

ENTRY NO. 30

NAME OF MACHINE **HEIDELBERG COMPACT CYCLOTRON**
 INSTITUTION **INSTITUTE FOR NUCLEAR MEDICINE - GERMAN CANCER RESEARCH CENTER**
 ADDRESS **IM NEUENHEIMER FELD 280 D-6900 HEIDELBERG W.-GERMANY**
 TEL **06221/484 681** TELEX **461 562 dkfz d**
 IN CHARGE **W.J. LORENZ, G. WOLBER**, REPORTED BY **GERD WOLBER**

HISTORY AND STATUS

DESIGN, date **1967** Model tests **1968-69**
 ENG DESIGN, date **1**
 CONSTRUCTION, date **Oct. 71 - May 72**
 FIRST BEAM, date (or goal) **June 1972**
 MAJOR ALTERATIONS

COST, ACCELERATOR **1.5 MDM**
 COST, FACILITY, total **10 MDM**
 FUNDED BY **Volkswagenwerk Foundation**

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS **1** ENGINEERS **1**
 TECHNICIANS **3** CRAFTS **3**
 GRAD STUDENTS involved during year
 OPERATED BY **Research staff or 4 Operators**
 OPERATION **50 hr/wk. On target 25 hr/wk**
 TIME DISTR. in house **90 %**, outside **10 %**
 BUDGET, op & dev **300-500 KDM/a**
 FUNDED BY **Federal Government 90%, State 10%**

RESEARCH STAFF, not included above

USERS, in house **4** outside **3**
 GRAD STUDENTS involved during year
 RESEARCH BUDGET, in house
 FUNDED BY **Federal Government 90%, State 10%**

MAGNET

POLE FACE, diameter (compact) **109 cm**, R-extraction **49 cm**
 R injection **cm**
 GAP, min **5.4 cm**, Field **20 kG**
 max **17.5 cm**, Field **8 kG** at **175 000**
 AVERAGE FIELD at R ext **14 kG** Ampere turns
 B max / < B > **1.43**
 NUMBER OF SECTORS {compact **4**} Spiral, max **0 deg**
 {separated }
 SECTOR ANGLE (SSC) **deg**
 TRIMMING COILS **4 pairs at 4 radii**

CONDUCTOR, material and type **Cu pipe**
 STORED ENERGY (cryogenic) **5 MJ**
 POWER: main coils **40** max kW: current stability **10-4**
 trimming coils **0.8** max kW: current stability **10**
 WEIGHT: Fe **24** tons: coils **2**
 COOLING system **deionized water**
 ION ENERGY (Bending limit) E/A = **q²/A² MeV/amu**
 (Focusing limit) E/A = **q/A MeV/amu**

ACCELERATION SYSTEM

DEES, number **2** angle **43 deg**
 BEAM APERTURE **2, 3 cm**; DC Bias **kV**
 TUNED by, coarse **λ/4 stub line**, fine **variable capacitor**
 RF **28.6** to **43** MHz, stable ± **2.5 x 10⁻⁶**
 Orb F **10.5** to **21** MHz
 HARMONICS, RF/Orb F, used **2, 4**
 DEE-Gnd, max **50** kV, min gap **5** cm
 STABILITY, (pk-pk noise)/(pk RF volt) **5 / 10³**
 ENERGY GAIN, max **165** kV/turn
 RF PHASE, stable to ± **not measured** deg
 RF POWER input, max **6.0** kW
 FREQUENCY MODULATION, rate **/s**
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE **2 x 10⁻⁵** Torr or mbar
 PUMPS, No., Type, Size **2 x 450 ltr/s**
vertical turbomolecular pumps

ION SOURCES

Livingston type

INJECTION SYSTEM

EXTRACTION SYSTEM

DC electrostatic deflector + magnetic channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed **16 x 18 m²**; movable **m²**
 TARGET STATIONS **10** in **3** rooms
 STATIONS served at same time, max **2**
 MAG SPECTROGRAPH, type
 COMPUTER model
 OTHER FACILITIES **D₂-Target for fast d-D neutrons**
vertical beam downwards

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (µA)	
	Goal	Achieved	Internal	External
p	22	21.5	≤1000	30
d	11	10.6	≤1000	70
3He ⁺⁺	28	28	≤50	15
	22	21.5	≤50	15

SECONDARY

n $\bar{E}_n = 8.5 \text{ MeV}$ (part/s) **6 x 10⁷**

BEAM PROPERTIES

	MEASURED		CONDITIONS	
	RF deg	µA of	MeV	ions
PULSE WIDTH				
PHASE EXC. max	RF deg	µA of	MeV	ions
EXTRACT eff.	%	µA of	MeV	ions
RESOL ΔE/E	%	µA of	MeV	ions
EMITTANCE				
(π mm-mrad)	axial	µA of	MeV	
	rad			

OPERATING PROGRAMS, time distribution **2)**

BASIC NUCLEAR PHYSICS **7** SOLID STATES PHYSICS **1**
 BIOMEDICAL APPLICAT. **10%** ISOTOPE PRODUCTIONS **90%**

REFERENCES/NOTES

- H. Liesem, Nucl. Instr. Meth. **105**, 329, 1972
- G. Wolber et al., 7th Int. Conf. on Cycl. and Their Applications, SIN, Aug. 1975

PLAN VIEW OF FACILITY, COMMENTS, ETC.

