

ENTRY No. 32

NAME OF MACHINE **VARIABLE ENERGY CYCLOTRON** DATE August 1981
 INSTITUTION **BHABHA ATOMIC RESEARCH CENTRE**
 ADDRESS **1-AF BIDHAN NAGAR, CALCUTTA - 700 064, INDIA**
 TEL 35-1231 TELEX CA-7871
 IN CHARGE **A.S. DIVATIA** REPORTED BY **SANTIMAY CHATTERJEE**

HISTORY AND STATUS

DESIGN, date 1967 Model tests -
 ENG DESIGN, date 1968-69
 CONSTRUCTION, date 1969-77
 FIRST BEAM, date (or goal) June 77(Int) July 78(Ext)
 MAJOR ALTERATIONS

COST, ACCELERATOR $\$ 3 \times 10^6$
 COST, FACILITY, total $\$ 11 \times 10^6$
 FUNDED BY Department of Atomic Energy

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 12 ENGINEERS 32
 TECHNICIANS 58 CRAFTS 131
 GRAD STUDENTS involved during year x
 OPERATED BY Research staff or 12 Operators
 OPERATION 48 hr/wk, On target hr/wk
 TIME DISTR. in house % Outside %
 BUDGET, op & dev $\$ 1.25 \times 10^6$ (1981-82)
 FUNDED BY Department of Atomic Energy

RESEARCH STAFF, not included above
 USERS, in house 3 groups outside 12 groups
 GRAD STUDENTS involved during year x
 RESEARCH BUDGET, in house
 FUNDED BY Department of Atomic Energy

MAGNET

POLE FACE, diameter (compact) cm, R extraction cm
 R injection cm
 GAP, min 19 cm, Field 21 kG }
 max 30 cm, Field 14.1 kG } at 0.56×10^6
 AVERAGE FIELD at R ext 17.1 kG } Ampere turns
 B max/

NUMBER OF SECTORS { compact 3 } Spiral, max 55 deg
 separated
 SECTOR ANGLE (SSC) deg
 TRIMMING COILS 17 pairs

CONDUCTOR, material and type Cu
 STORED ENERGY (cryogenic) MJ
 POWER: main coils 525 max, kW ; current stability 0.01%
 trimming coils 460 max, kW ; current stability 0.01%
 WEIGHT: Fe 275 tons ; coils 10 tons
 COOLING system L.C.W.
 ION ENERGY (bending limit) E/A = 140 q²/a² MeV/amu
 (focusing limit) E/A = 70 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 1 ; angle 180 deg
 BEAM APERTURE 3.5 cm ; DC Bias kV
 TUNED by, coarse M.P. fine VC
 RF 5.5 to 16.5* MHz, stable ± 10 in 10^6
 Orb F to MHz
 HARMONICS, RF/Orb F, used
 DEE - Gnd, max 60 kV, min gap 6.19 cm
 STABILITY, (pk-pk noise)/(pk RF volt)
 ENERGY GAIN, max 120 kV/turn
 RF PHASE, stable to \pm deg
 RF POWER input, max 300 (DC)* kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 3×10^{-6} Torr or mbar
 PUMPS, No, Type, Size Two 89 cm dia oil diffusion pumps

ION SOURCES

P I G - Hot Filament

INJECTION SYSTEM

Internal Ion Source

EXTRACTION SYSTEM

DC Electrostatic Deflector

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 226 m²; movable 535 m²
 TARGET STATIONS 9 in 4 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type QSD (under construction)
 COMPUTER model Unichannel-15 IRIS-80
 OTHER FACILITIES Target, Detector, Electronic, Radio-Chemistry

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (μ A)	
	Goal	Achieved	Internal	External
He ⁺⁺	140	30	10	3
		50	Under Development	
Energy limited by availability of diesel generator power (part/s)				

BEAM PROPERTIES

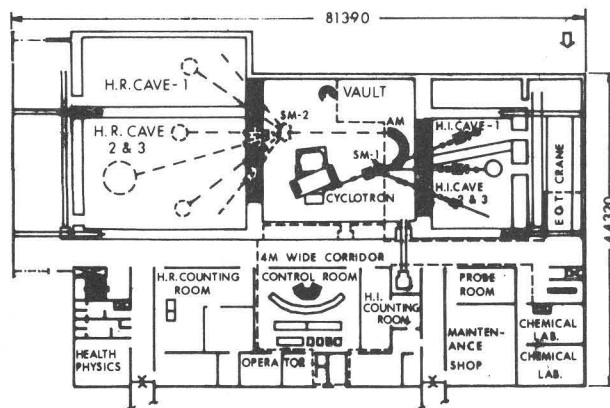
MEASURED	CONDITIONS	
	axial	rad
PULSE WIDTH 36 RF deg 10	μ A of 30 MeV He ⁺⁺ ions	
PHASE EXC, max RF deg 35	μ A of 30 MeV He ⁺⁺ ions	
EXTRACT eff 35 % 10	μ A of 30 MeV He ⁺⁺ ions	
RESOL $\Delta E/E$ 1 % 10	μ A of 30 MeV He ⁺⁺ ions	
EMITTANCE	μ A of MeV ions	

OPERATING PROGRAMS, time distribution
 BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS
 Utilization just started

REFERENCES/NOTES

VEC Staff - Presented by A.S. Divatia
 IEE TRANS NS 26, April 1979 pp 1882-1888
 * Design value.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS



--- BOUNDARY OF AREA IN BASEMENT
 DIMENSIONS ARE IN MM.

THREE LINES IN THE HIGH INTENSITY
 CAVES NOW OPERATIVE.