K500 operations and development

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Introduction

During the 2006-2007 reporting period a total of 37 different beams, including 7 newly developed beams, were used for experiments. There were a total of 69 beam tunings not counting multiple tunes of beams for the SEE program. The SEE program will be treated separately.

Ion Sources

An attempt to sputter titanium resulted in 4 eμA of $^{48}Ti^{14+}$ and 5.5 eμA of $^{48}Ti^{13+}$. A high sputter voltage of 4.5 kV was required. The titanium was introduced into the plasma chamber as a target on the 8-finger sputter fixture, so its position could not be adjusted to enable optimizing this beam.

ECR2 was used occasionally to provide beams for the K500, notably high-charge-state gold. Progress on the ECR2 ion source will be described in a separate contribution.

Cyclotron Beams

New beams of ^{10}B at 15 AMeV, ^{14}N at 14 and 45 AMeV, ^{18}O at 15 AMeV, ^{39}K at 10 AMeV and ^{165}Ho at 15 AMeV were developed. The ^{165}Ho beam was developed for the SEE program with charge state 31+ since a previous beam solution using charge state 30+ resulted in confusion with the 4+ charge state of ^{22}Ne in the cyclotron. Sometimes residual neon in the ion source from previous SEE beams does not clear out quickly enough to avoid this confusion.

Operations

For the period April 1, 2006 through March 31, 2007, the operational time is summarized in Table I, while Table II lists how the scheduled time was divided. There were three major repairs that caused significant loss of time. In September a water leak in a cyclotron dee shell caused a loss of almost eight days of beam time, followed in October by a breakdown in the expansion engine of the helium refrigerator that resulted in six and one half days of lost beam time. Finally, the repair of a water leak in the inner copper rf liner cost six days of beam time in February. The unscheduled maintenance for this year represents a much higher percentage of time than for previous years.

Table I. 2006-2007 operational time.

Time	Hrs.	%Time
Beam on target	5948.25	**73.3**
Tuning, optics, set-up	410.25	**5.1**
Beam development	423.75	**5.2**
Scheduled maint.	594.50	**7.3**
Unscheduled maint.	633.25	**7.8**
Idle time	102.00	**1.3**
Total	**8112.00**	**100.0**

Table II. 2006-2007 scheduled beam time.

Time	Hrs.	%Time
Nuclear physics	2196.25	**30.9**
Nuclear chemistry	1146.25	**16.2**
Atomic physics	143.50	**2.0**
Outside collaboration	36.00	**0.5**
Outside users	3150.25	**44.4**
Beam development	423.75	**6.0**
Total	**7096.00**	**100.0**