ENTRY NO. 21

NAME OF MACHINE VICKSI (Separated-Sector Cyclotron)+ DATE July 78
INSTITUTION Hahn-Meitner-Institut für Kernforschung Berlin GmbH
ADDRESS 1000 Berlin 39, Glienicker Straße 100

IN CHARGE K. Ziegler REPORTED by K. Ziegler

HISTORY AND STATUS

DESIGN, date 1973-74 MODEL tests 1973-74
ENG. DESIGN, date 1973-75
CONSTRUCTION, date 1974-76
FIRST BEAM date (or goal) June 77
MAJOR ALTERATIONS none

OPERATION, -- hr/wk; On Target -- hr/wk
TIME DIST., in house -- %, outside -- %
USERS' SCHEDULING CYCLE no reg. schedule yet ~~weeks~~
COST, ACCELERATOR
COST, FACILITY, total DM 40 Million
FUNDED BY Hahn-Meitner-Institut

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 6 ENGINEERS 6
TECHNICIANS 7 CRAFTS 30
GRAD STUDENTS involved during year
OPERATED BY -- Res staff or X Operators
BUDGET, op & dev DM 5.5 million
FUNDED BY Hahn-Meitner-Institut

RESEARCH STAFF, not included above

USERS, in house ~40 outside
GRAD STUDENTS involved during year
RES. BUDGET, in house
FUNDED BY Hahn-Meitner-Institut

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 800 m^2
movable m^2
TARGET STATIONS 14 in 6 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type Q3D
COMPUTER, model PDP 11/70
OTHER FACILITIES External pulsing system

REFERENCES/NOTES

+The Cyclotron was designed and built under contract with Scanditronix, Uppsala, Sweden. Scanditronix notation for the Cyclotron is SPC 120 refering to the energy constant $E=120\,q^2/A$. The cyclotron was accepted in March 78.

MAGNET

POLE FACE diameter 380 cm; R extraction 171 cm
GAP, min 6 cm; Field 15.7 kG } at .98 X 10^6 ampere turns
max open cm; Field ~1 kG
AVERAGE FIELD at R ext 8.9 kG
CURRENT STABILITY 5 parts/10^6; $B_{max}/\langle B\rangle$ 1.74
NUMBER OF SECTORS 4 ; SPIRAL, max 0 deg
POLE FACE COIL PAIRS: AVF /sec;
Harmonic correction 3/sector
Rad grad 12 /sec or Circ coils --
WEIGHT: Fe 360 tons; Coils 6 tons
CONDUCTOR, Material and type Hollow Copper
STORED ENERGY ~0.5 MJ
COOLING SYSTEM Demineralized Water
POWER: Main coils 300 max, kW
Trimming coils 50 max, kW
YOKE/POLE AREA 108 %
SECTOR ANGLE (Sep Sec) 50 deg
ION ENERGY (Bending limit) E/A = 128 q^2/A^2 MeV
(Focusing limit) E/A = q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 36 deg
BEAM APERTURE 4 cm; DC BIAS 0 kV
TUNED by, coarse Piston fine Flaps
RF 10 to 20 mHz, stable ± 0.05 /10^6
Orb F 1.43 to 8.9 mHz; GAIN, max 400 kV/turn
HARMONICS, RF/Orb F, used 2-6
DEE-Gnd, max 100 kV, min gap 3.7 cm
STABILITY, (pk-pk noise)/(pk RF volt) <10-3
RF PHASE stable to ± <0.05 deg
RF POWER input, max 90 kW
RF PROTECT circuit, speed 5 μsec
Type RF-turn off
FREQUENCY MODULATION, rate -- /sec
MODULATOR, type --
BEAM PULSE, width --

VACUUM SYSTEM

PUMPS, No., Type, Size 2 Kryopumps (4.2° K)
2 Turbopumps (1450 l/sec)
OPERATING PRESSURE 0.1 - 0.5 μTorr,
PUMPDOWN TIME 8 hrs

ION SOURCES/INJECTION SYSTEM

Axial Penning source in 6MV Van de Graaff, Stripper between Injector and Cyclotron

EXTRACTION SYSTEM El.stat. deflector, current septum, bending magnet

CONTROL SYSTEM

Computer Control System, PDP 11/40 2)

ENTRY NO. 21 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	50	--
	^{12}C	200	--
	^{20}Ne	200	280
	to ^{40}Ar	200	205
CURRENT		(μA)	(μA)
Internal			
External	^{3}He		0.06pμA
	^{20}Ne	0.1pμA	0.01pμA
	^{40}Ar		0.01pμA
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	<9	RF deg	0.08p	μA of 180	MeV	^{20}Ne
Phase Exc, max	± 1	RF deg	0.08p	μA of 180	MeV	^{20}Ne
Extract Eff	96	%	0.02p	μA of 220	MeV	^{20}Ne
Res, ΔE/E	<10^{-3}	%	0.08p	μA of 180	MeV	^{20}Ne
Emittance						
(mm-mrad)	___ axial / 6.3 radial		0.08p	μA of 180	MeV	^{20}Ne

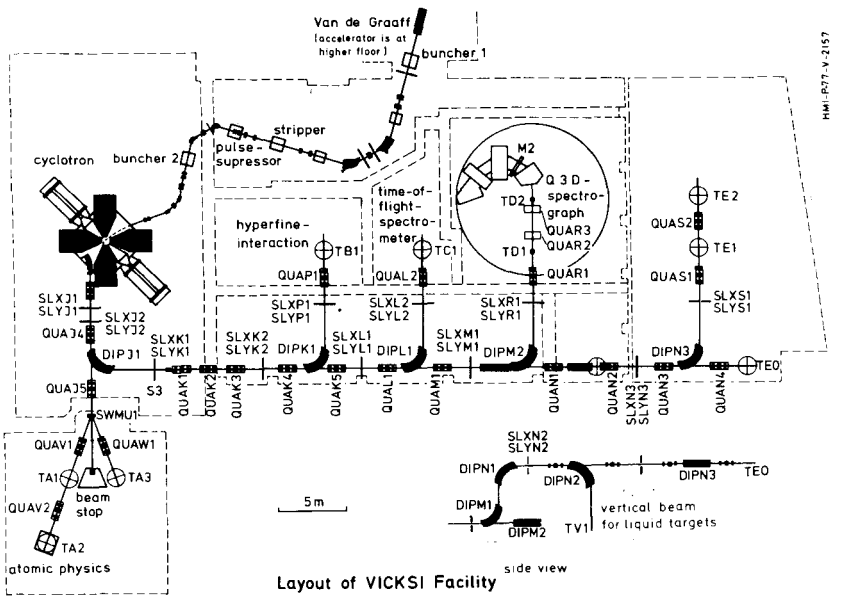
OPERATING PROGRAMS, time dist

Basic Nuclear Physics	~40 %
Solid State Physics	~40 %
Bio-Medical Applications	%
Isotope Production	%
Development	~20 %
No reg. schedule yet. Data are estimated from short test periods. 1)	%

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

The accelerator facility consists of a 6 MV Van de Graaff as injector for a 4-fold symmetric separated sector cyclotron. Mostly 2^+ ions from an axial penning ion source are accelerated to a maximum energy of 12 MeV and after stripping injected into the cyclotron. Before injection the beam is bunched into a phase width of ~5°. The energy of the extracted beam is 17 times that of injection. Single turn extraction with $\Delta E/E \approx 10^{-3}$ and sharp time structure is the normal mode of operation. The main target positions are reached via a double monochromator that allows for very flexible beam preparation. Beam has been delivered to target stations TB1, TC1 and TD1, the other stations are under construction.

Ref: 1) Running in of VICKSI and first operating experience, this conference
2) The computer aided Control-System of the VICKSI Accelerators, this conference



Layout of VICKSI Facility