^{58}Ni(^{3}He,2pγ) 1989Ju02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 151, 1 (2018)	1-Apr-2018

E(^{3}He)=15-27 MeV. Measured excit, Eγ, Iγ, Ice, $\gamma(\theta)$, pγ and $\gamma\gamma$ coin (1989Ju02).
α(K)exp values were normalized using the (2^{+} to g.s.) E2 transition in ^{58}Ni.
For p-p-339γ coin study of (^{3}He,2pγ) reaction mechanism, see 1982HaZU.

^{59}Ni Levels

E(level)	J$^{\pi}$ †	Comments
0.0	3/2^{-} #	
339.45 *11*	5/2^{-} @	
465.03 *16*	1/2^{-}	
877.97 *11*	3/2^{-} #	
1189.01 *13*	5/2^{-} #	
1301.36 *15*	1/2^{-}	
1337.98 *11*	7/2^{-} #	
1680.04 *20*	5/2^{-}	
1735 *1*	3/2^{-}	
1767.50 *14*	9/2^{-} @	J$^{\pi}$: From Adopted Levels. Authors′ value 9/2.
1948.02 *11*	7/2^{-} @	
2530.47 *15*	9/2^{-} #	
2553.5		
2627.28 *17*	7/2^{-}	
2682.0 *7*	5/2^{-}	
2705.29 *14*	11/2^{-} #	
3054.52 *14*	9/2^{+} ‡	
3125.53 *18*	(7/2^{-},9/2^{-})	
3377.00 *15*	11/2^{-} @	
3538.60 *23*	9/2^{-}	
3559.54 *13*	(11/2)$^{-}$	J$^{\pi}$: From Adopted Levels. Authors′ value (11/2).
4103.11 *20*	11/2$^{(+)}$ ‡	
4141.13 *16*	13/2^{-}	
4418.84 *24*	(13/2^{-})	
4455.28 *17*	13/2^{+} ‡	
4615.95 *24*	(9/2^{+})	J$^{\pi}$: inconsistent with authors′ inclusion of level in $g_{9/2}$ band.
4947.20 *22*	15/2^{-}	
5098.27 *23*	(13/2^{-})	
5251.3 *3*	17/2^{+} ‡	
5293.04 *25*	(15/2^{-})	
5381.38 *19*	(15/2^{+}) ‡	
5989.2 *3*	‡	
6076.13 *22*	(15/2^{-},17/2^{-})	
6502.43 *25*	(19/2^{-})	
7163.9 *3*	(19/2^{-},21/2^{-})	
7950.4 *4*	(19/2^{-},21/2^{-})	

† Authors′ values, based on $\gamma(\theta)$, excit and reaction systematics, except otherwise noted.
‡ Possible $g_{9/2}$ collective state (1989Ju02).
# Possible $p_{3/2}$ collective band member (1989Ju02).
@ Possible $f_{5/2}$ collective band member (1989Ju02).

^{58}Ni(^{3}He,2pγ) 1989Ju02 (continued)

γ(^{59}Ni)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[#]	Comments
310.9 *2*	0.5	1189.01	5/2⁻	877.97	3/2⁻			A_2=−0.19 *5*; A_4=−0.05 *8*
339.4 *2*	100	339.45	5/2⁻	0.0	3/2⁻	M1+E2		α(K)exp=200×10^{-5} *10*. A_2=−0.142 *11*, A_4=+0.02 *2*; δ=−2.8 +*8*−*16* or −0.05 +*28*−*26* (favored by α(K)exp datum).
349.1 *2*	0.1	3054.52	9/2⁺	2705.29	11/2⁻			
423.5 *2*	2.0	1301.36	1/2⁻	877.97	3/2⁻			
426.5 *2*	0.9[a]	6502.43	(19/2⁻)	6076.13	(15/2⁻,17/2⁻)			
427.0 *2*	0.9[a]	3054.52	9/2⁺	2627.28	7/2⁻			
429.6 *2*	3.0	1767.50	9/2⁻	1337.98	7/2⁻	M1+E2	−0.18 +*7*−*5*	α(K)exp=150×10^{-5} *30*. A_2=−0.317 *11*, A_4=+0.04 *1*; δ=−0.18 +*7*−*5* (favored by α(K)exp datum) or −3 +*2*−*4*.
434.0 *2*	0.6	3559.54	(11/2)⁻	3125.53	(7/2⁻,9/2⁻)			A_2=−0.19 *5*; A_4=+0.12 *8*
465.1 *2*	7.6[@]	465.03	1/2⁻	0.0	3/2⁻			
538.6 *2*	0.3	877.97	3/2⁻	339.45	5/2⁻			
581.8 *2*	5.0	4141.13	13/2⁻	3559.54	(11/2)⁻	M1(+E2)	+0.07 *5*	A_2=−0.102 *10*; A_4=+0.04 *2* α(K)exp=71×10^{-5} *10*.
610.0 *2*	0.7	1948.02	7/2⁻	1337.98	7/2⁻			A_2=+0.10 *6*; A_4=−0.04 *8*
661.5 *2*	0.6	7163.9	(19/2⁻,21/2⁻)	6502.43	(19/2⁻)			A_2=+0.11 *5*; A_4=−0.03 *8*
671.5 *2*	4.0[@]	3377.00	11/2⁻	2705.29	11/2⁻	E2(+M1)		A_2=+0.149 *7*; A_4=+0.01 *1* α(K)exp=60×10^{-5} *9*.
759.0 *2*	1.4	1948.02	7/2⁻	1189.01	5/2⁻	D+Q	+0.27 +*13*−*10*	A_2=+0.07 *2*; A_4=−0.04 *3*
764.1 *2*	5.0[@]	4141.13	13/2⁻	3377.00	11/2⁻	E2,M1		α(K)exp=37×10^{-5} *7*; A_2=+0.25.
786.5 *2*	0.4	7950.4	(19/2⁻,21/2⁻)	7163.9	(19/2⁻,21/2⁻)			A_2=−0.09 *7*; A_4=+0.02 *11*
796.0 *2*	3.7	5251.3	17/2⁺	4455.28	13/2⁺	E2		α(K)exp=36×10^{-5} *5*. A_2=+0.352 *4*, A_4=−0.110 *5*; δ=+0.07 *12*.
806.0 *2*	3.9	4947.20	15/2⁻	4141.13	13/2⁻	M1+E2	+0.23 *4*	A_2=+0.101 *3*; A_4=+0.040 *5* α(K)exp=29×10^{-5} *4*.
836.4 *2*	[&]	1301.36	1/2⁻	465.03	1/2⁻			
854.3 *2*	2.2	3559.54	(11/2)⁻	2705.29	11/2⁻	M1+E2	−0.07 *5*	A_2=+0.244 *4*; A_4=+0.017 *6* α(K)exp=33×10^{-5} *10*.
858.5 *2*	0.2	4418.84	(13/2⁻)	3559.54	(11/2)⁻			A_2=−0.46 *11*; A_4=+0.5 *2*
878.0 *2*	13.6	877.97	3/2⁻	0.0	3/2⁻	M1		A_2=−0.02 *2*; A_4=−0.02 *2* α(K)exp=22×10^{-5} *3*.
926.0 *2*	0.3	5381.38	(15/2⁺)	4455.28	13/2⁺			A_2=+0.6 *2*; A_4=−0.2 *2*
938.1 *2*	2.1	2705.29	11/2⁻	1767.50	9/2⁻	D+Q	−0.9 +*5*−*9*	A_2=−0.786 *13*; A_4=+0.13 *2*
[x]958[ed]	0.5[e]							
958[ed]	0.5[e]	5098.27	(13/2⁻)	4141.13	13/2⁻			A_2=+0.22 *9*; A_4=−0.13 *12*
998.5 *2*	28.7	1337.98	7/2⁻	339.45	5/2⁻	E2+M1	+4.3 *8*	A_2=+0.184 *4*; A_4=+0.088 *6* α(K)exp=22×10^{-5} *2*.
1029.2 *2*	0.7	3559.54	(11/2)⁻	2530.47	9/2⁻	D		A_2=−0.201 *8*; A_4=+0.017 *12*; δ=−0.00 *4*
1070.2 *2*	0.2	1948.02	7/2⁻	877.97	3/2⁻			
1106.6 *2*	5.4	3054.52	9/2⁺	1948.02	7/2⁻	E1(+M2)	−0.03 *3*	A_2=−0.195 *10*; A_4=+0.015 *16* α(K)exp=8.7×10^{-5} *15*.
1129.0 *2*	0.3	6076.13	(15/2⁻,17/2⁻)	4947.20	15/2⁻			A_2=−0.38 *8*; A_4=+0.14 *12*
1151.9 *2*	0.4	5293.04	(15/2⁻)	4141.13	13/2⁻			A_2=−0.28 *8*; A_4=+0.25 *12*

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$^{58}Ni(^{3}He,2p\gamma)$ 1989Ju02 (continued)

$\gamma(^{59}Ni)$ (continued)

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[#]	Comments
1189.1 2	10.0[@]	1189.01	5/2⁻	0.0	3/2⁻	M1,E2		A_2=−0.197 8; A_4=+0.003 12 α(K)exp=14×10^{-5} 2.
1192.5 2	1.7	2530.47	9/2⁻	1337.98	7/2⁻	D+Q	−0.9 +6−13	A_2=−0.71 4; A_4=+0.18 7
1240.3 2	0.5	5381.38	(15/2⁺)	4141.13	13/2⁻			A_2=−0.66 11; A_4=+0.2 2
1278.3 2	0.8	5381.38	(15/2⁺)	4103.11	11/2$^{(+)}$			A_2=+0.28 5; A_4=−0.02 7
1301.0 2	10.0	1301.36	1/2⁻	0.0	3/2⁻			
1338.0 2	13.3	1337.98	7/2⁻	0.0	3/2⁻	E2		A_2=+0.208 6; A_4=−0.031 9 α(K)exp=9.9×10^{-5} 10.
1341[ec]	3.8[ec]	1680.04	5/2⁻	339.45	5/2⁻			
1341[ec]	3.8[ec]	2530.47	9/2⁻	1189.01	5/2⁻			
1358.0 2	<0.5	3125.53	(7/2⁻,9/2⁻)	1767.50	9/2⁻			
1367.1 2	18.6	2705.29	11/2⁻	1337.98	7/2⁻	E2		A_2=+0.219 3; A_4=−0.032 5 α(K)exp=8.5×10^{-5} 8.
1400.5 2	3.1[@]	4455.28	13/2⁺	3054.52	9/2⁺	Q		A_2=+0.164 6; A_4=−0.021 9
1428.1 2	29.5	1767.50	9/2⁻	339.45	5/2⁻	E2		A_2=+0.230 6; A_4=−0.022 9 α(K)exp=8.2×10^{-5} 8.
1436.1 2	≈0.1[@]	4141.13	13/2⁻	2705.29	11/2⁻			
1533.9 2	0.4	5989.2		4455.28	13/2⁺			A_2=+0.42 7; A_4=−0.01 9
1538.7 2	0.7	5098.27	(13/2⁻)	3559.54	(11/2)⁻			A_2=+0.16 4; A_4=−0.04 6
1555.0 2	0.7	6502.43	(19/2⁻)	4947.20	15/2⁻	Q		A_2=+0.23 3; A_4=−0.04 4
1561.4 2	0.4	4615.95	(9/2⁺)	3054.52	9/2⁺			A_2=+0.29 4; A_4=+0.06 5
1569.3 2	≈0.1	4947.20	15/2⁻	3377.00	11/2⁻			
1608.3 2	2.5[b]	1948.02	7/2⁻	339.45	5/2⁻	[b]	[b]	
1609.5 2	5.4[b]	3377.00	11/2⁻	1767.50	9/2⁻	[b]	[b]	
1611.3 2	1.2	3559.54	(11/2)⁻	1948.02	7/2⁻			A_2=+0.14 9; A_4=+0.16 15
1680.0 2	1.2	1680.04	5/2⁻	0.0	3/2⁻			A_2=−0.25 3, A_4=−0.05 4.
1716.4 2	2.8	3054.52	9/2⁺	1337.98	7/2⁻	E1		α(K)exp<4.8×10^{-5}. A_2=−0.190 13, A_4=−0.011 2, giving δ=−0.03 +7−5.
1735	≈1.0	1735	3/2⁻	0.0	3/2⁻			
1750.1 2	2.5	4455.28	13/2⁺	2705.29	11/2⁻	E1+M2	−0.11 7	A_2=−0.321 9; A_4=+0.036 15 α(K)exp<3.0×10^{-5}.
1792.1 2	5.2	3559.54	(11/2)⁻	1767.50	9/2⁻	M1+E2	+0.11 +5−3	A_2=−0.051 11; A_4=−0.01 2 α(K)exp=6×10^{-5} 2. Mult.: M1,E2 from α(K)exp, D+Q from $\gamma(\theta)$.
1804	0.2	2682.0	5/2⁻	877.97	3/2⁻			
1935.1 2	1.0	6076.13	(15/2⁻,17/2⁻)	4141.13	13/2⁻	M1,E2		A_2=+0.172 9; A_4=+0.07 1 α(K)exp=6×10^{-5} 3.
1948.0 2	6.6	1948.02	7/2⁻	0.0	3/2⁻	E2		A_2=+0.171 7; A_4=−0.016 11 α(K)exp=4.2×10^{-5} 13. Mult.: M1,E2 from α(K)exp; ΔJ=2 from $\gamma(\theta)$.
2039.1 2	0.5	3377.00	11/2⁻	1337.98	7/2⁻	Q		A_2=+0.54 5; A_4=−0.17 8
2191.1 2	1.6	2530.47	9/2⁻	339.45	5/2⁻	Q		A_2=+0.12 3; A_4=−0.03 4
2200.6 2	0.2	3538.60	9/2⁻	1337.98	7/2⁻			A_2≈−0.3
2214	[&]	2553.5		339.45	5/2⁻			
2222.0 2	0.7	3559.54	(11/2)⁻	1337.98	7/2⁻			
2287.1 2	0.4	2627.28	7/2⁻	339.45	5/2⁻			A_2=−0.9 2
2335.6 2	1.2	4103.11	11/2$^{(+)}$	1767.50	9/2⁻			A_2≈−0.2
2348.0 2	0.5	3538.60	9/2⁻	1189.01	5/2⁻	Q		A_2=+0.12 5; A_4=−0.07 7
2373.4 2	0.5	4141.13	13/2⁻	1767.50	9/2⁻	Q		A_2=+0.13 5; A_4=−0.08 4
2392.1 2	0.4	5098.27	(13/2⁻)	2705.29	11/2⁻			A_2=−0.05 7; A_4=+0.13 10

