^{208}Pb(^{48}Ca,2nγ):prompt γ 2006He19,2005Ee01,1999Le42

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 156, 1 (2019)	31-Jan-2019

For the two high-K isomers, see ^{254}No IT decay datasets based on experimental results reported by 2016WaZW, 2010He10, 2010Cl01, 2006Ta19 and 2006He19.

2006He19 (also 2007Gr17, 2005Gr36, 2010Ju02): E=219 MeV. The fragments were separated from the beam using the gas-filled recoil separator RITU at Jyvaskyla facility. The fragments were implanted in a double-sided position sensitive Si detector DSSD at the GREAT spectrometer. Measured Eγ, Iγ, $\gamma\gamma$, γ(ce) coin with the GREAT spectrometer consisting of a double-sided position sensitive Si detector, a large segmented planar Ge detector and a large Clover Ge detector. In addition to the ground band up to 24^+, levels of $K^\pi=3^+$ band, and two high-spin isomers discovered.

2005Ee01, 2005Ee02: E(^{48}Ca)=219 and 221 MeV. Measured Eγ, Iγ, $\gamma\gamma$ using JUROGAM array of 31 EUROGAM phase-1 and 12 GASP-type Compton-suppressed HPGe detectors, (recoil)(γ) coin, RITU gas-filled recoil separator and GREAT focal-plane spectrometer. The ground-state band extended to (24^+), and evidence for a non-yrast state at 987 keV, (3^+) reported.

1999Le42 (also 2001Ju05): E=216 MeV. Measured Eγ, Iγ, $\gamma\gamma$, recoil-γ coin, α-decay tagging. Prompt γ rays were detected by an array of four Clover (Ge) detectors without Compton-suppression shields. The half-life of ^{254}No was also measured. Ground-state band was identified up to (16^+). Measurements were made using recoil gating and recoil decay tagging method at Jyvaskyla accelerator facility.

2016WaZW: ^{208}Pb(^{48}Ca,2n),E=219 MeV; measured Eγ, Iγ, ce, recoils, (recoil)γ-coin, $\gamma\gamma$-coin, and γ(ce)-coin using RITU separator, SAGE and GREAT spectrometers at JYFL accelerator facility. Recoil-decay tagging method. Deduced high-spin levels, J, π, conversion coefficients, and multipolarities.

2004Hu11 (also 2003Bu23, 2002He24, 2002Bu28, 2002Bu04, 2001Bu11, 2001Am09): E=219 MeV. Measured ce, ce-ce coin using SACRED electron spectrometer in conjunction with gas-filled recoil separator RITU.

1999Re02, 2000Re05 (also 2004Re25): E=215, 219 MeV. Measured Eγ, Iγ, $\gamma\gamma$, recoil-γ coin, ce, α-decay tagging using GAMMASPHERE array of 101 Ge detectors and recoils by fragment mass analyzer at ATLAS-ANL. ^{254}No identified by α-decay lines. Ground-state band identified up to (20^+).

Others:

2016La25: E=217 MeV: measured σ, and upper limit for the ionization potential of nobelium.

2015KaZX: E=218.5 MeV: measured Eγ, Iγ, Eα, Iα, $\alpha\gamma$-coin at GARIS-RIKEN facility; deduced production yields, 8.093 MeV α branch from ^{254}No decay.

2014He32: E=217, 220.5 MeV; measured Eγ, Iγ using Gammasphere array at ATLAS-ANL facility; deduced fission barrier heights, and entry point distributions for ^{254}No up to J=27.

2014HeZZ is superseded by 2014He32.

2012Fo03: E=4.59 MeV/nucleon; measured characteristic x rays, yields of evaporation residues and Eα for super-heavy elements using TASCA separator at GSI.

2011Ga19: E=231.2 MeV; measured Eα, Iα, Eγ, $\alpha\gamma$- and α(particle)-coin, yields, cross sections and half-lives of evaporation residues for super-heavy elements using TASCA separator at GSI.

^{254}No Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0[#]	0^+	51.2 s *4*	$T_{1/2}$: from Adopted Levels, where this value is adopted from 2006He19.
44.2[#] *4*	2^+		Additional information 1. E(level): estimated by 1999Le42 from Harris parameters extracted for the g.s. rotational band.
145.3[#] *7*	4^+		
304.8[#] *8*	6^+		
518.9[#] *8*	8^+		
786.2[#] *8*	10^+		
987.2 *9*	(3^+)		Configuration=π1/2[521]$\otimes\pi$7/2[514],$K^\pi=(3^+)$ (2006He19).
1104.3[#] *8*	12^+		
1470.9[#] *8*	(14^+)		

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^{208}Pb(^{48}Ca,2nγ):prompt γ 2006He19,2005Ee01,1999Le42 (continued)

^{254}No Levels (continued)

E(level)[†]	Jπ[‡]
1883.6[#] *8*	(16+)
2339.6[#] *9*	(18+)
2837.6[#] *14*	(20+)
3373.6[#] *17*	(22+)
3943.6?[#] *20*	(24+)

[†] From Eγ values, keeping the 44.2-keV level fixed in energy.
[‡] As proposed in 2005Ee01 and 2006He19, based on g.s. band, where multipolarities of several transitions in the band have been assigned E2 from internal conversion data.
[#] Band(A): $K^\pi=0^+$, g.s. band. No indication of a backbend was found. The quadrupole deformation of $\beta(2)=0.27$ *3* was deduced by 1999Le42 from E(2+ state)=44.2 *4*, extrapolated from energies of first 2+ states in neighboring nuclei.

γ(^{254}No)

Eγ[†]	Iγ	Ei(level)	Jiπ	Ef	Jfπ	Mult.	α[&]	I(γ+ce)[‡]	Comments
(44.2 *4*)		44.2	2+	0.0	0+	[E2]	1510 *70*		Eγ: from level energy. α(exp)=27 *14* (2016WaZW)
101.1 *6*		145.3	4+	44.2	2+	E2	30.0 *10*		Eγ: from ce data (2004Hu11). Other: 101.2 *6* (2016WaZW). Iγ=5.6 *27*, I(ce(L))=120 *30*, I(ce(M))=30 *11* (2016WaZW). Transition intensity/1000 recoils=440 *35* (2004Hu11). Additional information 2. Mult.: from comparison of measured I(M1+M2+M3+M4+M5)/I(L1+L2)=0.8 *3*, I(L3)/I(L1+L2)=0.8 *2* with theoretical values for E2, M1 and E1 (2002He24).
159.5 *2*	20[#] *6*	304.8	6+	145.3	4+	E2	3.94	100 *32*	α(exp)=3.6 *9* (2016WaZW) Eγ: 159.1 *3* (1999Re02); 157.7 *6*, 158.9 *3*, 159.1 *3* (2004Hu11), 159.1 *2* (2016WaZW). Transition intensity/1000 recoils=300 *30* (2004Hu11). Additional information 3. Iγ=31 *4*, I(ce(L))=82 *23*, I(ce(M))=31 *7* (2016WaZW). Mult.: from comparison of measured I(M1+M2+M3+M4+M5)/I(L1+L2)=0.64 *15*, I(L3)/I(L1+L2)=0.55 *14* with theoretical values for E2, M1 and E1 (2002He24).
214.1 *1*	38[#] *7*	518.9	8+	304.8	6+	E2	1.204	84 *16*	α(exp)=0.9 *1* (2016WaZW) Eγ: 214.1 *2* (1999Re02); 214.2 *8*, 214.1 *3*, 214.1 *2* (2004Hu11), 214.5 *2* (2016WaZW). Mult.: from α(exp) (2016WaZW). Transition intensity/1000 recoils=240 *20* (2004Hu11). Additional information 4. Iγ(214)/Iγ(778)=0.93 *37* (2010He10). Iγ=60 *5*, I(ce(L))=35 *6*, I(ce(M))=17 *3* (2016WaZW).

