Entry: FM3 Date:

Machine Name: Synchrocyclotron on 1 Gev Institution: Petersburg Nuclear Physics Institute

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HISTORY

Design by: Efremov Institute

Construction time: 1959 - 1965

First beam: Nov. 1967

CHARACTERISTIC BEAMS

ions / energy (MeV/n) / current (pps) / power (W) :

π^+ - p, 1000, $6 \cdot 10^{12}$

- π^+, 150, $1.6 \cdot 10^7$ - 10^8
- μ^+, 90, $3 \cdot 10^5$ - 10^8
- μ^+, 4, $3 \cdot 10^4$

transmission efficiency (total)

- typical: % - best: %

transverse emittance (rms)

- vertical: π mmmrad
- horizontal: π mmmrad

longitudinal emittance (rms) ΔE/E.deg RF

USES

basic research: 90 % therapy: 5 %

development: % isotope production: %

other applications: 5 % maintenance: %

beam tuning: %

total time: 2000 h/year

TECHNICAL DATA

a) magnet

type: E - 9

Kb: MeV/A Kf: MeV/A

average field (min-max): 1.9 T

number of magnet sectors:

- angle: deg
- spiral (max): deg

pole parameters

- diameter: 6.85 m
- injection radius: m
- extraction radius: 3.15 m

hill gap: 0.39 m valley gap: m

field trimming

- trim coils
  - number:
  - current (max): A
- harmonic coils
  - number:
  - current (max): A
- others
  - number: 1
  - current (max): 200 A

main coils:

- number: 2 x 132
- Ampere-turns: $1.3 \cdot 10^5$ A.T.
- current: 4800 A

stored energy: MJ

weight : - iron: 7800 t - coils: 120 t

power

- main coils (total): 1000 kW
- trim coils (total max): 20 kW
- refrigerator (cryogenic): kW

b) RF

- acceleration
  - frequency range: 29 - 13.3 MHz
  - harmonic modes: 1
  - number of dees: 1
  - angular aperture: 180 deg
  - voltage:- average (min-max): 10 kV
    - variation with radius:
    -
  - power in (max): 200 kW
  - stability: - phase: deg - voltage: %

- other cavities
  - purpose: Slow extraction, Cee - electrode
  - frequency range: 13.3 - 13.2 MHz
  - region of influence: 2.95 - 3.2 m
  - voltage (max): 3 kV
  - power in (max): 2 kW
  - stability:- phase: deg - voltage: %

c) injection

- internal source: open, with cold cathod
- external (radial/axial):
  - elements:
  - source voltage: kV
  - injection energy: MeV/n
  - buncher:
- injection efficiency: %

d) ion sources/injector

e) extraction

- elements, characteristics:
  - non - linear regenerative system
  -
  -
  -
- efficiency
  - typical: 30 % - best: %

f) vacuum

- pumps: 2 diffusion pumps
  2 x 40000 l/s
- achieved vacuum: $0.26 \cdot 10^{-3}$ Pa

REFERENCES

Proc. of the All - Union Conf. on Charged Particle Accel.
V2, p75 (1980)

EXPERIMENTAL FACILITIES

Spectrometre with 0.03% resolution
Muon and Pion channels, Medical Facility
TOF Neutron Spectr., IRIS

PLAN VIEW OF FACILITY

COMMENTS