

ENTRY NO. 63

NAME OF MACHINE Indiana University Cyclotron Facility DATE August 1978
 INSTITUTION Indiana University
 ADDRESS Milo B. Sampson Lane, Bloomington IN 47401

IN CHARGE R. E. Pollock REPORTED by R. E. Pollock

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 New DC ion source
terminal 1977, polarized source 1978
 OPERATION, 120 hr/wk; On Target 80 hr/wk
 TIME DIST., in house 50 %, outside 50 %
 USERS' SCHEDULING CYCLE 10 weeks
 COST, ACCELERATOR \$5.6 10⁶
 COST, FACILITY, total \$12.5 10⁶
 FUNDED BY National Science Foundation
and IU

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 4 ENGINEERS 6
 TECHNICIANS 14 CRAFTS 14
 GRAD STUDENTS involved during year 0
 OPERATED BY Res staff or Operators
 BUDGET, op & dev & user services \$2.4 10⁶
 FUNDED BY NSF

RESEARCH STAFF, not included above

USERS, in house 20 outside >100
 GRAD STUDENTS involved during year 10
 RES. BUDGET, in house \$0.6 10⁶
 FUNDED BY NSF

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 300 m²
 movable 800 m²
 TARGET STATIONS 6 in 5 rooms
 STATIONS served at same time, max 1 (later 2)
 MAG SPECTROGRAPH, type QDDM 250 MeV
 COMPUTER, model 3 Harris Slash 4
 OTHER FACILITIES In Beam Gamma Ray
160 cm Scatter Chamber
Isotope Production Station
100 m Neutron Time-of-Flight
(Pion Spectrograph)

REFERENCES/NOTES

IEEE Trans Nucl Sci NS-22 1975
 (9 papers)

MAGNET

POLE FACE diameter 692 cm; R extraction 330 cm
 GAP, min 7.6 cm; Field 16 kG } at 0.15x 10⁶
 max ∞ cm; Field <0.2 kG } ampere turns
 AVERAGE FIELD at R ext 6.4 kG }
 CURRENT STABILITY ±10 parts/10⁶; B_{max}/(tB) 2.50
 NUMBER OF SECTORS 4; SPIRAL, max 0 deg
 POLE FACE COIL PAIRS: AVF 0 /sec;
 Harmonic correction 0
 Rad grad 21 /sec or Circ coils 0
 WEIGHT: Fe 2000 tons; Coils 10 tons
 CONDUCTOR, Material and type Hollow Copper
 STORED ENERGY _____ MJ
 COOLING SYSTEM Deionized water
 POWER: Main coils 400 max, kW
 Trimming coils 120 max, kW
 YOKE/POLE AREA 125 %
 SECTOR ANGLE (Sep Sec) 36 deg
 ION ENERGY (Bending limit) E/A = 215 q²/A² MeV
 (Focusing limit) E/A = >200 q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 38 deg
 BEAM APERTURE 4 cm; DC BIAS 0 kV
 TUNED by, coarse Hinged Panels fine x
 RF 25 to 35 mHz, stable ± 1 /10⁶
 Orb F 1.5 to 9.0 mHz; GAIN, max 1000 kV/turn
 HARMONICS, RF/Orb F, used 3 - 8 12 - 17
 DEE-Gnd, max 25^o kV, min gap 3 cm
 STABILITY, (pk-pk noise)/(pk RF volt) 0.03%
 RF PHASE stable to ± _____ deg
 RF POWER input, max 200 kW
 RF PROTECT circuit, speed _____ μsec
 Type Crowbar
 FREQUENCY MODULATION, rate x /sec
 MODULATOR, type _____
 BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size Diffusion plus cryopanel
 OPERATING PRESSURE 5 μTorr,
 PUMPDOWN TIME 8 hrs

ION SOURCES/INJECTION SYSTEM DC terminal/Injector
Cyclotron, External Duoplasmatron, Lithium
Self-ionizing plus polarized source and arc
 EXTRACTION SYSTEM source in development
non-resonant electric-magnetic

CONTROL SYSTEM

Sigma 2 computer control exclusively

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	225	199
	d, α	105Q	75Q
	⁶ Li	300	154
	H.I	210 Q ² /A	-
CURRENT		e(μA)	e(μA)
	Internal		
	p d	3	2
	α	2	1
	⁶ Li	1	.5
	External		
p d	2	1	
α	1.	.5	
⁶ Li	0.5	0.2	
Secondary		(part/s)	(part/s)
	n	2 10 ⁶	-

BEAM PROPERTIES

	Measured	Conditions (Vary)
Pulse Width	6 RF deg	μA of MeV
Phase Exc, max	7 RF deg	μA of MeV
Extract Eff	85 %	μA of MeV
Res, ΔE/E	0.05 %	μA of MeV
Emittance	(mm-mrad) { axial } μA of MeV	
	{ radial }	

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	85	%
Solid State Physics		%
Bio-Medical Applications	}	< 5
Isotope Production		
Development	10	%
		%
		%

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

Noteworthy Features

- beam klystrom-bunched and chopped before injection
- low orbit frequency exploited for clean (>2000:1) pulse suppression for time-of-flight
- main stage can function with one dee shut off
- extensive user program
- spectrograph resolution 30 keV fwhm at 100 MeV has been achieved

