ENTRY NO. 34

NAME OF MACHINE AVF CYCLOTRON - MILAN DATE Sept. 78
INSTITUTION UNIVERSITY OF MILAN - PHYSICS DEPARTMENT
ADDRESS VIA CELORIA, 16

IN CHARGE F. Resmini REPORTED by M. Castiglioni & F. Resmini

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

OPERATION, 120 hr/wk; On Target 100 hr/wk
TIME DIST., in house 50 %, outside 50 %
USERS' SCHEDULING CYCLE 2 weeks
COST, ACCELERATOR 7.10^5
COST, FACILITY, total $1x10^6$
FUNDED BY Ministry of Education - Ist. Nazionale di Fisica Nucl.

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 5 ENGINEERS 2
TECHNICIANS 5 CRAFTS 7
GRAD STUDENTS involved during year 3
OPERATED BY ____ Res staff or 4 Operators
BUDGET, op & dev 10^5
FUNDED BY Ministry of Education and Istituto Nazionale de Fisica Nucl.

RESEARCH STAFF, not included above

USERS, in house 5 outside 7
GRAD STUDENTS involved during year 6
RES. BUDGET, in house 2.0×10^5
FUNDED BY Istituto Nazionale de Fisica Nucl. and Cons Naz. Ricerche

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed ____ m^2
movable 600° m^2
TARGET STATIONS 7 in 6 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type ____
COMPUTER, model LABEN 70 - PDP 11/45
OTHER FACILITIES Isotope production--one high level vault
Biological--1 shared beam line

REFERENCES/NOTES

1) Nucl. Instr. and Meth. 18.19 (1962)
2) IEEE Trans. Nucl. Sci. NS-13 (1966)

These are really undergraduates; no graduates (U.S. - like) are provided in Italy's university system.

MAGNET

POLE FACE diameter 166 cm; R extraction 72 cm
GAP, min 11 cm; Field 19.5 kG
max 31 cm; Field 8 kG
AVERAGE FIELD at R ext 13.9 kG
} at 36 X 10^6 ampere turns
CURRENT STABILITY 20 parts/10^6; $B_{max}/\langle B \rangle$ 1.47
NUMBER OF SECTORS 3 ; SPIRAL, max 0 deg
POLE FACE COIL PAIRS: AVF none /sec;
Harmonic correction none
Rad grad none /sec or Circ coils 8
WEIGHT: Fe 181 tons; Coils ____ tons
CONDUCTOR, Material and type ____
STORED ENERGY ____ MJ
COOLING SYSTEM water
POWER: Main coils 80 max, kW
Trimming coils ____ max, kW
YOKE/POLE AREA 127 %
SECTOR ANGLE (Sep Sec) 1 deg
ION ENERGY (Bending limit) E/A = ____ q^2/A^2 MeV
(Focusing limit) E/A = ____ q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 170 deg
BEAM APERTURE 4 cm; DC BIAS 0 kV
TUNED by, coarse MP auto fine VC auto
RF 15 to 22 mHz, stable ± 1 /10^6
Orb F 19 to 21 mHz; GAIN, max 100 kV/turn
HARMONICS, RF/Orb F, used first
DEE-Gnd, max 60 kV, min gap ____ cm
STABILITY, (pk-pk noise)/(pk RF volt) 003
RF PHASE stable to ± 12 deg
RF POWER input, max 30 kW
RF PROTECT circuit, speed 5 μsec
Type rectifier cut off
FREQUENCY MODULATION, rate ____ /sec
MODULATOR, type ____
BEAM PULSE, width ____

VACUUM SYSTEM

PUMPS, No., Type, Size 3 - 10.000 liter/sec diffusion pumps
OPERATING PRESSURE 1×10^{-6} Torr,
PUMPDOWN TIME 12 hrs

ION SOURCES/INJECTION SYSTEM

H^- internal ion source

EXTRACTION SYSTEM

stripping foil for H^-

CONTROL SYSTEM

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	H^-	18-45	18-45
	P	40-45	45
		(μA)	(μA)
CURRENT Internal	H^-	40-30	20-15
	P	100	100
External	H^-	40-30	20-15
	P	60	oo
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions		
Pulse Width	7.25	RF deg	10^{-3}	μA of 18-45 MeV	H^-
Phase Exc, max	70	RF deg	10^{-3}	μA of 30 MeV	H^-
Extract Eff	100	%	1	μA of 18-45 MeV	H^-
Res, ΔE/E	8	%	1	μA of 30 MeV	H^-
Emittance (mm-mrad)	40 axial / 35 radial		1	μA of 30 MeV	H^-

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	70 %
Solid State Physics	5 %
Bio-Medical Applications	%
Isotope Production	20 %
Development	%
machine development	5 %
	%

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

- Beam pulsing device (external) for on-line spectroscopy being built (selection of 1 out of 2, 3, 4, 5 pulses allowed) - Installation anticipated by early 1979.

- New operating console built - installed

- Accelerator research concentrated on design of a K600 superconducting cyclotron, construction and operation of a 1:6 superconducting model magnet, 1:1 R.F. cavity model.