The Use of a ^{14}C beam in Conjunction with both ^{14}C and ^{10}Be Targets to study Neutron-rich s-d Shell Nuclei

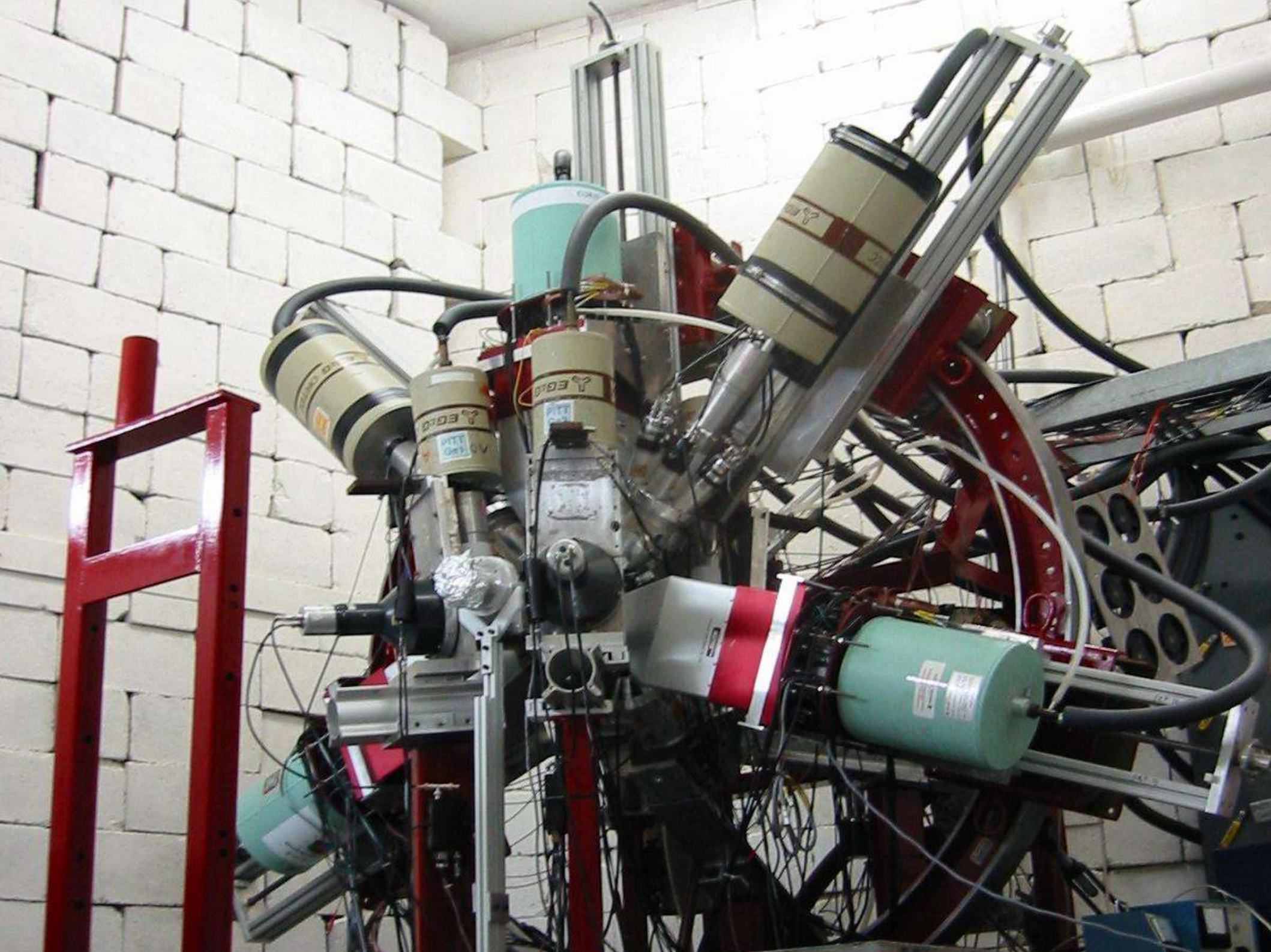
John Pavan
Florida State University

Outline

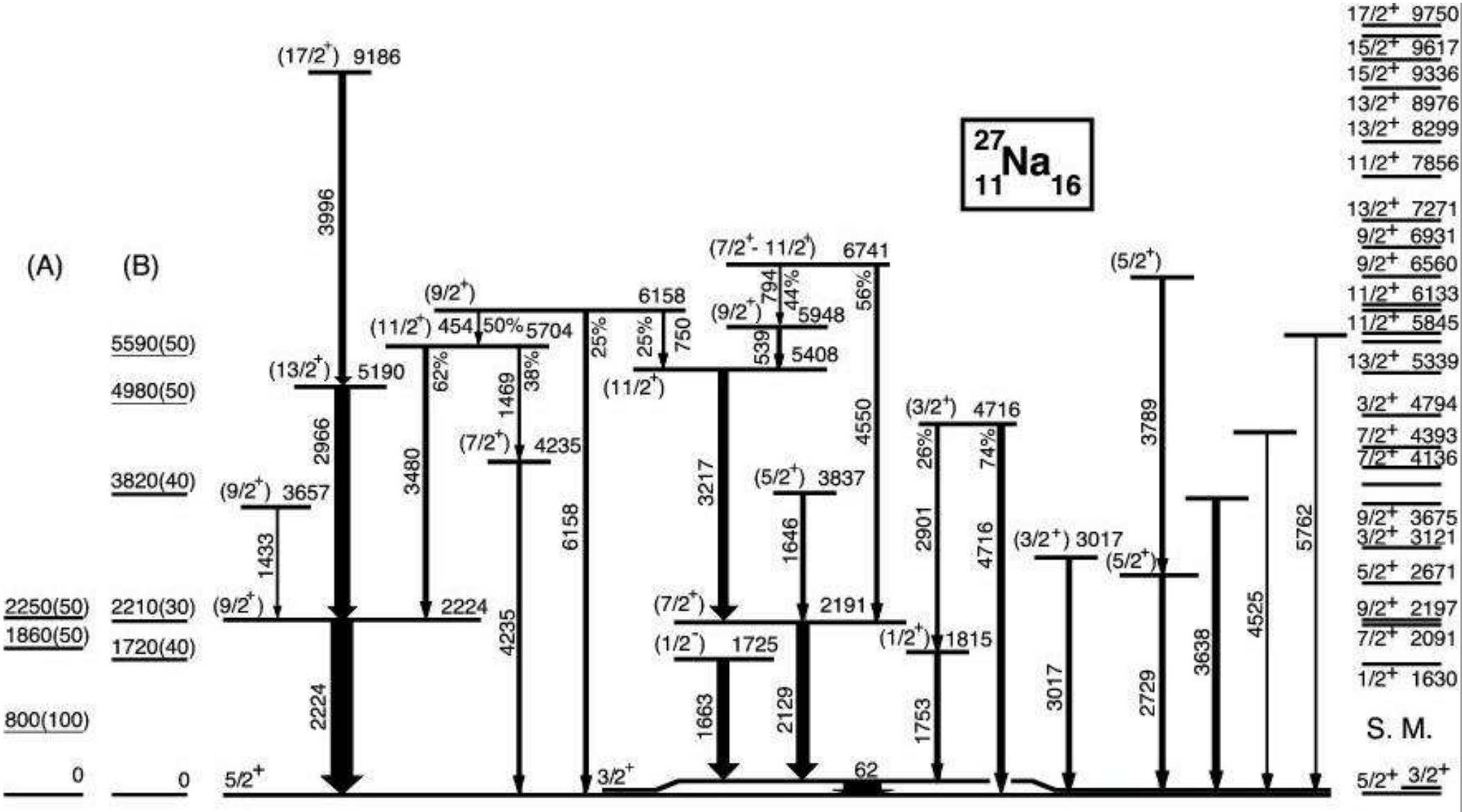
- Motivation
- Experimental overview
- Published and in Press
  - ^{27}Na by Cooper et al.
  - ^{24}Ne by Hoffman et al.
