

ENTRY NO. 111

NAME OF MACHINE **Oak Ridge Isochronous Cyclotron**
 INSTITUTION **Holifield Heavy Ion Research Facility, Oak Ridge National Laboratory**
 ADDRESS **P. O. Box X, Oak Ridge, Tennessee 37831-6368 USA**
 TEL **(615) 574-4749** TELEX **854468**
 IN CHARGE **John A. Martin** REPORTED BY **John A. Martin**

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**
Injection system for 25 MV tandem beams - 1979
 COST, ACCELERATOR **2.3 x 10⁶**
 COST, FACILITY, total **6 x 10⁶ + 18 x 10⁶ tandem facility**
 FUNDED BY **U.S. Department of Energy**

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT (1)

SCIENTISTS **4** ENGINEERS **9**
 TECHNICIANS **11** CRAFTS **6**
 GRAD STUDENTS involved during year
 OPERATED BY **Research staff or x Operators**
 OPERATION **168** hr/wk. On target **113** hr/wk
 TIME DISTR. in house **45** % outside **55** %
 BUDGET, op & dev **~3.6 x 10⁶**
 FUNDED BY **U.S. Department of Energy**

RESEARCH STAFF, not included above

USERS, in house **53** outside **105**
 GRAD STUDENTS involved during year **25**
 RESEARCH BUDGET, in house **~3.6 x 10⁶**
 FUNDED BY

MAGNET

POLE FACE, diameter (compact) **193** cm, R-extraction **77** cm
 R injection **23-50** cm
 GAP, min **19** cm, Field **23.7** kG
 max **71** cm, Field **14.0** kG at **1.6 x 10⁶**
 AVERAGE FIELD at R ext **19.2** kG Ampere turns
 B max / < B > **1.3**

NUMBER OF SECTORS {compact **3**} Spiral, max **30** deg
 {separated }
 SECTOR ANGLE (SSC) **10** pairs - water-cooled copper deg
 TRIMMING COILS **10** pairs - water-cooled copper

CONDUCTOR, material and type **aluminum**
 STORED ENERGY (cryogenic) **2/10⁵** MJ
 POWER: main coils **1750** max kW: current stability **2/10⁵**
 trimming coils **250** max kW: current stability **2/10⁴**
 WEIGHT: Fe **200** tons: coils **9** tons
 COOLING system **demineralized water**
 ION ENERGY (Bending limit) E/A = **100** q²/A² MeV/amu
 (Focusing limit) E/A = **75** q/A MeV/amu

ACCELERATION SYSTEM

DEES, number **1** angle **180** deg
 BEAM APERTURE **2.5** cm; DC Bias **0** kV
 TUNED by coarse **moveable short** fine **trim capacitors**
 RF **6.8** to **19.5** MHz, stable ± **1 x 10⁻⁶**
 Orb F **2.3** to **19.5** MHz
 HARMONICS, RF/Orb F, used **1.3**
 DEE-Gnd, max **80** kV, min gap **1** cm
 STABILITY, (pk-pk noise)/(pk RF volt) **5/10⁴**
 ENERGY GAIN, max **160** kV/turn
 RF PHASE, stable to ± **1** deg
 RF POWER input, max. **200** kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE **1 x 10⁻⁶** Torr
 PUMPS, No, Type, Size **3 oil diffusion pumps: 2 80 cm,**
1 50 cm; 1 50 cm cryopump.

ION SOURCES

INJECTION SYSTEM

radial injection with foil stripping in cyclotron

EXTRACTION SYSTEM

electrostatic deflector ± 2 magnetic channels

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed **235** m²; movable **330** m²
 TARGET STATIONS **14** in **6** rooms
 STATIONS served at same time, max **1**
 MAG SPECTROGRAPH, type **Q1D**
 COMPUTER model **3 Perkin-Elmer 3230, VAX 11/780**
 OTHER FACILITIES **On line mass spec.; 4π γ-ray spectrometer; time-of-flight spectrometer**

CHARACTERISTIC BEAMS (coupled operation--tandem + cyclotron)

PARTICLE	ENERGY (MeV)		CURRENT (μA)	
	Goal	Achieved	Internal	External
160+8	400	400	~0.120	0.06
32S+15	700	700	0.035	0.024
58Ni+23	920	920	0.014	0.010
116Sn+28	620	620	0.0042	0.0025
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED CONDITIONS
 PULSE WIDTH RF deg μA of MeV ions
 PHASE EXC. max RF deg μA of MeV ions
 EXTRACT eff. **65** % **0.035** μA of **350** MeV **180+8** ions
 RESOL ΔE/E **<0.1** % **0.035** μA of **350** MeV **180+8** ions
 EMITTANCE est. **1-2** axial **0.035** μA of **350** MeV **180+8**
 (π mm-mrad) **1-2** rad

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS **95** SOLID STATES PHYSICS
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS
Atomic Physics - 5%

REFERENCES/NOTES

- 1) For operation of both tandem and cyclotron.
- 2) Cyclotron provides 1100 hours BOT for 1600 scheduled hours.
Tandem provides 4200 hours BOT for 6400 scheduled hours.

PLAN VIEW OF FACILITY, COMMENTS, ETC.

