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The update of an evaluation when no new experimental information is available

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The evaluation has to be performed from zero, but most probably the old evaluation will be the basis of the new one.

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The evaluation has to be performed from zero, but most probably the old evaluation will be the basis of the new one.

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The case of ^{101}Cd:

- Previous evaluation performed in 2006.
- A new evaluation of A=101 performed by the groups in Debrecen and Bucharest. 4 authors, each of them evaluation 3-4 isotopes. The whole project coordinated by Timar Janos.
- No new experimental data for ^{101}Cd after 2006.

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^{101}Cd – currently in ENSDF:

^{101}Cd Levels

Cross Reference (XREF) Flags

A ^{101}In β^+ decay
B ^{92}Mo(^{12}C,3nγ)
C (HI,xnγ)

E(level)	J^π †	$T_{1/2}$	XREF	Comments
0.0‡	(5/2$^+$)	1.36 min *5*	ABC	%ε+%β^+=100 $T_{1/2}$: weighted average of: 1.37 min *5* (1980Ka05) and 1.2 min *2* (1969Ha03) β+ decay; on−line ms of Sn(p,spallation) products. J^π: based on syst with ^{105}Cd, ^{107}Cd, ^{109}Cd g.s. and γ decays.
252.0‡ *1*	(7/2$^+$)		A C	
891.1# *6*	(9/2$^+$)		C	
1143.7‡ *6*	(11/2$^+$)		C	
1672.6# *1*	(13/2$^+$)		C	
1799.0‡ *1*	(15/2$^+$)		C	
2127.7 *2*	(15/2$^+$)		C	
2284.8‡ *2*	(19/2$^+$)	4.6 ns *4*	C	$T_{1/2}$: from 1992Al17 in (HI,xnγ).
2301.2# *2*	(17/2$^+$)		C	
2404.1 *2*			C	
2479.8# *2*	(19/2$^+$)		C	
2638.3‡ *2*	(21/2$^+$)		C	
2918.1 *2*			C	
3034.1 *2*			C	

^{101}Cd – currently in ENSDF:

^{101}Cd Levels

Cross Reference (XREF) Flags

A	^{101}In β^+ decay
B	^{92}Mo(^{12}C,3nγ)
C	(HI,xnγ)

Only 2 levels

Empty dataset (unpublished data)

^{50}Cr(^{58}Ni,2pn$\alpha\gamma$) 1996Pa30, 1992Al17

E(level)	J^{π} †	$T_{1/2}$	XREF	Comments
0.0‡	(5/2$^+$)	1.36 min *5*	ABC	%ε+%β^+=100 $T_{1/2}$: weighted average of: 1.37 min *5* (1980Ka05) and 1.2 min *2* (1969Ha03) β+ decay; on−line ms of Sn(p,spallation) products. J^{π}: based on syst with ^{105}Cd, ^{107}Cd, ^{109}Cd g.s. and γ decays.
252.0‡ *1*	(7/2$^+$)		A C	
891.1# *6*	(9/2$^+$)		C	
1143.7‡ *6*	(11/2$^+$)		C	
1672.6# *1*	(13/2$^+$)		C	
1799.0‡ *1*	(15/2$^+$)		C	
2127.7 *2*	(15/2$^+$)		C	
2284.8‡ *2*	(19/2$^+$)	4.6 ns *4*	C	$T_{1/2}$: from 1992Al17 in (HI,xnγ).
2301.2# *2*	(17/2$^+$)		C	
2404.1 *2*			C	
2479.8# *2*	(19/2$^+$)		C	
2638.3‡ *2*	(21/2$^+$)		C	
2918.1 *2*			C	
3034.1 *2*			C	

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^{101}Cd – currently in ENSDF:

† Jπ without comments are preliminary based on γ(θ)

^{101}Cd Levels

Cross Reference (XREF) Flags

- A ^{101}In β^+ decay
- B ^{92}Mo(^{12}C,3nγ)
- C (HI,xnγ)

