

ENTRY NO. 112  
 NAME OF MACHINE Princeton AVF Cyclotron  
 INSTITUTION PRINCETON UNIVERSITY, Department of Physics  
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 IN CHARGE F.P. Calaprice REPORTED BY R.T. 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

COST, ACCELERATOR \$1.45M  
 COST, FACILITY, total \$3.0 M  
 FUNDED BY 70% University; 30% AEC

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**

SCIENTISTS 0 ENGINEERS 1  
 TECHNICIANS 2 CRAFTS 0  
 GRAD STUDENTS involved during year 0  
 OPERATED BY X Research staff or Operators  
 OPERATION 60 hr/wk, On target 50 hr/wk  
 TIME DISTR, in house 90 %, outside 10 %  
 BUDGET, op & dev \$300K  
 FUNDED BY NSF

**RESEARCH STAFF, not included above**

USERS, in house 13 outside 15  
 GRAD STUDENTS involved during year 11  
 RESEARCH BUDGET, in house \$800K  
 FUNDED BY NSF

**MAGNET**

POLE FACE, diameter (compact) 175 cm, R-extraction 75 cm  
 R injection 2 cm  
 GAP, min 17 cm, Field 19.5 kG  
 max 50 cm, Field 8.0 kG at  $5.1 \times 10^6$   
 AVERAGE FIELD at R ext 15 kG Ampere turns  
 B max / < B > 1.3

NUMBER OF SECTORS { compact 3 } Spiral, max . 0. deg  
 { separated }  
 SECTOR ANGLE (SSC) deg  
 TRIMMING COILS 8

CONDUCTOR, material and type Cu  
 STORED ENERGY (cryogenic) MJ  
 POWER: main coils 175 max kW: current stability  $10^{-5}$   
 trimming coils 20 max kW: current stability  $10^{-5}$   
 WEIGHT: Fe 100 tons: coils 16 tons  
 COOLING system Water  
 ION ENERGY (Bending limit) E/A = 60  $q^2/A^2$  MeV/amu  
 (Focusing limit) E/A = 60  $q/A$  MeV/amu

**ACCELERATION SYSTEM**

DEES, number 2 angle 138 deg  
 BEAM APERTURE 4.5 cm; DC Bias 0 kV  
 TUNED by, coarse Movable panels, fine None  
 RF 11.2 to 24.5 MHz, stable  $\pm 10^{-7}$   
 Orb F 5.6 to 20.6 MHz  
 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  
 ENERGY GAIN, max 250 kV/turn  
 RF PHASE, stable to  $\pm 2$  deg  
 RF POWER input, max. 300 kW  
 FREQUENCY MODULATION, rate /s  
 modulator, type  
 beam pulse, width

**VACUUM SYSTEM**

OPERATING PRESSURE  $5 \times 10^{-6}$  Torr or mbar  
 PUMPS, No, Type, Size 1 Diffusion 32 inch

**ION SOURCES**

Hooded Arc; Cold Cathode

**INJECTION SYSTEM**

**EXTRACTION SYSTEM**

Electrostatic & Magnetic

**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, QDDD,  $p/\Delta P = 10^4$   
 COMPUTER model Data General Eclipse

OTHER FACILITIES Scattering Chambers 150, 50, 30 cm;  
 On-Line Recirculating Gas Target; Orange Spectro-  
 meter; On-Line Atomic Beams Machine; On-Line Isotope  
 Separator

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT ( $\mu A$ )	
	Goal	Achieved	Internal	External
p	50	48		20
d	30	28		15
<sup>3</sup> He	75	85		8
$\alpha$	60	58		8
SECONDARY			(part/s)	

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH 1.6 RF deg .1  $\mu A$  of .42 MeV p. ions  
 PHASE EXC. max RF deg  $\mu A$  of MeV ions  
 EXTRACT eff. 95 % .1  $\mu A$  of .42 MeV p. ions  
 RESOL  $\Delta E/E$  .05 % .1  $\mu A$  of .42 MeV p. ions  
 EMITTANCE  
 20, axial  
 ( $\pi$  mm-mrad) .3 rad .1  $\mu A$  of .42 MeV p.

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS 100 SOLID STATES PHYSICS 0  
 BIOMEDICAL APPLICAT. 0 ISOTOPE PRODUCTIONS 0

**REFERENCES/NOTES**

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

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