- Present Work
  - ^{22}F by Pavan (me)
  - ^{26}Na by Calderin

Motivation

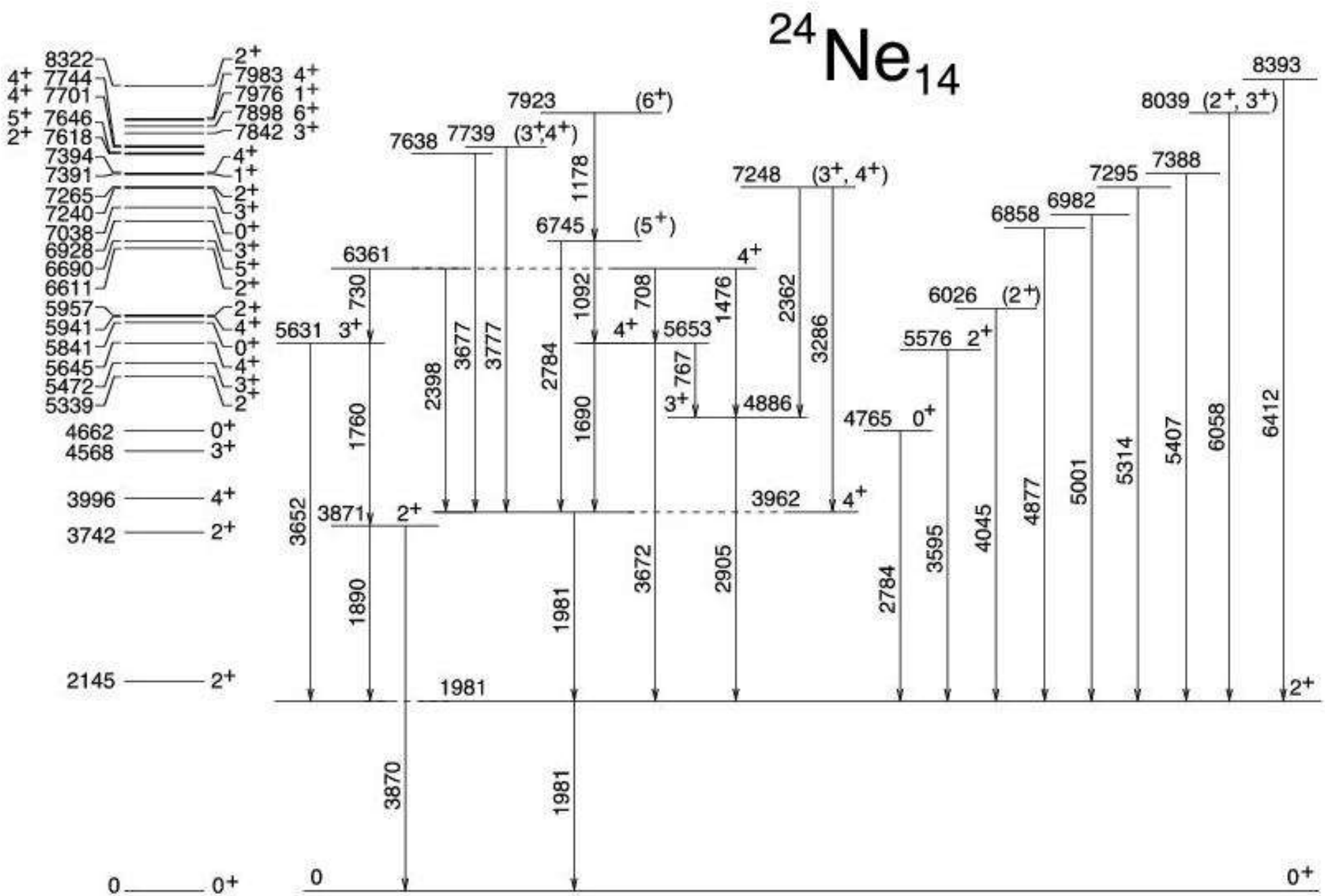
- Understanding excited states provides information about lower lying states further from stability.
- Tests of the Shell Model
  - Low lying intruder states in some of these nuclei
  - How well does the s-d Shell Model predict the higher energy states?



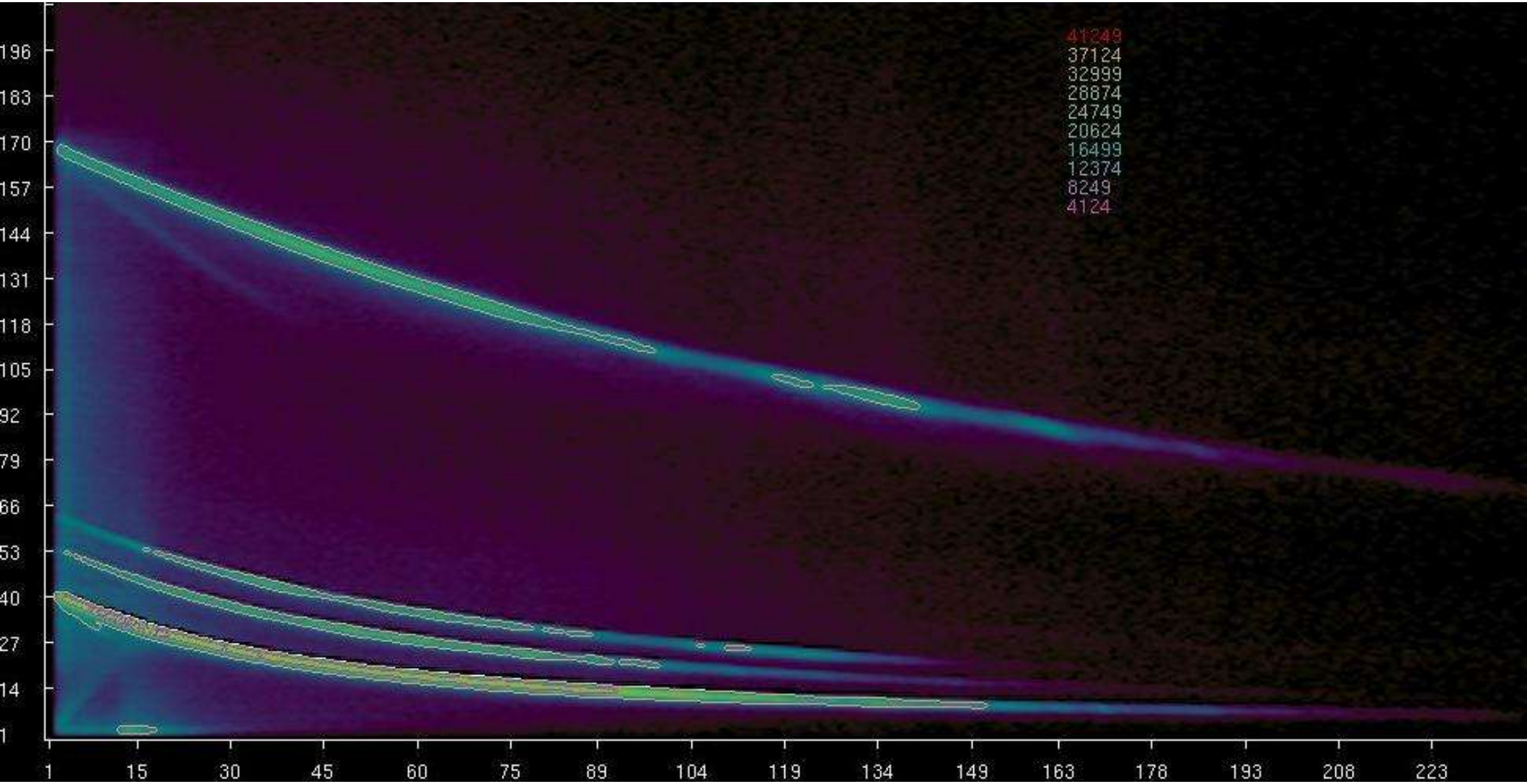
Cooper et al


(A)
(B)
$^{27}_{11}Na_{16}$
(17/2+) 9186
3996
(13/2+) 5190
2966
(9/2+) 3657
1433
(9/2+)
2224
2224
5/2+
(9/2+)
(11/2+) 454
50%
5704
62%
38%
3480
1469
(7/2+) 4235
4235
25%
25%
6158
750
(11/2+)
6158
3/2+
(7/2+- 11/2+) 6741
794
44%
56%
(9/2+) 5948
539
5408
3217
(7/2+)
(5/2+) 3837
1646
2191
(1/2-) 1725
1663
2129
62
4550
(3/2+) 4716
26%
74%
2901
4716
(1/2+) 1815
1753
(3/2+) 3017
3017
(5/2+)
(5/2+)
3789
2729
3638
4525
5762
5590(50)
4980(50)
3820(40)
2250(50)
1860(50)
2210(30)
1720(40)
800(100)
0
0
17/2+ 9750
15/2+ 9617
15/2+ 9336
13/2+ 8976
13/2+ 8299
11/2+ 7856
13/2+ 7271
9/2+ 6931
9/2+ 6560
11/2+ 6133
11/2+ 5845
13/2+ 5339
3/2+ 4794
7/2+ 4393
7/2+ 4136
9/2+ 3675
3/2+ 3121
5/2+ 2671
9/2+ 2197
7/2+ 2091
1/2+ 1630
S. M.
5/2+ 3/2+

Hoffman et al.



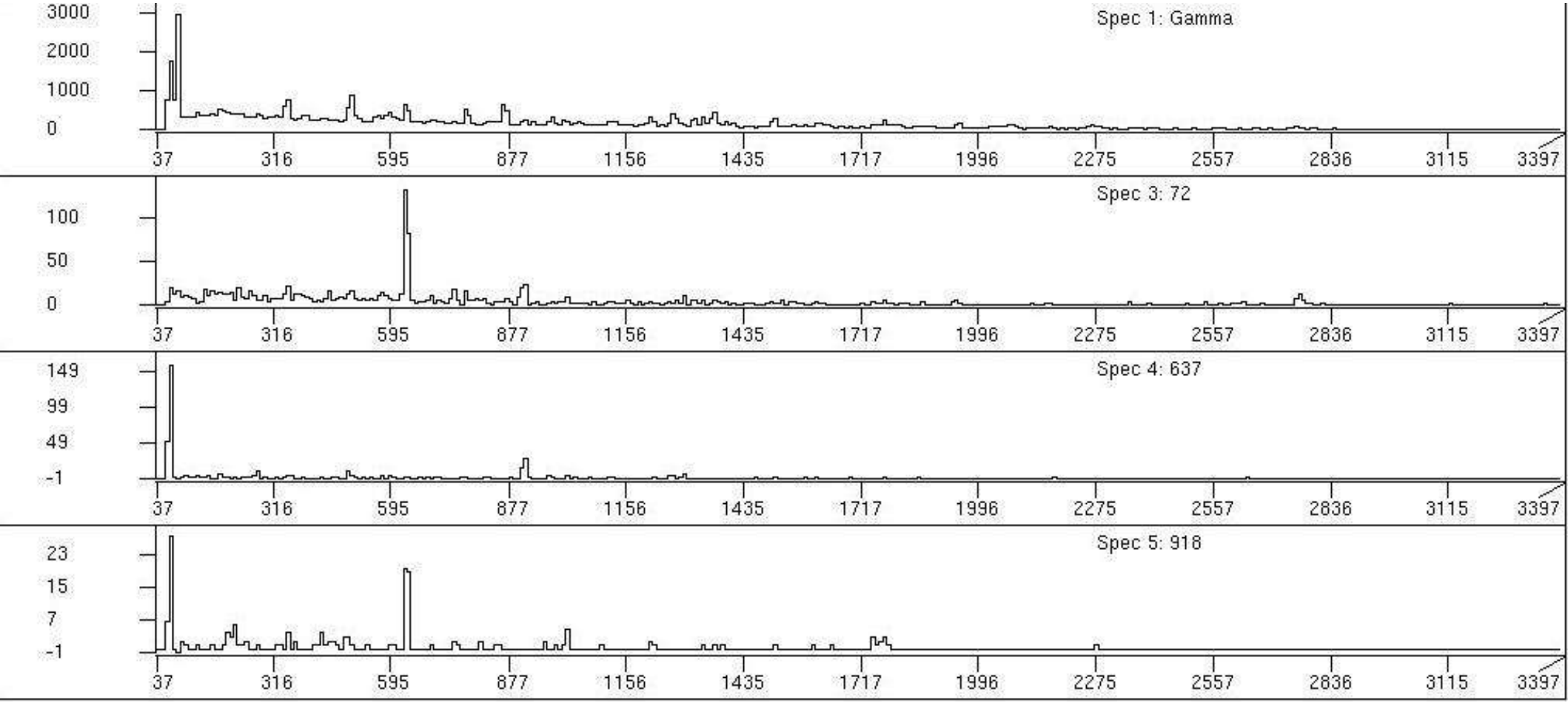
E vs E from $^{10}Be(^{14}C,p/d/t/\ )$



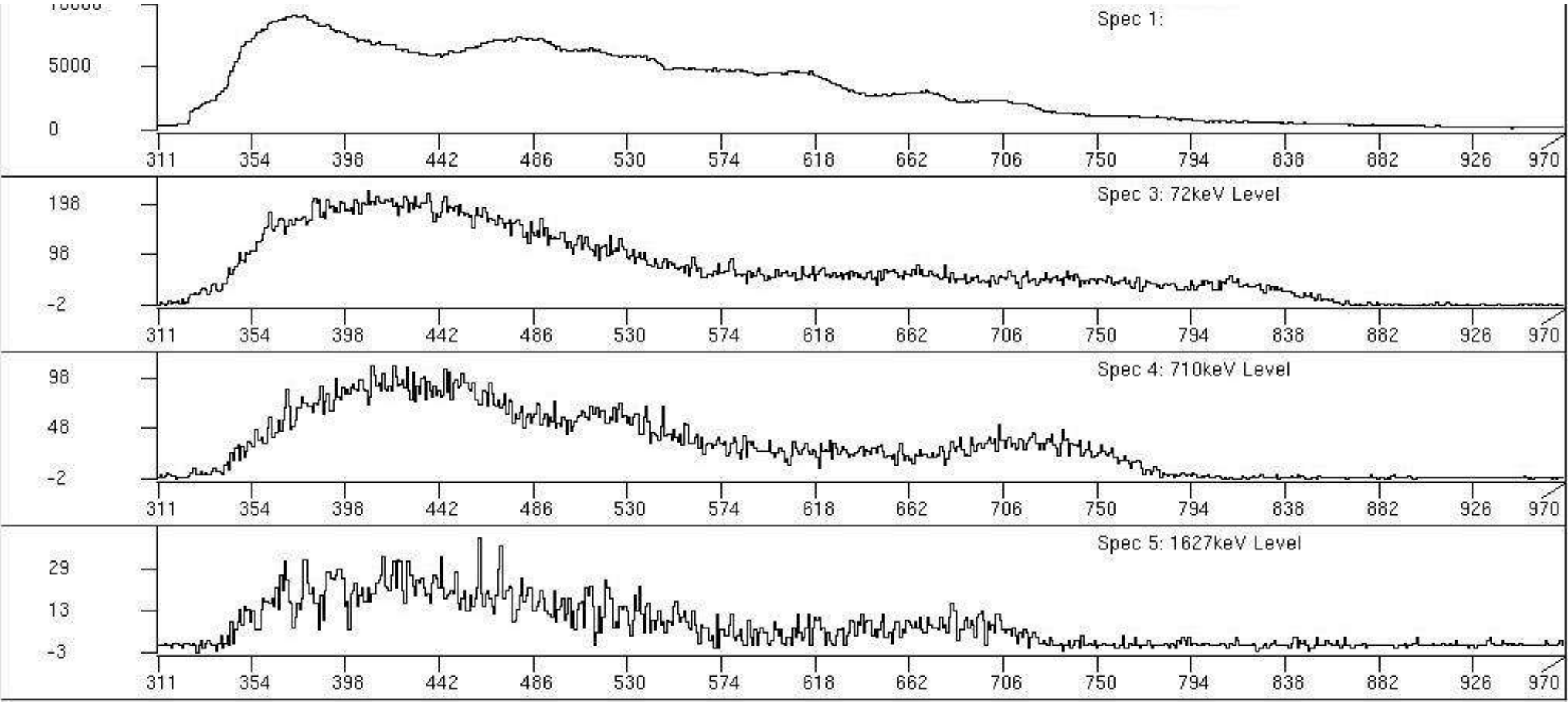
Prior ^{22}F

- $^{22}Ne(t,^{3}He)^{22}F$ reaction in 1988 by Clarke et al.
- $^{22}O\ ^{-}$ decay to ^{22}F in 1989 by Hubert et al.

