

ENTRY No. 23

NAME OF MACHINE Bonn Isochronous Cyclotron DATE July 81
 INSTITUTION Institut für Strahlen- und Kernphysik der Universität Bonn
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 IN CHARGE T. Mayer-Kuckuk REPORTED BY H. Wahl

HISTORY AND STATUS

DESIGN, date 1965 Model tests 1966-67
 ENG DESIGN, date 1966-67
 CONSTRUCTION, date 1967-69
 FIRST BEAM, date (or goal) Dec. 68
 MAJOR ALTERATIONS none
 COST, ACCELERATOR $\sim 5 \cdot 10^6$ DM
 COST, FACILITY, total $\sim 8 \cdot 10^6$ DM
 FUNDED BY Bundesminister f. Forsch. u. Technologie
ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
 SCIENTISTS 2 ENGINEERS 3
 TECHNICIANS 5 CRAFTS 1
 GRAD STUDENTS involved during year 15
 OPERATED BY Research staff or 5 Operators
 OPERATION 140 hr/wk, On target ~ 120 hr/wk
 TIME DISTR. in house 98% Outside 2%
 BUDGET, op & dev $1.6 \cdot 10^6$ DM
 FUNDED BY Land Nordrhein-Westfalen
RESEARCH STAFF, not included above
 USERS, in house ~ 80 outside ~ 10
 GRAD STUDENTS involved during year ~ 20
 RESEARCH BUDGET, in house $4 \cdot 10^5$ DM
 FUNDED BY Land NRW und BMFT

MAGNET

POLE FACE, diameter (compact) 200 cm, R extraction .91 cm
 R injection .38 cm
 GAP, min .84 cm, Field 18.5 kG }
 max .24 cm, Field 7.0 kG } at $0.14 \cdot 10^6$
 AVERAGE FIELD at R ext 12.7 kG } Ampere turns
 B max/ 1.46
 NUMBER OF SECTORS { compact 3 } Spiral, max .0 deg
 separated }
 SECTOR ANGLE (SSC) .77 deg
 TRIMMING COILS 6 x 7

CONDUCTOR, material and type copper
 STORED ENERGY (cryogenic) ~ 0.3 MJ
 POWER: main coils 40 max, kW; current stability 10^{-5}
 trimming coils 5 max, kW; current stability 10^{-5}
 WEIGHT: Fe ~ 200 tons; coils ~ 5 tons
 COOLING system demineralized water
 ION ENERGY (bending limit) E/A = 60 q²/a² MeV/amu
 (focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 3; angle .40 deg
 BEAM APERTURE 2.4 cm; DC Bias .0 kV
 TUNED by, coarse panels fine rot. loops
 RF 20.1 to 28.5 MHz, stable $\pm 10^{-5}$
 Orb F 6, 7 to 9.5 MHz
 HARMONICS, RF/Orb F, used 3 (9)
 DEE - Gnd, max .45 kV, min gap 2.3 cm
 STABILITY, (pk-pk noise)/(pk RF volt) $\sim 5 \cdot 10^{-4}$
 ENERGY GAIN, max 200 kV/turn
 RF PHASE, stable to ± 3 deg
 RF POWER input, max 40 kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE $2 \cdot 10^{-6}$ Torr or mbar
 PUMPS, No, Type, Size 1. oil-diffusion, 60 cm,
 12,000 l/s

ION SOURCES

int.: Livingstone type; ext.: PIG

INJECTION SYSTEM axial

EXTRACTION SYSTEM

electrostat. deflector, screen channel, foc. chann.

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 415 m²; movable m²
 TARGET STATIONS 12 in 4 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type split pole (Scanditronix)
 COMPUTER model PDP. 9, PDP. 15, XVM 200
 OTHER FACILITIES isotope production + chem., Orange-
 spectr., time-of-flight-study, off line mass separation

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
d		14-30	50	30
α		28-60	20:2	16:2
¹² C ⁴⁺		84	0.8:4	0.4:4
¹⁴ N ⁵⁺		98	0.8:5	0.4:5
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED CONDITIONS
 PULSE WIDTH ~ 5 RF deg ~ 1 pA of 28 MeV d. ions
 PHASE EXC, max RF deg pA of MeV d. ions
 EXTRACT eff 90% 25 pA of 28 MeV d. ions
 RESOL $\Delta E/E$.0.1% 5 pA of 25 MeV d. ions
 EMITTANCE
 (π mm. mrad) { ≤ 10 axial } ~ 10 pA of 14-30 MeV d. ions
 { ≤ 10 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 75% SOLID STATES PHYSICS .5%
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 12%
 archaeometric appl. 2%
 development 6%

REFERENCES/NOTES

T. Mayer-Kuckuk: IEEE NS 13, (1966) 435
 F. Hinterberger et al. Nucl. Instr. 130 (1975) 335 + 347
 M. Agena et al., IEEE NS 26, 2156, (1979)

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

