ENTRY NO. 70

NAME OF MACHINE Naval Research Laboratory Cyclotron DATE 7/24/78
INSTITUTION Naval Research Laboratory, Radiation Technology Division
ADDRESS Washington, D. C. USA 20375

IN CHARGE Rollon O. Bondelid REPORTED by Rollon O. Bondelid

HISTORY AND STATUS

DESIGN, date Note[1] MODEL tests Note[1]
ENG. DESIGN, date 1963 - 1964
CONSTRUCTION, date 1965 - 1967
FIRST BEAM date (or goal) int. 1967; ext. 1968
MAJOR ALTERATIONS Note[2]

OPERATION, 52 hr/wk; On Target 50 hr/wk
TIME DIST., in house 60 %, outside 40 %
USERS' SCHEDULING CYCLE 6 weeks
COST, ACCELERATOR $1.8 x 10^6
COST, FACILITY, total $6 x 10^6
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 ____ Res staff or x Operators
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
RES. BUDGET, in house 725k
FUNDED BY Office of Naval Research

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 868 m^2
movable ____ m^2
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 meter beam analyzing magnet; Provision for 11 beam paths, 8 with analyzed beam; Beam Pickoff Unit for time-of-flight measurements.

REFERENCES/NOTES

[1] Horizontal median plane version of ORIC.

[2] Conversion to RCA 4648 power tetrode from RCA 6949 in late 1976. New computer installed July 1976.

MAGNET

POLE FACE diameter 193 cm; R extraction 80 cm
GAP, min 19 cm; Field 22.7 kG
max 71 cm; Field 12.7 kG
AVERAGE FIELD at R ext 17 kG
} at ____ X 10^6 ampere turns
CURRENT STABILITY 50 parts/10^6; $B_{max}/\langle B \rangle$ 1.3
NUMBER OF SECTORS 3 ; SPIRAL, max 30 deg
POLE FACE COIL PAIRS: AVF 1 /sec;
Harmonic correction 3/sector
Rad grad --- /sec or Circ coils 10
WEIGHT: Fe 250 tons; Coils 45 tons
CONDUCTOR, Material and type CU, square hollow
STORED ENERGY ~ 6.5 MJ
COOLING SYSTEM demineralized water
POWER: Main coils 800 max, kW
Trimming coils 350 max, kW
YOKE/POLE AREA 100 %
SECTOR ANGLE (Sep Sec) - deg
ION ENERGY (Bending limit) E/A = - q^2/A^2 MeV
(Focusing limit) E/A = ~ 75 q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
BEAM APERTURE 4.5 cm; DC BIAS 0 kV
TUNED by, coarse MS fine VC, auto
RF 7.5 to 22.5 mHz, stable ± 1 /10^6
Orb F 1.5 to 22.5 mHz; GAIN, max 100 kV/turn
HARMONICS, RF/Orb F, used 1.3
DEE-Gnd, max 70 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) .005
RF PHASE stable to ± ~ 3 deg
RF POWER input, max 300 kW
RF PROTECT circuit, speed 1 μsec
Type Ignitron crowbar
FREQUENCY MODULATION, rate NA /sec
MODULATOR, type NA
BEAM PULSE, width NA

VACUUM SYSTEM

PUMPS, No., Type, Size 2 diffusion 30", 32" (32k & 50 k ℓ/sec
OPERATING PRESSURE 10 μTorr,
PUMPDOWN TIME 3.0 - 3.5 hrs

ION SOURCES/INJECTION SYSTEM

Hot filament

EXTRACTION SYSTEM

Electrostatic with magnetic channel

CONTROL SYSTEM

Conventional

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	70	52
	d	40	40
	α	78	78
	^{3}He	120	90
CURRENT		(μA)	(μA)
Internal	p	30	30
	d	30	30
	α	30	30
External	p	10	10
	d	12	12
	α	10	10
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	5	RF deg		μA of		MeV
Phase Exc, max	30	RF deg		μA of		MeV
Extract Eff	40	%		μA of		MeV
Res, ΔE/E		%		μA of		MeV
Emittance						
(mm-mrad)	10 axial / 30 radial			μA of		MeV

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	0 %
Solid State Physics	40 %
Bio-Medical Applications	60 %
Isotope Production	0 %
Development	%
	%
	%

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