Possible Uncertain Levels from Gamma-ray Coincidence Data

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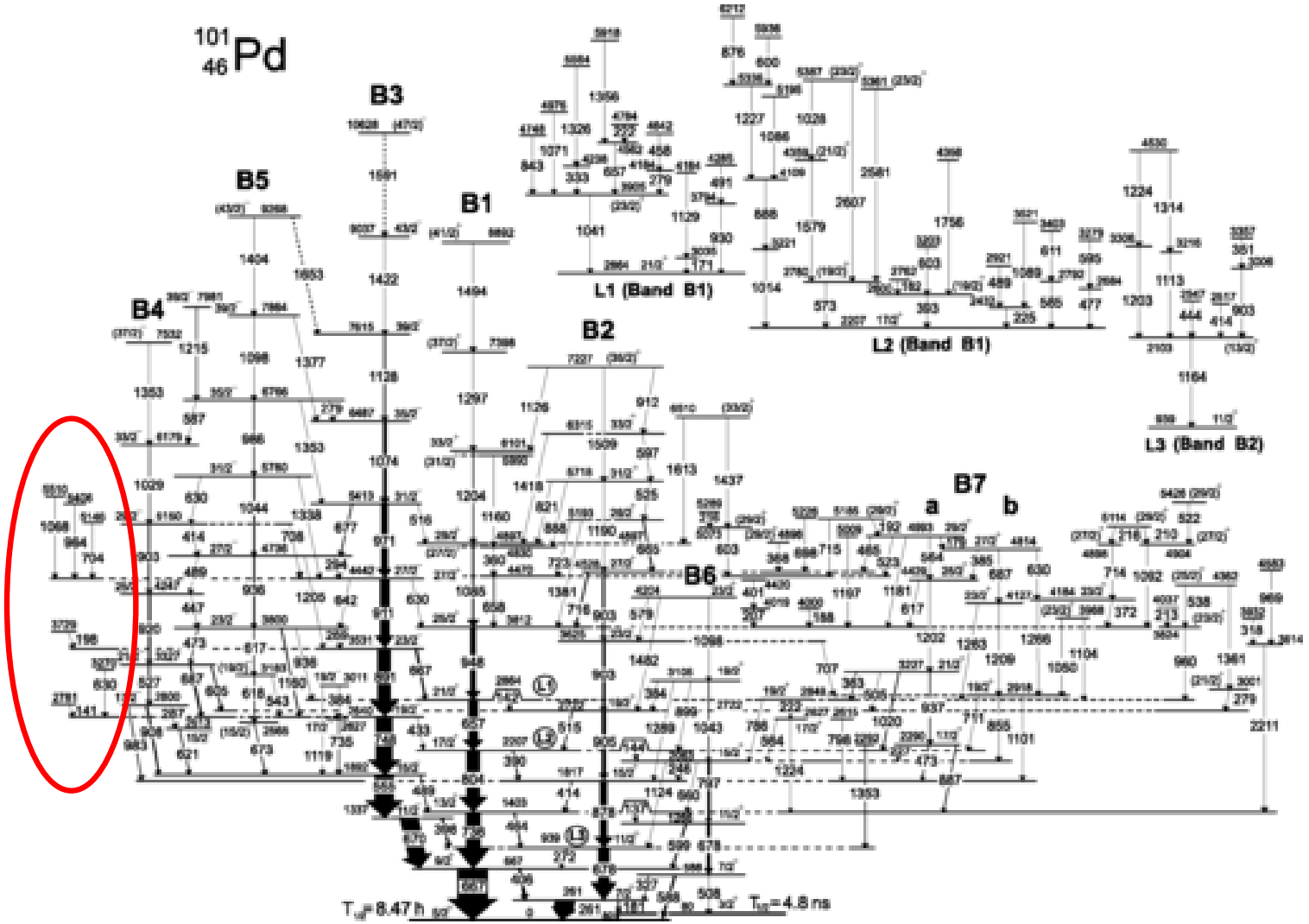
In 101Pd, in the 2017Si14 HI reaction, many new levels are introduced based on coincidence relations between the gamma-rays, as well as on energy and intensity balances. Among them several levels decay only by one weak transition, and either do not have populating gammas (e.g. 2432, 2517, 2547, 2684, 2781 keV levels with gammas of 225, 414, 444, 477, 141 keV, respectively), or are populated by another weak transition (e.g. 3006 and 3357 keV levels). According to my experiences these level- and gamma-placements are uncertain. On the other hand, coincidence relations between the gamma-rays are not published except a few example spectra, thus the published levels and placements of the gamma-rays in the level scheme are the "primary data". If the energy and intensity balances are fulfilled, evaluator should believe in them according to the principles.


101 46 Pd
B1
B2
B3
B4
B5
B6
B7
a
b
L1 (Band B1)
L2 (Band B1)
L3 (Band B2)
T1/2= 8.47 h
T1/2= 4.8 ns

Problem:

1) Should the evaluator adopt these levels as certain or uncertain levels?
2) If they are adopted as uncertain, should they be marked in the reaction data set as uncertain, too?

