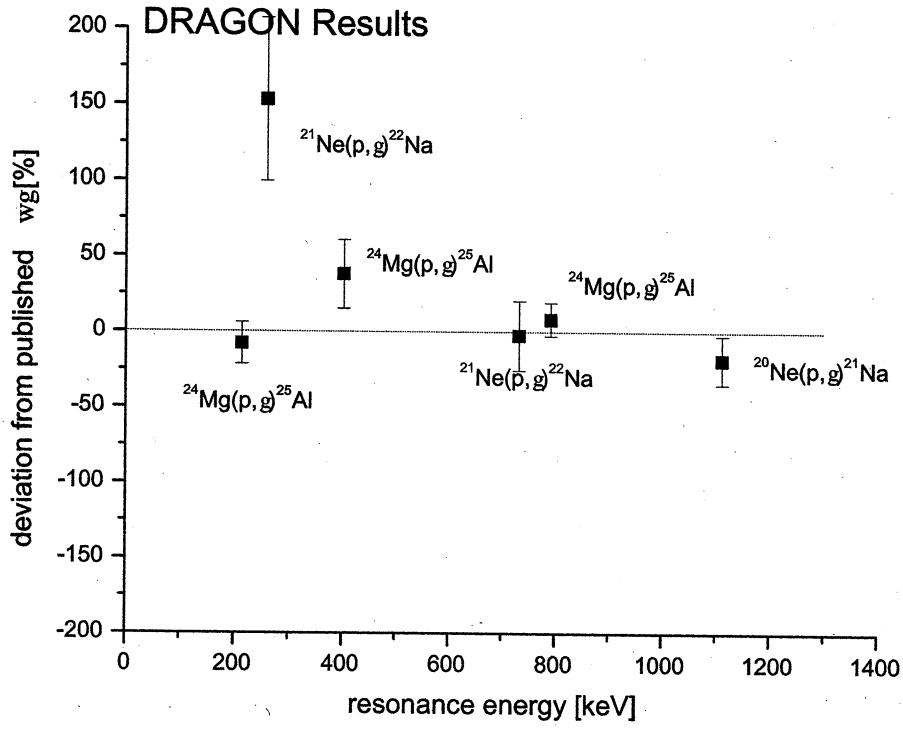
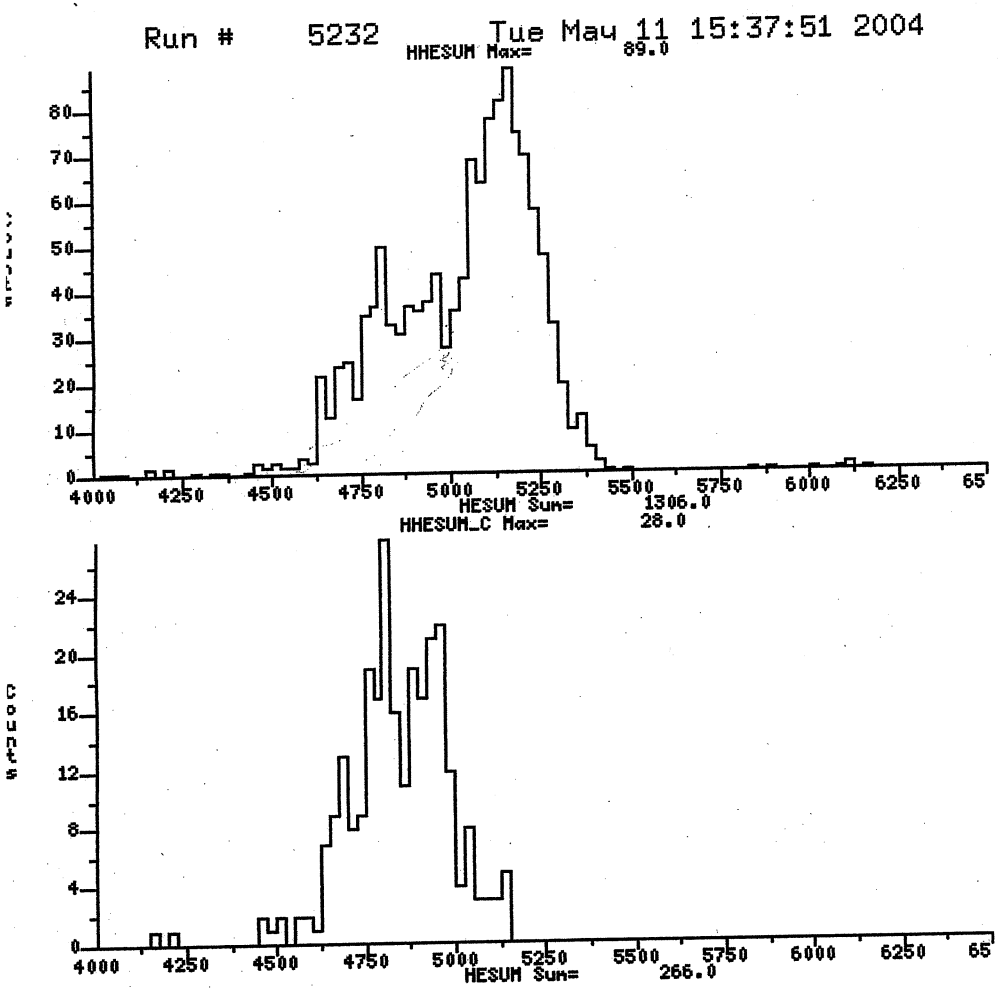
SABINE'S THESIS

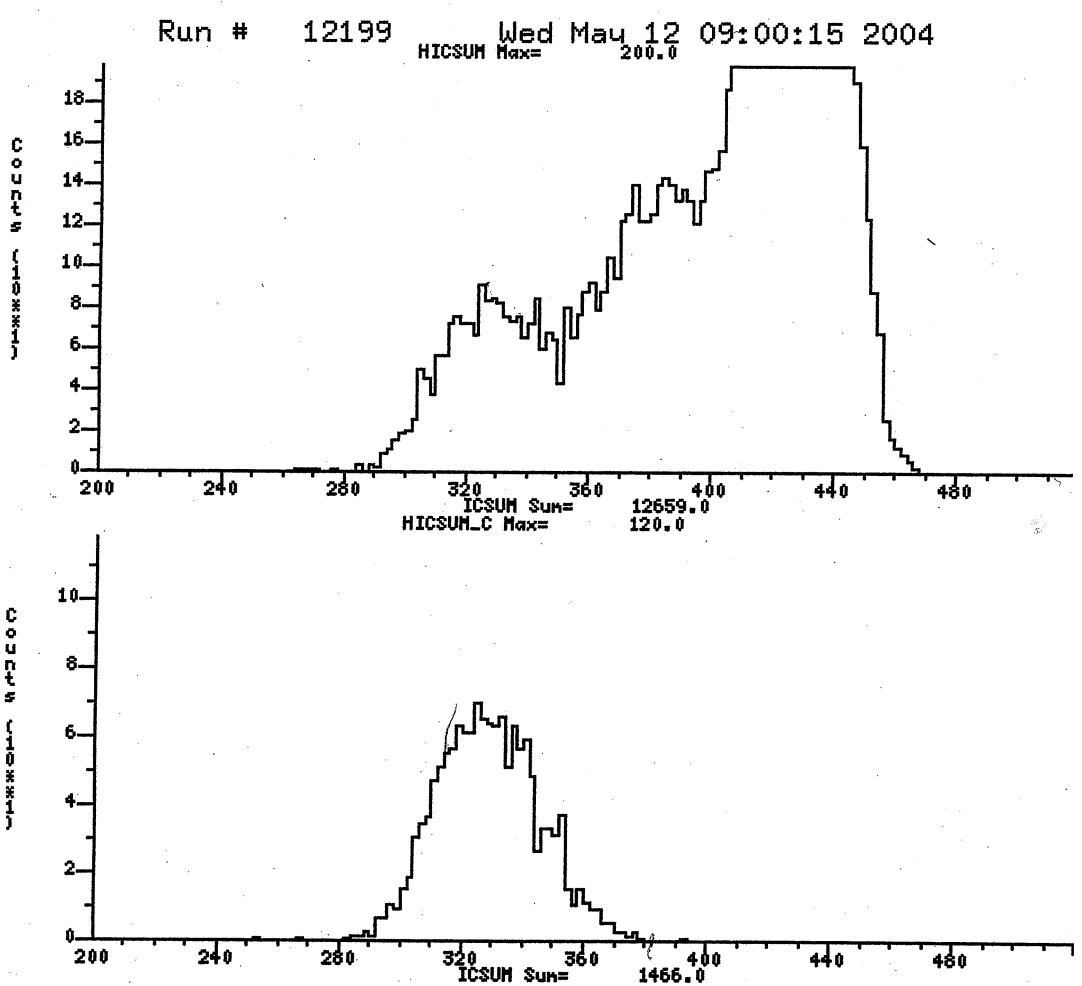


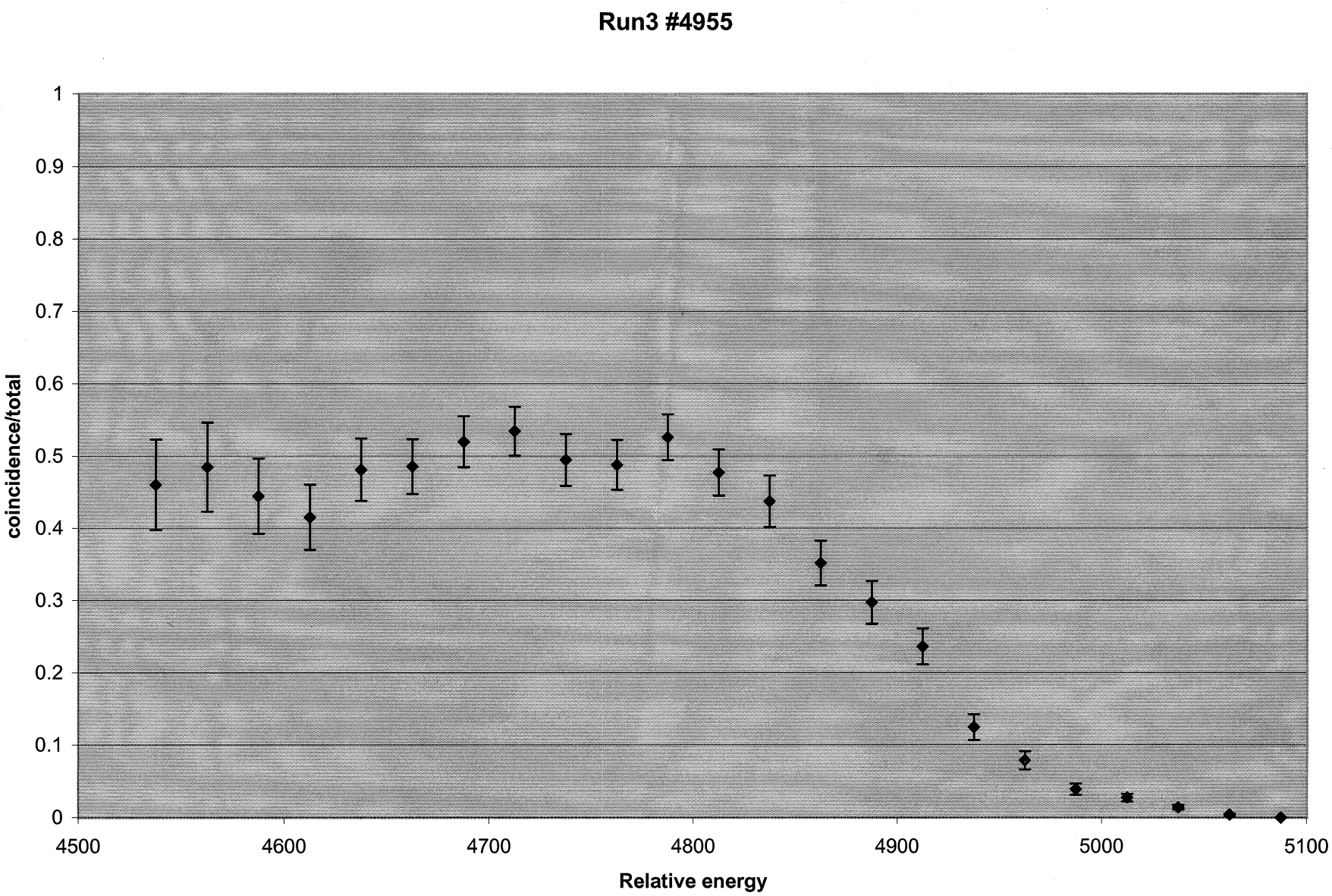
Problems that were analyzed:

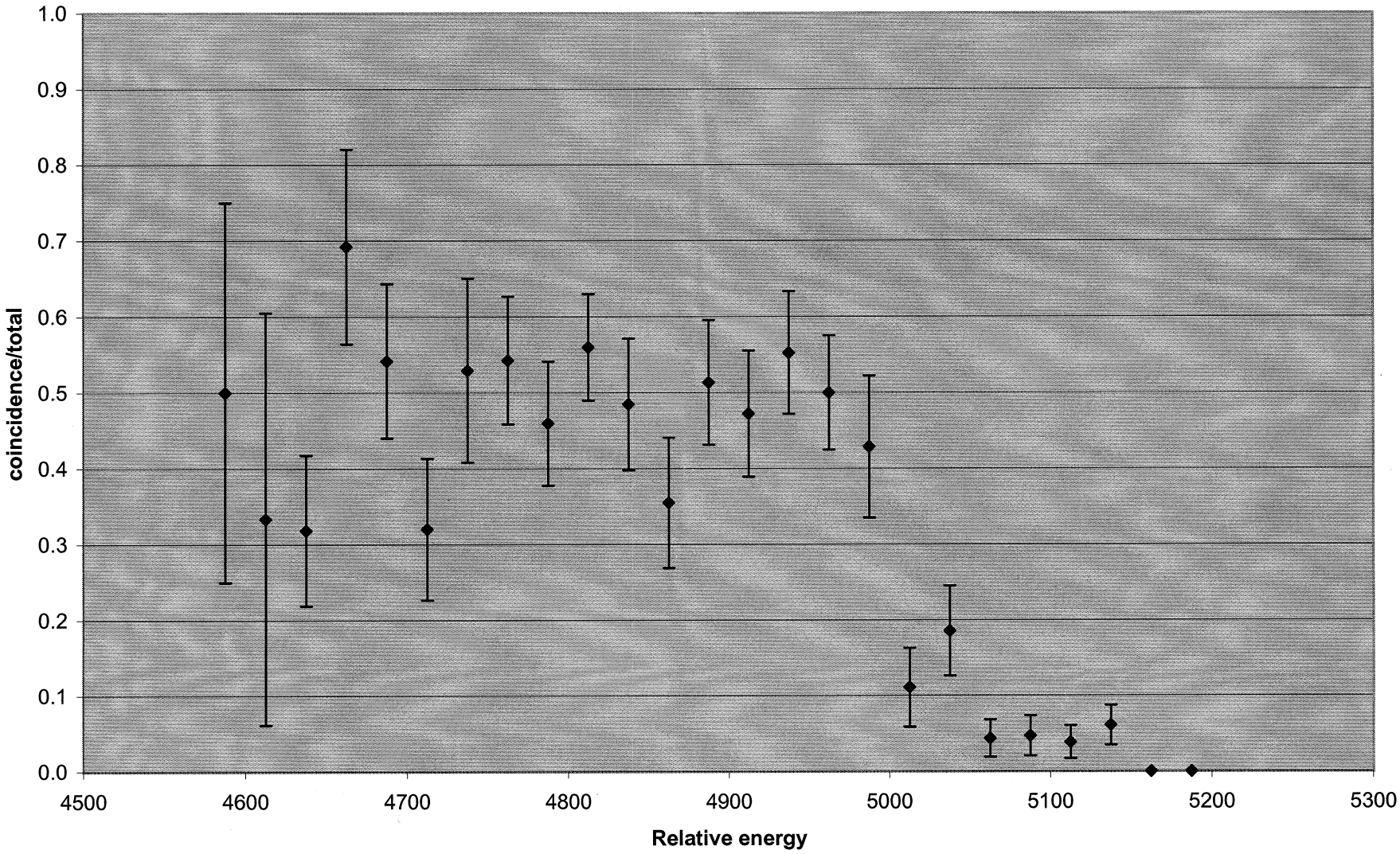
- **Charge state distribution**
  - **-In thesis, distribution was not specifically measured**
  - **-Distribution was changed from 35% to 49.5% for the 4+ state**

- **A more accurate estimate of determining between leaky beam and recoils**


Run # 5232 Tue May 11 15:37:51 2004
HHESUM Max= 89.0
HESUM Sum= 1306.0
HHESUM_C Max= 28.0
HESUM Sum= 266.0


Run # 12199 Wed May 12 09:00:15 2004
HICSUM Max= 200.0
ICSUM Sum= 12659.0
HICSUM_C Max= 120.0
ICSUM Sum= 1466.0


Run3 #4955
coincidence/total
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4500
4600
4700
4800
4900
5000
5100
Relative energy


Run3 #5232
coincidence/total
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
4500
4600
4700
4800
4900
5000
5100
5200
5300
Relative energy

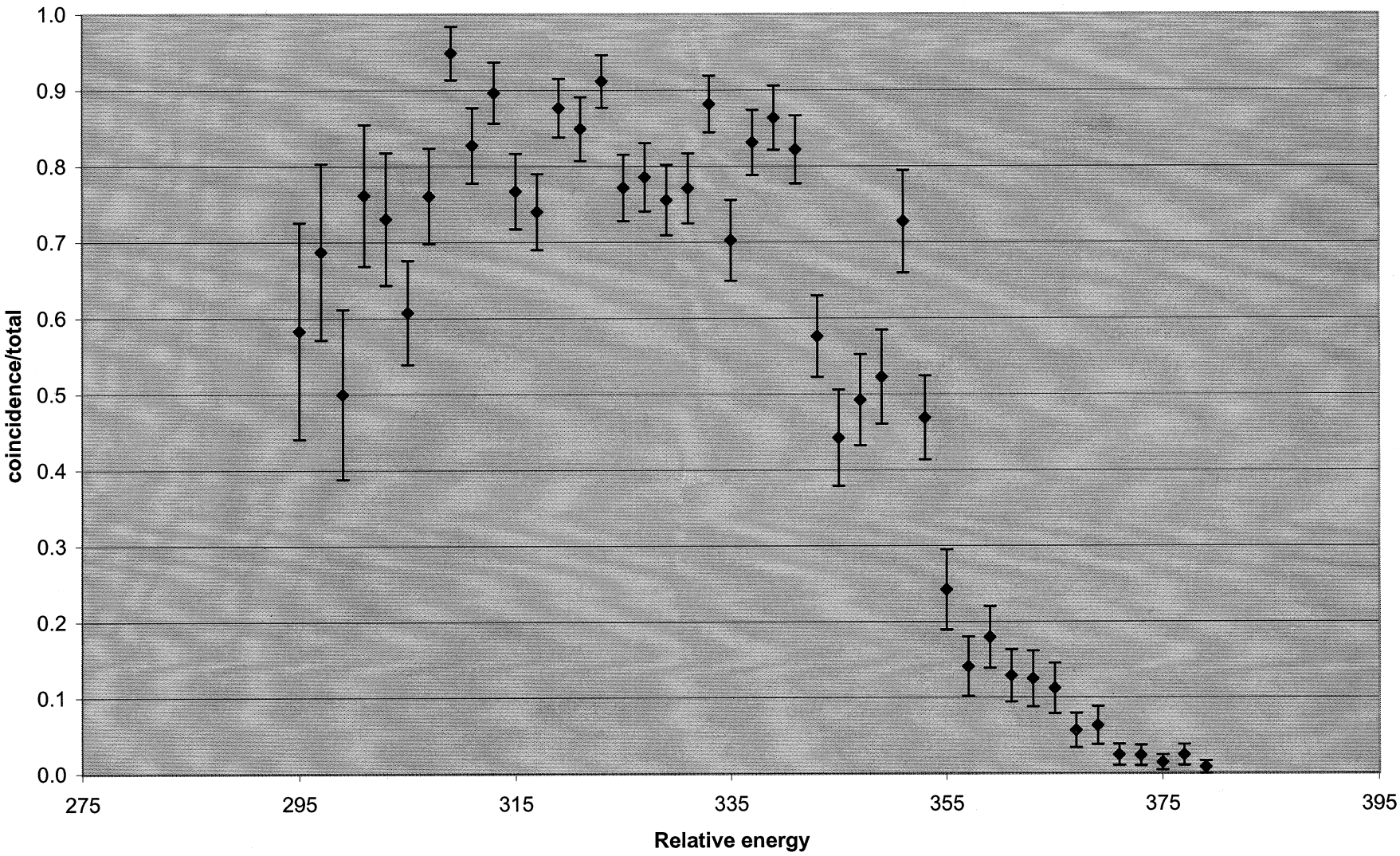

Run3 #12199
coincidence/total
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
275
295
315
335
355
375
395
Relative energy

Table - BGO efficiency and resonant strength as calculated from 3 different runs.

Run Number	relative Energy range	# of points n	mean (BGO efficiency)	Error on mean calc #1	coin/s 4+	recoils/s (total)	current (nA)	Yield	Strength meV	measured published