Gamma Spectra

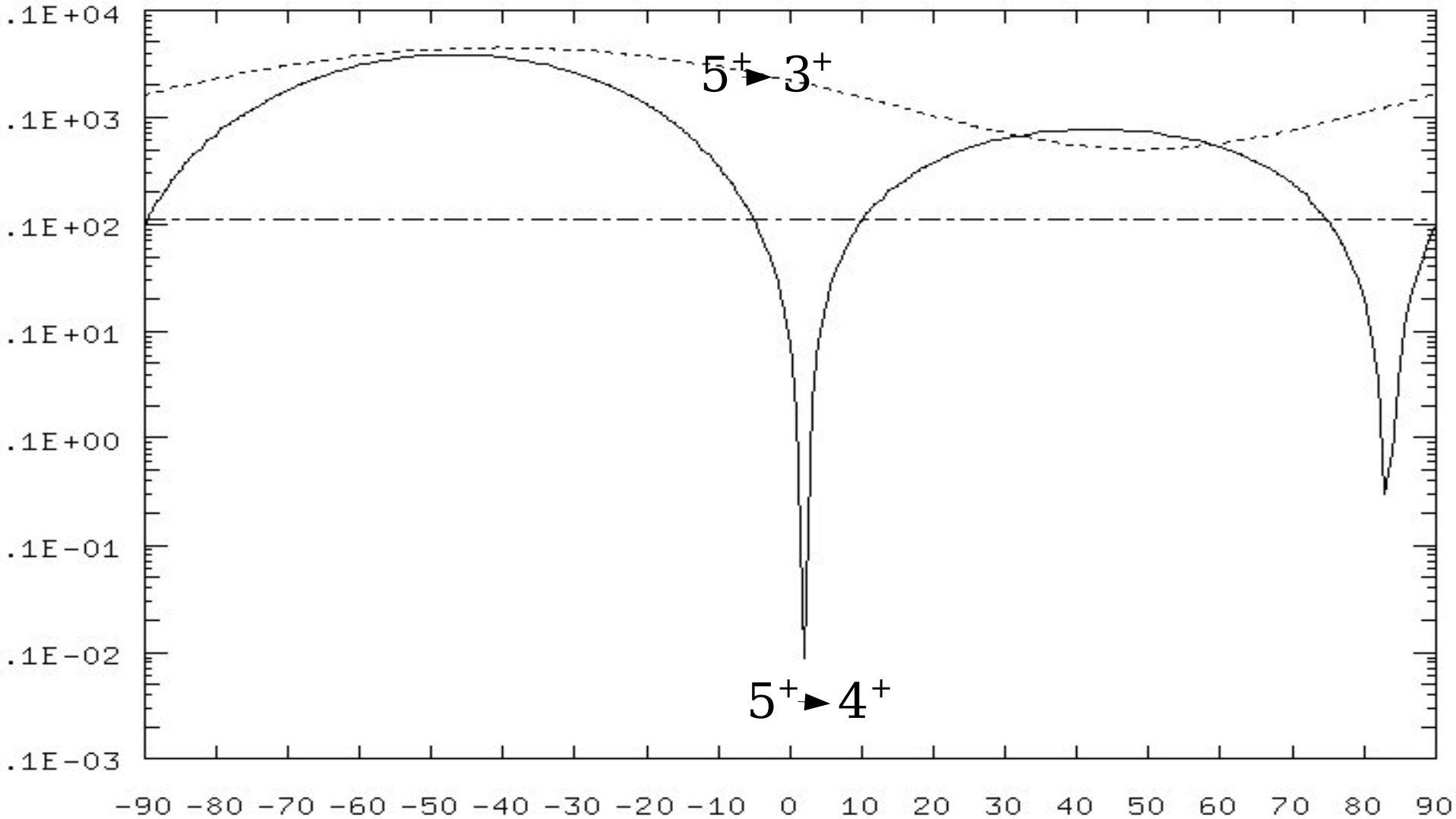


Deuteron Spectra

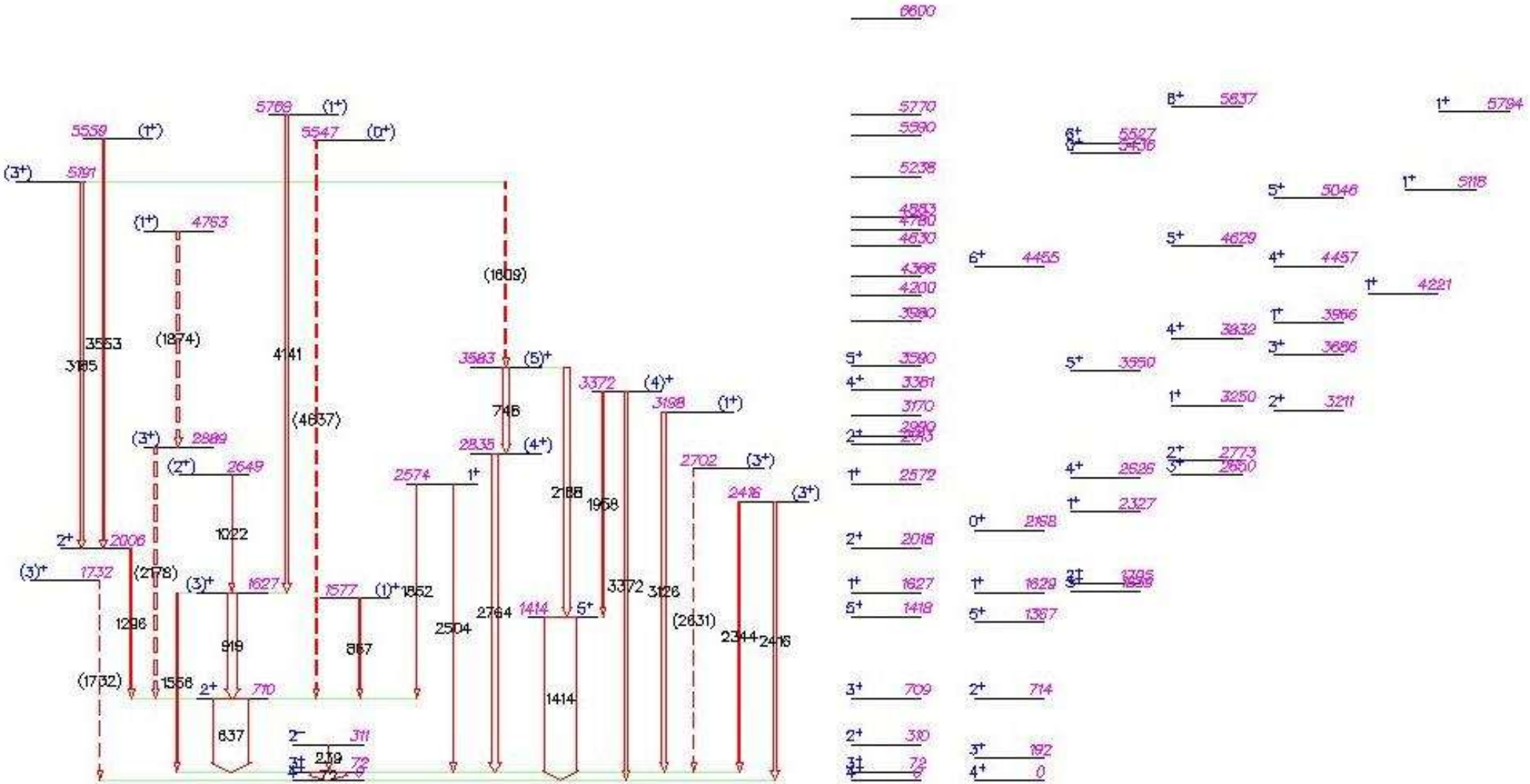


Angular Correlations

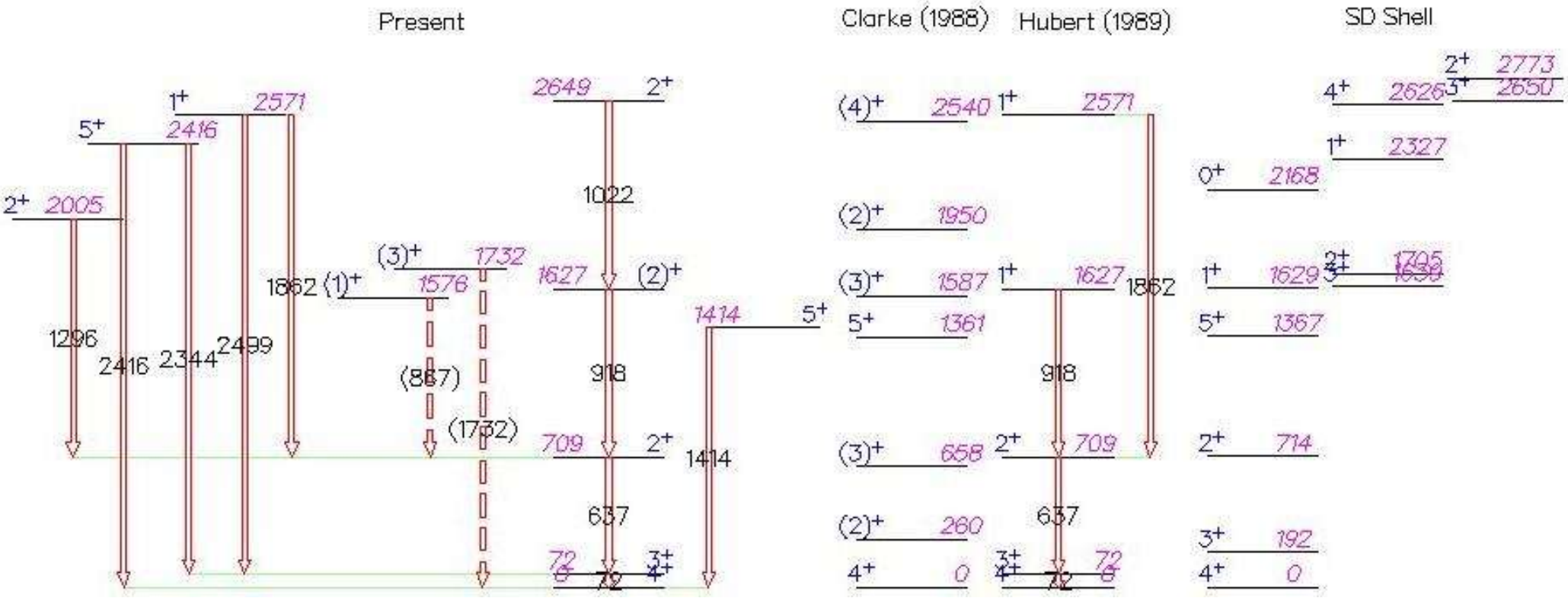
1414 keV ray

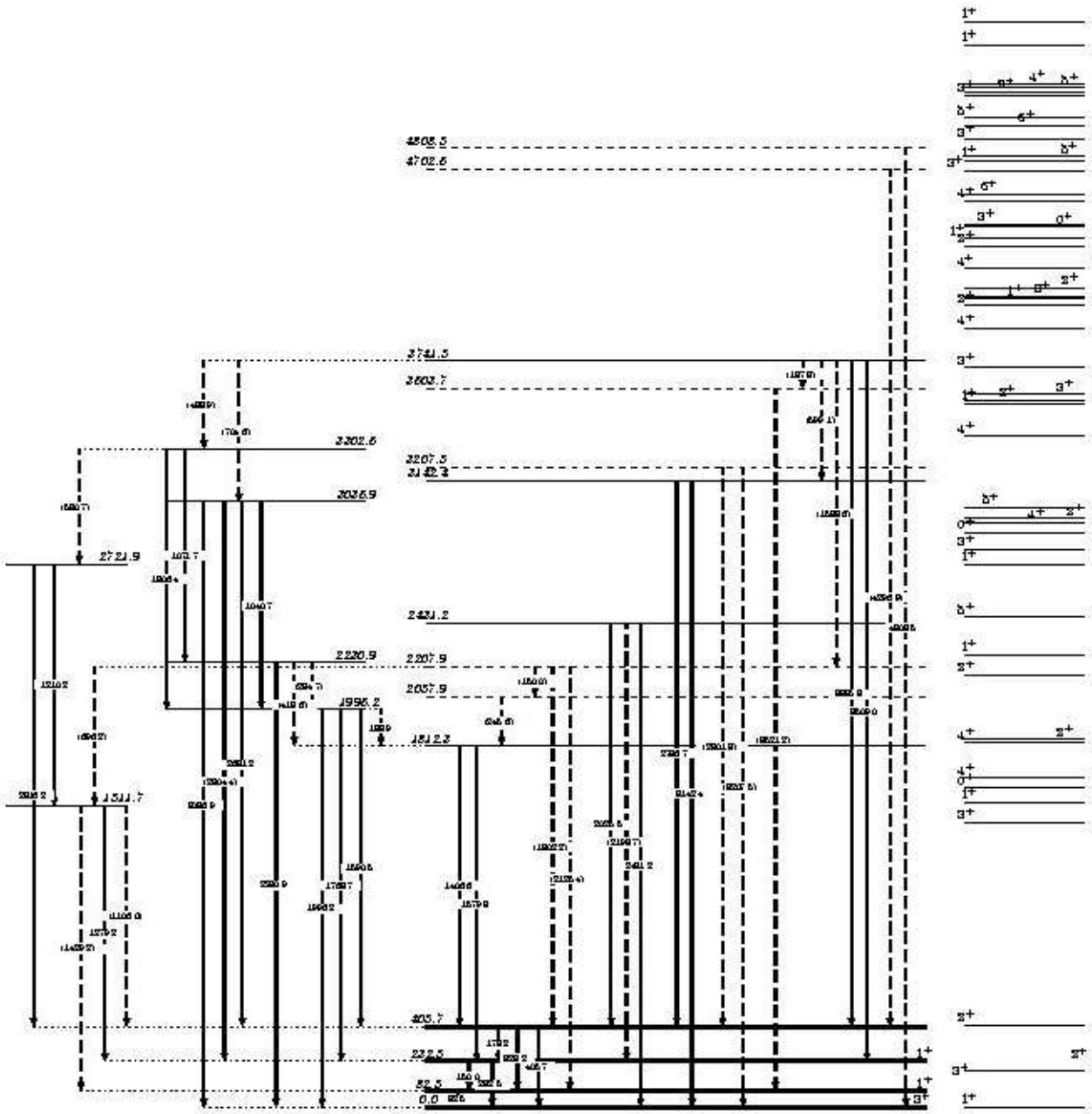


