

Entry: **C33**
 Machine Name: LNS - SUPERCONDUCTING CYCLOTRON
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HISTORY

Design by: INFN
 Construction time: STARTED IN FEB.1981
 First beam: 1994

CHARACTERISTIC BEAMS

ions / energy (MeV/n) / current (pps) / power (W) :
 - ¹²C / 100 (to be developed)
 - ⁵⁸Ni / 15,30,45 / 10¹⁰/5
 - ⁹³Nb / 10,40 / 10¹⁰
 - ¹⁹⁷Au / 20 (to be developed)

transmission efficiency (total)
 - typical: 10 % - best: 20 ..%

transverse emittance (rms)
 - vertical: 1 ..π mmmrad
 - horizontal: 1 ..π mmmrad

longitudinal emittance (rms) 0.01 ΔE/E.deg RF

USES

basic research: 55.2 % therapy: %
 development: 12 % isotope production: %
 other applications: % maintenance: 17.8 .. %
 beam tuning: 15 %
 total time: 3330 h/year

TECHNICAL DATA

a) magnet
 type: SUPERCONDUCTING
 Kb: 800 MeV/A Kf: 200 .. MeV/A
 average field (min-max): 2.2 - 4.8 .. T
 number of magnet sectors: 3 COMPACT
 - angle: deg
 - spiral (max): 69 ..deg
 pole parameters
 - diameter: 1.80.. m
 - injection radius: 0.1 - 0.25.. m
 - extraction radius: 0.84 - 0.87 .. m
 hill gap: 0.086 m valley gap: 0.916 .. m
 field trimming
 - trim coils
 - number: 20.
 - current (max): 400.. A
 - harmonic coils
 - number: 4..
 - current (max): 400.. A
 - others
 - number:
 - current (max): A
 main coils: superconducting
 - number: 2
 - Ampere-turns: 6.55 x 10⁶ .. A.T.
 - current: 1950.. A
 stored energy: 45..... MJ
 weight : - iron: 176.. t - coils: 9.6.. t
 power

- main coils (total): kW
 - trim coils (total max): 100.. kW
 - refrigerator (cryogenic): 0.180.. kW

b) RF

- acceleration
 - frequency range: 15 - 48.. MHz
 - harmonic modes: 1, 2, 3, 4.....
 - number of dees: 3
 - angular aperture: 58.. deg
 - voltage:- average (min-max): 30 -100.. kV
 - variation with radius: ≈ 10 %.....
 - power in (max): 50 PER CAVITY. kW
 - stability: - phase: 0.5 deg - voltage: 0.01. %

- other cavities
 - purpose:
 - frequency range: MHz
 - region of influence: m
 - voltage (max): kV
 - power in (max): kW
 - stability:- phase: deg - voltage: %

c) injection

- internal source:
 - external (radial/axial): RADIAL BY TANDEM
 - elements: STRIPPER
 - source voltage: 15000 (TANDEM)kV
 - injection energy: 0.5-3 MeV/n
 - buncher: 1 LOW ENERGY + 1 HIGH ENERGY
 - injection efficiency: 100..... %

d) ion sources/injector

SPUTTERING IN 450 KV PRE-INJECTOR.....

e) extraction

- elements, characteristics:
 - 2 ELECTROSTATIC DEFLECTORS
 - 7 MAGNETIC CHANNELS
 -
 - efficiency
 - typical: 50... % - best: 90.. %

f) vacuum

- pumps: 8 CRYOPUMPS + 3 TURBOMOLECULAR
 - achieved vacuum: 6.10⁵ Pa

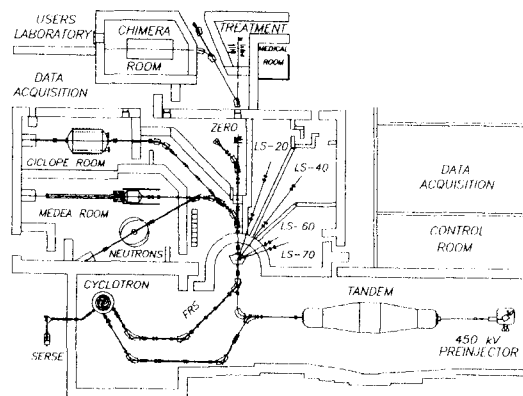
REFERENCES

L. CALABRETTA ET AL. 14TH INT. CONF. ON CYCL. AND THEIR APPL. 1996, P12-19.....

EXPERIMENTAL FACILITIES

- 4 π DETECTOR MEDEA + SUPERC. SOLEN. SOLE.....
 - MULTI - PURPOSE SCATTERING CHAMBER "CICLOPE"
 - ARRAY OF NEUTRON DETECTORS

PLAN VIEW OF FACILITY



COMMENTS

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