

ENTRY NO. C56 Date August 1995
Name of Machine PSI Injector Cyclotron 2 4)
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HISTORY

MILESTONE DATES:

Design 1972 Model Tests 1973 - 1980
Construction 1978 - 1983 First Beam April 1984

DESIGN/CONSTRUCTION BY:

in house PSI other

COST: Accelerator 22 M\$ Facility

FUNDED BY: Swiss Federal Government

STATUS

STAFF: Machine (see PSI-590 MeV Ring Cyclotron) 4)

Scientists Engineers

Technicians Students

Research (in house/external)

Scientists / Engineers /

Technicians / Students /

BUDGET: Machine Funded by

Research Funded by

TIME DISTRIBUTION:

Basic Research (in house/external) % / %

Applied Program (in house/external) % / %

Maintenance % Development %

MAGNET

POLE PARAMETERS: (separated sector magnets)

Diameter cm R_{extract} 342 cm R_{inject} 46 cm

HILL PARAMETERS: Gap (min) 3.5 cm B_{max} 1.10 T

(@ AT) Gap (max) 3.5 cm B_{min} 1.05 T

VALLEY PARAMETERS: Gap (min) cm B_{max} T

(@ AT) Gap (max) cm B_{min} T

AVERAGE FIELD: $\langle B \rangle_{\text{min}}$ 0.33 T $\langle B \rangle_{\text{max}}$ 0.36 T

NUMBER OF SECTORS: compact/separated / 4

sector angle 27 deg. spiral (max) 0 deg.

FIELD TRIMMING: Trim Coils 11 pairs per magnet 3)

Harmonic Coils 1

Other

CURRENT: Main Coils 400 Amps Stability 5E-6

Trim Coils < 40 Amps Stability 5E-5

Stored Energy (cryogenic) MJ

WEIGHT: Iron 4 x 180 tons Conductor 4 x 0.96 tons

ION ENERGY: Bending Limit E/A = 72 q^2/A^2 MeV/u

Focusing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 2 Resonators 50 MHz 4)

No. of Gaps/turn 4 dE/dn(max) 1.0 MeV/q

Voltage (max) 0.5 MV Harmonic f_H/f_{ion} 10

Freq 50.6 MHz Power in(max) 0.18 MW

Stability: Phase 0.01 deg. Voltage 0.03 %

OTHER CAVITIES (Flattopping or otherwise):

Description: 2 flattop cavities 150 MHz 4)

Region of influence: R_{min} 80 cm R_{max} 342 cm

No. of Gaps/turn 2 dE/dn(max) 0.1 MeV/q

Voltage (max) 0.05 MV Harmonic f_H/f_{ion} 30

Freq 151.8 MHz Power in(max) 0.01 MW

Stability: Phase < 0.1 deg. Voltage 0.1 %

VACUUM SYSTEM

OPERATING PRESSURE: 2E-6

PUMPS: (No. and type) 4 x turbo molecular pumps

2200 l/s each

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ (mm mrad)	Ion Species
(a) Multicusp in Cockcroft-Walton preaccelerator			
(b) 12 (60 keV)	0.3	p	
(c) 9 (870 keV)	0.5	p	
(d)			

INJECTION SYSTEM

Axial, at 870 keV magn. cone with Efficiency 100 %
 $n = 0.6$

EXTRACTION SYSTEM

el. stat. deflector and
2 septum magnets Efficiency 100 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μ A)	
		Internal	External
(a) p	72	1500	1500
(b)			
(c)			
(d)			

Secondary Particles	E (MeV)	part/sec
(a)		
(b)		
(c)		

EXTRACTED BEAM PROPERTIES:

For 1500 μ A of 72 MeV/u p ions
 $\Delta E/E$ < 0.3 % $\Delta\phi$ < 5 °
 $\epsilon_n = \beta\gamma\epsilon$ x 1.5 π mm mrad z 1.5 π mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed m² Moveable m²

Target Stations: No. Served At Same Time:

MAGNETIC SPECTROMETERS:

OTHER FACILITIES: Isotope production

see entry "PSI 590 MeV Ring Cyclotron" 2)

REFERENCES/NOTES

(a)
(b)

PLAN VIEW OF FACILITY, COMMENTS

- Two stage accelerator for 72 MeV protons (see Proc. 9th Int. Conf. on Cyclotrons & their Application, (1981), 43
Stage 1: 870 keV DC preacc. (Cockcroft Walton)
Stage 2: Isochronous ring cyclotron
- See PSI 590 MeV Ring Cyclotron (this compilation)
- Special coils outside vacuum chamber for correction of isochronism
- RF-systems: two $\lambda/2$ -resonators (50.6 MHz) for acceleration and two flattop cavities (151.8 MHz)