ENTRY NO. 30

NAME OF MACHINE Karlsruhe Isochronous Cyclotron
INSTITUTION Kernforschungszentrum Karlsruhe GmbH, Insitute of Nuclear Physics/Cyclotron
ADDRESS D-7500 Karlsruhe, Postfach 3640, West-Germany
TEL 07247 82 2433 TELEX 7826484 d
IN CHARGE H. Schweickert REPORTED BY H. Schweickert

HISTORY AND STATUS

DESIGN, date 1958 Model tests 1958-60
ENG DESIGN, date
CONSTRUCTION, date 1960-1962
FIRST BEAM, date (or goal) int. 1962, ext 1964
MAJOR ALTERATIONS axial injection 1971
COST, ACCELERATOR 4.6×10^6 DM
COST, FACILITY, total 20×10^6 DM
FUNDED BY Federal Government & State of B.-Württemberg

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 5 ENGINEERS 5
TECHNICIANS 10 CRAFTS 20
GRAD STUDENTS involved during year
OPERATED BY - Research staff or 10 Operators
OPERATION 168 hr/wk. On target 135 hr./wk
TIME DISTR. in house 50 % Outside 50 %
BUDGET, op & dev 2×10^6 DM
FUNDED BY Federal Government & State of B.-Württembg.

RESEARCH STAFF, not included above

USERS, in house 40 outside 90
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY

MAGNET

POLE FACE, diameter (compact) 225 cm, R extraction 105 cm
R injection cm
GAP, min 8 cm, Field 19.5 kG
min 16 cm, Field 9.5 kG
at 0.16×10^6 Ampere turns
AVERAGE FIELD at R ext 14.4 kG
B max/< B > 1.3
NUMBER OF SECTORS compact 3 Spiral, max ... deg
separated
SECTOR ANGLE (SSC) deg
TRIMMING COILS 6 coils per plate with summing field on hill sectors
CONDUCTOR, material and type copper
STORED ENERGY (cryogenic) MJ
POWER: main coils 32 max, kW; current stability 10^{-6}
trimming coils 1 max, kW; current stability 10^{-4}
WEIGHT: Fe 280 tons; coils 8.5 tons
COOLING system water
ION ENERGY (bending limit) E/A = 104 q^2/a^2 MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 3 angle 60 deg
BEAM APERTURE 3.5 cm; DC Bias 0 kV
TUNED by, coarse - fine rotating loop
RF to 33 mHz, stable ± 5×10^{-6}
Orb F to 11 mHz
HARMONICS, RF/Orb F, used 3
DEE–Gnd, max 40 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 10^{-3}
ENERGY GAIN, max 240 kV/turn
RF PHASE, stable to ± 1 deg
RF POWEP input, max 50 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width 0.5 - 3.0 nsec

VACUUM SYSTEM

OPERATING PRESSURE 2×10^{-6} Torr or mbar
PUMPS, No, Type, Size 2 diffusion pumps (8000 l/sec + 12 000 l/sec)

ION SOURCES

Internal: Hot cathode Penning; External: Hot cathode Penning, Lambshift, ECR-source

INJECTION SYSTEM

Axial 10 keV, electrostatic with hyperboloid inflector

EXTRACTION SYSTEM

Two electrostatic deflectors + magn. iron channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 350 m²; movable ... m²
TARGET STATIONS 8 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Little John K = 300
COMPUTER model Two Nova-2; CAMAC
OTHER FACILITIES Large neutron-time-of-flight spectrometer (190 m), resolution 5 psec/m
Neutron Hall with POLKA

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
$p(H_2^+)$		26 (52)	100	> 20
d		52	> 1000	> 20
α		104	50	> 10
$^6Li^{3+}$		156	0,1	0,05
SECONDARY		(part/s)		

BEAM PROPERTIES

MEASURED		CONDITIONS			
PULSE WIDTH	10 RF deg	1	pμ A of 52	MeV	d ions
PHASE EXC. max	20 RF deg	1	pμ A of 52	MeV	d ions
EXTRACT eff	> 70 %		pμ A of 52	MeV	d ions
RESOL ΔE/E	0.3 %		pμ A of 52	MeV	d ions
EMITTANCE (π mm. mrad)	9 axial / 6 rad	5	pμ A of 52	MeV	d

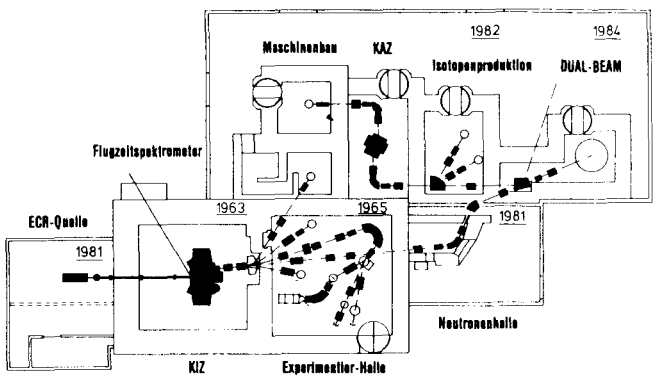
OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 50 % SOLID STATES PHYSICS 30 %
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 10 %
Materials Research 10 %

REFERENCES/NOTES

1) Proc. Int. Conf. SF Cyclotrons CERN 63-19, p. 24
2) Nucl. Instr. Meth. 13, 55 (1961) KfK 754 (1968)

PLAN VIEW OF FACILITY, COMMENTS, ETC.



1) Applications of cyclotrons in technical and analytical studies: A. Gervé, G. Schatz; Proc. 7th Int. Conf. on Cyclotrons and their Applications (Birkhäuser, Basel, 1975), p. 496-502.
2. Axial injection system: G. Haushahn, J. Möllenbeck, G. Schatz, F. Schulz, H. Schweickert; Proc. 7th Int. Conf. on Cyclotrons and their Appl. (Birkhäuser, Basel, 1975) p. 376-380
3. External Ion Sources: V. Bechtold, L. Friedrich, F. Schulz; these Proceedings

* In house refers to users from KfK