^{231}Pa(pol d,t) 2013Ko11

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 197,259 (2024).	26-Sep-2023

2013Ko11 (also 2012Ko37): E=22 MeV, 80% polarized deuteron beam from the Garching/Munich Tandem accelerator at the Maier-Leibnitz- Laboratory. Target=140 μg/cm^2 radioactive (28 KBq) ^{231}Pa. Measured triton spectra, $\sigma(\theta)$ using the Munich Q3D magnetic spectrometer and multiwire proportional chamber. Calibration done using known spectra from ^{234}U(d,t)^{233}U and ^{230}Th(d,t)^{229}Th reactions. FWHM=6.9 keV to 12.6 keV. Deduced levels, J, π, bands, configurations. DWBA analysis. In 2012Ko37, eleven excited states up to 199 keV were reported.

^{230}Pa Levels

E(level)[†]	J$^\pi$[#]	Comments
0[@]	2$^-$	
28[@] *1*	(3$^-$)	
48[&] *1*	(2$^-$)	
66[@] *1*	(4$^-$)	
69[&] *2*	(3$^-$)	
104[&] *1*	(4$^-$)	
112[@] *1*	(5$^-$)	
146[&] *1*	(5$^-$)	
157[a] *1*	(3$^-$)	
170[@] *1*	(6$^-$)	
199[a] *1*	(4$^-$)	In 2012Ko37, this level was considered as possible 6$^-$ member of configuration=π1/2[530]-ν5/2[633], K^π=2$^-$.
202[b] *1*	(0$^-$)	
223 *1*		
237[b] *1*	(2$^-$)	
247[a] *1*	(5$^-$)	
259[c] *1*	(1$^-$)	
284[c] *1*	(2$^-$)	
297[b] *1*	(1$^-$)	
312[‡a] *1*	(6$^-$)	
312[‡c] *1*	(3$^-$)	
322[b] *1*	(4$^-$)	
341[d] *1*	(1$^-$)	
350[c] *1*	(4$^-$)	
357[b] *1*	(3$^-$)	
373[d] *1*	(2$^-$)	
401[c] *1*	(5$^-$)	
409 *1*		
423[d] *1*	(3$^-$)	
437 *1*		
455[b] *1*	(6$^-$)	
465[‡b] *1*	(5$^-$)	
465[‡c] *1*	(6$^-$)	
488[‡d] *1*	(4$^-$)	
488[‡e] *1*	(0$^+$)	
497 *1*		
506 *1*		
518[e] *1*	(2$^+$)	

Continued on next page (footnotes at end of table)

^{231}Pa(pol d,t) 2013Ko11 (continued)

^{230}Pa Levels (continued)

E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]
532 *1*		735[g] *1*	(2$^+$)	944 *1*		1145 *1*	
538 *1*		747[f] *1*	(3$^+$)	958[h] *1*	(3$^+$)	1163[j] *1*	(5$^+$)
559[e] *1*	(1$^+$)	755 *1*		969[i] *1*	(4$^+$)	1173 *1*	
580 *1*		772[g] *1*	(3$^+$)	992 *1*		1195 *1*	
594[e] *1*	(4$^+$)	795[f] *1*	(4$^+$)	1012 *1*		1211[h] *1*	(6$^+$)
605 *1*		807 *1*		1026[‡h] *1*	(4$^+$)	1218 *1*	
618[e] *1*	(3$^+$)	828[g] *1*	(4$^+$)	1026[‡i] *1*	(5$^+$)	1243 *1*	
634 *1*		865 *1*		1035[j] *1*	(3$^+$)	1256 *1*	
641 *1*		873[h] *1*	(1$^+$)	1057 *1*		1318 *1*	
662 *1*		887[i] *1*	(2$^+$)	1092[j] *1*	(4$^+$)	1336 *1*	
689[f] *1*	(1$^+$)	906[h] *1*	(2$^+$)	1112[h] *1*	(5$^+$)	1349 *1*	
713[f] *1*	(2$^+$)	921[i] *1*	(3$^+$)	1129 *1*		1361 *1*	

[†] Uncertainty is approximately 1 keV, determined from both the statistical uncertainty in the peak position and the uncertainty in the calibration polynomial.

[‡] 312, 465, 488 and 1026 are interpreted as doublets from analysis of measured cross sections and comparison with theoretical values for assigned configurations.

[#] From fingerprint method (2013Ko11).

[@] Band(A): K^{π}=2$^-$, π1/2[530]+ν3/2[631]. While configuration=π1/2[530]+ν3/2[631], K^{π}=2$^-$ is more probable, π1/2[530]-ν5/2[633], K^{π}=2$^-$ cannot be ruled out.

[&] Band(B): K^{π}=2$^-$, π1/2[530]-ν5/2[633]. While configuration=π1/2[530]-ν5/2[633], K^{π}=2$^-$ is more probable, π1/2[530]+ν3/2[631], K^{π}=2$^-$ cannot be ruled out.

[a] Band(C): K^{π}=3$^-$, π1/2[530]+ν5/2[633].

[b] Band(D): K^{π}=0$^-$, π1/2[530]-ν1/2[631].

[c] Band(E): K^{π}=1$^-$, π1/2[530]-ν3/2[631].

[d] Band(F): K^{π}=1$^-$, π1/2[530]+ν1/2[631].

[e] Band(G): K^{π}=0$^+$, π1/2[530]-ν1/2[501].

[f] Band(H): K^{π}=1$^+$, π1/2[530]+ν1/2[501].

