

ENTRY No. 92

NAME OF MACHINE Injector Cyclotron DATE July 1981
INSTITUTION Lawrence Livermore National Laboratory
ADDRESS P.O. Box 808, Livermore, CA 94550 (USA)
TEL 415-422-7804 TELEX
IN CHARGE Ivan D. Proctor REPORTED BY Ivan D. Proctor

HISTORY AND STATUS

DESIGN, date * Model tests
ENG DESIGN, date 1968
CONSTRUCTION, date 1968
FIRST BEAM, date (or goal) 1969
MAJOR ALTERATIONS None

COST, ACCELERATOR 430 K \$
COST, FACILITY, total 580 K \$
FUNDED BY U.S. DOE

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 0.5 ENGINEERS 0.5
TECHNICIANS 4.5 CRAFTS 1
GRAD STUDENTS involved during year 0
OPERATED BY Research staff or 2.5 Operators
OPERATION 2.80 hr/wk, On target 2.70 hr/wk
TIME DISTR. in house 90 % Outside 10 %
BUDGET, op & dev 750 K \$
FUNDED BY U.S. DOE

RESEARCH STAFF, not included above

USERS, in house 10 outside 3
GRAD STUDENTS involved during year 2
RESEARCH BUDGET, in house
FUNDED BY

MAGNET

POLE FACE, diameter (compact) 82 cm, R extraction 35 cm
R injection cm
GAP, min 5 cm, Field 20 kG }
max 10 cm, Field 12 kG } at 0.16x10⁶
AVERAGE FIELD at R ext 16.5 kG } Ampere turns
B max/ 1.016

NUMBER OF SECTORS { compact 3 } Spiral, max 30 deg
{ separated }
SECTOR ANGLE (SSC) deg
TRIMMING COILS None

CONDUCTOR, material and type Al ribbon
STORED ENERGY (cryogenic) MJ
POWER: main coils 58 max, kW; current stability 4/10⁵
trimming coils max, kW; current stability
WEIGHT: Fe 14 tons; coils 1.2 tons
COOLING system LCH
ION ENERGY (bending limit) E/A = 15 q²/a² MeV/amu
(focusing limit) E/A = 15 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 120 deg
BEAM APERTURE 1.9 cm; DC Bias -1.0 kV
TUNED by coarse strap fine capacitor
RF 12.5 to 25.0 MHz, stable ± 5/10⁶
Orb F 12.5 to 25.0 MHz
HARMONICS, RF/Orb F, used 1
DEE - Gnd, max 25 kV, min gap cm
STABILITY, (pk-pk noise)/(pk RF volt)
ENERGY GAIN, max 100 kV/turn
RF PHASE, stable to ± deg
RF POWER input, max 36 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 1.0 x 10⁻⁶ Torr or mbar
PUMPS, No, Type, Size 4000 l/s cryo and 1500 l/s Turbo

ION SOURCES

P.I.G. Internal and external

INJECTION SYSTEM

Axial

EXTRACTION SYSTEM

Electrostatic and channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 215 m²; movable m²
TARGET STATIONS 6 in 2 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Split pole
COMPUTER model Nuclear Data, PDP 15
OTHER FACILITIES 16 Detector, 10.7 meter neutron TOF,
charged particle quad spectrometer, 10 x 10 NaI
spectrometer

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (µA)	
	Goal	Achieved	Internal	External
H ⁺	15	15	50	25
D ⁺	8	8	15	10

SECONDARY

(part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH 15 RF deg 50 µA of 15 MeV H⁺ ions
PHASE EXC, max RF deg µA of MeV ions
EXTRACT eff 80 % 10 µA of 15 MeV H⁺ ions
RESOL ΔE/E 0.1 % 1 µA of 15 MeV H⁺ ions
EMITTANCE

(π mm. mrad) { 25 axial } 10 µA of 15 MeV H⁺ ions
{ 50 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 75 SOLID STATES PHYSICS 10
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 5
10% applied

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

* Cyclotron Crop. Model CNI-15