ENTRY NO. FM7 **Date** 13 August 1992

Name of Machine 160 MeV synchrocyclotron

Institution Harvard Cyclotron Laboratory, Harvard University

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In Charge: A.M. Koehler Reported by: B. Gottschalk

HISTORY

MILESTONE DATES:

Design ----- Model Tests -----

Construction 1946 First Beam 1949

DESIGN/CONSTRUCTION BY:

in house X other

COST: Accelerator $1 million Facility $ 0.7 million

FUNDED BY: Office of Naval Research 1946 - 1967

STATUS

STAFF: Machine Other 5

Scientists 2 Engineers 1

Technicians 7 Students 0

Research (in house/external)

Scientists 2 / Engineers /

Technicians / Students 1 /

BUDGET: Machine $1 million Funded by fees and

Research Funded by subcontract

TIME DISTRIBUTION:

Basic Research (in house/external) % /

Applied Program (in house/external) 90 % /

Development 5 % Maintenance 5 %

MAGNET

POLE PARAMETERS:

Diameter 241 cm $R_{extract}$ 105 cm R_{inject} 0 cm

HILL PARAMETERS: Gap (min) 29.6 cm B_{max} 1.83 T

(@ 600 000 AT) Gap (max) 30.5 cm B_{min} 1.90 T

VALLEY PARAMETERS: Gap (min) cm B_{max} T

(@ AT) Gap (max) cm B_{min} T

AVERAGE FIELD: $< B >_{min}$ T $< B >_{max}$ T

NUMBER OF SECTORS: compact/separated /

sector angle deg. spiral (max) deg.

FIELD TRIMMING: Trim Coils

Harmonic Coils

Other

CURRENT: Main Coils 160 KW Amps Stability 0.1 %

Trim Coils Amps Stability

Stored Energy (cryogenic) MJ

WEIGHT: Iron 641 tons Conductor 74 tons

ION ENERGY: Bending Limit E/A = q^2/A^2 MeV/u

Focussing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 3CW40,000H3 , rotating condenser

No. of Gaps/turn 2 dE/dn(max) MeV/q

Voltage(max) .012 MV Harmonic f_{rf}/f_{ion} 1

Freq 30 - 24 MHz Power in(max) .010 MW

Stability: Phase Voltage

OTHER CAVITIES (Flattopping or otherwise):

Description: cee for stochastic extraction

Region of Influence: R_{min} cm R_{max} cm

No. of Gaps/turn dE/dn(max) MeV/q

Voltage(max) MV Harmonic f_{rf}/f_{ion}

Freq MHz Power in(max) MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 3×10^{-6} (3×10^{-7} base)

PUMPS: No. and type 4 x NRC 6" oil diffusion

ION SOURCE(S)

	Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (πmm mrad)	Ion Species
(a)	hot filament pulsed arc "volcano"				
(b)					
(c)					
(d)					

INJECTION SYSTEM

Efficiency %

EXTRACTION SYSTEM

passive regenerator and channel... Efficiency ca. 3 %

CHARACTERISTIC BEAMS

	Accelerated Ions	E/A (MeV/u)	Current(part μA) Internal	External
(a)	protons	158.6 MeV	ca. 1 muA	ca. 10 nA
(b)				
(c)				
(d)				

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

EXTRACTED BEAM PROPERTIES:

For μA of MeV/u ions

$\Delta E/E$ % $\Delta\phi$ °rf

$\epsilon_n = \beta\gamma\epsilon$ x πmm mrad z πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed m^2 Moveable m^2

Target Stations: No. Served At Same Time:

MAGNETIC SPECTROMETERS: none

OTHER FACILITIES: Since 1967 we have operated on a fee for service basis, mostly for treating patients. The current hourly fee is $300 . As of 7/92 we have treated 5600 patients. Current rate is 300/year. The equipment and techniques developed here for irradiating patients have proved convenient for radiation damage studies often related to satellites and space probes. A fourth beamline is under construction to facilitate such studies.

REFERENCES/NOTES

(a)

(b)

PLAN VIEW OF FACILITY, COMMENTS