

**ENTRY No. 44**

NAME OF MACHINE Philips cyclotron DATE 1965  
 INSTITUTION Natuurkundig Laboratorium der Vrije Universiteit  
 ADDRESS De Boelelaan 1081, 1081 HV Amsterdam, Holland  
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 IN CHARGE J. Rethmeier REPORTED BY

**HISTORY AND STATUS**

DESIGN, date Model tests  
 ENG DESIGN, date  
 CONSTRUCTION, date  
 FIRST BEAM, date (or goal) 1965  
 MAJOR ALTERATIONS

**COST, ACCELERATOR**

COST, FACILITY, total  
 FUNDED BY

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**

SCIENTISTS 2 ENGINEERS 1  
 TECHNICIANS 8 (incl. operators)

GRAD STUDENTS involved during year 1, 2

OPERATED BY Research staff or Operators

OPERATION 100-120 hr/wk, On target ≈ 50 hr/wk

TIME DISTR. in house 90% , Outside 10%

BUDGET, op & dev 130 K Dfl.

FUNDED BY government

**RESEARCH STAFF, not included above**

USERS, in house ≈ 10 outside 4

GRAD STUDENTS involved during year

RESEARCH BUDGET, in house

FUNDED BY government

**MAGNET**

POLE FACE, diameter (compact) 70 cm, R extraction 59 cm

R injection cm

GAP, min 15 cm, Field kG } at 4.10<sup>5</sup>

max 27 cm, Field kG } Ampere turns

AVERAGE FIELD at R ext 14,6 kG

B max/ <B>

NUMBER OF SECTORS { compact 3 } Spiral, max 45 deg

SECTOR ANGLE (SSC) deg

TRIMMING COILS 10

CONDUCTOR, material and type Al, hollow tube

STORED ENERGY (cryogenic) MJ

POWER: main coils max, kW ; current stability

trimming coils max, kW ; current stability

WEIGHT: Fe tons ; coils 8 tons

COOLING system H<sub>2</sub>O

ION ENERGY (bending limit) E/A = q<sup>2</sup>/a<sup>2</sup> MeV/amu

(focusing limit) E/A = q/a MeV/amu

**ACCELERATION SYSTEM**

DEES, number 1 ; angle 180 deg

BEAM APERTURE 2,5 cm ; DC Bias 5 kV

TUNED by, coarse moving short fine capacity

RF 6 to 22 MHz, stable ± 10<sup>-5</sup>

Orb F to MHz

HARMONICS, RF/Orb F, used

DEE - Gnd, max 50 kV, min gap 2 cm

STABILITY, (pk-pk noise)/(pk RF volt) 3.10<sup>-4</sup>

ENERGY GAIN, max 100 kV/turn

RF PHASE, stable to ± deg

RF POWER input, max 85 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

**VACUUM SYSTEM**

OPERATING PRESSURE 2.10<sup>-6</sup> Torr or mbar

PUMPS, No, Type, Size

1 oil diffusion

**ION SOURCES**

Livingston

**INJECTION SYSTEM****EXTRACTION SYSTEM**

Electrostatic

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed 250 m<sup>2</sup> ; movable m<sup>2</sup>

TARGET STATIONS 7 in 3 rooms

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type split pole (Enge)

COMPUTER model

OTHER FACILITIES proton μ beam

C<sup>11</sup>, Rb/Kr production

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
α		27	30	20
α		32	15	10

**SECONDARY**

(part/s)

**BEAM PROPERTIES**

MEASURED	CONDITIONS	
	μA of	MeV ions
PULSE WIDTH 35 RF deg	μA of	MeV ions
PHASE EXC, max RF deg	μA of	MeV ions
EXTRACT eff 70 %	μA of	MeV ions
RESOL ΔE/E 3 %	μA of	MeV ions

EMITTANCE (π mm. mrad) { axial } 5 pμA of 12,9 MeV p ions

{ 15 rad }

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS 75% SOLID STATES PHYSICS

BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 10%

mach. development 15%

**REFERENCES/NOTES****PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS**