

ENTRY NO. C62 Date 21 JUNE 92
 Name of Machine INDIANA UNIVERSITY CYCLOTRON FACILITY
 Institution INDIANA UNIVERSITY
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HISTORY

MILESTONE DATES:
 Design 1966 Model Tests 1967-1972
 Construction 1968-1974 First Beam Sept. 1975
 DESIGN/CONSTRUCTION BY:
 in house yes other Various Fabrication Vendors
 COST: Accelerator \$5 x 10⁶ Facility \$11 x 10⁶
 FUNDED BY: NATIONAL SCIENCE FOUNDATION (NSF)

STATUS

STAFF: Machine
 Scientists 14 Engineers 14
 Technicians 46 Students 3
 Research (in house/external)
 Scientists 41 / >200 Engineers 0 / 1
 Technicians 9 / 22 Students 53 / 25
 BUDGET: Machine \$10x10⁶ Funded by NSF
 Research Funded by NSF
 TIME DISTRIBUTION:
 Basic Research (in house/external) 34. % / 34. %
 Applied Program (in house/external) 2. % / 1. %
 Development 12. % Maintenance 17. %

MAGNET

POLE PARAMETERS:
 Diameter N/A cm R_{extract} 330 cm R_{inject} 101 cm
 HILL PARAMETERS: Gap (min) 7.6 cm B_{max} 1.65 T
 (@ 150,000 AT) Gap (max) 7.6 cm B_{min} 1.65 T
 VALLEY PARAMETERS: Gap (min) ∞ cm B_{max} <0.02 T
 (@ 150,000 AT) Gap (max) ∞ cm B_{min} <0.02 T
 AVERAGE FIELD: < B >_{min} 0.058 T < B >_{max} 0.64 T
 NUMBER OF SECTORS: compact/separated N/A / 4
 sector angle 36 deg. spiral (max) N/A deg.
 FIELD TRIMMING: Trim Coils 21 Gradient
 Harmonic Coils 4 Axial, 4 Radial
 Other None
 CURRENT: Main Coils 1000 Amps Stability 1x10⁻⁶
 Trim Coils 950 Amps Stability 1x10⁻⁵
 Stored Energy (cryogenic) MJ
 WEIGHT: Iron 2000 Tons Conductor 10 Tons
 ION ENERGY: Bending Limit E/A = 215 q²/A² MeV/u
 Focussing Limit E/A = 215 q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description: 2-L/4 Wave RF Resonators
 No. of Gaps/turn 4 dE/dn(max) 0.80 MeV/q
 Voltage(max) 0.2 MV Harmonic f_{rf}/f_{ion} 3-7, 11-14
 Freq 25-35.5 MHz Power in(max) 150 MW
 Stability: Phase 0.25 RF Degree Voltage 8 x 10⁻⁵
 OTHER CAVITIES (Flattopping or otherwise):
 Description: NONE
 Region of Influence: R_{min} cm R_{max} cm
 No. of Gaps/turn dE/dn(max) MeV/q
 Voltage(max) MV Harmonic f_{rf}/f_{ion}
 Freq MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 3 x 10⁻⁶ Torr
 PUMPS: No. and type 4 CRYOGENIC, 2 DIFFUSION PUMPS

ION SOURCE(S)

	Type	Intensity (mA)	ϕ (πmm mrad)	ε _n = βγϵ (πmm mrad)	Ion Species
(a)	ANAL POL	0.008	20.0	20.0	P, d (78% Pol)
(b)	Duoplasmatron	0.300	<10.0	<10.0	P, d, ³ He, ⁴ He
(c)	AB (ECR) PIS*	0.100	<20.0	<20.0	P, d (>70% Pol)
(d)					*Undergoing beam development presently.

INJECTION SYSTEM

Midplane Injection Radial Inflector Efficiency 75. %

EXTRACTION SYSTEM

Electrostatic & Magnetic Septums Efficiency 99. %

CHARACTERISTIC BEAMS

	Accelerated Ions	E/A (MeV/u)	Internal Current (part μA)	External Current (part μA)
(a)	H ⁺ & Pol H ⁺	20-205	0.5	0.5
(b)	d & Pol d	10-50	0.5	0.5
(c)	³ He	8-95	0.3	0.3
(d)	⁴ He	7-50	0.3	0.3

	Secondary Particles	E (MeV)	part/sec
(a)	n & Pol n	20-205	10 ⁵
(b)			
(c)			

EXTRACTED BEAM PROPERTIES:

For 0.5 μA of ALL MeV/u ALL ions
 ΔE/E 0.1 % Δφ 4.0 °rf
 ε_n = βγϵ x 1.5 πmm mrad z 1.5 πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed 4600 m² Moveable 8 m²
 Target Stations 8 No. Served At Same Time 2
 MAGNETIC SPECTROMETERS: K600 High Res. Spectrometer
 OTHER FACILITIES: QOSP Pion Spectrometer
 --3.6 Tm Synchrotron Storage Ring with Electron Cooling
 --Neutron Beam Swinger & PNF TOF Facilities
 --Proton Radiation Therapy Facility (under construction)

REFERENCES/NOTES

- (a) 1991 IUCF Scientific and Technical Report
- (b) The IUCF Cooler, R.E. Pollock, IEEE Trans. Nucl. Sci., NS-30, No. 4, p. 2056 (1983).

PLAN VIEW OF FACILITY, COMMENTS

