ENTRY No. 41

NAME OF MACHINE Tohoku University Cyclotron . DATE .....
INSTITUTION . Cyclotron and Radioisotope Center, Tohoku University .....
ADDRESS .... Aramaki-Aoba, 980 Sendai, Japan .....
TEL ...0222-63-5360..... TELEX .....
IN CHARGE ....T. Ishimatsu..... REPORTED BY ...M. Fujioka .....

HISTORY AND STATUS CGR-MeV Model 680
DESIGN, date ..... Model tests .....
ENG DESIGN, date .....
CONSTRUCTION, date ....1975-1977 .....
FIRST BEAM, date (or goal) . December, 1977 .....
MAJOR ALTERATIONS .... none .....
.....
COST, ACCELERATOR .....
COST, FACILITY, total ..... $14×10^6 .....
FUNDED BY .....Japan Ministry of Education .....

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS ...4..... ENGINEERS .....
TECHNICIANS ..4..... CRAFTS ....1.....
GRAD STUDENTS involved during year .....~10.....
OPERATED BY .....5.... Research staff or ....4.... Operators
OPERATION ....100.... hr/wk, On target ..88..... hr/wk
TIME DISTR. in house ...10..... %, Outside .....90... %
BUDGET, op & dev .....$1.0×10^6 .....
FUNDED BY .....Japan Ministry of Education .....

RESEARCH STAFF, not included above
USERS, in house .....6..... outside .....~30.....
GRAD STUDENTS involved during year .....~20.....
RESEARCH BUDGET, in house .....$0.3×10^6 .....
FUNDED BY .....Japan Ministry of Education .....

MAGNET
POLE FACE, diameter (compact) 160 cm, R extraction ..68 cm
R injection ..... cm
GAP, min ....13... cm, Field ...19.0.... kG
max ....28... cm, Field ...10.7.... kG } at 0.26×10^6 Ampere turns
AVERAGE FIELD at R ext .....15.6.... kG
B max/ <B> .....1.22.....
NUMBER OF SECTORS { compact ..4... / separated ..... } Spiral, max 50 deg
SECTOR ANGLE (SSC) ..... deg
TRIMMING COILS .....8 circular coils and
.....2 harmonic coil pairs .....
CONDUCTOR, material and type .....
STORED ENERGY (cryogenic) ..... MJ
POWER : main coils ..100. max, kW ; current stability 2×10^-5
trimming coils ...26. max, kW ; current stability 2×10^-5
WEIGHT : Fe .....100... tons ; coils ..... tons
COOLING system .....Deionized Water .....
ION ENERGY (bending limit) E/A = ..50... q²/a² MeV/amu
(focusing limit) E/A = ... q /a MeV/amu

ACCELERATION SYSTEM
DEES, number .....2.... ; angle .....60..... deg
BEAM APERTURE .....3... cm ; DC Bias .....0..... kV
TUNED by, coarse .....M.P..... fine .....M.P.....
RF ....20..... to .....40... mHz, stable ± <1×10^-6
Orb F ...5..... to .....20... mHz
HARMONICS, RF/Orb F, used .....2,3 and 4.....
DEE - Gnd, max ..50.. kV, min gap .....~3..... cm
STABILITY, (pk-pk noise)/(pk RF volt) ...10^-3.....
ENERGY GAIN, max .....200..... kV/turn
RF PHASE, stable to ± .....0.5..... deg
RF POWER input, max .....120..... kW
FREQUENCY MODULATION, rate ..... /s
modulator, type .....
beam pulse, width .....

VACUUM SYSTEM
OPERATING PRESSURE .....2×10^-6..... Torr or mbar
PUMPS, No, Type, Size .....2×8000 ℓ/s.....
.....
.....

ION SOURCES
.....Internal axial Livingstone-type .....

INJECTION SYSTEM
.....

EXTRACTION SYSTEM
.....Deflector + two magnetic channels .....

FACILITIES FOR RESEARCH
SHIELDED AREA, fixed .....800.. m² ; movable ..... m²
TARGET STATIONS .....9... in .....5.. rooms
STATIONS served at same time, max ....1.....
MAG SPECTROGRAPH, type .....
COMPUTER model .MELCOM COSMO 500 + MELCOM COSMO 70/35
OTHER FACILITIES .Isotope production, Irradiation of
solid, Time-of-flight study (40 m flight path), Mass
separator, Beam choppers.....

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (μA) Internal	External
p	3~40	same		100
d	5~25	same		60
^{3}He	7~65	same		40
α	10~50	same		40
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 ...72.. %	..50..	μ A of 40 . MeV	p	. ions	
RESOL ΔE/E ...0.5. %	..20..	μ A of 35 . MeV	α	. ions	

EMITTANCE
(π mm. mrad) { 21 axial / 30 rad } ..40.. μA of .40. MeV p. ions

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS 50% SOLID STATES PHYSICS 15%
BIOMEDICAL APPLICAT. .10% ISOTOPE PRODUCTIONS 10%
.....Others 15%.....
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REFERENCES/NOTES

1) Morita S., et al., IEEE Trans. N. S., Vol. NS-26, No. 2 (1979), 1930.

2) CYRIC Annual Report, 1980
Cyclotron Radioisotope Center, Tohoku University.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS