ENTRY No. 2

NAME OF MACHINE . CYCLOTRON CGR-MeV 520 ..... DATE . March 3, 1989 .....
INSTITUTION . LABORATORY OF ANALYTICAL CHEMISTRY - INSTITUTE FOR NUCLEAR SCIENCES - RIJKSUNIVERSITEIT GENT .....
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IN CHARGE . Prof. Dr. R. DAMS ... REPORTED BY Dr. K. STRIJCKMANS .....
(director)

HISTORY AND STATUS

DESIGN, date 1974 ..... Model tests .....
ENG DESIGN, date 1975 .....
CONSTRUCTION, date 1976-77 .....
FIRST BEAM, date (or goal) 1977 .....
MAJOR ALTERATIONS 1981-82 .....
(7 target stations, isocentric neutron therapy unit) ..
COST, ACCELERATOR .....
COST, FACILITY, total .....
FUNDED BY N.F.W.O. and R.U.G. (1) .....

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS ...1..... ENGINEERS ...-.....
TECHNICIANS ..2..... CRAFTS .....1.....
GRAD STUDENTS involved during year ...-.....
OPERATED BY ..... Research staff or ..... Operators
OPERATION ..45..... hr/wk, On target ...40..... hr/wk
TIME DISTR. in house ..100..... %, Outside .....-..... %
BUDGET, op & dev .....
FUNDED BY O.O.A., I.I.K.W. and R.U.G. (1) .....

RESEARCH STAFF, not included above

USERS, in house .1 scientist + 4 technicians .....
GRAD STUDENTS involved during year . 2 .....
RESEARCH BUDGET, in house .....
FUNDED BY . O.O.A., IIKW and R.U.G. (1) .....

MAGNET

POLE FACE, diameter (compact) .120 cm, R extraction 52,5 cm
R injection ....0.... cm
GAP, min ...8.6... cm, Field ...17.5..... kG } at 150 000 Ampere turns
max ...14.... cm, Field ...11.0..... kG }
AVERAGE FIELD at R ext .....14.8..... kG
B max/ <B> .....1.18.....
NUMBER OF SECTORS { compact ..4... } Spiral, max 34 deg
{ separated ..... }
SECTOR ANGLE (SSC) ..... deg
TRIMMING COILS ....7. pairs .....
.....
CONDUCTOR, material and type .copper, water cooled .....
STORED ENERGY (cryogenic) ..... MJ
POWER : main coils . 65... max, kW ; current stability 10^{-5}
trimming coils . 10... max, kW ; current stability . 10^{-3}
WEIGHT : Fe .....28..... tons ; coils ..... tons
COOLING system .deionised water .....
ION ENERGY (bending limit) E/A = ..29.... q²/a² MeV/amu
(focusing limit) E/A = ... q²/a² MeV/amu

ACCELERATION SYSTEM

DEES, number ...2..... ; angle .....50..... deg
BEAM APERTURE ....2,5... cm ; DC Bias ..... kV
TUNED by, coarse piston..... fine ...panel.....
RF .....20..... to ...40..... MHz, stable ± 10^{-6}
Orb F ..5,1.... to ...20,2.. MHz
HARMONICS, RF/Orb F, used ..2,3,4.....
DEE - Gnd, max . 30... kV, min gap 2..... cm
STABILITY, (pk-pk noise)/(pk RF volt) 5.10^{-4}.....
ENERGY GAIN, max ..... kV/turn
RF PHASE, stable to ± ..0.2..... deg
RF POWER input, max ...30..... kW
FREQUENCY MODULATION, rate ..... /s
modulator, type .....
beam pulse, width .....

VACUUM SYSTEM

OPERATING PRESSURE ...10^{-6}..... Torr or mbar
PUMPS, No, Type, Size BALZERS BP 800 011 .....
PF 7310 DIF 320 oil diffusion pump 3 m³/s .....
.....

ION SOURCES

Livingstone-Jones .....

INJECTION SYSTEM

internal - axial .....

EXTRACTION SYSTEM

electrostatic deflector V..... = 50 kV .....

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed .200..... m² ; movable .../..... m²
TARGET STATIONS .7..... In ..5..... rooms
STATIONS served at same time, max ...1.....
MAG SPECTROGRAPH, type .....
COMPUTER model Digital VAX 11-780 .....
OTHER FACILITIES 3γ spectrometers, X-ray spectrometer ..
γ-γ coincidence set-up .2 positron emission tomographs, .
neutron dosimetry, 6 hot-cells, radiochemistry labs ....

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	6 - 21	2,5 - 24		100
d	3 - 13,5	3 - 14,5		100
^{3}He	6 - 31	6 - 32		60
α	10 - 27	10 - 29		60

SECONDARY (part/s)
n, d(14,5)+Be .2.10^{12}. n s^{-1} cm^{-2} (act. anal.) .....
0,18 Gy min^{-1} (n-therapy) .....

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 60-70..	% ....25.	pμ A of .7.. MeV .d. ions
RESOL ΔE/E .0,5...	%	pμ A of .... MeV ... ions

EMITTANCE
(π mm. mrad) { <50 axial, <50 rad } ..... pμA of ..... MeV ... Ions

OPERATING PROGRAMS, time distribution (2)

BASIC NUCLEAR PHYSICS .. SOLID STATES PHYSICS ....
BIOMEDICAL APPLICAT. .... ISOTOPE PRODUCTIONS 50 %
CHARGED PARTICLE AND NEUTRON ACTIVATION ANALYSIS 25 % ..
PROTON INDUCED X-RAY EMISSION ANALYSIS 20 % .....

REFERENCES/NOTES

NEUTRON THERAPY 5 %

(1) NFWO = National Fund for Scientific Research (Belgium)
RUG = Rijksuniversiteit Gent (University of Ghent)
OOA = Onderling Overlegde Aktie (DPWB, Ministry of Science Policy)
IIKW = Inter-University Institute for Nuclear Sciences

(2) An annual report, describing the research activities (cyclotron applications a.o.) can be obtained to the director.

PLAN VIEW OF FACILITY