ENTRY NO. C54 **Date** July 1992
Name of Machine PSI Injector Cyclotron 2
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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 MSFr Facility 134 MSFr
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 $R_{extract}$ 342 cm R_{inject} 46 cm
HILL PARAMETERS: Gap (min) 3.5 cm B_{max} 11.0 T
(@ AT) Gap (max) 3.5 cm B_{min} 10.5 T
VALLEY PARAMETERS: Gap (min) cm B_{max} T
(@ AT) Gap (max) cm B_{min} T
AVERAGE FIELD: $< B >_{min}$ 0.33 T $< B >_{max}$ 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
Harmonic Coils 1
Other
CURRENT: Main Coils 400 Amps Stability 5E-6
Trim Coils $\lesssim$ 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
Focussing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
Description: 2 Resonators 50 MHz
No. of Gaps/turn 4 dE/dn(max) 1.0 MeV/q
Voltage(max) 0.5 MV Harmonic f_{rf}/f_{ion} 10
Freq 50.6 MHz Power in(max) 0.17 MW
Stability: Phase 0.01 deg. Voltage 0.03 %
OTHER CAVITIES (Flattopping or otherwise):
Description: 2 flattop cavities 150 MHz
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) $\simeq$ 0.05 MV Harmonic f_{rf}/f_{ion} 30
Freq 151.8 MHz Power in(max) 0.01 MW
Stability: Phase $\lesssim$ 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)	@	$\epsilon_n = \beta\gamma\epsilon$ (πmm mrad)	Ion Species
(a)	cusp type, in Cockcroft Walton preaccelerator				
(b)		8.0			p
(c)					
(d)					

INJECTION SYSTEM

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

EXTRACTION SYSTEM

el. stat. deflector
2 septum magnets Efficiency 100 %

CHARACTERISTIC BEAMS

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

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

EXTRACTED BEAM PROPERTIES:
For 1500 μA of 72 MeV/u ions
$\Delta E/E$ 0.6 % $\Delta\phi$ 16 °rf
$\epsilon_n = \beta\gamma\epsilon$ x 1.5 πmm mrad, z 1.5 πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed m^2 Moveable m^2
Target Stations: No. Served At Same Time:
MAGNETIC SPECTROMETERS:
OTHER FACILITIES: Isotope production
see entry "PSI 590 MeV Ring Cyclotron"

REFERENCES/NOTES

(a)
(b)

PLAN VIEW OF FACILITY, COMMENTS

1) 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
2) See PSI 590 MeV Ring Cyclotron (this compilation)
3) Special coils outside vacuum chamber for correction of isochronism
4) RF-systems: two /2-resonators (50.6 MHz) for acceleration and two flattop cavities (151.8 MHz)