ENTRY NO. 87

NAME OF MACHINE K500 DATE 3/15/84
INSTITUTION Michigan State University
ADDRESS Cyclotron Laboratory, East Lansing, Michigan 48824 USA
TEL 517-355-9671 TELEX
IN CHARGE H. Blosser REPORTED BY P. Miller

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) 8/82
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
min 91.4 cm, Field 43 kG at 4,681,600 Ampere turns
AVERAGE FIELD at R ext 49.5 kG
B max/ < B >
NUMBER OF SECTORS compact 3 Spiral, max 120 deg
separated
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
trimming coils 80 max, kW; current stability 5/4
WEIGHT: Fe 100 US tons; coils 8 US tons
COOLING system Helium bath
ION ENERGY (bending limit) E/A = 520 q^2/a^2 MEV/amu
(focusing limit) E/A = 160 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 3 53 deg
BEAM APERTURE 2.5 cm; DC Bias kV
TUNED by, coarse sliding ahort fine capacitive blade
RF 9.0 to 27.5 mHz, stable ± 1/107
Orb F 1.3 to 27.5 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 ± 0.5 deg
RF POWEP input, max 3 x 140 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 1×10^{-5} Torr
PUMPS, No, Type, Size 2 cryopanels 4.5K (charcoal) 100 K shield 20 x 50 cm mounted in dee + 3 turbo-molecular pumps

ION SOURCES

PIG (dual sources top & bottom); ECR (proposed)

INJECTION SYSTEM

designed for future axial injection system

EXTRACTION SYSTEM

Precessional & 2 electrostatic deflectors

FACILITIES FOR RESEARCH + 9 iron channels

SHIELDED AREA, fixed m², movable 600 m²
TARGET STATIONS 7 in 2 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Enge Splitpole & S320
COMPUTER model Vax 11/750 & 11/780
OTHER FACILITIES Reaction Product Mass Separa. 60" scattering chamber, γ-ray, goniometer, neutron TOF

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
$^{4}He^{++}$	320	215		
$^{12}C^{4+}$	670	480		
$^{22}Ne^{5+}$	572	540		
$^{40}Ar^{6+}$	450			
SECONDARY		(part/s)		

BEAM PROPERTIES

MEASURED		CONDITIONS	
PULSE WIDTH 35 RF deg	.04	pμ A of 420 MeV	$^{14}N^{4+}$ ions
PHASE EXC. max RF deg		pμ A of MeV	$^{14}N^{5+}$ ions
EXTRACT eff 25-50%	.05	pμ A of 490 MeV	N ions
RESOL ΔE/E %		pμ A of MeV	ions
EMITTANCE (π mm. mrad) axial		pμ A of MeV	
rad			

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 90% SOLID STATES PHYSICS 0
BIOMEDICAL APPLICAT 5% ISOTOPE PRODUCTIONS 0
Accel. develop. 5%

REFERENCES/NOTES

1) IEEE Tras. on Nuc. Sci. NS-26 (1979) 2040
2) MSU Annual Reports 1974-1983

PLAN VIEW OF FACILITY, COMMENTS, ETC