

ENTRY NO. FM-2

NAME OF MACHINE McGill Synchrocyclotron
INSTITUTION McGill University
ADDRESS 3610 University Street, Montréal, Québec H3A 2B2 CANADA
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IN CHARGE . Professor J.K.P. Lee . REPORTED BY . Leo Nikkinen

HISTORY AND STATUS

DESIGN, date . . . 1945 Model tests
ENG DESIGN, date
CONSTRUCTION, date . . . 1945 - 1946
FIRST BEAM, date (or goal) June, 1949
MAJOR ALTERATIONS . External Beam Hall added in 1963,
converted to Laser Hall in 1983
COST, ACCELERATOR . \$200K
COST, FACILITY, total . \$2 Million
FUNDED BY

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
TECHNICIANS 2 CRAFTS
GRAD STUDENTS involved during year
OPERATED BY X Research staff or Operators
OPERATION . . . 40 . . . hr/wk. On target . . . 35 . . . hr/wk
TIME DISTR, in house . . 80% % , outside . . 20% %
BUDGET, op & dev
FUNDED BY NSERC

RESEARCH STAFF, not included above

USERS, in house 10 outside 3
GRAD STUDENTS involved during year 12
RESEARCH BUDGET, in house \$200,000
FUNDED BY NSERC

MAGNET

POLE FACE, diameter (compact) . 90 cm, R-extraction . 90 cm
R injection . . 0 cm
GAP, min . 15 cm, Field . 16.1 kG }
max . 19 cm, Field . 15.1 kG } at . 5.3x10⁵
AVERAGE FIELD at R ext . . 15.9 kG } Ampere turns
B max / < B > 1.01
NUMBER OF SECTORS { compact } Spiral, max deg
{ separated }
SECTOR ANGLE (SSC) deg
TRIMMING COILS

CONDUCTOR, material and type . Aluminum. 6x0.35 cm
STORED ENERGY (cryogenic) MJ
POWER: main coils 150 max kW: current stability 10⁻⁵
trimming coils max kW: current stability
WEIGHT: Fe . 273 tons: coils 11 tons
COOLING system . . . De-Ionized Water
ION ENERGY (Bending limit) E/A = . 100 q²/A² MeV/amu
(Focusing limit) E/A = q/A MeV/amu

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
BEAM APERTURE . . 1 cm; DC Bias . . 0-3 kV
TUNED by, coarse fine
RF 30 to 6 MHz, stable ±
Orb F 26 to 22.3 (protons) MHz
HARMONICS, RF/Orb F, used
DEE-Gnd, max 10 kV, min gap 5 cm
STABILITY, (pk-pk noise)/(pk RF volt)
ENERGY GAIN, max 20 kV/turn
RF PHASE, stable to ± deg
RF POWER input, max. 40 (avg.); 200 (pk) kW
FREQUENCY MODULATION, rate . . 4,000 /s
modulator, type . Swept Oscillator
beam pulse, width . 20 μsec

VACUUM SYSTEM

OPERATING PRESSURE 10⁻⁵ Torr or mbar
PUMPS, No, Type, Size . 2, oil diffusion, 16"
10,000 l/sec. each

ION SOURCES

. Cold Cathode. PIG

INJECTION SYSTEM

Radial Extraction Ion-Source

EXTRACTION SYSTEM

Regenerative Deflection

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 125 m²; movable m²
TARGET STATIONS . 3 in 1 room rooms
STATIONS served at same time, max . 1
MAG SPECTROGRAPH, type
COMPUTER model . . . PDP-15 and PDP-11/34
OTHER FACILITIES . Isotope Separator, Superconducting-
solenoid Beta Spectrometer, Internal Bombardment
Target Probes

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (μA)	
	Goal	Achieved	Internal	External
p	100	100	2	0.3
d	50	50	2	0.3
³ He	133	133	1	0.1
⁴ He	100	100	0.8	0.08
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 10-15 %	μA of MeV	ions	
RESOL ΔE/E . . . 1 %	μA of MeV	ions	
EMITTANCE			
(π mm-mrad) . . . 1.5 axial	μA of MeV		
	20 rad		

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS .80 . SOLID STATES PHYSICS
BIOMEDICAL APPLICAT ISOTOPE PRODUCTIONS 20%

REFERENCES/NOTES

- 1)
- 2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

