

<sup>54</sup>Fe(<sup>58</sup>Ni,αpnγ) 2005So06,1999So08

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	D. De Frenne and A. Negret		NDS 109, 943 (2008)	1-May-2007

2005So06: E=240 MeV. Measured E<sub>γ</sub>, I<sub>γ</sub>, γγ, γγ(θ), γ (lin pol), particle-γ coin using the EUROBALL multi-detector array, comprising 26 clover and 15 cluster composite Compton-suppressed Ge detectors. Light, charged particles were detected with ISIS detector ball equipped with 40 Si ΔE-E telescopes. Forward 1π solid angle covered by neutron wall consisting of 50 liquid scintillation detectors.

<sup>106</sup>Sb Levels

Other: 1994Se01.

E(level) <sup>†</sup>	J <sup>π</sup> #	T <sub>1/2</sub>	Comments
0.0	(2 <sup>+</sup> )		J <sup>π</sup> : Adopted from 1999So08; 2005So06 do not exclude a possible spin-parity assignment of 1 <sup>+</sup> to the ground state.
103.5@ 3	(4 <sup>+</sup> )	232 ns 21	J <sup>π</sup> ,T <sub>1/2</sub> : From 1999So08 using I <sub>γ</sub> (t).
318.9& 5	(5 <sup>+</sup> )		
437.7@ 5	(6 <sup>+</sup> )		
1135.7& 5	(7 <sup>+</sup> )		
1528.3@ 6	(8 <sup>+</sup> )		
1841.8 6	(8 <sup>+</sup> )		
2052.9& 6	(9 <sup>+</sup> )		
2166.1 6	(9 <sup>+</sup> )		
2255.1@ 6	(10 <sup>+</sup> )		
2492.2 6	(10 <sup>+</sup> )		
2703.2& 6	(11 <sup>+</sup> )		
2980.2 7			
3117.3 8	(11 <sup>+</sup> )		
3315.9 7			
3384.8 6	(11 <sup>-</sup> )		
3483.0@ 6	(12 <sup>+</sup> )		
3764.2& 6	(13 <sup>+</sup> )		
3944.6 <sup>a</sup> 6	(13 <sup>-</sup> )		
3947.9 8			
3991.3 6	(13 <sup>-</sup> )		
4339.1@ 6	(13,14 <sup>+</sup> )		Possible configuration= $\pi g_{7/2} \nu d_{5/2}^3 \nu g_{7/2}^2$ .
4368.9 <sup>a</sup> 6	(14 <sup>-</sup> )		
4823.9 <sup>a</sup> 8	(15 <sup>-</sup> )		
5204.1 8			Possible configuration= $\pi d_{5/2} \nu d_{5/2}^2 \nu g_{7/2}^3$ , J <sup>π</sup> =14 <sup>+</sup> or $\pi g_{7/2} \nu d_{5/2}^2 \nu g_{7/2}^3$ , J <sup>π</sup> =15 <sup>+</sup> .
5349.9?‡ <sup>a</sup> 8	(16 <sup>-</sup> )		
5768.9 <sup>a</sup> 9	(17 <sup>-</sup> )		
5923.9 8	(17 <sup>-</sup> )		
6087.9 9	(18)		Level may be interpreted as 18 <sup>-</sup> with fully aligned configuration= $\pi d_{5/2} \nu h_{11/2} d_{5/2}^2 \nu g_{7/2}^2$ .
6305.9?‡ <sup>a</sup> 9	(18)		
6573.6 9	(19 <sup>-</sup> )		Possible configuration= $\pi g_{7/2} \nu h_{11/2} d_{5/2}^2 \nu g_{7/2}^2$ .
6784.1 <sup>a</sup> 10			Possible configuration= $\pi g_{7/2} \nu h_{11/2} d_{5/2} \nu g_{7/2}^3$ .

<sup>†</sup> From least-squares fit to E<sub>γ</sub>'s (by evaluators).

<sup>‡</sup> The orderings of the 478-537 and 419-526 cascades is uncertain, thereby making the energies of the 5349 and 6305 levels

<sup>54</sup>Fe(<sup>58</sup>Ni, $\alpha$ pn $\gamma$ ) **2005So06,1999So08 (continued)**

<sup>106</sup>Sb Levels (continued)

uncertain.  
 # From 2005So06.  
 @ Band(A): (4<sup>+</sup>) band,  $\alpha=0$ .  
 & Band(a): (4<sup>+</sup>) band,  $\alpha=1$ .  
<sup>a</sup> Band(B): (13<sup>-</sup>) band.

$\gamma$ (<sup>106</sup>Sb)

All results here are from 2005So06. The earlier study (1999So08) reported only nine gamma rays and nine levels.  $R_{ang}=I_{\Theta 1}/I_{\Theta 2}$ , where a transition was detected by the cluster detectors placed at  $\approx 123^\circ$  and  $\approx 164^\circ$ , or  $\approx 73^\circ$  and  $\approx 107^\circ$ , in coincidence with a  $\gamma$ -ray observed in any direction.  $I_{\Theta 1}$  and  $I_{\Theta 2}$  were determined in spectra gated by  $\gamma$  rays seen in any direction. For known stretched  $\Delta J=2$  and  $\Delta J=1$  transitions,  $R_{ang}$  has an average value of 0.97 and 0.60, respectively.  $Pol=(1/Q)(n_{perpendicular} - n_{parallel})/(n_{perpendicular} + n_{parallel})$ , where Q is the polarization sensitivity for the clover detectors. Linear polarization measurements of  $\gamma$ -rays were obtained by using the four-element clover detectors placed close to  $90^\circ$  as Compton polarimeters.  $Pol>0$  expected for stretched E1, E2 and non-stretched M1 transitions, whereas  $pol<0$  is typical of stretched M1 and non- stretched E1 transitions.

$E_\gamma$	$I_\gamma$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Mult.	Comments
103.4 3	12.0 9	103.5	(4 <sup>+</sup> )	0.0	(2 <sup>+</sup> )	E2	Mult.: From 1999So08; determined from delayed $\gamma$ -ray and conversion electron measurements.
118.8 3	91 5	437.7	(6 <sup>+</sup> )	318.9	(5 <sup>+</sup> )	D	$R_{ang}=0.58$ 11.
202.2 3	10.8 8	2255.1	(10 <sup>+</sup> )	2052.9	(9 <sup>+</sup> )	M1	$R_{ang}=0.59$ 11. $Pol=-0.7$ 5.
215.4 3	100 6	318.9	(5 <sup>+</sup> )	103.5	(4 <sup>+</sup> )	M1	$R_{ang}=0.63$ 11. $Pol=-0.5$ 2.
281.2 3	2.0 3	3764.2	(13 <sup>+</sup> )	3483.0	(12 <sup>+</sup> )		
319.0 3	2.6 4	6087.9	(18)	5768.9	(17 <sup>-</sup> )	D	$R_{ang}=0.59$ 11.
326.1 3	1.5 3	2492.2	(10 <sup>+</sup> )	2166.1	(9 <sup>+</sup> )		
335.7 3	4.4 5	3315.9		2980.2			
377.6 3	4.0 4	4368.9	(14 <sup>-</sup> )	3991.3	(13 <sup>-</sup> )	(D)	$R_{ang}=0.66$ 12.
392.4 3	4.5 7	1528.3	(8 <sup>+</sup> )	1135.7	(7 <sup>+</sup> )		
413.4 4	8.2 7	2255.1	(10 <sup>+</sup> )	1841.8	(8 <sup>+</sup> )	E2	$R_{ang}=1.03$ 14. $Pol=+0.6$ 4.
419.0 <sup>‡</sup> 3	5.2 5	5768.9	(17 <sup>-</sup> )	5349.9?	(16 <sup>-</sup> )	M1	$R_{ang}=0.59$ 11. $Pol=-0.6$ 5.
424.3 4	11.5 10	4368.9	(14 <sup>-</sup> )	3944.6	(13 <sup>-</sup> )	M1	$R_{ang}=0.65$ 11. $Pol=-0.5$ 3.
448.0 4	19.1 14	2703.2	(11 <sup>+</sup> )	2255.1	(10 <sup>+</sup> )	M1	$R_{ang}=0.62$ 11. $Pol=-0.9$ 4.
455.0 4	15.9 12	4823.9	(15 <sup>-</sup> )	4368.9	(14 <sup>-</sup> )	M1	$R_{ang}=0.59$ 11. $Pol=-0.3$ 3.
461.6 4	8.4 7	3944.6	(13 <sup>-</sup> )	3483.0	(12 <sup>+</sup> )	E1	$R_{ang}=0.66$ 11. $Pol=+0.9$ 5.
478.2 <sup>†</sup> 3	2.4 6	6784.1		6305.9?	(18)		
508.4 3	7.1 7	3991.3	(13 <sup>-</sup> )	3483.0	(12 <sup>+</sup> )	E1	$R_{ang}=0.64$ 11. $Pol=+0.8$ 5.
524.6 3	3.1 7	2052.9	(9 <sup>+</sup> )	1528.3	(8 <sup>+</sup> )		
526.0 <sup>‡</sup> 3	5.2 5	5349.9?	(16 <sup>-</sup> )	4823.9	(15 <sup>-</sup> )	M1	$R_{ang}=0.55$ 11. $Pol=-0.7$ 8.
537.0 <sup>†</sup> 3	2.6 3	6305.9?	(18)	5768.9	(17 <sup>-</sup> )	D	$R_{ang}=0.61$ 11.
559.7 4	5.2 6	3944.6	(13 <sup>-</sup> )	3384.8	(11 <sup>-</sup> )	Q	$R_{ang}=1.04$ 14.
574.8 4	2.8 3	4339.1	(13,14 <sup>+</sup> )	3764.2	(13 <sup>+</sup> )		

