^{174}Yb(^{48}Ca,4nγ) 2020Od01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	10-Jun-2021

Dataset adapted from compiled dataset from 2020Od01 in the XUNDL database by J. Chen (NSCL, MSU), December 11, 2020.

2020Od01: E=207 MeV ^{48}Ca beam from the K130 cyclotron facility of the University of Jyvaskyla bombarded 0.85 mg/cm^2, 98% enriched ^{174}Yb target. Measured Eγ, Iγ, (recoil)γ-, $\alpha\gamma$- and $\gamma\gamma$-coin, $\gamma\gamma$(angular anisotropy), Eα using the JUROGAM II array of 34 escape-suppressed HPGe detectors, and LISA array of 16 Si strip detectors for the detection of light charged particles. Reaction products were separated and identified using the RITU magnetic separator, implanted in DSSD detectors, and detected using the GREAT spectrometer. Recoil-decay Tagging (RDT) used to study excitations in ^{218}Th. Comparison with large-scale shell-model calculations, based on ^{208}Pb treated as a core with 82 to 126 model space for protons and 126 to 184 model space for neutrons.

^{218}Th Levels

Listed configurations are from shell model calculations in 2020Od01.

E(level)[†]	J$^\pi$[‡]	Comments
0.0[#]	0^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 14% probability (2020Od01).
689.0[#] *3*	2^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 25% probability (2020Od01).
1078.0 *6*	(3^-)	Configuration=$\pi h^8_{9/2}\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 26% probability (2020Od01).
1192.3[#] *5*	4^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
1560.8[#] *6*	6^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
1761.7[#] *7*	8^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
2099.5[#] *9*	10^+	Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu(i^1_{11/2}g^1_{9/2}$ with 26% probability (2020Od01).
2272.6[@] *10*	(11^-)	Configuration=$\pi h^8_{9/2}\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 32% probability (2020Od01).
2686.3[@] *10*	(13^-)	Configuration=$\pi(h^6_{9/2}i^2_{13/2})\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 31% probability (2020Od01).
3160.0[@] *12*	(15^-)	Configuration=$\pi(h^6_{9/2}i^2_{13/2})\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 37% probability (2020Od01).
3306.7 *13*	(16^+)	Configuration=$\pi(h^7_{9/2}f^1_{7/2})\otimes\nu g^2_{9/2}$ with 42% probability (2020Od01).

[†] From Eγ values.
[‡] As given in 2020Od01, based on previous assignments for the g.s. band members, and a γ cascade of new transitions observed in this work, supported by shell-model calculations.
[#] Band(A): Yrast structure.
[@] Band(B): Band based on (11^-).

γ(^{218}Th)

Angular anisotropy R(θ)=Iγ(109°)/Iγ(100′), corresponding to detectors placed at 100° and 109° with respect to the beam line. R(θ) value is expected as >1.0 for ΔJ=2, quadrupole and <1.0 for ΔJ=1, dipole transitions, as stated by 2020Od01.

E$_\gamma$	I$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[†]	α[‡]	Comments
114.2 *7*	2.1 *2*	1192.3	4^+	1078.0	(3^-)	(D)		R(θ)=0.93 *32*.
146.7 *5*	9.2 *3*	3306.7	(16^+)	3160.0	(15^-)	(E1)	0.197 *4*	R(θ)=0.85 *10*. Mult.: from R(θ) and intensity balance arguments, from which mult=M1, E2 or M1+E2 is unlikely. In addition, a 16^+ level is reproduce in shell-model calculations.
173.1 *4*	44.3 *8*	2272.6	(11^-)	2099.5	10^+	(E1)	0.133 *2*	R(θ)=0.93 *3*. Mult.: from R(θ) and intensity balance arguments,

Continued on next page (footnotes at end of table)

^{174}Yb(^{48}Ca,4nγ) 2020Od01 (continued)

$\gamma(^{218}Th)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
							from which mult=M1, E2 or M1+E2 is not allowed. In addition, no conversion line was seen in ce data of 1985Bo32 for this strong transition.
200.9 *4*	41.6 *7*	1761.7	8^+	1560.8	6^+	Q	R(θ)=1.23 *5*.
337.8 *5*	53.6 *10*	2099.5	10^+	1761.7	8^+	Q	R(θ)=1.09 *4*.
368.5 *3*	76.7 *13*	1560.8	6^+	1192.3	4^+	Q	R(θ)=1.21 *4*.
388.9 *6*	8.6 *4*	1078.0	(3^-)	689.0	2^+	(D)	R(θ)=0.99 *10*.
413.7 *4*	32.6 *8*	2686.3	(13^-)	2272.6	(11^-)	(Q)	R(θ)=1.05 *6*.
473.7 *5*	20.6 *6*	3160.0	(15^-)	2686.3	(13^-)	(Q)	R(θ)=1.08 *9*.
503.3 *3*	92.4 *16*	1192.3	4^+	689.0	2^+	Q	R(θ)=1.12 *4*.
689.0 *3*	100.0 *20*	689.0	2^+	0.0	0^+	Q	R(θ)=1.13 *4*.

