ENTRY NO. 88

NAME OF MACHINE: Minicyclotron Model 1710 (JSW)

INSTITUTION: Brookhaven National Laboratory

ADDRESS: Upton, NY 11973

TEL 516-282-4587, 4397 TELEX 6852516 BNL DOE

IN CHARGE A.P. Wolf, D.J. Schlyer REPORTED BY D.J. Schlyer, A.P. Wolf

A.P. Wolf, Head of Program
D.J. Schlyer, Head of Cyclotron

HISTORY AND STATUS

DESIGN, date 1981 Model tests 1981
ENG DESIGN, date
CONSTRUCTION, date 1981
FIRST BEAM, date (or goal) 1982
MAJOR ALTERATIONS None

COST, ACCELERATOR $860,000
COST, FACILITY, total $1,100,000
FUNDED BY DOE

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS
TECHNICIANS 3 CRAFTS Laboratory Support
GRAD STUDENTS involved during year None
OPERATED BY Research staff or XX Operators
OPERATION 40 hr/wk, On target 20-30 hr/wk
TIME DISTR. in house 100 %, outside %
BUDGET, op & dev
FUNDED BY NIH and DOE

RESEARCH STAFF, not included above

USERS, in house 10 outside Variable
GRAD STUDENTS involved during year Variable
RESEARCH BUDGET, in house
FUNDED BY NIH and DOE

MAGNET

POLE FACE, diameter (compact) 105 cm, R-extraction 42 cm
R injection cm
GAP, min 7 cm, Field 18.4 kG
max 13 cm, Field 12.4 kG } at 1.3×10^5 Ampere turns
AVERAGE FIELD at R ext 15.4 kG
B max/<B> 1.2
NUMBER OF SECTORS { compact 4 / separated } Spiral, max 0 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS 3
CONDUCTOR, material and type Hollow copper
STORED ENERGY (cryogenic) MJ
POWER: main coils 60 max kW: current stability 20/10^6
trimming coils 3 max kW: current stability
WEIGHT: Fe 35 tons: coils 1 tons
COOLING system Water
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 45 deg
BEAM APERTURE 1 cm; DC Bias 0 kV
TUNED by, coarse fine
RF 43.5 & 47 to MHz, stable ± 5 ppm
Orb F 11.75 to 21.75 MHz
HARMONICS, RF/Orb F, used 2.4
DEE–Gnd, max 45 kV, min gap cm
STABILITY, (pk-pk noise)/(pk RF volt)
ENERGY GAIN, max 180 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 5×10^{-6} Torr or mbar
PUMPS, No, Type, Size 1 - Diffusion Pump 9-1/2"

ION SOURCES

INJECTION SYSTEM Hot Cathode Axial Source

EXTRACTION SYSTEM Electrostatic & Magnetic Channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 60 m²; movable 0 m²
TARGET STATIONS 1 in 1 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES Automatic Target Changer Fan Type

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
H	17	17	120	50
D	10	10	140	50
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
Chemistry Research 20%

REFERENCES/NOTES

1)
2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

This machine is used primarily for the biomedical program involving carbon-11, nitrogen-13, oxygen-15 and fluorine-18 production for use in the positron emission tomographs at BNL. It is reliable and stable. Downtime is 2-5% of the years use, mostly for routine maintenance.