ENTRY NO. 71

NAME OF MACHINE: NAC Separated-Sector Cyclotron

INSTITUTION: National Accelerator Centre, Council for Scientific and Industrial Research

ADDRESS: P O Box 72, Faure, 7131, Republic of South Africa

TEL: 024-43820 TELEX: 5-22202 SA

IN CHARGE: D Reitmann REPORTED BY: A H Botha

HISTORY AND STATUS

DESIGN, date: 1977 Model tests:

ENG DESIGN, date: 1978

CONSTRUCTION, date: 1979

FIRST BEAM, date (~~or goal~~): October 1985

MAJOR ALTERATIONS: -

COST, ACCELERATOR:

COST, FACILITY, total:

FUNDED BY: CSIR

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS: 12 ENGINEERS: 18

TECHNICIANS: 33 CRAFTS: 6

GRAD STUDENTS involved during year:

OPERATED BY: 6 Research staff or Operators

OPERATION: hr/wk. On target hr/wk

TIME DISTR. in house %, outside %

BUDGET, op & dev:

FUNDED BY:

RESEARCH STAFF, not included above

USERS, in house outside

GRAD STUDENTS involved during year:

RESEARCH BUDGET, in house:

FUNDED BY: CSIR

MAGNET

POLE FACE, diameter (compact): - cm, R-extraction: 443 cm

R injection: 101 cm

GAP, min: 6,6 cm, Field: 12,7 kG

max: cm, Field: kG } at 1,08 × 10^5 Ampere turns

AVERAGE FIELD at R ext: 5,2 kG

B max/<B>: 2,4

NUMBER OF SECTORS: compact -, separated 4 Spiral, max: 0 deg

SECTOR ANGLE (SSC): 34 deg

TRIMMING COILS: 29

CONDUCTOR, material and type: Copper, HC

STORED ENERGY (cryogenic): 1,5 MJ

POWER: main coils 700 max kW: current stability 10^{-5}

trimming coils 150 max kW: current stability 10^{-4}

WEIGHT: Fe 1400 tons: coils 5,8 tons

COOLING system: Demineralised water

ION ENERGY (Bending limit) E/A = 200 q^2/A^2 MeV/amu

(Focusing limit) E/A = 200 q/A MeV/amu

ACCELERATION SYSTEM

DEES, number: 2 angle: 51 deg

BEAM APERTURE: 3 cm; DC Bias: 0 kV

TUNED by, coarse: MS, VC fine: VC,AUTO

RF: 6 to 26 MHz, stable ±: 1 Hz

Orb F: 0,5 to 6,5 MHz

HARMONICS, RF/Orb F, used: 4 and 12

DEE–Gnd, max: 250 kV, min gap: 10 cm

STABILITY, (pk-pk noise)/(pk RF volt): 10^{-3}

ENERGY GAIN, max: 1000 kV/turn

RF PHASE, stable to ±: 0,1 deg

RF POWER input, max: 2 × 150 kW

FREQUENCY MODULATION, rate: - /s

modulator, type: -

beam pulse, width: -

VACUUM SYSTEM

OPERATING PRESSURE: 7×10^{-7} Torr or mbar

PUMPS, No, Type, Size: 4 Rotary vane 120 $m^3 h^{-1}$, 4 roots pumps 350 $m^3 h^{-1}$, 6 turbo pumps 2 $m^3 s^{-1}$ and 2 cryo-pumps 25 $m^3 s^{-1}$

ION SOURCES

-

INJECTION SYSTEM

Two dipoles and a magnetic channel in one pole-tip.

EXTRACTION SYSTEM

One electrostatic channel and two septum-magnets.

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed: 700 m^2; movable: 900 m^2

TARGET STATIONS: 9 in 9 rooms

STATIONS served at same time, max: 1

MAG SPECTROGRAPH, type: K = 600 QDD (under construction)

COMPUTER model:

OTHER FACILITIES:

1. Facility for Isotope Production
2. Facility for Radiotherapy

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	40 - 200	66,200	3	2,8 (at 66 MeV)
d	40 - 100			
^{3}He	40 - 300			
^{4}He	40 - 200			
SECONDARY			(part/s)	

BEAM PROPERTIES

	MEASURED		CONDITIONS			
PULSE WIDTH	15	RF deg	3	pμA of 66	MeV	H^+ ions
PHASE EXC. max		RF deg		pμA of	MeV	ions
EXTRACT eff	95	%	3	pμA of 66	MeV	H^+ ions
RESOL ΔE/E		%		pμA of	MeV	ions
EMITTANCE						
(π mm-mrad)		axial		pμA of	MeV	
		rad				

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS

BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

1) Proc. Ninth Int. Cycl. Conf., 33 (1981)
2) Proc. Tenth Int. Cycl. Conf., 263 (1984)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

The experimental facilities for basic nuclear research consist of a 1,5 m diameter scattering chamber, a three-armed γ-ray correlation table, a high-energy γ-ray detector, a k = 600 QDD spectrometer (under construction) and a beam swinger facility (presently being designed) for neutron time-of-flight measurements.

A 66 MeV isocentric system is available for neutron therapy.