Only 2 levels

Empty dataset (unpublished data)

^{50}Cr(^{58}Ni,2pnαγ) 1996Pa30, 1992Al17

E(level)	Jπ†	$T_{1/2}$	XREF	Comments
0.0‡	(5/2+)	1.36 min 5	ABC	%ε+%β+=100 $T_{1/2}$: weighted average of: 1.37 min 5 (1980Ka05) and 1.2 min 2 (1969Ha03) β+ decay; on−line ms of Sn(p,spallation) products. Jπ: based on syst with ^{105}Cd, ^{107}Cd, ^{109}Cd g.s. and γ decays.
252.0‡ 1	(7/2+)		A C	
891.1# 6	(9/2+)		C	
1143.7‡ 6	(11/2+)		C	
1672.6# 1	(13/2+)		C	
1799.0‡ 1	(15/2+)		C	
2127.7 2	(15/2+)		C	
2284.8‡ 2	(19/2+)	4.6 ns 4	C	$T_{1/2}$: from 1992Al17 in (HI,xnγ).
2301.2# 2	(17/2+)		C	
2404.1 2			C	
2479.8# 2	(19/2+)		C	
2638.3‡ 2	(21/2+)		C	
2918.1 2			C	
3034.1 2			C	

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^{101}Cd – currently in ENSDF, the HI dataset:

(HI,xnγ) 1996Pa30,1992Al17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	ENSDF	1-Jul-2006

1996Pa30: ^{58}Ni(^{58}Ni,2pαnγ) E= 261 MeV.
Measured: pnγ, $\gamma\gamma\gamma$, $\gamma\gamma$n, $\gamma\gamma$(t), Nordball array with 15 Ge Compton suppressed, a neutron wall and a silicon ball.
1992Al17: ^{46}Ti(^{58}Ni,xnpγ) E= 231 MeV,^{50}Cr(^{58}Ni,xnpγ).
E= 231 MeV . Measured: pnγ, $\gamma\gamma\gamma$, $\gamma\gamma$n, $\gamma\gamma$(t).
The level scheme is as given by 1996Pa30.

@ From 1996Pa30 based on syst and γ(Theta).

^{101}Cd Levels

E(level)	J$^{\pi}$ †	T$_{1/2}$	E(level)	J$^{\pi}$ †	E(level)	J$^{\pi}$ †
0.0‡	(5/2$^+$)		3062.3# *2*	(21/2)	5039.4@ *2*	(27/2,29/2)
252.0‡ *1*	(7/2$^+$)		3398.5‡ *2*	(23/2$^+$)	5128.2‡ *3*	(29/2)
891.1# *1*	(9/2$^+$)		3561.1@ *2*	(23/2$^+$)	5612.7# *2*	(29/2)
1143.7‡ *1*	(11/2$^+$)		3657.3 *2*		6014.4 *4*	
1672.6# *1*	(13/2$^+$)		3700.8# *2*	(23/2)	6077.4# *2*	(31/2)
1799.0‡ *1*	(15/2$^+$)		3717.6 *5*		6105.0@ *2*	(31/2)
2127.7 *2*	(15/2$^+$)		3739.5‡ *2*	(25/2$^+$)	6131.0 *2*	
2284.8‡ *2*	(19/2$^+$)	4.6 ns *4*	3991.3# *2*	(25/2)	6262.8‡ *3*	(31/2)
2301.2# *2*	(17/2$^+$)		4062.3‡ *3*	(27/2)	6363.2@ *2*	(33/2)
2404.1 *2*			4217.3 *2*		6531.9‡ *4*	(33/2)
2479.8# *2*	(19/2$^+$)		4288.6@ *2*	(25/2$^+$)	6824.8‡ *4*	(35/2)
2638.3‡ *2*	(21/2$^+$)		4380.9 *2*		7099.6‡ *4*	(37/2)
2918.1 *2*			4504.2# *2*		7178.9@ *2*	(35/2)
3034.1 *2*			4687.9 *3*			

† From 1996Pa30 based on syst and γ(Theta).

