

ENTRY NO. 24

NAME OF MACHINE Isochronous variable energy cyclotron CV 28 ~~DATE~~ TCC, Berkeley
INSTITUTION Institute Med. Rad. Physics and Biology, Div. Rad. Physics (20.8.78)
ADDRESS Hufelandstr. 55, D 4300 Essen 1, Western Germany

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 (in Essen)
MAJOR ALTERATIONS _____

OPERATION, 40 hr/wk; On Target 20 hr/wk
TIME DIST., in house * _____ %, outside * _____ %
USERS' SCHEDULING CYCLE _____ weeks
COST, ACCELERATOR \$ 0.9 x 10⁶
COST, FACILITY, total \$ 1.6 x 10⁶
FUNDED BY Land Nordrhein-Westfalen
(University)

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 7 ENGINEERS 5
TECHNICIANS 3 CRAFTS 1
GRAD STUDENTS involved during year 0
OPERATED BY _____ Res staff or _____ Operators
BUDGET, op & dev _____
FUNDED BY Land Nordrhein-Westfalen
(University)

RESEARCH STAFF, not included above

USERS, in house 3 groups outside _____
GRAD STUDENTS involved during year _____
RES. BUDGET, in house _____
FUNDED BY University

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 138 m²
movable _____ m²
TARGET STATIONS 7 in 4 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type _____
COMPUTER, model _____
OTHER FACILITIES isocentric neutron facility
5 external and 1 internal target
stations, 1 neutron activation station

REFERENCES/NOTES Rassow, J.: Planning of a
Cyclotron Facility within a Radiological
Centre. In: Korman, M., Stieve, F.: Plan-
ning of Radiological Departments. Thieme
Publisher, Stuttgart, 1974.

Rassow, J., Hüdepohl, G., Maier, E.,
Meissner, P.: CIRCE - Cyclotron Isocen-
tric Neutron Therapy Facility, Radiation
Physics Essen. In: Burger, G., Ebert, H.G.: Proceedings Third Symposium on Neu-
tron Dosimetry in Biology and Medicine. Neuberger May 1977. EURATOM EUR 5848 DE/
EN/FR 1978

MAGNET

POLE FACE diameter 96 cm; R extraction 42 cm
GAP, min 5.0 cm; Field 14 kG } at 0.25 x 10⁶
max 10.1 cm; Field 20 kG } ampere turns
AVERAGE FIELD at R ext 17 kG }
CURRENT STABILITY 300 parts/10⁶; B_{max}/(B) _____
NUMBER OF SECTORS 3; SPIRAL, max 47 deg
POLE FACE COIL PAIRS: AVF none /sec;
Harmonic correction 2 sets
Rad grad -- /sec or Circ coils --
WEIGHT: Fe 21 tons; Coils 2 tons
CONDUCTOR, Material and type Cu tubes
STORED ENERGY -- MJ
COOLING SYSTEM water
POWER: Main coils 70 max, kW
Trimming coils 20 max, kW
YOKE/POLE AREA 110 %
SECTOR ANGLE (Sep Sec) 120 deg
ION ENERGY (Bending limit) E/A = 28* q²/A MeV
(Focusing limit) E/A = _____ q/A MeV
* 24 (H⁺)

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 /10⁶
Orb 6.5 to 26.5 MHz; GAIN, max 80 kV/turn
HARMONICS, RF/Orb F, used fundamental
DEE-Gnd, max 30 kV, min gap 1.3 cm
STABILITY, (pk-pk noise)/(pk RF volt) _____
RF PHASE stable to ± _____ deg
RF POWER input, max 40 kW
RF PROTECT circuit, speed 0.05 μsec
Type crowbar - series tube
FREQUENCY MODULATION, rate 0 /sec
MODULATOR, type --
BEAM PULSE, width --

VACUUM SYSTEM Oil diffusion pump

PUMPS, No., Type, Size NRC 1 x 25 cm
8 x 5 cm
OPERATING PRESSURE 10 μTorr,
PUMPDOWN TIME 0.3 hrs

ION SOURCES/INJECTION SYSTEM

EXTRACTION SYSTEM Electrostatic deflector
and magnetic channel

CONTROL SYSTEM

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	protons	2 - 24	2 - 24
	deuterons	3 - 14	3 - 14
	Helium3++	5 - 38	5 - 38
	Helium4++	6 - 28	6 - 28
CURRENT		(μ A)	(μ A)
	Internal		
	protons	500	300
	deuterons	500	400
	He-3	150	150
	External		
	He-4	100	100
	protons	70	85
deuterons	100	120	
		(rt/s)	(rt/s)
	He-3	70	80
	He-4	50	50
Secondary			

BEAM PROPERTIES

	Measured	Conditions
Pulse Width	RF deg	μ A of MeV
Phase Exc, max	RF deg	μ A of MeV
Extract Eff	70 %	100 μ A of 14 MeV deuterons
Res, $\Delta E/E$	%	μ A of MeV
Emittance	(mm-mrad) { 250 axial } { 250 radial }	100 μ A of 14 MeV deuterons

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	33	%
Solid State Physics		%
Bio-Medical Applications	33	%
Isotope Production	33	%
Development	included above	%
		%
		%

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

