

ENTRY NO. **C 50** Date November, 1995  
 Name of Machine U-400  
 Institution Joint Institute for Nuclear Research, Flerov Laboratory of Nuclear Reactions  
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 In Charge: G. Gulbekian Reported by: A. Tikhomirov

**HISTORY**  
**MILESTONE DATES:**  
 Design 1973-1977 Model Tests  
 Construction 1974-1978 First Beam 1978  
**DESIGN/CONSTRUCTION BY:**  
 in house other  
**COST: Accelerator Facility**  
**FUNDED BY:**

**STATUS**  
**STAFF: Machine**  
 Scientists 3 Engineers 5  
 Technicians 10 Students 2  
 Research (in house/external)  
 Scientists / Engineers /  
 Technicians / Students /  
**BUDGET: Machine** Funded by  
 Research Funded by  
**TIME DISTRIBUTION:**  
 Basic Research (in house/external) 60 % / 10 %  
 Applied Program (in house/external) 15 % / 5 %  
 Maintenance 6 % Development 4 %

**MAGNET**  
**POLE PARAMETERS:**  
 Diameter 400 cm  $R_{extract}$  172 cm  $R_{inject}$  cm  
**HILL PARAMETERS:** Gap (min) 4.2 cm  $B_{max}$  2.6 T  
 (@ AT) Gap (max) cm  $B_{min}$  T  
**VALLEY PARAMETERS:** Gap (min) cm  $B_{max}$  T  
 (@ AT) Gap (max) 30 cm  $B_{min}$  1.6 T  
**AVERAGE FIELD:**  $\langle B \rangle_{min}$  1.9 T  $\langle B \rangle_{max}$  2.1 T  
**NUMBER OF SECTORS:** compact/separated 4 /  
 sector angle 42 deg. spiral (max) 0 deg.  
**FIELD TRIMMING:** Trim Coils 10  
 Harmonic Coils 8  
 Other  
**CURRENT:** Main Coils 2500 Amps Stability  $10^{-4}$   
 Trim Coils 600 Amps Stability  $10^{-3}$   
 Stored Energy (cryogenic) MJ  
**WEIGHT:** Iron 2000 Conductor 30  
**ION ENERGY:** Bending Limit E/A = 625 q<sup>2</sup>/A<sup>2</sup> MeV/u  
 Focusing Limit E/A = 35 q/A MeV/u

**ACCELERATION SYSTEM**  
**FUNDAMENTAL ACCELERATION:**  
 Description: Two Dees system, MS  
 No. of Gaps/turn 4 dE/dn(max) 0.1 MeV/q  
 Voltage (max) 0.1 MV Harmonic  $f_H/f_{ion}$  2, 4, 6  
 Freq 5.6 - 12 MHz Power in(max) 0.1 MW  
 Stability: Phase Voltage  $5 \cdot 10^{-3}$   
**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  $f_H/f_{ion}$   
 Freq MHz Power in(max) MW  
 Stability: Phase Voltage

**VACUUM SYSTEM**  
**OPERATING PRESSURE:**  $10^{-6}$  mbar  
**PUMPS: (No. and type)** 5 oil diffusion pumps  
 400ℓ/s each

**ION SOURCE(S)**

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ ( $\pi$ mm mrad)	Ion Species
(a) Internal PIG			
(b) External ECR (14.5GHz)			
(c)			
(d)			

**INJECTION SYSTEM**  
 Axial injection, spiral inflector Efficiency (1996) %

**EXTRACTION SYSTEM**  
 Stripping Efficiency 30-80 %

**CHARACTERISTIC BEAMS**

Accelerated Ions	E/A (MeV/u)	Current (part $\mu$ A)	
		Internal	External
(a) $^7\text{Li}^{1+}$	12.5	2.5	2.0
(b) $^{36}\text{S}^{4+}$	6.8	2.5	1.2
(c) $^{56}\text{Fe}^{6+}$	5.3	3.5	1.2
(d) $^{84}\text{Kr}^{7+}$	3.6	0.35	0.15

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

**EXTRACTED BEAM PROPERTIES:**  
 For  $\mu$ A of MeV/u ions  
 $\Delta E/E$  1 %  $\Delta\phi$  30 °rf  
 $\epsilon_n = \beta\gamma\epsilon$  x  $4 \pi$  mm mrad z 8  $\pi$  mm mrad

**FACILITIES FOR RESEARCH**  
 SHIELDED AREA: Fixed: 400 m<sup>2</sup> Moveable m<sup>2</sup>  
 Target Stations: 15 No. Served At Same Time: 1  
**MAGNETIC SPECTROMETERS:**  
 OTHER FACILITIES: Electrostatic and gas filled separators

**REFERENCES/NOTES**  
 (a)  
 (b)

**PLAN VIEW OF FACILITY, COMMENTS**