ENTRY NO. 80

NAME OF MACHINE Davis 76" Isochronous Cyclotron DATE July 31, 1978
INSTITUTION Crocker Nuclear Laboratory, University of California
ADDRESS Davis, California 95616

IN CHARGE J. A. Jungerman REPORTED by J. A. Jungerman

HISTORY AND STATUS

DESIGN, date _____ MODEL tests _____
ENG. DESIGN, date ORIC copy
CONSTRUCTION, date 1964-1966
FIRST BEAM date (or goal) Int., ext. 1966
MAJOR ALTERATIONS none

OPERATION, 128 hr/wk; On Target 65 hr/wk
TIME DIST., in house 75 %, outside 25 %
USERS' SCHEDULING CYCLE 4 weeks
COST, ACCELERATOR 1.4×10^6
COST, FACILITY, total 4.5×10^6
FUNDED BY A.E.C., U.D., N.S.F.

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS 2
TECHNICIANS 4 CRAFTS 6
GRAD STUDENTS involved during year 5
OPERATED BY 1/3 Res staff or 2/3 Operators
BUDGET, op & dev $350,000
FUNDED BY beam recharges

RESEARCH STAFF, not included above

USERS, in house 11 outside 5
GRAD STUDENTS involved during year 12
RES. BUDGET, in house $1,065,000
FUNDED BY NCI, DOE, EPA, CA Air Resources Board

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 360 m^2
movable 0 m^2
TARGET STATIONS 7 in 3 rooms
STATIONS served at same time, max 2
MAG SPECTROGRAPH, type none
COMPUTER, model PDP 15/40, PDP 11
OTHER FACILITIES Isotope production, Irradiation; Solid State Biological, ch. part and n Flight study 10 m

REFERENCES/NOTES

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 17.5 kG
} at 0.8 X 10^6 ampere turns
CURRENT STABILITY 10 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
Rad grad – /sec or Circ coils 10
WEIGHT: Fe 268 tons; Coils 42 tons
CONDUCTOR, Material and type Copper 1" square hollow cond
STORED ENERGY 10 MJ
COOLING SYSTEM Demineralized H_2O
POWER: Main coils 800 max, kW
Trimming coils 500 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 = _____ 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 7.3 to 22 mHz, stable ± 1 /10^6
Orb F 1.5 to 22 mHz; GAIN, max 180 kV/turn
HARMONICS, RF/Orb F, used 1,3
DEE-Gnd, max 90 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.005
RF PHASE stable to ± 10 deg
RF POWER input, max 150 kW
RF PROTECT circuit, speed 2 μsec
Type Ignitron Crowbar
FREQUENCY MODULATION, rate _____ /sec
MODULATOR, type _____
BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size 2 diffusion pumps 81 cm and 89 cm
OPERATING PRESSURE 10 μTorr,
PUMPDOWN TIME 3 hrs

ION SOURCES/INJECTION SYSTEM

Hot fil, mod. LBL 88"

EXTRACTION SYSTEM

CONTROL SYSTEM

ENTRY NO. 80 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	20-75	20-65
	α	25-90	25-90
	^{3}He	30-100	35-86
CURRENT		(μA)	(μA)
Internal	p	1000	300+
	α		100
External	p		30
	α		40
	d		40
		(part/s)	(part/s)
Secondary	n		5×10^6
	pol. n		3×10^5

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	4° RF deg	5	μA of	32	MeV	d
Phase Exc, max	40° RF deg	7	μA of	38	MeV	p
Extract Eff	90 %	20	μA of	65	MeV	p
Res, ΔE/E	0.2 %	0.1	μA of	30	MeV	p
Emittance						
(mm-mrad) { axial / radial }			μA of		MeV	

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	35 %
Solid State Physics	2 %
Bio-Medical Applications	5 %
Isotope Production	23 %
Development	%
Elemental Analysis	20 %
Space Simulation	5 %
Hot Atom Chemistry	3
Machine Improvement	5
Neutron Therapy	2

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

The following are special features of the of the Davis 76" Isochronous Cyclotron program:

1. A large and active program in nuetron scattering and reactions in the energy region between 25 MeV and 60 MeV. Both unpolarized and polarized neutron beams of reasonable intensity are available, as is a polarized proton target.

2. The neutron program, when added to programs in charged particle reactions, particle-gamma techniques, and hot atom chemistry, form the research bse of the facility which comprises about half of the scheduled operating time. Considerable work is done in a variety of programs based upon applications of accelerator beams to environmental, medical, and industrial problems, particularly air pollution monitoring, production of ^{123}I and ^{201}Tl for nuclear medicine, and neutron cancer therapy.

3. The accelerator is almost entirely supported by beam recharges from private, state and federal programs.