

ENTRY NO. FM-2

NAME OF MACHINE McGill Synchrocyclotron
 INSTITUTION McGill University
 ADDRESS 3610 University Street, Montréal, Québec H3A 2B2 CANADA
 TEL (514)392-4836 TELEX 05-268510 (from Canada); 5268510 (elsewhere)
 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 }
 min 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 27.3 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 1 180 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 MHz/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
 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
³ d	50	50	2	0.3
⁴ 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 { 15 axial }
 (π mm. mrad) { 20 rad } µA of MeV

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.

