$^{12}C(^{18}O,\alpha p\gamma)$ 2020Wi11

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia, Anagha Chakraborty	NDS 205,1 (2025)	31-May-2025

Adapted/Edited the XUNDL dataset compiled by J. Chen (NSCL, MSU), December 8, 2020.

2020Wi11: ^{18}O beam, E=48 MeV, was produced from the TRIUMF-ISAC facility. Targets were a thin and a backed foil of natural carbon. γ rays were detected with the TIGRESS array consisting of 13 Compton-suppressed HPGe clovers and charged particles were detected with a 38-element array of CsI(Tl) scintillators. Measured Eγ, Iγ, $\gamma\gamma$-coin, particle-γ-coin, $\gamma(\theta)$. Deduced excited level energies, spin, parity, lifetimes, γ-ray multipolarities, transition strengths. Shell-model calculations.

Other reactions: $^{12}C,^{16}O(^{16}O,X)$ at E=70-130 MeV (1986Ik03).

^{25}Na Levels

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[&]	Comments
0[c]	5/2$^+$[@]		
(92[f] *3*)	3/2$^+$[@]		E(level): from energy difference of transitions depopulating 2791 level. Not observed in this work (2020Wi11).
1072[f] *3*	1/2$^+$[@]	>0.55 ps	$T_{1/2}$: from τ>900 fs.
2204[f] *3*	3/2$^+$[@]	18 fs *8*	$T_{1/2}$: from τ=26 fs *11*.
2419.7[c] *8*	(9/2$^+$)	159[a] fs *28*	$T_{1/2}$: from τ=230 fs *40*.
2791.1[d] *9*	7/2$^+$	104[a] fs *14*	J$^\pi$: from literature in 2020Wi11. $T_{1/2}$: from τ=150 fs *20*.
3356.1[e] *22*	(7/2$^+$)[@]	<34 fs	$T_{1/2}$: from τ<49 fs.
3460.8[c] *9*	(9/2$^+$)	132[a] fs *21*	$T_{1/2}$: from τ=190 fs *30*.
3964 *4*	(1/2,3/2,5/2$^+$)	<173 fs	$T_{1/2}$: from τ<250 fs.
4000.0[d] *9*	(9/2$^+$)	62.4 fs *49*	J$^\pi$: from literature in 2020Wi11. $T_{1/2}$: from τ=90 fs *7*.
4006 *4*	(1/2,3/2)	62 fs *35*	$T_{1/2}$: from τ=90 fs *50*.
4295 *4*	1/2$^+$[@]	<20 fs	$T_{1/2}$: from τ<29 fs.
4967.2[c] *9*	(11/2$^+$)[@]	49.9[a] fs *42*	$T_{1/2}$: from τ=72 fs *6*.
5231.4[e] *22*	(7/2,9/2)	<10 fs	$T_{1/2}$: from τ<15 fs.
5388.1[b] *14*	(11/2$^+$)	<2.8 fs	$T_{1/2}$: from τ<4 fs.
5749 *4*	(9/2,11/2,13/2)	<194 fs	$T_{1/2}$: from τ<280 fs.
5848 *3*		<52 fs	$T_{1/2}$: from τ<75 fs.
6271[‡] *3*	(9/2,11/2)	<26 fs	$T_{1/2}$: from τ<37 fs.
6381 *3*	(9/2,11/2,13/2)	<6.2 fs	$T_{1/2}$: from τ<9 fs.
6582 *3*		<28 fs	J$^\pi$: (11/2$^-$) from literature (Ph.D. thesis) for a 6.55 MeV level. $T_{1/2}$: From τ<40 fs.
6737.0 *14*	(13/2$^+$)	<2.8 fs	$T_{1/2}$: from τ<4 fs.
6856.1[b] *16*	(13/2$^+$)	42 fs *28*	$T_{1/2}$: from τ=60 fs *40*.
7218[‡d] *4*	(9/2,11/2,13/2)	<97 fs	$T_{1/2}$: from τ<140 fs.
7625[‡c] *4*	(11/2,13/2)	<52 fs	$T_{1/2}$: from τ<75 fs.

[†] From a least-squares fit to γ-ray energies. The bands proposed in 2020Wi11 are labelled as "sequence" in this dataset. Same spin is proposed for two states by the authors doe most of their proposed bands.

[‡] Newly identified level in 2020Wi11 compared to the known excited levels of ^{25}Na prior to their work.

[#] As given in 2020Wi11 based on $\gamma(\theta)$ and γ de-excitation pattern, unless otherwise noted.

[@] From Adopted Levels. In 2020Wi11, it was quoted from the literature.

[&] From DSAM in 2020Wi11. Limit reported to a 90% confidence level. Authors note that most of their mean lifetime values are lower than those reported in $^9Be(^{18}O,pn\gamma)$ (2015Vo12), this is most likely a systematic effect resulting from the use of two stopping models in this work compared to $^9Be(^{18}O,pn\gamma)$ that used the SRIM model exclusively.

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$^{12}C(^{18}O,\alpha p\gamma)$ 2020Wi11 (continued)

^{25}Na Levels (continued)

[a] Corrected for feeding from an observed transition (2020Wi11).
[b] Seq.(A): based on 5388, $(11/2^+)$.
[c] Seq.(B): based on g.s., $5/2^+$.
[d] Seq.(C): based on 2791, $7/2^+$.
[e] Seq.(D): based on 3356, $(7/2^+)$.
[f] Seq.(E): based on 92, $3/2^+$.

$\gamma(^{25}Na)$

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
669.1 *7*	2.2 *3*	3460.8	$(9/2^+)$	2791.1	$7/2^+$		A_2=−0.4 *2*
967.3 *9*	1.1 *3*	4967.2	$(11/2^+)$	4000.0	$(9/2^+)$		A_2=−0.2 *5*
980.4 *5*	17.0 *14*	1072	$1/2^+$	92?	$3/2^+$		A_2=−0.7 *3*
1041.3 *4*	42.7 *11*	3460.8	$(9/2^+)$	2419.7	$(9/2^+)$	D+Q[@]	A_2=+0.20 *6*; A_4=+0.12 *7*
1131.8 *4*	6.9 *12*	2204	$3/2^+$	1072	$1/2^+$		A_2=−0.1 *3*
1209.0 *4*	13.5 *10*	4000.0	$(9/2^+)$	2791.1	$7/2^+$		A_2=−0.31 *9*
1348.9[†] *13*	2.1 *5*	6737.0	$(13/2^+)$	5388.1	$(11/2^+)$		A_2=+0.3 *3*
1467.9 *10*	2.6 *4*	6856.1	$(13/2^+)$	5388.1	$(11/2^+)$		A_2=−0.6 *3*
1506.2 *6*	24.4 *10*	4967.2	$(11/2^+)$	3460.8	$(9/2^+)$	D+Q[@]	A_2=−0.54 *13*; A_4=+0.24 *16*
1579.1 *13*	2.8 *4*	4000.0	$(9/2^+)$	2419.7	$(9/2^+)$		A_2=+0.0 *3*
1770.7 *16*	6.4 *8*	6737.0	$(13/2^+)$	4967.2	$(11/2^+)$		A_2=−0.3 *2*
1875.0 *12*	4 *2*	5231.4	(7/2,9/2)	3356.1	$(7/2^+)$		A_2=+0.3 *2*
2419.6 *11*	100 *3*	2419.7	$(9/2^+)$	0	$5/2^+$	Q[@]	A_2=+0.13 *6*; A_4=−0.27 *7*
2441[†] *3*	0.9 *3*	5231.4	(7/2,9/2)	2791.1	$7/2^+$		A_2=−0.9 *9*
2548.0 *12*	14.0 *9*	4967.2	$(11/2^+)$	2419.7	$(9/2^+)$		A_2=−0.03 *13*
2658[†] *4*	2.7 *5*	7625	(11/2,13/2)	4967.2	$(11/2^+)$		A_2=−0.6 *4*
2699 *3*	1.8 *4*	2791.1	$7/2^+$	92?	$3/2^+$		A_2=+0.9 *3*
2790.8 *13*	19.2 *15*	2791.1	$7/2^+$	0	$5/2^+$		A_2=+0.39 *14*
2891 *3*	2.6 *9*	3964	$(1/2,3/2,5/2^+)$	1072	$1/2^+$		A_2=+0.0 *5*
2924[†] *5*	1.8 *5*	6381	(9/2,11/2,13/2)	3460.8	$(9/2^+)$		A_2=−0.6 *8*
2933 *3*	2.6 *9*	4006	(1/2,3/2)	1072	$1/2^+$		A_2=−0.8 *6*
2968.4 *15*	17.0 *10*	5388.1	$(11/2^+)$	2419.7	$(9/2^+)$		A_2=−0.15 *13*
3058 *3*	1.4 *3*	5848		2791.1	$7/2^+$		A_2=+0.9 *5*
3120 *4*	2.0 *4*	6582		3460.8	$(9/2^+)$		A_2=−0.2 *7*
3218[†] *4*	1.2 *3*	7218	(9/2,11/2,13/2)	4000.0	$(9/2^+)$		A_2=+0.6 *4*
3222 *3*	3.0 *10*	4295	$1/2^+$	1072	$1/2^+$		A_2=−0.4 *7*
3275[†] *6*	1.2 *4*	6737.0	$(13/2^+)$	3460.8	$(9/2^+)$		A_2=−0.1 *10*
3329[†] *4*	1.6 *3*	5749	(9/2,11/2,13/2)	2419.7	$(9/2^+)$		A_2=+0.1 *4*
3355 *3*	4.5 *16*	3356.1	$(7/2^+)$	0	$5/2^+$		A_2=−0.2 *3*
3395[†] *5*	1.5 *4*	6856.1	$(13/2^+)$	3460.8	$(9/2^+)$		A_2=−0.7 *7*
3427 *4*	1.7 *3*	5848		2419.7	$(9/2^+)$		A_2=+0.1 *4*
3462[†] *3*	3.2 *11*	3460.8	$(9/2^+)$	0	$5/2^+$		A_2=−0.1 *7*
3480[†] *4*	1.0 *2*	6271	(9/2,11/2)	2791.1	$7/2^+$		A_2=−0.3 *7*
3851[†&] *5*	<0.4	6271	(9/2,11/2)	2419.7	$(9/2^+)$		
3958 *4*	3.7 *4*	6381	(9/2,11/2,13/2)	2419.7	$(9/2^+)$		A_2=−0.1 *2*
4163 *4*	2.7 *3*	6582		2419.7	$(9/2^+)$		A_2=−0.1 *3*
4313[†] *3*	5.3 *4*	6737.0	$(13/2^+)$	2419.7	$(9/2^+)$	Q	A_2=+0.3 *2*
4436 *3*	3.1 *3*	6856.1	$(13/2^+)$	2419.7	$(9/2^+)$	Q	A_2=+0.5 *4*
4796[†] *9*	0.6 *2*	7218	(9/2,11/2,13/2)	2419.7	$(9/2^+)$		A_2=−1.4 *13*

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^{12}C(^{18}O,αpγ) 2020Wi11 (continued)

γ(^{25}Na) (continued)

† New transition (2020Wi11).
‡ Relative intensity with respect to Iγ(2419.6γ)=100. In 2020Wi11, relative intensities were reported with respect to Iγ(2419.6γ)=1.00.
# From $\gamma(\theta)$ (2020Wi11), proposed by the evaluator, except where otherwise noted.
@ Assignment in 2020Wi11, based on their $\gamma(\theta)$ data.
& Placement of transition in the level scheme is uncertain.

