ENTRY NO. 18

NAME OF MACHINE: Minicyclotron MC-20
INSTITUTION: Department of Physics, University of Jyväskylä
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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: New central region and ion source 1985 (RF-extraction)
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: ~ 2 000 000 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: 2 500 000 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
max: 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, separated; Spiral, max: 48 deg
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 x 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 angle: 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 POWER 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, 5000 ℓ/s

ION SOURCES

Internal cold cathode penning, RF-extraction

INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic deflector and magnetic channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed: 100 m²; movable: m²
TARGET STATIONS: 5 in: 3 rooms
STATIONS served at same time, max: 1
MAG SPECTROGRAPH, type:
COMPUTER model: VAX 11/750, PDP 11/44, PDP 11/45
OTHER FACILITIES: On line mass separator, in-beam electron spectrometers

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	6-20.5	5	2
SECONDARY			(part/s)	

BEAM PROPERTIES

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

OPERATING PROGRAMS, time distribution

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

REFERENCES/NOTES

1) No distinction made
2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.