

$^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma) E=125 \text{ MeV}$ **1998Sv01,1997Sv02,1997Fu08**

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Alan L. Nichols, Balraj Singh, Jagdish K. Tuli		NDS 113, 973 (2012)	15-Apr-2012

1998Sv01, 1997Sv02, 1998SvZY: E=125 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma\gamma$, (particle) $\gamma\gamma$ coin., $T_{1/2}$ by Doppler shift attenuation method, deduced SD band. See also **1997Sv04** and Svensson, p407, ENAM98 conference proceedings (1998).

1997Fu08: E=120 MeV. Measured γ , $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO) using an array of ten Compton-suppressed Ge detectors and Si-ball for charged-particles.

1979Mu04 (also **1980MuZV** thesis): E=93.5 MeV. Measured γ , $\gamma\gamma$, $\gamma(\theta)$ and $\gamma\gamma(\theta)$. (1161)–1341-1177-1197-1521-1232-954 and 1177-557-1604-557-1232 γ cascades proposed in this study.

Additional information 1.

Decay scheme based on $I\gamma$ for main cascade and levels known from $^{64}\text{Zn}(p,t)$ data of **1972Fa08** for side branch from 4905 level.

SD band data are from **1997Sv02**. High-spin structures are from **1998Sv01**, **1998SvZY** and **1997Fu08**.

Most data are from **1998Sv01**, **1998SvZY**; SD band data are from **1997Sv02**.

 ^{62}Zn Levels

E(level)	J $\pi^{\#}$	E(level)	J $\pi^{\#}$	E(level)	J $\pi^{\#}$	E(level)	J $\pi^{\#}$
0.0@	0 ⁺	6081.4 ^b 9	9 ⁻	11183 ^f 1	13 ⁽⁺⁾	16373 ^f 1	19 ⁽⁺⁾
953.9@ 4	2 ⁺	6113.4 ^c 11	8 ⁻	11655 ^h 1	13 ⁻	16379 ^h 1	19 ⁻
1805.0& 6	2 ⁺	7422.8 ^b 9	11 ⁻	11756 ^g 1	14 ⁽⁺⁾	17485 ⁱ 1	20 ⁻
2186.1@ 6	4 ⁺	7423 ^c 2	10 ⁻	11962 ^e 1	16 ⁺	17590 ^g 1	20 ⁽⁺⁾
2385.1 ^a 7	3 ⁺	7500@ 1	10 ⁺	12333 ⁱ 1	14 ⁻	18509 ^h 1	21 ⁻
2743.1& 7	4 ⁺	7630 1		12537 ^f 1	15 ⁽⁺⁾	19507 ^f 2	21 ⁽⁺⁾
3210.1 ^b 10	3 ⁻	7701.8 [‡]		12815 1	15 ⁻	19684 ⁱ 1	22 ⁻
3586.2 ^a 8	5 ⁺	7976 ^d 1	9 ⁺	12997 ^h 1	15 ⁻	21046 ^h 1	23 ⁻
3707.5@ 7	6 ⁺	8438 ^e 1	10 ⁺	13237 ^g 1	16 ⁽⁺⁾	23190 ⁱ 2	24 ⁻
4043.3 ^b 8	5 ⁻	9049 ^d 1	11 ⁺	13731 ⁱ 1	16 ⁻	x ^{†j}	(18)
4347.4& 8	6 ⁺	9215 ^b 1	13 ⁻	14125 ^f 1	17 ⁽⁺⁾	1992.7+x ^j 12	(20)
4535 [‡]		9466 ^e 1	12 ⁺	14447 1	17 ⁻	4208.1+x ^j 15	(22)
4904.5 ^b 8	7 ⁻	10247 ^f 1	11 ⁽⁺⁾	14546 ^h 1	17 ⁻	6647.6+x ^j 17	(24)
5130.3 ^c 11	6 ⁻	10317 ^d 1	13 ⁺	15049 ^g 1	18 ⁽⁺⁾	9337.4+x ^j 20	(26)
5143.3 ^a 10	7 ⁺	10375 ^e 1	14 ⁺	15420 ⁱ 1	18 ⁻	12276.6+x ^j 23	(28)
5482.5@ 11	8 ⁺	10636 ^g 1	12 ⁽⁺⁾	15707 2	19 ⁻	15512+x ^j 3	(30)

[†] x=17408 in Adopted Levels based on $^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma)$ reaction.

[‡] Level from **1997Fu08** only.

[#] From **1998Sv01**.

@ Band(A): g.s. band.

& Band(B): $K^{\pi}=2^{+}$, $\alpha=0$.

^a Band(b): $K^{\pi}=2^{+}$, $\alpha=1$.

^b Band(C): $K^{\pi}=3^{-}$, $\alpha=1$.

^c Band(c): $K^{\pi}=3^{-}$, $\alpha=0$.

^d Band(D): $K^{\pi}=9^{+}$ band, $\alpha=1$.

^e Band(d): $K^{\pi}=9^{+}$ band, $\alpha=0$.

^f Band(E): $K^{\pi}=11^{+}$, $\alpha=1$. High-j valence configuration= $\pi f_{7/2}^{-1}\pi g_{9/2}^{-1}\nu g_{9/2}^{-1}$ gives maximum (terminating) spin of 21^{+} with remaining three valence neutrons in $f_{5/2}p_{3/2}$ orbits. Experimental Q(intrinsic) from Doppler-shift data decrease from 1.0 2 (J=15) to 0.25 5 (for J=21) as the spin increases.

^g Band(e): $K^{\pi}=11^{+}$, $\alpha=0$.

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$^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01,1997Sv02,1997Fu08 (continued) ^{62}Zn Levels (continued)

^h Band(F): $K^\pi=13^-$, $\alpha=1$. High-j valence configuration= $\pi f_{7/2}^{-1}\pi g_{9/2}^1\nu g_{9/2}^2$ gives maximum (terminating) spin of 24^- with remaining two valence neutrons in $f_{5/2}p_{3/2}$ orbits. Experimental $Q(\text{intrinsic})$ from Doppler-shift data decrease from 1.25 20 (for $J=16$) to 0.30 5 (for $J=24$) as the spin increases.

ⁱ Band(f): $K^\pi=13^-$, $\alpha=0$.

^j Band(G): SD band (1997Sv02). Band intensity $\approx 1\%$. $Q(\text{transition})=2.7 +7-5$ (1997Sv02) corresponding to $\beta_2=0.45 +10-7$. Probable configuration= $\nu f_{7/2}^{-2}\nu g_{9/2}^{+2}$ with possible contribution from configuration= $\nu f_{7/2}^{-2}\nu g_{9/2}^{+3}$ (1997Sv02).

 $\gamma(^{62}\text{Zn})$

A_2 and A_4 coefficients from $\gamma(\theta)$ data and DCO from $\gamma\gamma(\theta)$ are from 1979Mu04.

E_γ †	I_γ †	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡	Comments
279		7701.8		7422.8	11^-		E_γ : from 1997Fu08 only.
358		2743.1	4^+	2385.1	3^+		
370		4904.5	7^-	4535			E_γ : from 1997Fu08 only.
388.3 3	1.2 1	10636	$12^{(+)}$	10247	$11^{(+)}$		
417		9466	12^+	9049	11^+		
546.9 3	5.0 3	11183	$13^{(+)}$	10636	$12^{(+)}$		
557.0 @# 4		2743.1	4^+	2186.1	4^+		$A_2=+0.021$ 21; $A_4=-0.035$ 25
557.0 @# 4		4904.5	7^-	4347.4	6^+		
573.1 3	5.0 3	11756	$14^{(+)}$	11183	$13^{(+)}$		
580		2385.1	3^+	1805.0	2^+		
611		9049	11^+	8438	10^+		
640		4347.4	6^+	3707.5	6^+		
663.6 3	4.3 3	12997	15^-	12333	14^-		
677.7 4	2.0 2	12333	14^-	11655	13^-		
699.6 3	4.2 3	13237	$16^{(+)}$	12537	$15^{(+)}$		
717		14447	17^-	13731	16^-		
733.6 3	5.0 4	13731	16^-	12997	15^-		
761		4347.4	6^+	3586.2	5^+		
780.6 3	4.1 3	12537	$15^{(+)}$	11756	$14^{(+)}$		
796		5143.3	7^+	4347.4	6^+		
815.0 3	3.7 3	14546	17^-	13731	16^-		
833		4043.3	5^-	3210.1	3^-		
843		3586.2	5^+	2743.1	4^+		
851		1805.0	2^+	953.9	2^+		
851		10317	13^+	9466	12^+		
861		4904.5	7^-	4043.3	5^-		
873.7 3	3.5 3	15420	18^-	14546	17^-		
888.7 3	3.4 2	14125	$17^{(+)}$	13237	$16^{(+)}$		
910		10375	14^+	9466	12^+		Ordering of 2043-910 is reversed in 1997Fu08.
^x 913							E_γ : reported by 1997Fu08 only as a part of 1557-1073-913-2830-954 cascade. Similar cascade (but without 913 γ) reordered by 1998Sv01 as given in comment on 2833 γ .
924.1 4	2.4 2	15049	$18^{(+)}$	14125	$17^{(+)}$		
935.5 5	1.2 1	11183	$13^{(+)}$	10247	$11^{(+)}$		
938		2743.1	4^+	1805.0	2^+		
953.9 # 4		953.9	2^+	0.0	0^+	(E2)	$A_2=+0.293$ 16; $A_4=-0.104$ 20
959.0 8	3.0 8	16379	19^-	15420	18^-		
983		6113.4	8^-	5130.3	6^-		
1024		3210.1	3^-	2186.1	4^+		

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$^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma) E=125\text{ MeV}$ [1998Sv01](#),[1997Sv02](#),[1997Fu08](#) (continued) $\gamma(^{62}\text{Zn})$ (continued)

E_γ [†]	I_γ [†]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	Comments
1024.3 4	2.0 2	18509	21 ⁻	17485	20 ⁻		
1028		9466	12 ⁺	8438	10 ⁺		
1072		9049	11 ⁺	7976	9 ⁺		See comment for 2833 γ .
1087		5130.3	6 ⁻	4043.3	5 ⁻		
1105.9 4	2.4 2	17485	20 ⁻	16379	19 ⁻		
1119.8 4	3.2 2	11756	14 ⁽⁺⁾	10636	12 ⁽⁺⁾		
1160.8 [#] 4		10375	14 ⁺	9215	13 ⁻	D	$A_2=-0.26$ 4; $A_4=+0.09$ 5
1174.6 12	1.6 8	19684	22 ⁻	18509	21 ⁻		
1176.9 [#] 4		6081.4	9 ⁻	4904.5	7 ⁻	Q	$A_2=+0.318$ 21; $A_4=-0.173$ 26; DCO=0.46 16
1197.2 [#] 4		4904.5	7 ⁻	3707.5	6 ⁺	D	$A_2=-0.303$ 24; $A_4=+0.006$ 26; DCO=2.1 4
1201		3586.2	5 ⁺	2385.1	3 ⁺		
1209		6113.4	8 ⁻	4904.5	7 ⁻		
1217.5 7	0.6 1	17590	20 ⁽⁺⁾	16373	19 ⁽⁺⁾		
1232.2 [#] 4		2186.1	4 ⁺	953.9	2 ⁺	(E2)	$A_2=+0.322$ 18; $A_4=-0.093$ 22; DCO=1.03 9
1260		15707	19 ⁻	14447	17 ⁻		
1268		10317	13 ⁺	9049	11 ⁺		
1300		4043.3	5 ⁻	2743.1	4 ⁺		
1310		7423	10 ⁻	6113.4	8 ⁻		
1323.3 6	1.5 2	16373	19 ⁽⁺⁾	15049	18 ⁽⁺⁾		
1341.5 [#] 6		7422.8	11 ⁻	6081.4	9 ⁻	Q	$A_2=+0.134$ 25; $A_4=-0.036$ 30
1342.0 10	4.1 10	12997	15 ⁻	11655	13 ⁻		
1353.8 5	2.8 2	12537	15 ⁽⁺⁾	11183	13 ⁽⁺⁾		
1362.3 7	1.5 2	21046	23 ⁻	19684	22 ⁻		
1397.6 4	3.8 3	13731	16 ⁻	12333	14 ⁻		
1431		2385.1	3 ⁺	953.9	2 ⁺		
1481.2 4	4.8 3	13237	16 ⁽⁺⁾	11756	14 ⁽⁺⁾		
1521.7 [#] 4		3707.5	6 ⁺	2186.1	4 ⁺	(E2)	$A_2=+0.288$ 20; $A_4=-0.130$ 25; DCO=1.03 18
1548		7630		6081.4	9 ⁻		
1549.3 5	3.4 3	14546	17 ⁻	12997	15 ⁻		
1557		5143.3	7 ⁺	3586.2	5 ⁺		See comment for 2833 γ .
1587		11962	16 ⁺	10375	14 ⁺		
1589.0 6	2.7 2	14125	17 ⁽⁺⁾	12537	15 ⁽⁺⁾		
1604.0 [#] 5		4347.4	6 ⁺	2743.1	4 ⁺	Q	$A_2=+0.19$ 5; $A_4=-0.10$ 6
1632		14447	17 ⁻	12815	15 ⁻		
1689.2 5	4.5 3	15420	18 ⁻	13731	16 ⁻		
1775		5482.5	8 ⁺	3707.5	6 ⁺		
1792		9215	13 ⁻	7422.8	11 ⁻		
1805		1805.0	2 ⁺	0.0	0 ⁺		
1813.0 5	3.2 2	15049	18 ⁽⁺⁾	13237	16 ⁽⁺⁾		
1833.1 5	3.7 3	16379	19 ⁻	14546	17 ⁻		
1857		4043.3	5 ⁻	2186.1	4 ⁺		
1931		16379	19 ⁻	14447	17 ⁻		
1992.7 12	0.14 7	1992.7+x	(20)	x	(18)		
2018		7500	10 ⁺	5482.5	8 ⁺		
2043		9466	12 ⁺	7422.8	11 ⁻		Ordering of 2043-910 is reversed in 1997Fu08 .
2065.4 6	5.0 4	17485	20 ⁻	15420	18 ⁻		
2130.3 8	3.5 4	18509	21 ⁻	16379	19 ⁻		
2143.8 12	0.4 1	23190	24 ⁻	21046	23 ⁻		
2199.5 7	4.0 3	19684	22 ⁻	17485	20 ⁻		
2215.3 8	0.93 13	4208.1+x	(22)	1992.7+x	(20)		
2246.7 8	1.6 2	16373	19 ⁽⁺⁾	14125	17 ⁽⁺⁾		
2349		4535		2186.1	4 ⁺		E_γ : from 1997Fu08 only. This γ may correspond to 2356 γ from 8438 level of 1998Sv01 .

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$^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma) E=125 \text{ MeV}$ [1998Sv01,1997Sv02,1997Fu08](#) (continued) $\gamma(^{62}\text{Zn})$ (continued)

$E_\gamma^\dagger$	$I_\gamma^\dagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
2356		8438	10^+	6081.4	9^-	E_γ : 2349 γ in 1997Fu08 placed above 2186.1 level.
2439.5 9	1.02 15	6647.6+x	(24)	4208.1+x	(22)	
2440		12815	15^-	10375	14^+	
2485		14447	17^-	11962	16^+	
2537.4 9	2.7 3	21046	23^-	18509	21^-	
2541.4 9	1.8 2	17590	$20^{(+)}$	15049	$18^{(+)}$	
2585		14546	17^-	11962	16^+	
2689.7 10	0.86 13	9337.4+x	(26)	6647.6+x	(24)	
2747		10247	$11^{(+)}$	7500	10^+	Placed above 953.9 level in 1997Fu08 to define a level at 3784. 1557-1073-913 cascade was proposed to feed the 3784 level. 1072-2833-1557 cascade feeds the 3586 level in 1998Sv01 . No 913 γ was reported by 1998Sv01 .
2833		7976	9^+	5143.3	7^+	
2939.1 12	0.43 11	12276.6+x	(28)	9337.4+x	(26)	
3006		10636	$12^{(+)}$	7630		
3118		12333	14^-	9215	13^-	
3134.7 12	0.6 1	19507	$21^{(+)}$	16373	$19^{(+)}$	
3213		10636	$12^{(+)}$	7422.8	11^-	
3235.6 14	0.10 5	15512+x	(30)	12276.6+x	(28)	
3505.7 14	1.0 2	23190	24^-	19684	22^-	
3986 ^{&}	≈ 0.08	1992.7+x	(20)	15420	18^-	
4232		11655	13^-	7422.8	11^-	

[†] From [1998SvZY](#), unless stated otherwise.[‡] From $\gamma(\theta)$. Mult=Q or E2 corresponds to $\Delta J=2$, stretched; mult=D corresponds to $\Delta J=1$.# From [1979Mu04](#).

@ Multiply placed.

& Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

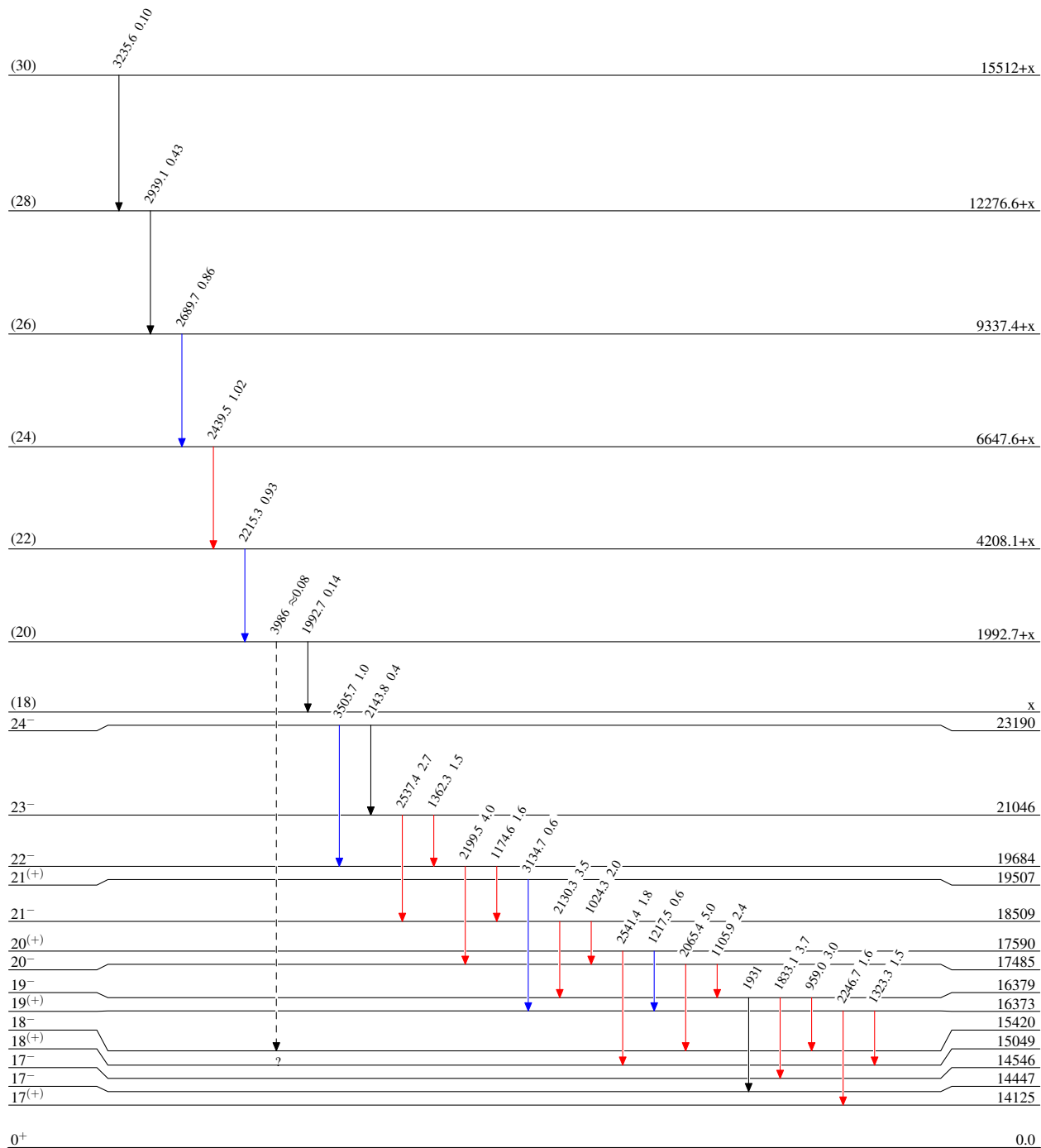
$^{40}\text{Ca}(^{28}\text{Si}, \alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01,1997Sv02,1997Fu08

Legend

Level Scheme

Intensities: Percent of reaction channel

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

 $^{62}_{30}\text{Zn}_{32}$

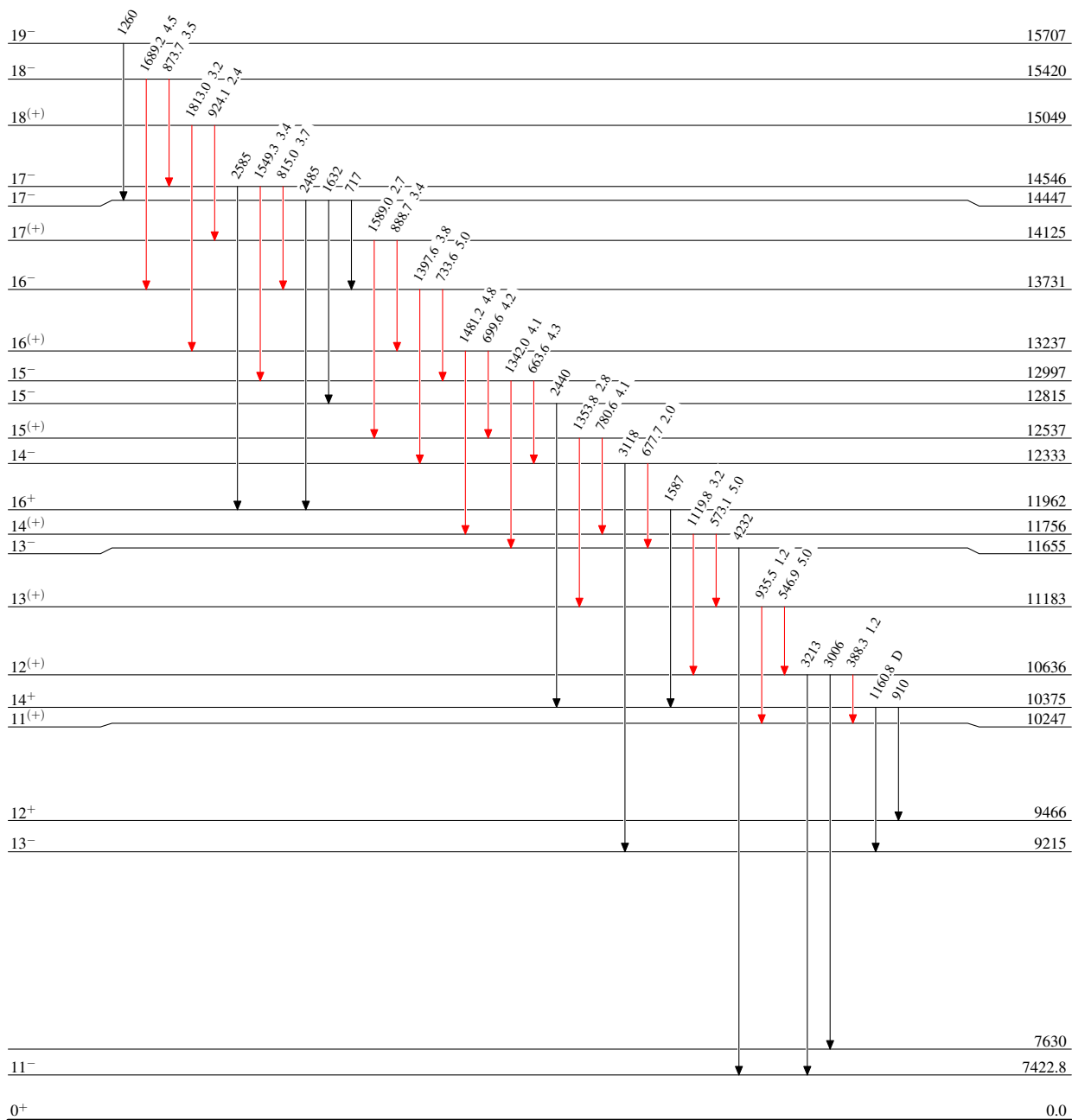
$^{40}\text{Ca}(^{28}\text{Si}, \alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01,1997Sv02,1997Fu08

Level Scheme (continued)

Intensities: Percent of reaction channel

Legend

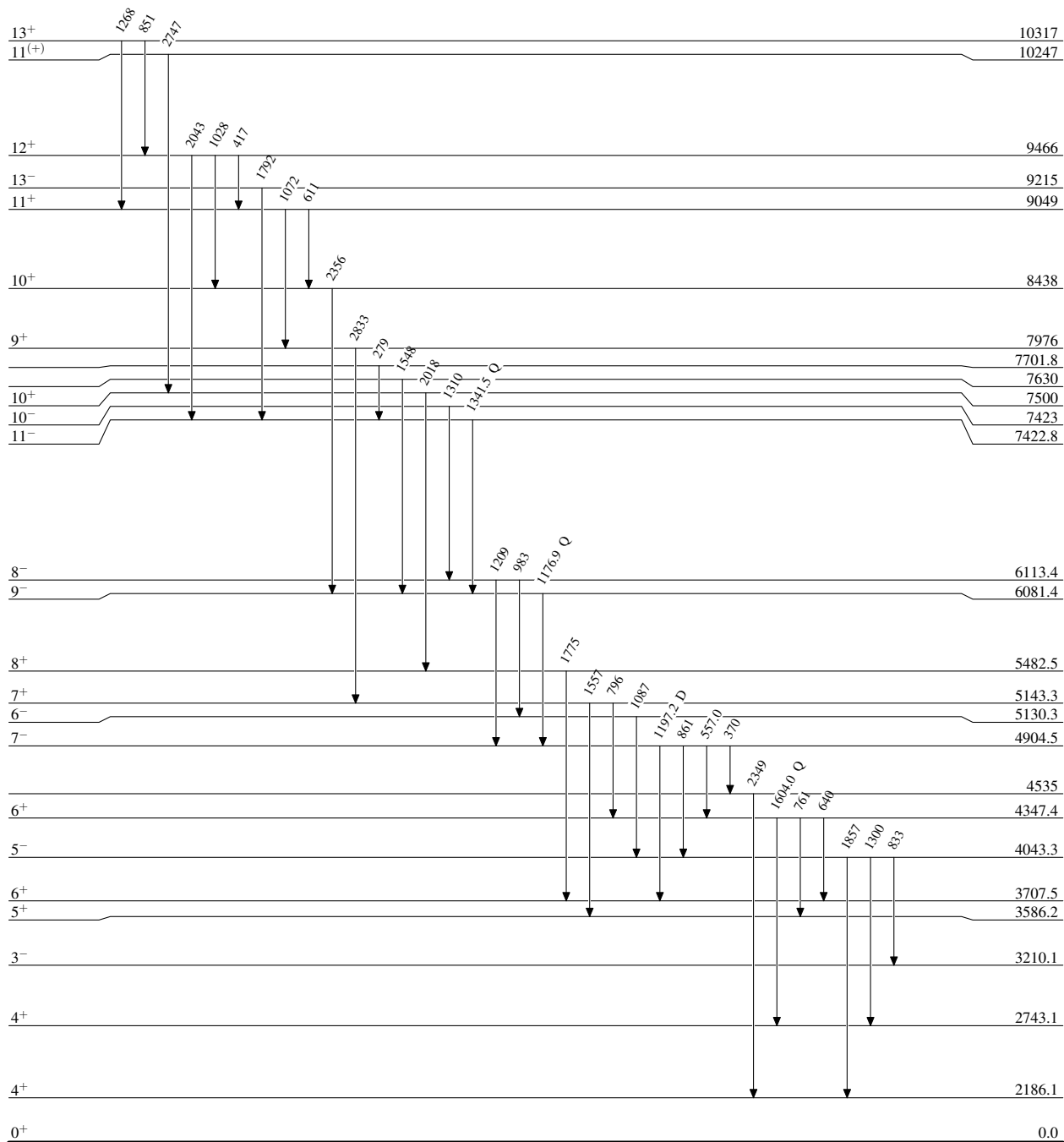
- $\rightarrow$ $I_\gamma < 2\% \times I_\gamma^{\max}$
 $\rightarrow$ $I_\gamma < 10\% \times I_\gamma^{\max}$
 $\rightarrow$ $I_\gamma > 10\% \times I_\gamma^{\max}$



$^{40}\text{Ca}(^{28}\text{Si}, \alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01, 1997Sv02, 1997Fu08

Level Scheme (continued)

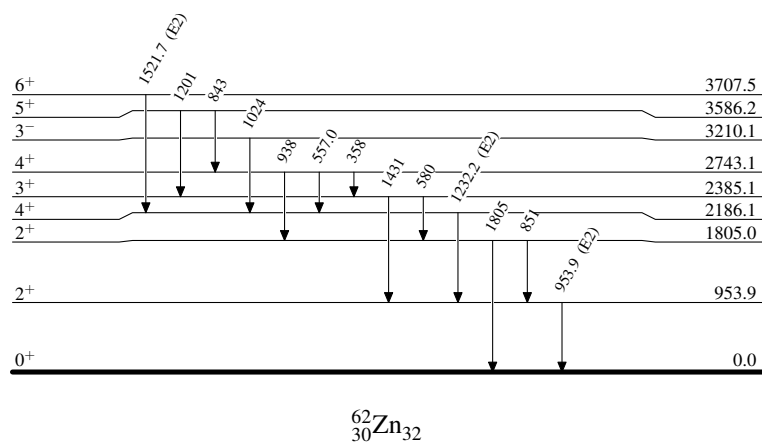
Intensities: Percent of reaction channel

 $^{62}_{30}\text{Zn}_{32}$

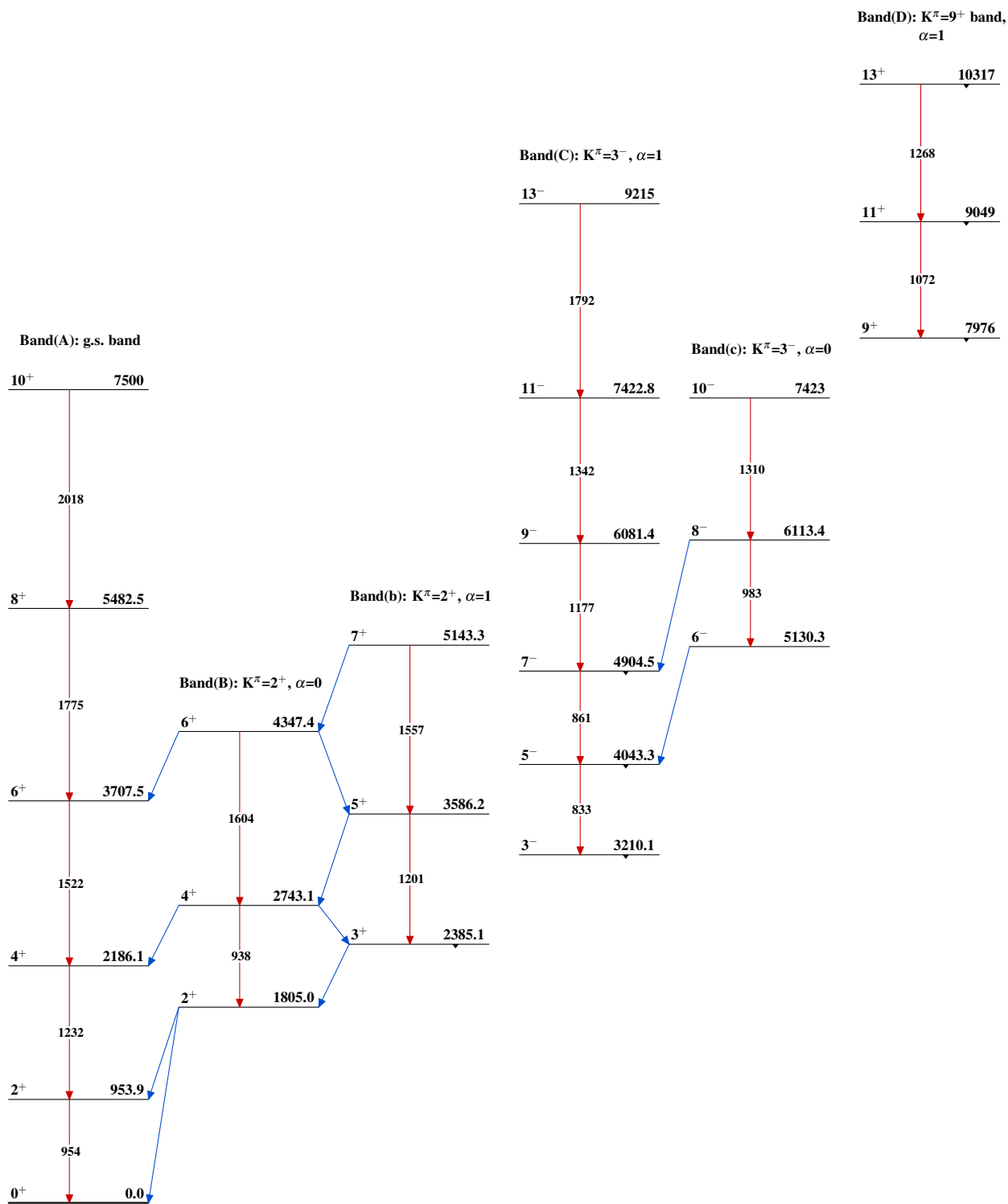
$^{40}\text{Ca}(^{28}\text{Si},\alpha 2p\gamma)$ E=125 MeV 1998Sv01,1997Sv02,1997Fu08

Level Scheme (continued)

Intensities: Percent of reaction channel



$^{62}_{30}\text{Zn}_{32}$

$^{40}\text{Ca}(^{28}\text{Si}, \alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01,1997Sv02,1997Fu08

$^{40}\text{Ca}(^{28}\text{Si}, \alpha 2p\gamma) E=125 \text{ MeV}$ 1998Sv01,1997Sv02,1997Fu08 (continued)