

ENTRY NO. 78

NAME OF MACHINE Texas A&M Variable Energy Cyclotron DATE 7/78
 INSTITUTION Texas A&M University
 ADDRESS College Station, Texas 77843

IN CHARGE D. H. Youngblood REPORTED by R. C. Rogers

HISTORY AND STATUS

DESIGN, date 1964 MODEL tests None
 ENG. DESIGN, date 1964-1966
 CONSTRUCTION, date 1965-1967
 FIRST BEAM date (or goal) August 8, 1967
 MAJOR ALTERATIONS none

OPERATION, 160 hr/wk; On Target _____ hr/wk
 TIME DIST., in house 75 %, outside 25 %
 USERS' SCHEDULING CYCLE 4 weeks
 COST, ACCELERATOR \$3 x 10⁶
 COST, FACILITY, total \$6 x 10⁶
 FUNDED BY State of Texas, AEC, Welch
Foundation

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 4
 TECHNICIANS 11 CRAFTS 4
 GRAD STUDENTS involved during year _____
 OPERATED BY _____ Res staff or Operators
 BUDGET, op & dev \$505,000
 FUNDED BY State of Texas

RESEARCH STAFF, not included above

USERS, in house 27 outside _____
 GRAD STUDENTS involved during year 20
 RES. BUDGET, in house \$515,000
 FUNDED BY NSF, DOE, Welch Foundation

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 447 m²
 movable 0 m²
 TARGET STATIONS 12 in 5 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type Enge split pole
 COMPUTER, model IBM 7094, PDP-15/40
 OTHER FACILITIES _____

REFERENCES/NOTES

MAGNET

POLE FACE diameter 224 cm; R extraction 99 cm
 GAP, min 19 cm; Field 21.8 kG } at 56 X 10⁶
 max 30 cm; Field 14.2 kG } ampere turns
 AVERAGE FIELD at R ext 17.1 kG
 CURRENT STABILITY 10 parts/10⁶; B_{max}/(B) 1.2
 NUMBER OF SECTORS 3; SPIRAL, max 55 deg
 POLE FACE COIL PAIRS: AVF _____ /sec;
 Harmonic correction 5
 Rad grad _____ /sec or Circ coils 17
 WEIGHT: Fe 290 tons; Coils 12 tons
 CONDUCTOR, Material and type Cu
 STORED ENERGY _____ MJ
 COOLING SYSTEM H₂O
 POWER: Main coils 490 max, kW
 Trimming coils 460 max, kW
 YOKE/POLE AREA 100 %
 SECTOR ANGLE (Sep Sec) _____ deg
 ION ENERGY (Bending limit) E/A = 147 q²/A² MeV
 (Focusing limit) E/A = 70 q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
 BEAM APERTURE 3.8 cm; DC BIAS 0 kV
 TUNED by, coarse MP fine VC
 RF 5.5 to 15.5 MHz, stable ± 10 /10⁶
 Orb F 1.87 to 15.5 MHz; GAIN, max 160 kV/turn
 HARMONICS, RF/Orb F, used 1.3
 DEE-Gnd, max 80 kV, min gap _____ cm
 STABILITY, (pk-pk noise)/(pk RF volt) .002
 RF PHASE stable to ± 1.1 deg
 RF POWER input, max 200 kW
 RF PROTECT circuit, speed 1 μsec
 Type thyatron crowbar
 FREQUENCY MODULATION, rate _____ /sec
 MODULATOR, type _____
 BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size 4, oil diffusion,
1-35", 1-10", 2-6"
 OPERATING PRESSURE 1-2 μTorr,
 PUMPDOWN TIME 4 hrs

ION SOURCES/INJECTION SYSTEM

Internal filament, Internal cold
cathode, Axial injector for polar-

EXTRACTION SYSTEM ized p, d, ³He
electrostatic

CONTROL SYSTEM

manual

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	50	50
	d		60
	³ He		100
	α		130
CURRENT		(μA)	(μA)
	Internal	1000	300
			150
			200
External	d		80
	\bar{p}		1.05
	HI*		
Secondary		(part/s)	(part/s)

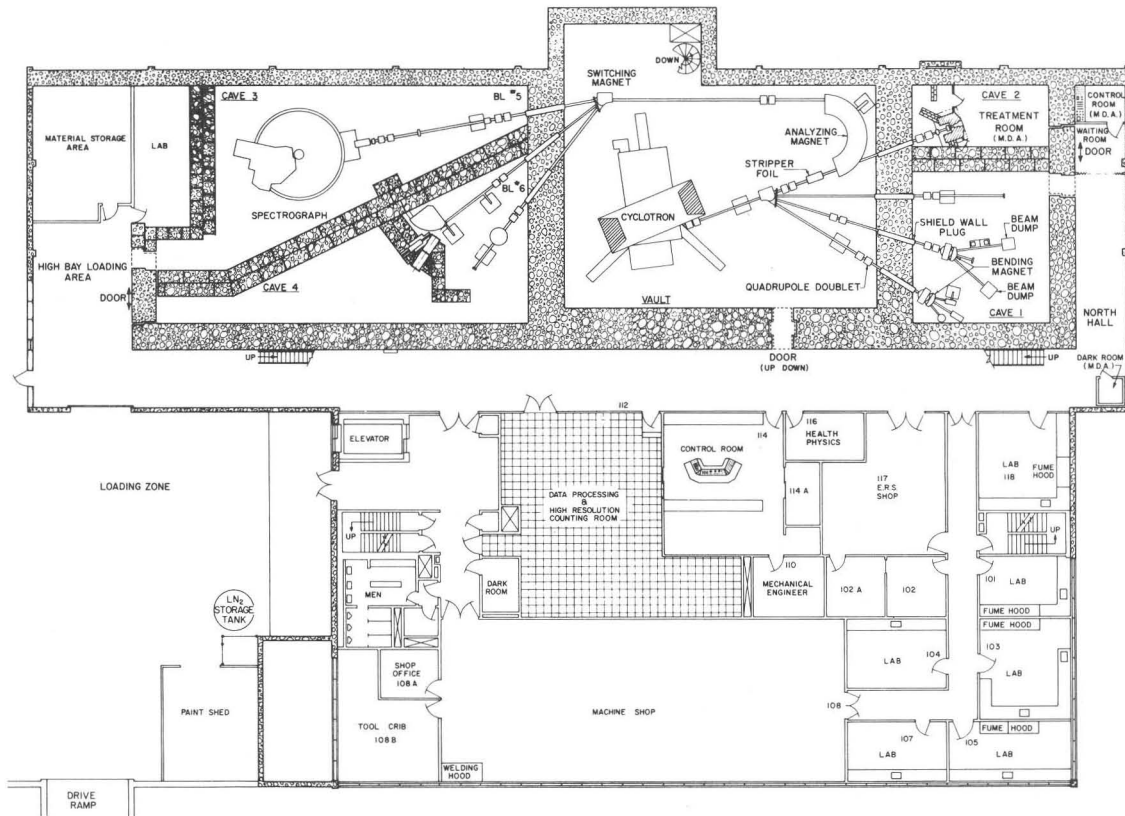
BEAM PROPERTIES

	Measured	Conditions
Pulse Width	4.5 RF deg	0.2 μA of 120 MeV ⁴ He ⁺²
Phase Exc, max	30 RF deg	var μA of 20 MeV \bar{d}^+
Extract Eff	75 %	1.6 μA of 20 MeV \bar{d}^+
Res, ΔE/E	0.5 %	10 μA of 40 MeV ⁴ He ⁺²
Emittance	(mm-mrad) { $\frac{NM}{NM}$ axial } — μA of — MeV —	
	{ $\frac{NM}{NM}$ radial }	

OPERATING PROGRAMS, time dist

Basic Nuclear Physics/Chemistry	81 %
Solid State Physics	%
Bio-Medical Applications	13 %
Isotope Production	%
Development	6 %
	%
	%

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



*Heavy-ion beams account for 36% of all operational beams. Heavy-ion energies range from 0.5 MeV/amu for ¹³⁶Xe⁸⁺ to 25 MeV/amu for ¹²C⁵⁺. Intensities vary from a low of .15 eμA for ¹⁴N⁶⁺ to as much as 10 eμA for ¹¹B³⁺.