ENTRY NO. 76

NAME OF MACHINE SIN Injector Cyclotron 2 [1] Date: Sept. 1986

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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) cm, R-extraction cm

R injection 46 cm

GAP, min 3.5 cm, Field 11.0 kG

max 3.5 cm, Field 11.0 kG } at 3E4 Ampere turns

AVERAGE FIELD at R ext kG

B max/<B>

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 4.35 max kW; current stability 5E-6

trimming coils tot 15 max kW; current stability 5E-5

WEIGHT: Fe 4x180 tons; coils 4x0.96 tons

COOLING system demin. water

ION ENERGY (Bending limit) E/A = 72 q^2/A^2 MeV/amu

(Focusing limit) E/A = q/A MeV/amu

ACCELERATION SYSTEM

DEES, number 2 [4] angle 18°(RF) 20°(geom)

BEAM APERTURE cm; DC Bias kV

TUNED by, coarse -- fine Trim.cap.

RF 50.63 to -- MHz, stable ± E-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) 3E-4

ENERGY GAIN, max 1000 kV/turn

RF PHASE, stable to ± <0.01 deg

RF POWER input, max. incl. beam power 2x200 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 1E-6 Torr or mbar

PUMPS, No, Type, Size 4 turbo-molecular pumps 2200 l/s each

ION SOURCES

Cusp type, in Cockcroft-Walton preaccelerator

INJECTION SYSTEM

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

EXTRACTION SYSTEM

2 septum magnets with 5.5° and 39.5°

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m^2; movable m^2

TARGET STATIONS in rooms

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	72	>1000 μA	>1000 μA
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS			
PULSE WIDTH	20 RF deg	1000	pμA of	MeV	ions
PHASE EXC. max	RF deg		pμA of	MeV	ions
EXTRACT eff	99.8%	1000	pμA of	MeV	ions
RESOL ΔE/E	0.6%	1000	pμA of	MeV	ions
EMITTANCE					
(π mm-mrad)	∿3 axial	200	pμA of	MeV	
	∿3 rad				

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS

BIOMEDICAL APPLICAT ∿20% ISOTOPE PRODUCTIONS ∿20%

Injection into 590 MeV Ring Cyclotron 100%

Biomed. Applic. and isotope prod. parasitic

REFERENCES/NOTES

PLAN VIEW OF FACILITY, COMMENTS, ETC.

PLAN VIEW OF FACILITY: see "SIN 590 MeV Ring Cycl."

COMMENTS:

1) Two stage accelerator for 72 MeV protons
(see Proc. 9th Inst. Conf. on Cyclotrons and their Application, (1981), 43)

Stage 1: 870 keV DC preacc. (Cockcroft-Walton)
Stage 2: Isochronous ring cyclotron

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)