

ENTRY No. FM-4

NAME OF MACHINE Göttingen Synchrozyklotron DATE March 7, 1989
 INSTITUTION University of Göttingen, II. Physikalisches Institut
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HISTORY AND STATUS

DESIGN, date 1958 Model tests
 ENG DESIGN, date
 CONSTRUCTION, date 1960-1962
 FIRST BEAM, date (or goal) int., 1962
 MAJOR ALTERATIONS ext., 1962
partially removed 1980
 COST, ACCELERATOR 4.2 x 10⁹ DM
 COST, FACILITY, total 5.9 x 10⁹ DM
 FUNDED BY Fed. Rep. Germany, Land Niedersachsen
ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
 SCIENTISTS 1 ENGINEERS 1
 TECHNICIANS 2 CRAFTS
 GRAD STUDENTS involved during year
 OPERATED BY Research staff or 2 Operators
 OPERATION 30 hr/wk, On target 20 hr/wk
 TIME DISTR. in house 90 % , Outside 10 %
 BUDGET, op & dev
 FUNDED BY Land Niedersachsen
RESEARCH STAFF, not included above
 USERS, in house 10 outside 3
 GRAD STUDENTS involved during year 7
 RESEARCH BUDGET, in house
 FUNDED BY Land Niedersachsen
MAGNET
 POLE FACE, diameter (compact) 180 cm, R extraction .75 cm
 R injection 0 cm
 GAP, min 35 cm, Field 14.5 kG }
 max cm, Field kG } at .5 x 10⁵
 AVERAGE FIELD at R ext 14.2 kG } Ampere turns
 B max/ < B > 0.99
 NUMBER OF SECTORS { compact } Spiral, max deg
 separated }
 SECTOR ANGLE (SSC) deg
 TRIMMING COILS
 CONDUCTOR, material and type Aluminium
 STORED ENERGY (cryogenic) 5 MJ
 POWER: main coils 250 max, kW ; current stability 3 x 10⁻⁴
 trimming coils max, kW ; current stability
 WEIGHT: Fe 250 tons ; coils 2 tons
 COOLING system deminerIALIZED water
 ION ENERGY (bending limit) E/A = 13.9 q²/a² MeV/amu
 (focusing limit) E/A = q²/a² MeV/amu
ACCELERATION SYSTEM
 DEES, number 1 ; angle 180 deg
 BEAM APERTURE >10 cm ; DC Bias ±0.5 kV
 TUNED by, coarse fixed fine variable
 RF 10.6 to 11.1 MHz, stable ±
 Orb F to MHz
 HARMONICS, RF/Orb F, used 1
 DEE - Gnd, max 20 kV, min gap 7 cm
 STABILITY, (pk-pk noise)/(pk RF volt)
 ENERGY GAIN, max 13 kV/turn
 RF PHASE, stable to ± deg
 RF POWER input, max 18 kW
 FREQUENCY MODULATION, rate 2000 /s
 modulator, type rotating capacitor
 beam pulse, width 25 ns
VACUUM SYSTEM
 OPERATING PRESSURE 10⁻⁶ Torr or mbar
 PUMPS, No, Type, Size diffusion pumps
6000 l/s and 1000 l/s
ION SOURCES
gas discharge

INJECTION SYSTEM

EXTRACTION SYSTEM

magnetic channel inside cyclotron
FACILITIES FOR RESEARCH
 SHIELDED AREA, fixed 160 m² ; movable m²
 TARGET STATIONS 1 in rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type
 COMPUTER model 11/23 microvax
 OTHER FACILITIES gas transport from internal target

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
<u>e⁻</u>	<u>54</u>	<u>55.4</u>	<u>0.3</u>	<u> </u>
<u>d</u>	<u>27</u>	<u>27.7</u>	<u>8</u>	<u> </u>

SECONDARY

(part/s)

BEAM PROPERTIES

MEASURED	CONDITIONS	
	RF deg	μA of MeV ions
PULSE WIDTH	<u> </u>	<u> </u>
PHASE EXC, max	<u> </u>	<u> </u>
EXTRACT eff	<u>5</u> %	<u> </u>
RESOL ΔE/E ≤ 0.1 %	<u> </u>	<u> </u>
EMITTANCE	<u> </u>	<u> </u>
(π mm. mrad)	{ 100 axial }	<u> </u> μA of <u> </u> MeV ions
	{ 100 rad }	

OPERATING PROGRAMS, time distribution [%]
 BASIC NUCLEAR PHYSICS 60 SOLID STATES PHYSICS 40
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

REFERENCES/NOTES

- 1) Philips Tech. Rev. Vol 12, No 3
- 2) CERN-Report 63-19, 80

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS