

ENTRY No. 113

NAME OF MACHINE **NAVAL RESEARCH LABORATORY CYCLOTRON** DATE **7/24/78**
 INSTITUTION **NAVAL RESEARCH LABORATORY, Radiation Technology Division**
 ADDRESS **Washington, D.C. 20375, USA**
 TEL **TELEX**
 IN CHARGE **Rollon O. Bondelid** REPORTED BY **Rollon O. Bondelid**

HISTORY AND STATUS

DESIGN, date 1) Model tests 1)
 ENG DESIGN, date 1963-1964
 CONSTRUCTION, date 1965-1967
 FIRST BEAM, date (or goal) int. 1967 ext. 1968
 MAJOR ALTERATIONS 2)
 COST, ACCELERATOR \$ 1.8 10⁶
 COST, FACILITY, total \$ 6.0 10⁶
 FUNDED BY U.S. Navy Department
ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
 SCIENTISTS 0 ENGINEERS 4
 TECHNICIANS 6 CRAFTS 2
 GRAD STUDENTS involved during year 3
 OPERATED BY Research staff or Operators
 OPERATION 52 hr/wk, On target 50 hr/wk
 TIME DISTR. in house 60 % , Outside 40 %
 BUDGET, op & dev
 FUNDED BY Office of Naval Research & Users
RESEARCH STAFF, not included above
 USERS, in house 11 outside 3
 GRAD STUDENTS involved during year 3
 RESEARCH BUDGET, in house 725 k
 FUNDED BY Office of Naval Research
MAGNET
 POLE FACE, diameter (compact) 19.3 , R extraction cm
 R injection cm
 GAP, min 19 cm, Field 22.7 kG }
 max 71 cm, Field 12.7 kG } at
 AVERAGE FIELD at R ext 17 kG } Ampere turns
 B max/ 1.3
 NUMBER OF SECTORS { compact 3 } Spiral, max 30 deg
 { separated }
 SECTOR ANGLE (SSC) deg
 TRIMMING COILS Harmonic correction; 3/sect
 10 circular coils
 CONDUCTOR, material and type
 STORED ENERGY (cryogenic) 6.5 MJ
 POWER: main coils 800 max, kW ; current stability 5.10⁻⁵
 trimming coils 350 max, kW ; current stability
 WEIGHT: Fe 250 tons ; coils 45 tons
 COOLING system Demineralized water
 ION ENERGY (bending limit) E/A = q²/a² MeV/amu
 (focusing limit) E/A = .75 q²/a² MeV/amu
ACCELERATION SYSTEM
 DEES, number 1 ; angle 180 deg
 BEAM APERTURE 4.5 cm ; DC Bias 0 kV
 TUNED by, coarse fine VC auto
 RF 7.5 to 22.5 MHz, stable ± 10⁻⁶
 Orb F 1.5 to 22.5 MHz
 HARMONICS, RF/Orb F, used 1,3
 DEE - Gnd, max 70 kV, min gap 1 cm
 STABILITY, (pk-pk noise)/(pk RF volt) 0.005
 ENERGY GAIN, max 100 kV/turn
 RF PHASE, stable to ± 3 deg
 RF POWER input, max 300 kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width
VACUUM SYSTEM
 OPERATING PRESSURE 10⁻⁵ Torr or mbar
 PUMPS, No, Type, Size 2 diffusion 30", 32"
 (32 K & 50 k1/s)

INJECTION SYSTEM

EXTRACTION SYSTEM
 Electrostatic with magnetic channel
FACILITIES FOR RESEARCH
 SHIELDED AREA, fixed 868 m² ; movable m²
 TARGET STATIONS 4 in 3 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type
 COMPUTER model SEL 32/55
 OTHER FACILITIES Double focusing 2.75 m beam analyzing magnet; provision for 11 beam paths, 8 with analyzed beam; beam pickoff unit for T.Q.E. measurements
CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
p	70	52	30	10
d	40	40	30	12
α	78	78	30	10
³ He	120	90		

SECONDARY (part/s)

BEAM PROPERTIES

MEASURED	CONDITIONS
PULSE WIDTH .5 RF deg	μA of MeV ions
PHASE EXC, max 30 RF deg	μA of MeV ions
EXTRACT eff 40 %	μA of MeV ions
RESOL ΔE/E %	μA of MeV ions
EMITTANCE	
(π mm. mrad) { axial } { rad }	μA of MeV ions

OPERATING PROGRAMS, time distribution
 BASIC NUCLEAR PHYSICS 0% SOLID STATES PHYSICS 40%
 BIOMEDICAL APPLICAT. 60% ISOTOPE PRODUCTIONS 0%

REFERENCES/NOTES
 1) Horizontal median plane version of ORIC
 2) Conversion to RCA4648 power tetrode from RCA 6949 in late 1976. New computer installed July 1976

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS