Entry: C 57
Machine Name: Gustaf Werner Cyclotron
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HISTORY
Design by: in house
Construction time:1946-51,1977-86
First beam: 1951,1986

CHARACTERISTIC BEAMS
ions / energy (MeV/n) / **current** (pps) / **power** (W) :
- protons 180 MeV/n $6*10^{11}$ pps
- protons 98 MeV/n $6*10^{13}$ pps
- $^{14}N^{7+}$ 45 MeV/n $8*10^{9}$ pps
- $^{129}Xe^{27+}$ 8.33 MeV/n $7*10^{8}$ pps

transmission efficiency (total)
- **typical**: 50% - **best**: 80%

transverse emittance (rms)
- **vertical**: 9 π mmmrad
- **horizontal**: 9 π mmmrad

longitudinal emittance (rms) -- ΔE/E.deg RF

USES
basic research: 50 % **therapy**: 20 %
development: 5 % **isotope production**: 5 %
other applications: 10 % **maintenance**: 5 %
beam tuning: 5 %
total time: 4300 h/year

TECHNICAL DATA
a) magnet
type: compact, room temp.
Kb: 200 MeV/A **Kf**: 100 MeV/A
average field (min-max): 0.6-1.75 T
number of magnet sectors: 3
- **angle**: 60-85 deg
- **spiral (max)**: 55 deg

pole parameters
- **diameter**: 2.8 m
- **injection radius**: (0.038 m)
- **extraction radius**: 1.2 m

hill gap: 0.2 m **valley gap**: 0.36 m
field trimming
- **trim coils**
  - **number**: 13
  - **current (max)**: 60 A
- **harmonic coils**
  - **number**: 2 sets
  - **current (max)**: 40 A , 170 A
- **others**
  - **number**:
  - **current (max)**: A

main coils: copper, room temp.
- **number**: 1
- **Ampere-turns**: 814 000 A.T.
- **current**: 1000 A

stored energy: 9 MJ
weight : - **iron**: 600 t - **coils**: 50 t
power
- **main coils (total)**: 275 kW
- **trim coils (total max)**: 70 kW
- **refrigerator (cryogenic)**: - kW

b) RF
- **acceleration**
  - **frequency range**: 12.25-24.5 MHz
  - **harmonic modes**: 1,2,3 and 4
  - **number of dees**: 2
  - **angular aperture**: 72 -42 deg
  - **voltage:- average (min-max)**: 10-50 kV
    - **variation with radius**:
  - isochr. and FM mode (synchrocyclotron)
  - **power in (max)**: 280 kW
  - **stability:** - **phase**: +/-0.5 deg - **voltage**: +/-0.1 %

- **other cavities**
  - **purpose**:
  - **frequency range**: MHz
  - **region of influence**: m
  - **voltage (max)**: kV
  - **power in (max)**: kW
  - **stability:- phase**: deg - **voltage**: %

c) injection
- **internal source**: PIG sources (Isochr. mode, FM mode)
- **external (radial/axial)**: axial
  - **elements**: Spiral inflector
  - **source voltage**:20 kV
  - **injection energy**: -- MeV/n
  - **buncher**: sinusoidal h=1 double gap
- **injection efficiency**: 5-10 %

d) ion sources/injector
1) ECR source (room temp.)
2) Polarized source (atomic beam)

e) extraction
- **elements, characteristics:**
  - el. stat. defl. (65 kV, apert. 5 mm, septum 0.5 mm)
  - electromagnetic channel 4.7 kA, septum 5 mm
  - peeler, regenerator (FM mode)
  - passive focussing channel
- **efficiency**
  - **typical**: 50 % - **best**: 90 %

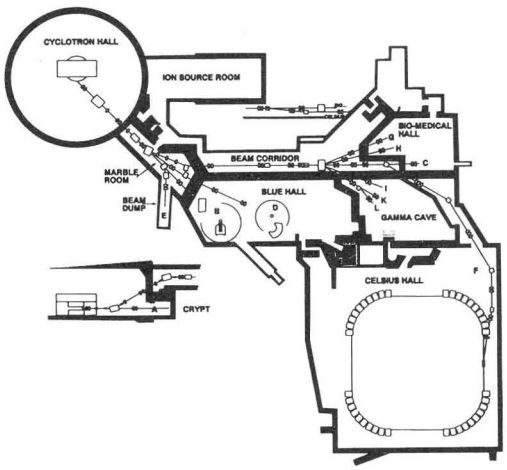
f) vacuum
- **pumps**: 2+1 oil diff. pumps with cryo baffles
  2 cryogenic Meissner traps
- **achieved vacuum**: 10^{-5} Pa

REFERENCES

1)S.Holm, Proc. 13th Int. Conf, Vancouver 1992 p.106
2)Hermansson et al, Proc. EPAC 1998 (to be published)

EXPERIMENTAL FACILITIES
CELSIUS cooler ring
Spectrometers HESM, LISA, PACMAN
Neutron beam, radiotherapy area, radionuclide production

PLAN VIEW OF FACILITY



COMMENTS