ENTRY NO. 76

NAME OF MACHINE Princeton AVF Cyclotron DATE Aug. 21, 1978
INSTITUTION Princeton University, The Joseph Henry Laboratory of Physics
ADDRESS Princeton, New Jersey 08540

IN CHARGE Rubby Sherr REPORTED by Richard Kouzes

HISTORY AND STATUS

DESIGN, date 1965 MODEL tests
ENG. DESIGN, date 1966-1967
CONSTRUCTION, date 1967-1968
FIRST BEAM date (or goal) December 1968
MAJOR ALTERATIONS None

OPERATION, 80 hr/wk; On Target 70 hr/wk
TIME DIST., in house 75 %, outside 25 %
USERS' SCHEDULING CYCLE 1 weeks
COST, ACCELERATOR $1.45 x 10^6
COST, FACILITY, total $3.0 x 10^6
FUNDED BY Accel. and 70% of Lab by Univ. Beam Transport System by US-AEC

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 0 ENGINEERS 1
TECHNICIANS 3 CRAFTS 0
GRAD STUDENTS involved during year 0
OPERATED BY X Res staff or Operators
BUDGET, op & dev $1.7 x 10^5
FUNDED BY NSF

RESEARCH STAFF, not included above

USERS, in house 9 outside 13
GRAD STUDENTS involved during year 9
RES. BUDGET, in house $2.5 x 10^5
FUNDED BY NSF

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 0 m^2
movable 325 m^2
TARGET STATIONS 8 in 4 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type 14 msr Q3D
COMPUTER, model Data General Eclipse
OTHER FACILITIES Scattering Chambers 150, 50, 30 cm.; On-Line Recirculating Gas Target; Orange Spectrometer; Pair Spectrometer; On-Line Atomic Beams Machine; See "Other Features"

REFERENCES/NOTES

Pollock, R. E., Proceedings of the Fifth International Cyclotron Conference (1969), p. 120.

MAGNET

POLE FACE diameter 175 cm; R extraction 75 cm
GAP, min 17 cm; Field 19.5 kG
max 50 cm; Field 8 kG
} at .51 x 10^6 ampere turns
AVERAGE FIELD at R ext 15 kG
CURRENT STABILITY ±5 parts/10^6; $B_{max}/\langle B \rangle$ 1.3
NUMBER OF SECTORS 3 ; SPIRAL, max ~ 0 deg
POLE FACE COIL PAIRS: AVF 0 /sec;
Harmonic correction 2
Rad grad 0 /sec or Circ coils 8
WEIGHT: Fe 100 tons; Coils 16 tons
CONDUCTOR, Material and type Cu
STORED ENERGY MJ
COOLING SYSTEM Water
POWER: Main coils 175 kW max, kW
Trimming coils 20 max, kW
YOKE/POLE AREA 90 %
SECTOR ANGLE (Sep Sec) - deg
ION ENERGY (Bending limit) E/A = q^2/A^2 MeV
(Focusing limit) E/A = q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 138 deg
BEAM APERTURE 4.5 cm; DC BIAS 0 kV
TUNED by, coarse Movable Panel fine None
RF 11.2 to 24.5 mHz, stable ± .1 /10^6
Orb F 5.6 to 20.6 mHz; GAIN, max 250 kV/turn
HARMONICS, RF/Orb F, used 1,2,4
DEE-Gnd, max 70 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) .0005
RF PHASE stable to ± - deg
RF POWER input, max 300 kW
RF PROTECT circuit, speed 1 μsec
Type ignitron crowbar
FREQUENCY MODULATION, rate /sec
MODULATOR, type
BEAM PULSE, width

VACUUM SYSTEM

PUMPS, No., Type, Size 1-Diffusion
OPERATING PRESSURE 5 μTorr,
PUMPDOWN TIME 1 hrs

ION SOURCES/INJECTION SYSTEM

Hooded Arc; Cold Cathode

EXTRACTION SYSTEM DC Electrostatic followed by laminated, compensated magnetic deflector

CONTROL SYSTEM

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	P	50	50
	d/α	30/60	30/58
	He-3	80	85
CURRENT		(μA)	(μA)
Internal	P		>1000
	d/α		200/30
	He-3		>100
External	P		25
	d/		18/10
	He-3		10
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	1.6	RF deg	1	μA of	28	MeV P
Phase Exc, max		RF deg		μA of		MeV
Extract Eff	>95	%	1	μA of	42	MeV P
Res, ΔE/E	.05	%	1	μA of	42	MeV P
Emittance						
(mm-mrad) { axial / radial }				μA of		MeV

OPERATING PROGRAMS, time dist

Basic Nuclear Physics & Chemistry	96 %
Solid State Physics	%
Bio-Medical Applications	1 %
Isotope Production	1 %
Development	2 %
	%
	%

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

1. Accelerator design based on Michigan State University cyclotron.
2. Obtains single turn extraction by means of internal phase selection.
3. Q3D spectrograph: $p/_{\Delta p} = 1x10^4$
4. On-line isotope separator: 90^o sector magnet, 150 cm radius, $M/_{\Delta M} > 3x10^3$