ENTRY NO. 2

NAME OF MACHINE . CYCLOTRON CGR-MeV 520

INSTITUTION . INSTITUTE FOR NUCLEAR SCIENCES - RIJKSUNIVERSITEIT GENT

ADDRESS . PROEFTUINSTRAAT 86 - B-9000 GENT (BELGIUM)

TEL . 091/22.87.21 . TELEX

IN CHARGE Prof.J.HOSTE (director). REPORTED BY . Dr.K.STRIJCKMANS

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; neutron therapy unit)

COST, ACCELERATOR

COST, FACILITY, total

FUNDED BY . NFWO and RUG (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 . OOA, IIKW and RUG (1)

RESEARCH STAFF, not included above

USERS, in house 2 scient. + 5 techn outside

GRAD STUDENTS involved during year . 6

RESEARCH BUDGET, in house

FUNDED BY . OOA; IIKW and RUG (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

max . 14 . cm, Field . 11.0 . kG } at . 150000

AVERAGE FIELD at R ext . 14.8 . kG } Ampere turns

B max/<B> . 1.18

NUMBER OF SECTORS { compact . 4 / separated . } Spiral, max 34 deg

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 . q^2/A^2 MeV/amu

(Focusing limit) E/A = . q/A MeV/amu

ACCELERATION SYSTEM

DEES, number . 2 . angle . 50 . deg

BEAM APERTURE . 25 . 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 . 2×10^{-4} . cm

STABILITY, (pk-pk noise)/(pk RF volt) . 5.10

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

. $3 m^3/s$

ION SOURCES

. Livingstone-Jones

INJECTION SYSTEM

. internal-axial

EXTRACTION SYSTEM

. electrostatic deflector V_{max} = 50 kV

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed . 200 . m^2; movable . - . m^2

TARGET STATIONS . 7 . in . 5 . rooms

STATIONS served at same time, max . 1

MAG SPECTROGRAPH, type

COMPUTER model . Digital VAX 11-780

OTHER FACILITIES 2 γ-spectrometers; X-spectrometer.

. γ-γ coincidence set-up, 2 positron emission tomographs,

. neutron dosimetry, hot-cells lab

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
^1H	6-21	25-24		100
^2H	3-13.5	3-14.5		100
^3He	6-31	6-32		60
^4He	10-27	10-29		60

SECONDARY

. n . d(14.5) + Be . 2×10^{12} . $n.s^{-1}.cm^{-2}$ (part/s) . (act.anal.)

. 0.18 Gy. min . (n.therapy)

BEAM PROPERTIES

MEASURED	CONDITIONS
PULSE WIDTH . RF deg	pμA of . MeV . ions
PHASE EXC. max . RF deg	pμA of . MeV . ^2H . ions
EXTRACT eff 60-70 %	25 . pμA of . 7 . MeV . ^2H . ions
RESOL ΔE/E 0.5 . %	pμA of . MeV . ions
EMITTANCE	
(π mm-mrad) <50 . axial <50 . rad	pμA of . MeV

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%

neutron therapy (development) 5%

REFERENCES/NOTES

1) NFWO = National Fund for Scientific Research (Belgium)
RUG = Rijksuniversiteit Gent (State University Ghent)
OOA = Onderlinge Overlegde Aktie (Joint Research projec of the Belgian Government)
IIKW = Inter-University Institute for Nuclear Sciences

2) C.Vandecasteele, K.Strijckmans and W.Maenhaut, The cyclotron of Ghent University and its applications, Physicalia Mag. 8 (1986) 129-144

PLAN VIEW OF FACILITY