^{102}Pd(^{58}Ni,2p2nγ) 2005Se11

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 2537 (2012)	1-Mar-2012

Additional information 1.

2005Se11: E(^{58}Ni)=270 MeV. 1 mg/cm^2−thick ^{102}Pd target (69% enrichment). Reaction products studied using the Gammasphere array of Compton-suppressed HPGe detectors and the Argonne Fragment Mass Analyzer. Recoils implanted in a double-sided Si-strip detector. Measured Eγ, Iγ, γγ, fragment-γ coin, angular-distribution ratios.

1997SeZS: E(^{58}Ni)=270 MeV. 1 mg/cm^2 ^{102}Pd target (enrichment not given). γ radiation studied using the "AYE-ball" array of 16 HPGe detectors and 2 LEPS detectors and assigned to the various reaction channels using recoil-decay tagging techniques. Recoil nuclei analyzed using a fragment mass analyzer and detected in a double-sided Si-strip detector.

1997Ca40 give similar information on this reaction.

2005Se11 state that their study is a continuation of an earlier study (1997SeZS) by many of the same authors. It is considerably more extensive than that of 1997SeZS. The evaluator assumes that these later data supersede those of the earlier studies; and those are not listed here.

Unless noted otherwise, the data listed here are from 2005Se11.

^{156}Hf Levels

E(level)[†‡]	Jπ[#]	$T_{1/2}$[@]	Comments
0[&]	0$^+$	23 ms *1*	%α≈100
857.2[&]	2$^+$		
1454.2[a]	(2$^+$)		
1585.2[&]	4$^+$		
1959[b] *6*	8$^+$	0.52 ms *1*	%α=100 E(level): Computed from the difference in the Q(α) values of the 7782 and 5873 α transitions from the 8$^+$ state and the g.s., respectively, to the ^{152}Yb g.s. (1996Pa01). Jπ: From the adopted values. Probable configuration=$((\nu\ h_{9/2})(\nu\ f_{7/2}))_{8+}$.
2000.2[&]	6$^+$		
2221.6[a]	(4$^+$)		
2547.8[a]	(6$^+$)		
2878.2[c]	10$^+$		
3189.6	11$^-$		Jπ: E3 transition to 8$^+$. Level interpreted as $((\nu\ h_{9/2})(\nu\ f_{7/2}))_{8+}$ coupled to a 3$^-$ phonon.
3336.7[d]	(10$^+$)		Jπ: Member of the $((\nu\ h_{9/2})(\nu\ f_{7/2}))\otimes(6^+)$ multiplet.
3678.3[c]	12$^+$		
3816.5[d]	(12$^+$)		Jπ: Stretched conf: $(\nu\ f_{7/2})^2\otimes(6^+)$.
3996.9[d]	(14$^+$)		Jπ: Proposed conf is $((\nu\ h_{9/2})(\nu\ f_{7/2}))_{8+}$ coupled to two octupole phonons (Jπ=6$^+$) (2005Se11).
4264.5[c]	14$^+$		
4384.0[d]	(14$^+$)		Jπ: possible conf is $((\nu\ h_{9/2})(\nu\ f_{7/2}))\otimes(6^+)$.
4482.5	(16$^+$)		Suggested (2005Se11) as the 16$^+$ member of the $(((\nu\ h_{9/2})(\nu\ f_{7/2}))_{8+})\otimes(\ (\pi\ h_{11/2})^2_{10+})$ multiplet.
4590.6			
4592.5			
4812.6[c]	(16$^+$)		Jπ: Possible 16$^+$ member of the indicated multiplet (2005Se11).
5019.3			

† From a least-squares fit by the evaluator to the listed Eγ values. Equal uncertainties (1 keV) were assigned to these values. No uncertainties are listed for the resulting level energies.

‡ The energy of the 8$^+$ isomer was computed from the difference of the Q(α) values of the 7782 and 5873 α transitions from the 8$^+$ state and the g.s., respectively, to the ^{152}Yb g.s. 2005Se11 use the value 1977 keV for this quantity, presumably from 1981HoZM. Thus, the energies of the levels based on this state are 18 keV lower than those reported in 2005Se11.

