

ENTRY No. 66

NAME OF MACHINE Groningen K=160 DATE
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IN CHARGE R.H. Siemssen REPORTED BY A.G. Drentje

HISTORY AND STATUS

DESIGN, date 1963 Model tests 1964-66
ENG DESIGN, date 1966-1968
CONSTRUCTION, date 1968-1970
FIRST BEAM, date (or goal) 1970
MAJOR ALTERATIONS central region 1972
axial injection 1983
COST, ACCELERATOR \$ 4.10
COST, FACILITY, total
FUNDED BY Univ. Groningen + foundation FOM

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 2 ENGINEERS
TECHNICIANS 9 CRAFTS 2
GRAD STUDENTS involved during year
OPERATED BY Research staff or 7(1t)+2(1t) Operators
OPERATION 130 hr/wk, On target 110 hr/wk
TIME DISTR. in house 70 % , Outside 30 %
BUDGET, op & dev
FUNDED BY Univ. Groningen and foundation FOM
RESEARCH STAFF, not included above
USERS, in house 25 (incl. grad. students) outside 30
GRAD STUDENTS involved during year 12
RESEARCH BUDGET, in house
FUNDED BY Univ. Groningen + foundation FOM

MAGNET

POLE FACE, diameter (compact) 280 cm, R extraction 121 cm
R injection cm
GAP, min 22.4 cm, Field 20 kG
max 45 cm, Field 10 kG } at 560000...
AVERAGE FIELD at R ext 16 kG } Ampere turns
B max/ <B> 1.25

NUMBER OF SECTORS { compact 3 } Spiral, max 56 deg
{ separated }

SECTOR ANGLE (SSC) deg

TRIMMING COILS 12 concentric
5 harmonic and 2 bump coils

CONDUCTOR, material and type aluminium

STORED ENERGY (cryogenic) MJ

POWER: main coils 360 max, kW ; current stability <10^-3
trimming coils 100 max, kW ; current stability <10^-3

WEIGHT: Fe 650 tons ; coils 29 tons

COOLING system Demin. water

ION ENERGY (bending limit) E/A = 1.60 q^2/a^2 MeV/amu
(focusing limit) E/A = q^2/a^2 MeV/amu

ACCELERATION SYSTEM

DEES, number 1 ; angle 180 deg

BEAM APERTURE 2.5 cm ; DC Bias 0.7 kV

TUNED by, coarse moving, short, fine trim. cap.

RF 4.7 to 13.9 MHz, stable +/- 2.10^-6

Orb F to 13.9 MHz

HARMONICS, RF/Orb F, used 1, 3

DEE - Gnd, max 70 kV, min gap 0.6 cm

STABILITY, (pk-pk noise)/(pk RF volt) 2.10^-4

ENERGY GAIN, max 140 kV/turn

RF PHASE, stable to +/- deg

RF POWER input, max 150 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE <10^-6 (ext. src.) mbar

PUMPS, No, Type, Size 2 diffusion (3000+2000)

1 cryo (6000 l/s)

ION SOURCES

ECR, pol p (ext), Livingston (int)

INJECTION SYSTEM

Axial, hyperboloid inflector

EXTRACTION SYSTEM

Electrostatic

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed m^2 ; movable 650 m^2

TARGET STATIONS 10 in 7 rooms

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type QMG/2

COMPUTER model VAX8300, VAX 11/750, PDP 11/34 (Cycl.)

OTHER FACILITIES large scatt. ch., H.I. detector

multiplicity filter, Sumspectr., BGO spectr., Mini Oranges

Atomic Physics and Surface Physics set ups

CHARACTERISTIC BEAMS

PARTICLE ENERGY (MeV) CURRENT (pA)

Goal Achieved Internal External

p 7 60

Ar 25 160

Ar 5 25

Ar 4.5 12

SECONDARY (part/s)

1 - 3 MeV beta+ via 27Al(p,n) and fast transport

BEAM PROPERTIES

MEASURED CONDITIONS

PULSE WIDTH 4-40 RF deg pA of MeV ions

PHASE EXC, max RF deg pA of MeV ions

EXTRACT eff 50 % pA of MeV ions

RESOL delta E/E 0.2 % pA of MeV ions

EMITTANCE

(pi mm. mrad) { 10 axial } pA of MeV ions

{ 7 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 82 SOLID STATES PHYSICS 8

BIOMEDICAL APPLICAT 10 ISOTOPE PRODUCTIONS 8

REFERENCES/NOTES

1. O.C. Dermois, A.G. Drentje, H.W. Schreuder, IEEE Trans NS26-2

(1979)1992

2. W.K. v. Asselt, O.C. Dermois, A.G. Drentje, H.W. Schreuder, Proc.

9th Int. Cycl. Conf. (Caen) 1981 p. 267

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

The cyclotron will be in operation until 1992. It will be replaced

by the AGOR K=600 machine (see entry no. ...)

reference 3.

J. van Klinken et al. Phys.Lett.B205(1988)223, KVI Ann.rep.1988 p.87

