

ENTRY NO. C49 Date June 15/92
 Name of Machine NAC Injector Cyclotron 1
 Institution National Accelerator Centre
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HISTORY

MILESTONE DATES:
 Design 1978 Model Tests 1979 - 1980
 Construction 1978 - 1983 First Beam December 1983
 DESIGN/CONSTRUCTION BY:
 in house yes other various engineering contractors
 COST: Accelerator Facility
 FUNDED BY:

STATUS (See NAC Separated-Sector Cyclotron)

STAFF: Machine
 Scientists Engineers
 Technicians Students
 Research (in house/external)
 Scientists / Engineers /
 Technicians / Students /
 BUDGET: Machine Funded by
 Research Funded by
 TIME DISTRIBUTION:
 Basic Research (in house/external) % / %
 Applied Program (in house/external) % / %
 Development % Maintenance %

MAGNET

POLE PARAMETERS:
 Diameter 116 cm R_{extract} 47.6 cm R_{inject} cm
 HILL PARAMETERS: Gap (min) cm B_{max} T
 (0 AT) Gap (max) 15.6 cm B_{min} 1.23 T
 VALLEY PARAMETERS: Gap (min) cm B_{max} T
 (0 AT) Gap (max) 25.0 cm B_{min} 0.75 T
 AVERAGE FIELD: < B >_{min} 0.3 T < B >_{max} 0.98 T
 NUMBER OF SECTORS: compact/separated 4 /
 sector angle 45 deg. spiral (max) deg.
 FIELD TRIMMING: Trim Coils 5
 Harmonic Coils 2
 Other 2 cone coils
 CURRENT: Main Coils 800 Amps Stability 10⁻⁵
 Trim Coils 180 Amps Stability 10⁻⁴
 Stored Energy (cryogenic) 0.1 MJ
 WEIGHT: Iron 54.5 tons Conductor 1.85 tons
 ION ENERGY: Bending Limit E/A = 11 q²/A² MeV/u
 Focussing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description: Two λ/4 resonators with 90° dees
 No. of Gaps/turn 4 dE/dn(max) 0.24 MeV/q
 Voltage(max) 0.060 MV Harmonic f_{rf}/f_{ion} 2.6
 Freq 8.6 - 26 MHz Power in(max) 2 x 0.025 MW
 Stability: Phase 0.1 deg. Voltage 10⁻³
 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_{rf}/f_{ion}
 Freq MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 1.5 x 10⁻⁵ mbar
 PUMPS: No. and type 1 Turbo 4.8 m³ s⁻¹, 1 Roots 350 m³ h⁻¹,
 1 Rotary Vane 60 m³ h⁻¹

ION SOURCE(S)

Type	Intensity (mA)	ε _n = βγε (πmm mrad)	Ion Species
(a) PIG	4		p
(b)			
(c)			
(d)			

INJECTION SYSTEM

Efficiency %

EXTRACTION SYSTEM

Electrostatic & 2 magnetic channels. Efficiency 96 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current(part μA)	
		Internal	External
(a) p	1.4 - 8	414	323
(b) d	0.9 - 1.9	6	3
(c) ⁴ He ⁺	0.62	3	3
(d) α	1.88	5	3

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

EXTRACTED BEAM PROPERTIES:

For 230 μA of 3.14 MeV/u p ions
 ΔE/E 0.85 % Δφ 15 °rf
 ε_n = βγε x 0.98 πmm mrad z 0.49 πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed m² Moveable m²
 Target Stations: No. Served At Same Time:

MAGNETIC SPECTROMETERS:

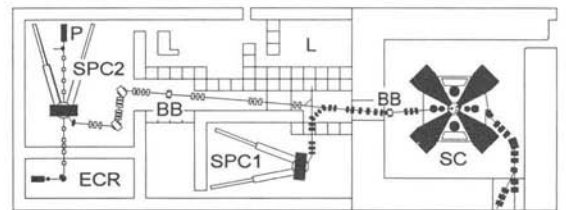
OTHER FACILITIES:

See NAC Separated-Sector Cyclotron

REFERENCES/NOTES

- (a) Proc. Tenth Int. Cycl. Conf., 67, 94, 373 (1984)
- (b) Proc. Eleventh Int. Cycl. Conf., 9, 109 (1986)

PLAN VIEW OF FACILITY, COMMENTS



- BB Beamline buncher
- ECR ECR ion source (basement)
- L Low energy experimental area
- P Polarized ion source (basement)
- SPC1 Solid pole injector cyclotron for light ions
- SPC2 Solid pole injector cyclotron for heavy or polarized ions
- SC Separated-sector cyclotron