

Detailed Spectroscopy of ^{132}Sn with GRIFFIN

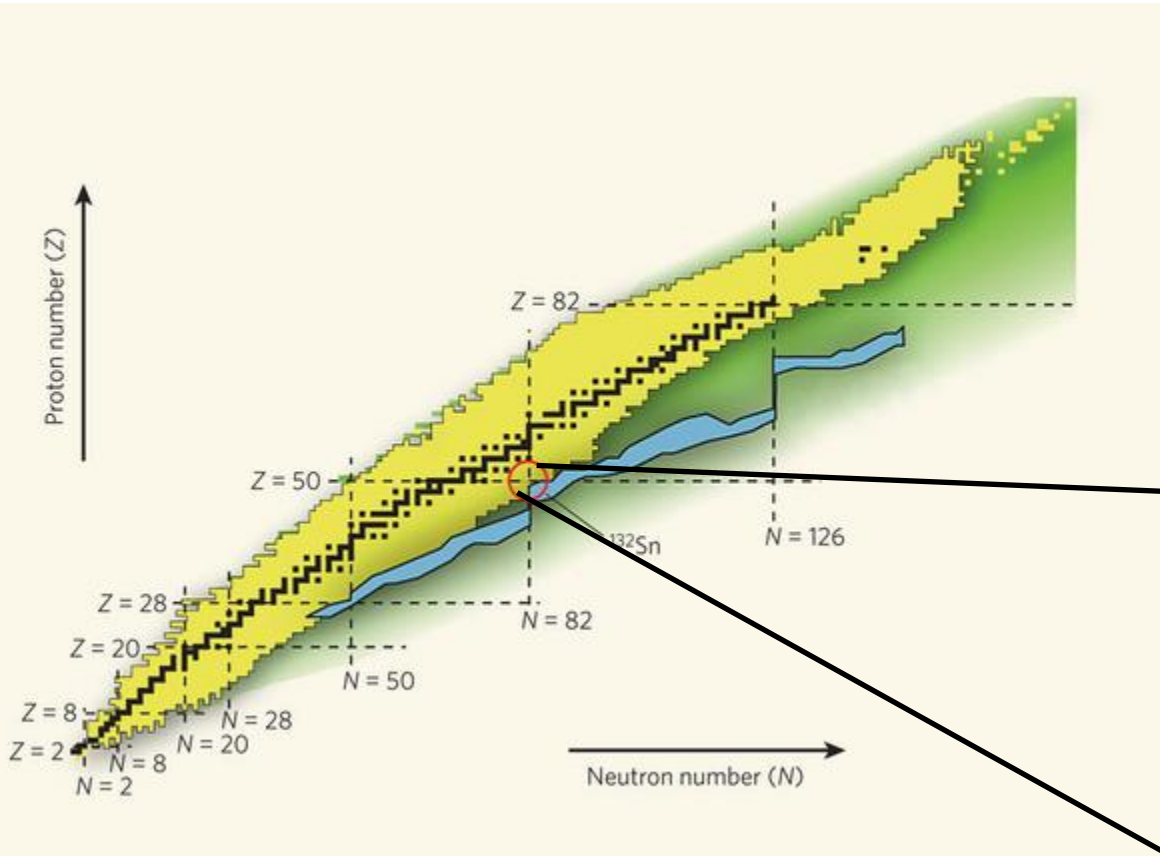
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Introduction

- ^{132}Sn is doubly magic
- Lies along r-process path

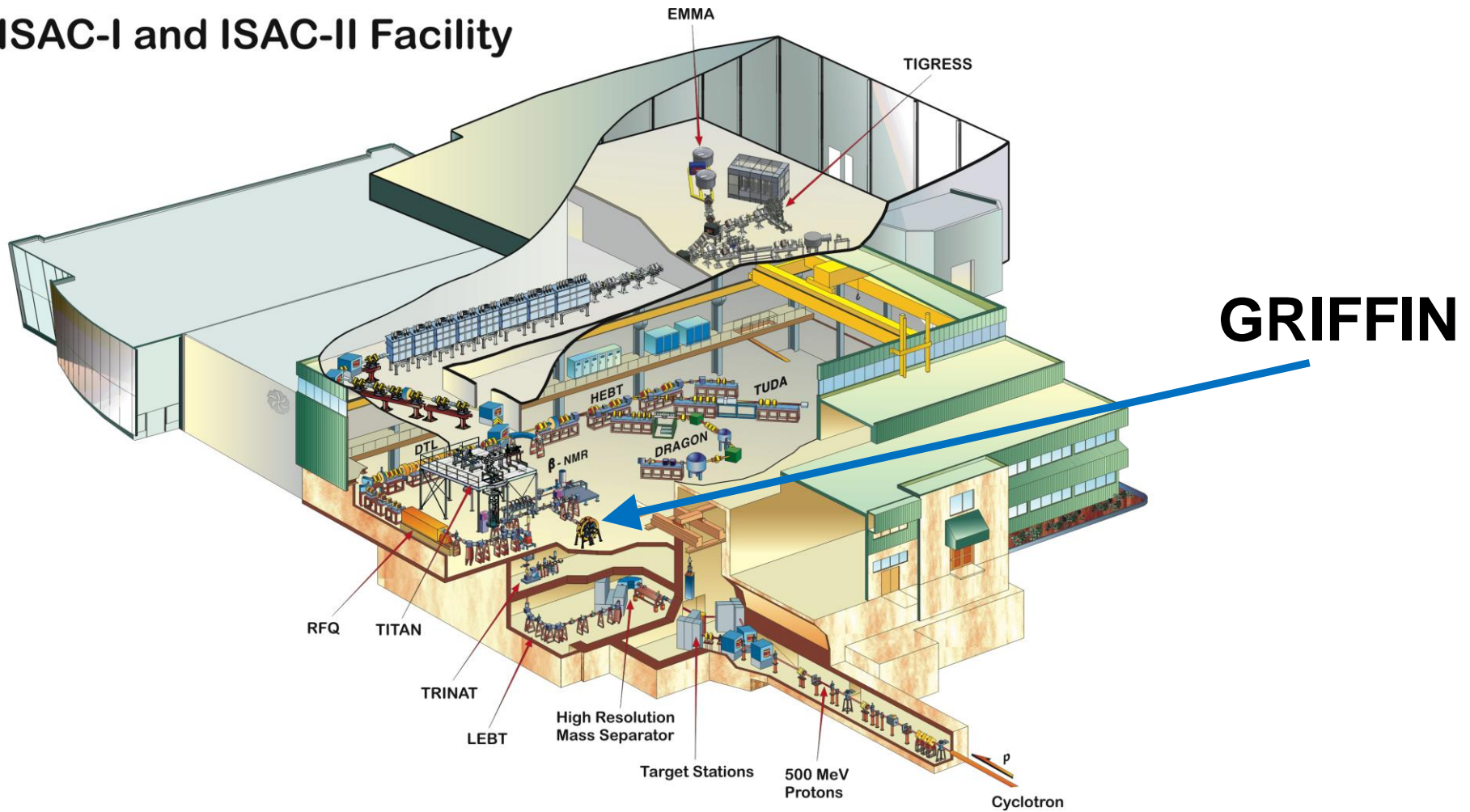


^{130}Te	^{131}Te	^{132}Te	^{133}Te	^{134}Te	^{135}Te	^{136}Te	^{137}Te
^{129}Sb	^{130}Sb	^{131}Sb	^{132}Sb	^{133}Sb	^{134}Sb	^{135}Sb	^{136}Sb
^{128}Sn	^{129}Sn	^{130}Sn	^{131}Sn	^{132}Sn	^{133}Sn	^{134}Sn	^{135}Sn
^{127}In	^{128}In	^{129}In	^{130}In	^{131}In	^{132}In	^{133}In	^{134}In

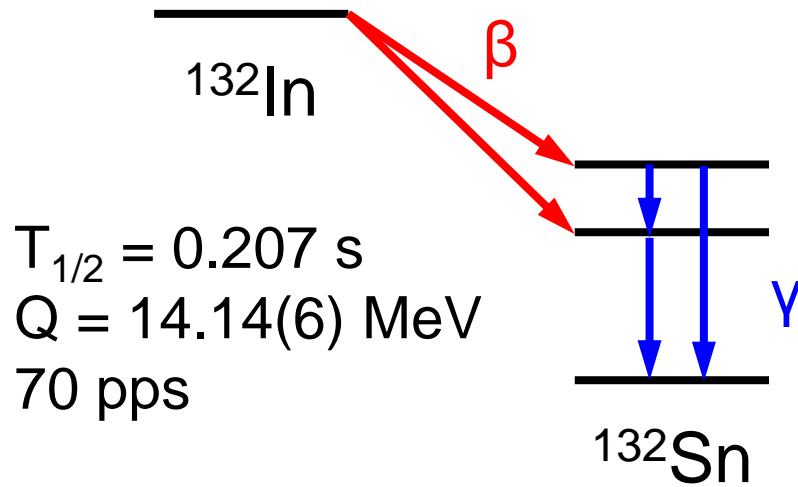
P. Cottle, Nature 465, 430 (2010)
www.nndc.bnl.gov