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^{101}Cd – currently in ENSDF, the HI dataset:

† From the ratio of the intensity γ lines at two angles.

(HI,xnγ) 1996Pa30,1992Al17 (continued)

γ(^{101}Cd) (continued)

E_γ [#]	I_γ [#]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [@]	Comments
274.8 *1*	1.9 *1*	7099.6	(37/2)	6824.8	(35/2)		
290.4 *1*	5.6 *3*	3991.3	(25/2)	3700.8	(23/2)		
292.9 *1*	1.5 *1*	6824.8	(35/2)	6531.9	(33/2)		
x321† *1*							E_γ: Deexciting a 2957 level in 1992Al17, not seen by 1996Pa30.
322.5 *2*	28.2 *14*	4062.3	(27/2)	3739.5	(25/2$^+$)		
328.7 *1*	2.9 *2*	2127.7	(15/2$^+$)	1799.0	(15/2$^+$)		
334.0 *1*	2.5 *2*	3991.3	(25/2)	3657.3			
x340† *1*							E_γ: Deexciting a 3297 level in 1992Al17, not seen by 1996Pa30.
341.1 *1*	23.7 *12*	3739.5	(25/2$^+$)	3398.5	(23/2$^+$)		
345.8‡ *6*	0.8 *1*	4062.3	(27/2)	3717.6			
353.4† *1*	56 *3*	2638.3	(21/2$^+$)	2284.8	(19/2$^+$)		
395.7 *1*	3.3 *2*	3034.1		2638.3	(21/2$^+$)		
464.7 *1*	2.4 *2*	6077.4	(31/2)	5612.7	(29/2)		
485.7† *1*	72 *4*	2284.8	(19/2$^+$)	1799.0	(15/2$^+$)	(E2)	B(E2)(W.u.)=0.160 *19*
492.3 *1*	4.9 *3*	6105.0	(31/2)	5612.7	(29/2)		
502.4 *1*	3.9 *8*	2301.2	(17/2$^+$)	1799.0	(15/2$^+$)		
512.9 *1*	4.7 *3*	4504.2		3991.3	(25/2)		

Only 3 γs have multipolarities: (E2)

^{101}Cd – the updated version:

Adopted Levels, Gammas

Q(β^-)=−7292 *12*; S(n)=9713.2 *23*; S(p)=4987 *6*; Q(α)=−456 *5* 2021Wa16
Q(εp)=2087 *18*, S(2n)=22048.0 *22*, S(2p)=8232 *5* (2021Wa16).
The current evaluation uses the previous one performed by J. Blachot in 2006.
A 15-min activity assigned to ^{101}Cd by 1966Bu05 via 340-MeV p on cadmium was not observed by 1970Hn03. The Sn(p,3pxn) yield ratio of activities 15 min/1.2 min < 0.004 (1970Hn03).
1973SiZP reports preliminary results from a ^{92}Mo(^{12}C,3nγ) reaction performed at E(^{12}C)=56 MeV. 1980Ka25 showed that some of the levels assigned to ^{101}Cd by 1973SiZP were ^{101}Ag levels, therefore these unpublished data were not considered.
Theoretical calculations: 2011Li48, 1997Pa20, 1996Pa30, 1992Al17, 2019Sa51, 2019Ve02.

^{101}Cd Levels

Cross Reference (XREF) Flags

A ^{101}In β^+ decay
B ^{50}Cr(^{58}Ni,2pn$\alpha\gamma$)

Transformed (HI, xnγ) dataset into
^{50}Cr(^{58}Ni,2pn$\alpha\gamma$) 1996Pa30, 1992Al17

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0#	5/2(+)	1.36 min *5*	AB	%ε+%β^+=100 μ=−0.8983 *2* Q=−0.177 *7* μ: Deduced from hyperfine parameters measured in 2018Yo07. The μ=−0.8278461 *15* μ_N of ^{109}Cd is used for calibration; uncertainties are statistical only. Q: Deduced from hyperfine parameters measured in 2018Yo07. The uncertainty is obtained by adding in quadrature the statistical (0.002) and the systematic (0.007) uncertainties given by authors.

