

ENTRY NO: C-3
Machine Name: TRIUMF cyclotron
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Institution: TRIUMF
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HISTORY

Designed By: in house, various engineering firms
Construction Dates: April, 1968 to December, 1974
First Beam Date: December 14, 1974

CHARACTERISTIC BEAMS

ions	/ energy(MeV/N)	/current(pps)	/power(w)
p+	180-520	180 uA	
p+	65-115	100 uA	
p+(pol)	180-520	25 uA	

transmission efficiency(source to extract beam)

typical: 55-60% - **best:** 61%

tranverse emittance

emittance definition: RMS

vertical: 2π mm mrad

horizontal: 2π mm mrad

longitudinal: $0.2(\Delta) E/E$ %xdeg RF

USES

basic research: 86%	therapy: 2%
development: 2%	isotope production: 45%
other: 4%	maintenance: 10%
beam tuning: 2%	Total Time: 5400h/year

TECHNICAL DATA

a)magnet: **type:** sector focussed laminated low carbon steel

Kb: MeV/A **Kf:** MeV/A

average field (min/max): 0.30-0.46 T

number of magnet sectors: 6

hill angular width: 17.5hill angular width

spiral (max): 70 deg

pole parameters

diameter: 17.17 m

injection radius: 0.25 m

extraction radius: 5.80-7.80 m

hill gap: 0.528m **valley gap:** m

trim coils

-number: 55x2

-current(max): 300 A-turns

harmonic coils

-number: 13xNsectorsx2

-current(max): 180 A-turns

main coils

number: 1x2

total ampere-turns: 276000 A-turns

current: 18400 A

stored energy: MJ

weight - iron: 4400t coils: 170t

power

main coils (total): 1380 kW

trim coils (total max): 68 kW

refrigerator (cryogenic): kW

b)RF

acceleration

frequency range: 23.05MHz

harmonic modes: 5

number of dees: 2

number of cavities:

dee angular width: 180degrees

voltage

at injection: 96kV(peak to ground, max)

at extraction: 96kV(peak to ground, max)

peak: 96kV(peak to ground, max)

line power(max): 1100kW

stability

phase: +/- 5 deg

voltage: 0.0004%

injection

c)ion source: Ehlers PIG, CUSP, polarized (Lamb shift, optically)

external injection: axial

components: spiral inflector, electrostatic transport

source bias voltage: kV

injection energy: 0.300MeV/N

buncher: 2

injection efficiency: 65-70%

d)injector:

e)extraction

stripping in pyrolytic graphite simultaneous extraction to 4 beamlines

efficiency

typical: 99.95%

best: %

f)vacuum

pumps: 2 He cooled cryo-panels (2.8 m square), 5 cryo-pum

achieved vacuum: 6.7×10^{-8} Pa

REFERENCES

EXPERIMENTAL FACILITIES

proton therapy proton irradiation radioactive ion source and accelerator (ISAC) operating at 500 MeV, 20 uA, 2500 hours/year pion production targets with upto 10^{+8} particles/sed

COMMENTS