^{242}Pu(n,γ):secondary γ's 1976Ca25

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan	NDS 121, 695 (2014)	30-Sep-2013

1976Ca25: 288 mg ^{242}Pu target bombarded with 2.66 eV neutrons from Brookhaven high flux beam reactor. Singles and coincidence gammas were detected with Ge(Li) detectors (15-40 cm^3 volume). Typical FWHM= 2.2 keV at 1.33 MeV γ. Pileup reduced with a 1.5 mm Pb absorber.

^{243}Pu Levels

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
0.0	7/2$^+$	446.8 *3*	(5/2$^+$)	845.5 *4*	(5/2$^+$)	1301.7 *5*	1/2,3/2
58.13 *22*	9/2$^+$	625.7 *3*	(1/2$^+$)	873.7? *10*	(1/2$^-$)	1367.9 *6*	1/2,3/2
124.8 *7*	11/2$^+$	653.8 *4*	(3/2$^+$)	905.7 *4*	(1/2$^-$)	1387.4 *4*	3/2$^+$
287.46 *20*	5/2$^+$	677.1 *6*	(5/2$^+$)	948.0 *3*	(3/2$^-$)	1420.5 *6*	(3/2$^+$)
333.22 *24*	7/2$^+$	704.0 *3*	(3/2$^-$)	981.0 *4*	(5/2$^+$)	1434.6 *4*	1/2$^+$,3/2
383.64 *25*	(1/2$^+$)	790.7 *3*	(3/2$^-$)	1130.2 *3*	(1/2$^+$,3/2)	1516.6 *10*	(3/2$^-$)
392.1 *3*	(3/2$^+$)	809.6 *4*	1/2$^+$,3/2	1176.5 *3*	3/2$^+$,5/2$^+$		
402.6 *3*	9/2$^-$	813.76 *17*	3/2$^+$	1213 *2*	(5/2$^-$)		

† From least squares fit to Eγ data.
‡ From Adopted Levels.

γ(^{243}Pu)

Iγ normalization: Intensities normalized to Iγ(381γ) from ^{243}Pu decay =0.58 *6* per 100 β- decays.
Iγ(β,P,K) Broad peak; Iγ is for total peak.

E$_\gamma$†	I$_\gamma$‡[a]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
(58.1)		58.13	9/2$^+$	0.0	7/2$^+$	E$_\gamma$: γ was not observed in (n,γ); Eγ is from adopted level energies.
(96.2 *2*)		383.64	(1/2$^+$)	287.46	5/2$^+$	E$_\gamma$: from (d,pγ). This gamma was not seen in (n,γ).
(125)		124.8	11/2$^+$	0.0	7/2$^+$	E$_\gamma$: γ was not observed in (n,γ); Eγ is from (^{208}Pb,^{209}Pb γ).
159.2 *13*	5 *2*	813.76	3/2$^+$	653.8	(3/2$^+$)	
x185.7 *7*	14 *4*					
219.9[c] *3*	6 *2*	873.7?	(1/2$^-$)	653.8	(3/2$^+$)	
229.3 *2*	9 *2*	287.46	5/2$^+$	58.13	9/2$^+$	
233.9 *6*	2.2 *7*	625.7	(1/2$^+$)	392.1	(3/2$^+$)	
242.0 *2*	44 *8*	625.7	(1/2$^+$)	383.64	(1/2$^+$)	
261.7 *3*	6 *2*	653.8	(3/2$^+$)	392.1	(3/2$^+$)	
275.1 *2*	11 *2*	333.22	7/2$^+$	58.13	9/2$^+$	
(278.0 *8*)	0.76 *19*	402.6	9/2$^-$	124.8	11/2$^+$	E$_\gamma$: from ^{247}Cm α decay; this γ was not seen in (n,γ). I$_\gamma$: from I(278γ)/I(402γ)=3.4 *7*/72 *6*, as measured in ^{247}Cm α decay.
284.4[c] *3*	10 *4*	677.1	(5/2$^+$)	392.1	(3/2$^+$)	
287.4 *3*	496 *67*	287.46	5/2$^+$	0.0	7/2$^+$	
333.0 *10*	7[@] *3*	333.22	7/2$^+$	0.0	7/2$^+$	
343.9[bc] *2*	13.2 *18*	677.1	(5/2$^+$)	333.22	7/2$^+$	
343.9[b] *2*	13.2 *18*	790.7	(3/2$^-$)	446.8	(5/2$^+$)	
344.5 *5*	≈0.3	402.6	9/2$^-$	58.13	9/2$^+$	E$_\gamma$: γ was obscured by 343.9γ; energy is from level scheme. I$_\gamma$: from I(402γ)/I(345γ)=72 *6*/≈1.3, as measured in ^{247}Cm α decay.