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$^{58}Ni(^{3}He,2p\gamma)$ 1989Ju02 (continued)

$\gamma(^{59}Ni)$ (continued)

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	Comments
2627.2 *2*	0.6	2627.28	7/2⁻	0.0	3/2⁻	Q	A_2=+0.27 *4*; A_4=−0.10 *7*
2651.3 *2*	1.7	4418.84	(13/2⁻)	1767.50	9/2⁻		A_2=+0.13 *5*; A_4=−0.11 *4*
2682	0.3	2682.0	5/2⁻	0.0	3/2⁻		
2786.0 *2*	1.4	3125.53	(7/2⁻,9/2⁻)	339.45	5/2⁻		A_2=+0.06 *3*; A_4=−0.02 *6*

[†] Relative photon intensity at 23.1 MeV from 1989Ju02; ΔIγ=1-30%.
[‡] Based on $\gamma(\theta)$ and/or ce data from 1989Ju02; from $\gamma(\theta)$ alone if $\Delta\pi$ not indicated.
[#] From $\gamma(\theta)$.
[@] From coincidence spectrum (1989Ju02).
[&] Transition shown on level scheme, but absent from table of observed γ rays.
[a] I(426.5γ)+I(427.0γ)=0.9. A_2=−0.21 *3*, A_4=+0.07 *5* for doublet (1989Ju02).
[b] Iγ from coincidence spectrum. A_2=−0.155 *7*, A_4=+0.03 *1*, α(K)exp=6.1×10^{-5} *15*, allowing mult.=M1(+E2) and δ=+0.02 *3* for doublet (1989Ju02).
[c] Doublet, for which A_2=+0.07 *2*, A_4=+0.04 *3*.
[d] Doublet; placement known for one component only (1989Ju02).
[e] Multiply placed with undivided intensity.
[x] γ ray not placed in level scheme.

