

ENTRY NO. 37

NAME OF MACHINE AVF CYCLOTRON - MILAN
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HISTORY AND STATUS

DESIGN, date 1961 Model tests 1961-62
ENG DESIGN, date 1961-62
CONSTRUCTION, date 1961-62
FIRST BEAM, date (or goal) Int. 1965 - Ext. 1965
MAJOR ALTERATIONS New. dec. 1967

COST, ACCELERATOR $\$ 7.10^5$
COST, FACILITY, total $\$ 1.10^6$
FUNDED BY INFN - MINISTRY OF PUBLIC EDUCATION

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 2 ENGINEERS 1
TECHNICIANS 5 CRAFTS 2
GRAD STUDENTS involved during year
OPERATED BY / Research staff or 2 Operators
OPERATION .80 hr/wk. On target .65 hr/wk
TIME DISTR. in house .50 % Outside .50 %
BUDGET, op & dev $\$.80.000/\text{year}$
FUNDED BY Ist. Naz. di Fisica Nucleare

RESEARCH STAFF, not included above

USERS, in house 8 outside 2
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house $\$ 100.000/\text{year}$
FUNDED BY Ministry of Education and Istituto Nazio-

MAGNET nale di Fisica Nucleare

POLE FACE, diameter (compact) 166 cm, R extraction 72 cm
R injection cm
GAP, min 11 cm, Field 19.5 kG
max 31 cm, Field 8 kG at $3 \cdot 6 \cdot 10^5$
AVERAGE FIELD at R ext 13.9 kG Ampere turns
B max / < B > 1.47
NUMBER OF SECTORS { compact 3 } Spiral, max deg
{ separated }
SECTOR ANGLE (SSC) deg
TRIMMING COILS None in use

CONDUCTOR, material and type
STORED ENERGY (cryogenic) MJ₅
POWER: main coils 80 max, kW; current stability 2-10
trimming coils max, kW; current stability
WEIGHT: Fe 181 tons; coils
COOLING system WATER
ION ENERGY (bending limit) E/A = P. only q²/a² MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 1 170 deg
BEAM APERTURE 4 cm; DC Bias kV
TUNED by, coarse MP. Auto. fine Vc. Auto. -6
RF 15 to 22 mHz, stable ± 1.10
Orb F 19 to 21 mHz
HARMONICS, RF/Orb F, used h=1
DEE-Gnd, max 50 kV, min gap 4 4 cm
STABILITY, (pk-pk noise)/(pk RF volt) 3.10
ENERGY GAIN, max 100 kV/turn
RF PHASE, stable to ± 10 deg
RF POWER input, max 30 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE $2 \cdot 10^{-6}$ Torr or mbar
PUMPS, No, Type, Size 2 x 10.000 liter/sec
Diffusion pumps

ION SOURCES

H⁻ internal Ion Source

INJECTION SYSTEM

EXTRACTION SYSTEM

Stripping for H⁺ Beams

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m²; movable 600 m²
TARGET STATIONS 4 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model PDP. 11-45
OTHER FACILITIES High level isotope production Vault -
Analysing Magnet E/E 3.10

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
H ⁻	18-45	18-45	30	20
P	45	45	60	

SECONDARY

(part/s)

BEAM PROPERTIES

MEASURED	CONDITIONS	
	MEASURED	CONDITIONS
PULSE WIDTH 7, 25 RF deg	10^{-3} pμA of 18-45 MeV	H ⁻ ions
PHASE EXC. max 70 RF deg	10^{-3} pμA of 30 MeV	H ⁻ ions
EXTRACT eff 100 %	1 pμA of 18-45 MeV	H ⁻ ions
RESOL ΔE/E 5 %	1 pμA of 30 MeV	H ⁻ ions
EMITTANCE (π mm. mrad) { 40 axial } { 35 rad }	1 pμA of 30 MeV	H ⁻

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 60% SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 5% ISOTOPE PRODUCTIONS 20%
15% Tests on components of K=800 superconducting
Cyclotron

REFERENCES/NOTES

- 1)
- 2)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

The accelerator staff of the AVF Cyclotron is also involved in the construction of the K=800 Superconducting Cyclotron.