

**ENTRY NO. 98**

NAME OF MACHINE . . . . . NIH, BABY CYCLOTRON  
 INSTITUTION . . . . . National Institutes of Health, Clinical Center  
 ADDRESS . . . . . NIH, Cyclotron, Bldg. 10, Rm 1C401, Bethesda, Maryland, 20892  
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 IN CHARGE . Ron Finn . . . . . REPORTED BY . . . . . Paul Plascjak

**HISTORY AND STATUS**

DESIGN, date . . . . . 1981 . . . . . Model tests  
 ENG DESIGN, date . . . . . Japan Steel Works JSW-1710  
 CONSTRUCTION, date . . . . . 1984  
 FIRST BEAM, date (or goal) . . . . . Acceptance: Sept. 1985  
 MAJOR ALTERATIONS . . . . .

COST, ACCELERATOR . . . . .  
 COST, FACILITY, total . . . . .  
 FUNDED BY . . . . . National Institutes of Health

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**  
 SCIENTISTS . . . . . ENGINEERS . . . . . 4  
 TECHNICIANS . . . . . CRAFTS support

GRAD STUDENTS involved during year . . . . .  
 OPERATED BY . . . . . Research staff or . . . . . x . . . . . Operators  
 OPERATION . . . . . 45 . . . . . hr/wk, On target . . . . . 15 . . . . . hr/wk  
 TIME DISTR. in house . . . . . 100% . . . . . %, outside . . . . . %

BUDGET, op & dev . . . . .  
 FUNDED BY . . . . . National Institutes of Health

**RESEARCH STAFF**, not included above:  
 USERS, in house . . . . . PET Facility . . . . . outside . . . . . Nuclear Med.  
 GRAD STUDENTS involved during year . . . . .  
 RESEARCH BUDGET, in house . . . . .  
 FUNDED BY . . . . . National Institutes of Health

**MAGNET**  
 POLE FACE, diameter (compact) . . . . . 101.4 cm, R-extraction . . . . . 42.0 cm  
 R injection . . . . . cm  
 GAP, min . . . . . 7 . . . . . cm, Field . . . . . 18.4 . . . . . kG  
 max . . . . . 13 . . . . . cm, Field . . . . . 12.4 . . . . . kG at . . . . .  $1.3 \times 10^5$   
 AVERAGE FIELD at R ext . . . . . 15.4 . . . . . kG . . . . . Ampere turns  
 B max / < B > . . . . . 1.2

NUMBER OF SECTORS { compact . . . . . 4 . . . . . } Spiral, max . . . . . 0 . . . . . deg  
 { separated . . . . . }  
 SECTOR ANGLE (SSC) . . . . . 3 . . . . . deg

TRIMMING COILS . . . . . 3 . . . . .  
 CONDUCTOR, material and type . . . . . Copper, hollow  
 STORED ENERGY (cryogenic) . . . . . MJ  
 POWER: main coils . . . . . 60 . . . . . max kW: current stability . . . . .  $2 \times 10^5$   
 trimming coils . . . . . 3 . . . . . max kW: current stability . . . . .

WEIGHT: Fe . . . . . 30 . . . . . tons: coils . . . . . 1 . . . . . tons  
 COOLING system . . . . . chilled deionized 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 . . . . . movable short . . . . . fine . . . . . active capacitor  
 RF . . . . . 43.5 . . . . . to . . . . . 47 . . . . . MHz, stable  $\pm$  . . . . .  $5 \times 10^6$   
 Orb F . . . . . 11.7 . . . . . to . . . . . 21.7 . . . . . MHz  
 HARMONICS, RF/Orb F, used . . . . . 2nd, 4th  
 DEE-Gnd, max . . . . . 45 . . . . . kV, min gap . . . . . 3 . . . . . cm  
 STABILITY, (pk-pk noise)/(pk RF volt) . . . . .  
 ENERGY GAIN, max . . . . . 100 . . . . . kV/turn  
 RF PHASE, stable to  $\pm$  . . . . . deg  
 RF POWER input, max. . . . . 28 . . . . . kW  
 FREQUENCY MODULATION, rate . . . . . /s  
 modulator, type . . . . .  
 beam pulse, width . . . . .

**VACUUM SYSTEM**  
 OPERATING PRESSURE . . . . .  $1 \times 10^{-5}$  Torr or mbar  
 PUMPS, No, Type, Size . . . . . oil diffusion, 10"

**ION SOURCES**  
 . . . . . Hot Cathode, axial

**INJECTION SYSTEM**

**EXTRACTION SYSTEM**  
 . . . . . Electrostatic deflector, magnetic channel

**FACILITIES FOR RESEARCH**  
 SHIELDED AREA, fixed . . . . . 34 . . . . . m<sup>2</sup>; movable . . . . . 0 . . . . . m<sup>2</sup>  
 TARGET STATIONS . . . . . 1 . . . . . ext . . . . . in . . . . . 1 . . . . . rooms  
 STATIONS served at same time, max . . . . . 1 . . . . .  
 MAG SPECTROGRAPH, type . . . . .  
 COMPUTER model . . . . . NEC 9800 (target system)  
 OTHER FACILITIES . . . . . isotope production, hot cells

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT ( $\mu$ A)	
	Goal	Achieved	Internal	External
Protons		17.5		50
Deuterons		9.8		50
SECONDARY (part/s)				

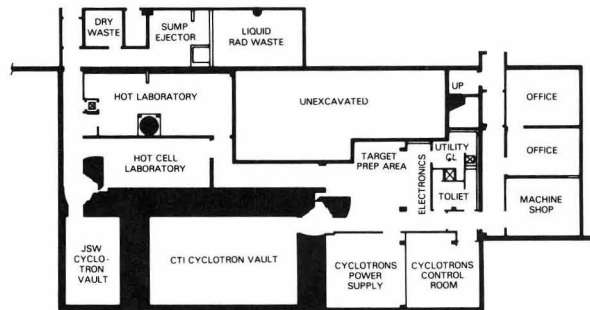
**BEAM PROPERTIES**

MEASURED	CONDITIONS	
	RF deg	$\mu$ A of . . . . . MeV . . . . . ions
PULSE WIDTH		
PHASE EXC, max		
EXTRACT eff. 70 %	5.2	$\mu$ A of 17.5 MeV H <sup>+</sup> . . . . . ions
RESOL $\Delta E/E$ . . . . . 1 %		$\mu$ A of . . . . . MeV . . . . . ions
EMITTANCE		
( $\pi$ mm-mrad)	32 . . . . . ext Horiz.	
	15 . . . . . rad-Vert	$\mu$ A of . . . . . MeV . . . . .

**OPERATING PROGRAMS**, time distribution  
 BASIC NUCLEAR PHYSICS . . . . . SOLID STATES PHYSICS . . . . .  
 BIOMEDICAL APPLICAT . . . . . ISOTOPE PRODUCTIONS . . . . . 100%  
 . . . . . 60% Radiopharmaceutical Production  
 . . . . . 40% . . . . . Development

**REFERENCES/NOTES**  
 1)  
 2)

**PLAN VIEW OF FACILITY, COMMENTS, ETC.**



NIH CYCLOTRON FACILITY B-3 LEVEL