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^{102}Pd(^{58}Ni,2p2nγ) 2005Se11 (continued)

^{156}Hf Levels (continued)

Unless noted otherwise, based on multipolarities deduced (but not explicitly given) from angular-distribution data (2005Se11), together with comparison with the systematics of levels in the lighter-mass doubly even N=84 nuclides, supplemented by detailed shell-model calculations.
@ From adopted values.
& Band(A): $(\nu\ f_{7/2})^2$ multiplet.
a Band(B): possible $(\nu\ h_{9/2})^2$ multiplet.
b Band(C): 8^+ isomer, conf=$((\nu\ h_{9/2})(\nu\ f_{7/2}))_{8+}$.
c Band(D): $(\nu\ f_{7/2})^2\otimes(\pi\ h_{11/2})^2_{10+}$ multiplet.
d Band(E): Two-phonon-octupole ($J^\pi=6^+$)−based excitations.

γ(^{156}Hf)

The angular-distribution ratio, R_{ang}, is defined as $R_{ang}=I\gamma(\approx180°)/I\gamma(\approx90°)$. These data presumably give information regarding the mult of the respective transition, but 2005Se11 do not list the range of values which corresponds to the various mults.
I(Kα x ray)=79 *10*, I(Kβ x ray)=31 *6*.

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
x133.5	12 *3*					R_{ang}=1.6 *7*.
180.4	21 *2*	3996.9	(14+)	3816.5	(12+)	R_{ang}=1.3 *4*.
206.7	23 *3*	5019.3		4812.6	(16+)	R_{ang}=0.66 *21*.
208.5	10 *2*	4592.5		4384.0	(14+)	
218.0	12.6 *17*	4482.5	(16+)	4264.5	14+	R_{ang}=1.2 *5*.
x255.0	8.4 *15*					
311.0	38 *3*	3189.6	11−	2878.2	10+	R_{ang}=0.78 *18*.
x317.3	13 *2*					R_{ang}=0.51 *19*.
x388.3	9.7 *18*					
415.0	35 *3*	2000.2	6+	1585.2	4+	R_{ang}=1.06 *25*.
x428.8	8.4 *19*					
x434.1	18 *2*					
x469.4	15 *2*					
480.2	24 *3*	3816.5	(12+)	3336.7	(10+)	R_{ang}=1.0 *3*.
x524.6	9 *2*					
547.6	20 *2*	2547.8	(6+)	2000.2	6+	R_{ang}=1.9 *7*.
548.1	15 *3*	4812.6	(16+)	4264.5	14+	
567.5	18 *3*	4384.0	(14+)	3816.5	(12+)	
x579.3	10 *3*					R_{ang}=0.9 *3*.
586.2	50 *5*	4264.5	14+	3678.3	12+	R_{ang}=1.9 *5*.
x591.8	16 *3*					R_{ang}=1.5 *6*.
597		1454.2	(2+)	857.2	2+	
x600.4	26 *4*					
626.5	17 *3*	3816.5	(12+)	3189.6	11−	R_{ang}=2.3 *7*.
636.4	18 *3*	2221.6	(4+)	1585.2	4+	R_{ang}=0.7 *3*.
x673.8	13 *3*					
728.0	80 *5*	1585.2	4+	857.2	2+	R_{ang}=0.84 *17*.
x779.7	9 *2*					
x788.0	14 *3*					
800.1	100 *6*	3678.3	12+	2878.2	10+	R_{ang}=1.4 *3*. Placement is that shown on the level scheme of 2005Se11. In their table of γ-ray properties, they show it as a 10+→8+ transition.
x818.4	15 *3*					
857.2	100 *19*	857.2	2+	0	0+	R_{ang}=1.01 *19*.
912.3	29 *4*	4590.6		3678.3	12+	
918.8	77 *6*	2878.2	10+	1959	8+	R_{ang}=1.6 *4*.

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^{102}Pd(^{58}Ni,2p2nγ) 2005Se11 (continued)

γ(^{156}Hf) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
						Placement is that shown on the level scheme of 2005Se11. In their table of γ-ray properties, they show it as a 12+→10$^+$ transition.
1230.7	15 *3*	3189.6	11$^-$	1959	8$^+$	Mult.: Assigned as E3 by 2005Se11, but no basis given for it.
[x]1317.8	11 *3*					
1378.0	25 *4*	3336.7	(10$^+$)	1959	8$^+$	R_{ang}=1.1 *4*.

