

ENTRY No. 128

NAME OF MACHINE U-400 DATE  
INSTITUTION Joint Institute for Nuclear Research  
ADDRESS Dubna, USSR  
TEL TELEX MSK DUBNA 412621  
IN CHARGE G. N. Flory REPORTED BY

### HISTORY AND STATUS

DESIGN, date Model tests  
ENG DESIGN, date 1973-1977  
CONSTRUCTION, date 1974-1978  
FIRST BEAM, date (or goal) 1978  
MAJOR ALTERATIONS

COST, ACCELERATOR  
COST, FACILITY, total  
FUNDED BY

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT  
SCIENTISTS ENGINEERS  
TECHNICIANS CRAFTS

GRAD STUDENTS involved during year  
OPERATED BY Research staff or Operators

OPERATION 80 hr/wk, On target 65 hr/wk  
TIME DISTR. in house %, Outside %  
BUDGET, op & dev

FUNDED BY  
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) 400 cm, R extraction 172 cm  
R injection cm

GAP, min 4.2 cm, Field 26 kG }  
max 30 cm, Field 16 kG } at  $1.26 \times 10^6$

AVERAGE FIELD at R ext 21.4 kG } Ampere turns  
B max/ <B> 1.21

NUMBER OF SECTORS { compact 4 } Spiral, max 7 deg  
{ separated }  
SECTOR ANGLE (SSC) deg

TRIMMING COILS 10 circular  
8 harmonic

CONDUCTOR, material and type Al  
STORED ENERGY (cryogenic) MJ

POWER: main coils 850 max, kW; current stability  $10^{-4}$   
trimming coils 56 max, kW; current stability  $10^{-3}$

WEIGHT: Fe 2000 tons; coils tons  
COOLING system Demineralized water  
ION ENERGY (bending limit) E/A = 625 q<sup>2</sup>/a<sup>2</sup> MeV/amu  
(focusing limit) E/A = 35 q<sup>2</sup>/a<sup>2</sup> MeV/amu

ACCELERATION SYSTEM  
DEES, number 2.420; angle deg  
BEAM APERTURE 4.2 cm; DC Bias 0 kV

TUNED by, coarse MS, fine VC  
RF 6 to 12 MHz, stable  $\pm 10^{-5}$   
Orb F 1.5 to 12 MHz

HARMONICS, RF/Orb F, used 1, 2, 3, 4  
DEE - Gnd, max 100 kV, min gap 8 cm

STABILITY, (pk-pk noise)/(pk RF volt)  $10^{-3}$   
ENERGY GAIN, max 400 kV/turn  
RF PHASE, stable to  $\pm 2$  deg

RF POWER input, max 150 kW  
FREQUENCY MODULATION, rate 7/s  
modulator, type  
beam pulse, width

VACUUM SYSTEM  
OPERATING PRESSURE  $1 \times 10^{-6}$  Torr or mbar  
PUMPS, No, Type, Size 5 oil diffusion pumps  
4000 l s<sup>-1</sup> each

ION SOURCES  
Arc type with heated cathode

### INJECTION SYSTEM

EXTRACTION SYSTEM  
Stripping + magnetic channel

FACILITIES FOR RESEARCH  
SHIELDED AREA, fixed 400 m<sup>2</sup>; movable m<sup>2</sup>  
TARGET STATIONS 15 in 7 rooms

STATIONS served at same time, max 1  
MAG SPECTROGRAPH, type  
COMPUTER model Intel-8080  
OTHER FACILITIES

### CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
14N <sup>2+</sup>		176	30	25
48Ti <sup>5+</sup>		269	7	2.5
58Fe <sup>6+</sup>		298	3.5	1.2
76Ge <sup>8+</sup>		400	0.3	0.1

SECONDARY (part/s)

### BEAM PROPERTIES

MEASURED	CONDITIONS	
	RF deg	μA of MeV ions
PULSE WIDTH 30		
PHASE EXC, max RF deg		
EXTRACT eff 30-70 %		
RESOL ΔE/E 1 %		

EMITTANCE  
(r mm. mrad) { 80 axial }  
{ 40 rad } μA of MeV ions

OPERATING PROGRAMS, time distribution  
BASIC NUCLEAR PHYSICS 100% SOLID STATES PHYSICS  
BIOMEDICAL APPLICAT. - ISOTOPE PRODUCTIONS

### REFERENCES/NOTES

1) Proc. of the VIIIth All-Union Meeting on charged Particle Accelerators, Dubna, v.1, 47, 1983

### PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS