^{9}Be(^{48}Ca,pnγ) 2011De20,2007Zh37

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	30-Apr-2022

2011De20, 2007Zh37: E(^{48}Ca)=172 MeV beam produced by the ATLAS-ANL facility. Target=1.0 mg/cm^2 thick ^{9}Be. Gammasphere array with 101 Compton suppressed HPGe detectors used for prompt γ-rays. Reaction products were identified by the Fragment Mass Analyzer (FMA) by their mass-to-charge ratio, and energy loss. Measured Eγ, Iγ, $\gamma\gamma$-coin, and $\gamma(\theta)$. Deduced levels and J^{π}. Comparison with shell model calculations.

Other:

2008LuZZ: ^{238}U(^{64}Ni,X),E=400 MeV and ^{238}U(^{70}Zn,X), E=460 MeV. Measured prompt γ spectra using CLARA-PRISMA set-up at the LNL Tandem-ALPI accelerator complex, where two γ rays were reported in ^{55}V at 1434 and 1076 keV, first placed from 1434, (11/2$^-$) level to the g.s., and the second from 2510, (15/2$^-$) level to the 1434 level, in agreement with results from 2007Zh37 and 2011De20.

All data are from 2011De20.

^{55}V Levels

E(level)[†]	J$^{\pi}$[‡]	E(level)[†]	J$^{\pi}$[‡]	E(level)[†]	J$^{\pi}$[‡]	E(level)[†]	J$^{\pi}$[‡]
0.0[#]	7/2$^-$	1942.8 *4*	11/2$^-$	3479.2 *6*	15/2$^-$	5039.1 *10*	(19/2$^-$)
323.8 *3*	5/2$^-$	2176.40 *25*	11/2$^-$	3826.9 *6*	(15/2$^-$)	5170.8[#] *4*	21/2$^{(+)}$
671.90 *19*	3/2$^-$	2508.11[#] *14*	15/2$^-$	4364.6 *5*	17/2$^{(+)}$	5350.2 *6*	19/2,21/2$^{(+)}$
1433.10[#] *10*	11/2$^-$	2630.2 *3*	13/2$^-$	4421.8 *5*	17/2$^-$	5695.8[#] *4*	23/2$^{(+)}$
1570.0 *3*	9/2$^-$	2642.7 *4*	11/2$^-$,13/2$^-$	4695.5 *9*	19/2$^-$	6620.7 *5*	23/2$^{(+)}$
1570.4 *6*	(3/2$^-$)	2916.4 *4*	(13/2$^-$)	4750.2[#] *4*	19/2$^{(+)}$	7012.7[#] *5*	25/2$^{(+)}$
1620.8 *4*	9/2$^-$	3165.51[#] *17*	15/2$^-$	4855.7 *4*	19/2$^-$	7466.8 *10*	27/2$^{(+)}$

[†] From least-squares fit to Eγ data.
[‡] Assignments from 2011De20, based on $\gamma(\theta)$ measurements, yrast-feeding arguments, and relative γ-ray intensities.
[#] Seq.(A): Yrast sequence.

γ(^{55}V)

Statistics were insufficient for full angular distributions or correlations to be measured, so R$_{ang}$ is given by the sum of gamma intensities from 79° to 101° divided by the sum from 143° to 163° (2011De20). Expected values of R$_{ang}$ are >1 for pure stretched-dipole transitions, and <1 for stretched-quadrupole transitions.

E$_\gamma$	I$_\gamma$	E$_i$(level)	J$_i^{\pi}$	E$_f$	J$_f^{\pi}$	Mult.[†]	Comments
233.8 *5*	0.50 *20*	2176.40	11/2$^-$	1942.8	11/2$^-$		
248.2 *12*	0.6 *3*	3165.51	15/2$^-$	2916.4	(13/2$^-$)		
273.7 *1*	2.5 *3*	2916.4	(13/2$^-$)	2642.7	11/2$^-$,13/2$^-$	D	R$_{ang}$=1.3 *2*. Mult.: ΔJ=1 or 0.
285.1 *5*	0.5 *3*	2916.4	(13/2$^-$)	2630.2	13/2$^-$		
315.1 *1*	3.8 *5*	5170.8	21/2$^{(+)}$	4855.7	19/2$^-$	D	R$_{ang}$=1.2 *1*.
322.0 *3*	4.5 *15*	1942.8	11/2$^-$	1620.8	9/2$^-$		
323.1 *5*	19.2 *21*	323.8	5/2$^-$	0.0	7/2$^-$	D	R$_{ang}$=1.2 *1*.
343.6 *4*	1.5 *7*	5039.1	(19/2$^-$)	4695.5	19/2$^-$		
345.7 *10*	4.9 *9*	5695.8	23/2$^{(+)}$	5350.2	19/2,21/2$^{(+)}$	D	R$_{ang}$=1.5 *3*.
347.9 *3*	1.4 *10*	671.90	3/2$^-$	323.8	5/2$^-$		
392.0 *1*	4.6 *5*	7012.7	25/2$^{(+)}$	6620.7	23/2$^{(+)}$	D	R$_{ang}$=1.6 *2*.
420.6 *1*	7.2 *7*	5170.8	21/2$^{(+)}$	4750.2	19/2$^{(+)}$	D	R$_{ang}$=1.6 *1*.
433.9 *5*	2.4 *9*	4855.7	19/2$^-$	4421.8	17/2$^-$		

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^{9}Be(^{48}Ca,pnγ) 2011De20,2007Zh37 (continued)

$\gamma(^{55}V)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	Comments
453.8 *1*	8.8 *8*	2630.2	13/2$^-$	2176.40	11/2$^-$	D	R_{ang}=1.6 *1*.
454.1 *10*	0.10 *10*	7466.8	27/2$^{(+)}$	7012.7	25/2$^{(+)}$		
525.0 *1*	7.8 *8*	5695.8	23/2$^{(+)}$	5170.8	21/2$^{(+)}$	D	R_{ang}=1.4 *1*.
534 *4*	0.5 *3*	3165.51	15/2$^-$	2630.2	13/2$^-$		
594.8 *5*	3.3 *8*	4421.8	17/2$^-$	3826.9	(15/2$^-$)	D	R_{ang}=1.7 *5*.
606.3 *2*	6.9 *8*	2176.40	11/2$^-$	1570.0	9/2$^-$	D	R_{ang}=1.7 *4*.
657 *4*	1.0 *5*	5695.8	23/2$^{(+)}$	5039.1	(19/2$^-$)	[M2]	
657.4 *1*	24.2 *10*	3165.51	15/2$^-$	2508.11	15/2$^-$	D	R_{ang}=0.79 *4* MΔJ=0 transition.
672.0 *2*	11.5 *15*	671.90	3/2$^-$	0.0	7/2$^-$	(Q)	R_{ang}=0.9 *1*.
699.9 *3*	4.5 *7*	2642.7	11/2$^-$,13/2$^-$	1942.8	11/2$^-$	D	R_{ang}=1.4 *2*. Mult.: ΔJ=1 or 0.
739.9 *7*	2.5 *12*	2916.4	(13/2$^-$)	2176.40	11/2$^-$		
742.9 *4*	10.7 *13*	2176.40	11/2$^-$	1433.10	11/2$^-$		R_{ang}=1.1 *1* MΔJ=0 transition.
748.5 *10*	8.2 *12*	5170.8	21/2$^{(+)}$	4421.8	17/2$^-$	Q	Mult.: (M2) from ΔJ^π. R_{ang}=0.76 *8*.
848.1 *11*	1.4 *9*	3479.2	15/2$^-$	2630.2	13/2$^-$		
985.6 *3*	9.7 *11*	5350.2	19/2,21/2$^{(+)}$	4364.6	17/2$^{(+)}$	(D,Q)	R_{ang}=1.2 *1*. Mult.: $\gamma(\theta)$ suggests ΔJ=1, dipole, ΔJ=2, quadrupole also possible from ΔJ^π assigned by 2011De20.
1075.0 *1*	54 *3*	2508.11	15/2$^-$	1433.10	11/2$^-$	Q	E_γ: other: 1076 (2008LuZZ). R_{ang}=0.79 *3*.
1199.0 *5*	12.3 *8*	4364.6	17/2$^{(+)}$	3165.51	15/2$^-$	D	R_{ang}=2.2 *4*.
1246.6 *5*	2.0 *15*	1570.4	(3/2$^-$)	323.8	5/2$^-$	D	R_{ang}=2.5 *14*.
