

ENTRY NO. 47

CSIR Pretoria Cyclotron

July 24, 78

NAME OF MACHINE _____ DATE _____
 INSTITUTION Council for Scientific and Industrial Research (CSIR)
 ADDRESS P O Box 395, Pretoria 0001, Republic of South Africa
 IN CHARGE S J Mills REPORTED BY A A Cowley

HISTORY AND STATUS

DESIGN, date 1950 MODEL tests -
 ENG. DESIGN, date 1951 - 1953
 CONSTRUCTION, date 1953 - 1958
 FIRST BEAM date (or goal) 1958
 MAJOR ALTERATIONS (See below $\frac{3}{4}$)
 OPERATION, 136 hr/wk; On Target 110 hr/wk
 TIME DIST., in house 100 %, outside 0 %
 USERS' SCHEDULING CYCLE 4 weeks
 COST, ACCELERATOR _____
 COST, FACILITY, total R200 000 (1958)
 FUNDED BY CSIR

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
 TECHNICIANS 5 CRAFTS ~ 2
 GRAD STUDENTS involved during year 0
 OPERATED BY _____ Res staff or 5 Operators
 BUDGET, op & dev _____
 FUNDED BY CSIR

RESEARCH STAFF, not included above

USERS, in house 7 outside 0
 GRAD STUDENTS involved during year 1
 RES. BUDGET, in house _____
 FUNDED BY CSIR

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 150 m²
 movable None m²
 TARGET STATIONS 4 in 2 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type _____
 COMPUTER, model Varian V 73
 OTHER FACILITIES Facility for Isotope
 Production

REFERENCES/NOTES

Nucl. Inst. & Meth., 3,323 (1958)
 Nucl. Inst. & Meth., 8,261 (1960)

MAGNET

POLE FACE diameter 112 cm; R extraction 49.5 cm
 GAP, min 14.7 cm; Field 17.7 kG } at 0.32 x 10⁶
 max 15.9 cm; Field 16.4 kG } ampere turns
 AVERAGE FIELD at R ext 17.7 kG
 CURRENT STABILITY 200 parts/10⁶; B_{max}/(B) _____
 NUMBER OF SECTORS 3; SPIRAL, max 0 deg
 POLE FACE COIL PAIRS: AVF _____ /sec;
 Harmonic correction 3
 Rad grad _____ /sec or Circ coils 2
 WEIGHT: Fe 73.8 tons; Coils 5.4 tons
 CONDUCTOR, Material and type Aluminium
 STORED ENERGY 0,2 MJ
 COOLING SYSTEM Water
 POWER: Main coils 70 max, kW
 Trimming coils 2 max, kW
 YOKE/POLE AREA 115 %
 SECTOR ANGLE (Sep Sec) - deg
 ION ENERGY (Bending limit) E/A = 32 q²/A² MeV
 (Focusing limit) E/A = ~ 15 q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 140 deg
 BEAM APERTURE 5 cm; DC BIAS - kV
 TUNED by, coarse MS fine VC, AUTO
 RF 10.8 to 17.4 MHz, stable \pm 10 /10⁶
 Orb F 10.8 to 17.4 MHz; GAIN, max 280 kV/turn
 HARMONICS, RF/Orb F, used 1
 DEE-Gnd, max 72 kV, min gap 1 cm
 STABILITY, (pk-pk noise)/(pk RF volt) -
 RF PHASE stable to \pm _____ deg
 RF POWER input, max 40 kW
 RF PROTECT circuit, speed 1000 μ sec
 Type Rectifier Cut-off
 FREQUENCY MODULATION, rate _____ /sec
 MODULATOR, type _____
 BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size 2 Diffusion HV,
2 Roughing
 OPERATING PRESSURE 50 μ Torr,
 PUMPDOWN TIME 5 hrs

ION SOURCES/INJECTION SYSTEM

Internal hot cathode ion source.

EXTRACTION SYSTEM

D C Electrostatic with 1st harmonic
 bump

CONTROL SYSTEM

Manual

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	8	5.8-15.3
	d	16	11.5-17.3
	³ He		18-38
	⁴ He	32	23-34.6
CURRENT		(μA)	(μA)
	Internal		
	p		700
	d		700
	³ He, ⁴ He		150
External	p		60
	d		60
	³ He, ⁴ He		50
Secondary		(part/s)	(part/s)

BEAM PROPERTIES

	Measured	Conditions
Pulse Width	— RF deg	— μA of — MeV —
Phase Exc, max	— RF deg	— μA of — MeV —
Extract Eff	30 %	60 μA of 16 MeV d
Res, ΔE/E	— %	— μA of — MeV —
Emittance	(mm-mrad) { — axial } — μA of — MeV — — radial	

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	20 %
Solid State Physics	0 %
Bio-Medical Applications,	
Isotope Production }	70 %
Development	10 %
	%
	%

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

During 1960 Thomas shims were installed in order to improve the vertical focussing.

The cyclotron has been modified for variable-energy operation and for acceleration of ³He-ions during 1969. A ³He-recovering system has been installed.