ENTRY No. 95 University of Colorado

NAME OF MACHINE Isochronous Cyclotron DATE July 10, 1981
INSTITUTION University of Colorado
ADDRESS Nuclear Physics Laboratory, Box 446, University of Colorado, Boulder, CO 80309 USA
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IN CHARGE J. J. Kraushaar, D. A. Lind REPORTED BY A. B. Phillips

HISTORY AND STATUS

DESIGN, date 1956-57 Model tests 1957-59
ENG DESIGN, date 1958-61
CONSTRUCTION, date 1960-62
FIRST BEAM, date (or goal) 1962; full use 1963
MAJOR ALTERATIONS Added beam switchyard
COST, ACCELERATOR $1.55 x 10^6
COST, FACILITY, total $2.95 x 10^6
FUNDED BY US Department of Energy and State of Colorado

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 3 ENGINEERS 2
TECHNICIANS 3 CRAFTS 2
GRAD STUDENTS involved during year 2
OPERATED BY X Research staff or Operators
OPERATION 105 hr/wk, On target 82 hr/wk
TIME DISTR. in house 99.5 %, Outside 0.5 %
BUDGET, op & dev Included in research budget
FUNDED BY USDOE and State of Colorado

RESEARCH STAFF, not included above

USERS, in house 12 outside 7
GRAD STUDENTS involved during year 11
RESEARCH BUDGET, in house
FUNDED BY USDOE and State of Colorado

MAGNET

POLE FACE, diameter (compact) 132 cm, R extraction 60 cm
R injection cm
GAP, min 11 cm, Field kG
max 21 cm, Field kG
at 3 x 10^5 Ampere turns
AVERAGE FIELD at R ext 12.6 kG
B max/ <B> 1.25
NUMBER OF SECTORS compact 4 / separated Spiral, max 45 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS 4 on hills, 1 in valleys
CONDUCTOR, material and type copper
STORED ENERGY (cryogenic) MJ
POWER : main coils 80 max, kW ; current stability $\pm 10 x 10^{-6}$
trimming coils max, kW ; current stability
WEIGHT : Fe 85 U.S. tons ; coils 14 U.S. tons
COOLING system Internal distilled water
ION ENERGY (bending limit) E/A = 36 q^2/a^2 MeV/amu
(focusing limit) E/A = 28 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 1 ; angle 180 deg
BEAM APERTURE 3.2 cm ; DC Bias 0 kV
TUNED by, coarse move short fine auto. capacitor servo
RF 7 to 21 mHz, stable ± 0.5 x 10^{-6}
Orb F 1.2 to 21 mHz
HARMONICS, RF/Orb F, used 1 and 3 and 5
DEE - Gnd, max 85 kV, min gap 2.5 cm
STABILITY, (pk-pk noise)/(pk RF volt) .4 x 10^{-4}
ENERGY GAIN, max 150 kV/turn
RF PHASE, stable to ± 0.72 deg
RF POWER input, max 75 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 2 x 10^{-6} Torr
PUMPS, No, Type, Size Oil diffusion, one 20-inch, one 10-inch

ION SOURCES

Hooded arc, H_2O-cooled Cu chimney, pulsing option

INJECTION SYSTEM

Internal source only

EXTRACTION SYSTEM

Electrostatic deflector, magnetic channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 44 m² ; movable 12 m²
TARGET STATIONS 7 in 4 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Energy-loss
COMPUTER model PDP-11/34, PDP-11/60
OTHER FACILITIES Isotope production, irradiation, solid state and biological; neutron time-of-flight; fast rabbit; beam-swinger, energy-loss spectrometer

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	10-30	0.3-28	200	40
d	18	0.3-18	100	20
^3He	45	16-45	100	20
α	36	2-36	100	15
SECONDARY			(part/s)	

BEAM PROPERTIES

	MEASURED		CONDITIONS
PULSE WIDTH	2 RF deg	.5	pμ A of 23 MeV p. ions
PHASE EXC, max	2 RF deg	.5	pμ A of 23 MeV p. ions
EXTRACT eff	10-40 %	.5	pμ A of 23 MeV p. ions
RESOL ΔE/E	0.05 %	.5	pμ A of 23 MeV p. ions
EMITTANCE (π mm. mrad)	1.6 axial / 0.6 rad	65%/.5	pμA of 23 MeV H^+ ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 95% SOLID STATES PHYSICS 1%
BIOMEDICAL APPLICAT. 1% ISOTOPE PRODUCTIONS 1%
Development 2%

REFERENCES/NOTES

B. W. Ridley et al., Nucl. Instr. and Meth. 130 (1975) 79.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS