ENTRY NO. 41

NAME OF MACHINE AVF CYCLOTRON - MILAN
INSTITUTION UNIVERSITY OF MILAN - INSTITUTE OF PHYSICS
ADDRESS Via Celoria 16 20133 Milan ITALY
TEL (02) 2392254 TELEX 334687 INFNMI
IN CHARGE C. BIRATTARI REPORTED BY G. BACCAGLIONI - C. BIRATTARI

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 dee 1967
COST, ACCELERATOR $ $7 \cdot 10^{5}$
COST, FACILITY, total $ $1 \cdot 10^{6}$
FUNDED BY INFN - MINISTRY OF PUBLIC EDUCATION

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
TECHNICIANS 3 CRAFTS 1
GRAD STUDENTS involved during year
OPERATED BY Research staff or 1 Operators
OPERATION 50 hr/wk. On target 40 hr/wk
TIME DISTR. in house 80 %, outside 20 %
BUDGET, op & dev $ 80000/year
FUNDED BY INFN

RESEARCH STAFF, not included above

USERS, in house 5 outside 1
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house $ 100000/year
FUNDED BY INFN and Ministry of Education

MAGNET

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 8.0 kG at $3.6 \cdot 10^{5}$ Ampere turns
AVERAGE FIELD at R ext 13.9 kG
B max/<B> 1.47
NUMBER OF SECTORS compact 3, separated — Spiral, max 0 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS None in use
CONDUCTOR, material and type
STORED ENERGY (cryogenic) MJ
POWER: main coils 80 max kW: current stability $2 \cdot 10^{-5}$
trimming coils max kW: current stability
WEIGHT: Fe 181 tons: coils tons
COOLING system Water
ION ENERGY (Bending limit) E/A = 45 q^2/A^2 MeV/amu
(Focusing limit) E/A = 45 q/A MeV/amu

ACCELERATION SYSTEM

DEES, number 1 angle 170 deg
BEAM APERTURE 4 cm; DC Bias kV
TUNED by, coarse MP auto fine Vc auto
RF 15 to 22 MHz, stable ± $1 \cdot 10^{-6}$
Orb F 19 to 21 MHz
HARMONICS, RF/Orb F, used h = 1
DEE–Gnd, max 50 kV, min gap 4 cm
STABILITY, (pk-pk noise)/(pk RF volt) $3 \cdot 10^{-4}$
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 10000 liter/s diffusion pumps

ION SOURCES

H^- internal ion source

INJECTION SYSTEM

EXTRACTION SYSTEM

Stripping of H^- beam

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m^2; movable 600 m^2
TARGET STATIONS 3 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 $\Delta E/E = 3 \cdot 10^{-4}$

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
H^-	18-45	18-45	30	20
p	45	45	60	
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS	
PULSE WIDTH	7 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	0.7 %		pμA of 30 MeV H^- ions
EMITTANCE			
(π mm-mrad)	40 axial, 30 rad	1	pμA of 30 MeV H^-

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 20% SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 20% ISOTOPE PRODUCTIONS 40%
20% 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.