ENTRY NO. FM-12

NAME OF MACHINE 184" Synchrocyclotron DATE Jan. 10, 1979
INSTITUTION LBL
ADDRESS

IN CHARGE H. A. Grunder REPORTED by L. Kanstein

**HISTORY AND STATUS**

DESIGN, date _____ MODEL tests _____
ENG. DESIGN, date _____
CONSTRUCTION, date _____
FIRST BEAM date (or goal) Nov. 1946
MAJOR ALTERATIONS 1949, 1955 to 1957

OPERATION, 25 hr/wk; On Target 24 hr/wk
TIME DIST., in house 99 %, outside 1 %
USERS' SCHEDULING CYCLE _____ weeks
COST, ACCELERATOR _____
COST, FACILITY, total _____
FUNDED BY NIH

**ACCELERATOR STAFF, OPERATION and DEVELOPMENT**

SCIENTISTS _____ ENGINEERS _____
TECHNICIANS 1 CRAFTS 1/2
GRAD STUDENTS involved during year _____
OPERATED BY _____ Res staff or 3 Operators
BUDGET, op & dev 315K
FUNDED BY NIH

**RESEARCH STAFF, not included above**

USERS, in house 3 outside 2
GRAD STUDENTS involved during year _____
RES. BUDGET, in house $182,070
FUNDED BY NIH

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed 200 $m^2$
movable - $m^2$
TARGET STATIONS 1 in 1 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type _____
COMPUTER, model _____
OTHER FACILITIES _____

**REFERENCES/NOTES**

*Used for clinical radiotherapy trials, and some radiobiology

**MAGNET**

POLE FACE diameter 470 cm; R extraction 208 cm
GAP, min 28 cm; Field 17 kG } at _____ X $10^6$
max _____ cm; Field 23.4 kG } ampere turns
AVERAGE FIELD at R ext 22.3 kG
CURRENT STABILITY 10 parts/$10^6$; $B_{max}/\langle B \rangle$ _____
NUMBER OF SECTORS _____ ; SPIRAL, max _____ deg
POLE FACE COIL PAIRS: AVF _____ /sec;
Harmonic correction _____
Rad grad _____ /sec or Circ coils _____
WEIGHT: Fe 4,000 tons; Coils 340 tons
CONDUCTOR, Material and type copper
STORED ENERGY 30 MJ
COOLING SYSTEM oil/water
POWER: Main coils 850kW/1600kW max, kW
Trimming coils _____ max, kW
YOKE/POLE AREA 85 %
SECTOR ANGLE (Sep Sec) _____ deg
ION ENERGY (Bending limit) E/A = _____ $q^2/A^2$ MeV
(Focusing limit) E/A = _____ q/A MeV

**ACCELERATION SYSTEM**

DEES, number 1 angle 180 deg
BEAM APERTURE 12.3 cm; DC BIAS 1.5 kV
TUNED by, coarse _____ fine _____
RF 36 to 18 mHz, stable ± _____ /$10^6$
Orb F _____ to _____ mHz; GAIN, max 10 kV/turn
HARMONICS, RF/Orb F, used _____
DEE-Gnd, max 11 kV, min gap 12 cm
STABILITY, (pk-pk noise)/(pk RF volt) _____
RF PHASE stable to ± _____ deg
RF POWER input, max 72 kW
RF PROTECT circuit, speed _____ μsec
Type _____
FREQUENCY MODULATION, rate 64 /sec
MODULATOR, type Vibrating Blades
BEAM PULSE, width 13

**VACUUM SYSTEM**

PUMPS, No., Type, Size 6 20 inch oil Diffusion Pumps
OPERATING PRESSURE 10 μTorr,
PUMPDOWN TIME _____ hrs

**ION SOURCES/INJECTION SYSTEM**

Open ARC, Hot Filament

**EXTRACTION SYSTEM**

Le Couteur Regenerator & Mag. Channel

**CONTROL SYSTEM**

ENTRY NO. FM-12 (cont.)

**CHARACTERISTIC BEAMS**

| | Particle | Goal (MeV) | Achieved (MeV) |
|---|---|---|---|
| ENERGY | proton | .740 | |
| | deut. | 460 | |
| | alpha | 910 | |
| | | | |
| CURRENT | | (μA) | (μA) |
| Internal | P | 1 | |
| | D | 1 | |
| | α | .5 | |
| External | | .12 | |
| | | .12 | |
| | | .06 | |
| | | (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 | 15 | % | .12 | μA of 740 | MeV | P | |
| Res, ΔE/E | ____ | % | ____ | μA of ____ | MeV | ____ | |

Emittance

(mm-mrad) { ____ axial / ____ radial } ____ μA of ____ MeV ____

**OPERATING PROGRAMS, time dist**

| | |
|---|---|
| Basic Nuclear Physics | % |
| Solid State Physics | % |
| Bio-Medical Applications | 100 % |
| Isotope Production | % |
| Development | % |
| | % |
| | % |

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