ENTRY No. 76

NAME OF MACHINE K500 DATE 8/1/81
INSTITUTION Michigan State University
ADDRESS Cyclotron Laboratory, East Lansing, Michigan 48824 USA
TEL 517-355-9671 TELEX
IN CHARGE H.Blosser REPORTED BY H. Blosser

HISTORY AND STATUS
DESIGN, date 74-79 Model tests 75-77
ENG DESIGN, date 75-81
CONSTRUCTION, date 77-81
FIRST BEAM, date (or goal) 10/81
MAJOR ALTERATIONS
COST, ACCELERATOR $2,900,000
COST, FACILITY, total $3,500,000
FUNDED BY National Science Foundation

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS ENGINEERS
TECHNICIANS CRAFTS
GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION hr/wk, On target hr/wk
TIME DISTR. in house %, Outside %
BUDGET, op & dev
FUNDED BY

RESEARCH STAFF, not included above
USERS, in house outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY

MAGNET
POLE FACE, diameter (compact) 142 cm, R extraction 67 cm
R injection cm
GAP, min 6.35 cm, Field 58 kG
max 91.4 cm, Field 43 kG
AVERAGE FIELD at R ext 49.5 kG
} at 4,681,600 Ampere turns
B max/ <B>
NUMBER OF SECTORS { compact 3 / separated } Spiral, max 120 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS 14 (1 circular, 13 hill)
CONDUCTOR, material and type NbTi in Cu
STORED ENERGY (cryogenic) 18 MJ
POWER : main coils 0 max, kW ; current stability $1/10^5$
trimming coils 80 max, kW ; current stability $1/10^4$
WEIGHT : Fe 100 US tons ; coils 8 US tons
COOLING system Helium bath
ION ENERGY (bending limit) E/A = ≈510* q^2/a^2 MeV/amu
(focusing limit) E/A = 160 q /a MeV/amu

ACCELERATION SYSTEM
DEES, number 3 ; angle 53 deg
BEAM APERTURE 2.5 cm ; DC Bias kV
TUNED by, coarse Sliding short fine capacitive blade
RF 9.0 to 32.4 mHz, stable ± $1/10^7$
Orb F 1.3 to 32 mHz
HARMONICS, RF/Orb F, used 1,2,3,4,5,7
DEE - Gnd, max 100 kV, min gap 1.0 cm
STABILITY, (pk-pk noise)/(pk RF volt) 1/10,000
ENERGY GAIN, max 600 kV/turn
RF PHASE, stable to ± deg
RF POWER input, max 3 x 70 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM
OPERATING PRESSURE 1×10^{-7} Torr or mbar
PUMPS, No, Type, Size 3 cryopanels, 4.5K, 20 cm x 50 cm, mounted in dee. (3 turbines for Helium runs)

ION SOURCES
PIG (dual sources top & bottom)

*depends on relative excitation of split main coil

INJECTION SYSTEM
designed for future axial injection system

EXTRACTION SYSTEM
Precessional & 2 electrostatic deflectors & 9 iron channels.

FACILITIES FOR RESEARCH
SHIELDED AREA, fixed m² ; movable 600 m²
TARGET STATIONS 6 in 2 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Enge Splitpole & S320
COMPUTER model Sigma 7
OTHER FACILITIES Reaction Product Mass Separator 60" scattering chamber, γ-ray goniometer, cryogenic helium jet

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
$^{4}He^{++}$	320			
$^{12}C^{4+}$	670			
$^{20}Ne^{5+}$	625			
$^{40}Ar^{6+}$	450			
SECONDARY			(part/s)	

BEAM PROPERTIES

	MEASURED	CONDITIONS
PULSE WIDTH	RF deg	pμ A of MeV ions
PHASE EXC, max	RF deg	pμ A of MeV ions
EXTRACT eff	%	pμ A of MeV ions
RESOL ΔE/E	%	pμ A of MeV ions
EMITTANCE (π mm. mrad)	axial / rad	pμA of MeV ions

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES
IEEE Tras. on Nuc. Sci NS-26 (1979) 2040
MSU Annual Reports 1974-1979

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

Beams from K500 will be directly used for nuclear research until late 1984--the cyclotron will then become an injector for the two stage K500/K800 system.