

NAME OF MACHINE . Tohoku University Cyclotron DATE
 INSTITUTION Cyclotron and Radioisotope Center, Tohoku University
 ADDRESS Aramaki-Aoba, 980, Sendai, Japan
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 IN CHARGE M. Fujioka REPORTED BY T. Shinazuka

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 x 10⁶
 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 x 10⁶
 FUNDED BY Japan Ministry of Education

RESEARCH STAFF, not included above
 USERS, in house 6 outside 20
 GRAD STUDENTS involved during year 20
 RESEARCH BUDGET, in house \$.3 x 10⁶
 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 x 10⁶
 AVERAGE FIELD at R ext 15.6 kG } Ampere turns
 B max/ 1.22

NUMBER OF SECTORS { compact 4 } Spiral, max 50 deg
 SECTOR ANGLE (SSC) deg
 TRIMMING COILS 8 circular coils and
 2 harmonic coils pairs
 CONDUCTOR, material and type
 STORED ENERGY (cryogenic) MJ
 POWER: main coils 100 max, kW ; current stability 2 x 10⁻⁵
 trimming coils 26 max, kW ; current stability 2 x 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 = q²/a² 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 x 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 POWER input, max 120 kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM
 OPERATING PRESSURE 1 x 10⁻⁶ Torr or mbar
 PUMPS, No, Type, Size 2 x 8000 l/s
 oil diffusion pumps

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 Micro VAX 3500, PDP 11/44
 OTHER FACILITIES Isotope production, irradiation of
 solids, neutron TDF (44 m flight path), mass
 separator, beam choppers, positron tomograph

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
³ P (d)	3.5	4.0	25	100
⁴ He	7	7.65	same	60
¹⁴ O	1.0	1.50	same	40
¹⁴ N	5.0	4.84	same	1

SECONDARY

BEAM PROPERTIES

MEASURED CONDITIONS
 PULSE WIDTH 4-7 RF deg 10 pA of 35 MeV p ions
 PHASE EXC, max RF deg pA of MeV p ions
 EXTRACT eff 7.2 % 50 pA of 40 MeV p ions
 RESOL ΔE/E 0.5 % 20 pA of 35 MeV p ions
 EMITTANCE
 (π mm. mrad) { .21 axial } 40 pA of 40 MeV p ions
 { .30 rad }

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) M. Fujioka et al., Proc. Cyclo.'86 Tokyo p.57.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

