

ENTRY NO. C53 Date October 31, 1995
 Name of Machine NAC Separated-Sector Cyclotron
 Institution National Accelerator Centre
 Address P. O. Box 72, Faure 7131, Republic of South Africa
 Tel (024) 843-3820 Telex --- Fax (024) 843-3525 E-MAIL ADRIAAN@NAC.AC.ZA
 In Charge: A. H. Botha Reported by: A. H. Botha

HISTORY
MILESTONE DATES:
 Design 1977 Model Tests
 Construction 1979 First Beam October 1985
DESIGN/CONSTRUCTION BY:
 in house Yes other various contracts
COST: Accelerator Facility
FUNDED BY: South African Government

STATUS
STAFF: Machine
 Scientists 15 Engineers 15
 Technicians 31 Students 2
 Research (in house/external)
 Scientists 23 / 62 Engineers - / -
 Technicians 11 / 0 Students 5 / 15
BUDGET: Machine Funded by S. A. Government
 Research Funded by S. A. Government

TIME DISTRIBUTION:
 Basic Research (in house/external) 16 % / 26 %
 Applied Program (in house/external) 3.5 % / 27 %
 Maintenance 11.5 % Development 3 %

MAGNET
POLE PARAMETERS:
 Diameter cm $R_{extract}$ 443 cm R_{inject} 101 cm
HILL PARAMETERS: Gap (min) 6.6 cm B_{max} 1.27 T
 (@ 1.08×10^5 AT) Gap (max) cm B_{min} T
VALLEY PARAMETERS: Gap (min) cm B_{max} T
 (@ AT) Gap (max) cm B_{min} T
AVERAGE FIELD: $\langle B \rangle_{min}$ T $\langle B \rangle_{max}$ 0.24 T
NUMBER OF SECTORS: compact/separated / 4
 sector angle 34 deg. spiral (max) 0 deg.
FIELD TRIMMING: Trim Coils 29
 Harmonic Coils 0
 Other 2 yoke coils on each of the 4 sectors
CURRENT: Main Coils 1600 Amps Stability 10^{-5}
 Trim Coils 500 Amps Stability 10^{-4}
 Stored Energy (cryogenic) 1.5 MJ
WEIGHT: Iron 1400 tons Conductor 5.8 tons
ION ENERGY: Bending Limit E/A = 220 q^2/A^2 MeV/u
 Focusing Limit E/A = 220 q/A MeV/u

ION SOURCE(S)

Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (π mm mrad)	Ion Species
(a)				
(b)				
(c)				
(d)				

INJECTION SYSTEM
 2 dipoles and a magnetic channel Efficiency 100 %

EXTRACTION SYSTEM
 1 electrostatic channel & 2 septum magnets Efficiency 100 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μ A)	
		Internal	External
(a) p	27 - 220	205	200 (66 MeV)
(b) d	35 - 40	2	2
(c) $^4\text{He}^{2+}$	10 - 12.5	2	2
(d) $^4\text{He}^{3+}$	30 - 50	2	2

Secondary Particles

	E (MeV)	part/sec
(a) $^{12}\text{C}^{3+}$	33.3	30 nA
(b) $^{12}\text{C}^{4+}$	4.8	65 nA
(c) $^{40}\text{Ar}^{8+}$	7	40 nA

EXTRACTED BEAM PROPERTIES:
 For 35 μ A of 66 MeV/u p ions
 $\Delta E/E$ 0.4 % $\Delta\phi$ 10 $^\circ$ rf
 $\epsilon_n = \beta\gamma\epsilon$ x 2.7 π mm mrad z 0.8 π mm mrad

FACILITIES FOR RESEARCH
SHIELDED AREA: Fixed: 700 m^2 Moveable: 900 m^2
 Target Stations: 7 No. Served At Same Time: 1
MAGNETIC SPECTROMETERS: k=600 QDD
OTHER FACILITIES: 66 MeV isocentric system for neutron therapy, a beam swinger for neutron time-of-flight measurements, a 1.5m scattering chamber, a neutron time-of-flight facility, a 3-armed γ correlation table

REFERENCES/NOTES
 (a) Proc. Eleventh Int. Conf. 9 (1986)
 (b) Proc. Twelfth Int. Conf. 80 (1989)

ACCELERATION SYSTEM
FUNDAMENTAL ACCELERATION:
 Description: 2 $\lambda/2$ resonators, push-push mode
 No. of Gaps/turn 4 Gap (max) dE/dn(max) 1 MeV/q
 Voltage (max) 0.25 MV Harmonic f_H/f_{ion} 4 and 12
 Freq. 6 to 26 MHz Power in(max) 2 x 0.15 MW
 Stability: Phase 0.1 deg. Voltage 10^{-3}
OTHER CAVITIES (Flattopping or otherwise):
 Description:
 Region of Influence: R_{min} cm R_{max} cm
 No. of Gaps/turn dE/dn(max) MeV/q
 Voltage (max) MV Harmonic f_H/f_{ion}
 Freq. MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM
OPERATING PRESSURE: 7×10^{-7} mbar
PUMPS: (No. and type) 4 Rotary vane $120\text{m}^3\text{h}^{-1}$, 4 Roots $350\text{m}^3\text{h}^{-1}$, 6 turbo pumps $2\text{m}^3\text{s}^{-1}$ and 2 cryopumps $5\text{m}^3\text{s}^{-1}$

PLAN VIEW OF FACILITY, COMMENTS

