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Machine Name: CYCLONE 18/9

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History

Designed by: Ion Beam Applications, s.a., Belgium

Construction Dates:

First Beam Date: routine operation for radionuclide production since 1996

Characteristic Beams

p, 18 MeV, 30 micro-A on the targets

d, 9 MeV, 18 micro-A in the targets

Transmission Efficiency

Typical (%): From internal probe to targets outside the yoke

p: 25

d: 20

Best (%): from internal probe to targets outside the yoke p:

30 d: 28

Emittance

Emittance Definition:

Vertical (pi mm mrad):

Horizontal (pi mm mrad):

Longitudinal (dE/E[%] x RF[deg.]):

USES

Basic Research (%):

Development (%):

Therapy (%):

Isotope Production (%): 93

Other Application (%):

Maintenance (%): 7

Beam Tuning (%):

Total Time (h/year): total beam time in 2004: ca. 600

TECHNICAL DATA

(a)Magnet

Type: compact, deep valley design

Kb (MeV):

Kf (MeV):

Average Field (min./max. T): 1.3

Number of Sectors: 4

Hill Angular Width (deg.):

Spiral (deg.):

Pole Diameter (m): 1.08

Injection Radius (m):

Extraction Radius (m): 0.445 - 0.465

Hill Gap (m): 0.031

Valley Gap (m): 0.665

Trim Coils

Number:

Maximum Current (A-turns):

Harmonic Coils

Number:

Maximum Current (A-turns):

Main Coils

Number: 2

Total Ampere Turns:

Maximum Current (A): 200

Stored Energy (MJ):

Total Iron Weight (tons): 20

Total Coil Weight (tons): 2

Power

Main Coils (total KW): 24

Trim Coils (total, maximum, KW):

Refrigerator (cryogenic, KW):

(b)RF

Acceleration

Frequency Range (MHz): 41.8, fixed frequency

Harmonic Modes: protons: 2 deuterons: 4

Number of Dees: 2

Number of Cavities:

Dee Angular Width (deg.): 30

Voltage

At Injection (peak to ground, KV):

At Extraction (peak to ground, KV):

Peak (peak to ground, KV): 32

Line Power (max, KW): 10

Phase Stability (deg.):

Voltage Stability (%):

(c)Injection

Ion Source: 2 x PIG IS (one for p, one for d)

Source Bias Voltage (kV):

External Injection:

Buncher Type:

Injection Energy (MeV/n):

Component:

Injection Efficiency (%):

Injector:

(d)Extraction

Elements, Characteristic: carbon stripper foils

Typical Efficiency (%): (40 - 60)

Best Efficiency (%): 70

(e)Vacuum

Pumps:

4 x Edwards ODP diff stack 160/700p

1 x Edwards ODP diff stack 100/300p for external beam transport line

Achieved Vacuum (Pa): stand-by: 7E-05

REFERENCES

EXPERIMENTAL FACILITIES

COMMENTS

1.

Cyclotron building and radiochemistry/ radiopharmaceutical/ nuclear medicine buildings are separated by 500 meters.

→ Radionuclide transport system (RATS):

- Pneumatic transport system for liquids
- Copper tubes for gases

2. Attached figure

Fig. 1: Layout of the Rossendorf PET cyclotron facility

RATS = Radionuclide transport system

