ENTRY No. 31

NAME OF MACHINE Munich Compact Cyclotron DATE
INSTITUTION Technical University Munich
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IN CHARGE REPORTED BY E. Huenges

HISTORY AND STATUS

DESIGN, date 1970 Model tests 1971
ENG DESIGN, date 1972
CONSTRUCTION, date 1972
FIRST BEAM, date (or goal) 1973
MAJOR ALTERATIONS Rotating target, copper dee's tritium ion source
COST, ACCELERATOR 1 Million DM
COST, FACILITY, total 1 Million DM
FUNDED BY Bavarian Government

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 5 ENGINEERS 1
TECHNICIANS 2 CRAFTS 1
GRAD STUDENTS involved during year 3
OPERATED BY 2 Research staff or 2 Operators
OPERATION 20 hr/wk, On target 20 hr/wk
TIME DISTR. in house 80 %, Outside 20 %
BUDGET, op & dev
FUNDED BY Bavarian Government

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 cm
GAP, min 5.4 cm, Field 19 kG } at
max 17.5 cm, Field 8 kG } Ampere turns
AVERAGE FIELD at R ext 14 kG
B max/ <B> 1.36
NUMBER OF SECTORS { compact 4 / separated } Spiral, max - deg
SECTOR ANGLE (SSC) - deg
TRIMMING COILS 4 trimming coils in each hill sector
CONDUCTOR, material and type copper water cooled
STORED ENERGY (cryogenic) MJ
POWER : main coils 25 max, kW ; current stability 10^{-4}
trimming coils 1 max, kW ; current stability 10^{-4}
WEIGHT : Fe 30 tons ; coils tons
COOLING system demineralized water
ION ENERGY (bending limit) E/A = q^2/a^2 MeV/amu
(focusing limit) E/A = q /a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 ; angle 38 deg
BEAM APERTURE 2.3 cm ; DC Bias 12 kV
TUNED by, coarse mechanic fine capacity
RF 28 to 43 mHz, stable ± 10^{-4}
Orb F 7 to 21 mHz
HARMONICS, RF/Orb F, used 2-4
DEE - Gnd, max 45 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt)
ENERGY GAIN, max 120 kV/turn
RF PHASE, stable to ± deg
RF POWER input, max 30 kW
FREQUENCY MODULATION, rate - /s
modulator, type -
beam pulse, width -

VACUUM SYSTEM

OPERATING PRESSURE 10^{-5} Torr or mbar
PUMPS, No, Type, Size 2 Oil diffusion pumps with 1000 l/s each; alternatively 1 ion getter pump; with 2000 l/s pumping speed for N_2

ION SOURCES

internal ion source, Livingstone type

INJECTION SYSTEM

EXTRACTION SYSTEM

dc-s with 70 kV at 1 cm

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 36 + 60 m² ; movable m²
TARGET STATIONS 3 in 1 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type -
COMPUTER model -
OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p		22	500	100
d		11	500	100
t		7.2	35	
^{3}He		29	40	25
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED	CONDITIONS
PULSE WIDTH ..... RF deg	..... pμ A of .... MeV ... ions
PHASE EXC, max ... RF deg	..... pμ A of .... MeV ... ions
EXTRACT eff ..... %	..... pμ A of .... MeV ... ions
RESOL ΔE/E ..... %	..... pμ A of .... MeV ... ions
EMITTANCE	depending on the machine mode
(π mm. mrad) { ... axial / ... rad }	..... pμA of ..... MeV ... ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS .. SOLID STATES PHYSICS ....
BIOMEDICAL APPLICAT. .... ISOTOPE PRODUCTIONS 100%

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

A fast rotating internal target of 5 cm diameter for a beam power up to 12 kW.
A storage system for absorbing 5000 Ci tritium in a non gaseous phase which in connection with a lar ion getter pump for the cyclotron vacuum allows the safe acceleration of triton with a minimal radioactive pollution.