Experiment

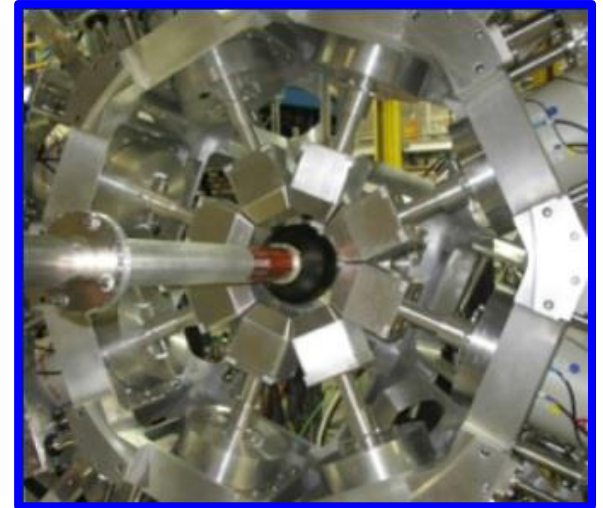
ISAC-I and ISAC-II Facility



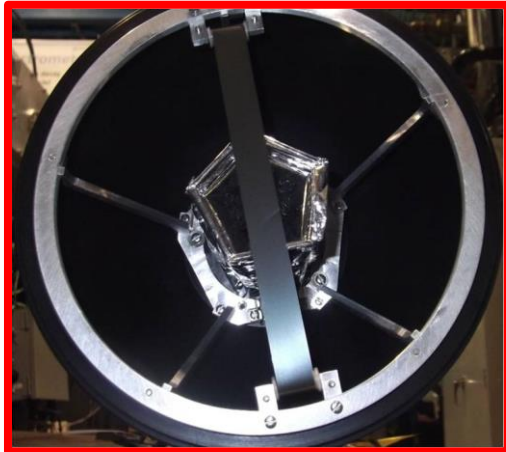
Experiment



$T_{1/2} = 0.207 \text{ s}$
 $Q = 14.14(6) \text{ MeV}$
70 pps



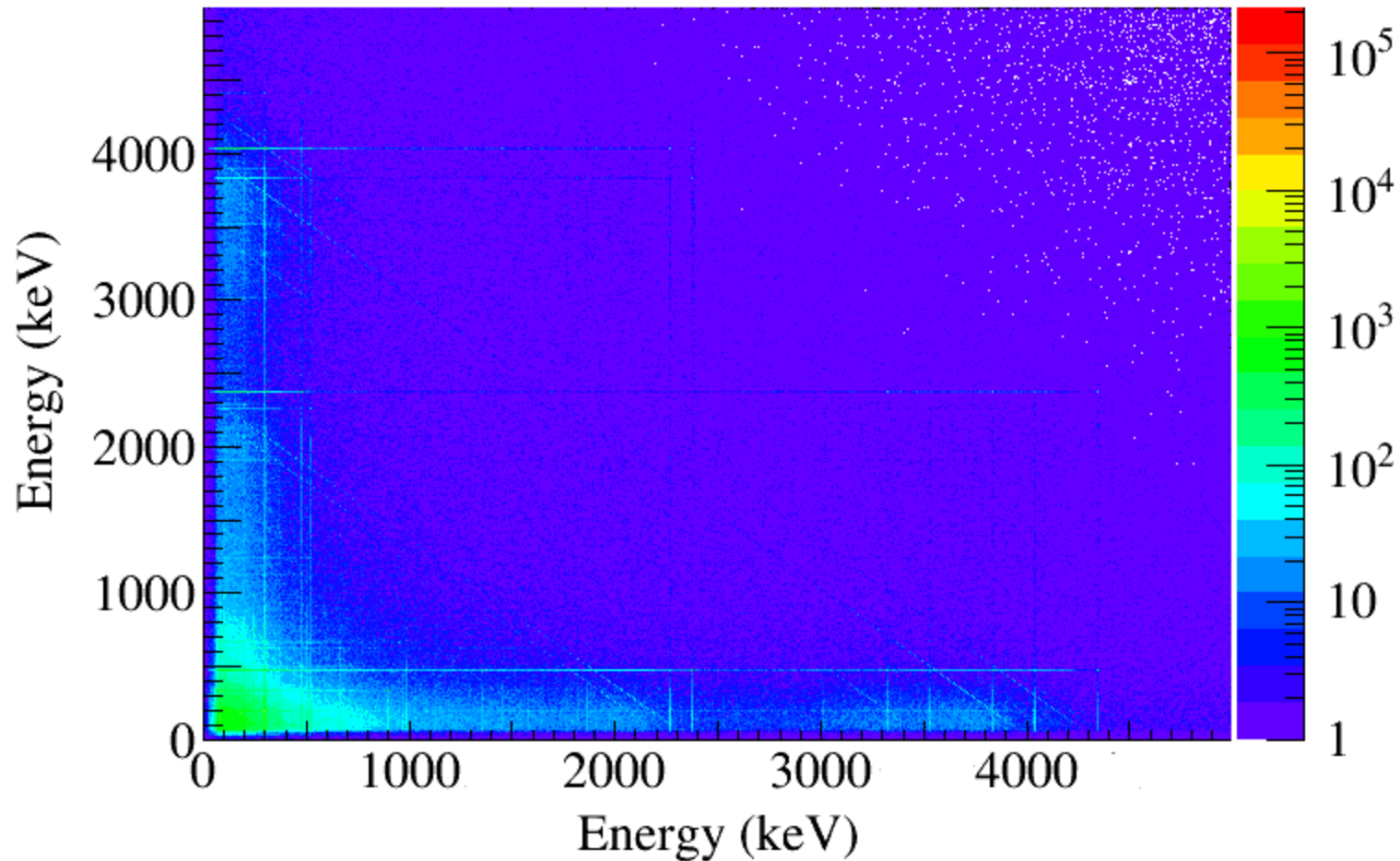
GRIFIN



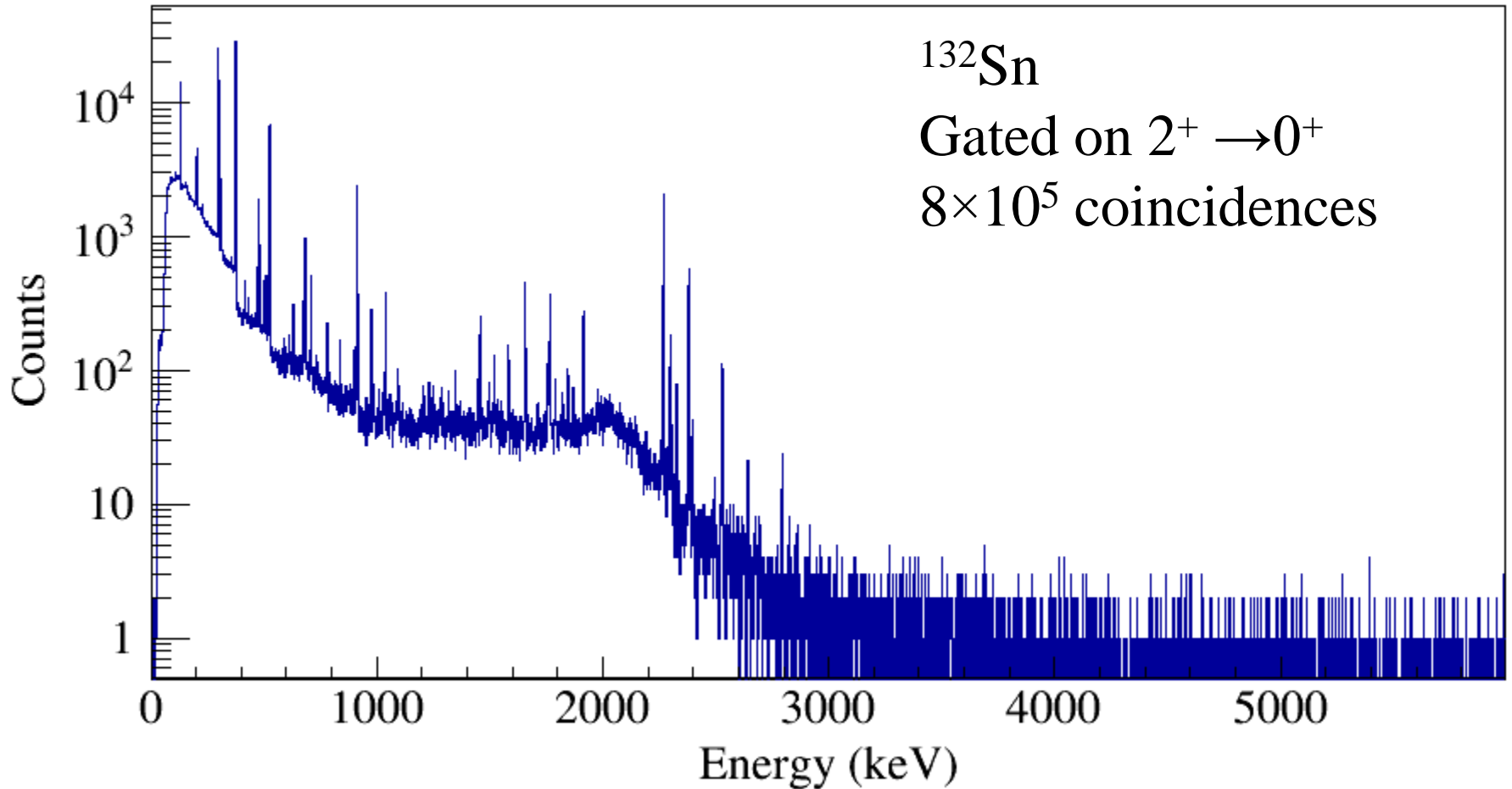
SCEPTAR

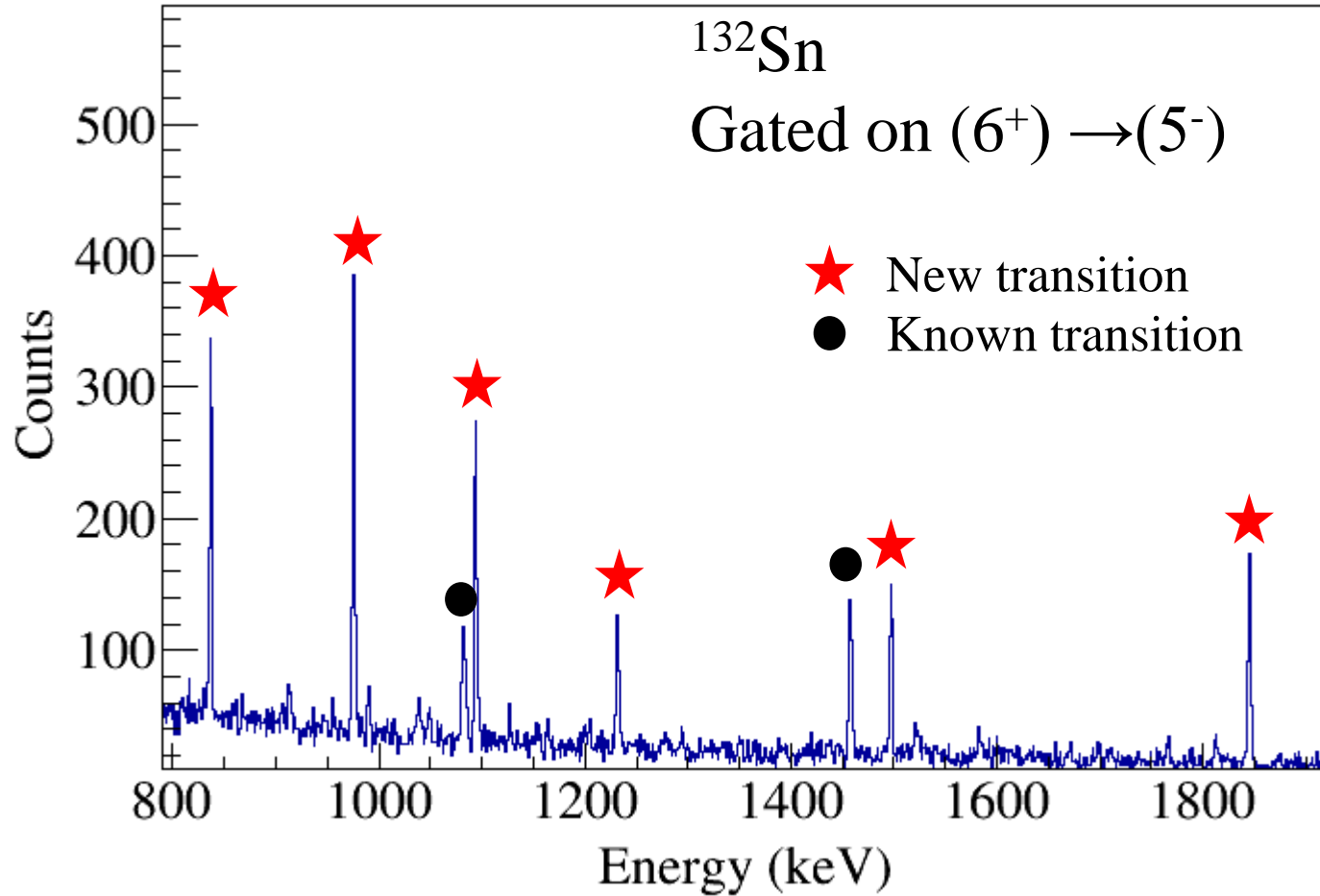
Coincidence Spectrum

10^8 β - γ - γ coincidences



Coincidence Spectrum



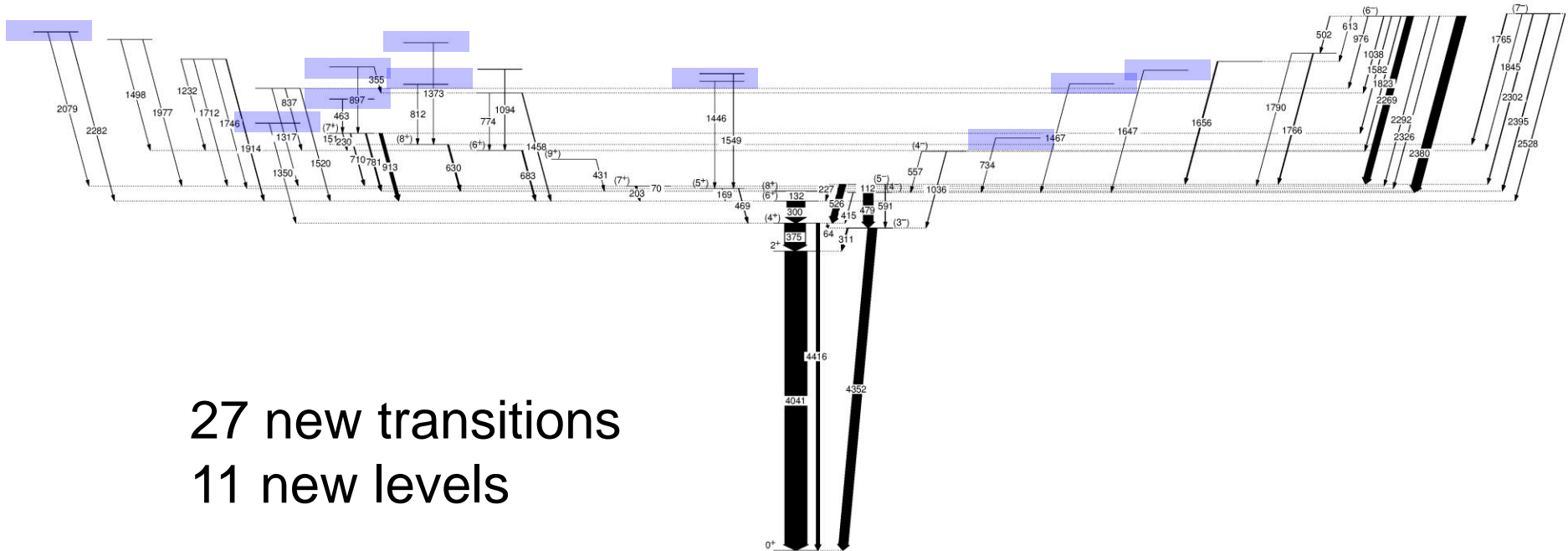


Energy (keV)	Intensity (I _γ)
837	0.44
975	2.6
1094	0.49
1232	0.26
1498	0.27
1845	0.51

New Levels

Energy (keV)	Feeding (%)	logft
5565	0.16(2)	>7.5
5766	0.16(3)	>7.4
6092	0.21(3)	>7.2
6291	0.32(4)	>7.0
6298	0.13(3)	>7.4
6331	0.04(1)	>7.9
6434	0.08(1)	>7.6
6478	0.19(4)	>7.2
6493	0.34(4)	>6.9
6527	0.38(4)	>6.9
6852	0.10(2)	>7.3
6998	0.52(4)	>7.3

Level Scheme

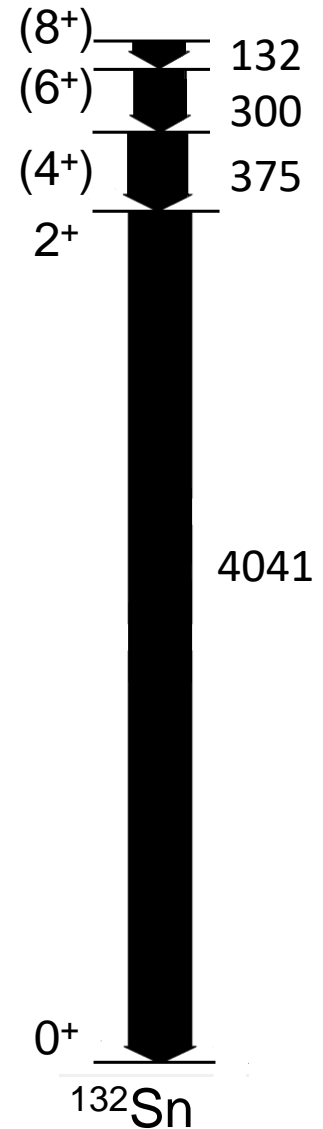


27 new transitions
11 new levels

6⁺, 8⁺ Levels

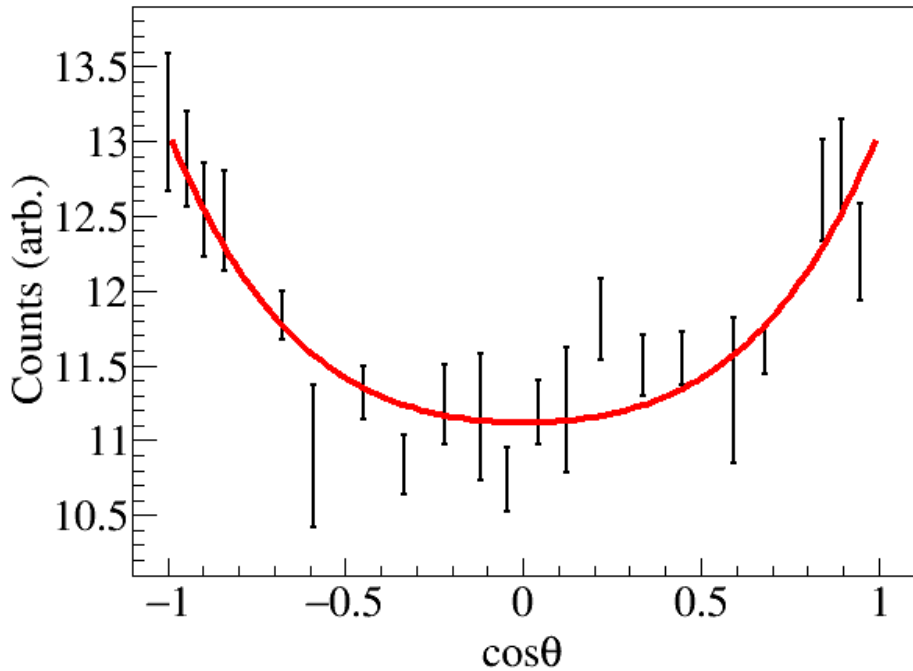
- Discrepancy in feeding
- 2 μ s isomer

Energy (keV)	J π	Feeding (%)	
		Current	NNDC
0	0 ⁺	0	0
4041	2 ⁺	0	0
4416	(4 ⁺)	0	0
4716	(6 ⁺)	0	6
4849	(8 ⁺)	21(2)	14



