

Entry: **C35**
 Machine Name: RCNP Ring Cyclotron
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HISTORY

Design by: RCNP Osaka University
 Construction time: 1986-1991
 First beam: 1991

CHARACTERISTIC BEAMS

ions / energy (MeV/n) / current (pps) / power (W) :
 - pol p / 420 / 6.2×10^{11}
 - ^3He / 150 / 2.5×10^{12}
 - ^4He / 100 / 2.5×10^{12}
 - $^{16}\text{O}^{+}$ / 60 / 6.2×10^{10}
 transmission efficiency (total)
 - typical: 80 % - best: 100 %
 transverse emittance (rms)
 - vertical: 1 π mmrad
 - horizontal: 1 π mmrad
 longitudinal emittance (rms) 0.1% 10deg $\Delta E/E$ deg RF

USES

basic research: 32 % therapy: %
 development: 27 % isotope production: %
 other applications: % maintenance: 33 %
 beam tuning: 7 %
 total time: 6900 h/year

TECHNICAL DATA

a) magnet
 type: normal conductor separated sector
 Kb: 400 MeV/A Kf: 400 MeV/A
 average field (min-max): 0.76 T
 number of magnet sectors: 6
 - angle: 22-27.5 deg
 - spiral (max): 30 deg
 pole parameters
 - diameter: m
 - injection radius: 2.0 m
 - extraction radius: 4.0 m
 hill gap: 0.06 m valley gap: m
 field trimming
 - trim coils
 - number: 36
 - current (max): 500x16, 350x20 A
 - harmonic coils
 - number: A
 - current (max): A
 - others
 - number: A
 - current (max): A
 main coils:
 - number: A.T.
 - Ampere-turns: 1.45×10^5
 - current: 900 A
 stored energy: MJ
 weight : - iron: 370x6 t - coils: 5.3x6 t
 power
 - main coils (total): 450 kW
 - trim coils (total max): 350 kW
 - refrigerator (cryogenic): kW
 b) RF
 - acceleration
 - frequency range: 30 - 52 MHz
 - harmonic modes: 6 and 10
 - number of dees: 3
 - angular aperture: deg
 - voltage: - average (min-max): 375 kV
 - variation with radius: kV
 - 250(inj), 500(ext) kV
 - power in (max): 250x3 kW
 - stability: - phase: 0.1 deg - voltage: 0.01 %

other cavities

- purpose: Flat-topping
 - frequency range: 90 - 156 MHz
 - region of influence: 2 - 4 m
 - voltage (max): 150 kV
 - power in (max): 50 kW
 - stability: - phase: 0.1 deg - voltage: 0.05 %

c) injection

- internal source:
 - external (radial/axial): axial
 - elements: Atomic polarized ion source, and ECR
 Inflector
 - source voltage: 15 kV
 - injection energy: MeV/n
 - buncher: f+2f+3f
 - injection efficiency: 12 %

d) ion sources/injector

AVF cyclotron

e) extraction

- elements, characteristics:
 - 2 deflector
 - 2 magnetic channel
 - efficiency
 - typical: 70 % - best: 90 %

f) vacuum

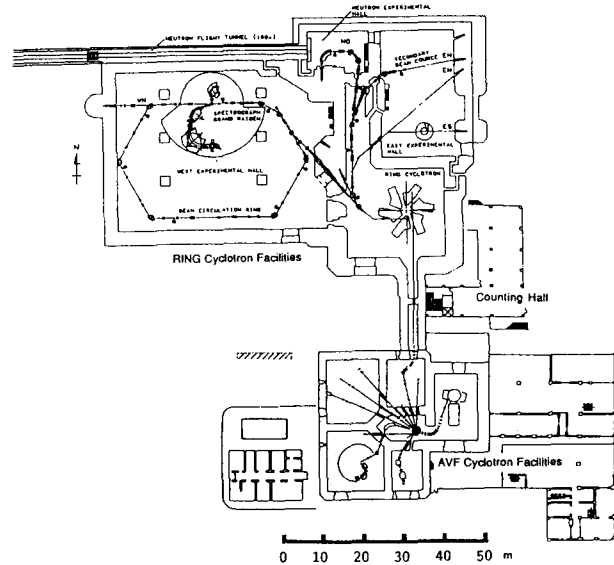
- pumps: 9 Cryo. pumps and 3 Diff. pumps
 - achieved vacuum: 1.5×10^{-5} Pa

REFERENCES

EXPERIMENTAL FACILITIES

Magnet spectro meters
 100m TOF Tunnel and 0-90 deg Beam Swinger

PLAN VIEW OF FACILITY



COMMENTS