

ENTRY NO. C55 **Date** July 1992
Name of Machine PSI 590 MeV Ring Cyclotron (with Injector cyclotron 1 and 2, see separate entries)
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In Charge: Dr. U. Schryber **Reported by:** Dr. W. Joho and Dr. M. Olivo

HISTORY

MILESTONE DATES:
 Design 1962 Model Tests 1962-1968
 Construction 1969-1974 First Beam Jan. 1974
DESIGN/CONSTRUCTION BY:
 in house PSI other
COST: Accelerator 35 MSFr. (1974). Facility 134 MSFr. (1975).
FUNDED BY: Swiss Federal Government

STATUS

STAFF: Machine
 Scientists ca. 15 Engineers ca. 15
 Technicians 50 Students
 Research (in house/external)
 Scientists 40 / 300 Engineers /
 Technicians / Students /
BUDGET: Machine 7 MSFr. Funded by Swiss Fed. Gov.
 Research Funded by
TIME DISTRIBUTION:
 Basic Research (in house/external) % / %
 Applied Program (in house/external) % / %
 Development % Maintenance %

MAGNET

POLE PARAMETERS:
 Diameter cm $R_{extract}$ 445 cm R_{inject} 210 cm
HILL PARAMETERS: Gap (min) 5 cm B_{max} 209 T
 (Θ AT) Gap (max) 9 cm B_{min} 1.5 T
VALLEY PARAMETERS: Gap (min) 5 cm B_{max} T
 (Θ AT) Gap (max) cm B_{min} T
AVERAGE FIELD: $\langle B \rangle_{min}$ 0.58 T $\langle B \rangle_{max}$ 0.87 T
NUMBER OF SECTORS: compact/separated / 8
 sector angle deg. spiral (max) 35 deg.
FIELD TRIMMING: Trim Coils 18
 Harmonic Coils 5
 Other
CURRENT: Main Coils 900 A Amps Stability $5E-6$
 Trim Coils ≤ 120 A Amps Stability $5E-4$
 Stored Energy (cryogenic) MJ
WEIGHT: Iron 1960 tons Conductor 28 tons
ION ENERGY: Bending Limit $E/A = 590$ q²/A² MeV/u
 Focussing Limit $E/A =$ q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description: 4 cavities 50 MHz (AJ)
 No. of Gaps/turn 4 $dE/dn(max)$ 2.0 MeV/q
 Voltage(max) 0.5-0.75 MV Harmonic f_{rf}/f_{ion} 6
 Freq 50.6 MHz Power in(max) 0.15-0.5 MW
 Stability: Phase 0.01 deg Voltage 0.03 %
OTHER CAVITIES (Flattopping or otherwise):
 Description: 1 flattop cavity 150 MHz
 Region of Influence: R_{min} 210 cm R_{max} 445 cm
 No. of Gaps/turn 1 $dE/dn(max)$ 0.3 MeV/q
 Voltage(max) 0.3 MV Harmonic f_{rf}/f_{ion} 18
 Freq 151.8 MHz Power in(max) 35 MW
 Stability: Phase ≤ 0.1 deg Voltage 0.1 %

VACUUM SYSTEM

OPERATING PRESSURE: $2E-6$ mbar
PUMPS: No. and type 4 turbomol. pumps 500 l/s and
 4 cryopumps and 4 Ti-sublimators 14000 l/s

ION SOURCE(S) see entry "PSI - Injector 1/2"

Type	Intensity (mA)	$\epsilon_n = \beta\gamma\epsilon$ (mm mrad)	Ion Species
(a) 4 Ti-sublimators	14000 l/s each		
(b)			
(c)			
(d)			

INJECTION SYSTEM

Magnetic and electrostatic channel Efficiency 100 %

EXTRACTION SYSTEM

Electrostatic septum Efficiency ~ 99.9 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μ A)	
		Internal	External
(a) p	590	500	500
(b)			
(c)			
(d)			

Secondary Particles	E (MeV)	part/sec
(a)	30-600	$10E-10$
(b)	5-125	$10E-8$
(c)		

EXTRACTED BEAM PROPERTIES:

For 500 μ A of 590 MeV/u p ions
 $\Delta E/E$ 0.1 % $\Delta\phi$ ~ 10 $^\circ$ rf
 $\epsilon_n = \beta\gamma\epsilon$ $\times \sim 2$ mm mrad z ~ 1.5 mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed m² Moveable m²
 Target Stations: 2 No. Served At Same Time: 2
MAGNETIC SPECTROMETERS: 2 pion spectrometers
OTHER FACILITIES: 2 superconduction channels
 detectors for the obs. of rare decays μ SR-facilities,
 annexes pion and proton therapy, nuclear area material
 irradiation, isotope production

REFERENCES/NOTES

- (a) W. Joho, M. Olivo, T. Stammach, H. Willax; IEEE NS-24
- (b) W. Joho, IEEE NS-26 (1979) 1950

PLAN VIEW OF FACILITY, COMMENTS

