ENTRY No. 57

NAME OF MACHINE MINICYCLOTRON MC40 DATE 1981-07-07
INSTITUTION INSTRUMENT AB SCANDITRONIX
ADDRESS HUSBYBORG S-755 90 UPPSALA SWEDEN
TEL (0)18 - 15 24 40 TELEX 76048 SCX S
IN CHARGE STIG LINDBACK REPORTED BY STIG LINDBACK

HISTORY AND STATUS

DESIGN, date 1974 Model tests 1974
ENG DESIGN, date 1974-1975
CONSTRUCTION, date 1974-1976
FIRST BEAM, date (or goal) 1976
MAJOR ALTERATIONS

COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY

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

USERS, in house outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY

MAGNET

POLE FACE, diameter (compact) 130 cm, R extraction 50 cm
R injection - cm
GAP, min 10 cm, Field 21.3 kG
max 18 cm, Field 13.2 kG } at 241.000 Ampere turns
AVERAGE FIELD at R ext 17.9 kG
B max/ <B> 1.19
NUMBER OF SECTORS { compact 3 / separated - } Spiral, max 45 deg
SECTOR ANGLE (SSC) - deg
TRIMMING COILS 8 concentric gradient coils
4 sets of harmonic coils
CONDUCTOR, material and type Cu, indirectly cooled
STORED ENERGY (cryogenic) - MJ
POWER : main coils 130 max, kW ; current stability 10^{-5}
trimming coils 10 max, kW ; current stability 10^{-4}
WEIGHT : Fe 57 tons ; coils 2.8 tons
COOLING system Demineralized water
ION ENERGY (bending limit) E/A = 40 q^2/a^2 MeV/amu
(focusing limit) E/A = - q /a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 ; angle 90 deg
BEAM APERTURE 2 cm ; DC Bias 0 kV
TUNED by, coarse mov. short fine variable cond.
RF 12 to 27 mHz, stable ± 10^{-6}
Orb F 6 to 26.8 mHz
HARMONICS, RF/Orb F, used 1,2
DEE - Gnd, max 44 kV, min gap - cm
STABILITY, (pk-pk noise)/(pk RF volt) $<10^{-3}$
ENERGY GAIN, max 176 kV/turn
RF PHASE, stable to ± 0.5 deg
RF POWER input, max 60 kW
FREQUENCY MODULATION, rate - /s
modulator, type
beam pulse, width 15-20 deg

VACUUM SYSTEM

OPERATING PRESSURE $5 \cdot 10^{-6}$ Torr or mbar
PUMPS, No, Type, Size 2 oil diffusion pumps, Ø 400 ea
2 mechanical fore pumps

ION SOURCES

Internal cold cathode, axially mounted

INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic deflector, magn. focusing channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m² ; movable m²
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	9-40	9-40	> 500	65
d	4.5-20	4.5-20	> 500	65
He-3	9-40	9-40	> 100	30
He-4	7-53	7-53	> 100	30
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS		
PULSE WIDTH	13 RF deg	5	pμ A of 20 MeV	P ions
PHASE EXC, max	RF deg		pμ A of MeV	ions
EXTRACT eff	80 %	10	pμ A of 38 MeV	P ions
RESOL ΔE/E	0.36 %	1	pμ A of 30 MeV	P ions
EMITTANCE				
(π mm. mrad)	{ 16 axial / 10 rad }	5	pμA of 30 MeV	P ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

CONTROL: Conventional analog control or optionally computer control. Microprocessor based interlock system (including external interlocks)

Installations:
MEDI-PHYSICS CHICAGO (1979)
CCR EURATOM ISPRA (1981)
MEDI-PHYSICS CHICAGO (1981)
UNIVERSITY OF MILANO (1982)
UNIVERSITY OF TEXAS,HOUSTON (1982)

In addition the Model MC35 cyclotron has been installed at:

Medizinische Hochschule Hannover (1976)

University of Oslo (1979)