ENTRY No. 101 Kazakhstan Variable Energy

NAME OF MACHINE Isochronous Cyclotron DATE July, 1981
INSTITUTION Institute of Nuclear Physics, Kazakhstan Academy of Sciences
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IN CHARGE A.A. Arzumanov REPORTED BY A.A. Arzumanov

HISTORY AND STATUS
DESIGN, date 1966 Model tests 1966-1968
ENG DESIGN, date 1967-1969
CONSTRUCTION, date 1970-1971
FIRST BEAM, date (or goal) September 1971
MAJOR ALTERATIONS
COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY Kazakhstan Academy of Sciences

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS ENGINEERS
TECHNICIANS CRAFTS
GRAD STUDENTS involved during year
OPERATED BY Research staff or Operators
OPERATION 160 hr/wk, On target 135 hr/wk
TIME DISTR. in house 85 %, Outside 15 %
BUDGET, op & dev
FUNDED BY Kazakhstan Academy of Sciences

RESEARCH STAFF, not included above
USERS, in house outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY

MAGNET
POLE FACE, diameter (compact) 150 cm, R extraction 66.5 cm
R injection cm
GAP, min 21 cm, Field 19.2 kG
max 35 cm, Field 12.2 kG
at $5 \cdot 10^5$ Ampere turns
AVERAGE FIELD at R ext 15.6 kG
B max/ <B>
NUMBER OF SECTORS compact 3, separated; Spiral, max 25 deg
SECTOR ANGLE (SSC) deg
TRIMMING COILS 9 circular
2 harmonic per sector
CONDUCTOR, material and type copper
STORED ENERGY (cryogenic) MJ
POWER : main coils 275 max, kW ; current stability 10^{-4}
trimming coils 50 max, kW ; current stability 10^{-4}
WEIGHT : Fe tons ; coils tons
COOLING system water
ION ENERGY (bending limit) E/A = 50 q^2/a^2 MeV/amu
(focusing limit) E/A = 30 q /a MeV/amu

ACCELERATION SYSTEM
DEES, number 2 ; angle 180 deg
BEAM APERTURE 7 cm ; DC Bias kV
TUNED by, coarse mov. short fine var. cap. auto
RF 8.5 to 19.0 mHz, stable ± 10^{-6}
Orb F 8.5 to 19.0 mHz
HARMONICS, RF/Orb F, used 1
DEE - Gnd, max 80 kV, min gap 3.9 cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.01
ENERGY GAIN, max 320 kV/turn
RF PHASE, stable to ± deg
RF POWER input, max 300 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM
OPERATING PRESSURE $8 \cdot 10^{-6}$ Torr or mbar
PUMPS, No, Type, Size 7 diffusion pumps
(two 50 cm, five 16 cm)

ION SOURCES
internal, hot filament, hooded

INJECTION SYSTEM

EXTRACTION SYSTEM
radially focusing dc deflector, magnetic chan.

FACILITIES FOR RESEARCH
SHIELDED AREA, fixed 132 m² ; movable m²
TARGET STATIONS 2 in 2 rooms
STATIONS served at same time, max
MAG SPECTROGRAPH, type
COMPUTER model
OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p		6-30	200	30
d		12-25	150	30
He-3		19-62	20	10
He-4		25-51	40	20
SECONDARY			(part/s)	

BEAM PROPERTIES

MEASURED		CONDITIONS
PULSE WIDTH	35 RF deg	20 pμ A of 30 MeV p ions
PHASE EXC, max	RF deg	pμ A of MeV ions
EXTRACT eff	60 %	pμ A of MeV ions
RESOL ΔE/E	0.6 %	pμ A of MeV ions
EMITTANCE		
(π mm. mrad)	16 axial, 16 rad	15 pμA of 30 MeV p ions

OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS 40 SOLID STATES PHYSICS 45
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 10
Development 5

REFERENCES/NOTES

A.A. Arzumanov, L.M. Nemenov,
Nucl. Instr. Meth. 166 (1973) 201

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

Conversion of 150 cm FF machine.

Circular coils in separate vacuum box.

^{3}He recovery system.

Radioisotope production.