^{22}F Level Scheme



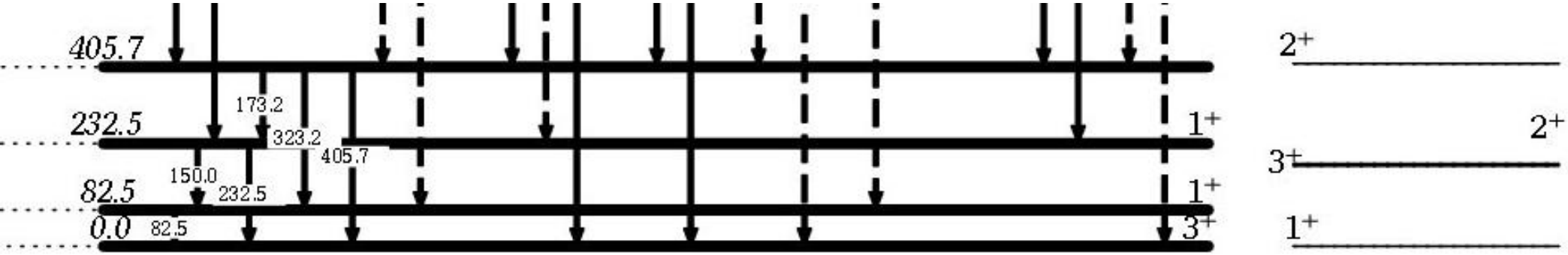
Low-lying States from ^{22}F





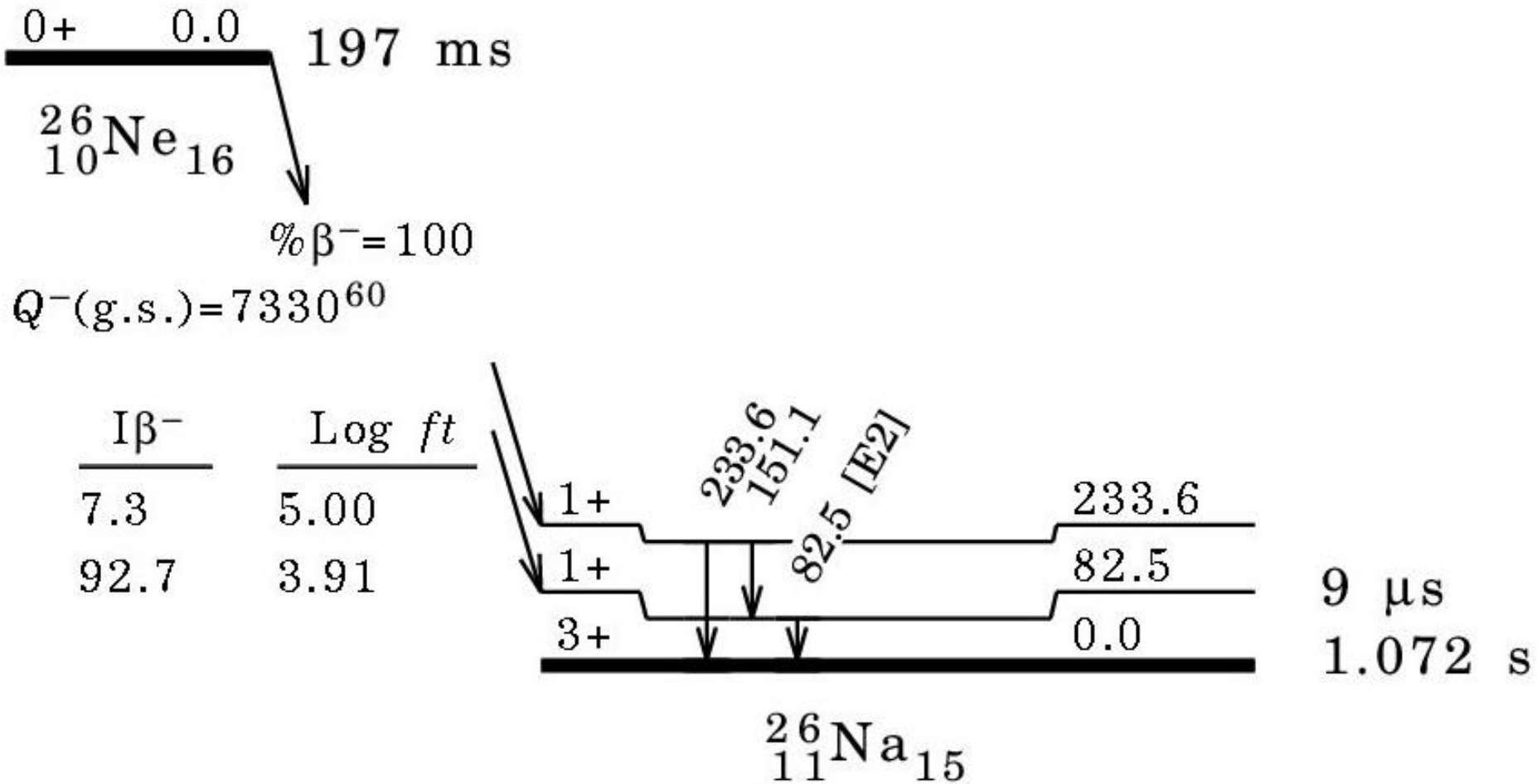
^{26}Na's Tentative Level Scheme

Low Lying States in ^{26}Na



^{26}Ne β⁻ Decay 1987DuZU,1990En08

Decay Scheme



Octopole Tetrahedral Symmetry

- Mathis Wiedeking is looking for Octopole Tetrahedral Symmetry in ^{100}Zr, ^{101}Zr, ^{102}Zr, ^{103}Zr, ^{104}Zr
- b- decay studies from ^{100}Y through ^{104}Y
- fluoridations process can be used to separate Yttrium from other fragments

Summary

- FSU ^{14}C on ^{14}C and ^{10}Be experiments
- Decay experiments would provide further insights and resolve some problems
- Search for Possible Tetrahedral Octopole symmetry in $^{100\text{-}104}Zr$