

ENTRY No. CU26

NAME OF MACHINE Isochronous variable energy DATE CV 28 TCC Berkeley Sept. 1981
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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 \$9.10⁶
 COST, FACILITY, total \$1.6 10⁶
 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 0.25 10⁶
 AVERAGE FIELD at R ext 17 kG Ampere turns
 B max/
 NUMBER OF SECTORS { compact 3 } Spiral, max 4.7 deg
 separated 3 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 2.10⁻⁶
 trimming coils 20 max, kW ; current stability 2.10⁻⁵
 WEIGHT : Fe 21 tons ; coils 1.8 tons
 COOLING system demineralized water
 ION ENERGY (bending limit) E/A = .29(H²)q²/a² MeV/amu
 (focusing limit) E/A = .28 q²/a² 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 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 < 5x10⁻⁵ 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 RESEARCHSHIELDED AREA, fixed 138 m²; movable m²

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)	CURRENT (pA)	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
			(part/s)	

BEAM PROPERTIES

MEASURED	CONDITIONS
PULSE WIDTH RF deg	pA of MeV ions
PHASE EXC, max RF deg	pA of MeV ions
EXTRACT eff 70 %	100 pA of 14 MeV dt ions
RESOL ΔE/E 0.5 %	50 pA of 28 MeV He ⁴ ions
EMITTANCE	

(ir mm. mrad) { 250 axial } 100 pA of 14 MeV dt ions

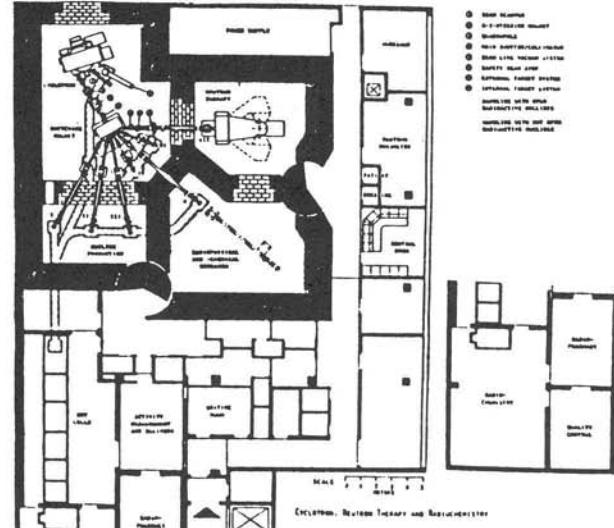
{ 250. rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS	SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. 10%	ISOTOPE PRODUCTION 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

Excerpt from Review Treaty and Registration