[x] γ ray not placed in level scheme.

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Level Scheme

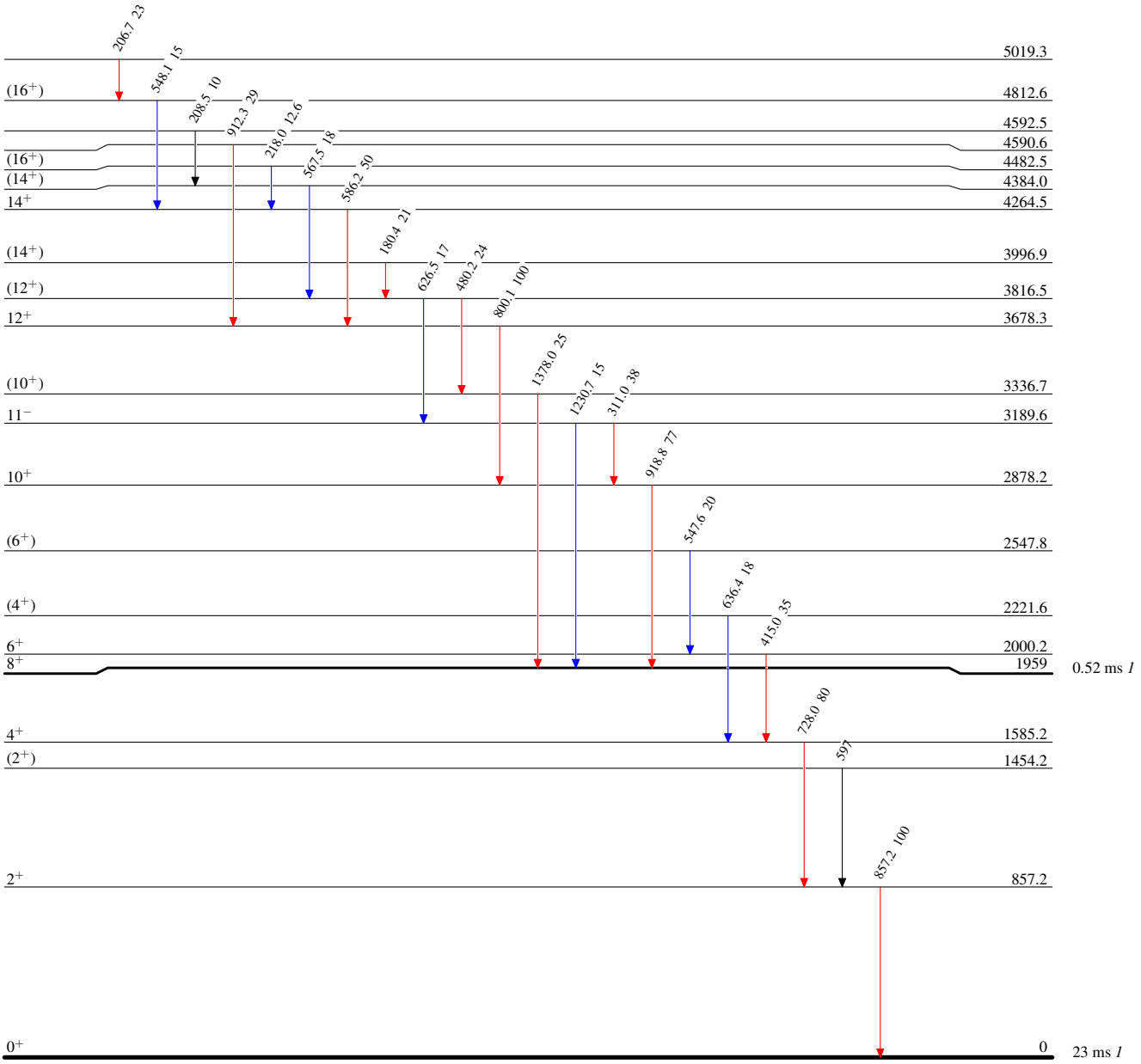
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

