

ENTRY No. 75

NAME OF MACHINE NAC Light-ion Injector DATE 05/05/1989
INSTITUTION National Accelerator Centre
ADDRESS P.O. Box 72, Faure, 7131, Republic of South Africa
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IN CHARGE D. Reitmann REPORTED BY A. H. Botha

HISTORY AND STATUS

DESIGN, date 1978 Model tests 1979 - 1980
ENG DESIGN, date 1978 - 1983
CONSTRUCTION, date 1980 - 1983
FIRST BEAM, date (or goal) December 1983
MAJOR ALTERATIONS

COST, ACCELERATOR R1.500.000
COST, FACILITY, total
FUNDED BY CSIR

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS ENGINEERS
TECHNICIANS CRAFTS
GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION hr/wk, On target hr/wk
TIME DISTR. in house % Outside %
BUDGET, op & dev
FUNDED BY CSIR

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) 116 cm, R extraction 47.6 cm
R injection 15.6 cm
GAP, min 29.0 cm, Field 12.3 kG } at 2.15×10^{15}
max 7.5 kG } Ampere turns
AVERAGE FIELD at R ext 9.8 kG
B max / 1.25

NUMBER OF SECTORS { compact 4 } Spiral, max 0 deg
separated

SECTOR ANGLE (SSC) deg
TRIMMING COILS Seven pairs of circular coils and two sets of harmonic coils

CONDUCTOR, material and type Copper, HC
STORED ENERGY (average) 0.1 MJ
POWER: main coils 50 max, kW; current stability 10^{-5}
trimming coils 2 max, kW; current stability 10^{-5}

WEIGHT: Fe 54.5 tons; coils 1.85 tons
COOLING system Demineralised water
ION ENERGY (bending limit) E/A = 8. q²/a² MeV/amu
(focusing limit) E/A = 8. q²/a² MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 90 deg
BEAM APERTURE 3 cm; DC Bias 0 kV
TUNED by, coarse MS fine VC, AUTO
RF 8.6 to 26 MHz, stable ± 1 Hz
Orb F 1.43 to 13 MHz
HARMONICS, RF/Orb F, used 2 and 6
DEE - Gnd, max 60 kV, min gap 0.6 (at puller) cm
STABILITY, (pk-pk noise)/(pk RF volt) 10
ENERGY GAIN, max 240 kV/turn
RF PHASE, stable to ± 0.1 deg
RF POWER input, max 2×25 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 1.5×10^{-5} Torr or mbar
PUMPS, No, Type, Size 1 Turbo $4.8 \text{ m}^3 \text{ s}^{-1}$, 1 Root
 $350 \text{ m}^3 \text{ h}^{-1}$, 1 Rotary Vane $60 \text{ m}^3 \text{ h}^{-1}$,
2 Cryo-pumps $5 \text{ m}^3 \text{ s}^{-1}$

ION SOURCES

Internal Hot Cathode Source, La B6 prelllet with W-filament

INJECTION SYSTEM

EXTRACTION SYSTEM

One Electrostatic channel and two magnetic channels.

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m²; movable m²
TARGET STATIONS in rooms
STATIONS served at same time, max
MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (μA)	
	Goal	Achieved	Internal	External
p	0.8 - 8	1.4 - 8	414	323
d	0.4 - 4	1.8 - 3.8	6	3
⁴ He ⁺	-	2.5	3	3
⁴ He ⁺⁺	0.8 - 8	7.5	5	3

SECONDARY (part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH 15 RF deg 100 μA of 3.14 MeV p ions
PHASE EXC, max 96 RF deg 100 μA of 3.14 MeV p ions
EXTRACT eff 96 % 100 μA of 3.14 MeV p ions
RESOL $\Delta E/E$ 0.9 % 100 μA of 3.14 MeV p ions
EMITTANCE

(π mm. mrad) { 6 axial } 100 μA of 3.14 MeV p ions
{ 12 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

- 1) Proc. Ninth Int. Cycl. Conf., 33, 129 (1981)
- 2) Proc. Tenth Int. Cycl. Conf., 67, 94, 373 (1984)
- 3) Proc. Twelfth Int. Cycl. Conf., 9 (1986)

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES,

COMMENTS