ENTRY No. 87

NAME OF MACHINE Sloan-Kettering Institute Cyclotron Date : May 1975
INSTITUTION Sloan-Kettering Institute for Cancer Research
ADDRESS New York, NY, USA
TEL ..... TELEX .....
IN CHARGE T.Y.T. KUO REPORTED BY T.Y.T. KUO

HISTORY AND STATUS
DESIGN, date CS-15, Cyclotron Corporation
ENG DESIGN, date
CONSTRUCTION, date Nov. 1967
FIRST BEAM, date (or goal)
MAJOR ALTERATIONS see features
COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY ERDA

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS 0.5 ENGINEERS 1.2
TECHNICIANS 0 CRAFTS 0.2
GRAD STUDENTS involved during year
OPERATED BY ..... Research staff or ..... Operators
OPERATION 60 hr/wk, On target 30 hr/wk
TIME DISTR. in house 98 %, Outside 2. %
BUDGET, op & dev
FUNDED BY NCI, ERDA

RESEARCH STAFF, not included above
USERS, in house 8 outside 1
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY NCI, ERDA

MAGNET
POLE FACE, diameter (compact) 80 cm, R extraction 36 cm
R injection ..... cm
GAP, min 5. cm, Field 20. kG
max 10. cm, Field 12. kG } at 2.10^5 Ampere turns
AVERAGE FIELD at R ext 16. kG
B max/ <B>
NUMBER OF SECTORS { compact 3 / separated ..... } Spiral, max 0 deg
SECTOR ANGLE (SSC) ..... deg
TRIMMING COILS
CONDUCTOR, material and type
STORED ENERGY (cryogenic) ..... MJ
POWER : main coils 40. max, kW ; current stability 10^{-4}
trimming coils ..... max, kW ; current stability .....
WEIGHT : Fe 14 ..... tons ; coils ..... tons
COOLING system water
ION ENERGY (bending limit) E/A = ... q^2/a^2 MeV/amu
(focusing limit) E/A = ... q /a MeV/amu

ACCELERATION SYSTEM
DEES, number 2 ; angle 120 deg
BEAM APERTURE 2 cm ; DC Bias 1.5 kV
TUNED by, coarse MP fine VC, trimmer
RF 12., 16., 24to ..... mHz, stable $\pm 10^{-5}$
Orb F 12, 16, 24to ..... mHz
HARMONICS, RF/Orb F, used 1
DEE - Gnd, max 30 kV, min gap ..... cm
STABILITY, (pk-pk noise)/(pk RF volt) 5.10^{-4}
ENERGY GAIN, max 120 ..... kV/turn
RF PHASE, stable to $\pm$ ..... deg
RF POWER input, max 30 ..... kW
FREQUENCY MODULATION, rate ..... /s
modulator, type
beam pulse, width

VACUUM SYSTEM
OPERATING PRESSURE ..... 1 μ. Torr
PUMPS, No, Type, Size

ION SOURCES 1)
Internal PIG

INJECTION SYSTEM

EXTRACTION SYSTEM
see features

FACILITIES FOR RESEARCH
SHIELDED AREA, fixed 60. m^2 ; movable ..... m^2
TARGET STATIONS 1. in 1. rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model IBM 1800
OTHER FACILITIES Int. and ext. isotope production
Irradiation, solid state, biological
Time of flight study being developed

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (μA) Internal	External	
p	15	14.7	500	100	2)
d	7.5	7.9	800	400	2)
$^3He^{2+}$	20	23.3	400	200	2)
α			400	300	2)
SECONDARY				(part/s)	
n 3)				2.10^{13}	

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	70 %	200.	μ A of 23.	MeV	$^3He^{2+}$ ions
RESOL $\Delta E/E$	%		pμ A of	MeV	ions
EMITTANCE					
(π mm. mrad)	16 axial / 16. rad	90. %	pμA of	MeV	ions

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS .. SOLID STATES PHYSICS ....
BIOMEDICAL APPLICAT. 100% ISOTOPE PRODUCTIONS ....

REFERENCES/NOTES

- Radiology 93, 331-337, 1969
- IEEE Trans. Nucl. Sci., NS-14 (3), 1967
- Proc. of the 5th and 6th Int. Cycl. Conf. 1969-1972
- Proc. of the 1975 Nat. Acc. Conf.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

First prototype cyclo. built by Cyclo. Corp. Major modif. : dees, RF system, ion source, extr. system.

1) 4 independant coordinate controls for ion source. High beam currents resulted from high operating power density (~140 kW/cm^3)

2) Extraction system :
- harmonic coils : azimut-angle and I controls
- deflector : fine adjust of R_{ext} (change of E also), taper angle adjust, channel gap adjust, dc voltage adjust.
- magnetic channel : compensated-iron type, entrance position control, exit position and channel curvature controls.

3) Neutron programs : dosimetry, n physics, activation, therapy.