ENTRY NO. 42

NAME OF MACHINE Delft Isochronous Cyclotron DATE 7/31/78
INSTITUTION Delft University of Technology, Dept. of Electrical Eng.
ADDRESS Kanaalweg 2B, Delft

IN CHARGE W.A. van Kampen REPORTED by J.Liedorp

HISTORY AND STATUS

DESIGN, date 1955 MODEL tests none
ENG. DESIGN, date 1955-57 1966-68
CONSTRUCTION, date 1955-57 1967-69
FIRST BEAM date (or goal) 1957 1969
MAJOR ALTERATIONS 1966 1974

OPERATION, _____ hr/wk; On Target _____ hr/wk
TIME DIST., in house 100 %, outside _____ %
USERS' SCHEDULING CYCLE _____ weeks
COST, ACCELERATOR _____
COST, FACILITY, total _____
FUNDED BY government

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS _____
TECHNICIANS 2 CRAFTS _____
GRAD STUDENTS involved during year _____
OPERATED BY _____ Res staff or _____ Operators
BUDGET, op & dev _____
FUNDED BY _____

RESEARCH STAFF, not included above

USERS, in house _____ outside _____
GRAD STUDENTS involved during year _____
RES. BUDGET, in house _____
FUNDED BY _____

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed _____ m^2
movable _____ m^2
TARGET STATIONS _____ in _____ rooms
STATIONS served at same time, max _____
MAG SPECTROGRAPH, type _____
COMPUTER, model _____
OTHER FACILITIES _____

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.

MAGNET

POLE FACE diameter 85 cm; R extraction 38 cm
GAP, min 9 cm; Field 10 kG
max 15 cm; Field 16 kG
AVERAGE FIELD at R ext 13.5 kG
} at .156 X 10^6 ampere turns
CURRENT STABILITY 100 parts/10^6; $B_{max}/\langle B \rangle$ 1.12
NUMBER OF SECTORS 4 ; SPIRAL, max 37 deg
POLE FACE COIL PAIRS: AVF _____ /sec;
Harmonic correction 3
Rad grad _____ /sec or Circ coils 3
WEIGHT: Fe 26 tons; Coils 1.65 tons
CONDUCTOR, Material and type Al
STORED ENERGY _____ MJ
COOLING SYSTEM water
POWER: Main coils 24 max, kW
Trimming coils 1 max, kW
YOKE/POLE AREA _____ %
SECTOR ANGLE (Sep Sec) _____ deg
ION ENERGY (Bending limit) E/A = _____ q^2/A^2 MeV
(Focusing limit) E/A = _____ q/A MeV

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 /10^6
Orb F 20.6 to _____ mHz; GAIN, max 60 kV/turn
HARMONICS, RF/Orb F, used _____
DEE-Gnd, max 30 kV, min gap _____ cm
STABILITY, (pk-pk noise)/(pk RF volt) _____
RF PHASE stable to ± _____ deg
RF POWER input, max 50 kW
RF PROTECT circuit, speed _____ μsec
Type _____
FREQUENCY MODULATION, rate _____ /sec
MODULATOR, type _____
BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size oil diffusionpump
OPERATING PRESSURE 2 μTorr,
PUMPDOWN TIME 2 hrs

ION SOURCES/INJECTION SYSTEM

~~duoplasmatron, precession injection~~

EXTRACTION SYSTEM

CONTROL SYSTEM

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	12.7	12.7
CURRENT		(μA)	(μA)
Internal	p	100	110
External			
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured	Conditions
Pulse Width	____ RF deg	____ μA of ____ MeV ____
Phase Exc, max	____ RF deg	____ μA of ____ MeV ____
Extract Eff	____ %	____ μA of ____ MeV ____
Res, ΔE/E	____ %	____ μA of ____ MeV ____
Emittance		
(mm-mrad) { ____ axial / ____ radial }		____ μA of ____ MeV ____

OPERATING PROGRAMS, time dist

Basic Nuclear Physics ____ %
Solid State Physics ____ %
Bio-Medical Applications ____ %
Isotope Production ____ %
Development 100 %
____ %
____ %

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

1966: the magnet 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,
a 200 keV proton injector giving 10mA protons in operation.

july 1975: 110 μA protons accelerated up to 12MeV with external ion source and precession injection.

1976-78: beam line between preaccelerator and cyclotron equipped with slits and a chopping system to inject beampulses,small in time and space,at various places and times into the cyclotron. Measuring the resultant betatronmotions in the main mode of the cyclotron.

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