^{12}C(^{58}Ni,pnγ)   **1998So23**

	Type	Author	History Citation	Literature Cutoff Date
	Full Evaluation	E. A. Mccutchan	NDS 113, 1735 (2012)	1-Mar-2012

E(^{58}Ni)=261 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO), particle-γ, and n-γ coincidences using the NORDBALL detector array consisting of 15 Compton-suppressed Ge detectors and 30 BaF$_2$ crystals. Channel selection performed with an inner 4π array of 21 ΔE type Si detectors and 11 liquid scintillators covering about 1π in the forward direction.

^{68}As Levels

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	E(level)[†]	J$^\pi$	T$_{1/2}$[‡]
0.0	3$^+$		1427.5 2	6$^{(-)}$	<5 ns	3170.1 2	10$^{(+)}$	<5 ns
158.0 1	3$^+$	<5 ns	1571.1 2	(6$^-$)	19 ns 3	3183.2 2	11$^{(+)}$	<5 ns
214.0 1	4$^+$	<5 ns	1859.1 3	(7$^-$)	<5 ns	3340.9? 3		<5 ns
313.2 1	3$^+$	<5 ns	1955.9 2	(8$^-$)	<5 ns	4366.1 3		<5 ns
500.2 1	4$^+$	<5 ns	2093.9 2	8$^{(-)}$	<5 ns	4388.1 2	12$^{(+)}$	<5 ns
549.7 1	4$^+$	<5 ns	2157.7 2	9$^{(+)}$	36 ns 2	4585.7 3		<5 ns
733.3 1	5$^+$	<5 ns	2251.1? 3	(7$^-$)	<5 ns	4897.1? 3	(12$^+$)	<5 ns
893.4 1	4$^{(-)}$	<5 ns	2301.1 2	(8$^-$)	<5 ns	5087.1 2	13$^{(+)}$	<5 ns
964.8 1	5$^{(-)}$	<5 ns	2474.3 2	8	<5 ns	5652.5 3	(14$^+$)	<5 ns
1214.6 2		<5 ns	2829.8 3		<5 ns	6063.4 3	(15$^+$)	<5 ns
1303.8 2	7$^{(-)}$	<5 ns	2938.7 2	9	<5 ns			
1322.9 2	6$^{(-)}$	<5 ns	3126.5? 3		<5 ns			

[†] From a least-squares fit to Eγ, by evaluator.
[‡] From delayed γ spectra.

γ(^{68}As)

E$_\gamma$	I$_\gamma$[†]	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.[‡]	Comments
56.1 4	1.7 5	214.0	4$^+$	158.0	3$^+$		
63.9 1	9.1 14	2157.7	9$^{(+)}$	2093.9	8$^{(-)}$		
71.3 1	91 15	964.8	5$^{(-)}$	893.4	4$^{(-)}$	D[&]	R = 0.85 11.
154.8 3	0.8 1	313.2	3$^+$	158.0	3$^+$		
158.0 1	95.2 6	158.0	3$^+$	0.0	3$^+$	M1+E2	R = 0.88 11.
							Mult.: δ=−1.3 +5−16 from ^{54}Fe(^{16}O,pnγ) is in agreement with only ΔJ=0 M1/E2 from R.
183.8 3	1.5 2	733.3	5$^+$	549.7	4$^+$		
187.6 3	0.4 1	500.2	4$^+$	313.2	3$^+$		
213.1 4	0.4 1	1427.5	6$^{(-)}$	1214.6			
214.1 1	26.7 4	214.0	4$^+$	0.0	3$^+$	M1+E2[#]	R = 1.18 12.
231.6 1	7.2 3	964.8	5$^{(-)}$	733.3	5$^+$	D[@]	R = 1.53 16.
236.4 1	2.7 2	549.7	4$^+$	313.2	3$^+$	M1+E2[#]	R = 1.34 19.
248.4 2	1.4 1	1571.1	(6$^-$)	1322.9	6$^{(-)}$	D[@]	R = 1.54 25.
250.2 3	1.0 2	1214.6		964.8	5$^{(-)}$		
266.6 5	0.3 1	1571.1	(6$^-$)	1303.8	7$^{(-)}$		
^{x}278.8 2	1.3 1						
285.9 4	0.4 1	500.2	4$^+$	214.0	4$^+$		
288.0 2	0.7 1	1859.1	(7$^-$)	1571.1	(6$^-$)	D[&]	R = 0.79 22.
^{x}301.9 3	0.7 1						
313.1 1	4.8 1	313.2	3$^+$	0.0	3$^+$		
316.6 1	10.3 4	2474.3	8	2157.7	9$^{(+)}$	D[&]	R = 0.80 12.

