ENTRY NO. C31 Date July 1, 1992

Name of Machine 715 CYCLOTRON-RIKEN

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In Charge: Y. Yano Reported by: A. Goto

HISTORY

MILESTONE DATES:

Design 1985-1987 Model Tests

Construction 1987-1989 First Beam April 1989

DESIGN/CONSTRUCTION BY: Dsign RIKEN/SHI

in house other Construction SHI

COST: Accelerator ¥12x10^{9} (incl. BT) Facility

FUNDED BY: Science and Technology Agency (STA)

STATUS

STAFF: Machine Same as those of RIKEN Ring Cyclotron (RRC).

Scientists Engineers

Technicians Students

Research (in house/external)

Scientists / Engineers /

Technicians / Students /

BUDGET: Machine Funded by

Research Funded by

TIME DISTRIBUTION:

Basic Research (in house/external) % / %

Applied Program (in house/external) % / %

Development % Maintenance %

MAGNET

POLE PARAMETERS:

Diameter 172.6 cm $R_{extract}$ 71.4 cm R_{inject} 1.63 cm

HILL PARAMETERS: Gap (min) 12.8 cm B_{max} 2.02 T

(@ 320,000 AT) Gap (max) cm B_{min} T

VALLEY PARAMETERS: Gap (min) cm B_{max} T

(@ 320,000 AT) Gap (max) 30.0 cm B_{min} 1.14 T

AVERAGE FIELD: $< B >_{min}$ 0.5 T $< B >_{max}$ 1.7 T

NUMBER OF SECTORS: compact/separated 4 /

sector angle deg. spiral (max) 50 deg.

FIELD TRIMMING: Trim Coils 9 pairs

Harmonic Coils 4 pairs (in the extraction region)

Other

CURRENT: Main Coils 1113 Amps Stability ±1x10^{-5}

Trim Coils 70-300 Amps Stability ±2x10^{-4}

Stored Energy (cryogenic) MJ

WEIGHT: Iron 102 tons Conductor 5.3tons

ION ENERGY: Bending Limit E/A = 70 q^2/A^2 MeV/u

Focussing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 2x85° -Dees

No. of Gaps/turn 4 dE/dn(max) 0.2 MeV/q

Voltage(max) 0.05 MV Harmonic f_{rf}/f_{ion} 2

Freq 12-24 MHz Power in(max) 0.06 MW

Stability: Phase ±0.2° Voltage ±5x10^{-4}

OTHER CAVITIES (Flattopping or otherwise):

Description:

Region of Influence: R_{min} cm R_{max} cm

No. of Gaps/turn dE/dn(max) MeV/q

Voltage(max) MV Harmonic f_{rf}/f_{ion}

Freq MHz Power in(max) MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 2x10^{-8} Torr

PUMPS: No. and type 1500 l/s TMPx1

4000 l/s CRYOx1, 6500 l/s CRYOx1

ION SOURCE(S)

	Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (πmm mrad)	Ion Species
(a)	ECR	0.05-0.2			p-Ar
(b)	PIS (under construction and will be conpleted this fall)				
(c)					
(d)					

INJECTION SYSTEM

Axial, Solenoid, Spiral inflector Efficiency 20-30 %

EXTRACTION SYSTEM

Deflector, Mag.chan., Passive focusing chan. Efficiency 40-60 %

CHARACTERISTIC BEAMS

	Accelerated Ions	E/A (MeV/u)	Current(part μA) Internal	External
(a)	p/d	4-9.9/4-9.5		1-4/1-3
(b)	^{12}C, ^{14}N, ^{16}O, ^{20}Ne,	4-7		0.5-2
(c)	^{24}Mg, ^{27}Al	5.5		0.03
(d)	^{40}Ar	4.5-5.2		0.03-0.2

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

EXTRACTED BEAM PROPERTIES:

For μA of MeV/u ions

$\Delta E/E$ % $\Delta\phi$ °rf

$\epsilon_n = \beta\gamma\epsilon$ x πmm mrad z πmm mrad

FACILITIES FOR RESEARCH Same as those of RRC.

SHIELDED AREA: Fixed m^2 Moveable m^2

Target Stations: No. Served At Same Time:

MAGNETIC SPECTROMETERS:

OTHER FACILITIES:

REFERENCES/NOTES

(a) A.Goto et al.: Proc.12th Int.Cyclo. Conf., 51 (1989)

(b) A.Goto et al.: ibid., 439 (1989)

PLAN VIEW OF FACILITY, COMMENTS

This cyclotron has been used as an injector for RIKEN RING Cyclotron (RRC)
The stand-alone use of the 715 cyclotron will also start from this fall.