ENTRY NO. C4 **Date** June 1/92

Name of Machine TRIUMF Cyclotron

Institution TRIUMF

Address 4004 Wesbrook Mall, Vancouver, B.C., Canada

Tel (604) 222-1047 Telex (0)4 508503 Fax (604) 222-1074 EMAIL PEARCED@TRIUMFCL

In Charge: G. Dutto Reported by: D. Pearce

HISTORY

MILESTONE DATES:

Design July 1966 Model Tests December 1966

Construction October 1968 First Beam December 1974

DESIGN/CONSTRUCTION BY:

in house yes other various engineering contracts

COST: Accelerator 12 M$ Can. Facility 50 M$ Can.

FUNDED BY: AECB, SFU, UBC, U of Victoria, U of Alberta (to 1976), NRC, Province of B.C. (since 1977)

STATUS

STAFF: Machine

Scientists 15 Engineers 26

Technicians 70 Students 2

Research (in house/external)

Scientists 47 / 150 Engineers 12 / .....

Technicians 30 / ..... Students 30 / 64

BUDGET: Machine 26 M$ Can. Funded by NRC

Research 4.6 M$ Can. Funded by NSERC

TIME DISTRIBUTION:

Basic Research (in house/external) 10 % / 44 %

Applied Program (in house/external) 12 % / - %

Development 3 % Maintenance 31 %

MAGNET

POLE PARAMETERS:

Diameter 1717. cm $R_{extract}$ 580-780. cm R_{inject} 25 cm

HILL PARAMETERS: Gap (min) 52.8 cm B_{max} 0.58 T

(@ 720000 AT) Gap (max) 52.8 cm B_{min} 0.30 T

VALLEY PARAMETERS: Gap (min) - cm B_{max} 0.30 T

(@ 720000 AT) Gap (max) - cm B_{min} 0.12 T

AVERAGE FIELD: $< B >_{min}$ 0.30 T $< B >_{max}$ 0.46 T

NUMBER OF SECTORS: compact/separated / 6

sector angle 17.5 deg. spiral (max) 70 deg.

FIELD TRIMMING: Trim Coils 55

Harmonic Coils 13

Other

CURRENT: Main Coils 18400 Amps Stability 10 ppm

Trim Coils Amps Stability

Stored Energy (cryogenic) MJ

WEIGHT: Iron 4000 tons Conductor 170 tons

ION ENERGY: Bending Limit E/A = 520 q^2/A^2 MeV/u

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

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 80 lambda/4 resonators, push-pull mode

No. of Gaps/turn 2 dE/dn(max) 0.34 MeV/q

Voltage(max) 0.085 MV Harmonic f_{rf}/f_{ion} 5

Freq 23.05 MHz Power in(max) 1.1 MW

Stability: Phase +-5 deg Voltage 4×10^{-4}

OTHER CAVITIES (Flattopping or otherwise):

Description: Auxiliary Acc. Cav., lambda/4

Region of Influence: R_{min} 700 cm R_{max} 775 cm

No. of Gaps/turn 2 dE/dn(max) 0.300 MeV/q

Voltage(max) 0.15 MV Harmonic f_{rf}/f_{ion} 20

Freq 92 MHz Power in(max) 0.060 MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 5×10^{-8} Torr

PUMPS: No. and type 2 He cooled cryo-panels (2.8 m^2) 4-41 cm cryo-pumps, 1-46 cm cryo-pump, 1-25 cm turbo

ION SOURCE(S)

	Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ (πmm mrad)	Ion Species
(a)	Ehlers PIG	0.30	0.2 h x 0.05 v	H^-
(b)	Cusp	2	0.25 h, v	H^-
(c)	Lamb Shift	6×10^{-4}	0.35 h, v	H^- pol (80%)
(d)	Optically pumped	0.010	0.35 h, v	H^- pol (75%)

INJECTION SYSTEM

axial injection, two bunchers, spiral inflector Efficiency 65-70 %

EXTRACTION SYSTEM

Stripping in pyrolytic graphite foil Efficiency 99.95 %

CHARACTERISTIC BEAMS

	Accelerated Ions	E/A (MeV/u)	Current(part μA) Internal	External
(a)	H^-	180-520	180 H^-	180 p^+
(b)	H^-	65-100	100 H^-	100 p^+
(c)	H^- (pol)	180-520	5 H^-	5 p^+ (pol)
(d)				

	Secondary Particles	E (MeV)	part/sec
(a)	π^+	20-350	10^7-10^8
(b)	μ^+	4-90	10^6-10^7
(c)			

EXTRACTED BEAM PROPERTIES:

For 160 μA of 500 MeV/u P ions

$\Delta E/E$ 0.2 % $\Delta\phi$ 35 °rf

$\epsilon_n = \beta\gamma\epsilon$ x 2 πmm mrad z 2 πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed 2350 m^2 Moveable m^2

Target Stations: 18 No. Served At Same Time: 10

MAGNETIC SPECTROMETERS: MRS R=2.5m, OOD R=0.6m

OTHER FACILITIES: Biomedical π^- irradiation

Thermal Neutron Source, Polarized Fast Neutron Beam

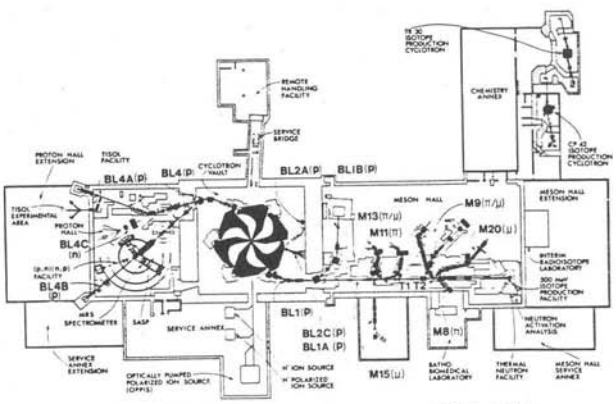
Isotope Production, on line isotope separator

REFERENCES/NOTES

(a)

(b)

PLAN VIEW OF FACILITY, COMMENTS



BEAM LINES AND EXPERIMENTAL FACILITIES
—— EXISTING ------ PROPOSED