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^{242}Pu(n,γ):secondary γ's 1976Ca25 (continued)

$\gamma(^{243}Pu)$ (continued)

E_γ[†]	I_γ[‡a]	E_i(level)	J_i^π	E_f	J_f^π
385.7 *3*	3.0 *5*	1176.5	$3/2^+,5/2^+$	790.7	$(3/2^-)$
[x]400.8 *3*	16.1 *18*				
402.6 *3*	16.1 *18*	402.6	$9/2^-$	0.0	$7/2^+$
407.1 *3*	9.5 *11*	790.7	$(3/2^-)$	383.64	$(1/2^+)$
416.5 *2*	61 *7*	704.0	$(3/2^-)$	287.46	$5/2^+$
426.0[b] *6*	2.2 *7*	809.6	$1/2^+,3/2$	383.64	$(1/2^+)$
426.0[b] *6*	2.2 *7*	1130.2	$(1/2^+,3/2)$	704.0	$(3/2^-)$
439.4 *3*	2.7 *4*	1387.4	$3/2^+$	948.0	$(3/2^-)$
[x]444.6 *3*	7.2 *8*				
480.6 *3*	5.8 *6*	813.76	$3/2^+$	333.22	$7/2^+$
501.2 *3*	10.8 *12*	948.0	$(3/2^-)$	446.8	$(5/2^+)$
513.6 *3*	22.8 *27*	905.7	$(1/2^-)$	392.1	$(3/2^+)$
[x]516.2 *3*	6.4 *7*				
522.1[b] *3*	7.7 *9*	809.6	$1/2^+,3/2$	287.46	$5/2^+$
522.1[b] *3*	7.7 *9*	905.7	$(1/2^-)$	383.64	$(1/2^+)$
526.2 *3*	18.5 *20*	813.76	$3/2^+$	287.46	$5/2^+$
533.9 *4*	3.5[#] *7*	981.0	$(5/2^+)$	446.8	$(5/2^+)$
[x]546.9 *4*	3.2 *16*				
551.7[&c] *5*	1.5 *4*	1176.5	$3/2^+,5/2^+$	625.7	$(1/2^+)$
555.7 *5*	9.3[@] *31*	948.0	$(3/2^-)$	392.1	$(3/2^+)$
558.0 *3*	8.5 *9*	845.5	$(5/2^+)$	287.46	$5/2^+$
[x]560.3 *5*	2.0 *7*				
564.7 *4*	18.3 *20*	948.0	$(3/2^-)$	383.64	$(1/2^+)$
[x]566.3 *4*	14.3 *20*				
[x]573.3 *6*	2.1 *7*				
589.1 *3*	4.4 *5*	981.0	$(5/2^+)$	392.1	$(3/2^+)$
[x]600.5[&c] *4*	1.6 *6*				
[x]606.9 *6*	1.0 *5*				
[x]609.8 *3*	5.8 *7*				
[x]619.3 *7*	0.8 *4*				
625.2[&c] *2*	5.5 *6*	1434.6	$1/2^+,3/2$	809.6	$1/2^+,3/2$
[x]633.8 *5*	2.7 *4*				
[x]637.8 *3*	2.8 *4*				
644.2 *4*	2.1 *5*	1434.6	$1/2^+,3/2$	790.7	$(3/2^-)$
648.8[bc] *8*	1.9 *5*	981.0	$(5/2^+)$	333.22	$7/2^+$
648.8[bc] *8*	1.9 *5*	1301.7	1/2,3/2	653.8	$(3/2^+)$
[x]656.3 *2*	5.1 *6*				
[x]662.3 *5*	6.3[#] *7*				
663.9 *6*	4.5 *7*	1367.9	1/2,3/2	704.0	$(3/2^-)$
[x]668.5 *6*	0.9 *5*				
676.0 *3*	5.1 *5*	1301.7	1/2,3/2	625.7	$(1/2^+)$
[x]679.2[&c] *6*	2.5 *10*				
683.4[b] *4*	3.1 *4*	1130.2	$(1/2^+,3/2)$	446.8	$(5/2^+)$
683.4[b] *4*	3.1 *4*	1387.4	$3/2^+$	704.0	$(3/2^-)$
693.5 *7*	1.4[#] *5*	981.0	$(5/2^+)$	287.46	$5/2^+$
714.7[&c] *11*	1.4 *7*	1367.9	1/2,3/2	653.8	$(3/2^+)$
716.9[c] *5*	1.9 *4*	1420.5	$(3/2^+)$	704.0	$(3/2^-)$
730.1 *7*	1.2 *4*	1176.5	$3/2^+,5/2^+$	446.8	$(5/2^+)$
738.2 *3*	4.6 *5*	1130.2	$(1/2^+,3/2)$	392.1	$(3/2^+)$
746.4 *3*	5.8 *6*	1130.2	$(1/2^+,3/2)$	383.64	$(1/2^+)$
[x]752.7 *4*	1.6 *5*				
757.5 *4*	2.4 *4*	1434.6	$1/2^+,3/2$	677.1	$(5/2^+)$
781.1[&c] *12*	1.4 *9*	1434.6	$1/2^+,3/2$	653.8	$(3/2^+)$

