ENTRY No. 46

NAME OF MACHINE Eindhoven AVF cyclotron DATE aug. 1981
INSTITUTION Eindhoven University of Technology (EUT)
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 2 CRAFTS
GRAD STUDENTS involved during year 1
OPERATED BY Research staff or 1 Operators
OPERATION 70 hr/wk, On target 50 hr/wk
TIME DISTR. in house 100 %, Outside %
BUDGET, op & dev k$40
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
AVERAGE FIELD at R ext 15 kG
} at 0.4×10^{6} 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
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

trochoidal median plane injector for polarized protons

EXTRACTION SYSTEM

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

FACILITIES FOR RESEARCH

channel
SHIELDED AREA, fixed 120 m² ; movable 230 m²
TARGET STATIONS 6 in 6 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model PDP 11
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 pμ A of MeV ions
PHASE EXC, max 5 RF deg pμ A of MeV ions
EXTRACT eff 80 % pμ A of MeV ions
RESOL ΔE/E 0.3 % pμ A of MeV ions
EMITTANCE
(π mm. mrad) { 10-20 axial / 10-20 rad } 5 pμA of 20 MeV H ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 40 SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 20
PIXE 10, microbeam 20, development and
machine research 10

REFERENCES/NOTES

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

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS