ENTRY NO. 15

NAME OF MACHINE Minicyclotron MC-20
INSTITUTION Department of Physics, University of Jyväskylä
ADDRESS Nisulankatu 78, SF-40100 Jyväskylä, Finland
TEL 358-41-292511 TELEX
IN CHARGE T. Poikolainen REPORTED BY T. Poikolainen

HISTORY AND STATUS

DESIGN, date 1968-69 Model tests 1968-69
ENG DESIGN, date 1969-71
CONSTRUCTION, date 1969-73
FIRST BEAM, date (or goal) 1974
MAJOR ALTERATIONS

COST, ACCELERATOR 2 500 000 FIM
COST, FACILITY, total 5 000 000 FIM
FUNDED BY Government of Finland

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS ENGINEERS 3
TECHNICIANS 1 CRAFTS 5
GRAD STUDENTS involved during year 2
OPERATED BY Research staff or - Operators
OPERATION 70 hr/wk. On target 55 hr./wk
TIME DISTR. in house 1) % Outside 1) %
BUDGET, op & dev 1 800 000 FIM
FUNDED BY Government of Finland

RESEARCH STAFF, not included above

USERS, in house 25 outside 15
GRAD STUDENTS involved during year 10
RESEARCH BUDGET, in house 2 300 000 FIM
FUNDED BY Government of Finland

MAGNET

POLE FACE, diameter (compact) 90 cm, R extraction 39 cm
R injection cm
GAP, min 6.5 cm, Field 20.5 kG
min 16.5 cm, Field 13.7 kG at 300 000 Ampere turns
AVERAGE FIELD at R ext 17.1 kG
B max/ < B > 1.2
NUMBER OF SECTORS compact 4 Spiral, max 48 deg
separated
SECTOR ANGLE (SSC) deg
TRIMMING COILS 4 in valleys and 8 circular

CONDUCTOR, material and type copper
STORED ENERGY (cryogenic) MJ
POWER: main coils 90 max, kW; current stability 2×10^{-5}
trimming coils 6 max, kW; current stability
WEIGHT: Fe 19.5 tons; coils 1 tons
COOLING system Demineralized water
ION ENERGY (bending limit) E/A = 20 q^2/a^2 MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 90 deg
BEAM APERTURE 1.8 cm; DC Bias kV
TUNED by, coarse MS fine VC
RF 10.5 to 25.6 mHz, stable ±
Orb F 5.3 to 25.6 mHz
HARMONICS, RF/Orb F, used 1 and 2
DEE—Gnd, max 30 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10^{-3}
ENERGY GAIN, max 120 kV/turn
RF PHASE, stable to ± 0.5 deg
RF POWEP input, max 50 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 10^{-5} Torr or mbar
PUMPS, No, Type, Size 2 oil diffusion pumps
2·5000 l/s

ION SOURCES

Internal cold cathode penning, dc-extract.

INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic deflector and magnetic channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 100 m²; movable m²
TARGET STATIONS 6 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model PDP 11/45 and PDP 11/44
OTHER FACILITIES In-beam gamma and electron spectrometer, on line mass separator

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	2.5-20	4.8-20.4	200	10
d	1.5-10	6 -10.2	200	10
^{3}He	2.5-27	11 -27.6	3	1
α	2.5-20	6 -20.4	3	1
SECONDARY		(part/s)		

BEAM PROPERTIES

	MEASURED	CONDITIONS
PULSE WIDTH	RF deg	pμ A of MeV ions
PHASE EXC. max	RF deg	pμ A of MeV ions
EXTRACT eff	35 %	4 pμ A of 13 MeV p ions
RESOL ΔE/E	0.5 %	1 pμ A of 20 MeV α ions
EMITTANCE (π mm. mrad)	axial / rad	pμ A of MeV

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 65 % SOLID STATES PHYSICS 15 %
BIOMEDICAL APPLICAT ISOTOPE PRODUCTIONS
Activations 5 % Development 15 %

REFERENCES/NOTES

1) No distinction made
2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.