

ENTRY No. 37

NAME OF MACHINE AEG COMPACT CYCLOTRON DATE 01 / 04 / 89  
INSTITUTION PHYSICS DEPARTMENT, TECHNICAL UNIVERSITY, MUNICH  
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IN CHARGE E. Huenges REPORTED BY

#### HISTORY AND STATUS

DESIGN, date 1968 Model tests 1970  
ENG DESIGN, date 1970  
CONSTRUCTION, date 1972  
FIRST BEAM, date (or goal) 1973  
MAJOR ALTERATIONS

TRITIUM ION SOURCE SYSTEM  
COST, ACCELERATOR 1.5 Mill. DM  
COST, FACILITY, total 3 " "  
FUNDED BY Bavarian Government

#### ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 2 ENGINEERS 1  
TECHNICIANS 4 CRAFTS 2

GRAD STUDENTS involved during year  
OPERATED BY X Research staff or X Operators  
OPERATION 100 hr/wk, On target 80 hr/wk  
TIME DISTR. in house % Outside %  
BUDGET, op & dev 90,000 DM

FUNDED BY Technical University  
RESEARCH STAFF, not included above  
USERS, in house 5 outside 10  
GRAD STUDENTS involved during year  
RESEARCH BUDGET, in house  
FUNDED BY

#### MAGNET

POLE FACE, diameter (compact) 109 cm, R extraction 48 cm  
R injection 5 cm  
GAP, min 5.4 cm, Field 19 kG }  
max 17.5 cm, Field 8 kG } at  
AVERAGE FIELD at R ext 14 kG } Ampere turns  
B max/ <B>

NUMBER OF SECTORS { compact 4 } Spiral, max .. deg  
SECTOR ANGLE (SSC) { separated .. deg  
TRIMMING COILS 4 Pairs

CONDUCTOR, material and type Copper  
STORED ENERGY (cryogenic) 5 MJ  
POWER: main coils 40 max, kW; current stability 10  
trimming coils 2 max, kW; current stability ..  
WEIGHT: Fe 25 tons; coils 5 tons  
COOLING system Water  
ION ENERGY (bending limit) E/A = 2.5 q<sup>2</sup>/a<sup>2</sup> MeV/amu  
(focusing limit) E/A = .. q<sup>2</sup>/a<sup>2</sup> MeV/amu

#### ACCELERATION SYSTEM

DEES, number 2; angle 63 deg  
BEAM APERTURE 2,3 cm; DC Bias .. kV  
TUNED by, coarse Short stub fine Trim. Capacitor  
RF 28 to 42,5 MHz, stable ± 2 · 10<sup>-6</sup>  
Orb F .. to .. MHz  
HARMONICS, RF/Orb F, used 2 4  
DEE - Gnd, max 50 kV, min gap 2,3 cm  
STABILITY, (pk-pk noise)/(pk RF volt) 5 · 10<sup>-4</sup>  
ENERGY GAIN, max 150 kv/turn  
RF PHASE, stable to ± .. deg  
RF POWER input, max 40 kW  
FREQUENCY MODULATION, rate .. /s  
modulator, type ..  
beam pulse, width ..

#### VACUUM SYSTEM

OPERATING PRESSURE 5 · 10<sup>-7</sup> - 2 · 10<sup>-5</sup> Torr or mbar  
PUMPS, No, Type, Size 2 oil diffusion pumps  
1000 l/s each

#### ION SOURCES

Internal Livingston Type

#### INJECTION SYSTEM

#### EXTRACTION SYSTEM

Electrostatic Septum 70 kV

#### FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 200 m<sup>2</sup>; movable .. m<sup>2</sup>  
TARGET STATIONS 5 in 2 rooms  
STATIONS served at same time, max 1  
MAG SPECTROGRAPH, type ..  
COMPUTER model ..  
OTHER FACILITIES ..

#### CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
p		22	500	50
d		11	"	"
t		7,3	50	30

#### SECONDARY

(part/s)

#### BEAM PROPERTIES

MEASURED	CONDITIONS	
	MEASURED	CONDITIONS
PULSE WIDTH .. 20 RF deg	300 pA of 22 MeV H <sup>+</sup> ions	
PHASE EXC, max .. RF deg	pA of .. MeV .. ions	
EXTRACT eff 40-80 %	pA of .. MeV .. ions	
RESOL ΔE/E .. 0,1 %	pA of .. MeVH <sup>+</sup> /Tions	

EMITTANCE (π mm. mrad) { .. axial } .. pA of .. MeV .. ions  
{ .. rad }

OPERATING PROGRAMS, time distribution  
BASIC NUCLEAR PHYSICS 10% SOLID STATES PHYSICS ..  
BIOMEDICAL APPLICAT. .. ISOTOPE PRODUCTIONS 90%

#### REFERENCES/NOTES

#### PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

The compact cyclotron is an energy fixed machine with rather high beam intensities for light ions including the radioactive triton beam. It is used nearly exclusively for radioisotope production. Very strong <sup>57</sup>Co-sources of about 1 Curie are produced with the 500 uA proton beam on a high speed rotational target. Biological tracer isotopes, as <sup>28</sup>Mg or <sup>42</sup>K, are produced using the triton beam.