ENTRY NO:C18
Date: 1 Apr 2005 17:00:00
Machine Name: LNS Superconducting Cyclotron
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History
Designed by: F. Resmini
Construction Dates: start in 1981, assembled in Catania in 1990
First Beam Date: 1994
Characteristic Beams

H2+,	80 AMeV,	5 enA,	
13C4+,	45 AMeV,	700 enA,	100 watt
58Ni19+,	45 AMeV,	10 enA,	
112Sn31+,	43.5 AMeV,	5 enA	
197Au36+,	23 AMeV,	5 enA	

Transmission Efficiency (source to extracted beam)
Typical (%): 10%
Best (%): 20%
Emittance
Emittance Definition: 90%
Vertical (pi mm mrad): 1
Horizontal (pi mm mrad): 2
Longitudinal (dE/E[%] x RF[deg.]): 4.5
USES
Basic Research (%): 40
Development (%):
Therapy (%): 15
Isotope Production (%):
Other Application (%): 15
Maintenance (%): 10
Beam Tuning (%): 20
Total Time (h/year): 4500

TECHNICAL DATA
(a)Magnet
Type: compact
Kb (MeV): 800
Kf (MeV): 200
Average Field (min./max. T): 2.2/4.8
Number of Sectors: 3
Hill Angular Width (deg.): 60
Spiral (deg.): 69
Pole Diameter (m): 1.8
Injection Radius (m): 0.018
Extraction Radius (m): 0.87
Hill Gap (m): 0.086
Valley Gap (m): 0.916
Trim Coils
Number: 20
Maximum Current (A-turns): 4000
Harmonic Coils
Number: 4
Maximum Current (A-turns): 4000
Main Coils
Number: 2
Total Ampere Turns: 6.5E6
Maximum Current (A): 1950 + 1950
Stored Energy (MJ): 45
Total Iron Weight (tons): 176
Total Coil Weight (tons): 9.6
Power
Main Coils (total KW): 0
Trim Coils (total, maximum, KW): 100
Refrigerator (cryogenic, KW): 0.180 at 4.2 K

(b)RF
Acceleration
Frequency Range (MHz): 15-48
Harmonic Modes: 2
Number of Dees: 3
Number of Cavities: 3
Dee Angular Width (deg.): 60
Voltage
At Injection (peak to ground, KV): 100
At Extraction (peak to ground, KV): 120
Peak (peak to ground, KV): 120
Line Power (max, KW): 50
Phase Stability (deg.): 0.5
Voltage Stability (%): 0.01

(c)Injection
Ion Source: Normal conducting and superconducting ECR
Source Bias Voltage (kV): 26
External Injection: axial
Buncher Type: single drift
Injection Energy (MeV/n): 0.010-0.026*q/A
Component: magnetic quadrupoles and solenoids, dipole magnets
Injection Efficiency (%): 36%
Injector:

(d)Extraction
Elements, Characteristic: 2 electrostatic deflectors, 7 passive magnetic channels
Typical Efficiency (%): 30
Best Efficiency (%): 60

(e)Vacuum
Pumps: rotative, turbo-molecular, cryo-split
Achieved Vacuum (Pa): 2*10E-4

REFERENCES L. Calabretta and D. Rifuggiato, Status and future plans at LNS Catania, Proc. of the XVI Int. Conf. on Cyclotrons and their Appl., 2001, p. 79

EXPERIMENTAL FACILITIES
Chimera: large 4 pi array detector, Medea: large 4 pi array detector, Catana: proton-therapy of eye cancer, MAGNEX: spectrometer designed for use with the Excyt radioactive beams

COMMENTS