Continued on next page (footnotes at end of table)

$^{12}\text{C}(^{58}\text{Ni,pn}\gamma)$ **1998So23** (continued)

$\gamma(^{68}\text{As})$ (continued)

E_γ	$I_\gamma{}^\dagger$	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	Comments
321.1 2	3.3 2	1214.6		893.4	4$^{(-)}$		
335.7 2	10.8 4	549.7	4$^+$	214.0	4$^+$	D$^@$	R = 1.43 10.
339.0 1	100.0 3	1303.8	7$^{(-)}$	964.8	5$^{(-)}$	Q$^\&$	R = 1.49 12.
343.7 1	51.2 2	893.4	4$^{(-)}$	549.7	4$^+$	D$^@$	R = 1.46 12.
358.1 1	14.5 6	1322.9	6$^{(-)}$	964.8	5$^{(-)}$	D$^\&$	R = 0.89 12.
391.7 1	30.0 1	549.7	4$^+$	158.0	3$^+$	M1+E2$^\#$	R = 1.35 17.
393.3 2	4.4 2	893.4	4$^{(-)}$	500.2	4$^+$		
415.1 1	8.5 4	964.8	5$^{(-)}$	549.7	4$^+$	D$^\&$	R = 0.82 12.
462.7 1	5.4 3	1427.5	6$^{(-)}$	964.8	5$^{(-)}$	D$^\&$	R = 0.87 14.
464.4 1	3.9 2	2938.7	9	2474.3	8	M1+E2$^\#$	R = 0.60 16.
500.1 1	6.7 1	500.2	4$^+$	0.0	3$^+$	M1+E2$^\#$	R = 0.58 14.
519.3 1	9.0 5	733.3	5$^+$	214.0	4$^+$	M1+E2$^\#$	R = 0.57 12.
549.7 1	14.4 6	549.7	4$^+$	0.0	3$^+$	M1+E2$^\#$	R = 1.27 16.
580.0 2	1.4 2	893.4	4$^{(-)}$	313.2	3$^+$		
633.0 2	2.5 2	1955.9	(8$^-$)	1322.9	6$^{(-)}$	Q$^\&$	R = 1.5 4.
652.1 3	0.6 2	1955.9	(8$^-$)	1303.8	7$^{(-)}$		
^{x}659.9 2	1.6 2						
679.4 2	1.9 2	893.4	4$^{(-)}$	214.0	4$^+$		
687.5^a 3	0.9 2	2938.7	9	2251.1?	(7$^-$)		
699.0 1	17.4 6	5087.1	13$^{(+)}$	4388.1	12$^{(+)}$	D$^\&$	R = 0.97 17.
735.4 1	60.1 2	893.4	4$^{(-)}$	158.0	3$^+$	D$^\&$	R = 0.92 14.
755.4^a 1	4.2 3	5652.5	(14$^+$)	4897.1?	(12$^+$)	Q$^\&$	R = 1.41 27.
790.1 1	15.1 6	2093.9	8$^{(-)}$	1303.8	7$^{(-)}$	M1+E2	R = 1.32 17.
853.9 1	75.0 3	2157.7	9$^{(+)}$	1303.8	7$^{(-)}$	M2$^\&$	R = 1.47 14.
928.1^a 3	1.3 2	2251.1?	(7$^-$)	1322.9	6$^{(-)}$	D$^\&$	R = 0.75 29.
968.8^a 2	2.8 3	3126.5?		2157.7	9$^{(+)}$		
976.3 1	5.2 3	6063.4	(15$^+$)	5087.1	13$^{(+)}$	Q$^\&$	R = 1.42 30.
978.2 1	4.2 3	2301.1	(8$^-$)	1322.9	6$^{(-)}$	Q$^\&$	R = 1.47 28.
1012.4 1	25.8 9	3170.1	10$^{(+)}$	2157.7	9$^{(+)}$	M1+E2$^\#$	R = 0.54 12.
1025.4 1	33.8 1	3183.2	11$^{(+)}$	2157.7	9$^{(+)}$	Q$^\&$	R = 1.52 23.
1067.1 6	0.5 2	5652.5	(14$^+$)	4585.7			
1183.2^a 2	2.6 3	3340.9?		2157.7	9$^{(+)}$		
1196.0 2	2.4 3	4366.1		3170.1	10$^{(+)}$		
1204.9 1	7.3 3	4388.1	12$^{(+)}$	3183.2	11$^{(+)}$	M1+E2$^\#$	R = 0.64 17.
1218.0 1	10.7 5	4388.1	12$^{(+)}$	3170.1	10$^{(+)}$	Q$^\&$	R = 1.48 26.
1402.6 3	1.7 2	4585.7		3183.2	11$^{(+)}$		
1526.0 2	2.6 3	2829.8		1303.8	7$^{(-)}$		
1713.9^a 2	4.3 3	4897.1?	(12$^+$)	3183.2	11$^{(+)}$	D$^\&$	R = 0.78 24.

† Relative intensity normalized to $I\gamma(339\gamma)$=100.

‡ Based on the angular distribution ratio $R=I\gamma(143°)/[I\gamma(79°)+I\gamma(101°)]$ where R≈1.5 corresponds to stretched Q, ΔJ=0 D, or ΔJ=1 mixed E2/M1 transitions, R≈0.8 to stretched D or ΔJ=0 highly mixed E2/M1 transitions, R≈1.2-1.3 to ΔJ=0,1 mixed E2/M1 transitions and R≈0.4-0.6 to ΔJ=1 mixed E2/M1 transitions.

$^\#$ ΔJ=1.

$^@$ ΔJ=0.

^{12}C(^{58}Ni,pnγ)   **1998So23 (continued)**

γ(^{68}As) (continued)

$^\&$ Stretched.
^{a} Placement of transition in the level scheme is uncertain.
^{x} γ ray not placed in level scheme.

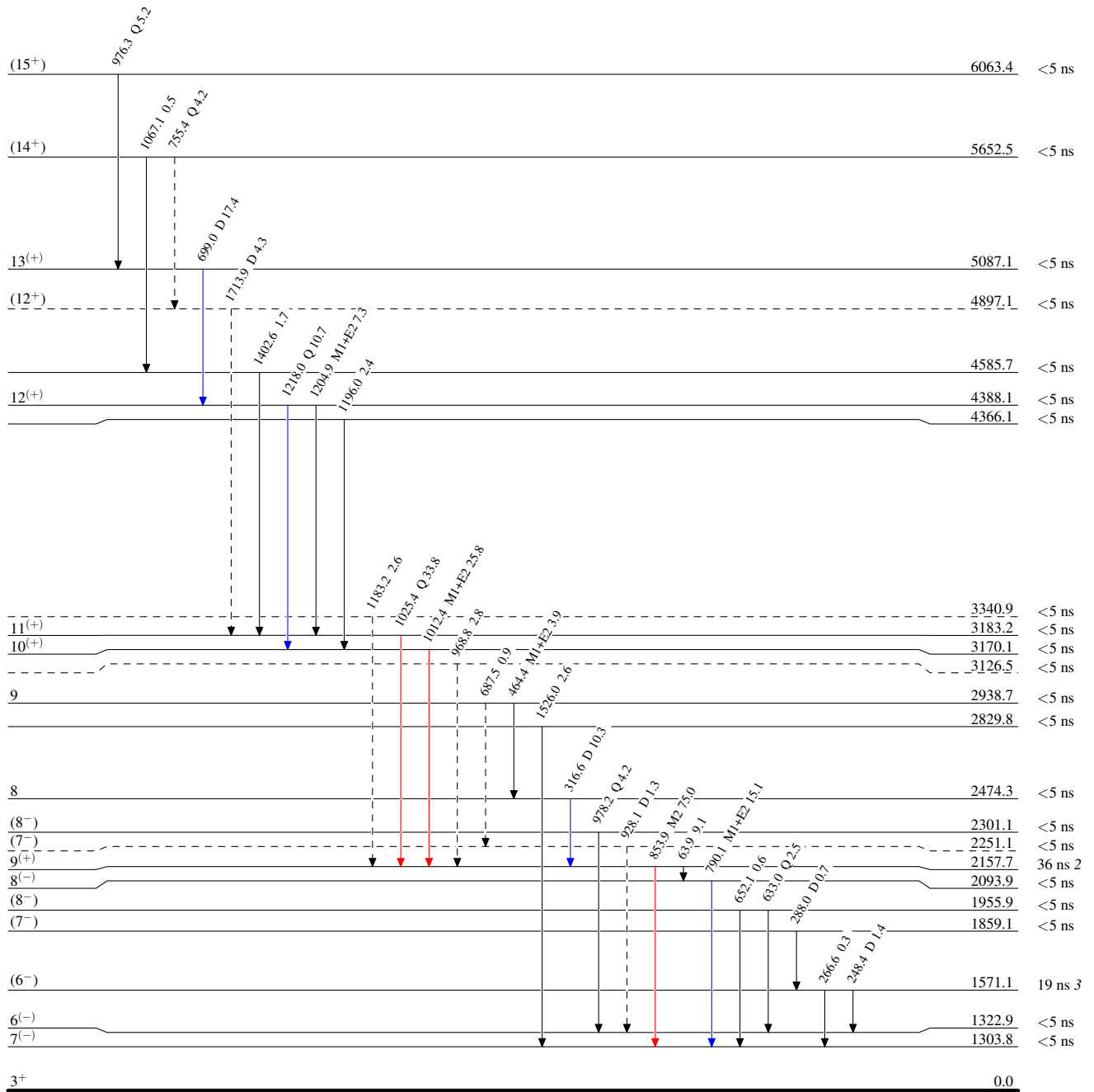^{12}C(^{58}Ni,pnγ)   **1998So23 (continued)**

$^{12}\text{C}(^{58}\text{Ni,pn}\gamma)$ 1998So23

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)

$^{68}_{33}\text{As}_{35}$

