ENTRY NO. 96

NAME OF MACHINE: Indiana University Cyclotron Facility
INSTITUTION: Indiana University
ADDRESS: 2401 Milo B. Sampson Lane, Bloomington, Indiana 47405
TEL: 812-335-9365 TELEX: INDIANA U BLOM 272279
IN CHARGE: V. Viola REPORTED BY: D.L. Friesel

HISTORY AND STATUS

DESIGN, date: 1966 Model tests: 1967-1972
ENG DESIGN, date: 1968-1973
CONSTRUCTION, date: 1968-1974
FIRST BEAM, date (or goal): September 24, 1975
MAJOR ALTERATIONS: Electron Cooling Ring under construction: $K = 560\ q^2/A$
COST, ACCELERATOR: $5 x 10^6 (initial operation, 1970 dollars)
COST, FACILITY, total: $11 x 10^6 (initial operation, 1970 dollars)
FUNDED BY: National Science Foundation

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS: 19 ENGINEERS: 9
TECHNICIANS: 31 CRAFTS: 8
GRAD STUDENTS involved during year: ---
OPERATED BY: 4 Research staff or 8 Operators
OPERATION: 138 Av. hr/wk. On target: 115 Av. hr/wk
TIME DISTR. in house: 45 %, outside: 55 %
BUDGET, op & dev: 6.1 x 10^6
FUNDED BY: National Science Foundation, Indiana University

RESEARCH STAFF, not included above

USERS, in house: 24 outside: 120 each year
GRAD STUDENTS involved during year: 29
RESEARCH BUDGET, in house: 1.2 x 10^6
FUNDED BY: National Science Foundation and NASA

MAGNET (Main Cyclotron)

POLE FACE, diameter (compact): --- cm, R-extraction: 330 cm
R injection: 101 cm
GAP, min: 7.6 cm, Field: 16.5 kG
max: ∞ cm, Field: <.2 kG } at 150,000 Ampere turns
AVERAGE FIELD at R ext: 6.4 kG
B max/<B>: 2.50
NUMBER OF SECTORS: compact: --- / separated: 4 Spiral, max: N/A deg
SECTOR ANGLE (SSC): 36 deg
TRIMMING COILS: 21 gradient, 4 axial harmonic, 4 radial harmonic
CONDUCTOR, material and type: Hollow Copper
STORED ENERGY (cryogenic): --- MJ
POWER: main coils: 400 max kW: current stability 5 parts in 10^6
trimming coils: 100 max kW: current stability 4 parts in 10^6
WEIGHT: Fe: 2000 tons: coils: 10 tons
COOLING system: Deionized Water
ION ENERGY (Bending limit) E/A = 215 q^2/A^2 MeV/amu
(Focusing limit) E/A = >215 q/A MeV/amu

ACCELERATION SYSTEM

DEES, number: 2 angle: (45° Geo.) (180° RF) deg
BEAM APERTURE: 4 cm; DC Bias: 0 kV
TUNED by, coarse: panels fine: none
RF: 25 to 35.5 MHz, stable ±: 0.5 Hz
Orb F: 1.6 to 9.0 MHz
HARMONICS, RF/Orb F, used: 3-8, 11-16
DEE–Gnd, max: 140 kV, min gap: 3.0 cm
STABILITY, (pk-pk noise)/(pk RF volt): 1 part in 10^3
ENERGY GAIN, max: 560 kV/turn
RF PHASE, stable to ±: 0.5 deg
RF POWER input, max.: 150 kW
FREQUENCY MODULATION, rate: --- /s
modulator, type: ---
beam pulse, width: <1 x 10^{-9} sec

VACUUM SYSTEM

OPERATING PRESSURE: 10 μ Torr or mbar
PUMPS, No, Type, Size: 2 35" Diffusion
4 CTI 20" Cryopanels

ION SOURCES

Duoplasmotron (H^+, H_2^+, H^-, d, He^+)
Beta-Euchriptite (Li^+)
Hot Filament PIG (H^+, He^{++})
Atomic Beam ($\vec{p}$,$\vec{d}$)

INJECTION SYSTEM

600 keV DC Terminal plus 1/3 Scale Injector Cyclotron

EXTRACTION SYSTEM

Non-Resonant Electrostatic/Magnetic

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed: 300 m^2; movable: 800 m^2
TARGET STATIONS: 8 in: 6 rooms
STATIONS served at same time, max: 2
MAG SPECTROGRAPH, type: QQDD (30 mSr), High Res. K600 QDD
COMPUTER model: 1 VAX 8600, 3-VAX 750, PDP 11/44
OTHER FACILITIES
1) Beam Splitting Serves 2 Users Simultaneously.
2) Stripper loop provides high brightness beams with variable pulse periods (1.8 to 10 μSec)

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
$p(\vec{p})$	200	215	7(0.5)	6(0.5)
$d(\vec{d})$	104	100	2(0.4)	1.5(0.3)
^3He, ^4He	300/200	270/200	0.7	0.6
^6Li, ^7Li	300/260	154/100	0.7	0.6
SECONDARY			(part/s)	
N/A				

BEAM PROPERTIES

MEASURED		CONDITIONS			
PULSE WIDTH	4 RF deg	all	pμA of all	MeV all	ions
PHASE EXC. max	7 RF deg	"	pμA of "	MeV "	ions
EXTRACT eff	98 %	"	pμA of "	MeV "	ions
RESOL ΔE/E	.04 %	"	pμA of "	MeV "	ions
EMITTANCE					
(π mm-mrad)	1.5 axial / 1.5 rad	all	pμA of all	MeV all	

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 95%. SOLID STATES PHYSICS ---.
BIOMEDICAL APPLICAT. ---. ISOTOPE PRODUCTIONS ---.
Radiation Damage, Effects of Radiation on Satellite Born Equip. and other applications 5%

REFERENCES/NOTES

1) IUCF Status Report, R.E. Pollock, IEEE Trans. Nucl. Science, NS-26, No. 2, p. 1965 (1978).
2) The IUCF Cooler, R.E. Pollock, IEEE Tran. Nucl. Sci, NS-30, No. 4, p.2056 (1983).

PLAN VIEW OF FACILITY, COMMENTS, ETC.