ENTRY NO. 81

NAME OF MACHINE IUCF Main Stage Cyclotron DATE: April, 1984

INSTITUTION Indiana University Cyclotron Facility

ADDRESS 2401 Milo B. Sampson Lane, Bloomington, IN 47405, USA

TEL 812-335-9365 TELEX Indiana U Blom 272279

IN CHARGE D.W. Miller/P.P. Singh REPORTED BY J.W. Hicks

HISTORY AND STATUS

DESIGN, date 1966 Model tests 1967-1972

ENG DESIGN, date 1968-1973

CONSTRUCTION, date 1968-1974

FIRST BEAM, date (or goal) August 1975

MAJOR ALTERATIONS

COST, ACCELERATOR $ 6 10^6

COST, FACILITY, total $ 14 10^6

FUNDED BY National Science Foundation and I.U.

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 6 ENGINEERS 8

TECHNICIANS 22 CRAFTS 18

GRAD STUDENTS involved during year

OPERATED BY --- Research staff or 8 Operators

OPERATION 138 hr/wk. On target 110 hr./wk

TIME DISTR. in house 45 % Outside 55 %

BUDGET, op & dev $4.6 10^6 (+ $2 10^6 Cooler)

FUNDED BY National Science Foundation

RESEARCH STAFF, not included above

USERS, in house 25 outside >120

GRAD STUDENTS involved during year

RESEARCH BUDGET, in house $1.1 10^6

FUNDED BY National Science Foundation

MAGNET

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 <0.2 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 ... deg

SECTOR ANGLE (SSC) 36 deg

TRIMMING COILS 21 Gradient, 4 harmonic

CONDUCTOR, material and type Hollow Copper

STORED ENERGY (cryogenic) MJ

POWER: main coils 400 max, kW; current stability

trimming coils 100 max, kW; current stability

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 10 deg

BEAM APERTURE 4 cm; DC Bias 0 kV

TUNED by, coarse panels fine ---

RF 25 to 35.5 mHz, stable ± ---

Orb F 1.6 to 9.0 mHz

HARMONICS, RF/Orb F, used 3-8, 11-16

DEE—Gnd, max 200(130) kV, min gap 3 cm

STABILITY, (pk-pk noise)/(pk RF volt) ---

ENERGY GAIN, max 800 Des. (520 Op.) kV/turn

RF PHASE, stable to ± 1.0 deg

RF POWEP input, max 150 kW

FREQUENCY MODULATION, rate --- /s

modulator, type ---

beam pulse, width ---

VACUUM SYSTEM

OPERATING PRESSURE 10 μ Torr

PUMPS, No, Type, Size 2 - 35" Diffusion

6 - Cryopanels

ION SOURCES

Duoplasmatron (H^+, H^-, He^+)

Beta-Euchryptite (Li^{++})

Hot Filament P.I.G. (He^{++})

Atomic Beam ($\vec{p}$,$\vec{d}$)

INJECTION SYSTEM

D.C. Terminal plus 1/3 scale Injector Cyclotron

EXTRACTION SYSTEM

Non-Resonant Electrostatic/Magnetic

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 300 m²; movable 800 m²

TARGET STATIONS 7 in 5 rooms

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type QDDM, QQDD (30 msr)

COMPUTER model VAX 750, PDP 11

OTHER FACILITIES

Beam splitting scheduled for 1984.

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
P	200	215	7	6
d	104	98	2	1.5
^3He, ^4He	300/200	270/200	.7	.5
^6Li, ^7Li	300/260	154/100	.7	.5
SECONDARY		(part/s)		

BEAM PROPERTIES

	MEASURED		CONDITIONS			
PULSE WIDTH	4	RF deg	all	pμ A of all	MeV all	ions
PHASE EXC. max	7	RF deg	all	pμ A of all	MeV all	ions
EXTRACT eff	95	%	all	pμ A of all	MeV all	ions
RESOL ΔE/E	.04	%	all	pμ A of all	MeV all	ions
EMITTANCE (π mm. mrad)	1.5 axial; 1.5 rad		all	pμ A of all	MeV all	

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 95%. SOLID STATES PHYSICS

BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

1)

2)

PLAN VIEW OF FACILITY, COMMENTS, ETC

1. Storage ring with electron cooling under construction.

2. K300/K600 double arm spectrometer under construction.