, max 100 kV/turn
RF PHASE, stable to +/- 0.5 deg
RF POWER input, max 60 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE <10^-5 Torr or mbar
PUMPS, No, Type, Size
2 x 4000 L/SEC OIL DIFFUSION PUMP
100m^3/HB+BOOSTER, 20m^3/HR. MECHANICAL. BACKING

ION SOURCES

INTERNAL, COLD CATHODE

INJECTION SYSTEM

ELECTROSTATIC+ELECTROMAGNETIC+FOCUSING CHANNEL

EXTRACTION SYSTEM

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m^2; movable m^2
TARGET STATIONS in rooms
STATIONS served at same time, max
MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES

CHARACTERISTIC BEAMS

Table with columns: PARTICLE, ENERGY (MeV) Goal, Achieved, CURRENT (pA) Internal, External. Row for P: Goal 60, Achieved 62.5, Internal >100, External 50.

SECONDARY

P. 50 RAD/MIN @ 150CM FROM TARGET AFTER FILTERING.

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 ΔE/E % pA of MeV Ions
EMITTANCE (π mm. mrad) {axial rad} pA of MeV Ions

OPERATING PROGRAMS, time distribution

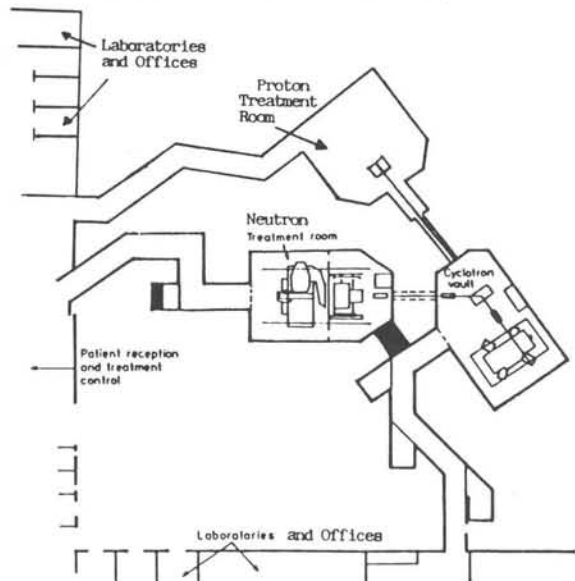
BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 100% ISOTOPE PRODUCTIONS

REFERENCES/NOTES

- 1) SCANDITRONIX MC60PF

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

ACCELERATOR USED WITH SCANDITEM HIGH ENERGY NEUTRON THERAPY UNIT. CONTROLLED BY PDP11-23.



Plan view of Clatterbridge high energy neutron therapy facility.