

ENTRY No. 120

NAME OF MACHINE Clinical Neutron Therapy Sys. ~~DAVE~~ Scanditronix MC50 Cyclotron May. 1989
INSTITUTION University of Washington
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IN CHARGE P. Wootton REPORTED BY R. Risler

HISTORY AND STATUS

DESIGN, date 1980 Model tests 1980
ENG DESIGN, date 1980/81
CONSTRUCTION, date 1981/82
FIRST BEAM, date (or goal) Factory: June 82
MAJOR ALTERATIONS Facility: June 83
First Patient: October 84
COST, ACCELERATOR \$4.2 Million (U.S.)
COST, FACILITY, total \$7.0 Million (U.S.)
FUNDED BY U.S. National Cancer Institute

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS ENGINEERS 3
TECHNICIANS 2 CRAFTS

GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION 48 hr/wk, On target hr/wk
TIME DISTR. in house 100 % 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) 155 cm, R extraction .57 cm
R injection .107 cm
GAP, min .11.5 cm, Field } 875 A
max .20.5 cm, Field .21.3 kG } at 320 turns
AVERAGE FIELD at R ext } 17.1 kG } Ampere turns
B max/
NUMBER OF SECTORS { compact 3 } Spiral, max 55 deg
separated
SECTOR ANGLE (SSC) deg
TRIMMING COILS 10 gradient, 4 harmonic

CONDUCTOR, material and type Cu
STORED ENERGY (cryogenic) MJ
POWER: main coils 110 max, kW; current stability 10⁻⁵
trimming coils 5 max, kW; current stability
WEIGHT: Fe 90 tons; coils
COOLING system deionized water
ION ENERGY (bending limit) E/A = .51 q²/a² MeV/amu
(focusing limit) E/A = q²/a² MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 90 deg
BEAM APERTURE 2.5 cm; DC Bias 77 kV
TUNED by, coarse piston fine flap
RF 20 to 26 MHz, stable ± 10⁻⁶
Orb F 10 to 26 MHz
HARMONICS, RF/Orb F, used 1:2
DEE - Gnd, max 41.5 kV, min gap 0.35 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10⁻³
ENERGY GAIN, max 160 kV/turn
RF PHASE, stable to ± 1 deg
RF POWER input, max 60 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 10⁻⁶ Torr or mbar
PUMPS, No, Type, Size 2, oil diffusion
8500 liters/sec total

ION SOURCES

internal PIG, dual chimney

INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic Deflector/EM channel/2 passive focussing channels
FACILITIES FOR RESEARCH
SHIELDED AREA, fixed .265 m²; movable m²
TARGET STATIONS 3 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model PDP 11/23
OTHER FACILITIES Two neutron therapy treatment rooms,
One isotope station in cyclotron vault

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
p	50	51	100+	70
d	25	24		50
p(H ⁺)		10	50	20
He ⁺⁺		41	30	15

SECONDARY (part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH RF deg μA of MeV ions
PHASE EXC, max RF deg μA of MeV ions
EXTRACT eff .75 % .10 μA of 50.5 MeV p ions
RESOL ΔE/E % μA of MeV ions
EMITTANCE
(π mm. mrad) { .15 axial } .10 μA of .50,5 MeV p ions
{ .15 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS .. SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 75% ISOTOPE PRODUCTIONS .10%
Radiation Physics .15%

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

