MEMO

To: Alan Shotter

From: The DRAGON Collaoration

Re: DRAGON Data Analysis

Preliminary data analysis has been completed on a portion of the RIB data we acquired Nov.-Dec. 2001. The analysis is sumarized by the following three figures which demonstrate features of DRAGON of which the Collaboration is especially proud.

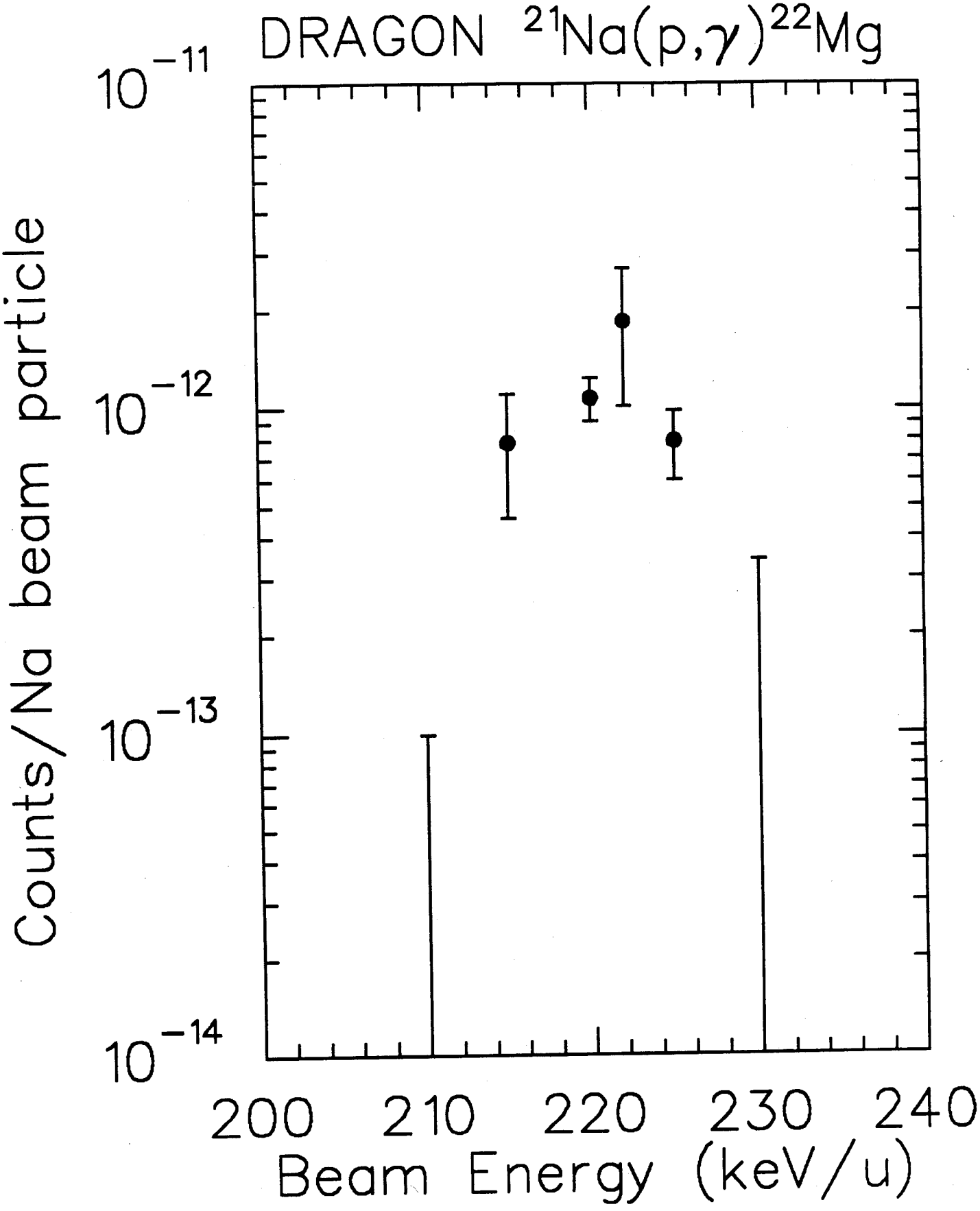
HIGH SENSITIVITY - Fig. 1 shows the measured resonant yield as a function of beam energy. Because the resonance is narrow, the yield curve exhibits a plateau characteristic of such excitation functions on thick targets. The data point on the left in the Figure is at 10**-13 of the beam intensity and was acquired in only 9h of running. Measuring lower yields are only limited by available beam current and time.

LOW BACKGROUND - Fig. 2 shows the cuts which were used to separate 8 capture events from approximately 1 million candidates recorded in a 6h run on-resonance. The upper box separates allowed ranges of gamma-ray energy and gamma-ray time-vs-r.f. The middle box shows required conditions placed simultaneously on the heavy ion (H) energy and H-time-of-flight relative to the gamma-ray. The middle spectrum is clean outside the valid-event region, which meant that no background subtraction was needed for any of the data points of Fig. 1. Low background improves statistical errors and saves beamtime which would otherwise be spent on background runs.

BROAD RANGE - Fig. 3 shows the distribution of gamma ray positions for three energies on the plateau of Fig. 1. As the beam energy increases from left to right in Fig. 1, the most-probable gamma-ray position marches downstram through the length of the target. We used these spectra for a postiori proof that the narrow resonance was contained in the target volume. The gamma efficiency and H-acceptance of DRAGON are uniform so the same yield was obtained for all 3 beam energies. The energy-acceptance is about 5% for this resonance.

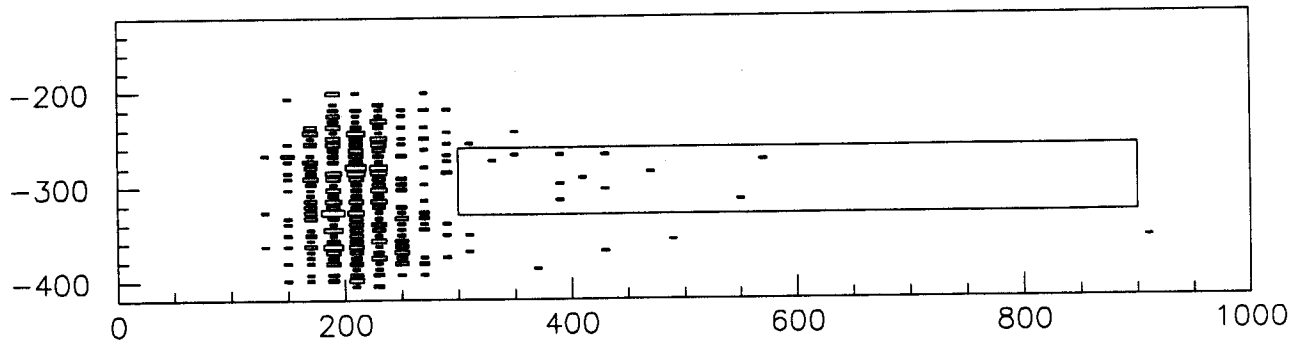
What remains is to convert the measured yields to resonance widths, using the calculated gamma-efficiency of the gamma array and measured H-efficiency of the spectrometer.

Joel Rogers for
The DRAGON Collaboration
17 January, 2002

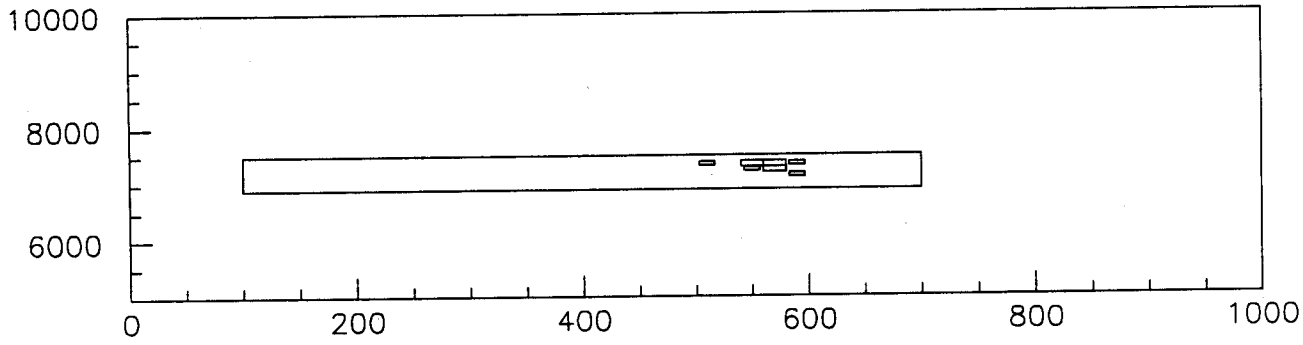

DRAGON $^{21}Na(p,\gamma)^{22}Mg$
10^{-11}
10^{-12}
10^{-13}
10^{-14}
Counts/Na beam particle
200
210
220
230
240
Beam Energy (keV/u)

(2)

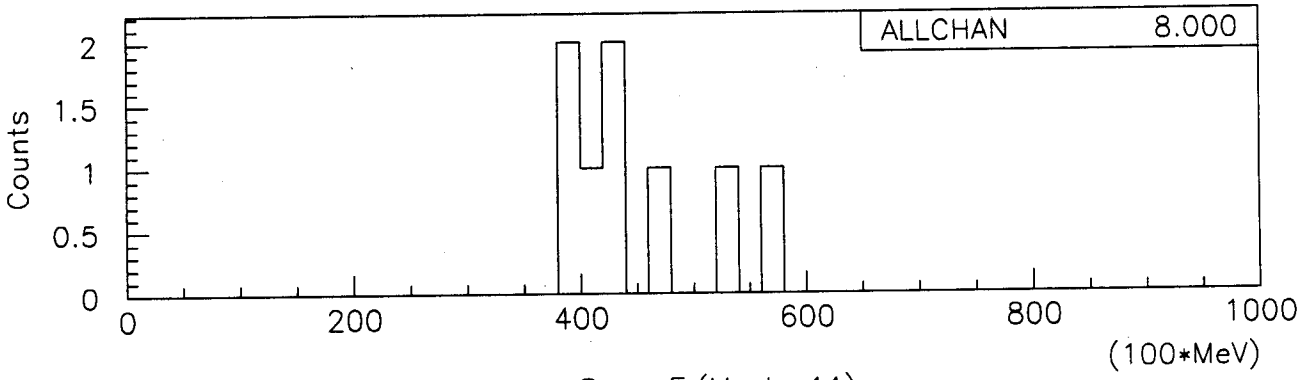
225 KeV/u $^{21}Na(p,\gamma)^{22}Mg$ DRAGON Analysis of 6h Beam at $4x10^8$ $^{21}Na/s$



cγ0 Energy x cγ0 Lrf Time



cH−Energy x cγ HI Time



cγ Sum−E (Mask=44)

2002/01/11 09.39

$^{21}Na(p,\gamma)^{22}Mg$ DRAGON Target Positions – Eb=215, 220, 225 Kev/u