

ENTRY NO. CU52 Date  
 Name of Machine Tohoku University Cyclotron  
 Institution Cyclotron and Radioisotope Center, Tohoku University  
 Address Aramaki-Aoba, 980 Sendai, Japan  
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 In Charge: M. Fujioka Reported by: T. Shinozuka

**HISTORY** (CGR-MeV Model 680)  
**MILESTONE DATES:**  
 Design 1975-1977 Model Tests  
 Construction 1975-1977 First Beam December, 1977  
**DESIGN/CONSTRUCTION BY:**  
 in house other CGR-MeV & SUNITOMO  
**COST:** Accelerator Facility 14 x 10<sup>5</sup>  
**FUNDED BY:** Japan Ministry of Education

**STATUS**  
**STAFF:** Machine  
 Scientists 4 Engineers 1  
 Technicians 4 Students  
 Research (in house/external)  
 Scientists 1 / 60 Engineers /  
 Technicians / Students /  
**BUDGET:** Machine } 0.3 x 10<sup>6</sup> Funded by Japan Ministry  
 Research } of Education  
**TIME DISTRIBUTION:**  
 Basic Research (in house/external) 10 % / 30 %  
 Applied Program (in house/external) 10 % / 30 %  
 Development 10 % Maintenance 10 %

**MAGNET**  
**POLE PARAMETERS:**  
 Diameter 160 cm R<sub>extract</sub> 68 cm R<sub>inject</sub> cm  
**HILL PARAMETERS:** Gap (min) 13 cm B<sub>max</sub> 1.9 T  
 (@ 0.26 x 10<sup>10</sup> AT) Gap (max) cm B<sub>min</sub> T  
**VALLEY PARAMETERS:** Gap (min) cm B<sub>max</sub> T  
 (@ AT) Gap (max) 28 cm B<sub>min</sub> 1.07 T  
**AVERAGE FIELD:** < B ><sub>min</sub> T < B ><sub>max</sub> 1.56 T  
**NUMBER OF SECTORS:** compact/separated 4 /  
 sector angle deg. spiral (max) 50 deg.  
**FIELD TRIMMING:** Trim Coils 8 circular  
 Harmonic Coils 2 pairs  
 Other  
**CURRENT:** Main Coils 1000 Amps Stability 2 x 10<sup>-5</sup>  
 Trim Coils 200 Amps Stability 2 x 10<sup>-5</sup>  
 Stored Energy (cryogenic) MJ  
**WEIGHT:** Iron 100 tons Conductor  
**ION ENERGY:** Bending Limit E/A = 50 q<sup>2</sup>/A<sup>2</sup> MeV/u  
 Focussing Limit E/A = q/A MeV/u

**ACCELERATION SYSTEM**  
**FUNDAMENTAL ACCELERATION:**  
 Description: 2 Dees and 60 deg.  
 No. of Gaps/turn 4 dE/dn(max) 0.2 MeV/q  
 Voltage(max) 0.05 MV Harmonic f<sub>rf</sub>/f<sub>ion</sub> 2-4  
 Freq 20-40 MHz Power in(max) 0.12 MW  
 Stability: Phase Voltage 10<sup>-3</sup>  
**OTHER CAVITIES (Flattopping or otherwise):**  
 Description:  
 Region of Influence: R<sub>min</sub> cm R<sub>max</sub> cm  
 No. of Gaps/turn dE/dn(max) MeV/q  
 Voltage(max) MV Harmonic f<sub>rf</sub>/f<sub>ion</sub>  
 Freq MHz Power in(max) MW  
 Stability: Phase Voltage

**VACUUM SYSTEM**  
**OPERATING PRESSURE:** 1 x 10<sup>-6</sup> Torr  
**PUMPS:** No. and type 2 x 8000 l/s  
 Oil diffusion pumps

**ION SOURCE(S)**

Type	Intensity (mA)	ε <sub>n</sub> = βγε (πmm mrad)	Ion Species
(a) PIG(Hot)	0.1		P, d, <sup>4</sup> He, <sup>3</sup> He
(b) PIG(Cold)			C, N, O
(c)			
(d)			

**INJECTION SYSTEM** Efficiency %

**EXTRACTION SYSTEM** Deflector: two magnetic channel Efficiency ~70 %

**CHARACTERISTIC BEAMS**

Accelerated Ions	E/A (MeV/u)	Current(part μA)	
		Internal	External
(a) P(d)	3.5 ~ 40	25	100
(b) <sup>3</sup> He	7 ~ 65		60
(c) <sup>4</sup> He	10 ~ 50		40
(d) <sup>14</sup> N	50 ~ 84		1

  

Secondary Particles	E (MeV)	part/sec
(a)		
(b)		
(c)		

**EXTRACTED BEAM PROPERTIES:**  
 For 2.0 μA of 35 MeV/u P ions  
 ΔE/E 0.5 % Δφ  
 ε<sub>n</sub> = βγε x 30 πmm mrad z 2.1 πmm mrad

**FACILITIES FOR RESEARCH**  
**SHIELDED AREA:** Fixed 800 m<sup>2</sup> Moveable m<sup>2</sup>  
 Target Stations: 10 No. Served At Same Time: 1  
**MAGNETIC SPECTROMETERS:**  
 OTHER FACILITIES: Isotope Production position  
 tomograph, neutron TOF, On-line mass  
 separator, beam choppers

**REFERENCES/NOTES**  
 (a) S. Morita et al., IEEE Trans. N.S. NS-26(1979)1930  
 (b) T. Shinozuka et al., Proc. Cys. Cont. (Caen)  
 (1981) 117

**PLAN VIEW OF FACILITY, COMMENTS**