My preferred solution would be to mark them in the Adopted levels, Gammas as uncertain, but in the reaction data set as certain levels.

Unrealistically small gamma-ray uncertainties

In 101Pd, in 2012Su18 for the majority of gamma rays the energy uncertainty is 0.1 keV (even for the weak gammas), which is unrealistically small value from a HI experiment with large gamma-ray array. On the other hand, except two gammas, they fit to the level scheme made by least-square fit quite well. GTOL gives chi-square/n less then 1 with these uncertainties.
The method of the gamma-ray energy determination is not discussed, so we should assume that they used the usual method with the usual normalization.

γ(^{101}Pd) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
281.1 *1*	0.1 *1*	6770.33	35/2$^-$	6489.23	35/2$^-$	D[‡]	
287.3 *2*	0.05 *5*	2800.88	17/2$^-$	2511.93	15/2$^-$		E_γ: poor fit. Level-energy difference=288.95.
294.6 *1*	0.53 *3*	4738.33	27/2$^-$	4443.74	27/2$^-$	D[‡]	ADO(1)=1.3 *2*, ADO(2)=1.3 *2*.
326.9 *1*	2.1 *1*	588.00	7/2$^+$	261.08	7/2$^+$	D[‡]	ADO(1)=1.06 *5*, ADO(2)=1.04 *5*.
362.7 *1*	1.21 *7*	3227.76	21/2$^+$	2865.11	21/2$^+$	Q[‡]	ADO(1)=0.73 *7*, ADO(2)=0.84 *8*.
369.0 *1*	1.08 *7*	4897.09	29/2$^+$	4528.19	27/2$^+$	D	ADO(1)=0.41 *7*, ADO(2)=0.8 *1*.
390.9 *1*	2.8 *2*	2207.94	17/2$^+$	1816.99	15/2$^+$	D	ADO(1)=0.58 *3*, ADO(2)=0.85 *4*.
398.5 *1*	3.7 *2*	1337.73	11/2$^-$	939.14	11/2$^+$	D[‡]	ADO(1)=1.12 *5*, ADO(2)=1.10 *5*.
406.3 *1*	6.7 *3*	667.43	9/2$^+$	261.08	7/2$^+$	D	ADO(1)=0.87 *3*, ADO(2)=0.89 *3*.
413.2 *1*	0.79 *5*	1816.99	15/2$^+$	1403.75	13/2$^+$	D	ADO(1)=0.58 *8*, ADO(2)=0.8 *1*.
433.5 *2*	0.3 *1*	2641.64	19/2$^-$	2207.94	17/2$^+$	D	ADO(1)=0.6 *2*, ADO(2)=0.8 *2*.
446.2 *1*	0.25 *2*	4248.32	25/2$^-$	3802.15	23/2$^-$	D	ADO(1)=0.6 *2*, ADO(2)=0.7 *2*.
464.5 *1*	2.6 *1*	1403.75	13/2$^+$	939.14	11/2$^+$	D	ADO(1)=0.56 *3*, ADO(2)=0.88 *5*.
474.1 *1*	0.79 *4*	3802.15	23/2$^-$	3327.91	21/2$^-$	D	ADO(1)=0.4 *1*, ADO(2)=0.8 *2*.
489.5 *1*	3.9 *2*	1893.22	15/2$^-$	1403.75	13/2$^+$	D	ADO(1)=0.61 *3*, ADO(2)=0.79 *4*.
489.9 *2*	0.33 *3*	4738.33	27/2$^-$	4248.32	25/2$^-$	D	ADO(1)=0.56 *6*, ADO(2)=0.60 *7*.
508.0 *1*	1.3 *1*	588.00	7/2$^+$	80.22	3/2$^+$		
513.7 *1*	1.44 *9*	2721.77	19/2$^+$	2207.94	17/2$^+$	D	ADO(1)=0.7 *2*, ADO(2)=1.0 *2*.
518.6 *1*	0.56 *3*	5415.42	31/2$^-$	4897.09	29/2$^+$	D	ADO(1)=0.6 *1*, ADO(2)=0.9 *1*.
525.7 *1*	1.35 *7*	5717.13	31/2$^+$	5191.51	29/2$^+$	D	ADO(1)=0.50 *6*, ADO(2)=0.71 *8*.
527.0 *1*	2.9 *2*	3327.91	21/2$^-$	2800.88	17/2$^-$	Q	ADO(1)=1.2 *1*, ADO(2)=1.2 *1*.
543.5 *1*	0.32 *3*	623.73	7/2$^+$	80.22	3/2$^+$		
555.5 *1*	62 *3*	1893.22	15/2$^-$	1337.73	11/2$^-$	Q	ADO(1)=1.33 *4*, ADO(2)=1.22 *4*.

Problem:
Should the evaluator
a) keep the original uncertainties (except for the two gammas) both for the reaction data set and for the averaging in the adopted data set, or
b) keep the original uncertainties for the reaction data set, but use ore realistic values for the averaging in the adopted data set, or

c) use more realistic values for both data sets?

My preferred solution would be the b) one.