ENTRY NO. 15

NAME OF MACHINE Grenoble Isochronous cyclotron DATE July 78
INSTITUTION Institut des Sciences Nucléaires
ADDRESS 53 avenue des Martyrs 38026 Grenoble Cedex

IN CHARGE J M LOISEAUX REPORTED by J M LOISEAUX and M. FRUNEAU

HISTORY AND STATUS

DESIGN, date 1962 MODEL tests 1963
ENG. DESIGN, date 1963 - 1965
CONSTRUCTION, date 1963 - 1967
FIRST BEAM date (or goal) July 1968
MAJOR ALTERATIONS None

OPERATION, 120 hr/wk; On Target 100 hr/wk
TIME DIST., in house 70 %, outside 30 %
USERS' SCHEDULING CYCLE 4 weeks
COST, ACCELERATOR $ 2.0 10^6
COST, FACILITY, total $ 6 10^6
FUNDED BY I N2 P3 - CNRS

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 7
TECHNICIANS 20 CRAFTS 5
GRAD STUDENTS involved during year
OPERATED BY Res staff or 9 Operators
BUDGET, op & dev $. 3 Millions
FUNDED BY

RESEARCH STAFF, not included above

USERS, in house 40 outside 20
GRAD STUDENTS involved during year
RES. BUDGET, in house $. 5 Millions
FUNDED BY CNRS and I N2 P3

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 300 m^2
movable 500 m^2
TARGET STATIONS 7 in 5 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Q1 D
COMPUTER, model PDP9 and PDP 15
OTHER FACILITIES
on line mass spectrometer (test)

REFERENCES/NOTES

Annales de Radioélectricité XX1 n° 84

J.L. Belmont Rapport interne 75-06

XIème Europ. Cycl. Prog. Meeting. Lieuvin

MAGNET

POLE FACE diameter 212 cm; R extraction 88 cm
GAP, min 16 cm; Field 19 kG
max 36 cm; Field 12 kG
AVERAGE FIELD at R ext 16 kG
} at 360 X 10^6 ampere turns
CURRENT STABILITY 5 parts/10^6; $B_{max}/\langle B \rangle$ 1.2
NUMBER OF SECTORS 4 ; SPIRAL, max 40 deg
POLE FACE COIL PAIRS: AVF /sec;
Harmonic correction 1/sector
Rad grad /sec or Circ coils 11
WEIGHT: Fe 200 tons; Coils 8 tons
CONDUCTOR, Material and type copper
STORED ENERGY MJ
COOLING SYSTEM Demineralized Water
POWER: Main coils 270 max, kW
Trimming coils 100 max, kW
YOKE/POLE AREA 100 % %
SECTOR ANGLE (Sep Sec) deg
ION ENERGY (Bending limit) E/A = 90 q^2/A^2 MeV
(Focusing limit) E/A = ~70 q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 80° deg
BEAM APERTURE 4 cm; DC BIAS kV
TUNED by, coarse Mov. Panels fine
RF 10.7 to 21.5 mHz, stable ± .1 $/10^6$
Orb F 3.6 to 21.5 mHz; GAIN, max 140 kV/turn
HARMONICS, RF/Orb F, used 1-2-3-
DEE-Gnd, max 70 kV, min gap ~ 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10^{-3}
RF PHASE stable to ± .2 deg
RF POWER input, max kW
RF PROTECT circuit, speed 60 10.000 μsec
Type Relay
FREQUENCY MODULATION, rate /sec
MODULATOR, type
BEAM PULSE, width 2-4 ns

VACUUM SYSTEM

PUMPS, No., Type, Size Diffusion pumps (80 cm)
OPERATING PRESSURE 1.5 μTorr,
PUMPDOWN TIME 5 hrs

ION SOURCES/INJECTION SYSTEM

Internal PIG source.
External PIG source with axial injection

EXTRACTION SYSTEM

Electrostatic + magnetic channel

CONTROL SYSTEM

Conventional and computer for checking and recording parameters.

ENTRY NO. 15 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	P	60	60
	d, ^{3}He, α		80 q^2/A
	Heavy ions		90 q^2/A
CURRENT		(μA)	(μA)
Internal			eμA
	$^{14}N^{5+}$		2
	$^{16}O^{6+}$		.1
External	$^{20}Ne^{6+}$		.1
	^{8+}Ar		.05
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured	Conditions
Pulse Width	10° RF deg	____ μA of ____ MeV ____
Phase Exc, max	____ RF deg	____ μA of ____ MeV ____
Extract Eff	60 %	____ μA of ____ MeV ____
Res, ΔE/E	.4 %	____ μA of ____ MeV ____
Emittance (mm-mrad)	15 axial, 50 radial	____ μA of ____ MeV ____

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	86 %
Solid State Physics	%
Bio-Medical Applications	%
Isotope Production	4 %
Development	8 %
~~Nuclear Accelerator spectrometer~~	%
~~(^{10}Be)~~	2 %

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

The Grenoble cyclotron in able to accelerate both light and heavy ions. More than 60 % of the running time is now used with heavy ions beams from Li to Ar.

The external source installed in July 1976 is now operating with a rather good transmission. This cyclotron is planned to be the injector of a postaccelerator (separated sector cyclotron with K = 120) see SARA Accelerator.