

ENTRY No. C45

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

#### 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 deg  
{ separated 7 }  
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, 42° 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 /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 (pA) |          |
|---------------------|--------------|----------|--------------|----------|
|                     | Goal         | Achieved | Internal     | External |
| 14 N <sup>2+</sup>  |              | 176      | 30           | 25       |
| 48 Ti <sup>5+</sup> |              | 269      | 7            | 2.5      |
| 58 Fe <sup>6+</sup> |              | 298      | 3.5          | 1.2      |
| 70 Ge <sup>8+</sup> |              | 400      | 0.3          | 0.1      |

SECONDARY (part/s)

#### BEAM PROPERTIES

| MEASURED                                      | CONDITIONS     |                |
|---|----------------|----------------|
|   | PULSE WIDTH    | PHASE EXC, max |
| 30 RF deg                                     | RF deg         | pA of MeV ions |
| EXTRACT eff 30-70 %                           | pA of MeV ions |                |
| RESOL $\Delta E/E$ 1 %                        | pA of MeV ions |                |
| EMITTANCE                                     |                |                |
| ( $\pi$ mm. mrad) { 80 axial }<br>{ 40. rad } | pA 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