

Entry: **C71**
 Machine Name: K500 (Upgraded)
 Address: NSCL/ Cyclotron Laboratory, East Lansing, MI 48824
 In Charge of the cyclotron: C.K. Gelbke
 Tel: 517-355-9671
 Fax: 517-353-5967

Date: 1998-06-02
 Institution: Michigan State University
 Web: www.nsl.msue.edu
 E-mail: grimm@nsl.msue.edu

HISTORY

Design by: Michigan State University 74-79
 Construction time: 77-81 (rebuilt 95-98)
 First beam: 8/82 (rebuilt planned 7/98)

CHARACTERISTIC BEAMS

ions / energy (MeV/n) / current (pps) / power (W) :
 - ¹⁶O³⁺ 16.7 MeV/n 7.6x10¹² pps 330 W
 - ⁴⁰Ar⁷⁺ 15.3 MeV/n 4.6x10¹² pps 450 W
 - ⁸⁴Kr¹⁴⁺ 13.6 MeV/n 1.2x10¹² pps 220 W
 - ¹²⁹Xe²¹⁺ 12.9 MeV/n 5.0x10¹¹ pps 130 W
 - ²³⁸U²⁸⁺ 6.9 MeV/n 1.5x10¹¹ pps 40 W

transmission efficiency (total)
 - typical: 10 % - best: 20 %
 transverse emittance (rms)
 - vertical: 8 π mmmrad
 - horizontal: 4 π mmmrad
 longitudinal emittance (rms) ΔE/E.deg RF

USES

basic research: 75 % therapy: 0 %
 development: 3 % isotope production: 0 %
 other applications: 3 % maintenance: 2 %
 beam tuning: 17 %
 total time: 5800 h/year

TECHNICAL DATA

a) magnet
 type: compact superconducting
 Kb: 500 MeV/A Kf: 160 MeV/A
 average field (min-max): 3.0 - 5.0 T
 number of magnet sectors: 3
 - angle: deg
 - spiral (max): 120 deg
 pole parameters
 - diameter: 1.42 m
 - injection radius: 0.01 m
 - extraction radius: 0.66 m
 hill gap: 0.0635 m valley gap: 0.914 m
 field trimming
 - trim coils
 - number: (13x3)+1
 - current (max): 400 A
 - harmonic coils
 - number: (2x3) (use trim coils)
 - current (max): 400 A
 main coils:
 - number: 2
 - Ampere-turns: (1152+2304)x2 x(700A)=5x10⁶ A.T.
 - current: 800 max A
 stored energy: 18 MJ
 weight : - iron: 91 t - coils: 7 t
 power
 - main coils (total): 0 kW
 - trim coils (total max): 100 kW
 - refrigerator (cryogenic): 850 kW

b) RF

- acceleration
 - frequency range: 11-27 MHz
 - harmonic modes: 2
 - number of dees: 3
 - angular aperture: 60 deg
 - voltage:- average (min-max): (20-70) kV
 - variation with radius: 2 % at 11 MHz
 - 8 % at 27 MHz
 - power in (max): 300 kW
 - stability: - phase: 0.1 deg - voltage: 0.01 %

c) injection

- internal source:
 - external (radial/axial): Axial
 - elements: solenoid lenses, electrostatic quadrupoles, ...
 magnetic and electrostatic dipoles, spiral inflector
 - source voltage: 5-30 kV
 - injection energy: q V_{source}/A= (1-9 x 10⁻³) MeV/n
 - buncher: double grid, h=1, 2
 - injection efficiency: 30 (including rf capture) %

d) ion sources/injector

RTECR, SCECR

e) extraction

- elements, characteristics:
 - electrostatic deflectors (2) 6mm gap, 100 kV/cm
 - movable focusing bars (7) and compensators (2)
 - precessional
 - combined function magnet in return yoke
 - efficiency
 - typical: 50 % - best: 80 %

f) vacuum

- pumps: 3 cryopanel, 7K, 1 turbomolecular pump
 - achieved vacuum: 7x10⁻⁵ Pa

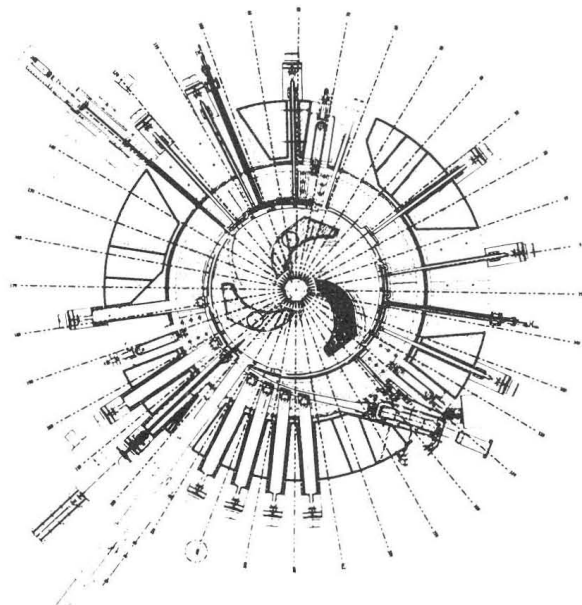
REFERENCES

R.C. York, et. al. "The NSCL Coupled Cyclotron Project - Overview and Status", this conference.

EXPERIMENTAL FACILITIES

Magnetic spectrometer S800, fragment separator A1200, 4 pi array, Miniball, Superball (neutron detector), 92 inch Chamber, Reaction Products Mass Spectrometer, Neutron Wall, NaI Gamma Detector Array

PLAN VIEW OF FACILITY



COMMENTS

The K500 is being rebuilt as an injector for the K1200