ENTRY NO. 62

NAME OF MACHINE . Eindhoven . AVF . cyclotron
INSTITUTION . Eindhoven . University . of . Technology
ADDRESS . Cyclotron . laboratory, . EUT, . Eindhoven, . The . Netherlands
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IN CHARGE . H.L. . Hagedoorn . REPORTED BY . J.I.M. . Botman

HISTORY AND STATUS

DESIGN, date . 1960 . Model tests . 1960
ENG DESIGN, date . 1961-1962
CONSTRUCTION, date . 1962- . 1963
FIRST BEAM, date (or goal) . april . 1963
MAJOR ALTERATIONS . moved . to . EUT . 1968
COST, ACCELERATOR . gift . from . Philips
COST, FACILITY, total . M$. 3 . (1968)
FUNDED BY . EUT

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS . 1 . ENGINEERS . 2
TECHNICIANS . 3 . CRAFTS
GRAD STUDENTS involved during year . 1
OPERATED BY . 1 . Research staff or . 1 . Operators
OPERATION . 70 . hr/wk. On target . 50 . hr/wk
TIME DISTR. in house . 100 . %, outside . %
BUDGET, op & dev . k$. 50
FUNDED BY . EUT

RESEARCH STAFF, not included above

USERS, in house . 10 . outside
GRAD STUDENTS involved during year . 20
RESEARCH BUDGET, in house . k$. 85
FUNDED BY . EUT

MAGNET

POLE FACE, diameter (compact) . 130 . cm, R-extraction . 52 . cm
R injection . 2 . cm
GAP, min . 15 . cm, Field . 20 . kG
max . 30 . cm, Field . 10 . kG } at . 4 x 10^6
AVERAGE FIELD at R ext . 15 . kG Ampere turns
B max/<B> . 1.3
NUMBER OF SECTORS { compact . 3 / separated } Spiral, max 35 deg
SECTOR ANGLE (SSC) . deg
TRIMMING COILS . 10 . pairs . of . circular . correction . coils
. 3 . sets . of . harmonic . coils
CONDUCTOR, material and type . Al
STORED ENERGY (cryogenic) . MJ
POWER: main coils . 130 . max kW: current stability . 10^{-5}
trimming coils . 20 . max kW: current stability . 10^{-5}
WEIGHT: Fe . 80 . tons: coils . 10 . tons
COOLING system . water
ION ENERGY (Bending limit) E/A = . 30 . q^2/A^2 MeV/amu
(Focusing limit) E/A = . q/A MeV/amu

ACCELERATION SYSTEM

DEES, number . 1 . angle . 180 . deg
BEAM APERTURE . 2 . cm; DC Bias . 0.7 . kV
TUNED by, coarse . MS . fine . VC
RF . 5 . to . 23.3 . MHz, stable ± . 10^{-5}
Orb F . 5 . to . 23.3 . MHz
HARMONICS, RF/Orb F, used . 1,3
DEE–Gnd, max . 50 . kV, min gap . 0.8 . cm
STABILITY, (pk-pk noise)/(pk RF volt) . 10^{-5}
ENERGY GAIN, max . 100 . kV/turn
RF PHASE, stable to ± . 1 . deg
RF POWER input, max. . 100 . kW
FREQUENCY MODULATION, rate . /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE . 10 . Torr or mbar
PUMPS, No, Type, Size . 1, . oil . diffusion, . 8000 . l/sec

ION SOURCES

. internal . Livingston . type

INJECTION SYSTEM

EXTRACTION SYSTEM

. electrostatic, . 80°, . 60 . kV/4mm, . followed . by . magnetic

FACILITIES FOR RESEARCH

channel
SHIELDED AREA, fixed . 120 . m^2; movable . 230 . m^2
TARGET STATIONS . 6 . in . 6 . rooms
STATIONS served at same time, max . 1
MAG SPECTROGRAPH, type
COMPUTER model . PDP . 11/73, . VAX
OTHER FACILITIES . isotope . production
. PIXE . analysis . facility
. micro . beam

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p		2.5÷29.5	500	50
d		3 ÷ 15	500	50
^{4}He		6 ÷ 30	50	30
^{3}He		5 ÷ 40	50	30
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS
PULSE WIDTH . 36 . RF deg	. . . .	pμA of . . . . MeV . . . . . ions
PHASE EXC. max 5 . RF deg	. . . .	pμA of . . . . MeV . . . . . ions
EXTRACT eff . . 80 . %	. . . .	pμA of . . . . MeV . . . . . ions
RESOL ΔE/E . . 0.3 %	. . . .	pμA of . . . . MeV . . . . . ions
EMITTANCE		
(π mm-mrad) 10÷20 axial		
10÷20 rad	. 5 .	xpμA of . . 20 MeV . protons

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS . . . . SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. . . 5 . . ISOTOPE PRODUCTIONS . . . 60 . .
. PIXE . 10, . microbeam . . 10 . Ruth. . back . scatt. . 15

REFERENCES/NOTES

1) Schutte, EUT thesis (1973)
2) Van Heusden, EUT thesis (1976)
3) Botman, EUT thesis (1981)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

. Minicyclotron ILEC (3 MeVp) under construction
. Proposal for mini electron/proton ring EUTERPE