

ENTRY No. **C74**  
 NAME OF MACHINE Princeton AVF Cyclotron. DATE March 21, 1989.  
 INSTITUTION PRINCETON UNIVERSITY, Department of Physics.  
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 IN CHARGE Robert A. Naumann. REPORTED BY Richard 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 3 CRAFTS 0

GRAD STUDENTS involved during year 1  
 OPERATED BY X Research staff or Operators  
 OPERATION 60 hr/wk, On target 50 hr/wk  
 TIME DISTR. in house 75 % , Outside 25 %  
 BUDGET, op & dev \$300K  
 FUNDED BY NSF

**RESEARCH STAFF, not included above**  
 USERS, in house 11 outside 34  
 GRAD STUDENTS involved during year 6  
 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 .51x10<sup>6</sup>.  
 AVERAGE FIELD at R ext 15. kG } Ampere turns  
 B max/ <B> 1.3

NUMBER OF SECTORS { compact 3 } Spiral, max <5 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<sup>-5</sup>  
 trimming coils 20. max, kW; current stability 10<sup>-5</sup>  
 WEIGHT: Fe 100. tons; coils 16. tons  
 COOLING system Water  
 ION ENERGY (bending limit) E/A = 60. q<sup>2</sup>/a<sup>2</sup> MeV/amu  
 (focusing limit) E/A = 60. q<sup>2</sup>/a<sup>2</sup> MeV/amu

**ACCELERATION SYSTEM**  
 DEES, number 2; angle 134. deg  
 BEAM APERTURE 4.5. cm; DC Bias 0. kV  
 TUNED by, coarse Movable Panels fine None  
 RF 14. to 23.5. MHz, stable ± 10<sup>-7</sup>  
 Orb F 3.5. 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) 0,001  
 ENERGY GAIN, max 250. kV/turn  
 RF PHASE, stable to ± 1. deg  
 RF POWER input, imax 300. kW  
 FREQUENCY MODULATION, rate /s  
 modulator, type  
 beam pulse, width

**VACUUM SYSTEM**  
 OPERATING PRESSURE 2.5x10<sup>-6</sup> Torr or mbar  
 PUMPS, No, Type, Size 1. Diffusion 32. inch.

**ION SOURCES**  
 Roped Arc; Cold Cathode

**INJECTION SYSTEM**

Internal Injection

**EXTRACTION SYSTEM**

Electrostatic & Magnetic

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed 0. m<sup>2</sup>; movable .325. m<sup>2</sup>

TARGET STATIONS 8. In 4. rooms

STATIONS served at same time, max 1.

MAG SPECTROGRAPH, type 14. msr., QDDD. p/AP=10<sup>4</sup>

COMPUTER model Data General MV4000. MV10000

OTHER FACILITIES Scattering Chambers, 150. cm; On-Line  
 Recirculating Gas Targets; Bombardment Box; Laser  
 Polarized Target; On-Line Isotope Separator

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
p	50	48		20
d	30	28		15
<sup>3</sup> He	75	85		8
α	60	58		8

SECONDARY (part/a)

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH ±1.8° RF deg 1. pμA of .42 MeV p. ions  
 PHASE EXC, max RF deg pμA of MeV ions  
 EXTRACT eff 95. % 1. pμA of .42 MeV p. ions  
 RESOL ΔE/E .05. % 1. pμA of .42 MeV p. ions  
 EMITTANCE  
 (π mm. mrad) { 2.0 axial } 1. pμA of .42 MeV p. ions  
 { .3. rad }

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 Cyclotron Conference (1969), p. 120.

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

