ENTRY NO. 64

NAME OF MACHINE SIN Injector Cyclotron II 1) Date: April 1984
INSTITUTION Swiss Institute for Nuclear Research
ADDRESS CH - 5234 Villigen, Switzerland
TEL (0)56 / 99 31 11 TELEX 5 46 40 sin ch
IN CHARGE U. Schryber REPORTED BY W. Joho / U. Schryber

HISTORY AND STATUS

DESIGN, date 1972 Model tests 1973/80
ENG DESIGN, date 1973/80
CONSTRUCTION, date 1978/83
FIRST BEAM, date (or goal) April 1984
MAJOR ALTERATIONS
COST, ACCELERATOR 22 MSFr.
COST, FACILITY, total 134 MSFr.
FUNDED BY Swiss Federal Government

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS ENGINEERS
TECHNICIANS CRAFTS
GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION hr/wk. On target hr./wk
TIME DISTR. in house % Outside %
BUDGET, op & dev
FUNDED BY
RESEARCH STAFF, not included above 2)
USERS, in house outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY

MAGNET

POLE FACE, diameter (compact) 760 cm, R extraction 370 cm
R injection 46 cm
GAP, min 3.5 cm, Field 11.0 kG
min 3.5 cm, Field 11.0 kG
at $3 \cdot 10^4$ Ampere turns
AVERAGE FIELD at R ext 3.3 kG
B max/ < B > 3.3
NUMBER OF SECTORS compact ; separated 4 ; Spiral, max 0 deg
SECTOR ANGLE (SSC) 27 deg
TRIMMING COILS 11 pairs per magnet 3)
CONDUCTOR, material and type OFHC-copper
STORED ENERGY (cryogenic) MJ
POWER: main coils 4x35 max, kW; current stability $5 \cdot 10^{-6}$
trimming coils tot.15 max, kW; current stability $5 \cdot 10^{-5}$
WEIGHT: Fe 4x180 tons; coils 4x0.96 tons
COOLING system demin. water
ION ENERGY (bending limit) E/A = 72 q²/a² MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 4) angle 18° (RF) 20° (geom.)
BEAM APERTURE 4 cm; DC Bias - kV
TUNED by, coarse - fine Trim. Cap.
RF 50.63 to - mHz, stable ± 10^{-6}
Orb F 5.063 to mHz
HARMONICS, RF/Orb F, used 10
DEE—Gnd, max 250 kV, min gap 3.0-16.0 cm
STABILITY, (pk-pk noise)/(pk RF volt) $3 \cdot 10^{-4}$
ENERGY GAIN, max 1000 kV/turn
RF PHASE, stable to ± < 0.01 deg
RF POWEP input, max incl.beam power 2x200 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE $1 \cdot 10^{-6}$ Torr or mbar
PUMPS, No, Type, Size 4 turbo-molecular pumps at 2000 l/s

REMARKS

1) Two stage accelerator for 72 MeV protons (see Proc. 9th Int. Conf. on Cycl. and their Applic. 1981, p. 43)
Stage 1: 860 keV DC preacc. (Cockcroft-Walton)
Stage 2: Isochronous ring cyclotron

INJECTION SYSTEM

Axial, at 860 keV, magn. cone with n=0.6

EXTRACTION SYSTEM

2 septum magnets 5.5° and 39.5°

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m²; movable 2) m²
TARGET STATIONS in
STATIONS served at same time, max
MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	72		>1000 μA	>1000 μA
SECONDARY (part/s)				

BEAM PROPERTIES

GOAL AT 1000 μA CONDITIONS

PULSE WIDTH 36 RF deg ..... pμ A of ..... MeV ..... ions
PHASE EXC. max ..... RF deg ..... pμ A of ..... MeV ..... ions
EXTRACT eff 100 % ..... pμ A of ..... MeV ..... ions
RESOL ΔE/E ≈0.2 % ..... pμ A of ..... MeV ..... ions
EMITTANCE (π mm. mrad) 2 axial ; 2 rad ..... pμ A of ..... MeV .....

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS ..... SOLID STATES PHYSICS .....
BIOMEDICAL APPLICAT ..... ISOTOPE PRODUCTIONS .....
INJECTION INTO 590 MeV RING CYCLOTRON 100 %
ISOTOPE PRODUCTION (≈ 100 μA) PARASITIC

REMARKS CONTD.

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

PLAN VIEW OF INJECTOR II