

**ENTRY NO:**C41

**Date:** 1 Apr 2005 17:00:00

**Machine Name:** PSI Philips Cyclotron "Injector 1"

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#### History

**Designed by:** Philips, Eindhoven, NL

**Construction Dates:** 1970-73

**First Beam Date:** 1974

#### Characteristic Beams

p 72 MeV

Heavy Ions k=120

#### Transmission Efficiency (source to extracted beam)

**Typical (%):**

**Best (%):** 93

#### Emittance

**Emittance Definition:** rms

**Vertical (pi mm mrad):** 2

**Horizontal (pi mm mrad):** 3

**Longitudinal (dE/E[%] x RF[deg.]):** 0.5

#### USES

**Basic Research (%):** 60

**Development (%):**

**Therapy (%):** 20

**Isotope Production (%):**

**Other Application (%):** 20

**Maintenance (%):**

**Beam Tuning (%):**

**Total Time (h/year):** 2000

#### TECHNICAL DATA

##### (a)Magnet

**Type:** H-Magnet with spiral shims

**Kb (MeV):** 135

**Kf (MeV):** 135

**Average Field (min./max. T):** 1.65

**Number of Sectors:** 4

**Hill Angular Width (deg.):**

**Spiral (deg.):** 55

**Pole Diameter (m):** 2.5

**Injection Radius (m):** 0.015

**Extraction Radius (m):** 1.05

**Hill Gap (m):** 0.24

**Valley Gap (m):** 0.45

##### Trim Coils

**Number:** 2 x 12

**Maximum Current (A-turns):** 250 A

##### Harmonic Coils

**Number:** 2 x 2 x 4

**Maximum Current (A-turns):** 200 A

##### Main Coils

**Number:** 2

**Total Ampere Turns:** 1.5 e5

**Maximum Current (A):** 700

**Stored Energy (MJ):**

**Total Iron Weight (tons):** 470

**Total Coil Weight (tons):** 20

##### Power

**Main Coils (total KW):**

**Trim Coils (total, maximum, KW):**

**Refrigerator (cryogenic, KW):**

##### (b)RF

##### Acceleration

**Frequency Range (MHz):** 4.6 - 17

**Harmonic Modes:** 1, 3

**Number of Dees:** 1

**Number of Cavities:**

**Dee Angular Width (deg.):** 180

##### Voltage

**At Injection (peak to ground, KV):** 20 - 100

**At Extraction (peak to ground, KV):**

**Peak (peak to ground, KV):**

**Line Power (max, KW):** 100

**Phase Stability (deg.):** 0.1 - 1

**Voltage Stability (%):** 0.01 - 1

##### (c)Injection

**Ion Source:** Livingston

**Source Bias Voltage (kV):**

**External Injection:** axial

**Buncher Type:** 2 gaps

**Injection Energy (MeV/n):** < 14 keV

**Component:** ECR, e.m.quads, spherical deflector, el. stat. mirror, buncher

**Injection Efficiency (%):** < 25

##### Injector:

##### (d)Extraction

**Elements, Characteristic:** el. stat extr. channel, e.m. extr. channel

**Typical Efficiency (%):** 60

**Best Efficiency (%):** 93

##### (e)Vacuum

**Pumps:** Diff. + Kryo 77K / 24K

**Achieved Vacuum (Pa):** 5 e-5

**REFERENCES** P.A. Schmelzbach et al., 14th Int. Cycl. Conf., Cape Town, (1995)404

#### EXPERIMENTAL FACILITIES

gas-jet target, OPTIS eye cancer treatment

**COMMENTS** Part time Operation, PSI internal use only