

Mass Measurements of Neutron-Deficient Ytterbium

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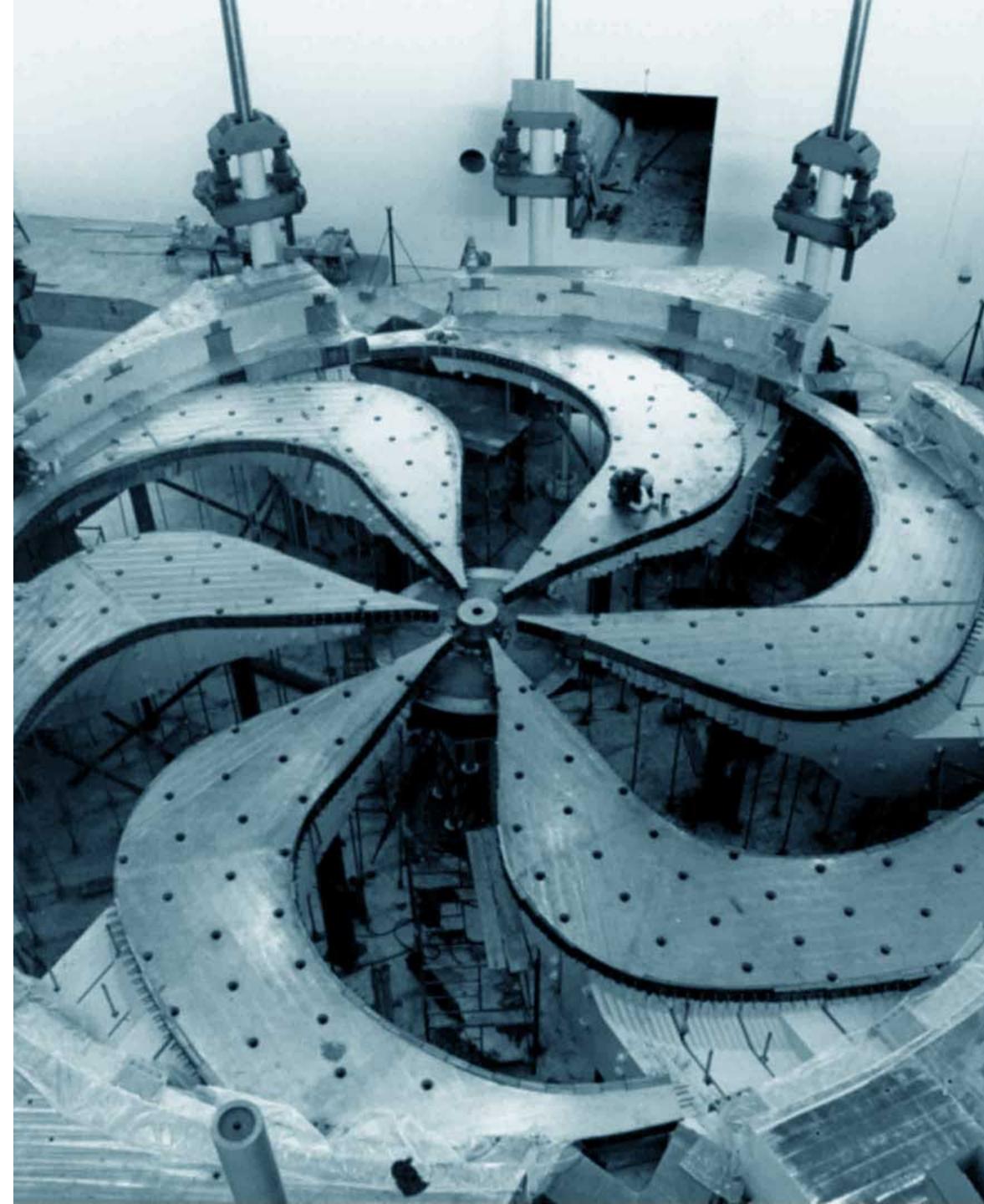


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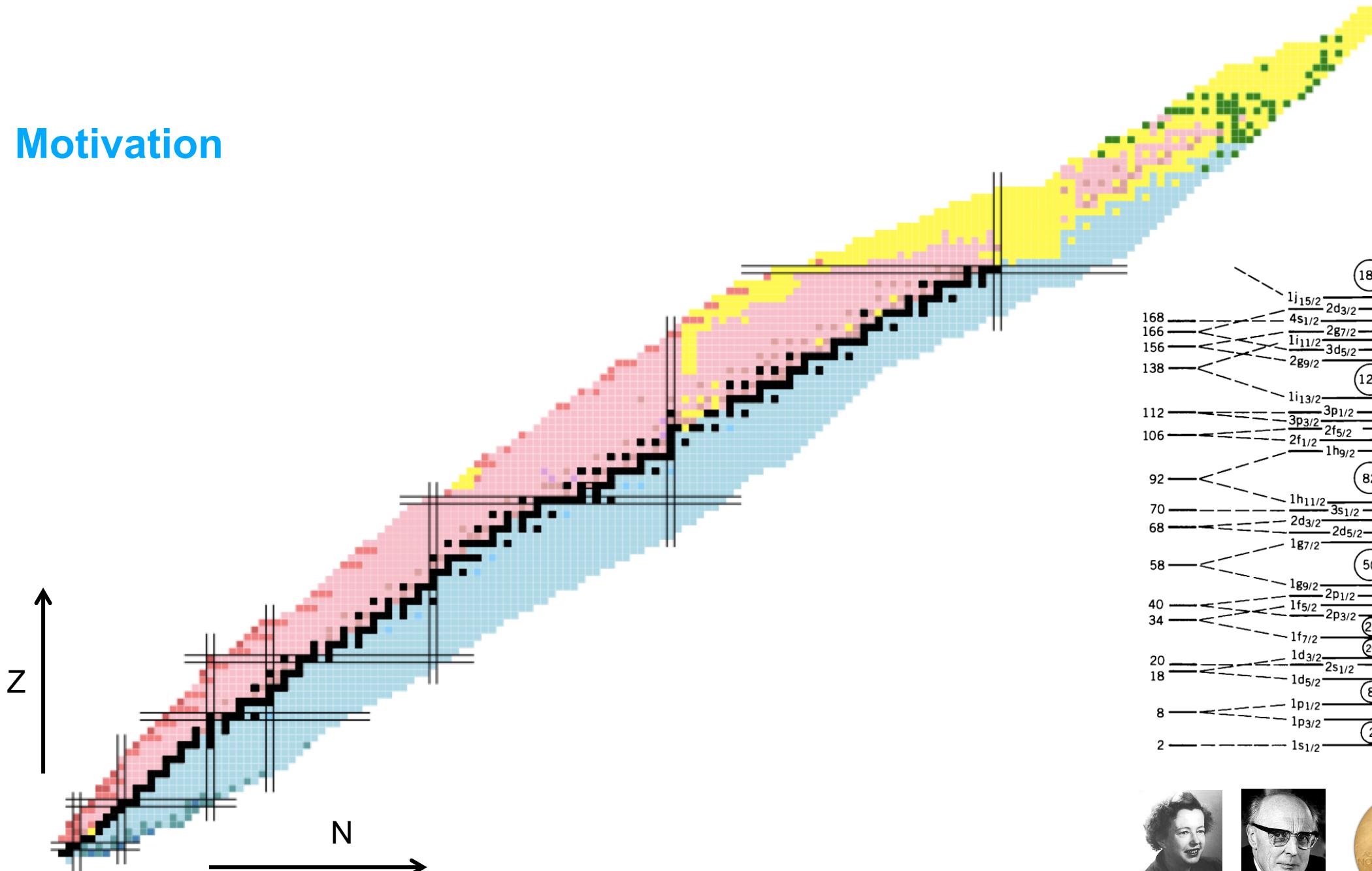


