ENTRY No. C70

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 .51x10^6 Ampere turns

AVERAGE FIELD at R ext 15 kG

B max/ <B> 1.3

NUMBER OF SECTORS { compact 3 / separated } Spiral, max ≤5 deg

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^2/a^2 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^{-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/Δp=10^4

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) Goal	Achieved	CURRENT (pμA) Internal	External
p	50	48		20
d	30	28		15
^{3}He	75	85		8
α	60	58		8
SECONDARY				(part/s)

BEAM PROPERTIES

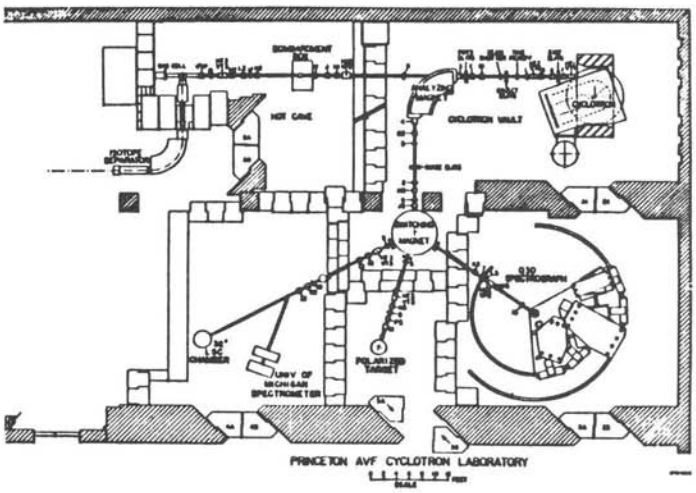
MEASURED	CONDITIONS
PULSE WIDTH ±1.8° RF deg	1 pμ A of 42 MeV p. ions
PHASE EXC, max RF deg	pμ A of MeV ions
EXTRACT eff 95 %	1 pμ A of 42 MeV p. ions
RESOL ΔE/E .05 %	1 pμ A of 42 MeV p. ions
EMITTANCE (π mm. mrad) { .20 axial / .3. rad }	1 pμA of 42 MeV p. Ions

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