ENTRY NO. 75

NAME OF MACHINE Oak Ridge Isochronous Cyclotron (ORIC) DATE 6/19/78
INSTITUTION Holifield Heavy Ion Research Facility, Oak Ridge National Lab.
ADDRESS P.O. Box X, Bldg. 6000, Oak Ridge, Tennessee 37830, USA

IN CHARGE James B. Ball REPORTED by S. W. Mosko

HISTORY AND STATUS

DESIGN, date 1958 MODEL tests 1958-59
ENG. DESIGN, date 1959-1961
CONSTRUCTION, date 1959-1962
FIRST BEAM date (or goal) 1963
MAJOR ALTERATIONS New dee, 1977
25 MV tandem injector, 1979
OPERATION, ~108 hr/wk; On Target ~65 hr/wk
TIME DIST., in house * %, outside * %
USERS' SCHEDULING CYCLE ~12 weeks
COST, ACCELERATOR $2.27 x 10^6
COST, FACILITY, total $6 x 10^6
FUNDED BY U.S. Department of Energy

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS ENGINEERS 3
TECHNICIANS 7 CRAFTS 9
GRAD STUDENTS involved during year 0
OPERATED BY Res staff or x Operators
BUDGET, op & dev $1.1 x 10^6
FUNDED BY U.S. Department of Energy

RESEARCH STAFF, not included above

USERS, in house 25 outside 200
GRAD STUDENTS involved during year
RES. BUDGET, in house $2.4 x 10^6
FUNDED BY U.S. Department of Energy

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 235 m^2
movable 330 m^2
TARGET STATIONS 14 in 5 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type QID
COMPUTER, model 2 - SEL 840A
OTHER FACILITIES
On-Line Mass Spectrometer
Time-of-Flight Spectrometer
In-Beam Gamma Ray Facility
Transfermium Chemistry Facility

REFERENCES/NOTES

R.J. Jones, et al., Nucl. Instr. & Meth., Vol. 18,19 (1962) pp. 46-61.

R.S. Lord, et al., Seventh Internat. Conf. on Cyclotrons and their Applications, Zurich (1975), pp. 622-625.

*Time is assigned by Program Committee. No distinction is made between "In-house" and "Outside" proposals.

MAGNET

POLE FACE diameter 193 cm; R extraction 75 cm
GAP, min 19 cm; Field 23.7 kG
max 71 cm; Field 14.0 kG
AVERAGE FIELD at R ext 19.2 kG
at $1.60 x 10^6$ ampere turns
CURRENT STABILITY 20 parts/10^6; $B_{max}/\langle B \rangle$ 1.3
NUMBER OF SECTORS 3 ; SPIRAL, max 30 deg
POLE FACE COIL PAIRS: AVF 1 /sec;
Harmonic correction 3 per sector
Rad grad /sec or Circ coils 10
WEIGHT: Fe 200 tons; Coils 9 tons
CONDUCTOR, Material and type Aluminum
STORED ENERGY ~ 10 MJ
COOLING SYSTEM Demineralized water
POWER: Main coils 1800 max, kW
Trimming coils 500 max, kW
YOKE/POLE AREA 100 %
SECTOR ANGLE (Sep Sec) - deg
ION ENERGY (Bending limit) E/A = 100 q^2/A^2 MeV
(Focusing limit) E/A = ~75 q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
BEAM APERTURE 2.5 cm; DC BIAS 0 kV
TUNED by, coarse Short. Pl. fine Trim. Cap.
RF 6.8 to 20.4 mHz, stable ± 1 part /10^6
Orb F 2.3 to 20.4 mHz; GAIN, max 160 kV/turn
HARMONICS, RF/Orb F, used 1, 3
DEE-Gnd, max 80 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.0005
RF PHASE stable to ± deg
RF POWER input, max 200 kW
RF PROTECT circuit, speed 1 μsec
Type Ignitron crowbar
FREQUENCY MODULATION, rate 0 /sec
MODULATOR, type -
BEAM PULSE, width -

VACUUM SYSTEM

PUMPS, No., Type, Size 3 Diffusion pumps (one 50 cm, two 80 cm); He cryopanels
OPERATING PRESSURE 2 μTorr,
PUMPDOWN TIME 8 hrs

ION SOURCES/INJECTION SYSTEM

Internal Penning; 25MV tandem electrostatic injector-stripper (1979)

EXTRACTION SYSTEM

Electrostatic deflector + mag. channel

CONTROL SYSTEM

Mod. Comp. III computer plus some conventional

ENTRY NO. 75 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	$^{14}N^{5+}$		180
	$^{16}O^{6+}$		225
	$^{20}Ne^{6+}$		180
	$^{40}Ar^{8+}$		160
CURRENT		(μA)	e (μA)
Internal			
External	$^{14}N^{5+}$		2
	$^{16}O^{6+}$		3
	$^{20}Ne^{6+}$		3
	$^{40}Ar^{8+}$		1.2
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	____ RF deg	____ μA of	____ MeV	____
Phase Exc, max	____ RF deg	____ μA of	____ MeV	____
Extract Eff	____ %	____ μA of	____ MeV	____
Res, ΔE/E	____ %	____ μA of	____ MeV	____

Emittance

(mm-mrad) { 10 axial / 30 radial } 5 μA of 40 MeV P

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	80 %
Solid State Physics	%
Bio-Medical Applications	%
Isotope Production	5 %
Development	10 %
Materials Science	5 %
	%

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

ORIC was originally designed for both light and heavy ion acceleration. Most early experiments used beams of protons, deuterons, and alphas. More recently, experimental program emphasis has shifted to heavy ions with 90% of all operation using beams of C, N, O, Ne, and Ar.

During 1977-78, ORIC underwent several modifications to permit operation as a medium-energy booster for the new Holifield 25 MV tandem electrostatic accelerator. First beams from the booster configuration are expected in late-1979. Examples of beams to be available: ^{16}O - 25 MeV/A; ^{79}Br - 12 MeV/A; ^{127}I - 8 MeV/A; ^{165}Ho - ∿6 MeV/A.