CINP
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physique nucléaire

2019-02-14



Motivation



		184	
168	1j _{15/2}	2d _{3/2}	16 184
166	4s _{1/2}	2g _{7/2}	2 164
164	1i _{11/2}	3d _{5/2}	8 162
156	2g _{9/2}		6 154
138			10 136
126	1i _{13/2}		14 126
112	3p _{3/2}	2f _{5/2}	2 112
106	2f _{1/2}	1h _{9/2}	4 108
			6 100
92			10 92
82	1h _{11/2}	3s _{1/2}	12 82
70	2d _{3/2}	2d _{5/2}	2 70
68	2d _{5/2}	1g _{7/2}	4 68
			6 64
58			8 58
50	1g _{9/2}	2p _{1/2}	10 50
40	1f _{5/2}	2p _{3/2}	2 40
34	2p _{3/2}	1f _{7/2}	6 38
			4 32
28	1f _{7/2}	1d _{3/2}	8 28
20	1d _{3/2}	2s _{1/2}	4 20
18	2s _{1/2}	1d _{5/2}	2 16
			6 14
8	1p _{1/2}	1p _{3/2}	(8)
			2 8
2	1p _{3/2}	1s _{1/2}	(2)
			2 2



Probes of the nuclear structure

$$S_{2n} = M(N-2, Z) + 2M(n) - M(N, Z)$$

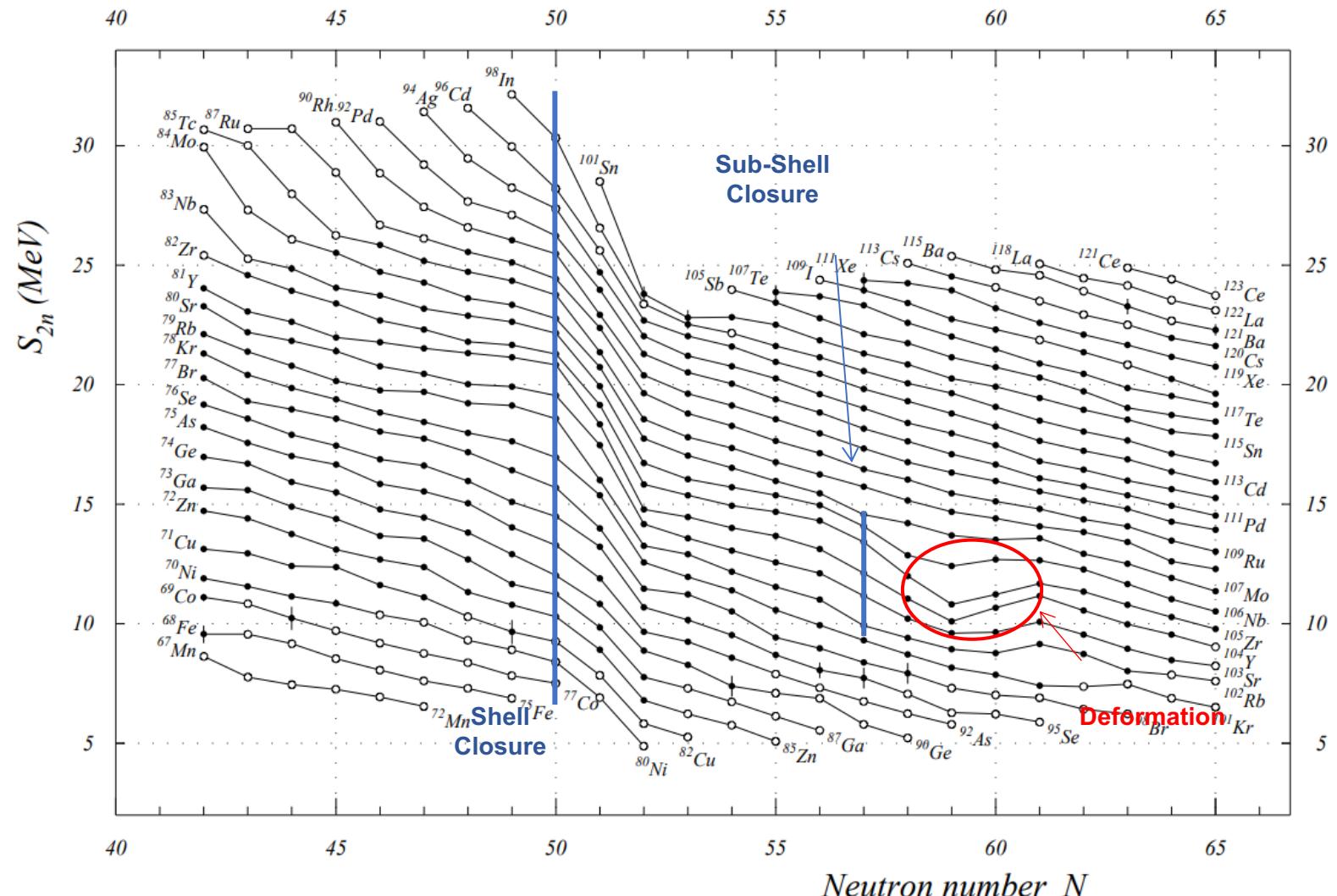
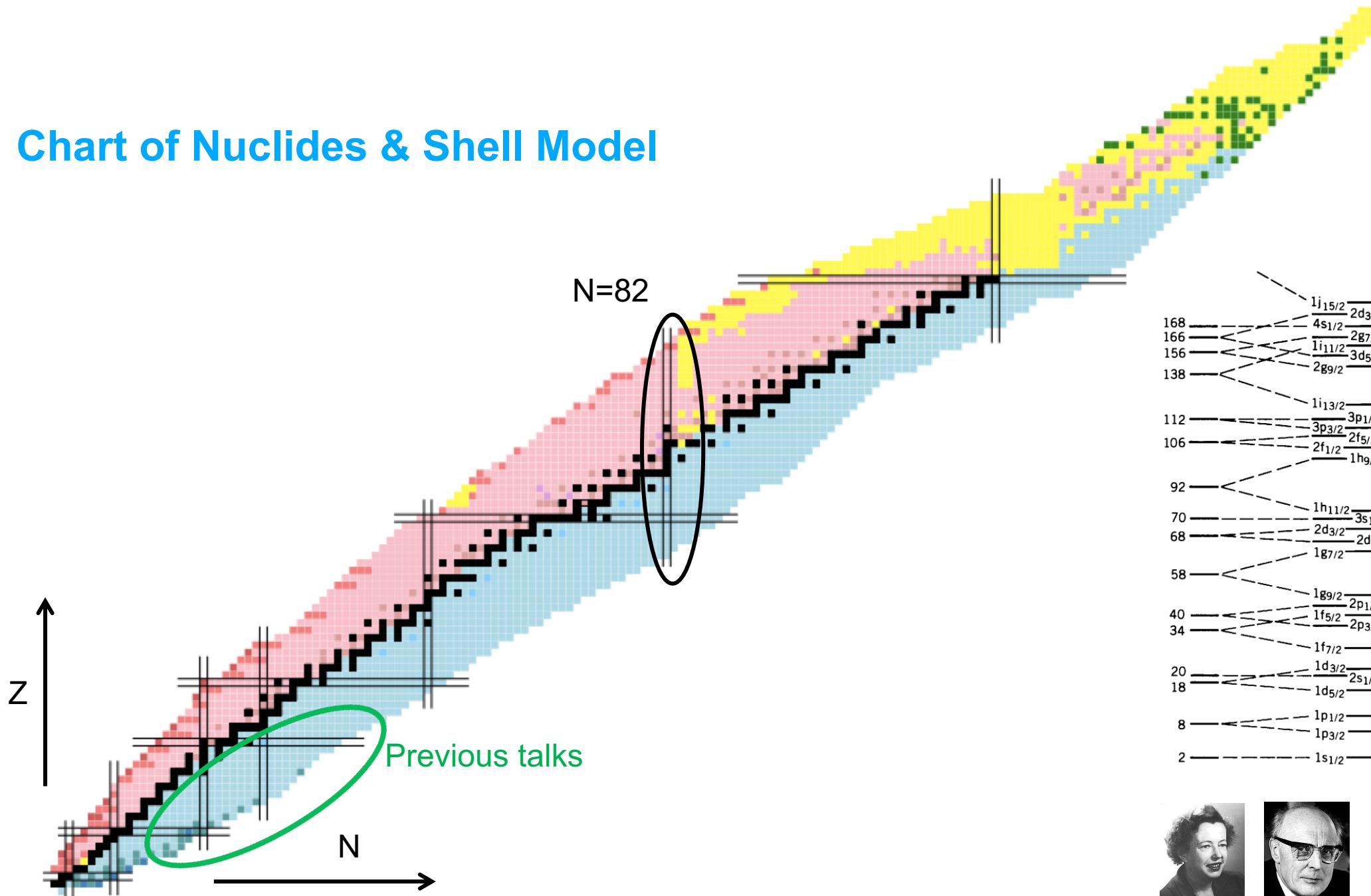


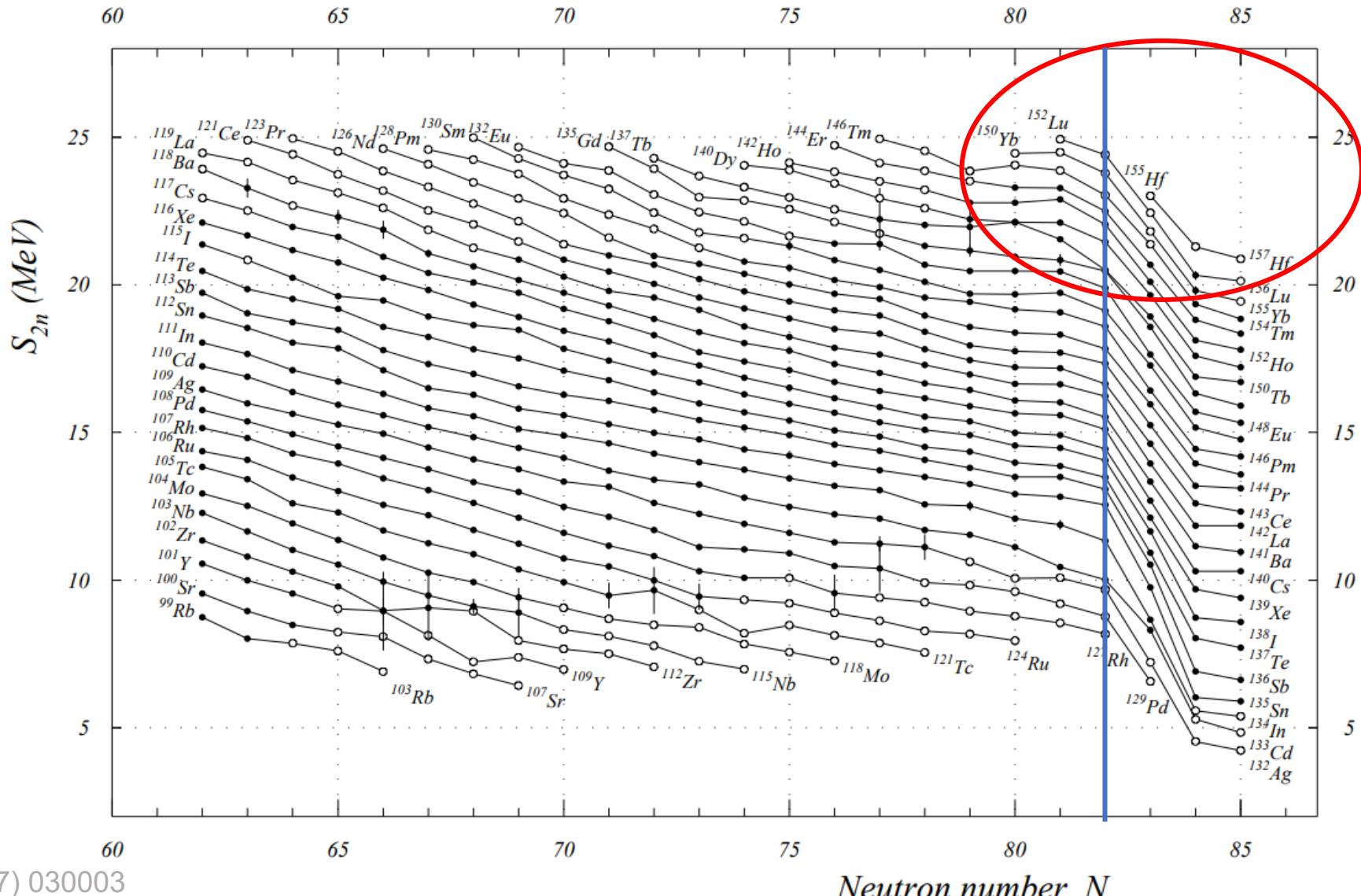
Chart of Nuclides & Shell Model



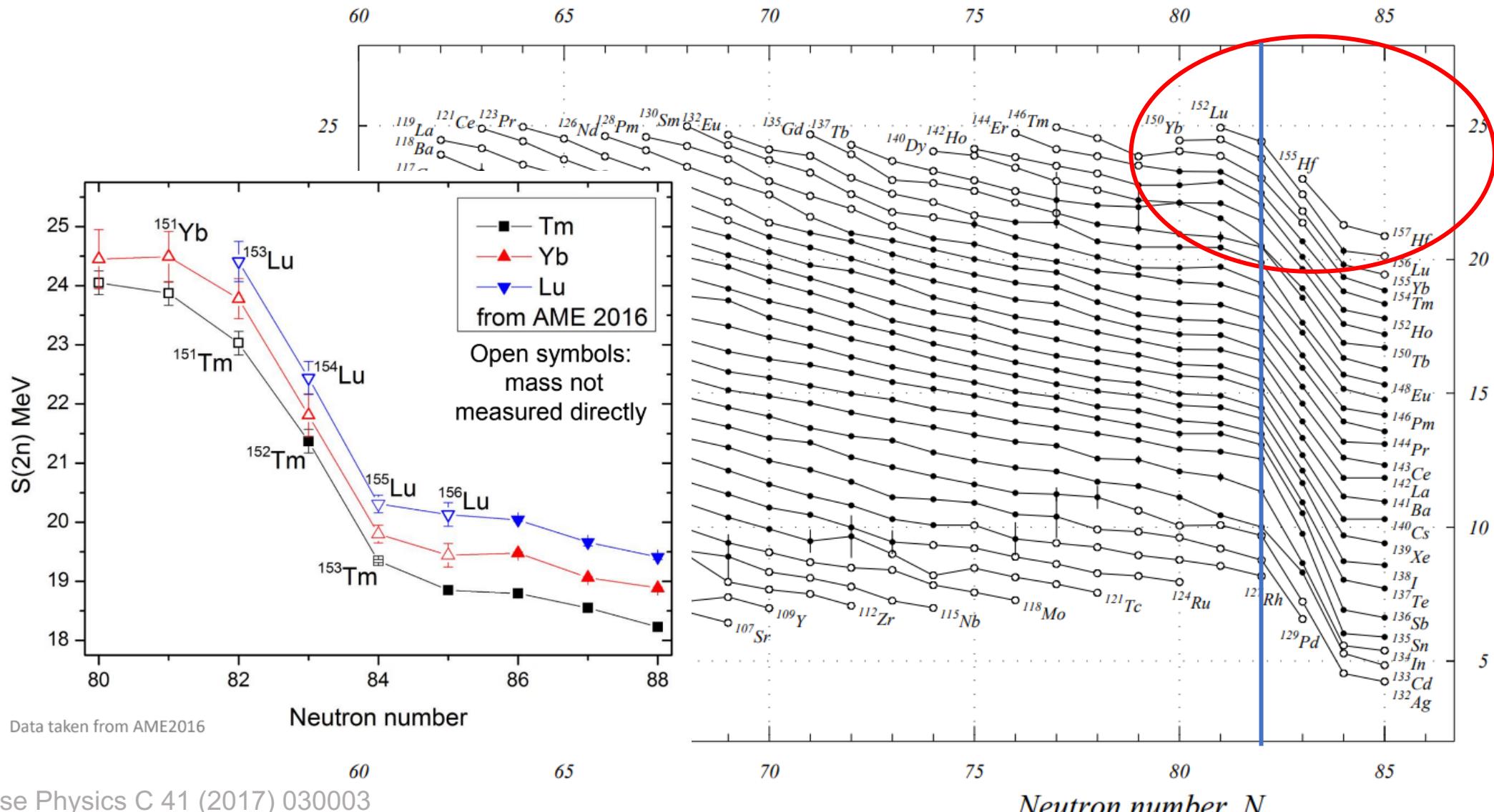
		184
168	16	184
166	4	164
164	2	162
156	8	154
154	12	152
138	6	142
136	10	136
		126
112	14	126
106	2	112
108	4	110
100	6	108
92	8	100
92	10	92
		82
70	12	82
68	2	70
68	4	68
58	6	64
58	8	58
		50
40	10	50
34	2	40
32	6	38
28	4	32
20	8	28
20	2	20
18	4	16
16	6	14
8	2	8
6	4	6
2	2	2



The N=82 shell closure



The N=82 shell closure



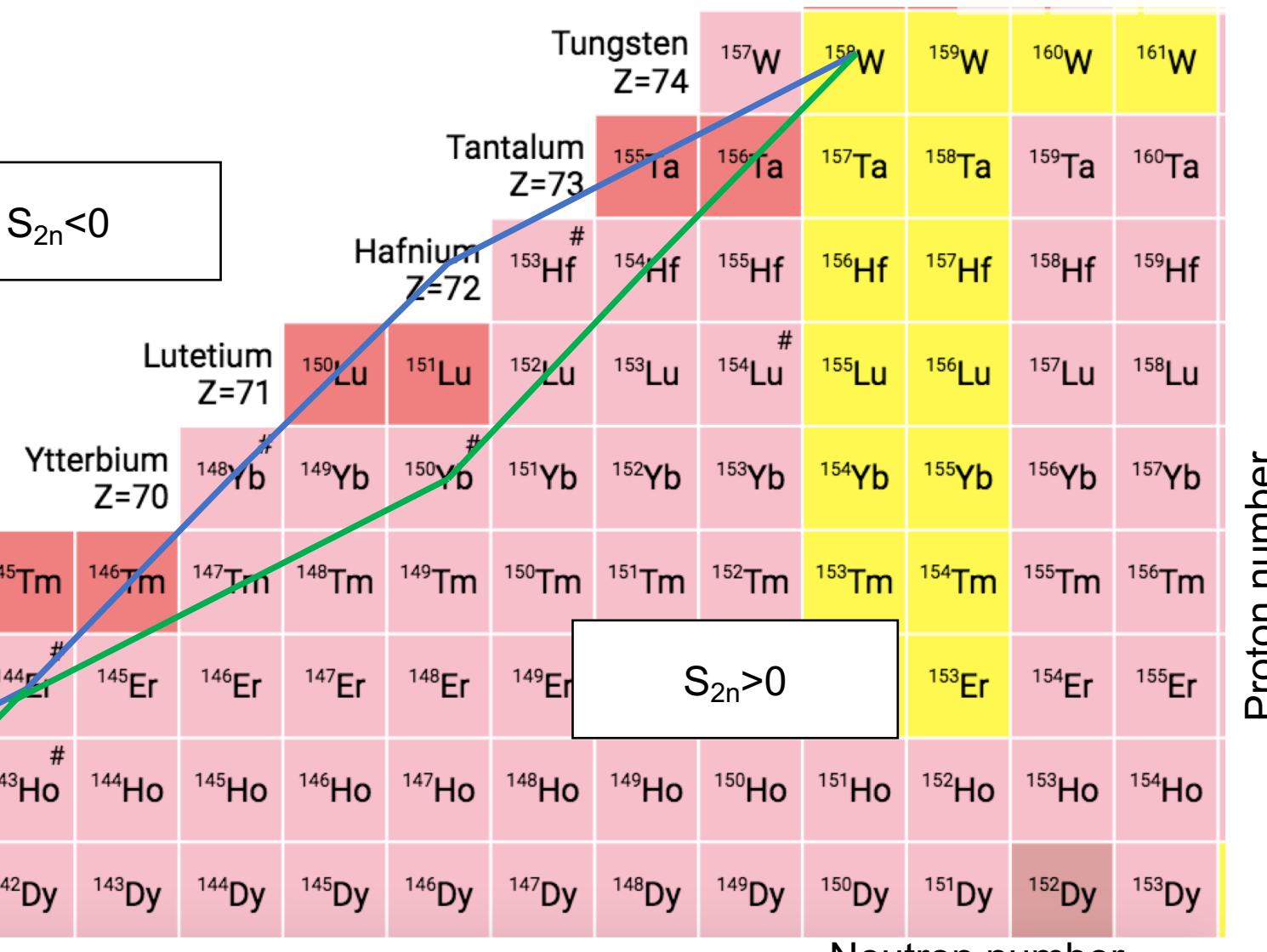
$$S_{2n} = M(N-2,Z) + 2M(n) - M(N,Z)$$

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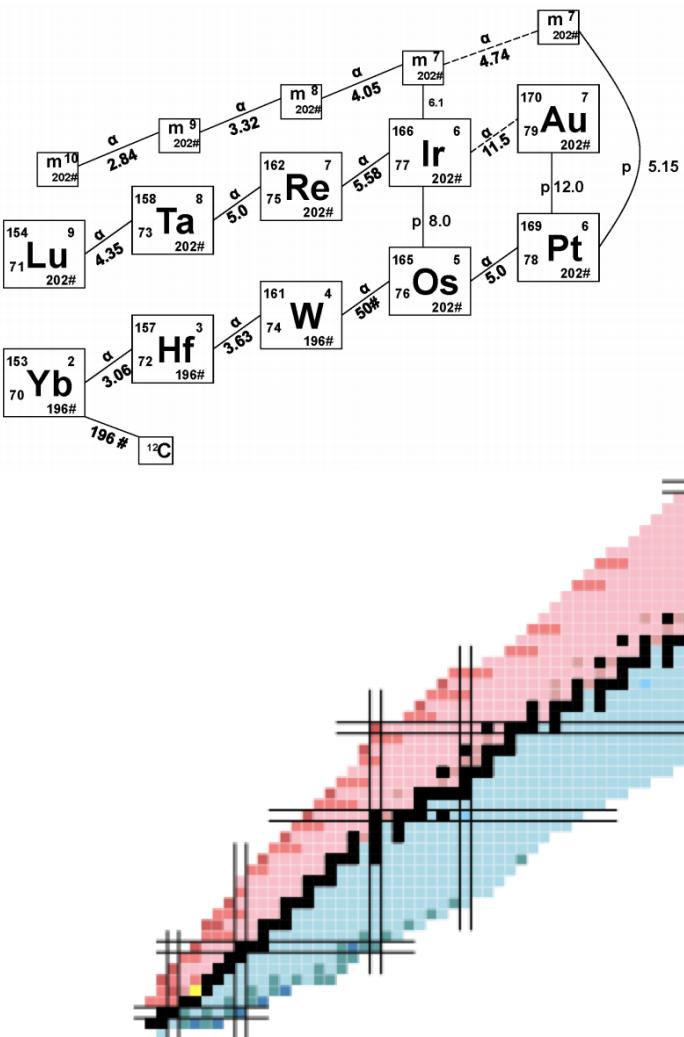
The Proton Drip-line

Models

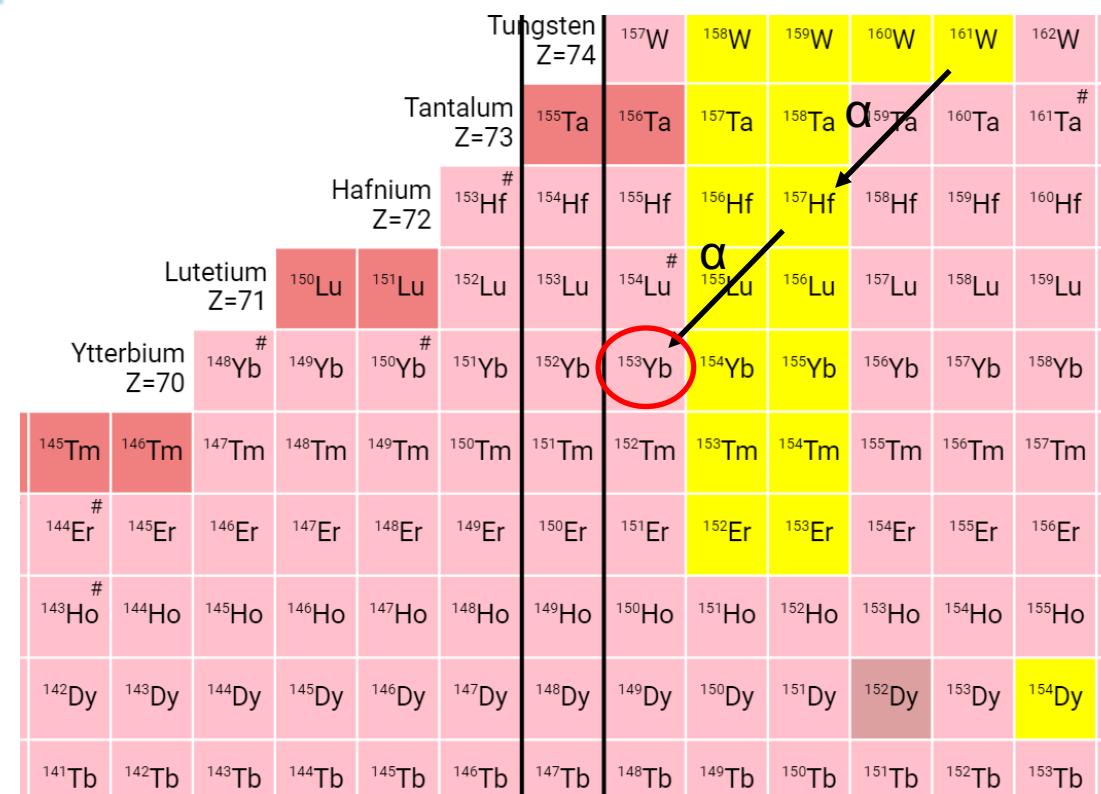
- SLy4 (Stoitsov et al., 2003)
- SkM (Erler et al, 2012)

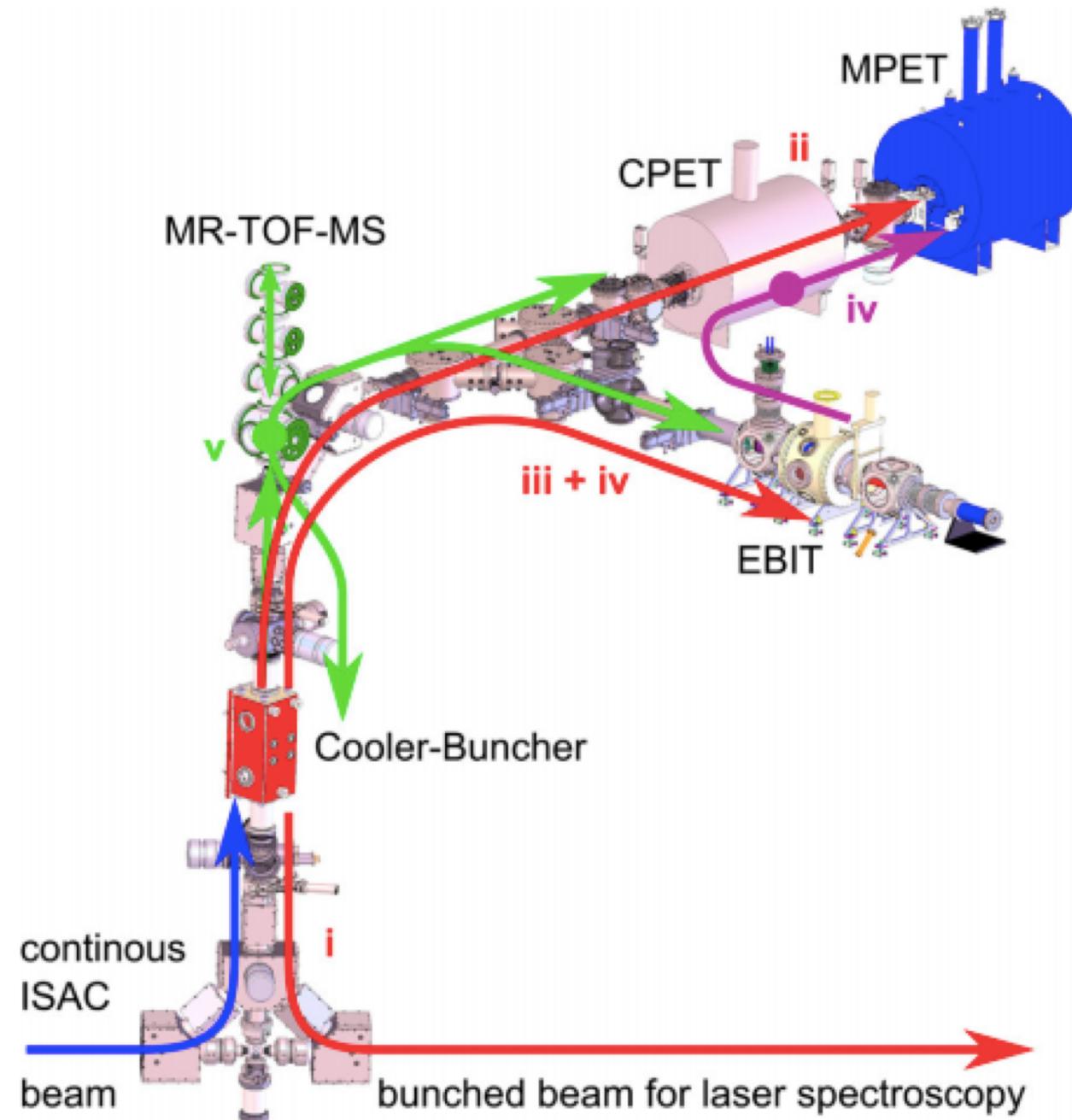


Alpha Chains

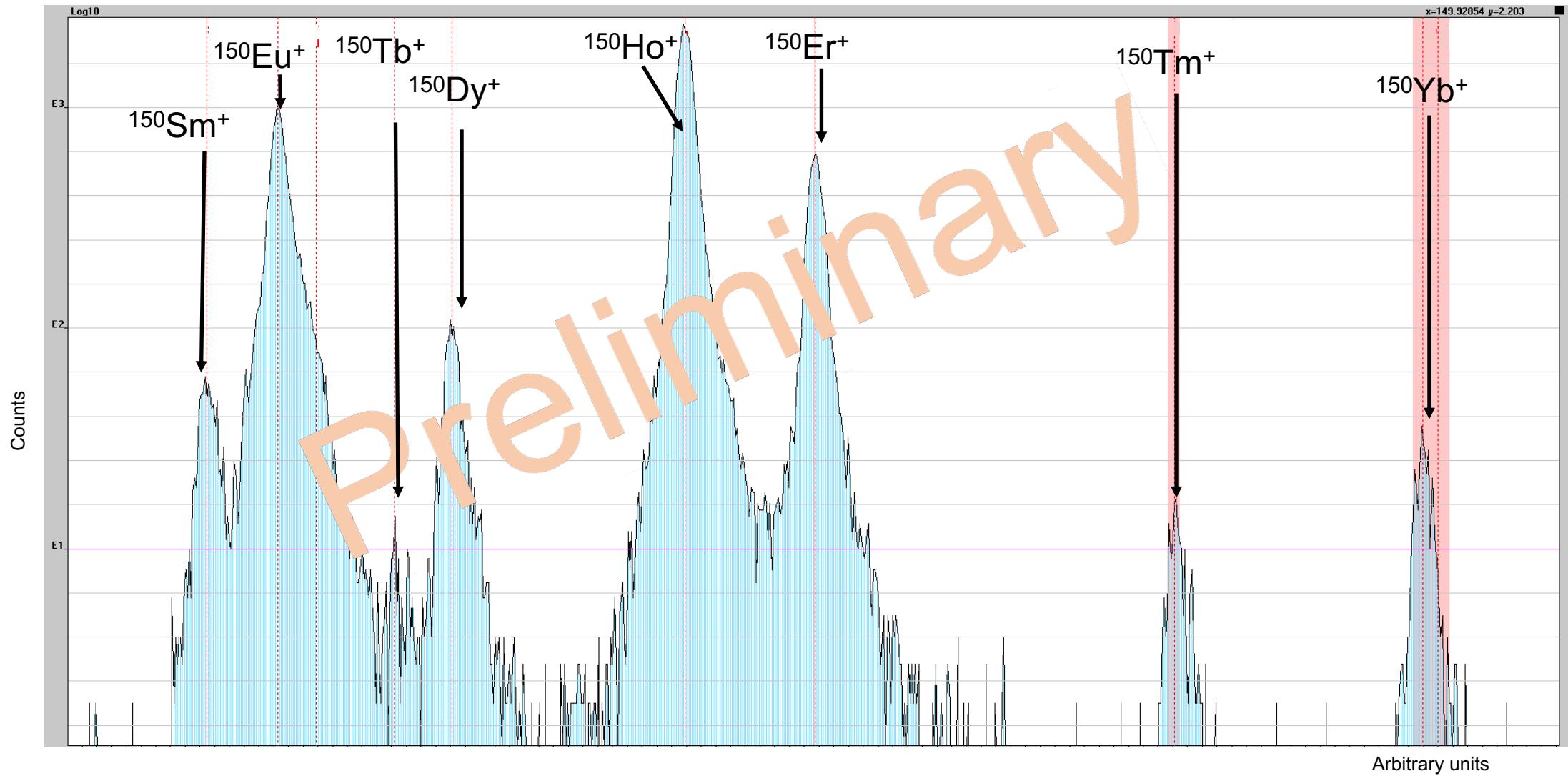


Alpha decay

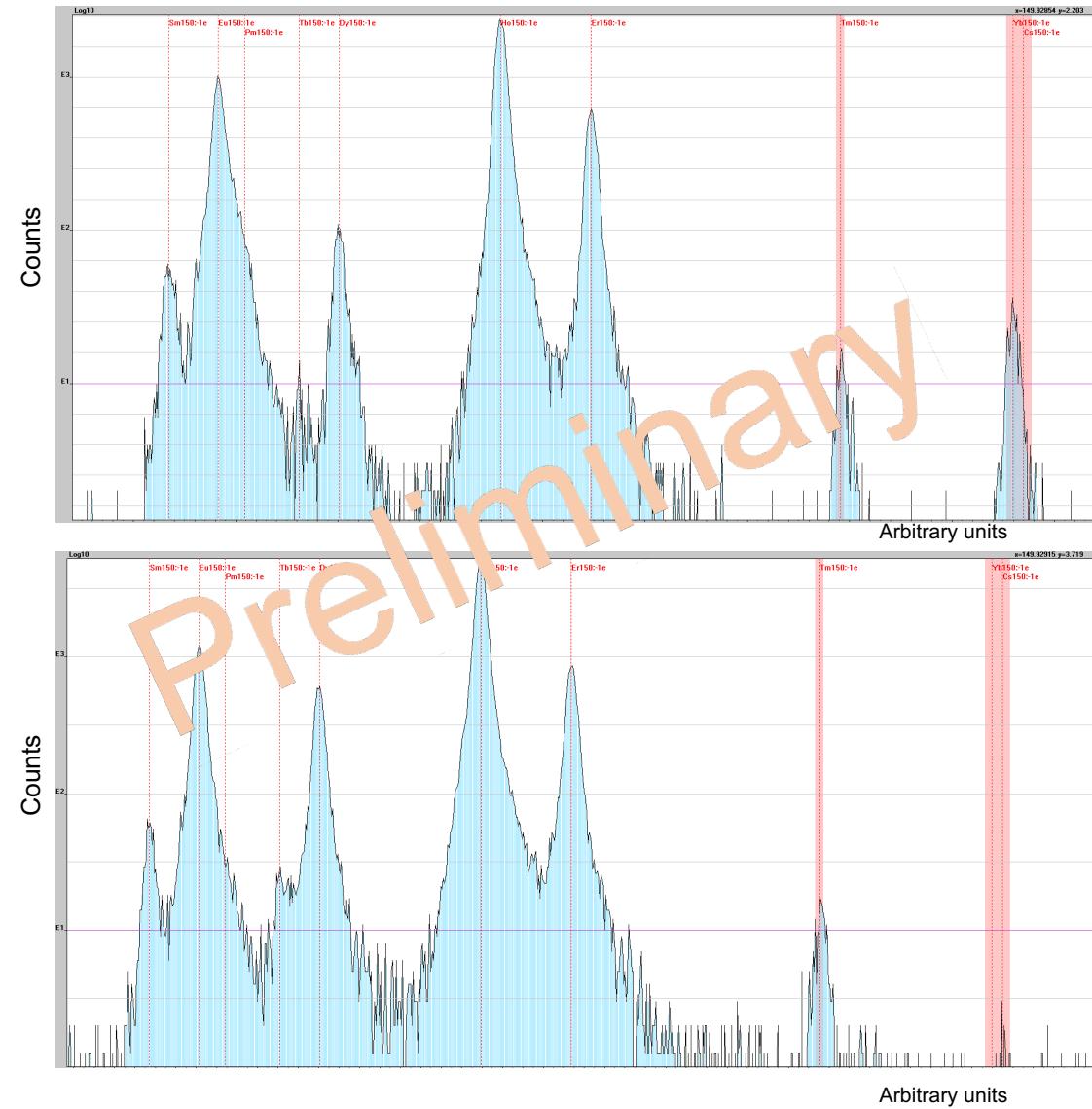




Mass measurement of $^{150}\text{Yb}^+$ and $^{150}\text{Tm}^+$ via Mass-Selective Re-trapping



Validation of identification of $^{150}\text{Yb}^+$

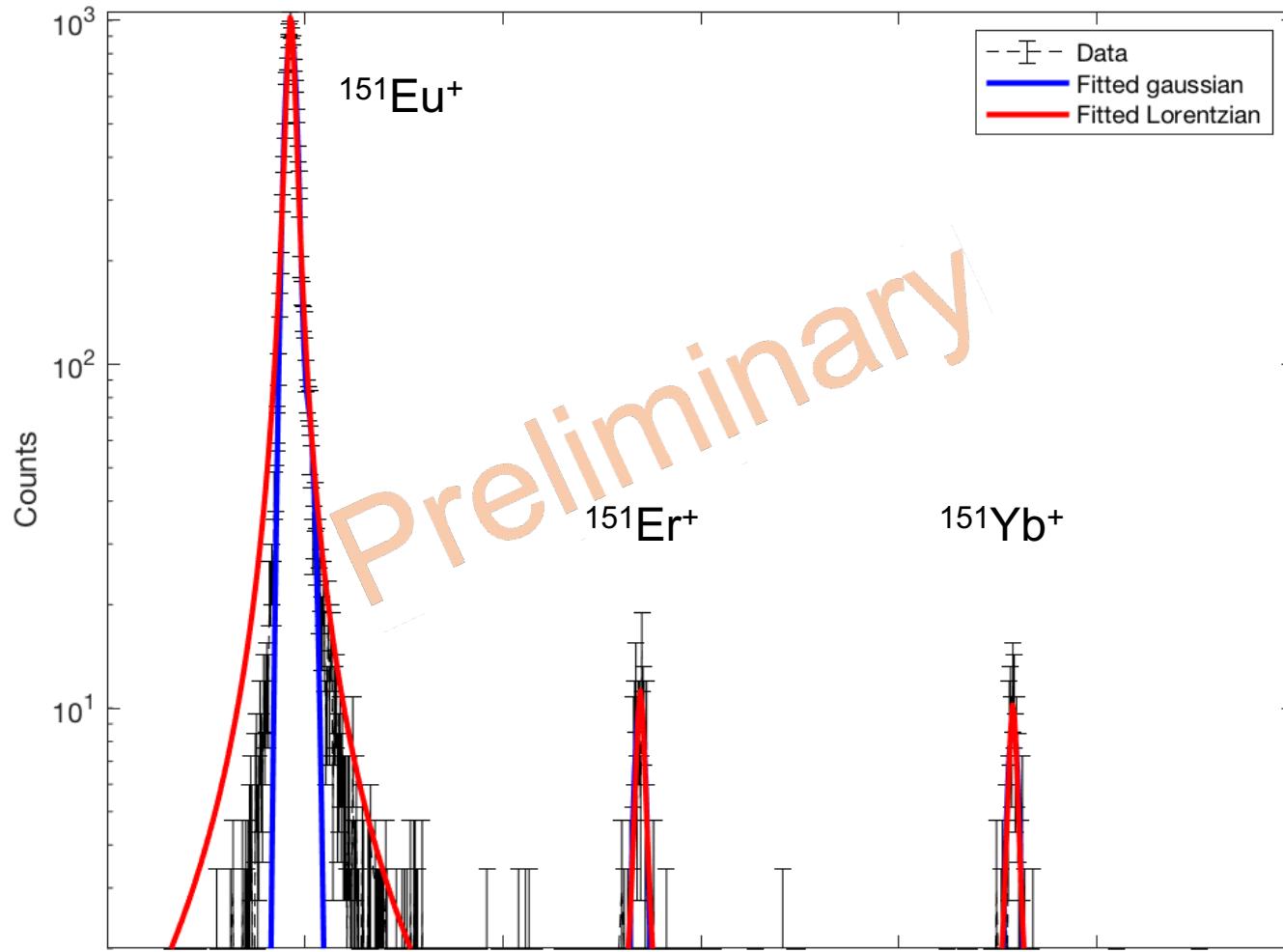


Yb lasers on

Yb lasers off

Analyzing data

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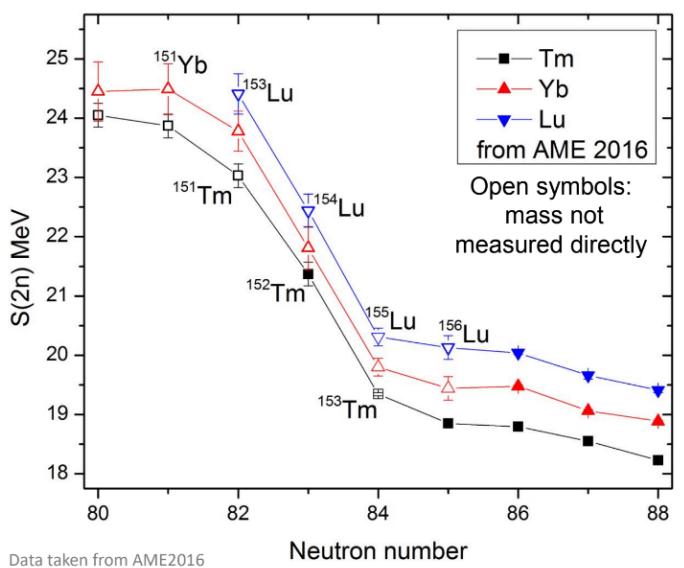
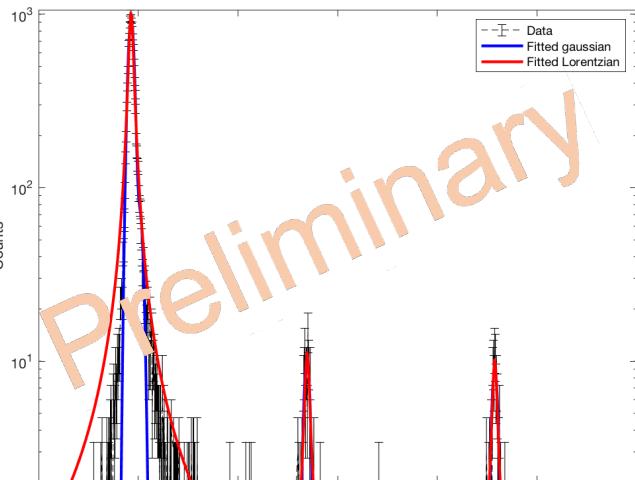
Summary

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- Measured neutron deficient Yb, Tm around N=82
- $^{150,153}\text{Yb}$ and ^{150}Tm were measured for the 1st time
- Expect to reduce uncertainties in $^{151,152}\text{Yb}$ and ^{151}Tm by an order of magnitude
- Analysis ongoing