^{12}C(^{58}Ni,pnγ)   1998So23

Level Scheme (continued)

Intensities: Relative I$_γ$

Legend

I$_γ$ < 2%×I$_γ^{max}$
I$_γ$ < 10%×I$_γ^{max}$
I$_γ$ > 10%×I$_γ^{max}$

462.7 D 5.4
213.1 0.4
358.1 D 14.5
339.0 Q 100.0
321.1 3.3
250.2 1.0
415.1 D 8.5
231.6 D 7.2
71.3 D 9I
735.4 D 60.1
679.4 1.9
580.0 1.4
393.3 4.4
343.7 D 51.2
519.3 M1+E2 9.0
183.8 1.5
549.7 M1+E2 14.4
391.7 M1+E2 30.0
335.7 D 10.8
236.4 M1+E2 2.7
500.1 M1+E2 6.7
285.9 0.4
187.6 0.4
313.1 4.8
154.8 0.8
214.1 M1+E2 26.7
56.1 1.7
158.0 M1+E2 95.2

6$^{(-)}$ 1427.5   <5 ns
6$^{(-)}$ 1322.9   <5 ns
7$^{(-)}$ 1303.8   <5 ns
                         1214.6   <5 ns
5$^{(-)}$ 964.8   <5 ns
4$^{(-)}$ 893.4   <5 ns
5$^+$ 733.3   <5 ns
4$^+$ 549.7   <5 ns
4$^+$ 500.2   <5 ns
3$^+$ 313.2   <5 ns
4$^+$ 214.0   <5 ns
3$^+$ 158.0   <5 ns
3$^+$ 0.0

$^{68}_{33}$As$_{35}$