1270.6 *7*	3.3 *12*	4750.2	19/2$^{(+)}$	3479.2	15/2$^-$	[M2]	
1316.9 *4*	11.9 *14*	7012.7	25/2$^{(+)}$	5695.8	23/2$^{(+)}$	(D)	R_{ang}=1.0 *1*.
1318.3 *13*	1.0 *5*	3826.9	(15/2$^-$)	2508.11	15/2$^-$		
1376.9 *12*	4.7 *16*	4855.7	19/2$^-$	3479.2	15/2$^-$		
1433.1 *1*	100 *6*	1433.10	11/2$^-$	0.0	7/2$^-$	Q	E_γ: other: 1434 (2008LuZZ). R_{ang}=0.77 *5*.
1449.8 *3*	8.9 *12*	6620.7	23/2$^{(+)}$	5170.8	21/2$^{(+)}$	D	R_{ang}=1.3 *2*.
1486.4 *9*	1.2 *7*	2916.4	(13/2$^-$)	1433.10	11/2$^-$		E_γ: poor fit. Level-energy difference=1483.3.
1505.0 *7*	3.3 *8*	4421.8	17/2$^-$	2916.4	(13/2$^-$)	(Q)	R_{ang}=1.1 *1*.
1560 *3*	2.8 *12*	5039.1	(19/2$^-$)	3479.2	15/2$^-$		
1569.7 *4*	13.3 *21*	1570.0	9/2$^-$	0.0	7/2$^-$	D	R_{ang}=1.5 *2*.
1584.7 *5*	8.1 *8*	4750.2	19/2$^{(+)}$	3165.51	15/2$^-$	(Q)	Mult.: (M2) from ΔJ^π. R_{ang}=0.8 *3*.
1620.8 *8*	4.5 *9*	1620.8	9/2$^-$	0.0	7/2$^-$	D	R_{ang}=1.2 *1*.
1690.2 *9*	7.1 *6*	4855.7	19/2$^-$	3165.51	15/2$^-$	Q	R_{ang}=0.6 *3*.
1771.0 *15*	2.3 *11*	7466.8	27/2$^{(+)}$	5695.8	23/2$^{(+)}$	(Q)	R_{ang}=0.9 *3*.
1791.7 *11*	1.1 *8*	4421.8	17/2$^-$	2630.2	13/2$^-$		
1835.4 *12*	0.5 *3*	4750.2	19/2$^{(+)}$	2916.4	(13/2$^-$)	[E3]	
1943.2 *7*	5.8 *11*	1942.8	11/2$^-$	0.0	7/2$^-$	Q	R_{ang}=0.73 *5*.
2046.2 *13*	9.9 *15*	3479.2	15/2$^-$	1433.10	11/2$^-$	(Q)	R_{ang}=0.8 *2*.
2121 *3*	0.5 *3*	4750.2	19/2$^{(+)}$	2630.2	13/2$^-$	[E3]	
2175.5 *10*	8.1 *23*	2176.40	11/2$^-$	0.0	7/2$^-$	(Q)	R_{ang}=0.8 *2*.
2187.4 *10*	10 *3*	4695.5	19/2$^-$	2508.11	15/2$^-$	Q	R_{ang}=0.5 *2*.
2190.4 *22*	0.5 *3*	4364.6	17/2$^{(+)}$	2176.40	11/2$^-$	[E3]	
2531.0 *24*	6 *2*	5039.1	(19/2$^-$)	2508.11	15/2$^-$		