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^{101}Cd – the updated version:

^{50}Cr(^{58}Ni, 2pn$\alpha\gamma$) dataset:

Levels comment: J^{π}: From 1996Pa30 based on systematics, band sequence, SM comparison and R_{ang}.

Gammas comment: Mult: Based on R_{ang}
+ explained the meaning and possible values of R_{ang}
+ provided all R_{ang} values from 1996Pa30 in comments
+ assigned a few additional Multipolarities based on the values of R_{ang}, as M1 or E2.

Adopted:

Levels comment: J^{π}: J^{π} without comments are preliminary based on $\gamma(\theta)$ in ^{50}Cr(^{58}Ni, 2pn$\alpha\gamma$) (1996Pa30).

Gammas comment: Mult: Based on relative γ intensity at 143° and 79° measured in the ^{50}Cr(^{58}Ni, 2pn$\alpha\gamma$) reaction (1996Pa30).
+ took over all Multipolarities from the dataset.

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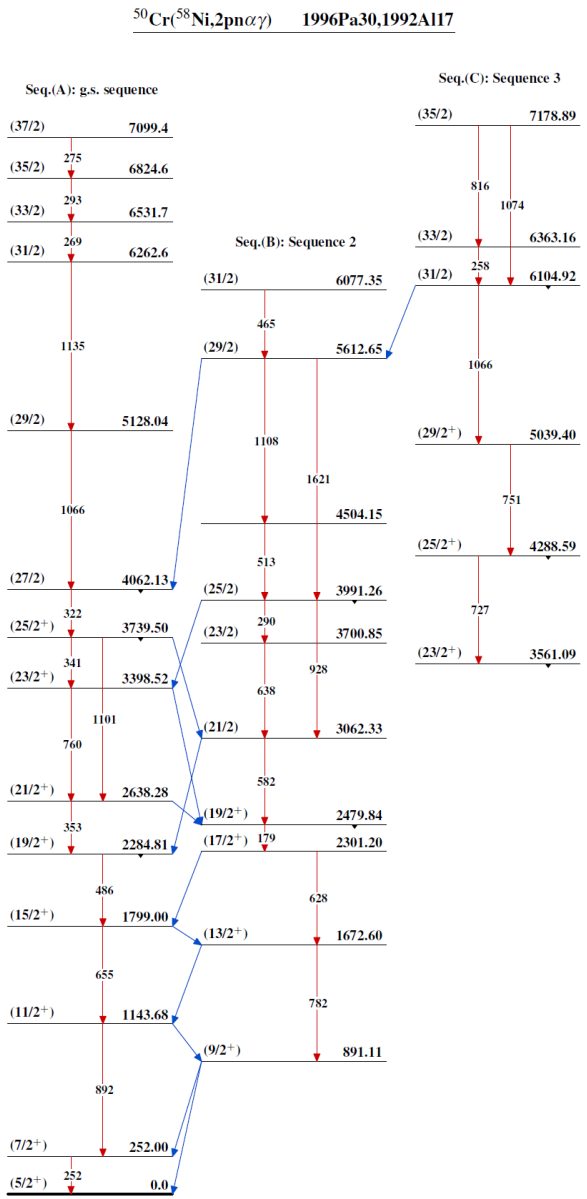
^{101}Cd – the level scheme (both in the old, the new evaluation and in 1996Pa30)



