ENTRY NO. 18

NAME OF MACHINE S.A.R.A.

INSTITUTION INSTITUT DES SCIENCES NUCLEAIRES

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IN CHARGE P. MARTIN / M. LIEUVIN REPORTED BY M. LIEUVIN

HISTORY AND STATUS

DESIGN, date 1976 Model tests 1977

ENG DESIGN, date 1977

CONSTRUCTION, date 1978 - 1981

FIRST BEAM, date (or goal) February 1982

MAJOR ALTERATIONS

COST, ACCELERATOR $ 1.6 . 10^6

COST, FACILITY, total $ 6 . 10^6

FUNDED BY I.N2.P3./C.N.R.S.

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 10

TECHNICIANS 30 CRAFTS 4

GRAD STUDENTS involved during year

OPERATED BY Research staff or Operators

OPERATION 144 hr/wk. On target 118 hr./wk

TIME DISTR. in house 50 % Outside 50 %

BUDGET, op & dev 6 . 10^5 $ (including injector)

FUNDED BY I.N2.P3./C.N.R.S.

RESEARCH STAFF, not included above

USERS, in house 40 outside 40

GRAD STUDENTS involved during year

RESEARCH BUDGET, in house

FUNDED BY

MAGNET

POLE FACE, diameter (compact) cm, R extraction cm

R injection <.88.> cm

GAP, min 6. cm, Field 16.5 kG
min cm, Field kG } at 100.10^3 Ampere turns

AVERAGE FIELD at R ext kG

B max/ < B >

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

SECTOR ANGLE (SSC) 48 deg

TRIMMING COILS 15 (+ 2 harmonics)

CONDUCTOR, material and type Copper 14 x 14 Ø 7

STORED ENERGY (cryogenic) MJ

POWER: main coils 400 max, kW; current stability 4.10^{-6}
trimming coils max, kW; current stability 5.10^{-5}

WEIGHT: Fe 400 tons; coils 5 tons

COOLING system water

ION ENERGY (bending limit) E/A = 160 q^2/a^2 MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 34 deg

BEAM APERTURE 3 cm; DC Bias kV

TUNED by, coarse 2 panels fine 10^{-6}

RF 21 to 32 mHz, stable ± 10

Orb F 3.5 to 8 mHz

HARMONICS, RF/Orb F, used 4, 5, 6

DEE—Gnd, max 100 kV, min gap 4 cm

STABILITY, (pk-pk noise)/(pk RF volt) 10^{-4}

ENERGY GAIN, max 400 kV/turn

RF PHASE, stable to ± .1 deg

RF POWEP input, max 2 x 60 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 5.10^{-7} Torr or mbar

PUMPS, No, Type, Size 6, oil diffusion, 5 000 l/s

ION SOURCES

See S.A.R.A. injector

INJECTION SYSTEM

Compact Cyclotron

EXTRACTION SYSTEM

Electrostatic inflector, septum magnet

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 300 m²; movable 500 m²

TARGET STATIONS 7 in 6

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type Narrow range 0.9 GeV/C

COMPUTER model PDP 11/10 for the machine

OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External	
^{12}C, ^{20}Ne		30 x A		4 x 10^{-2}	2
^{12}C, ^{20}Ne	40 x A	42 x A		1 x 10^{-2}	2
^{40}Ar		30 x A		1 x 10^{-3}	3
^{40}Ar	32 x A	36 x A		1 x 10^{-4}	4
SECONDARY		(part/s)			

BEAM PROPERTIES

MEASURED	CONDITIONS
PULSE WIDTH ∿ 10 RF deg	pμ A of MeV ions
PHASE EXC. max 20 RF deg	pμ A of MeV ions
EXTRACT eff 70 %	pμ A of MeV ions
RESOL ΔE/E 0.5 %	pμ A of MeV ions
EMITTANCE (π mm. mrad) { axial / rad }	pμ A of MeV

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 100% SOLID STATES PHYSICS

BIOMEDICAL APPLICAT ISOTOPE PRODUCTIONS

REFERENCES/NOTES

1) SARA, a low cost heavy ion accelerator for 10 to 40 MeV/A
2) IEEE transaction on nuclear science, vol. NS-30, n°4 August 1983.

PLAN VIEW OF FACILITY, COMMENTS, ETC.