† Assigned by evaluator based on magnitude of R_{ang} values; ΔJ=1, dipole (D) for R_{ang}>1 and ΔJ=2, quadrupole (Q) for R_{ang}<1. For ΔJ=1, only the dominant dipole multipolarity is assigned, with the understanding that some quadrupole admixture is possible,

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^{9}Be(^{48}Ca,pnγ) 2011De20,2007Zh37 (continued)

$\gamma(^{55}V)$ (continued)

especially in the case of ΔJ=1, M1 transitions. High multipolarities (M2 and E3), based on ΔJ^{π} are given in square brackets or in comments.

^{9}Be(^{48}Ca,pnγ) 2011De20,2007Zh37

Level Scheme

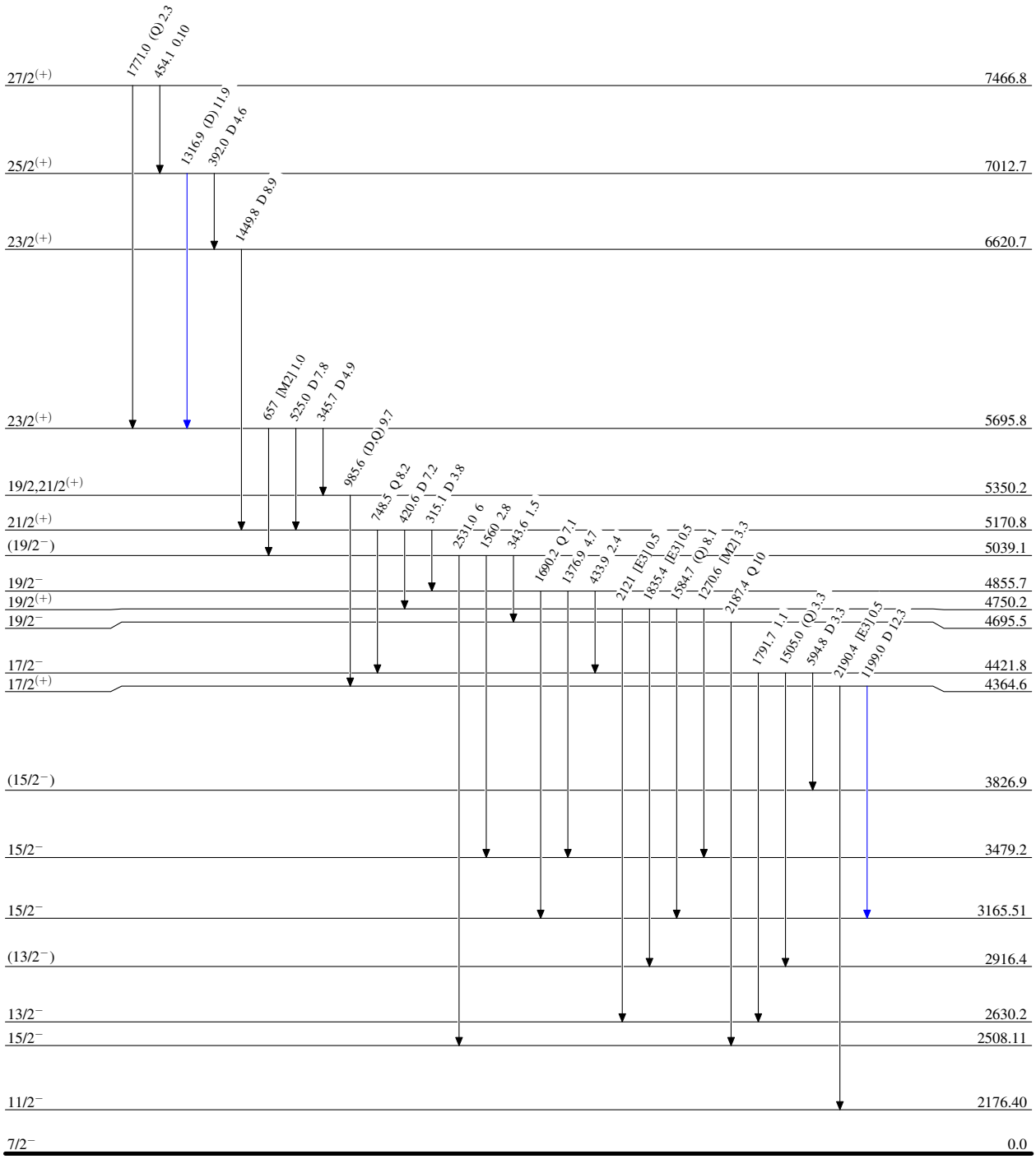
Intensities: Relative I_γ

Legend

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

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

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

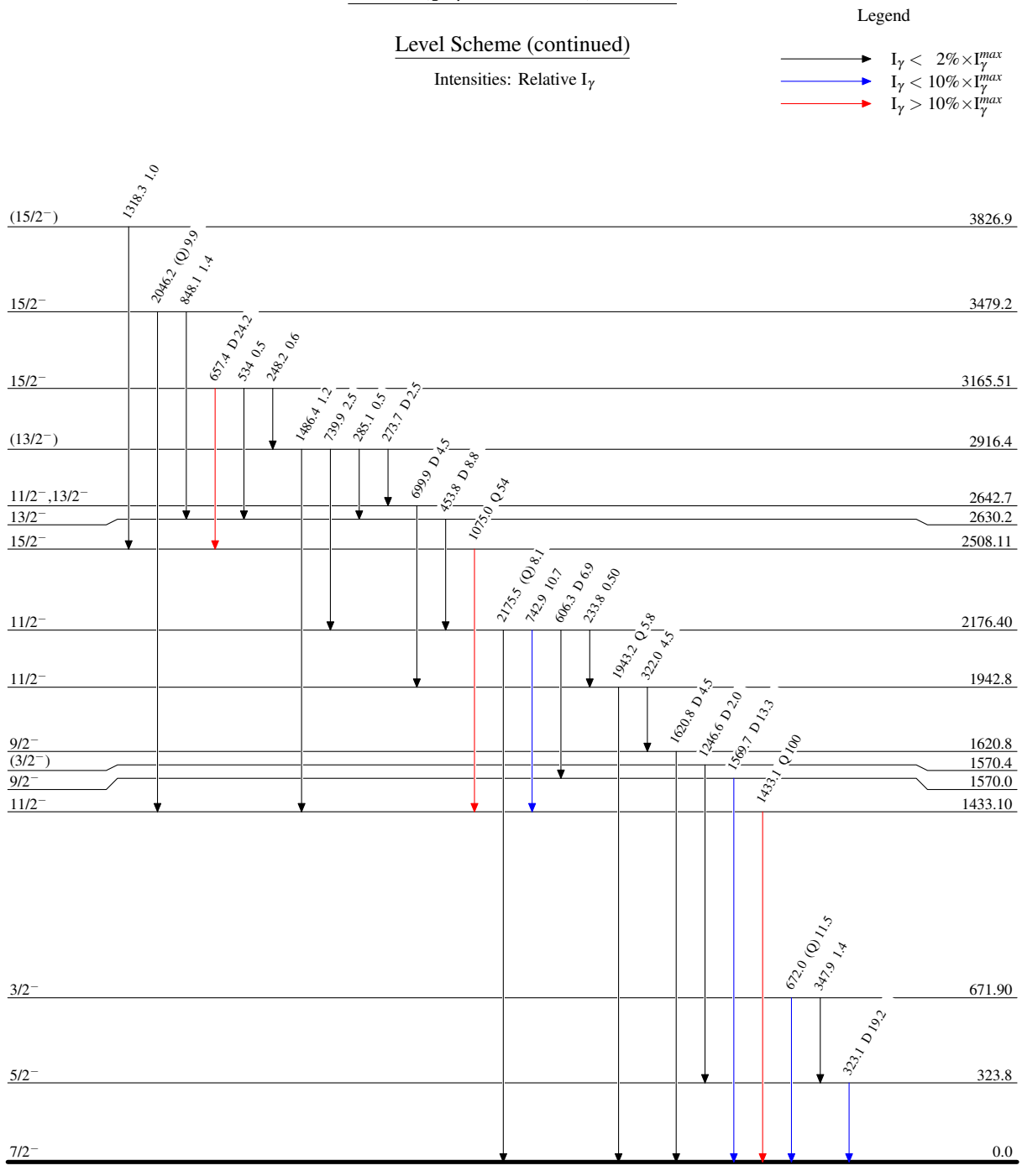


$^{55}_{23}V_{32}$

^{9}Be(^{48}Ca,pnγ) 2011De20,2007Zh37

Level Scheme (continued)

Intensities: Relative I_γ



$^{55}_{23}V_{32}$

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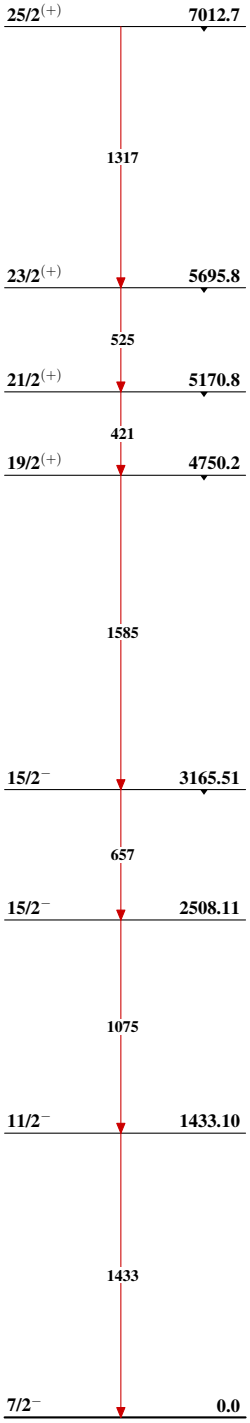
Seq.(A): Yrast sequence



$^{55}_{23}V_{32}$