

**ENTRY NO. 117**

NAME OF MACHINE . . . Biomedical cyclotron . . . . . DATE . . 7/10/78 . . . . .  
 INSTITUTION . . . . . University of California - Center for the Health Sciences . . . . .  
 ADDRESS . . . . . Los Angeles, CA . . 80024 - USA . . . . .  
 TEL . . . . . TELEX . . . . .  
 IN CHARGE . N.S. Mac Donald Ph-D . REPORTED BY . N.S. Mac Donald Ph-D . . . . .

**HISTORY AND STATUS**

DESIGN, date . CS-22 Cyclotron Corporation, 1970 . . . . .  
 ENG DESIGN, date . . . . .  
 CONSTRUCTION, date . . . . .  
 FIRST BEAM, date (or goal) . . . . 3/15/71 . . . . .  
 MAJOR ALTERATIONS . . . . . None . . . . .

COST, ACCELERATOR . . . . .  
 COST, FACILITY, total . . . . . \$ 700,000 . . . . .  
 FUNDED BY . . . . . AEC, University . . . . .

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**

SCIENTISTS . . . . 1 . . . . . ENGINEERS . . . . 2 . . . . .  
 TECHNICIANS . . . . 2 . . . . . CRAFTS . . . . .  
 GRAD STUDENTS involved during year . . . . . 1 . . . . .  
 OPERATED BY . . . . X . . . . Research staff or . . . . . Operators  
 OPERATION . . . . . 50 . . . . hr/wk. On target . . . . 24 . . . . hr/wk  
 TIME DISTR. in house . . 100 . . . . %, outside . . . . . %  
 BUDGET, op & dev . . . . .  
 FUNDED BY . . . . .

**RESEARCH STAFF, not included above**

USERS, in house . . . . 3 . . . . outside . . . . 2 . . . . .  
 GRAD STUDENTS involved during year . . . . . 1 . . . . .  
 RESEARCH BUDGET, in house . . . . .  
 FUNDED BY . . . . . D.O.E. . . . .

**MAGNET**

POLE FACE, diameter (compact) . . . . 97 . cm, R-extraction . 40.5 . cm  
 R injection . . . . . cm  
 GAP, min . . . 5 . cm, Field . . . . 20 . kG }  
 max . . 10 . cm, Field . . . . 12 . kG } at . 2.10<sup>5</sup> . . . . .  
 AVERAGE FIELD at R ext . . . . . 16 . kG } Ampere turns  
 B max / < B > . . . . . 1.25 . . . . .  
 NUMBER OF SECTORS { compact . . . 3 . . . } Spiral, max . . . deg  
 { separated . . . . . }  
 SECTOR ANGLE (SSC) . . . . . deg  
 TRIMMING COILS . . . . 3/sect . . . . .

CONDUCTOR, material and type . . . . .  
 STORED ENERGY (cryogenic) . . . . . MJ  
 POWER: main coils . 30 . max kW: current stability 3.10<sup>-5</sup> . . . . .  
 trimming coils . . . . max kW: current stability . . . . .  
 WEIGHT: Fe . . . . 24 . tons: coils . . . . . tons  
 COOLING system . . . . .  
 ION ENERGY (Bending limit) E/A = . . . . . q<sup>2</sup>/A<sup>2</sup> MeV/amu  
 (Focusing limit) E/A = . . . . . q/A MeV/amu

**ACCELERATION SYSTEM**

DEES, number . . . . 2 . . . . ; angle . . . . 180 . . . . deg  
 BEAM APERTURE . 4 . . . . cm; DC Bias . 2.5 . . . . kV  
 TUNED by, coarse . . straps . . . . fine . . VC, . . auto . . . . .  
 RF . . . . 12 . . . . to . . 25 . . . . MHz, stable ± . 10<sup>-5</sup> . . . . .  
 Orb F . . . . . to . . . . . MHz  
 HARMONICS, RF/Orb F, used . . . . .  
 DEE-Gnd, max . . . . 25 . . . . kV, min gap . . . . 1 . . . . cm  
 STABILITY, (pk-pk noise)/(pk RF volt) . . . . 1.7/12kV . . . . .  
 ENERGY GAIN, max . . . . . kV/turn  
 RF PHASE, stable to ± . . . . . deg  
 RF POWER input, max. . . . . 150 . . . . kW  
 FREQUENCY MODULATION, rate . . . . . /s  
 modulator, type . . . . .  
 beam pulse, width . . . . .

**VACUUM SYSTEM**

OPERATING PRESSURE . . . . . Torr or mbar  
 PUMPS, No, Type, Size . . . . .  
 . . . . .  
 . . . . .

**ION SOURCES**

. . . . . Penning cold cathode . . . . .

**INJECTION SYSTEM**

**EXTRACTION SYSTEM**

. . . DC electrostatic, mag, channel . . . . .

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed . . . . . m<sup>2</sup>; movable . . . . . m<sup>2</sup>  
 TARGET STATIONS . . 1 . . . . in . . . . . rooms  
 STATIONS served at same time, max . . 1 . . . . .  
 MAG SPECTROGRAPH, type . . . . .  
 COMPUTER model . . . . .  
 OTHER FACILITIES . . Isotope production . . . . .  
 Irradiation, solid state . . . . .

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT (µA)	
	Goal	Achieved	Internal	External
p	.22.1	.22.1	.100	.52
d	.12.2	.12.2	.750	.75
<sup>3</sup> He	.31.6	.31.6	.90	.50
α			.95	.55
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 60-70% . . 100 . . µA of . 22 . MeV . p . ions  
 RESOL ΔE/E . . . . % . . . . µA of . . . . MeV . . . . ions  
 EMITTANCE . . . . .  
 (π mm-mrad) . . . . axial . . . . µA of . . . . MeV . . . .  
 . . . . rad . . . .

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS . . . . . SOLID STATES PHYSICS . . . . .  
 BIOMEDICAL APPLICAT. . . . . ISOTOPE PRODUCTIONS . . . . .

**REFERENCES/NOTES**

- 1)
- 2)

**PLAN VIEW OF FACILITY, COMMENTS, ETC.**

- Principal use: preparing radionuclides for the nuclear medicine clinic of the hospital and for research in biology and medicine.
- Quantitative analysis of <sup>18</sup>O in small water samples of biological origin by proton activation to <sup>18</sup>F are routine.