ENTRY No. CU26

NAME OF MACHINE Isochronous variable energy DATE CV 28 TCC Berkeley Sept. 1981

INSTITUTION Institut Medizinische Strahlenphysik und Strahlenbiologie, Universitätsklinikum Essen

ADDRESS ...Hufelandstr. 55, D 4300 Essen, W-Germany

TEL ..0201/723 2171 ..... TELEX ... 857 9573 klies d

IN CHARGE .Prof.. Dr. J.. Rassow. REPORTED BY ...Rassow

HISTORY AND STATUS

DESIGN, date ...1973..... Model tests .....1974.....

ENG DESIGN, date ....1972.....

CONSTRUCTION, date ....1974.....

FIRST BEAM, date (or goal) ....Sept.. 1975 (Essen).....

MAJOR ALTERATIONS .....

.....

COST, ACCELERATOR ...so.9.....10^6.....

COST, FACILITY, total ....s1.6.....10^6.....

FUNDED BY Land Nordrhein-Westfalen (University).....

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS .....7..... ENGINEERS .....4.....

TECHNICIANS .....3..... CRAFTS .....2.....

GRAD STUDENTS involved during year .....

OPERATED BY ..... Research staff or ..2..... Operators

OPERATION ...50..... hr/wk, On target 45 ..... hr/wk

TIME DISTR. in house ..... %, Outside ..... %

BUDGET, op & dev .....

FUNDED BY .....

RESEARCH STAFF, not included above

USERS, in house .....3..... outside .....

GRAD STUDENTS involved during year .....

RESEARCH BUDGET, in house .....

FUNDED BY .....

MAGNET

POLE FACE, diameter (compact) ..96.. cm, R extraction ..42.. cm

R injection ..... cm

GAP, min ..5.0.... cm, Field ..14..... kG
max ..10.1... cm, Field ..20..... kG
} at 0.25 10^6 Ampere turns

AVERAGE FIELD at R ext .....17..... kG

B max/ <B> .....

NUMBER OF SECTORS { compact ...... / separated ...3.. } Spiral, max 47 deg

SECTOR ANGLE (SSC) ....120..... deg

TRIMMING COILS .3 pairs inner and outer harmonic coils

.....each 4 pairs profile coils .....

CONDUCTOR, material and type ..Cu tubes.....

STORED ENERGY (cryogenic) ..... MJ

POWER : main coils ..70.. max, kW ; current stability $2 \cdot 10^{-6}$

trimming coils ..20.. max, kW ; current stability $2 \cdot 10^{-5}$

WEIGHT : Fe ..21..... tons ; coils ....1.8..... tons

COOLING system .....demineralized water.....

ION ENERGY (bending limit) E/A = .28(H^+24 q^2/a^2 MeV/amu

(focusing limit) E/A = .28..... q^2/a^2 MeV/amu

ACCELERATION SYSTEM

DEES, number .....2.... ; angle .....90..... deg

BEAM APERTURE ..2.0.... cm ; DC Bias ..1..... kV

TUNED by, coarse .Short Plane. fine .Trim Capacitor.....

RF .....6.5.. to ...25.5... mHz, stable ± 100 Hz

Orb F ....6.5.. to ...26.5... mHz

HARMONICS, RF/Orb F, used ..fundamental.....

DEE - Gnd, max .30... kV, min gap ..1.3..... cm

STABILITY, (pk-pk noise)/(pk RF volt) .....

ENERGY GAIN, max .....60..... kV/turn

RF PHASE, stable to ± ..... deg

RF POWER input, max .....40..... kW

FREQUENCY MODULATION, rate .....0..... /s

modulator, type .....

beam pulse, width .....

VACUUM SYSTEM

OPERATING PRESSURE .< 5×10^{-5} Torr..... Torr or mbar

PUMPS, No, Type, Size ..NEC 1x25 cm

.....Oil diffusion pump.....

.....

ION SOURCES

.....penning ion source.....

INJECTION SYSTEM

.....

EXTRACTION SYSTEM

.electrostatic deflector magnet channel.....

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed ..138..... m^2 ; movable ..... m^2

TARGET STATIONS .....8. in ....4... rooms

STATIONS served at same time, max ..1.....

MAG SPECTROGRAPH, type .....

COMPUTER model .....

OTHER FACILITIES .isocentric neutron therapy facility..

6 external and 1 internal target stations.....

1 neutron activation station. , PET facility (Siemens).

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
proton	...2.24....	...2.24....	....300...	....85....
deuterons	...3.14....	...3.14....	....400...	....120....
Helium 3^{++}	...5.36....	...5.37....	....150...	....80....
Helium 4^{++}	...6.28....	...6.28....	....100...	....50....
SECONDARY				(part/s)
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

BEAM PROPERTIES

	MEASURED		CONDITIONS			
PULSE WIDTH	RF deg		pμ A of	MeV ...	ions	
PHASE EXC, max ...	RF deg		pμ A of	MeV ...	ions	
EXTRACT eff ...70..	%	.100..	pμ A of 14 .	MeV d^+ ..	ions	
RESOL ΔE/E ..0.5..	%	..50..	pμ A of 28 .	MeV He^{++}	ions	

EMITTANCE

(π mm. mrad) { 250 axial / 250. rad } .100.. pμA of .14. MeV d^+ ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS		SOLID STATES PHYSICS	
BIOMEDICAL APPLICAT.	10%	ISOTOPE PRODUCTIONS	10%
Neutron therapy	42%	Safety tests, maintenance	17%
Radiation physics	18%	Dead time	1%

REFERENCES/NOTES

Rassow, J., Hudepohl, G., Maier, E., Meissner, P.: CIRCE-Cyclotron Isocentric Neutron Therapy Facility. In: Burger, G., Ebert, H.G.: Proceedings Third Symposium on Neutron Dosimetry, Munich 1977, EURATOM EUR 5848/DE/EN/FR 1978

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS