ENTRY NO. C61 Date June 1992

Name of Machine U - 240 Cyclotron

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HISTORY

MILESTONE DATES:
Design 1965 - 1970 Model Tests 1963 - 1966
Construction 1966 - 1972 First Beam March 1976

DESIGN/CONSTRUCTION BY:
in house yes other Efremov's Institute/Leningrad

COST: Accelerator Facility 50 MRb(SU)

FUNDED BY: USSR Academy of Sciences
Comittee Utilization of Atomic Energy

STATUS

STAFF: Machine
Scientists 6 Engineers 20
Technicians 60 Students 2
Research (in house/external)
Scientists 200 / Engineers /
Technicians / Students /

BUDGET: Machine 2 MRub (1990) Funded by Ukr.Ac. of Scien-ces
Research Funded by

TIME DISTRIBUTION:
Basic Research (in house/external) 50 % / %
Applied Program (in house/external) 20 % / %
Development % Maintenance 30 %

MAGNET

POLE PARAMETERS:
Diameter 240 cm $R_{extract}$ 102 cm R_{inject} 23.2 cm
HILL PARAMETERS: Gap (min) 2.3 cm B_{max} T
(@ 0.85e6 AT) Gap (max) cm B_{min} T
VALLEY PARAMETERS: Gap (min) 53.2 cm B_{max} 11.2 T
(@ AT) Gap (max) cm B_{min} T
AVERAGE FIELD: $< B >_{min}$ T $< B >_{max}$ 1.7 T
NUMBER OF SECTORS: compact/separated 3 /
sector angle deg. spiral (max) 45 deg.
FIELD TRIMMING: Trim Coils 15 circulating coils
Harmonic Coils 3 per sector
Other valley coils (1per sector)
CURRENT: Main Coils 2100 Amps Stability 2.0e-5
Trim Coils 2100 Amps Stability 1.0e-4
Stored Energy (cryogenic) MJ
WEIGHT: Iron 650. tons Conductor 84. tons
ION ENERGY: Bending Limit E/A = 140 q^2/A^2 MeV/u
Focussing Limit E/A = 80(protons). q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
Description: 180 dee and dummy dee
No. of Gaps/turn 2 dE/dn(max) 0.18 MeV/q
Voltage(max) 0.09 MV Harmonic f_{rf}/f_{ion} 1.3
Freq 7 - 21 MHz Power in(max) 0.25 MW
Stability: Phase ± 20 Voltage 2.e-3
OTHER CAVITIES (Flattopping or otherwise):
Description:
Region of Influence: R_{min} cm R_{max} cm
No. of Gaps/turn dE/dn(max) MeV/q
Voltage(max) MV Harmonic f_{rf}/f_{ion}
Freq MHz Power in(max) MW
Stability: Phase Voltage

VACUUM SYSTEM

OPERATING PRESSURE: 2.0 e-6
PUMPS: No. and type 3 diffusion pumps (50 cm)

ION SOURCE(S)

	Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (πmm mrad)	Ion Species
(a)	internal pig				
(b)	with filament	2			P, D, α
(c)	with indirect heated cathode 0.1-1.0				$C^{3+}, B^{3+}, N^{3+}, N^{4+}$
(d)					F^{-}, O^{-}, Ne^{-}, etc.

INJECTION SYSTEM

Axial injection ... mirror inflector Efficiency ... %
not in operation

EXTRACTION SYSTEM

e/s deflector, compensated magnetic Efficiency 20-50 %
channel and iron channel

CHARACTERISTIC BEAMS

	Accelerated Ions	E/A (MeV/u)	Current(part μA) Internal	External
(a)	protons	20-78	up to 200	10
(b)	D, α	10-25	10-20	5-10
(c)	C^{3+}, O^{4+}, Ne^{5+}	5	2	0.5
(d)	N	10	1	0.3

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

EXTRACTED BEAM PROPERTIES:
For 5 μA of 70 MeV/u P ions
$\Delta E/E \pm 0.3$ % $\Delta\phi$ 30° °rf
$\epsilon_n = \beta\gamma\epsilon$ x 5 πmm mrad z 5 πmm mrad

FACILITIES FOR RESEARCH

SHIELDED AREA: Fixed 1000 m² Moveable 1200 m²
Target Stations: 15 No. Served At Same Time: 1
MAGNETIC SPECTROMETERS: MS 200 R=200 cm dE/E=20e-5
OTHER FACILITIES:

REFERENCES/NOTES

(a) Atomnaja Energia, 6, 1976
(b) 8. International Conference on Cyclotrons, Bloomington, September 18-21, 1976

PLAN VIEW OF FACILITY, COMMENTS

1. The polarized ion source will be installed in 1993
2. The ECR ion source in construction (collobaration with JINR, Dubna)
3. The radioactive ions seperator in design (Efremov NIIEPA - Petersburg)
4. The storage ring complex with U-240 injector under consideration.