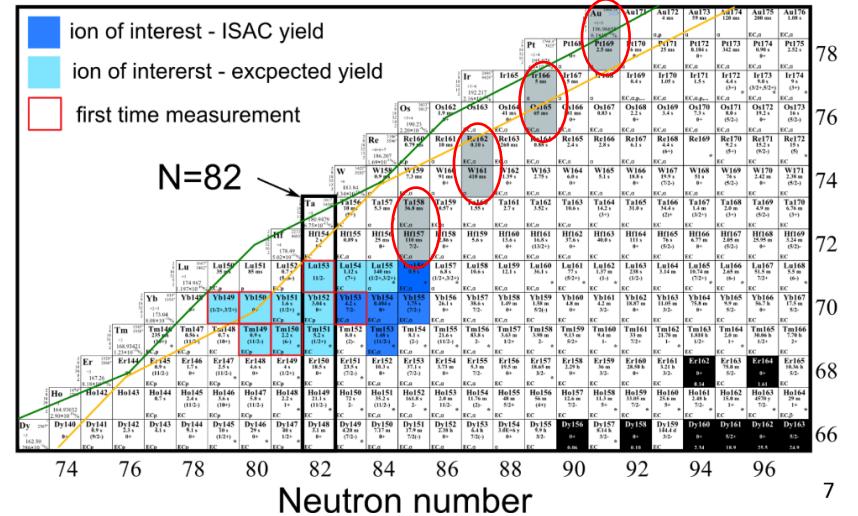
						Tungsten Z=74	^{157}W	^{158}W	^{159}W	^{160}W	^{161}W	^{162}W	
						Tantalum Z=73	^{155}Ta	^{156}Ta	^{157}Ta	^{158}Ta	^{159}Ta	^{160}Ta	^{161}Ta
						Hafnium Z=72	^{153}Hf	^{154}Hf	^{155}Hf	^{156}Hf	^{157}Hf	^{158}Hf	^{159}Hf
						Lutetium Z=71	^{150}Lu	^{151}Lu	^{152}Lu	^{153}Lu	^{154}Lu	^{155}Lu	^{156}Lu
						Ytterbium Z=70	^{148}Yb	^{149}Yb	^{150}Yb	^{151}Yb	^{152}Yb	^{153}Yb	^{154}Yb
							^{145}Tm	^{146}Tm	^{147}Tm	^{148}Tm	^{149}Tm	^{150}Tm	^{151}Tm
							^{144}Er	^{145}Er	^{146}Er	^{147}Er	^{148}Er	^{149}Er	^{150}Er
							^{143}Ho	^{144}Ho	^{145}Ho	^{146}Ho	^{147}Ho	^{148}Ho	^{149}Ho
							^{142}Dy	^{143}Dy	^{144}Dy	^{145}Dy	^{146}Dy	^{147}Dy	^{148}Dy
							^{141}Tb	^{142}Tb	^{143}Tb	^{144}Tb	^{145}Tb	^{146}Tb	^{147}Tb

Coming up next..



Data taken from AME2016

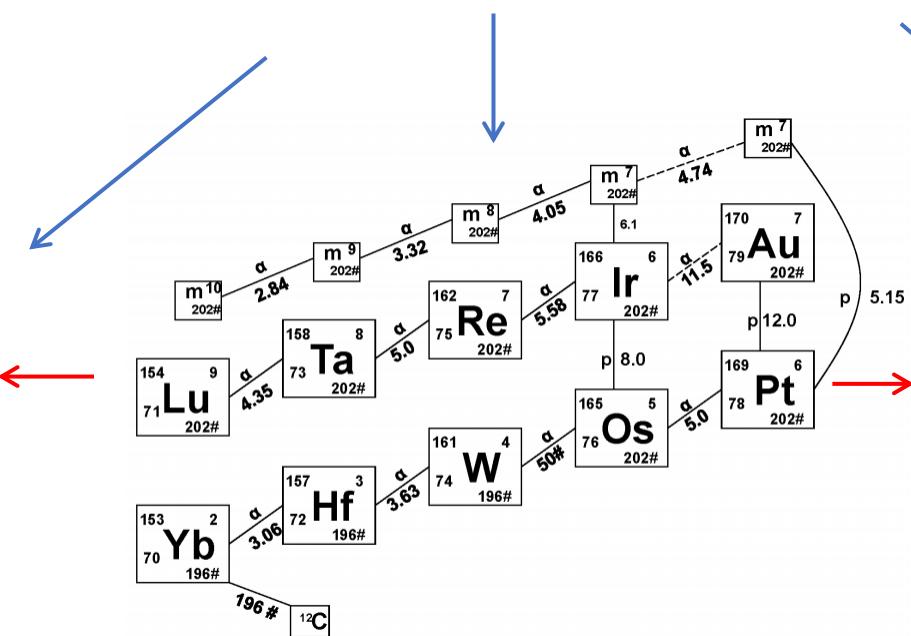
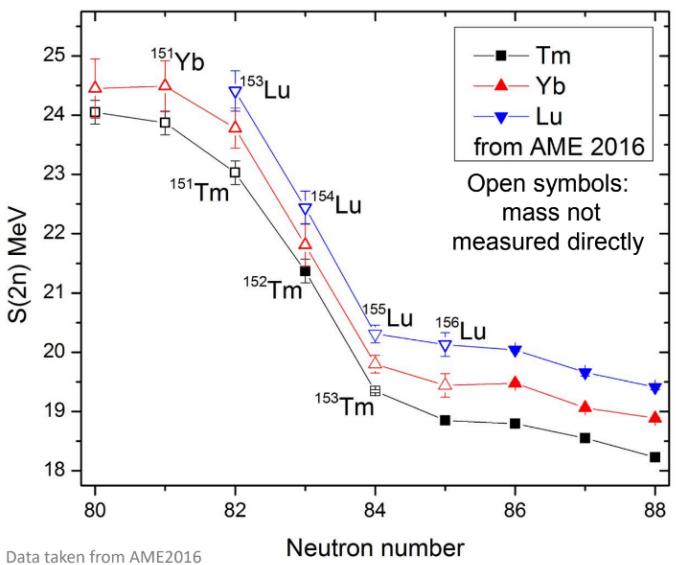
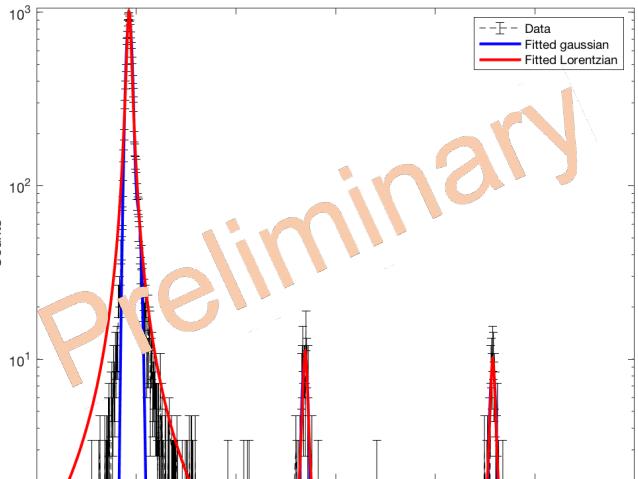
Evolution of Nuclear Shell



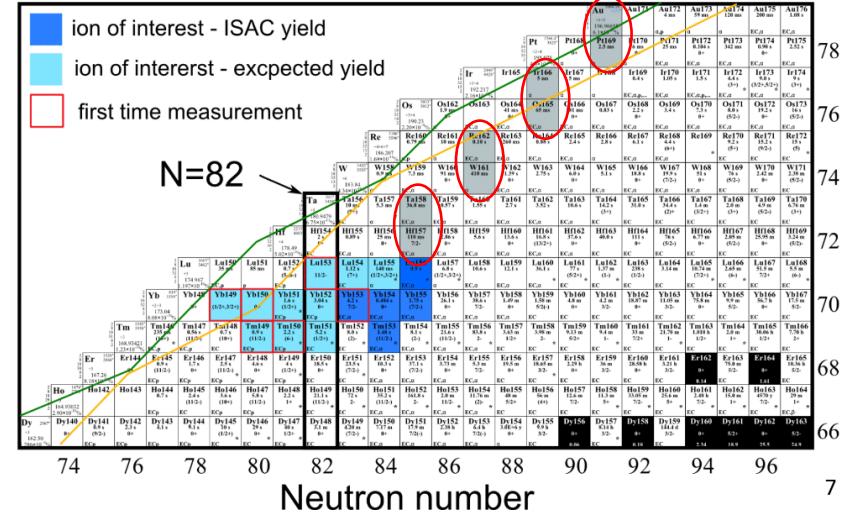
Neutron number

From AME 2016

Coming up next..



Alpha chains



Investigation of Proton driplines
From AME 2016

Thank you
Merci

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