

ENTRY NO. CB4 Date August 10, 1995
 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 10⁶ Facility \$9 x 10⁶

FUNDED BY: National Science Foundation (NSF)

STATUS

STAFF: Machine

Scientists 16 Engineers 12
 Technicians 36 Students 4

Research (in house/external)

Scientists 46 / 250 Engineers 0 /
 Technicians 0 / Students 50 / 25

BUDGET: Machine \$10 x 10⁶ Funded by NSF
 Research Funded by

TIME DISTRIBUTION:

Basic Research (in house/external) 19 % / 19 %
 Applied Program (in house/external) 0 % / 0 %
 Maintenance 50 % Development 12 %

MAIN PARAMETERS

MACHINE TYPE: Synchrotron/Storage Ring
 ION TYPES: P, P⁺, d, ³He, ⁴He, ENERGY: 3.6 TM MeV/u
 RING: Geometry Irregular Hexagon Circumference 86.83 m

INJECTED BEAM CHARACTERISTICS

PARAMETERS: Injected Ions P, P⁺, d, ³He, ⁴He
 Energy 30-200 MeV/u Ions/bunch 10⁶
 EMITTANCE: ϵ_x 1.5 π mm mrad ϵ_y 1.5 π mm mrad
 $\Delta E/E$ 0.1 % Bunch length 1.0 nsec
 TIMING: Bunch freq 8-35 MHz Filling Time 1-600 sec
 INJECTION METHOD: Stripping & Stacking Accumulation

MAGNET SYSTEM

LATTICE: Focusing Type Separated Function
 Focusing Order FODO
 Betatron Freq: ν_x 3.85 ν_y 4.85
 No. Short Straight Sections 3 Length 10 m
 No. Long Straight Sections 3 Length 12.5 m
 BENDING MAGNETS: No. 8+4 Length (ea) 1.24 & 1.2 m
 Field: max 1.53 T
 QUADRUPOLES: No. 18+18 Length (ea) 0.272 & 0.425 m
 Gradient: max 15 T/m
 OTHER MAGNETS: 16 Sextupoles

RF SYSTEM

CAVITIES: No. 2 Type Coaxial Lambda/4
 RF FREQ 0.5-16 MHz HARMONIC f_r/f_{ion} 1-9
 PEAK VOLTS/CAV 5×10^{-4} (h=1) and 3×10^{-3} (PPA) MV
 PEAK POWER/CAV 1×10^{-3} (h=1) and 5×10^{-4} (PPA) MW

VACUUM SYSTEM

VACUUM CHAMBER: Material Stainless Steel
 Aperture <5> x <5> cm²
 PUMPS: (No., Type, Speed) 7 ION@220.1/s, 8 Ti
 SUBLIMATION@900.1/s & 14 Getter@750.1/s
 PRESSURE: 1×10^{-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

	Ion	E/A (MeV/u)	Ions/pulse	$\Delta E/E$ (%)
(a) P, P ⁺		500	1×10^9	0.01 Cooled
(b) d, d ⁺		150	1×10^9	0.01 Cooled
(c) ³ He		250	1×10^9	0.01 Cooled
(d) ⁴ He		150	1×10^9	

EXTRACTED BEAM PROPERTIES:

Rep. Rate (pulse/sec) N/A
 $\epsilon_n = \beta \gamma \epsilon$ h π mm mrad for μ A of MeV/u ions
 v π mm mrad for μ A of MeV/u ions

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: 2000 m² Moveable -- m²
 Target Stations: 4 No. Served At Same Time: 2
 MAGNETIC SPECTROMETERS: NONE
 OTHER FACILITIES: POL Protons & ³He Targets
 Scraper and Gas Jet Targets, Siberian Snake
 Magnetic Channel
 Electron Cooling

REFERENCES/NOTES

- 1994 IUCF Scientific & Technical Report
- The Indiana Cooler Project, R.E. Pollock, Proc. 11th Intl. Cyclotron Conference, Tokyo, Japan P.123 (1986)

OTHER RELEVANT PARAMETERS, RECENT IMPROVEMENTS, ETC. Operating mode is to use thin internal targets (1100 ng/cm²) with circulating electron cooled ion beams to perform high resolution intermediate energy physics research ($\Delta E/E = 0.01\%$)

PLAN VIEW OF FACILITY, COMMENTS

