

ENTRY NO. 88

NAME OF MACHINE Wash. Univ. Sector Focused Cyclotron DATE 7/19/78
INSTITUTION Washington University
ADDRESS St. Louis, Mo.

IN CHARGE J.T. Hood, Director REPORTED by J. T. Hood
E. S. Macias, Director

HISTORY AND STATUS

DESIGN, date 1960 MODEL tests 1961-62
ENG. DESIGN, date 1961-63
CONSTRUCTION, date 1962-65
FIRST BEAM date (or goal) 1965
MAJOR ALTERATIONS none

OPERATION, 25 hr/wk; On Target 25 hr/wk
TIME DIST., in house 100 %, outside %
USERS' SCHEDULING CYCLE 1 weeks
COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY AFOSR, NSF

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 2
TECHNICIANS 1 CRAFTS 1
GRAD STUDENTS involved during year
OPERATED BY Res staff or x Operators
BUDGET, op & dev
FUNDED BY Washington University

RESEARCH STAFF, not included above

USERS, in house 6 outside
GRAD STUDENTS involved during year 6
RES. BUDGET, in house
FUNDED BY NIH, EPA, NSF, ERDA

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 100 m^2
movable m^2
TARGET STATIONS 6 in 2 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER, model
OTHER FACILITIES

REFERENCES/NOTES

- 1. J. T. Hood, R. A. Goldworm, E. S. Macias and D.G. Sarantites, Nuclear Inst. and Meth. 119, 213-215 (1974).
2. E. S. Macias, R. E. Head, H.-C. Hseuh and M. R. Zalutsky, Nuc. Inst. and Meth. 122, 365-368 (1974).

MAGNET

POLE FACE diameter 137 cm; R extraction 54.5 cm
GAP, min 14.8 cm; Field 17.8 kG } at 46 x 10^6
max 33.8 cm; Field 10.3 kG } ampere turns
AVERAGE FIELD at R ext 14 kG
CURRENT STABILITY 20 parts/10^6; B_max/(kB)
NUMBER OF SECTORS 3; SPIRAL, max low deg
POLE FACE COIL PAIRS: AVF /sec;
Harmonic correction 4/ Sec.
Rad grad /sec or Circ coils 5
WEIGHT: Fe 82 tons; Coils 12 tons
CONDUCTOR, Material and type Cu. Strap
STORED ENERGY MJ
COOLING SYSTEM Oil
POWER: Main coils 120 max, kW
Trimming coils 60 max, kW
YOKE/POLE AREA %
SECTOR ANGLE (Sep Sec) deg
ION ENERGY (Bending limit) E/A = q^2/A^2 MeV
(Focusing limit) E/A = q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
BEAM APERTURE 3.2 cm; DC BIAS 0 kV
TUNED by, coarse MS fine VC, Auto
RF 7 to 16 MHz, stable +/- 1 /10^6
Orb F 7 to 16 MHz; GAIN, max 120 kV/turn
HARMONICS, RF/Orb F, used
DEE-Gnd, max 60 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt)
RF PHASE stable to +/- deg
RF POWER input, max 100 kW
RF PROTECT circuit, speed msec
Type Plate Overload
FREQUENCY MODULATION, rate /sec
MODULATOR, type
BEAM PULSE, width

VACUUM SYSTEM

PUMPS, No., Type, Size 2-Oil Diffusion
Twenty and Seven Inch
OPERATING PRESSURE 20 uTorr,
PUMPDOWN TIME 1 hrs

ION SOURCES/INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic & Magnetic Channel

CONTROL SYSTEM

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CHARACTERISTIC BEAMS

| | Particle | Goal (MeV) | Achieved (MeV) |
|-----------|---------------|-------------------|-------------------------------|
| ENERGY | α | | 12-30 |
| | ^3He | | 9-37 |
| | p | | 12 |
| | d | | 15 |
| CURRENT | | (μA) | (μA) |
| | Internal | | |
| | External | | |
| | d | | 50 |
| | ^3He | | 25 |
| | p | | 20 |
| Secondary | | (part/s) | (part/s) |
| | n | | $3 \times 10^8 / \text{cm}^2$ |

BEAM PROPERTIES

| | Measured | Conditions |
|-------------------|--|----------------------|
| Pulse Width | RF deg | μA of MeV |
| Phase Exc, max | RF deg | μA of MeV |
| Extract Eff | % | μA of MeV |
| Res, $\Delta E/E$ | % | μA of MeV |
| Emittance | (mm-mrad) { axial } μA of MeV | |
| | { radial } | |

OPERATING PROGRAMS, time dist

| | | |
|--------------------------|----|---|
| Basic Nuclear Physics | 25 | % |
| Solid State Physics | | % |
| Bio-Medical Applications | 50 | % |
| Isotope Production | | % |
| Development | | % |
| Sample Analysis | 25 | % |

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

Conversion of 45 inch FF machine.
 Provision for reciprocating water cooled target vertically through beam.
 Heavy ion source.
 Beam pulses $\geq 0.5 \mu\text{s}$ with adjustable "off interval" available.
 Helium-jet recoils transfer system.