

K500 Operations and Development

D. P. May, G. J. Kim, F. P. Abegglen, and H. L. Clark

Introduction

During the 2001-2002 reporting period a total of 74 beams were tuned for experiments, and 108 beams (not counting multiple tunes of each beam during a run) were tuned for the SEE program. The demand for beam time as well as the total beam-on-target time increased significantly. The beams for experiments included the first uranium beam and one beam well outside the standard operating range of the cyclotron. The SEE program will be discussed in a separate contribution.

Ion Sources

The 14.5 GHz ECR2 ion source has been reassembled and is operating again. It has not been used for operations as of yet, and its progress will be presented in a separate contribution. ECR1 continues to operate in a reliable manner despite some problems. Late in the reporting period one of the 500 amp power supplies that operates one of the outer axial coils failed. It was replaced with one of the 350 amp supplies from one of the inner coils and this coil was left off. Also, after the holiday shut-down, the 6.4 GHz transmitter suffered a major failure, so the other 6.4 GHz transmitter, which was intended for use with ECR2, was redirected to ECR1.

Finally, in January during the shut-down a Hall-probe measurement of the hexapole field indicated that the pole strength of one of the bars had decreased near one position close to the

middle of its length. The field at this position had been initially measured to be low, 4.4 kilogauss compared to an average pole field of about 4.8 kilogauss. The field at this position has since declined to 3.9 kilogauss, and the wall at this position appears to have suffered some slight overheating. No other positions of field decline were found. Since the ECR resonance for 6.4 GHz is 2.28 kilogauss, the source should not be at risk at low to medium microwave power. At high power, however, there appears to be a risk. The performance of the source has declined fairly recently, so an effort will be made to relate this to incidents when, in trial runs, higher than normal microwave power was used. Options for repairing the hexapole will be considered once ECR2 is in routine operation.

Cyclotron Beams

Several beams of note have been developed. The first uranium beam from the cyclotron was run in March. The charge state was 39+, the highest charge-state beam to date. This 12 AMeV beam with extracted intensity of 1.0 enA indicates that the attenuation of such a highly charged beam by residual gas in the K500 is not large. A 47 AMeV alpha beam was developed for a NIMROD experiment. At $K=188$ the $v_R+2v_Z=3$ resonance is well inside the radius for extraction, and consequently the extraction ratio was poor. However, the experiment required only a low intensity, so after suitable attenuation the lost beam did not represent an intolerable load on the deflectors.

Operations

For the period April 1, 2001 through March 31, 2001, the operational time is summarized in Table I, while Table II lists how the scheduled time was divided among the experimenters. The beam-on-target time represents an 11.5% increase over last year. The scheduled time for physics and chemistry experiments increased by large percentages as well. Refrigerator problems after the holiday

Table 1: 2001-2002 Operational Time.

Time	Hours	% of Time
Beam on Target	5173.75	65.1
Tuning Cyc & Optics, Exp. Setup	1271.00	16.0
Beam Development	267.50	3.4
Scheduled Maintenance	408.50	5.2
Unscheduled Maintenance	741.75	9.3
Idle Time	81.50	1.0
Cool Down	0.00	0.0
TOTAL	7944	100.0

Table 2: Scheduled Beam Time.

Time	Hours	% of Time
Nuclear Physics	1552.00	22.9
Nuclear Chemistry	2374.50	35.0
Atomic Physics	545.00	8.0
Outside Collaboration	343.75	5.1
Outside Users	1694.25	25.0
Beam Development	267.50	4.0
TOTAL	6777.00	100.0

shutdown prevented an even larger increase in beam-on-target time and shows up in a 280 hour increase in unscheduled maintenance. In order to meet the increased demand for less available beam-time, the scheduled maintenance was more than halved. The refrigerator problems were a consequence of cutting into the system for the purposes of the Big Sol project.