4955	4538-4838	13	0.49	0.01	0.49	2.07	2.88	5.76E-10	131.2	1.59
5232	4588-4988	17	0.48	0.02	0.40	1.70	2.75	4.94E-10	112.6	1.36
12199	295-349	28	0.794	0.06	1.00	2.60	5.00	4.16E-10	94.8	1.15

Error bars were calculated using error = +/- sqrt (epsilon (1 - epsilon) / number of singles)

calc #1 = sqrt (sum { [(xi - meanx)^2/error^2] / [(n-1) sum (1/error^2)] }

numbers used for resonance strength:

deBroglie wavelength ^{2} = 33 * 10^{-24} cm^2
Na detection efficiencey = 98%
4+ recoils fraction (calculated) = 49.5%
Epsilon = 8.27586 * 10^{-14} eV cm^2 / atom
charge of incoming beam = 5+
Yield = [total counts/s / (BGO efficiency * Na efficiency * 4+ recoils)] / [current / (charge of beam * 1.602 * 10^{-19})]

Strength = Yield * 2 * Epsilon * (M/(M+m)) / wavelength^2
where M = 1 , m = 21

Sabine's thesis: Strength measured = 209 +/- 35 meV
Strength published = 82.5 +/- 12.5 meV

$$\varepsilon = \left(15 \frac{keV}{u}\right)(21\ u)\left(\frac{cm^2}{3.78\times10^{18}\ atoms}\right)$$