

ENTRY NO. C68 Date October 1995
 Name of Machine K500/Coupled Cyclotron Injector
 Institution National Superconducting Cyclotron Laboratory
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HISTORY

MILESTONE DATES:

Design 74-79 Model Tests 75-77
 Construction 77-81 First Beam 8/82

DESIGN/CONSTRUCTION BY:

in house other

COST: Accelerator \$2,900,000 Facility \$3,500,000

FUNDED BY: National Science Foundation

STATUS

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) % / %
 Maintenance % Development %

MAGNET

POLE PARAMETERS:

Diameter 142 cm R_{extract} 67 cm R_{inject} 1 cm

HILL PARAMETERS: Gap (min) 6.35 cm B_{max} 5.8 T

(@ 4.681 AT) Gap (max) 91.4 cm B_{min} 4.3 T

VALLEY PARAMETERS: Gap (min) cm B_{max} T

(@ AT) Gap (max) cm B_{min} T

AVERAGE FIELD: $\langle B \rangle_{\text{min}}$ 3.0 T $\langle B \rangle_{\text{max}}$ 4.95 T

NUMBER OF SECTORS: compact/separated 3 /

sector angle deg. spiral (max) 120 deg.

FIELD TRIMMING: Trim Coils (13x3) + 1

Harmonic Coils 2x3

Other

CURRENT: Main Coils 700 Amps Stability 1/105

Trim Coils 400 Amps Stability 6/104

Stored Energy (cryogenic) 18 MJ

WEIGHT: Iron 100 US ton Conductor 8 US ton

ION ENERGY: Bending Limit $E/A = 520 \text{ q}^2/A^2 \text{ MeV/u}$

Focusing Limit $E/A = 160 \text{ q/A MeV/u}$

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 3 half-wave length cavities

No. of Gaps/turn 6 $dE/dn(\text{max}) 0.37 \text{ MeV/q}$

Voltage (max) 0.07 MV Harmonic $f_{\text{rf}}/f_{\text{ion}} 2$

Freq 9-27 MHz Power in(max) 0.4 MW

Stability: Phase 1/104 Voltage 1/104

OTHER CAVITIES (Flattopping or otherwise):

Description: 1st & 2nd harmonic bunchers

Region of Influence: R_{min} cm R_{max} cm

No. of Gaps/turn $dE/dn(\text{max}) \text{ MeV/q}$

Voltage (max) MV Harmonic $f_{\text{rf}}/f_{\text{ion}}$

Freq MHz Power in(max) MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: -7 10 Torr

PUMPS: (No. and type) 3 LHe cryopanel, 3 turbos

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta \gamma c$ (mm mrad)	Ion Species
(a) RTECR	1.0	0.1-0.2	all
(b) SCECR	3.0	0.1-0.3	all
(c)			
(d)			

INJECTION SYSTEM

1st & 2nd harmonic buncher Efficiency 70 %
 spiral inflector

EXTRACTION SYSTEM

Precessional, 2 elec. defl. Efficiency 80 %
 7 magnetic channels

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Internal Current (part μA)	External
(a) $^{16}\text{O}^{4+}$	15	5	2
(b) $^{129}\text{Xe}^{22+}$	10		
(c)			
(d)			

Secondary Particles	E (MeV)	part/sec
(a) beam transported to stripper foil within K1200		
(b)		
(c)		

EXTRACTED BEAM PROPERTIES:

For 0.7 part μA of 15 MeV/u $^{16}\text{O}^{4+}$ ions
 $\Delta E/E$ % $\Delta \phi$ 3FWHM *rf
 $\epsilon_n = \beta \gamma c$ x 1.3 mm mrad z mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: m^2 Moveable 1300 m^2

Target Stations: 6 No. Served At Same Time: 1

MAGNETIC SPECTROMETERS: \$320, \$800, A1200

OTHER FACILITIES: 4 p.i. array, Miniball, Reaction

Product Mass Spectrometer, 92 inches

Scattering Chamber, 7T Solenoid, Superball Neutron

Detector

REFERENCES/NOTES

- R.C. York, et al., IEEE Part. Accel. Conf., Dallas95.
- The K500xK1200, A Coupled Cyclotron Facility at the NSCL-MSU, MSUCL-939, July 1994.

PLAN VIEW OF FACILITY, COMMENTS

