

**ENTRY No. 88**

NAME OF MACHINE Texas A&M Variable Energy Cyclotron DATE July 1981  
 INSTITUTION Texas A&M University  
 ADDRESS College Station, Texas 77843 (USA)  
 TEL (713) 845-1411 TELEX  
 IN CHARGE Dr. 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 Conversion to driven RF system, 1980  
 COST, ACCELERATOR \$3 x 10<sup>6</sup>  
 COST, FACILITY, total \$6 x 10<sup>6</sup>  
 FUNDED BY State of Texas, AEC, Welch Foundation

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**

SCIENTISTS 3 ENGINEERS 3  
 TECHNICIANS 13 CRAFTS 5  
 GRAD STUDENTS involved during year 7  
 OPERATED BY Research staff or Operators  
 OPERATION 168 hr/wk, On target 142 hr/wk  
 TIME DISTR. in house 84 %, Outside 16 %  
 BUDGET, op & dev \$800,000  
 FUNDED BY Texas A&M University, DOE

**RESEARCH STAFF, not included above**

USERS, in house 30 outside 3  
 GRAD STUDENTS involved during year 15  
 RESEARCH BUDGET, in house \$800,000  
 FUNDED BY DOE, Welch Foundation

**MAGNET**

POLE FACE, diameter (compact) 224 cm, R extraction .99 cm  
 R injection cm  
 GAP, min 19 cm, Field 21.8 kG }  
 max 30 cm, Field 14.2 kG } at .56 x 10<sup>6</sup>  
 AVERAGE FIELD at R ext 17.1 kG } Ampere turns  
 B max/ <B> 1.2

NUMBER OF SECTORS { compact 3 } Spiral, max 55 deg  
 { separated }  
 SECTOR ANGLE (SSC) deg  
 TRIMMING COILS 17

CONDUCTOR, material and type Cu  
 STORED ENERGY (cryogenic) MJ  
 POWER: main coils 490 max, kW; current stability 10<sup>-5</sup>  
 trimming coils 460 max, kW; current stability 10<sup>-5</sup>  
 WEIGHT: Fe 290 tons; coils 12 tons  
 COOLING system H<sub>2</sub>O  
 ION ENERGY (bending limit) E/A = .147 q<sup>2</sup>/a<sup>2</sup> MeV/amu  
 (focusing limit) E/A = .70 q/a MeV/amu

**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 16.5 MHz, stable ± 10<sup>-7</sup>  
 Orb F 1.87 to 16.5 MHz  
 HARMONICS, RF/Orb F, used 1, 3  
 DEE - Gnd, max .80 kV, min gap cm  
 STABILITY, (pk-pk noise)/(pk RF volt) 10<sup>-4</sup>  
 ENERGY GAIN, max 160 kV/turn  
 RF PHASE, stable to ± 20 deg  
 RF POWER input, max 200 kW  
 FREQUENCY MODULATION, rate /s  
 modulator, type  
 beam pulse, width

**VACUUM SYSTEM**

OPERATING PRESSURE 1-2 x 10<sup>-6</sup> Torr or mbar  
 PUMPS, No, Type, Size 1 - 35", 1 - 10", 2 - 6",  
 diffusion

**ION SOURCES**

Internal filaments, Internal cold cathode

**INJECTION SYSTEM**

axial for polarized p, d, <sup>3</sup>He

**EXTRACTION SYSTEM**

electrostatic

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed 447 m<sup>2</sup>; movable m<sup>2</sup>  
 TARGET STATIONS 11 in 4 rooms  
 STATIONS served at same time, max 1  
 MAG SPECTROGRAPH, type Enge split pole  
 COMPUTER model 2 - DEC VAX 11/780, 1 - DEC PDP 15/40  
 OTHER FACILITIES External beam pulsing from single pulse to burst of 999 seconds duration

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
p		55		300
d		60		150
<sup>3</sup> He		100		
<sup>4</sup> He		130		100

SECONDARY (part/s)

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH 4.5 RF deg .0.2 μA of 120 MeV <sup>4</sup>He<sup>2+</sup> ions  
 PHASE EXC, max 30 RF deg var μA of 20 MeV d<sup>+</sup> ions  
 EXTRACT eff .75 % .1.6 μA of 20 MeV d<sup>+</sup> ions  
 RESOL ΔE/E .0.5 % .10 μA of 40 MeV <sup>4</sup>He<sup>2+</sup> ions  
 EMITTANCE

(π mm. mrad) { axial } μA of MeV ions  
 { rad }

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS 57.2% SOLID STATES PHYSICS  
 BIOMEDICAL APPLICAT. 1.5% ISOTOPE PRODUCTIONS  
 Atomic Physics 7.2%, Activation Analysis 10.1%,  
 Development, Maintenance, Holidays 24%

**REFERENCES/NOTES**

**PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS**

