

ENTRY NO. 70 NAC Light-ion Injector  
 NAME OF MACHINE  
 INSTITUTION National Accelerator Centre, Council for Scientific and Industrial Research  
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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 4 ENGINEERS 1  
 TECHNICIANS 4 CRAFTS 2  
 GRAD STUDENTS involved during year 0  
 OPERATED BY 4 Research staff or 0 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 cm  
 GAP, min 15,6 cm, Field 12,3 kG  
 max 25,0 cm, Field 7,5 kG at  $2,15 \times 10^{+5}$   
 AVERAGE FIELD at R ext 9,8 kG Ampere turns  
 B max / < B > 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 (cryogenic) 0,1 MJ  
 POWER: main coils 90 max kW: current stability  $10^{-5}$   
 trimming coils 2 max kW: current stability  $10^{-4}$   
 WEIGHT: Fe 54,5 tons: coils 1,85 tons  
 COOLING system Demineralised water  
 ION ENERGY (Bending limit) E/A = 8 q<sup>2</sup>/A<sup>2</sup> MeV/amu  
 (Focusing limit) E/A = 8 q/A 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  $\pm 1$  Hz  
 Orb F 1,43 to 13 MHz  
 HARMONICS, RF/Orb F, used 2 and 6  
 DEE-Gnd, max 60 kV, min gap 0,5 cm  
 STABILITY, (pk-pk noise)/(pk RF volt)  $10^{-3}$   
 ENERGY GAIN, max 240 kV/turn  
 RF PHASE, stable to  $\pm 0,1$  deg  
 RF POWER input, max 2 x 25 kW  
 FREQUENCY MODULATION, rate /s  
 modulator, type  
 beam pulse, width

**VACUUM SYSTEM**

OPERATING PRESSURE  $10^{-6}$  Torr or mbar  
 PUMPS, No, Type, Size 1 Turbo 4,8 m<sup>3</sup>s<sup>-1</sup>, 1 Roots  
 350 m<sup>3</sup>h<sup>-1</sup>, 1 Rotary Vane 60 m<sup>3</sup>h<sup>-1</sup>,  
 2 Cryo-pumps 5 m<sup>3</sup>s<sup>-1</sup>

**ION SOURCES**

Internal Hot Cathode Source

**INJECTION SYSTEM**

**EXTRACTION SYSTEM**

One Electrostatic channel and two magnetic channels.

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed m<sup>2</sup>; movable m<sup>2</sup>  
 TARGET STATIONS in rooms  
 STATIONS served at same time, max  
 MAG SPECTROGRAPH, type  
 COMPUTER model  
 OTHER FACILITIES

**CHARACTERISTIC BEAMS**

| PARTICLE        | ENERGY (MeV) |           | CURRENT ( $\mu$ A) |          |
|-----------------|--------------|-----------|--------------------|----------|
|                 | Goal         | Achieved  | Internal           | External |
| p               | 0,8 - 8      | 2,7 - 8   | 200                | 10       |
| d               | 0,4 - 4      | 1,8 - 3,8 | 6                  | 3        |
| <sup>3</sup> He | 1,0 - 10,7   |           |                    |          |
| <sup>4</sup> He | 0,8 - 8      | 7,5       | 5                  |          |
| SECONDARY       |              |           | (part/s)           |          |

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH 15 RF deg 8  $\mu$ A of 8 MeV H<sup>+</sup> ions  
 PHASE EXC. max RF deg  $\mu$ A of MeV ions  
 EXTRACT eff. 100 % 10  $\mu$ A of 8 MeV H<sup>+</sup> ions  
 RESOL  $\Delta E/E$  0,1 % 10  $\mu$ A of 8 MeV H<sup>+</sup> ions  
 EMITTANCE

( $\pi$  mm-mrad) axial  
 rad  $\mu$ A of MeV

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS  
 BIOMEDICAL APPLICAT ISOTOPE PRODUCTIONS

**REFERENCES/NOTES**

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

**PLAN VIEW OF FACILITY, COMMENTS, ETC.**