[g] Band(I): K^{π}=2$^+$, π1/2[530]+ν3/2[501].

[h] Band(J): K^{π}=1$^+$, π1/2[530]-ν3/2[501].

[i] Band(K): K^{π}=2$^+$, π1/2[530]-ν5/2[503].

[j] Band(L): K^{π}=3$^+$, π1/2[530]+ν5/2[503].

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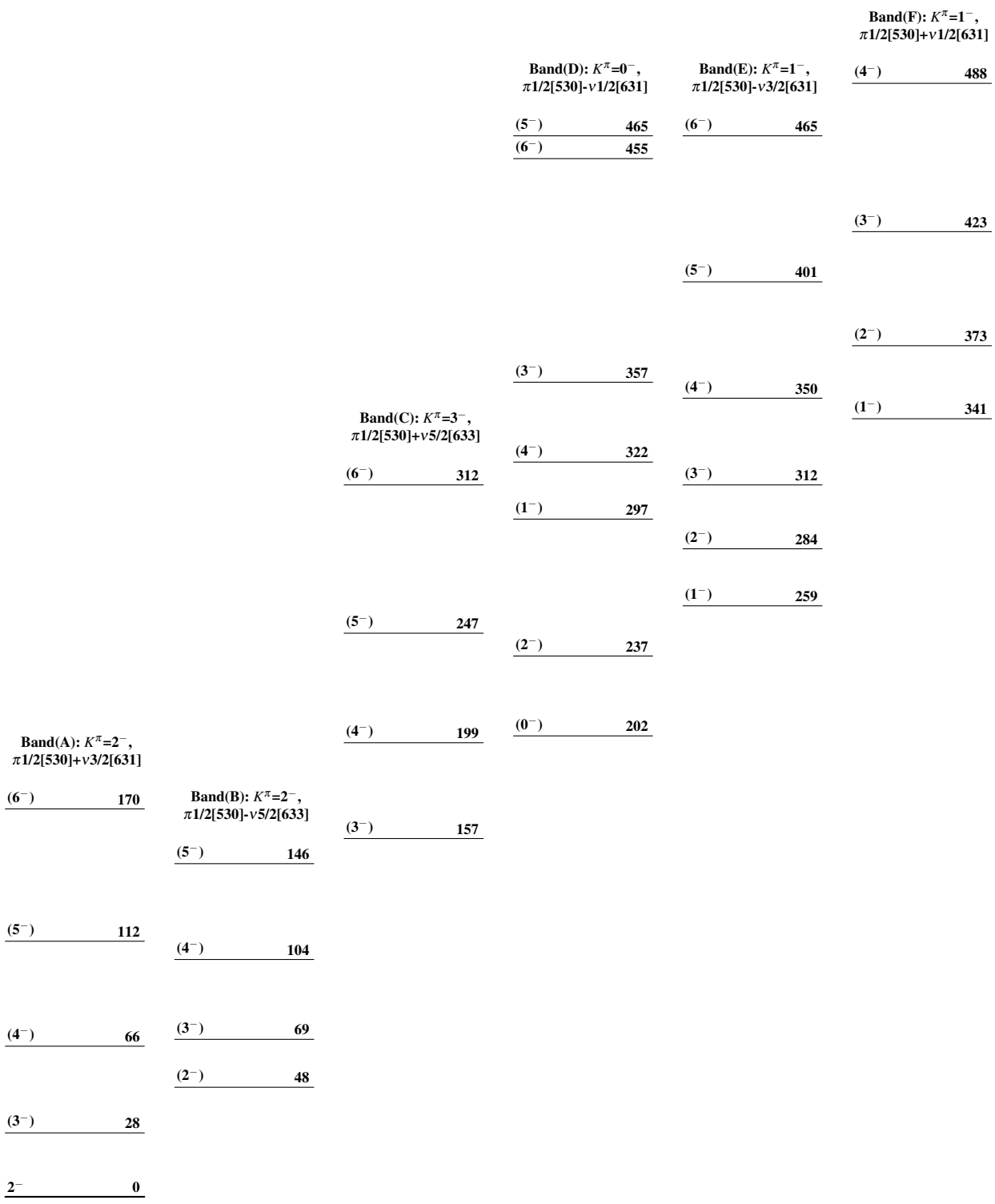

^{231}Pa(pol d,t) 2013Ko11 (continued)

Band(J): K^{π}=1^{+}, π1/2[530]-ν3/2[501]

(6^{+})	1211
(5^{+})	1112
(4^{+})	1026
(3^{+})	958
(2^{+})	906
(1^{+})	873

Band(L): K^{π}=3^{+}, π1/2[530]+ν5/2[503]

(5^{+})	1163
(4^{+})	1092
(3^{+})	1035

Band(K): K^{π}=2^{+}, π1/2[530]-ν5/2[503]

(5^{+})	1026
(4^{+})	969
(3^{+})	921
(2^{+})	887

Band(I): K^{π}=2^{+}, π1/2[530]+ν3/2[501]

(4^{+})	828
(3^{+})	772
(2^{+})	735

Band(H): K^{π}=1^{+}, π1/2[530]+ν1/2[501]

(4^{+})	795
(3^{+})	747
(2^{+})	713
(1^{+})	689

Band(G): K^{π}=0^{+}, π1/2[530]-ν1/2[501]

(3^{+})	618
(4^{+})	594
(1^{+})	559
(2^{+})	518
(0^{+})	488

$^{230}_{91}Pa_{139}$