ENTRY NO. 46

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

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 5 ENGINEERS 1
TECHNICIANS (operators) 4 CRAFTS
GRAD STUDENTS involved during year ~15
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 8 outside ~100
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
min 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 Cu, hollow conductor
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 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 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10^-3
ENERGY GAIN, max 200 kV/turn
RF PHASE, stable to ± 0.5 deg
RF POWEP 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 hot cathode P.I.G. for light ions
Internal cold cathode P.I.G. for heavy ions

INJECTION SYSTEM

EXTRACTION SYSTEM

Deflector + two magnetic channels

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 800 m²; movable m²
TARGET STATIONS 10 in 6 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model MELCOM COSMO 500 + 70/35, PDP 11/44
OTHER FACILITIES Isotope production, irradiation of solids, neutron TOF (44 m flight path), mass separator, beam choppers, positron tomograph

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p(d)	3(5)~40(25)	same		100
^{3}He	7~65	same		60
α	10~50	same		40
^{14}N	50~84	same		1
SECONDARY		(part/s)		

BEAM PROPERTIES

	MEASURED	CONDITIONS
PULSE WIDTH	4.7 RF deg	10 pμ A of 35 MeV p ions
PHASE EXC. max	RF deg	pμ A of MeV ions
EXTRACT eff	72 %	50 pμ A of 40 MeV p ions
RESOL ΔE/E	0.5 %	20 pμ A of 35 MeV α ions
EMITTANCE (π mm. mrad)	21 axial, 30 rad	40 pμ A of 40 MeV p ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 50% SOLID STATES PHYSICS 10%
BIOMEDICAL APPLICAT 15% ISOTOPE PRODUCTIONS 10%
Others 15%

REFERENCES/NOTES

1) S. Morita, et al., IEEE Trans. N.S., NS-26 (1979) 1930.
2) T. Shinozuka et al., Proc. 9th int. conf. cyclo. appl., Caen (1981) p. 1930.

PLAN VIEW OF FACILITY, COMMENTS, ETC.