$^{12}C(^{18}O,\alpha p\gamma)$ **2020Wi11**

Level Scheme

Intensities: Relative I_γ

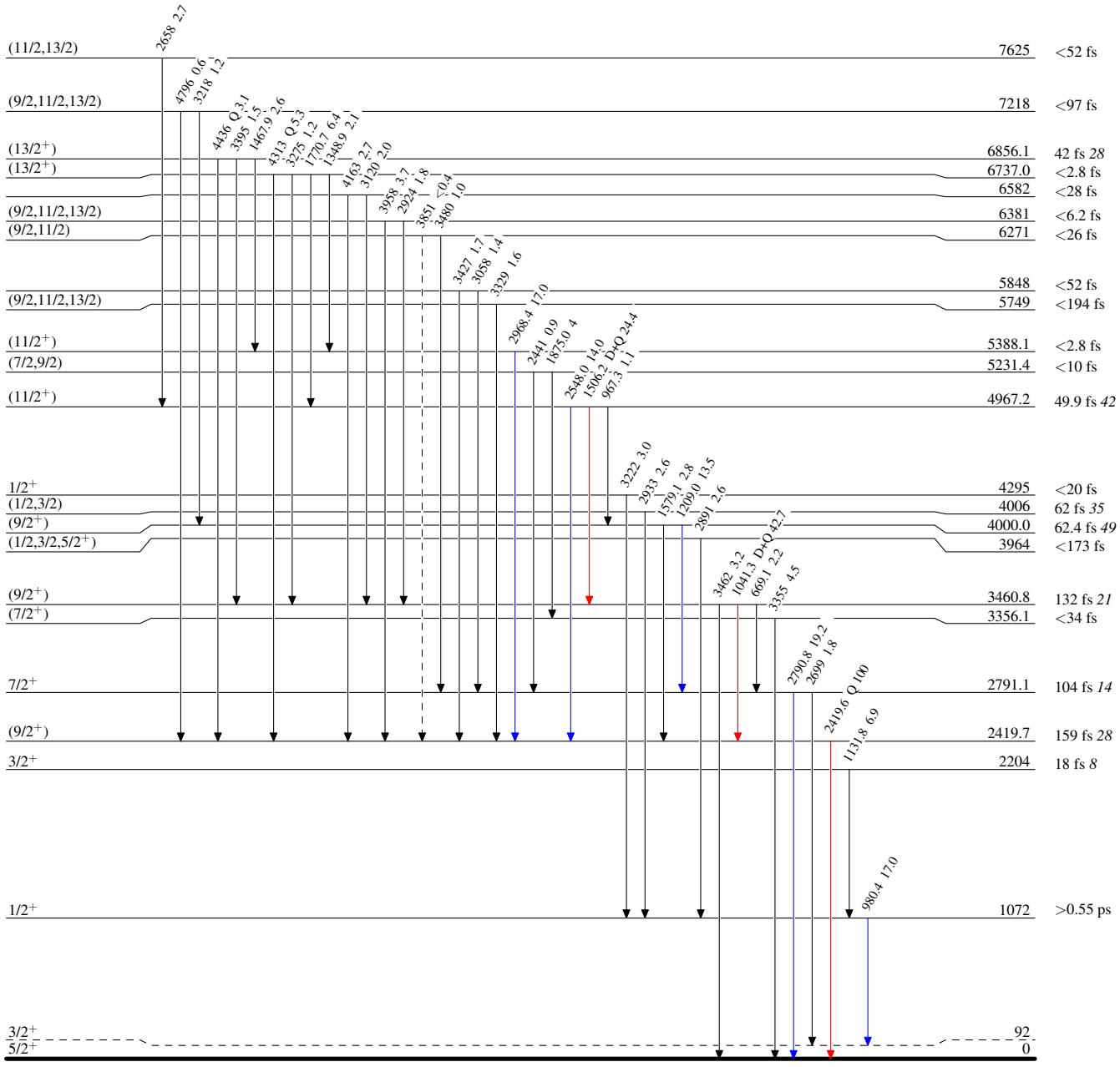
Legend

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

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

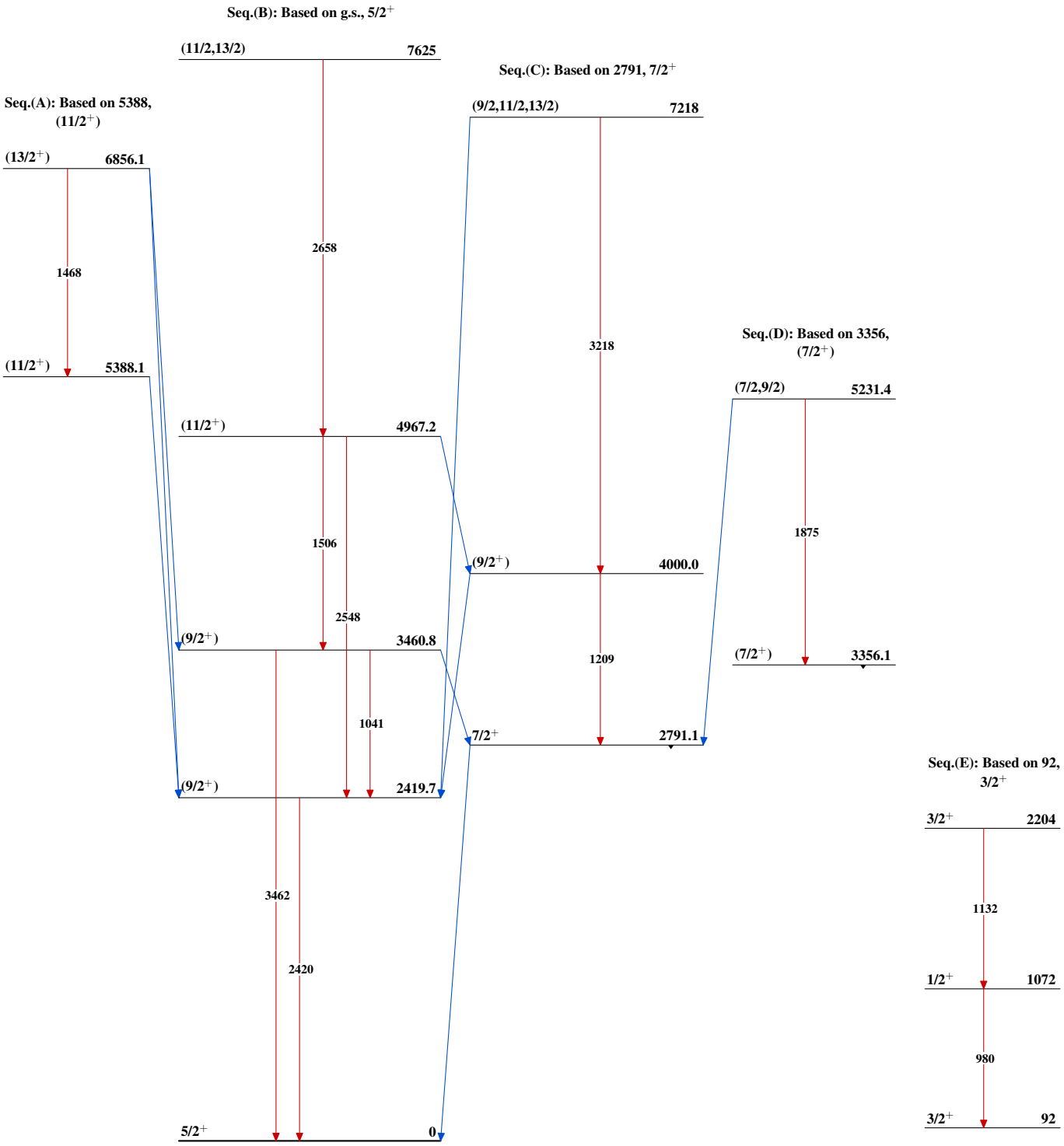
$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{25}_{11}Na_{14}$

$^{12}C(^{18}O,\alpha p\gamma)$ 2020Wi11



$^{25}_{11}Na_{14}$