

**ENTRY NO. 114**

NAME OF MACHINE Texas A&M Variable Energy Cyclotron  
 INSTITUTION Texas A&M University  
 ADDRESS College Station, Texas 77843 (USA)  
 TEL (409) 845-1411 TELEX  
 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 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 6  
 TECHNICIANS 15 CRAFTS 14  
 GRAD STUDENTS involved during year  
 OPERATED BY Research staff or X Operators  
 OPERATION 168 hr/wk. On target 142 hr/wk  
 TIME DISTR. in house 84 % outside 16 %  
 BUDGET, op & dev \$800,000.00  
 FUNDED BY Texas A&M University, DOE

**RESEARCH STAFF, not included above**

USERS, in house 32 outside 12  
 GRAD STUDENTS involved during year 18  
 RESEARCH BUDGET, in house \$800,000.00  
 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 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 filament, Internal cold cathode, external pol.

**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  
 OTHER FACILITIES External beam pulsing from single pulse to burst of 999 seconds duration

**CHARACTERISTIC BEAMS**

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

~~XXXXXXXXXX~~ Heavy Ions 6 ≤ A ≤ 136 E ≤ 147 Q<sup>2</sup>/A ~~XXXXXXXXXX~~ ≤ 20 pA

**BEAM PROPERTIES**

| MEASURED                     | CONDITIONS |                                    |
|------------------------------|------------|------------------------------------|
|                              | μA of      | ions                               |
| PULSE WIDTH 4.5 RF deg 0.2   | 120 MeV    | <sup>4</sup> He <sup>+2</sup> ions |
| PHASE EXC. max 30 RF deg var | 20 MeV     | d <sup>+</sup> ions                |
| EXTRACT eff. 75 %            | 20 MeV     | d <sup>+</sup> ions                |
| RESOL ΔE/E 0.5 %             | 40 MeV     | <sup>4</sup> He <sup>+2</sup> ions |
| EMITTANCE                    |            |                                    |
| (π mm-mrad) axial            | μA of      | MeV                                |
|                              | rad        |                                    |

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS  
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS  
 Atomic Physics Activation Analysis

**REFERENCES/NOTES**

- 1)
- 2)

**PLAN VIEW OF FACILITY, COMMENTS, ETC.**

Projected Facility Configuration, Circa 1988-89