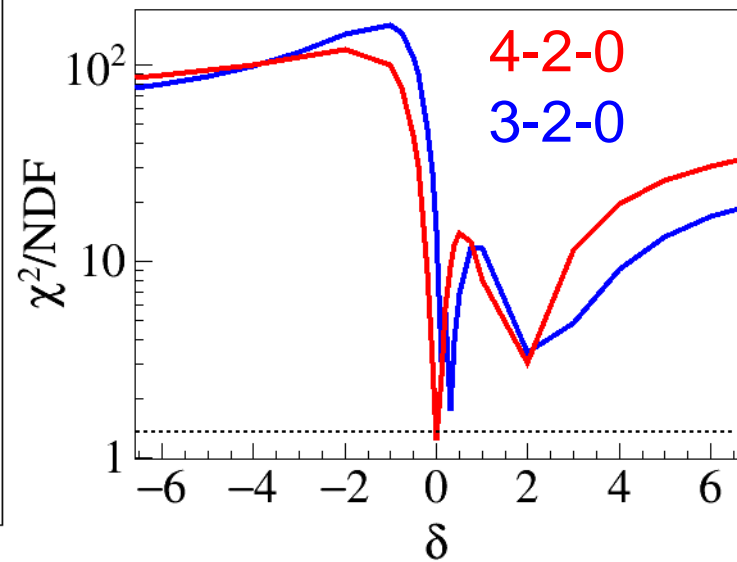
Angular Correlations

$$W(\theta) = 1 + a_2 P_2(\cos \theta) + a_4 P_4(\cos \theta)$$

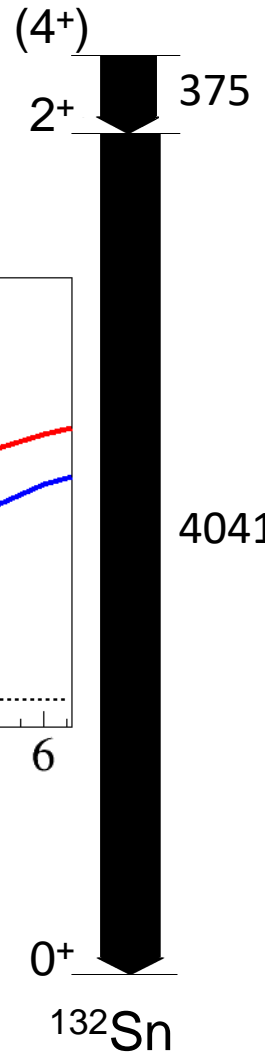


$$a_2 = 0.104(11)$$

$$a_4 = 0.020(14)$$

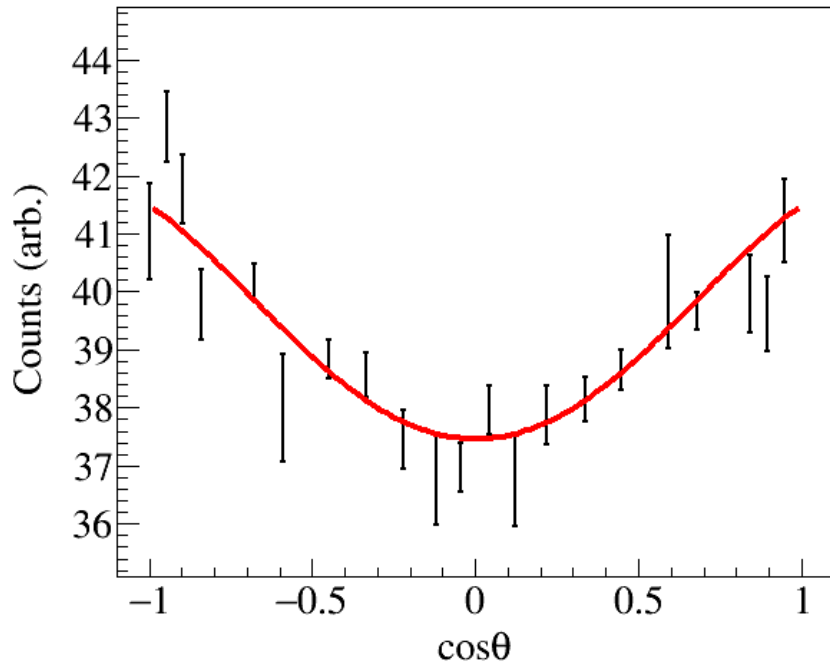


$$\delta(375 \text{ keV}) = 0.01(2)$$



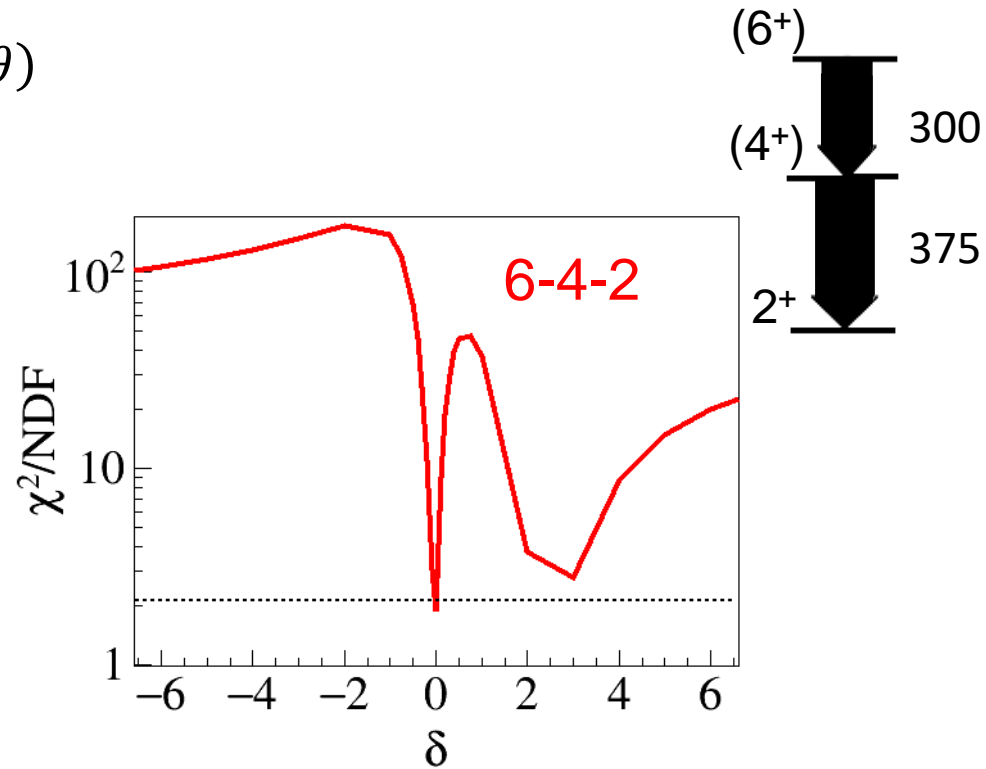
Angular Correlations

$$W(\theta) = 1 + a_2 P_2(\cos \theta) + a_4 P_4(\cos \theta)$$



$$a_2 = 0.074(6)$$

$$a_4 = -0.013(8)$$



$$\delta(375 \text{ keV}) = -0.05(3)$$

Summary

- Performed detailed spectroscopy of ^{132}Sn
- Identified 27 new transitions, 11 new levels
- Angular correlations ongoing
- More studies with ^{129}Sn , ^{133}Sn

