

ENTRY No. 115

NAME OF MACHINE .. Princeton AVF Cyclotron ... DATE .. March 21, 1989
INSTITUTION .. PRINCETON UNIVERSITY, Department of Physics
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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 } at $.51 \times 10^6$
max .. 50 .. cm, Field .. 8.0 .. kG } Ampere turns
AVERAGE FIELD at R ext .. 15 .. kG
B max/ .. 1.3
NUMBER OF SECTORS { compact .. 3 .. } Spiral, max <5 deg
separated ..
SECTOR ANGLE (SSC) .. 8 .. 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 .. q²/a² MeV/amu
(focusing limit) E/A = .. 60 .. q²/a² 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 $\pm 10^{-7}$
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, max .. 300 .. kW
FREQUENCY MODULATION, rate .. /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE .. 2.5×10^{-6} .. Torr or mbar
PUMPS, No, Type, Size .. 1 Diffusion 32 inch

ION SOURCES

.. Hooded Arc; Cold Cathode

INJECTION SYSTEM

.. Internal Injection

EXTRACTION SYSTEM

.. Electrostatic & Magnetic

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed .. 0 .. m² ; movable .. 325 .. m²
TARGET STATIONS .. 8 .. in .. 4 .. rooms
STATIONS served at same time, max .. 1
MAG SPECTROGRAPH, type .. 14 msr, QDDD, P/AP=10⁴
COMPUTER model .. Data General MV4000, MV10000
OTHER FACILITIES .. Scattering Chambers, 150 cm; On-Line ..
Recirculating Gas Target; Bombardement Box; Laser
Polarized Target; On-Line Isotope Separator

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (μ A)	
	Goal	Achieved	Internal	External
p	50	48		20
d	30	28		15
³ He	75	85		8
⁴ He	60	58		8

SECONDARY

(part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH ± 1.8 RF deg .. 1 .. μ A of .42 MeV p. ions
PHASE EXC, max .. RF deg .. μ A of .. MeV .. ions
EXTRACT eff .. 95 .. % .. 1 .. μ A of .42 MeV p. ions
RESOL $\Delta E/E$.. .05 .. % .. 1 .. μ A of .42 MeV p. ions
EMITTANCE
(π mm. mrad) { .20 axial } .. 1 .. μ A 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

