

ENTRY NO. C30 Date OCTOBER 1995
 Name of Machine L.N.S. SUPERCONDUCTING CYCLOTRON
 Institution I.N.F.N. (ISTITUTO NAZIONALE DI FISICA NUCLEARE)
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 In Charge: DOMENICO VINCIGUERRA Reported by: LUCIANO CALABRETTA

HISTORY

MILESTONE DATES:
 Design 1975-76 Model Tests 1977
 Construction STARTED FEB. 81 First Beam 1994
 DESIGN/CONSTRUCTION BY:
 in house MILAN other
 COST: Accelerator \$ 7 · 10⁶ Facility
 FUNDED BY: I.N.F.N.

STATUS

STAFF: Machine
 Scientists 5 Engineers 1
 Technicians 20 Students
 Research (in house/external)
 Scientists / Engineers /
 Technicians / Students /
 BUDGET: Machine \$ 3 · 10⁶ Funded by I.N.F.N.
 Research Funded by
 TIME DISTRIBUTION:
 Basic Research (in house/external) % / %
 Applied Program (in house/external) % / %
 Maintenance % Development %

MAGNET

POLE PARAMETERS:
 Diameter 180 cm R_{extract} 86.7 cm R_{inject} 10-25 cm
 HILL PARAMETERS: Gap (min) 8.6 cm B_{max} 5.6 T
 (@ 6.55 · 10⁶ AT) Gap (max) 8.6 cm B_{min} T
 VALLEY PARAMETERS: Gap (min) cm B_{max} T
 (@ 6.55 · 10⁶ AT) Gap (max) 91.6 cm B_{min} T
 AVERAGE FIELD: _{min} 2.2 T _{max} 4.8 T
 NUMBER OF SECTORS: compact/separated 3 / COMPACT
 sector angle deg. spiral (max) 69 2 deg.
 FIELD TRIMMING: Trim Coils 20-CONDUCTOR: COPPER 6X6 mm
 Harmonic Coils
 Other
 CURRENT: Main Coils 2000 Amps Stability 10⁻⁵
 Trim Coils 400 Amps Stability 10⁻⁴
 Stored Energy (cryogenic) 45 MJ
 WEIGHT: Iron 176 TONS Conductor 9.6 TONS
 ION ENERGY: Bending Limit E/A = 800 q²/A² MeV/u
 Focusing Limit E/A = 200 q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description: 3 DEES WITH ANGLE OF 58 DEG.
 No. of Gaps/turn 6 dE/dn(max) 0.520 MeV/q
 Voltage (max) 0.1 MV Harmonic f_r/f_{ion} 1.2.3
 Freq 15-48 MHz Power in(max) 0.18 MW
 Stability: Phase 0.5 DEG Voltage 10-4
 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_r/f_{ion}
 Freq MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 6 · 10⁻⁷
 PUMPS: (No. and type) 8 CRYOPUMPS + 3 TURBOMOLECULAR

ION SOURCE(S)

Type	Intensity (mA)	@ ε _n = βγc (π mm mrad)	Ion Species
(a)			
(b)			
(c)			
(d)			

INJECTION SYSTEM

RADIAL FROM 15 MV TANDEM AND AXIAL Efficiency 70 %
 ECR SOURCE PLANNED

EXTRACTION SYSTEM

2 ELETTROSTATIC DEFLECTOR AND MAGNETIC Efficiency 30 %
 7 MAGNETIC CHANNELS

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μA)	
		Internal	External
(a) Ni	30	0.003	0.001
(b)			
(c)			
(d)			

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

EXTRACTED BEAM PROPERTIES:

For 0.001 μA of Ni MeV/u 30 ions
 ΔE/E % Δφ °rf
 ε_n = βγc x π mm mrad z π mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: 2000 m² Moveable m²
 Target Stations: 6 No. Served At Same Time:
 MAGNETIC SPECTROMETERS:
 OTHER FACILITIES: FRAGMENT RECOIL SEPARATOR
 4 π DETECTOR FOR γ AND PARTICLES

REFERENCES/NOTES

- (a) E. ACERBI et al. XI Int. Conf. on Cycl. 168(1986)
 (b) E. ACERBI et al. XII Int. Conf. on Cycl. 26(1989)

PLAN VIEW OF FACILITY, COMMENTS