$^{58}Ni(^{3}He,2p\gamma)$ 1989Ju02

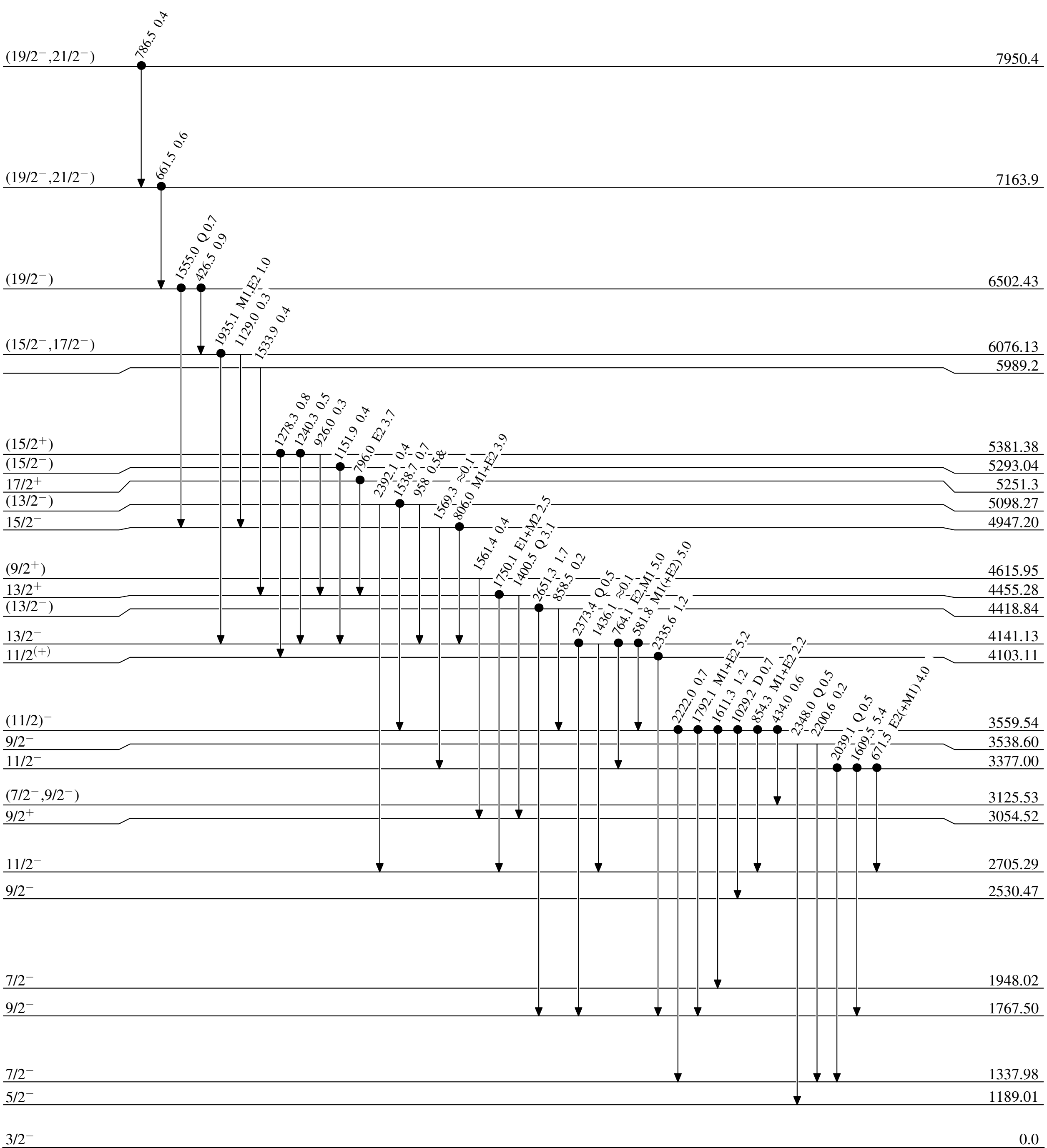
Level Scheme

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

Legend

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



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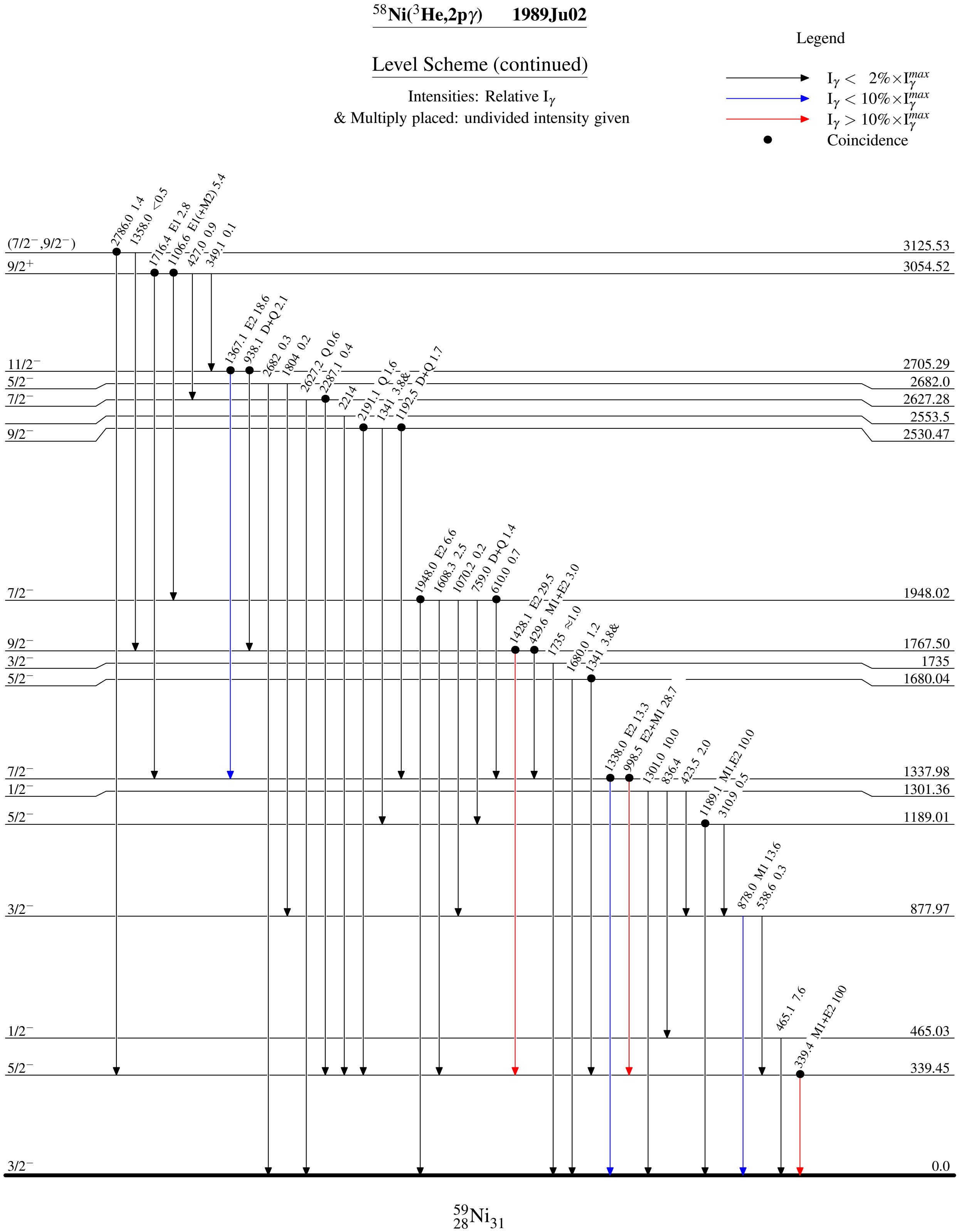
^{58}Ni(^{3}He,2pγ) 1989Ju02
Level Scheme (continued)
Intensities: Relative Iγ
& Multiply placed: undivided intensity given
Legend
Iγ < 2%×Iγ^max
Iγ < 10%×Iγ^max
Iγ > 10%×Iγ^max
Coincidence
(7/2⁻,9/2⁻) 3125.53
9/2⁺ 3054.52
11/2⁻ 2705.29
5/2⁻ 2682.0
7/2⁻ 2627.28
2553.5
9/2⁻ 2530.47
7/2⁻ 1948.02
