ENTRY NO. 94

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
min .. 10 .. cm, Field ..... 12 .. kG } at 2.10^5 Ampere turns
AVERAGE FIELD at R ext ..... kG
B max/ < B >
NUMBER OF SECTORS { compact ..... 3 ... } Spiral, max 0. deg
{ separated ..... }
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 ..... 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, 24 to ..... mHz, stable ± .. 10^-5 .....
Orb F 12, 16, 24 ..... to ..... 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 ± ..... deg
RF POWEP input, max .... 30 ..... kW
FREQUENCY MODULATION, rate ..... /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE ..... 1μ ..... Torr or mbar
PUMPS, No, Type, Size

ION SOURCES

.. Internal PIG 1)

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 (pμA) Internal	External
p	15	14.7	500	100 ... 2)
d	7.5	7.9	800 ... 1)	400 ... 2)
$^3He^{2+}$	20	23.3	400 ... 1)	200 ... 2)
α			400 ... 1)	300 ... 2)
SECONDARY		(part/s)		
n. 3)				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 pμ A of .. 23 .. MeV $^3He^{2+}$ ... ions
RESOL ΔE/E ..... %	..... pμ A of ..... MeV ..... ions
EMITTANCE (π mm. mrad) { ... 16 .. axial }	.. 90 % pμ A of ..... MeV .....
{ ... 16 .. rad }	

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, COMMENTS, ETC.

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.