

ENTRY No. 96

NAME OF MACHINE NEN Cyclotron 1 DATE 30 April 1989  
INSTITUTION E. I. Du Pont  
ADDRESS 331 Treble Cove Road, N. Billerica, MA (USA)  
TEL (508) 671-8012 TELEX 947126-NENMTC  
IN CHARGE P. Holton REPORTED BY R. Buck

**HISTORY AND STATUS** Built by the Cyclotron Corp.  
DESIGN, date Model tests  
ENG DESIGN, date  
CONSTRUCTION, date March 70  
FIRST BEAM, date (or goal) July 70  
MAJOR ALTERATIONS None

COST, ACCELERATOR  
COST, FACILITY, total  
FUNDED BY E. I. Du Pont

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**  
SCIENTISTS ENGINEERS  
TECHNICIANS CRAFTS  
GRAD STUDENTS involved during year None  
OPERATED BY Research staff or X Operators  
OPERATION 100 hr/wk, On target hr/wk  
TIME DISTR. in house 100 % , Outside %  
BUDGET, op & dev  
FUNDED BY E. I. Du Pont

**RESEARCH STAFF, not included above** None  
USERS, in house outside  
GRAD STUDENTS involved during year  
RESEARCH BUDGET, in house  
FUNDED BY

**MAGNET**  
POLE FACE, diameter (compact) 96.6 cm, R extraction .43 cm  
R injection cm  
GAP, min 5.1 cm, Field 21.0 kG }  
max 10.2 cm, Field 13.5 kG } at  $14 \times 10^6$   
AVERAGE FIELD at R ext 16.5 kG } Ampere turns  
B max/ <B> 1.22  
NUMBER OF SECTORS { compact 3 } Spiral, max 5 deg  
{ separated }  
SECTOR ANGLE (SSC) deg  
TRIMMING COILS Outer harmonic only, one per sector

CONDUCTOR, material and type Strap copper  
STORED ENERGY (cryogenic) MJ  
POWER: main coils 45 max, kW ; current stability  
trimming coils 0.5 max, kW ; current stability  
WEIGHT: Fe 19.5 tons ; coils 2.5 tons  
COOLING system Deionized water  
ION ENERGY (bending limit) E/A =  $q^2/a^2$  MeV/amu  
(focusing limit) E/A =  $q^2/a^2$  MeV/amu

**ACCELERATION SYSTEM**  
DEES, number 2 ; angle 90 deg  
BEAM APERTURE 2.5 cm ; DC Bias 2.5 kV  
TUNED by, coarse Tap Bars, fine Panels  
RF 25.0 to MHz, stable  $\pm$   
Orb F 25.0 to MHz  
HARMONICS, RF/Orb F, used 1st  
DEE - Gnd, max 30 kV, min gap 40 cm  
STABILITY, (pk-pk noise)/(pk RF volt)  
ENERGY GAIN, max kV/turn  
RF PHASE, stable to  $\pm$  deg  
RF POWER input, max 55 kW  
FREQUENCY MODULATION, rate None /s  
modulator, type  
beam pulse, width

**VACUUM SYSTEM**  
OPERATING PRESSURE 10-20 Micro Torr or mbar  
PUMPS, No, Type, Size 1, 10" oil diffusion

**ION SOURCES**  
Pic, cold cathode radial

## INJECTION SYSTEM

### EXTRACTION SYSTEM

#### FACILITIES FOR RESEARCH

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

#### CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT ( $\mu A$ )	
	Goal	Achieved	Internal	External
p	22	22	200	

#### SECONDARY (part/s)

#### BEAM PROPERTIES

MEASURED	CONDITIONS	
	MEASURED	CONDITIONS
PULSE WIDTH RF deg	$\mu A$ of MeV	ions
PHASE EXC, max RF deg	$\mu A$ of MeV	ions
EXTRACT eff %	$\mu A$ of MeV	ions
RESOL $\Delta E/E$ %	$\mu A$ of MeV	ions

EMITTANCE  
( $\pi$  mm. mrad) { axial }  $\mu A$  of MeV ions  
{ rad }

**OPERATING PROGRAMS, time distribution**  
BASIC NUCLEAR PHYSICS .. SOLID STATES PHYSICS ..  
BIOMEDICAL APPLICAT. .... ISOTOPE PRODUCTIONS ..

#### REFERENCES/NOTES

**PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS**