

ENTRY NO. 21

NAME OF MACHINE S.A.R.A.
 INSTITUTION INSTITUT DES SCIENCES NUCLEAIRES
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 IN CHARGE P. MARTIN/M. FRUNEAU REPORTED BY P. MARTIN

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 . 10⁶
 COST, FACILITY, total \$ 6 . 10⁶
 FUNDED BY I.N2.P3./C.N.R.S.

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 9
 TECHNICIANS 28 CRAFTS 1
 GRAD STUDENTS involved during year 1
 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 7.10⁵ \$ (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 4
 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 }
 max cm, Field kG } at 100.10³
 AVERAGE FIELD at R ext kG } Ampere turns
 B max / < B >
 NUMBER OF SECTORS { compact } Spiral, max deg
 { separated 4 }
 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 5.10⁻⁶
 WEIGHT: Fe 400 tons: coils 5 tons
 COOLING system water
 ION ENERGY (Bending limit) E/A = 160 q²/A² MeV/amu
 (Focusing limit) E/A = q/A MeV/amu

ACCELERATION SYSTEM

DEES, number 2 angle 34 deg
 BEAM APERTURE 3 cm, DC Bias kV
 TUNED by, coarse 2 panels fine
 RF 21 to 32 MHz, stable ± 10⁻⁶
 Orb F 3.5 to 8 MHz
 HARMONICS, RF/Orb F, used 4, 5, 6
 DEE-Gnd, max 100 kV, min gap cm
 STABILITY, (pk-pk noise)/(pk RF volt) 10⁻⁴
 ENERGY GAIN, max 400 kV/turn
 RF PHASE, stable to ± 0.1 deg
 RF POWER 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 5.000.1/s

ION SOURCES

See S.A.R.A. Injector

INJECTION SYSTEM

Compact Cyclotron (see # 17)

EXTRACTION SYSTEM

Electrostatic inflector, septum magnet

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 300 m²; movable 500 m²
 TARGET STATIONS 7 in 5 rooms
 STATIONS served at same time, max 4
 MAG SPECTROGRAPH, type Narrow range 0.9 GeV/C
 COMPUTER model PDP.11/10 for the machine
 OTHER FACILITIES

CHARACTERISTIC BEAMS

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

BEAM PROPERTIES

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

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.

