ENTRY No. 45

NAME OF MACHINE Delft Isochronus Cyclotron DATE 3 July 1981
INSTITUTION Delft University of Technology, Department of Electrical Engineering
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IN CHARGE W.A. van Kampen REPORTED BY J. Liedorp

HISTORY AND STATUS
DESIGN, date 1955 Model tests none
ENG DESIGN, date 1955/1957 1966/1968
CONSTRUCTION, date 1955/1957 1967/1969
FIRST BEAM, date (or goal) 1957 1969
MAJOR ALTERATIONS 1966 1974
COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY government

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS 2 ENGINEERS
TECHNICIANS 1 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 government

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) 85 cm, R extraction 38 cm
R injection cm
GAP, min 9 cm, Field 16 kG; max 15 cm, Field 10 kG; AVERAGE FIELD at R ext 13.5 kG — at 156x10^6 Ampere turns
B max/ <B> 1.12
NUMBER OF SECTORS compact 4, separated — Spiral, max 37 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS
CONDUCTOR, material and type Al
STORED ENERGY (cryogenic) MJ
POWER: main coils 24 max, kW ; current stability 10^{-4}
trimming coils 1 max, kW ; current stability
WEIGHT : Fe 26 tons ; coils 1.65 tons
COOLING system water
ION ENERGY (bending limit) E/A = 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 - 3 kV
TUNED by, coarse short fine moving panel
RF 20.2 to 20.9 mHz, stable ± 10^{-5}
Orb F 20.6 to mHz
HARMONICS, RF/Orb F, used
DEE - Gnd, max 30 kV, min gap cm
STABILITY, (pk-pk noise)/(pk RF volt)
ENERGY GAIN, max kV/turn
RF PHASE, stable to ± deg
RF POWER input, max 50 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM
OPERATING PRESSURE 2 x 10^{-6} Torr or mbar
PUMPS, No, Type, Size oil diffusion pump

ION SOURCES
duoplasmatron

INJECTION SYSTEM
Precession Injection

EXTRACTION SYSTEM

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	ENERGY (MeV) Achieved	CURRENT (pμA) Internal	CURRENT (pμA) External
p	12.7	12.7	100	

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	%	pμ A of MeV ions
RESOL ΔE/E	%	pμ A of MeV ions
EMITTANCE (π mm. mrad)	axial / rad	pμA of MeV ions

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

W.A. van Kampen and J.Liedorp, Experientia Suppl. (Zürich)24(1975)254.
W.A. van Kampen and J.Liedorp, Nucl.Instr.and Meth. 140(1977)219.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS
1966: the magnetic field and the r.f.system redesigned to incorporate spiral ridge magnet poles and externally excited r.f.system.
1974: cyclotron magnet central region and dee at the central region modified for precession injection.
1975 July: 110μA protons accelerated up to 12MeV with external ion source and precession injection.
1976/1978: beam line between pre-accelerator and cyclotron equipped with slits and a chopping system.
1979 operation ended.
1981 plans exist to use machine as antiproton decelerator at CERN.

notes:
1 from the original cyclotron, which was the first AVF proton cyclotron to operate, the magnet yoke, magnet excitation and windings and the vacuum chamber are still the same.
2 data given refer to the cyclotron with precession injection.