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^{242}Pu(n,γ):secondary γ's 1976Ca25 (continued)

$\gamma(^{243}Pu)$ (continued)

E_γ [†]	I_γ [‡ a]	E_i(level)	J_i^π	E_f	J_f^π	Comments
787.5 *8*	2.9 *14*	845.5	(5/2$^+$)	58.13	9/2$^+$	
x791.3 *3*	5.8 *15*					
x805.9 *12*	2.9 *9*					
813.8 *2*	17.7 *18*	813.76	3/2$^+$	0.0	7/2$^+$	
x830.9 &c *5*	1.5 *10*					
838.7 c *5*	2.1 *10*	1516.6	(3/2$^-$)	677.1	(5/2$^+$)	Partially resolved from the 841.3-keV γ.
x841.3 *8*	1.7 *4*					
844.3 bc *8*	2.2 *4*	845.5	(5/2$^+$)	0.0	7/2$^+$	
844.3 bc *8*	2.2 *4*	1176.5	3/2$^+$,5/2$^+$	333.22	7/2$^+$	
x847.7 *3*	5.7 *6*					
x850.3 *3*	5.1 *5*					
x862.0 *8*	4.0 *10*					
x867.3 *3*	5.0 *5*					
x871.4 &c *5*	2.7 *11*					
x874.1 *4*	4.5 *5*					
879.8 &c *10*	1.5 *7*	1213	(5/2$^-$)	333.22	7/2$^+$	
x887.3 *6*	9.0 *22*					Partially resolved from 889.1γ.
889.1 *6*	22.3 *30*	1176.5	3/2$^+$,5/2$^+$	287.46	5/2$^+$	Partially resolved from the 887.3-keV γ.
x894.6 *10*	2.4 *8*					
x902.8 *4*	8.4 *9*					
x913.3 *3*	6.2 *6*					
918.0 *10*	2.2 *8*	1301.7	1/2,3/2	383.64	(1/2$^+$)	
925.3 c *10*	2.0 *10*	1213	(5/2$^-$)	287.46	5/2$^+$	Partially resolved from the 930.9-keV γ.
x930.9 *12*	3.2 *10*					
976.0 *12*	3.8 *19*	1367.9	1/2,3/2	392.1	(3/2$^+$)	
x999.5 *12*	2.0 *6*					
x1009 *1*	2.5 *10*					
x1015.6 *4*	4.0 *5*					
x1022.6 *4*	5.7 *11*					
1028.4 &c *10*	1.2 *18*	1420.5	(3/2$^+$)	392.1	(3/2$^+$)	Partially resolved from the 1030.9-keV γ.
x1030.9 &c *8*	3.2 *13*					
1042.1 *5*	4.0 *6*	1434.6	1/2$^+$,3/2	392.1	(3/2$^+$)	
x1045.0 *13*	4.0 *18*					
x1050.1 *5*	2.3 *5*					
1053.8 *10*	2.9 *11*	1387.4	3/2$^+$	333.22	7/2$^+$	Partially resolved from the 1055.9-keV γ.
x1055.9 *10*	4.1 *13*					
x1070.3 *4*	2.2 *4*					
1087.1 &c *8*	3.1 *16*	1420.5	(3/2$^+$)	333.22	7/2$^+$	
x1091.4 *6*	5.1 *13*					
x1162.8 &c *6*	1.9 *7*					
x1169.9 *8*	3.1 *12*					
1176.5 *5*	11.6 *24*	1176.5	3/2$^+$,5/2$^+$	0.0	7/2$^+$	
x1180.4 &c *8*	1.3 *7*					
x1191.2 *3*	8.3 *10*					
x1197.6 *6*	3.5 *14*					
x1202.0 *3*	5.9 *7*					

[†] Measurements of 1976Ca25.
[‡] From 1976Ca25, given as per 1000 neutron captures. Relative intensities were normalized by the evaluator such that Iγ(381γ) from ^{243}Pu β^- decay= 0.58 *6* per 100 ^{243}Pu decays.
[#] Intensity may contain a small amount of contaminant (1976Ca25).
[@] Up to 25% of the intensity may be due to contaminant (1976Ca25).

