

ENTRY NO. C20 Date September 1995
 Name of Machine VICKSI (Van-de-Graaff Isochron Cyclicotron Kombination für Schwere Ionen)
 Institution Hahn-Meitner-Institut Berlin
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 In Charge: H. Homeyer Reported by: H. Homeyer

HISTORY

MILESTONE DATES:

Design 1973-74 Model Tests 1973-74
 Construction 1974-76 First Beam June 1977

DESIGN/CONSTRUCTION BY:

in house partly other Scanditronix AB, Uppsala

COST: Accelerator 40 MDM Facility 56 Million DM

FUNDED BY: Federal (90%), State (10%)

STATUS

STAFF: Machine 4 Scientists 6 Engineers 7 Technicians 6 Students 6

Research (in house/external)

Scientists 30 / 60 Engineers 30 / 65 Technicians 2.5 MDM Students 30 / 65

BUDGET: Machine 1.0 MDM Funded by State 90%

Research 1.0 MDM Funded by BMW

TIME DISTRIBUTION:

Basic Research (in house/external) 30 % / 25 %
 Applied Program (in house/external) 10 % / 15 %
 Maintenance 10 % Development 10 %

MAGNET

POLE PARAMETERS:

Diameter cm R_{extract} 171 cm R_{inject} 43 cm

HILL PARAMETERS: Gap (min) 6 cm B_{max} 1.57 T

(@ AT) Gap (max) 6 cm B_{min} T

VALLEY PARAMETERS: Gap (min) open cm B_{max} <0.1 T

(@ AT) Gap (max) cm B_{min} T

AVERAGE FIELD: $\langle B \rangle_{\text{min}}$ T $\langle B \rangle_{\text{max}}$ T

NUMBER OF SECTORS: compact/separated 50 / 4

sector angle 50 deg. spiral (max) 0 deg.

FIELD TRIMMING: Trim Coils 4

Harmonic Coils 4

Other

CURRENT: Main Coils 2000 Amps Stability 10^{-5}

Trim Coils 50 Amps Stability 10^{-4}

Stored Energy (cryogenic) MJ

WEIGHT: Iron 360 tons Conductor

ION ENERGY: Bending Limit E/A = 130 q²/A² MeV/u

Focusing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM

0°/180°-operation

FUNDAMENTAL ACCELERATION:

Description: 2 Quarterwave Resonators (30°) in opposite

No. of Gaps/turn dE/dn(max) 0.56 turn MeV/q

Voltage (max) 0.14 MV Harmonic f_n/f_{ion} 2-8

Freq 10-20 MHz Power in(max) 0.02 per cavity MW

Stability: Phase <0.1 deg. Voltage <10⁻³

OTHER CAVITIES (Flattopping or otherwise):

Description: none

Region of Influence: R_{min} cm R_{max} cm

No. of Gaps/turn dE/dn(max) MeV/q

Voltage (max) MV Harmonic f_n/f_{ion}

Freq MHz Power in(max) MW

Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 5 x 10⁻⁸ mbar

PUMPS: (No. and type) 1 Turbopump 1500 l/sec

2 Cryopumps 10000 l/sec

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta \gamma c$ (mm mrad)	Ion Species
(a) 5.0 GHz ECR on CN-injector terminal			
(b) 14 GHz ECR + RFQ (1996)			
(c)			
(d)			

INJECTION SYSTEM

radial, 2 magnetic, 1 electro- Efficiency 70 %
 static injectors

EXTRACTION SYSTEM

electrostatic deflector, current Efficiency 100 %
 septum magnet

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μA)	Internal	External
(a) ¹² C	72		0.5	0.5
(b) ⁴⁰ Ar	4 - 32		0.5 - 0.01	0.1 - 0.001
(c) ¹²⁹ Xe	1.3 - 13		0.01 - 0.001	
(d)	2.0 - 4.5			

Secondary Particles

E (MeV)	part/sec
(a)	
(b)	
(c)	

EXTRACTED BEAM PROPERTIES:

For 0.5 p μA of 7.5 MeV/u 20 Ne ions

$\Delta E/E$ 0.1 % $\Delta \phi$ ± 3 °rf

$\epsilon_n = \beta \gamma c$ x 6 π mm mrad z 5 π mm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed: 800 m² Moveable m²

Target Stations: 13 No. Served At Same Time: 1

MAGNETIC SPECTROMETERS: Q3D

OTHER FACILITIES: beams of the CN-Van-de-Graaff injector

available at additional 3 low energy targets. - external

pulsing gives 1 ns beam pulses with 100 ns repetition

down to one shot operation.

REFERENCES/NOTES

(a) IEEE, Vol. NS-26/2, 79, p.1872, 2300, 2209, 2355, 2202

(b) P. Arndt et al., NIM B89 (1994) 14-16

PLAN VIEW OF FACILITY, COMMENTS

- new RFQ injector under construction

- eye cancer therapy project under construction