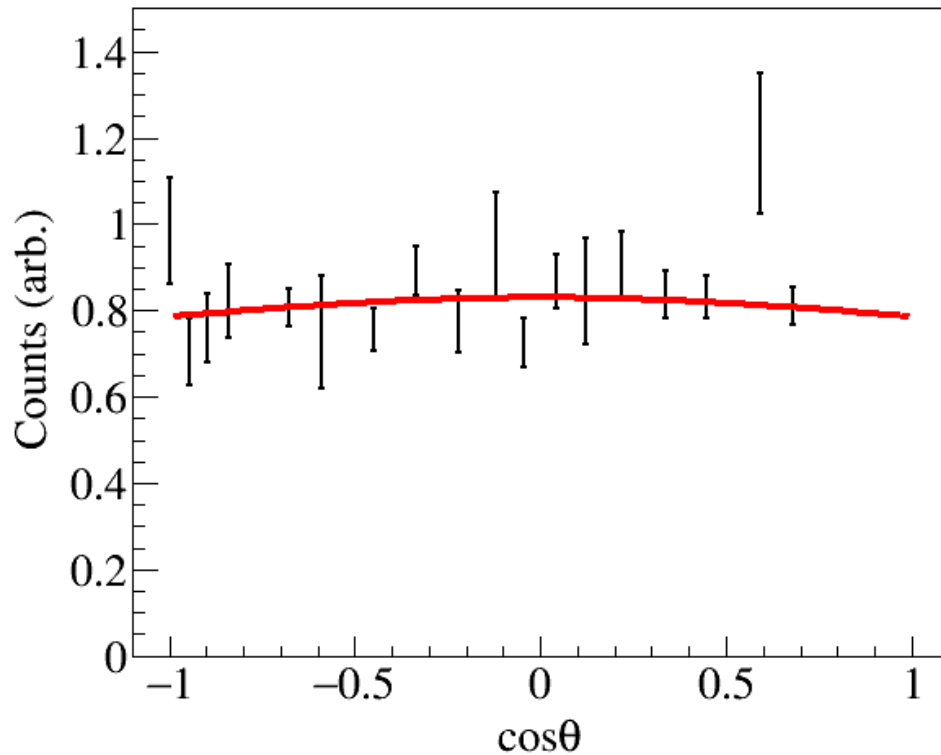
Acknowledgments

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- Reed College: J.K. Smith
- Waterloo: D. Southall
- Surrey: J. Measures



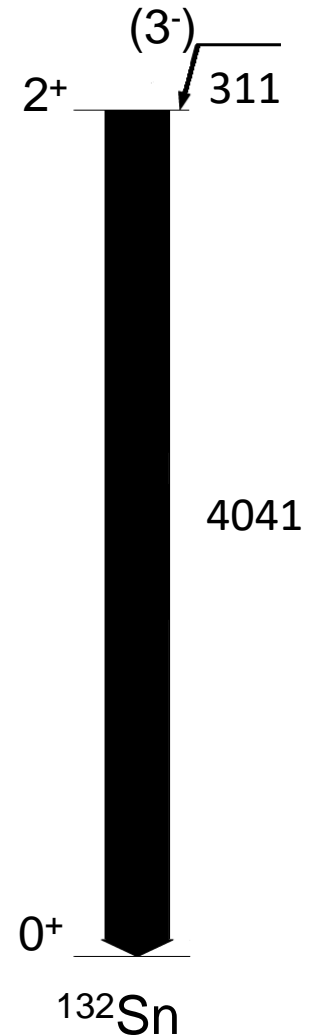
Backup

Angular Correlations



$$a_2 = -0.037(48)$$

$$a_4 = 0.003(57)$$



Beta Feeding

Energy (keV)	J^π	Feeding (%)		logft	
		Current	NNDC	Current	NNDC
0	0+	0	0		
4041	2+	0	0		
4352	(3-)	0	0		
4416	(4+)	0	0		
4716	(6+)	0	6		6.1
4831	(4-)	0	0		
4849	(8+)	21(2)	14	5.5(1)	5.7
4885	(5+)	0.4(1)	0.6	9.6(1)	9.4
4919	(7+)	2.7(6)	2.2	6.4(1)	6.5
4943	(5-)	0	>1		>6.5
5279	(9+)	0.28(3)		9.6(1)	
5388	(4-)	0	>0.1		>7.4
5399	(6+)	0.9(3)	2.3	6.8(2)	6.3
5479	(8+)	1.2(3)	2.8	6.6(1)	6.2
5565		0.16(2)		>7.5	
5629	(7+)	13(1)	12.4	5.52(4)	5.6
5766		0.16(3)		>7.4	
6092		0.21(3)		>7.2	

Energy (keV)	J^π	Feeding (%)		logft	
		Current	NNDC	Current	NNDC
6173	(5,6,7)	0.2(2)	>0.2	7.2(4)	>6.9
6236	(6,7,8+)	0.1(1)	0.35	7.5(4)	7
6291		0.32(4)		>7.0	
6298		0.13(3)		>7.4	
6331		0.04(1)		>7.9	
6434		0.08(1)		>7.6	
6478		0.19(4)		>7.2	
6493		0.34(4)		>6.9	
6527		0.38(4)		>6.9	
6598	(6,7-)	2.4(2)	2.4	6.0(1)	6
6630	(6,7,8+)	2.0(2)	1.3	6.1(1)	6.3
6709	(6,7-)	1.7(3)	1.9	6.2(1)	6.1
6852		0.10(2)		>7.3	
6896	(6,7,8)	0.50(4)	0.24	6.63(4)	7
6998		0.52(4)		>7.3	
7211	(6-)	51(3)	45	4.54(4)	4.6
7244	(7-)	6.2(4)	4.8	5.44(4)	4.8