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^{208}Pb(^{48}Ca,2nγ):prompt γ 2006He19,2005Ee01,1999Le42 (continued)

$\gamma(^{254}No)$ (continued)

E_γ [†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α [&]	$I_{(\gamma+ce)}$ [‡]	Comments
[x]256									Uncertain γ from 2010He10 only.
267.3 *1*	47[#] *8*	786.2	10^+	518.9	8^+	E2	0.535	72 *13*	α(exp)=0.37 *9* (2016WaZW) E_γ: 267.3 *3* (1999Re02); 266.5 *10*, 267.2 *3*, 267.3 *3* (2004Hu11), 267.8 *1* (2016WaZW). Mult.: from α(exp) (2016WaZW). Transition intensity/1000 recoils=180 *20* (2004Hu11). Additional information 5. $I_{(\gamma+ce)}$: from 2004Hu11. I(γ+ce)=72 *13* (1999Le42). Iγ=54 *5*, I(ce(L))=14 *4*, I(ce(M))=6 *2* (2016WaZW).
318.1 *2* [x]341	29[#] *7*	1104.3	12^+	786.2	10^+	(E2)[@]	0.300	38 *9*	E_γ: 318.4 *4* (1999Re02). E_γ: from 1999Re02 only, treated as a questionable γ ray as not seen in many of the later studies.
366.6 *2*	44[#] *9*	1470.9	(14^+)	1104.3	12^+	[E2]	0.195	53 *11*	E_γ: 366.6 *7* (1999Re02).
412.7 *2*	25[#] *9*	1883.6	(16^+)	1470.9	(14^+)	[E2]	0.1397	29 *10*	
456.0 *3*		2339.6	(18^+)	1883.6	(16^+)				
498 *1*		2837.6	(20^+)	2339.6	(18^+)	[E2]	0.086		
536 *1*		3373.6	(22^+)	2837.6	(20^+)	[E2]	0.0721		
570[a]		3943.6?	(24^+)	3373.6	(22^+)	[E2]	0.063		E_γ: from 2005Ee02 and 2006He19.
842 *1*		987.2	(3^+)	145.3	4^+				Iγ(778)/Iγ(842)=0.03 *2*, 0.16 *50* (2010He10). Iγ(842)/Iγ(214)=0.31 *8* (2005Ee02).
943 *1*		987.2	(3^+)	44.2	2^+				Iγ(943)/Iγ(214)=0.86 *14* (2005Ee02).

† From 2005Ee01 (also 2005Ee02) unless otherwise stated.
‡ Relative transition intensities, normalized to 100 for 158.9γ are from 1999Le42. These were deduced from the recoil decay tagged spectrum, and corrected for internal conversion assuming E2 multipolarity. See also 2004Hu11 for absolute transition intensities obtained from conversion electron spectra.
# Deduced from I(γ+ce) in 1999Le42 and total conversion coefficient.
@ (E2) consistent with L- and M- lines seen in the ce spectra (2004Hu11 and previous papers from the same group), and the γ-ray intensity pattern observed for the ground-state rotational band.
& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
a Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