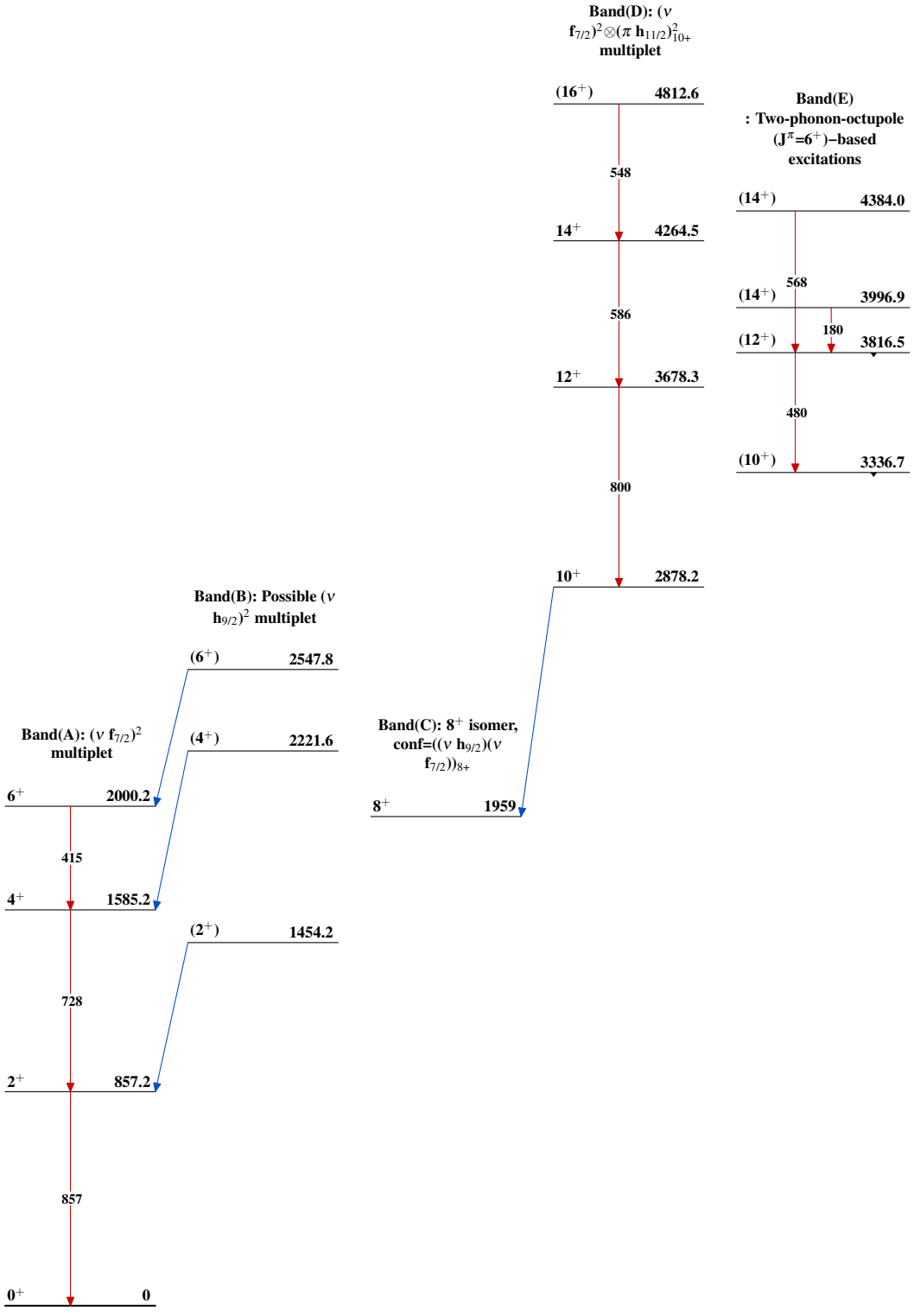
$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



$^{156}_{72}Hf_{84}$

^{102}Pd(^{58}Ni,2p2nγ) 2005Se11



$^{156}_{72}Hf_{84}$