9/2⁻ 1767.50
3/2⁻ 1735
5/2⁻ 1680.04
7/2⁻ 1337.98
1/2⁻ 1301.36
5/2⁻ 1189.01
3/2⁻ 877.97
1/2⁻ 465.03
5/2⁻ 339.45
3/2⁻ 0.0
2786.0 1.4
1358.0 <0.5
1716.4 E1 2.8
1106.6 E1(+M2) 5.4
427.0 0.9
349.1 0.1
1367.1 E2 18.6
938.1 D+Q 2.1
2682 0.3
1804 0.2
2627.2 Q 0.6
2287.1 0.4
2214
2191.1 Q 1.6
1341 3.8&
1192.5 D+Q 1.7
1948.0 E2 6.6
1608.3 2.5
1070.2 0.2
759.0 D+Q 1.4
610.0 0.7
1428.1 E2 29.5
429.6 M1+E2 3.0
1735 ≈1.0
1680.0 1.2
1341 3.8&
1338.0 E2 13.3
998.5 E2+M1 28.7
1301.0 10.0
836.4
423.5 2.0
1189.1 M1,E2 10.0
310.9 0.5
878.0 M1 13.6
538.6 0.3
465.1 7.6
339.4 M1+E2 100
$^{59}_{28}Ni_{31}$