

ENTRY NO. C34 Date September 25, 1995
 Name of Machine RIKEN Ring Cyclotron
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 In Charge: A. Goto Reported by: A. Goto

HISTORY

MILESTONE DATES:

Design 1975- Model Tests 1977
 Construction 1980-1986 First Beam Dec. 16, 1986

DESIGN/CONSTRUCTION BY:

Design RIKEN
 in house other Construction SHI(major)

COST: Accelerator ¥ 4.0B Facility ¥ 13.7B

FUNDED BY: Science and Technology Agency (STA)

STATUS

STAFF: Machine

Scientists 9 Engineers 15
 Technicians Students

Research (in house/external)

Scientists 50 / 110 Engineers 2 /
 Technicians / Students / 96

BUDGET: Machine ¥ 400M Funded by STA

Research ¥ 450M Funded by STA

TIME DISTRIBUTION:

Basic Research (in house/external) 20 % / 50 %

Applied Program (in house/external) % / %

Maintenance 25 % Development 5 %

MAGNET

POLE PARAMETERS:

Diameter cm R_{extract} 356 cm R_{inject} 89 cm

HILL PARAMETERS: Gap (min) 8 cm B_{max} 1.67 T

(@ 128,000 AT) Gap (max) 8 cm B_{min} T

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

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

AVERAGE FIELD: $\langle B \rangle_{\text{min}}$ T $\langle B \rangle_{\text{max}}$ 0.97 T

NUMBER OF SECTORS: compact/separated / 4

sector angle 50 deg. spiral (max) 0 deg.

FIELD TRIMMING: Trim Coils 26x4 pairs

Harmonic Coils

Other

CURRENT: Main Coils 1072 Amps Stability $< 5 \times 10^{-6}$

Trim Coils 220-600 Amps Stability $< 5 \times 10^{-5}$

Stored Energy (cryogenic) MJ

WEIGHT: Iron 2100 tons Conductor 16 tons

ION ENERGY: Bending Limit $E/A = 540 \text{ q}^2/A^2 \text{ MeV/u}$

Focusing Limit $E/A = \text{q/A MeV/u}$

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: $2 \times 23.5^\circ$ Dees with 2 gaps per each, Movable box

No. of Gaps/turn 4 $dE/dn(\text{max})$ 1.2 MeV/q

Voltage (max) 0.3 MV Harmonic f_r/f_{ion} 5, 9, 10, 11

Freq 18-45 MHz Power in(max) $2 \times 0.3 \text{ MW}$

Stability: Phase $\pm 0.2^\circ$ Voltage $\pm 1.5 \times 10^{-4}$

OTHER CAVITIES (Flattopping or otherwise):

Description:

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

No. of Gaps/turn $dE/dn(\text{max})$ MeV/q

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

Freq MHz Power in(max) MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: $< 1 \times 10^{-8}$ Torr

PUMPS: (No. and type) 5,000 l/s cryopanel $\times 4$,

10,000 l/s cryopump $\times 10$

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ ($\pi \text{ mm mrad}$)	Ion Species
(a) External injection by use of two injectors			
(b) (715 cyclotron and heavy-ion linac)			
(c)			
(d)			

INJECTION SYSTEM

Magnetic chan. and electrostatic chan. Efficiency 70 %

EXTRACTION SYSTEM

Electrostatic chan. and Magnetic chan. Efficiency 100 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μA)
(a) ^1_1H	210	0.3
(b) ^2_1H , ^3_1H , ^4_2He , ^6_3Li , ^7_3Li , ^9_4Be	135	0.2-0.5
(c) $^{40}_{18}\text{Ar}$	95	0.06
(d) $^{136}_{54}\text{Xe}$	26	0.002

Secondary Particles	E (MeV)	part/sec
(a) ^7_3Li	910	1×10^5
(b) ^9_4Be	980	3×10^6
(c) $^{12}_6\text{C}$	1250	3×10^7

EXTRACTED BEAM PROPERTIES:

For μA of MeV/u ions

$\Delta E/E$ 0.1 % $\Delta\phi$ 4 $^\circ$

$\epsilon_n = \beta\gamma\epsilon \times 0.7 \pi \text{ mm mrad}$ z 0.7 $\pi \text{ mm mrad}$

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: 4000 m^2 Moveable m^2

Target Stations: 14 No. Served At Same Time: 2

MAGNETIC SPECTROMETERS: QQD-QD (SMART)

OTHER FACILITIES: Projectile Fragment Separator (RIPS)

Gas-filled Recoil Isotope Separator/Ion-guided Isotope

Separator On-line (GARIS/IGISOL)

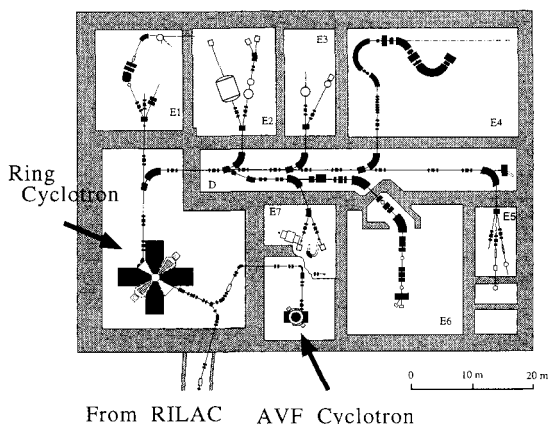
Scattering Chamber (ASCHRA)

REFERENCES/NOTES

(a) Y. Yano: Proc. 13th Int. Cyclo. Conf., 102 (1992)

(b)

PLAN VIEW OF FACILITY, COMMENTS



From RILAC AVF Cyclotron