[†] Assigned by evaluator based on R(θ) ratios in 2020Od01.

[‡] 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.

^{174}Yb(^{48}Ca,4nγ) 2020Od01

Level Scheme

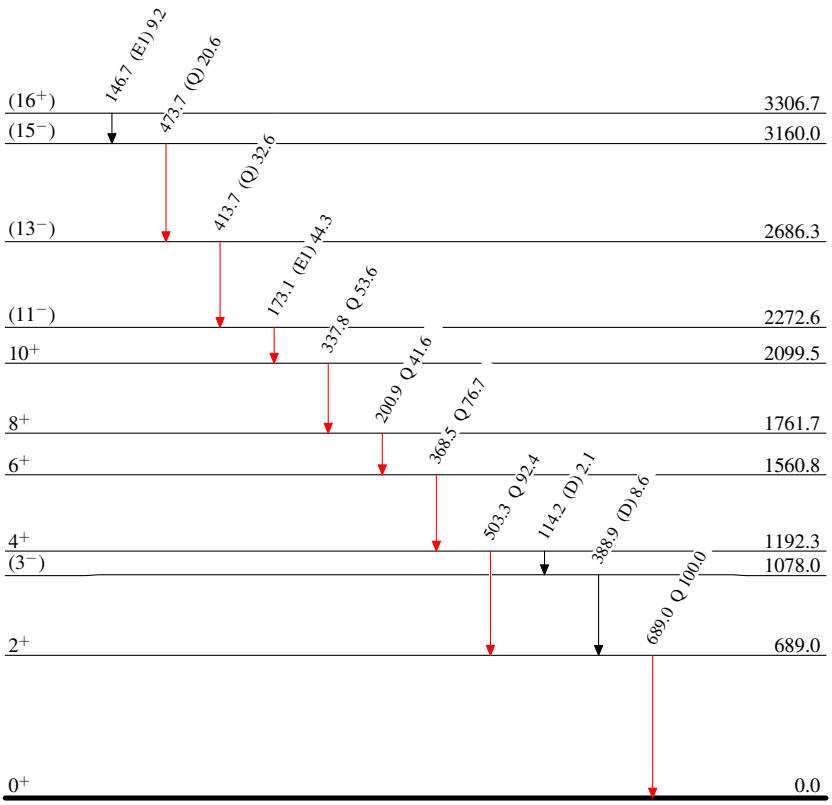
Intensities: Relative I_γ

Legend

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

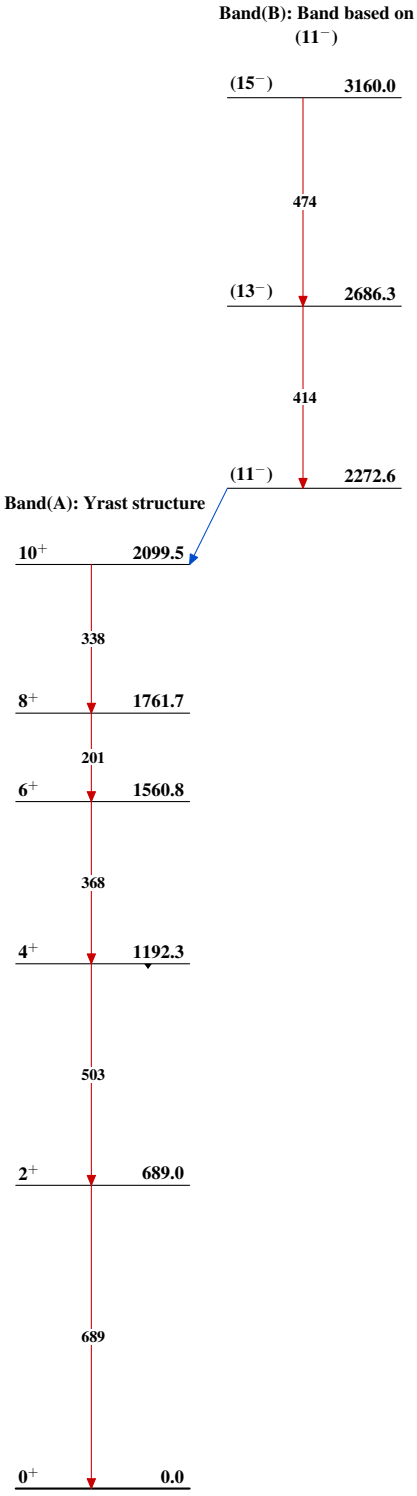
$I_\gamma < 10\% \times I_\gamma^{max}$

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



$^{218}_{90}Th_{128}$

^{174}Yb(^{48}Ca,4nγ) 2020Od01



$^{218}_{90}Th_{128}$