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^{242}Pu(n,γ):secondary γ's 1976Ca25 (continued)

$\gamma(^{243}Pu)$ (continued)

& Questionable γ for which contaminant origin cannot be completely ruled out (1976Ca25).
[a] For intensity per 100 neutron captures, multiply by 0.083 *9*.
[b] Multiply placed.
[c] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

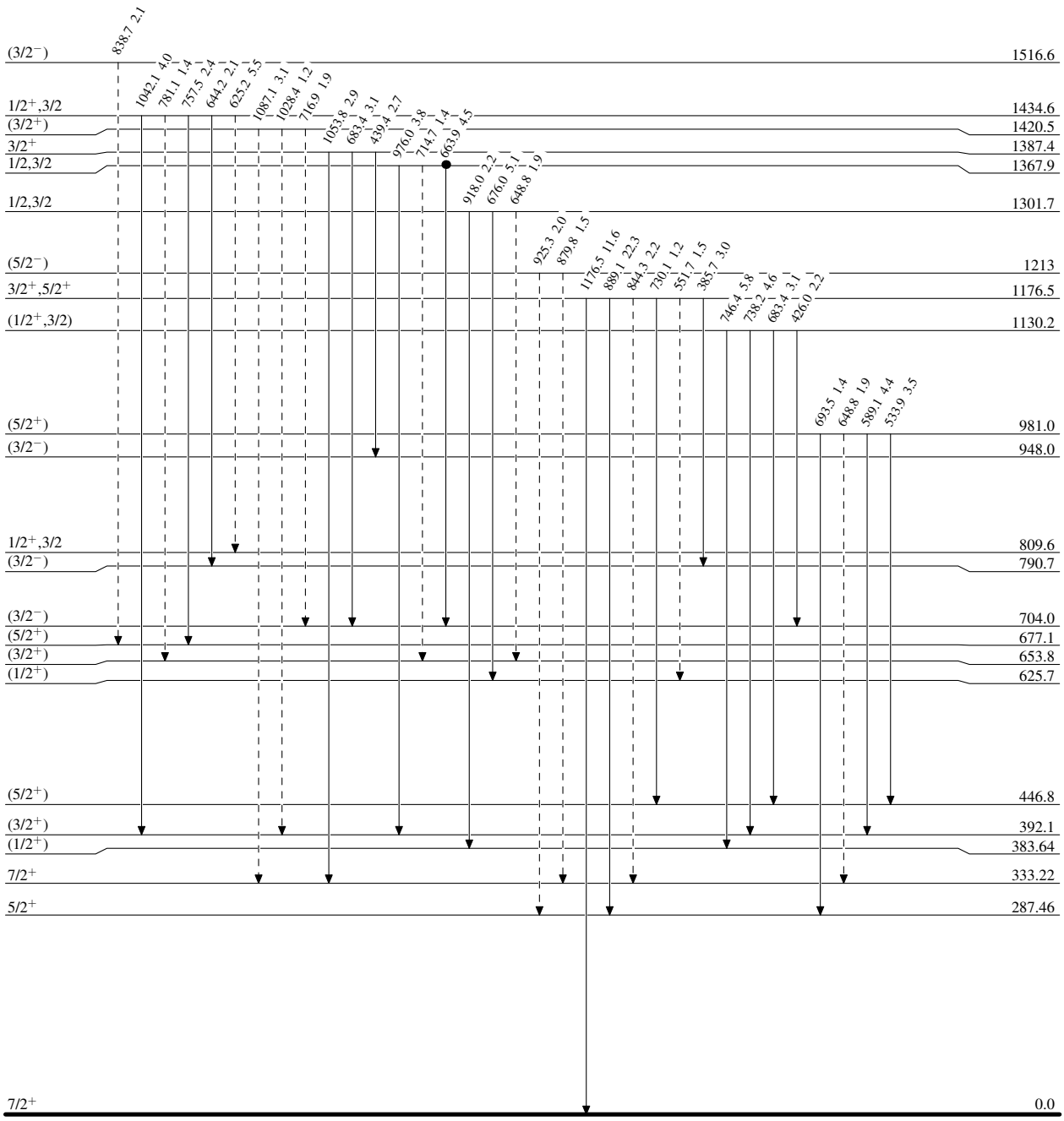
^{242}Pu(n,γ):secondary γ's 1976Ca25

Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence

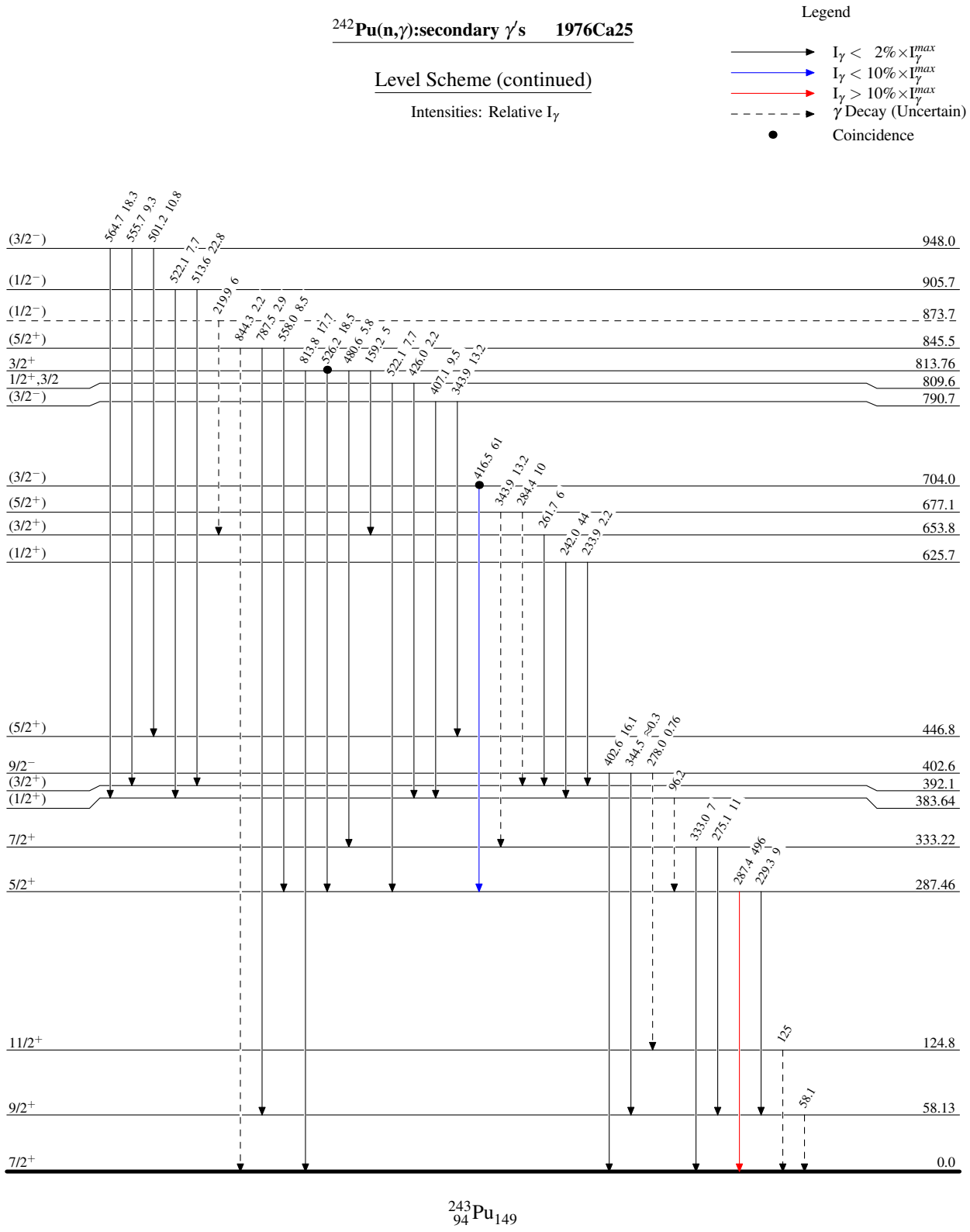


$^{243}_{94}Pu_{149}$

^{242}Pu(n,γ):secondary γ's 1976Ca25

Level Scheme (continued)

Intensities: Relative I_γ



$^{243}_{94}Pu_{149}$