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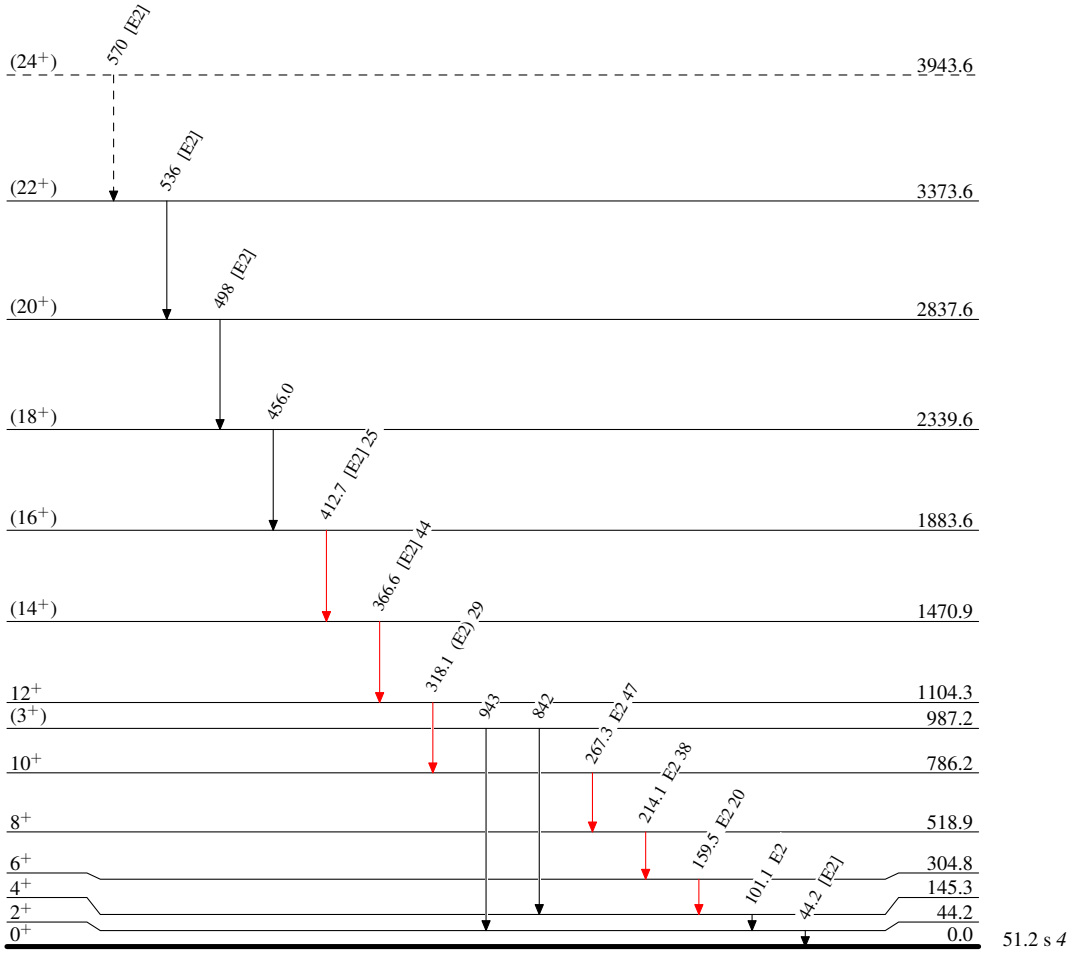
Legend

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

Level Scheme

Intensities: Relative I_γ



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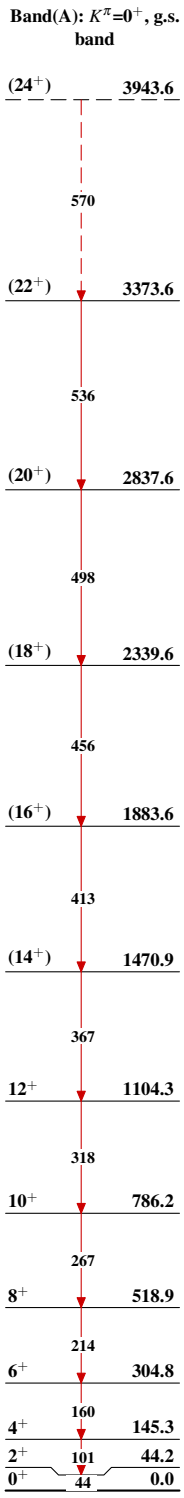

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