

ENTRY NO. **C76** Date 02-OCT-95  
 Name of Machine 60-inch cyclotron  
 Institution Brookhaven National Laboratory  
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 In Charge: J. S. Fowler Reported by: D. J. Schlyer

**HISTORY**  
**MILESTONE DATES:**  
 Design 1963 Model Tests 1963  
 Construction 1964 First Beam 1968  
**DESIGN/CONSTRUCTION BY:**  
 in house  other  
**COST:** Accelerator 400,000 Facility 950,000  
**FUNDED BY:** USAEC-DOE

**STATUS**  
**STAFF:** Machine  
 Scientists 1 Engineers  
 Technicians 1 Students  
 Research (in house/external)  
 Scientists 2 / 0 Engineers /  
 Technicians / Students /  
**BUDGET:** Machine DOE-NIH  
 Research Funded by DOE-NIH  
**TIME DISTRIBUTION:**  
 Basic Research (in house/external) 95 % / 5 %  
 Applied Program (in house/external) % / %  
 Maintenance % Development 5 %

**MAGNET**  
**POLE PARAMETERS:**  
 Diameter 152 cm  $R_{extract}$  65 cm  $R_{inject}$  0 cm  
**HILL PARAMETERS:** Gap (min) cm  $B_{max}$  T  
 (@ AT) Gap (max) cm  $B_{min}$  T  
**VALLEY PARAMETERS:** Gap (min) cm  $B_{max}$  T  
 (@ AT) Gap (max) cm  $B_{min}$  T  
**AVERAGE FIELD:**  $\langle B \rangle_{min}$  1 T  $\langle B \rangle_{max}$  1.54 T  
**NUMBER OF SECTORS:** compact/separated 3 /  
 sector angle deg. spiral (max) 50 deg.  
**FIELD TRIMMING:** Trim Coils 8  
 Harmonic Coils 5  
 Other  
**CURRENT:** Main Coils 1200 Amps Stability  
 Trim Coils 300 Amps Stability  
 Stored Energy (cryogenic) MJ  
**WEIGHT:** Iron 196 Tons Conductor Cu hollow  
**ION ENERGY:** Bending Limit E/A =  $q^2/A^2$  MeV/u  
 Focusing Limit E/A = q/A MeV/u

**ACCELERATION SYSTEM**  
**FUNDAMENTAL ACCELERATION:**  
 Description: 1 DEE, 1 DUMMY DEE @ 180°  
 No. of Gaps/turn 2  $dE/dn(max)$  0,120 MeV/q  
 Voltage (max) 0.060 MV Harmonic  $f_H/f_{ion}$  1,3  
 Freq MHz Power in(max) 0.100 MW  
 Stability: Phase Voltage  
**OTHER CAVITIES (Flattopping or otherwise):**  
 Description:  
 Region of Influence:  $R_{min}$  cm  $R_{max}$  cm  
 No. of Gaps/turn  $dE/dn(max)$  MeV/q  
 Voltage (max) MV Harmonic  $f_H/f_{ion}$   
 Freq MHz Power in(max) MW  
 Stability: Phase Voltage

**VACUUM SYSTEM**  
**OPERATING PRESSURE:**  $1 \times 10^{-5}$  Torr  
**PUMPS:** (No. and type) 1 - Diffusion 24"

**ION SOURCE(S)**

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ ( $\pi$ mm mrad)	Ion Species
(a) hot filament			H <sup>+</sup>
(b)			
(c)			
(d)			

**INJECTION SYSTEM**  
 Efficiency %  
**EXTRACTION SYSTEM**  
 Electrostatic Efficiency 10 %

**CHARACTERISTIC BEAMS**

Accelerated Ions	E/A (MeV/u)	Current (part $\mu$ A)	
		Internal	External
(a) H <sup>+</sup>	34	300	25
(b) D <sup>+</sup>	23	300	20
(c) He-3 <sup>++</sup>	56	200	10
(d) He-4 <sup>++</sup>	46	200	10

Secondary Particles	E (MeV)	part/sec
(a)		
(b)		
(c)		

**EXTRACTED BEAM PROPERTIES:**  
 For  $\mu$ A of ions  
 $\Delta E/E$  %  $\Delta\phi$  °rf  
 $\epsilon_n = \beta\gamma\epsilon$  x  $\pi$  mm mrad z  $\pi$  mm mrad

**FACILITIES FOR RESEARCH**  
**SHIELDED AREA:** Fixed: 100 m<sup>2</sup> Moveable m<sup>2</sup>  
 Target Stations: 2 No. Served At Same Time: 1  
**MAGNETIC SPECTROMETERS:**  
**OTHER FACILITIES:**

**REFERENCES/NOTES**  
 (a)  
 (b)

**PLAN VIEW OF FACILITY, COMMENTS**