ENTRY NO. 41

NAME OF MACHINE Isochronous Cyclotron Free University Amsterdam DATE Jan. 1979
INSTITUTION Natuurkundig Laboratorium van de Vrije Universiteit
ADDRESS De Boelelaan 1081, Amsterdam-Buitenveldert, The Netherlands

IN CHARGE J. Blok REPORTED by J. Rethmeier

HISTORY AND STATUS

DESIGN, date _____ MODEL tests _____
ENG. DESIGN, date _____
CONSTRUCTION, date _____
FIRST BEAM date (or goal) April 1965
MAJOR ALTERATIONS _____

OPERATION, 100 hr/wk; On Target 40 hr/wk
TIME DIST., in house 90 %, outside 10 %
USERS' SCHEDULING CYCLE 2 weeks
COST, ACCELERATOR _____
COST, FACILITY, total Dfl. 6 10^6 (1965)
FUNDED BY Free University

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 2 ENGINEERS 1
TECHNICIANS 3 CRAFTS 5
GRAD STUDENTS involved during year 1
OPERATED BY night Res staff or day Operators
BUDGET, op & dev Dfl. 100.000,-
FUNDED BY Free Unsiversity

RESEARCH STAFF, not included above

USERS, in house 15 outside 2
GRAD STUDENTS involved during year 15
RES. BUDGET, in house _____
FUNDED BY _____

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 235 m^2
movable _____ m^2
TARGET STATIONS 7 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type ENGE-SPLIT POLE
COMPUTER, model HP-3000
OTHER FACILITIES Rabbit-system for on-line Mass-separation
PIXE-facility
Momentum analyzing system $\Delta E/E$
Burst-suppression $3\ 10^{-4}$

REFERENCES/NOTES

Los Angelos Cycl. Conf. '62 p. 88
CERN Cycl. Conf. '63 p 43, 214
Nucl.Instr.Meth. '68 (1969)135

MAGNET

POLE FACE diameter 140 cm; R extraction 57 cm
GAP, min 16 cm; Field 20 kG } at 0,2 X 10^6 ampere turns
max 32 cm; Field 10 kG
AVERAGE FIELD at R ext 15 kG
CURRENT STABILITY 10 parts/10^6; $B_{max}/\langle B \rangle$ 1.33
NUMBER OF SECTORS 3 ; SPIRAL, max 37 deg
POLE FACE COIL PAIRS: AVF 3 /sec;
Harmonic correction _____
Rad grad _____ /sec or Circ coils 10
WEIGHT: Fe 100 tons; Coils 20 tons
CONDUCTOR, Material and type Aluminium
STORED ENERGY _____ MJ
COOLING SYSTEM Demineralized water
POWER: Main coils 140 max, kW
Trimming coils 32.5 max, kW
YOKE/POLE AREA 106 %
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 2,8 cm; DC BIAS 0,3 VAR. kV
TUNED by, coarse short.Pl. fine VAR.CAP.
RF 5 to 22 mHz, stable ± 1 /10^6
Orb F5 to 22 mHz; GAIN, max 100 kV/turn
HARMONICS, RF/Orb F, used 1,3
DEE-Gnd, max 50 kV, min gap 2-3 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10
RF PHASE stable to ± 1,5 deg
RF POWER input, max 85 kW
RF PROTECT circuit, speed _____ μsec
Type _____
FREQUENCY MODULATION, rate - /sec
MODULATOR, type _____
BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size 3 H.V. Oil Diff. 10.000L/sec. roots 400 m^3/hr. M.V. Pump 170 m^3/Hr.
OPERATING PRESSURE 1,5 μTorr,
PUMPDOWN TIME 1,5 hrs

ION SOURCES/INJECTION SYSTEM

Internal Livingston

EXTRACTION SYSTEM

Electrostatic + magnetic channel

CONTROL SYSTEM

HARDWARE

ENTRY NO. 41 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	33	30
	d	16	16,7
	α	33	33
CURRENT		(μA)	(μA)
Internal	p		≥300
	d		300
	He^3, He^4		8
External	p		50
	d		30
	He^3, He^4		5
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	30-2	RF deg	5	μA of 12	MeV	d
Phase Exc, max		RF deg		μA of	MeV	
Extract Eff	70 %		10	μA of 12	MeV	p
Res, ΔE/E	0.3 %			μA of 20	MeV	p
Emittance						
(mm-mrad) { 15 axial / 15 radial }				μA of 12	MeV	p

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	80 %
Solid State Physics	0 %
Bio-Medical Applications	5 %
Isotope Production	5 %
Development	10 %
	%
	%

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