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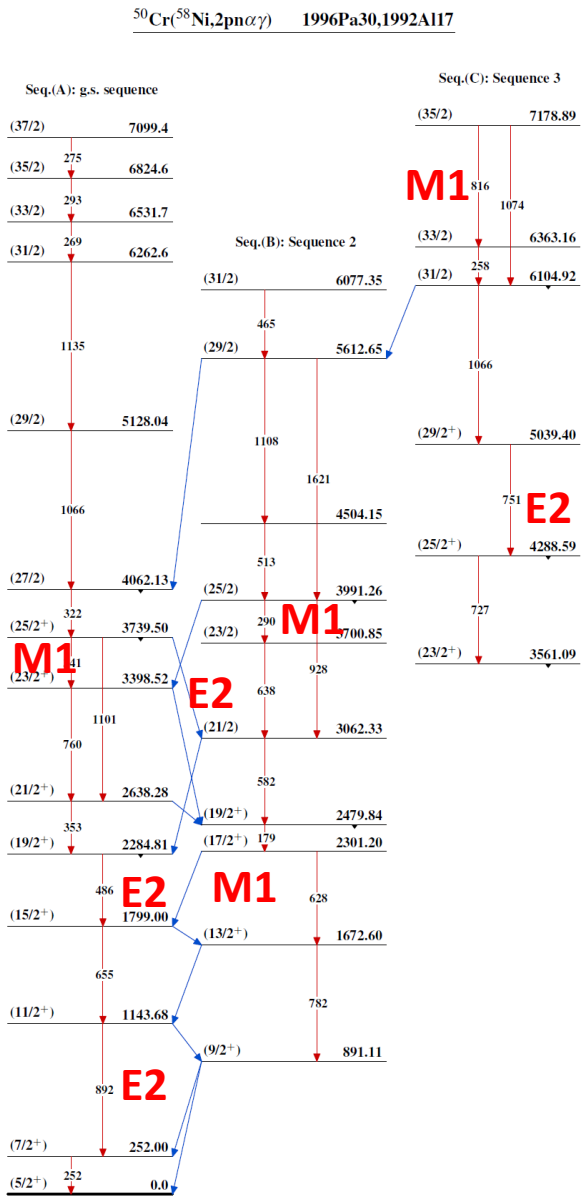
^{101}Cd – the level scheme (both in the old, the new evaluation and in 1996Pa30)



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^{101}Cd – the reviewer comment:

Reviewer comments:

- R_{ang} can only tell you if it's D or Q.
  $\Rightarrow$ all E2s should become Qs and all M1s should become Ds.

- We don't just accept authors Jpi assignments. We as evaluators carefully consider the data and arrive at our own recommendations for Jpi. These assignments should be supported by comments so that the reader can understand what is the basis for the Jpi.

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I totally agree with both statements, but:

- I cannot just turn E2 into Q and M1 into D and leave the J^{π} assignments unchanged:
  it looks strange to state that the (11/2+) -> (7/2+) transition is Q and not E2

- Regarding author's J^{π} assignments: I don't have anything better than "From 1996Pa30 based on systematics, band sequence, SM comparison and R_{ang}"

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Options:

Option1 – severe change:

- Turn all M1s into Ds and E2s into Qs
- Consider that "From 1996Pa30 based on systematics, band sequence, SM comparison and R_{ang}" is not sufficient to set even tentative J^{π} values.

⇒ Remove all spin assignments and keep only a few Qs and Ds, both in Adopted and in the $^{50}Cr(^{58}Ni,2pn\alpha\gamma)$ dataset,

…but then the new evaluation will have much less information than the old one.

Option2 – minimal change:

- Turn all M1s into Ds and E2s into Qs in the $^{50}Cr(^{58}Ni,2pn\alpha\gamma)$ dataset.
- Consider that "From 1996Pa30 based on systematics, band sequence, SM comparison and R_{ang}" is sufficient to set tentative J^{π} values.

⇒ Keep all J^{π} assignments both in Adopted and in the $^{50}Cr(^{58}Ni,2pn\alpha\gamma)$ dataset

⇒ Keep Multipolarities as D and Q in the $^{50}Cr(^{58}Ni,2pn\alpha\gamma)$ dataset

⇒ Multipolarities as M1s and E2s in Adopted

… but then, in the $^{50}Cr(^{58}Ni,2pn\alpha\gamma)$ dataset, we will have silly situations as (11/2+) -> (7/2+) , Q transition.