ENTRY NO. CB4 Date 21 JUNE 92

Name of Machine INDIANA UNIVERSITY COOLER RING

Institution INDIANA UNIVERSITY CYCLOTRON FACILITY

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HISTORY

MILESTONE DATES:

Design 1981-1983 Model Tests 1982-1986

Construction 1983-1987 First Beam 1987

DESIGN/CONSTRUCTION BY:

in house YES other Various Fabrication Vendors

COST: Accelerator $6.8 x 10^6 Facility 9. x 10^6

FUNDED BY: NATIONAL SCIENCE FOUNDATION (NSF)

STATUS

STAFF: Machine

Scientists 14 Engineers 14

Technicians 46 Students 3

Research (in house/external)

Scientists 41 / >250 Engineers -- / --

Technicians 9 / -- Students 53 / 25

BUDGET: Machine $10-x 10^6 Funded by NSF

Research Funded by

TIME DISTRIBUTION:

Basic Research (in house/external) 20. % / 20. %

Applied Program (in house/external) 0 % / 0 %

Maintenance 50 % Development 10 %

MAIN PARAMETERS

MACHINE TYPE: Synchrotron/Storage Ring

ION TYPES: P, $\bar{P}$, d, $\bar{d}$, ^{3}He, ^{4}He ENERGY: 3.6 Tm MeV/u

RING: Geometry Irregular Hexagon Circumference 86.83 m

INJECTED BEAM CHARACTERISTICS

PARAMETERS: Injected Ions P, $\bar{P}$, d, $\bar{d}$, ^{3}He, ^{4}He

Energy 200 MeV/u Ions/bunch 10^6

EMITTANCE: h 1.5 πmm mrad v 1.5 πmm mrad

$\Delta E/E$ 0.1 % Bunch length 1.0 x D.C. nsec

TIMING: Bunch freq 60-90 MHz Filling Time 10^3-10 sec

INJECTION METHOD: Stripping Inj. & Kick Accumulation

MAGNET SYSTEM

LATTICE: Focusing Type Separated Function

Focusing Order FODO

Betatron Freq: ν_h 3.85 ν_v 4.85

No. Short Straight Sections 3 Length 10.0 m

No. Long Straight Sections 3 Length 12.5 m

BENDING MAGNETS: No. 8 + 4 Length(ea) 1.24&1.12 m

Field: max 1.53 T

QUADRUPOLES: No. 18 + 18 Length(ea) 2.3 & 3.8 m

Gradient: max 15 T/m

OTHER MAGNETS: 16 Sextupoles

RF SYSTEM

CAVITIES: No. 2 Type Coaxial Lamda/4

RF FREQ. 0.5-16 MHz HARMONIC f_{rf}/f_{ion} 1-9

VOLTS/CAV(max) .3 x 10^{-3} (h=1) and 5. x 10^{-3} (PPA) MV

POWER/CAV(max) 1. x 10^{-3} (h=1) and 5. x 10^{-4} (PPA) MW

VACUUM SYSTEM

VACUUM CHAMBER: Material Stainless Steel

Aperture <5> x <5> cm^2

PUMPS:(No.,Type,Speed) 7 ION @ 220 l/s, 8 Ti Sublimation @ 900 l/s & 14 Getter @ 750 l/s

PRESSURE: 1. x 10^{-9} Torr

EXTRACTION SYSTEM

TYPE: (a) No external beam

(b) Internal target experiments

(c)

LENGTH OF SPILL: (a) sec

(b) sec

(c) sec

CHARACTERISTIC BEAMS (Internal Beams)

	Ion	E/A (MeV/u)	Ions/pulse	ΔE/E (%)
(a)	P, $\bar{P}$	500	1x10^9	0.01 Cooled.
(b)	d, $\bar{d}$	150	1x10^9	0.01 Cooled.
(c)	^{3}He	250	1x10^9	0.01 Cooled.
(d)	^{4}He	150	1x10^9	

EXTRACTED BEAM PROPERTIES:

Rep. Rate (pulse/sec) N/A

$\epsilon_n = \beta\gamma\epsilon$ h .... πmm mrad for .... μA of .... MeV/u .... ions

v .... πmm mrad for .... μA of .... MeV/u .... ions

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed 2000 m^2 Moveable -- m^2

Target Stations: 4 No. Served At Same Time: 1

MAGNETIC SPECTROMETERS: None

OTHER FACILITIES: Pol. ^{3}He & Proton Targets, Scrapper and Gas Jet Targets, Siberian Snake, Electron Cooling System

REFERENCES/NOTES

(a) 1991 IUCF Scientific & Technical Report

(b) The Indiana Cooler Project, R.E. Pollock, Proc. 11th Intl. Cyclotron Conf., Tokyo, Japan, p. 123 (1986).

OTHER RELEVANT PARAMETERS, RECENT IMPROVEMENTS, ETC.

Operating mode is to use thin internal targets (<100 ngm/cm^2) with circulating electron cooled ion beams to perform high Resolution Intermediate Energy Physics Research ($\Delta E/E = 0.01^0/_0$)

PLAN VIEW OF FACILITY, COMMENTS