ENTRY NO: C-3  
Machine Name: TRIUMF cyclotron  
Date: 6/15/01 2:04:11 PM  
Institution: TRIUMF  
Address: 4004 Wesbrook Mall, Vancouver, BC, Canada  
In Charge of Cyclotron: G. Dutto  
Telephone: 604-222-1047  
Fax: 604-222-1074  
Person Reporting: D. Pearce  
Web: www.triumf.ca  
E-mail: pearced@triumf.ca  

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

CHARACTERISTIC BEAMS  

<table>
<thead>
<tr>
<th>ions</th>
<th>energy (MeV/N)</th>
<th>current (pp/s)</th>
<th>power (w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p+</td>
<td>180-520</td>
<td>180 uA</td>
<td></td>
</tr>
<tr>
<td>p+</td>
<td>65-115</td>
<td>100 uA</td>
<td></td>
</tr>
<tr>
<td>p+(pol)</td>
<td>180-520</td>
<td>25 uA</td>
<td></td>
</tr>
</tbody>
</table>

transmission efficiency (source to extract beam)  
typical: 55-60%  
best: 61%  

traverse emmitance  
emmitance definition: RMS  
vertical: 2π mm mrad  
horizontal: 2π mm mrad  
longitudinal: 0.2(∆) E/E%xdeg RF  

USES  
basic research: 86%  
therapy: 2%  
development: 2%  
other: 4%  
beamer 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): 30.0-0.46 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  
extration 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: 180 degrees  
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 X 10^-8Pa  

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 up to 10+8 particles/second  

COMMENTS  