ENTRY NO. C57 Date August 1995

Name of Machine PSI - 590 MeV Ring Cyclotron

Institution Paul Scherrer Institute

Address CH-5232 Villigen PSI, Switzerland

Tel ++41 (0)56-310 21 11 Telex - Fax ++41 (0)56-310 33 83 E-MAIL SCHRYBER@psi.ch

In Charge: Dr. U. Schryber Reported by: Dr. U. Schryber, Dr. M. Olivo

HISTORY

MILESTONE DATES:

Design 1962 Model Tests 1962 - 1968

Construction 1968 - 1974 First Beam Jan. 18, 1974

DESIGN / CONSTRUCTION BY:

in house PSI (SIN) other

COST: Accelerator 35 MSFr. Facility 134 MSFr. (1974)

FUNDED BY: Swiss Federal Government

STATUS

STAFF: Machine

Scientists ca. 15 Engineers 15

Technicians 50 Students -

Research (in house/external)

Scientists ~40 / ~300 Engineers /

Technicians / Students /

BUDGET: Machine 7 MSFr. Funded by Swiss Gov.

Research Funded by

TIME DISTRIBUTION:

Basic Research (in house/external) } total % / %

Applied Program (in house/external) } total % / 3800 h/y %

Maintenance 370 h/y % Development 160 h/y %

MAGNET

POLE PARAMETERS: (separated sector magnets)

Diameter cm $R_{extract}$ 445 cm R_{inject} 210 cm

HILL PARAMETERS: Gap (min) 5 cm B_{max} 2.09 T

(@ AT) Gap (max) 9 cm B_{min} 1.5 T

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

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

AVERAGE FIELD: $<B>_{min}$ 0.58 T $<B>_{max}$ 0.87 T

NUMBER OF SECTORS: ~~compact~~/separated / 8

sector angle 18 deg. spiral (max) 35 deg.

FIELD TRIMMING: Trim Coils 18

Harmonic Coils 5

Other

CURRENT: Main Coils 1.5 x 10^3 Amps t Stability 5E-6

Trim Coils Amps Stability 5E-4

Stored Energy (cryogenic) MJ

WEIGHT: Iron 1960 tons Conductor 28 tons

ION ENERGY: Bending Limit E/A = 590 q^2/A^2 MeV/u

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

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:

Description: 4 cavities

No. of Gaps/turn 4 dE/dn(max) 2.920 MeV/q

Voltage (max) 0.73 MV Harmonic f_{rf}/f_{ion} 6

Freq 50.6 MHz Power in(max) per cav. 0.52 MW

Stability: Phase 0.01 deg. Voltage 0.03 %

OTHER CAVITIES (Flattopping or otherwise):

Description: 1 Flattop cavity

Region of Influence: R_{min} 210 cm R_{max} 445 cm

No. of Gaps/turn 1 dE/dn(max) 0.46 MeV/q

Voltage (max) 0.46 MV Harmonic f_{rf}/f_{ion} 18

Freq 151.8 MHz Power in(max) 0.12 MW

Stability: Phase < 0.1 deg. Voltage 0.1 %

VACUUM SYSTEM

OPERATING PRESSURE: < 10E-6

PUMPS: (No. and type) 4 x (1 cryopump + 1 turbomolecular pump) 4 x 11000 l/s

ION SOURCE(S)

	Type	Intensity (mA)	@ $\varepsilon_n = \beta\gamma\varepsilon$ (π mm mrad)	Ion Species
(a)	see entry PSI Injector 2			
(b)				
(c)				
(d)				

INJECTION SYSTEM

72 MeV magnetic + electrostatic Efficiency >99.9 %

EXTRACTION SYSTEM

electrostatic + magnetic Efficiency ~99.94%

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μA) Internal	External
(a) p (routine)	590	1300	1300
(b) p (goal)	590	1500	1500
(c)			
(d)			

Secondary Particles	E (MeV)	part/sec
(a) π^+, π^-		
(b) μ^+, μ^-		
(c)		

EXTRACTED BEAM PROPERTIES:

For 1200 μA of 590 MeV/u p ions

$\Delta E/E$ 0.1 % $\Delta\phi$ ~8 °rf

$\varepsilon_n = \beta\gamma\varepsilon$ x ~3 π mm mrad z ~2 π mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: m^2 Moveable m^2

Target Stations: 2 No. Served At Same Time: 2

MAGNETIC SPECTROMETERS: 2 Pion spectrometers

OTHER FACILITIES: 2 superconducting muon channels, μSR-facilities, medical annex for proton therapy, neutron spallation source (SINQ), nucleon area, material irradiation facility

REFERENCES/NOTES

(a) Dr. U. Schryber et al. Proc. EPAC 1992, p. 173

(b) Dr. U. Schryber et al. 14th Int. Cycl. Conf. 1995

PLAN VIEW OF FACILITY, COMMENTS