ENTRY NO. 3

NAME OF MACHINE CYCLOTRON LIEGE

INSTITUTION UNIVERSITE DE LIEGE - BELGIUM

ADDRESS CYCLOTRON RESEARCH CENTER - B.30 - B - 4000 LIEGE

TEL 3241561687 TELEX 41397 UNIV.LG.

IN CHARGE D. LAMOTTE REPORTED BY D. LAMOTTE

HISTORY AND STATUS

DESIGN, date 1972 Model tests 1973

ENG DESIGN, date 1973

CONSTRUCTION, date 1973-1975

FIRST BEAM, date (or goal) 23.3.1975

MAJOR ALTERATIONS 1982 : new dees

COST, ACCELERATOR

COST, FACILITY, total

FUNDED BY SPPS+, FNRS* and UNIVERSITY

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS ENGINEERS 1

TECHNICIANS 4 CRAFTS 2

GRAD STUDENTS involved during year

OPERATED BY Research staff or 4 Operators

OPERATION 68 hr/wk. On target ≈ 55 hr./wk

TIME DISTR. in house % Outside %

BUDGET, op & dev

FUNDED BY UNIVERSITY

RESEARCH STAFF, not included above

USERS, in house 8 outside 10

GRAD STUDENTS involved during year 5

RESEARCH BUDGET, in house

FUNDED BY LISN×, FNRS, FRSM°, UNIVERSITY

MAGNET

POLE FACE, diameter (compact) cm, R extraction cm

R injection cm

GAP, min 8.6 cm, Field 17.5 kG
min 14.0 cm, Field 11.0 kG
at 150 x 10^6 Ampere turns

AVERAGE FIELD at R ext 14.6 kG

B max/ < B > 1.18

NUMBER OF SECTORS compact 4
separated
Spiral, max 3.4 deg

SECTOR ANGLE (SSC) deg

TRIMMING COILS 7

CONDUCTOR, material and type Cu

STORED ENERGY (cryogenic) MJ

POWER: main coils 70 max, kW; current stability

trimming coils 10 max, kW; current stability

WEIGHT: Fe 28 tons; coils tons

COOLING system 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 2.5 cm; DC Bias kV

TUNED by, coarse s.c. pistons fine panels

RF 19.5 to 40.5 mHz, stable ± 10^{-6}

Orb F 4.9 to 20.5 mHz

HARMONICS, RF/Orb F, used 2-3-4

DEE—Gnd, max 35 kV, min gap 2 cm

STABILITY, (pk-pk noise)/(pk RF volt) .002

ENERGY GAIN, max kV/turn

RF PHASE, stable to ± .2 deg

RF POWER input, max 85 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 10^{-6} Torr or mbar

PUMPS, No, Type, Size diffusion 3200 l/s

primary 60 m^3/h

ION SOURCES

Axial Livingston Jones

INJECTION SYSTEM

EXTRACTION SYSTEM

electrostatic deflector, passive corrector

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 700 m^2; movable - m^2

TARGET STATIONS 8 in 6

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type

COMPUTER model PDP 11-45

OTHER FACILITIES remote target handling - biological laboratories, medical unit (positron tomographs, ...)

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External	Peak
p	6-20	2.5-23	300	100	
d	3-11.5	3-14.5	500	100	
3-He	6-29	6-32	200	100	
4-He	6-24	6-29	100	60	
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	50-70 %	30 pμ A of	23 MeV	p	ions
RESOL ΔE/E	5 ‰	pμ A of	MeV	ions	
EMITTANCE (π mm. mrad)	15 axial, 15 rad	20 pμ A of	20 MeV	p	ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS - SOLID STATES PHYSICS 20

BIOMEDICAL APPLICAT 40 ISOTOPE PRODUCTIONS 40

REFERENCES/NOTES

+ Service de la Programmation et de la Politique Scientifique

* Fonds National de la Recherche Scientifique.

x Institut Interuniversitaire des Sciences Nucléaires.

o Fonds de la Recherche Scientifique Médicale.

PLAN VIEW OF FACILITY, COMMENTS, ETC.