Continued on next page (footnotes at end of table)

$^{54}\text{Fe}(^{58}\text{Ni},\alpha\text{pn}\gamma)$  **2005So06,1999So08** (continued) $\gamma(^{106}\text{Sb})$  (continued)

$E_\gamma$	$I_\gamma$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Mult.	Comments
604.6 4	5.4 5	4368.9	(14 <sup>-</sup> )	3764.2	(13 <sup>+</sup> )	D	$R_{\text{ang}}=0.55$ 11.
637.9 4	14.2 12	2166.1	(9 <sup>+</sup> )	1528.3	(8 <sup>+</sup> )	M1	$R_{\text{ang}}=0.65$ 11. Pol=-0.1 2.
649.7 3	8.7 7	6573.6	(19 <sup>-</sup> )	5923.9	(17 <sup>-</sup> )	Q	$R_{\text{ang}}=1.04$ 12.
698.0 4	15.7 15	1135.7	(7 <sup>+</sup> )	437.7	(6 <sup>+</sup> )	M1	$R_{\text{ang}}=0.60$ 11. Pol=-0.9 4.
725.0 3	6.2 8	2980.2		2255.1	(10 <sup>+</sup> )		
726.8 4	42 3	2255.1	(10 <sup>+</sup> )	1528.3	(8 <sup>+</sup> )	E2	$R_{\text{ang}}=1.08$ 12. Pol=+0.4 2.
779.8 4	2.1 5	3483.0	(12 <sup>+</sup> )	2703.2	(11 <sup>+</sup> )		
816.8 3	8.9 8	1135.7	(7 <sup>+</sup> )	318.9	(5 <sup>+</sup> )	Q	$R_{\text{ang}}=1.03$ 12.
830.6 3	3.5 4	3947.9		3117.3	(11 <sup>+</sup> )		
856.0 3	2.6 5	4339.1	(13,14 <sup>+</sup> )	3483.0	(12 <sup>+</sup> )		
865.0 5	2.5 4	5204.1		4339.1	(13,14 <sup>+</sup> )		
892.6 3	3.1 4	3384.8	(11 <sup>-</sup> )	2492.2	(10 <sup>+</sup> )	D	$R_{\text{ang}}=0.57$ 12.
917.3 4	15.7 14	2052.9	(9 <sup>+</sup> )	1135.7	(7 <sup>+</sup> )	E2	$R_{\text{ang}}=1.02$ 14. Pol=+0.8 6.
951.1 4	8.9 9	3117.3	(11 <sup>+</sup> )	2166.1	(9 <sup>+</sup> )	Q	$R_{\text{ang}}=0.96$ 12.
964.0 4	5.6 8	2492.2	(10 <sup>+</sup> )	1528.3	(8 <sup>+</sup> )	E2	$R_{\text{ang}}=1.07$ 14. Pol=+0.9 10.
1061.0 4	8.7 10	3764.2	(13 <sup>+</sup> )	2703.2	(11 <sup>+</sup> )	E2	$R_{\text{ang}}=0.95$ 12. Pol=+1.5 11.
1090.4 4	63 4	1528.3	(8 <sup>+</sup> )	437.7	(6 <sup>+</sup> )	E2	$R_{\text{ang}}=1.03$ 14. Pol=+0.8 3.
1100.0 3	10.5 9	5923.9	(17 <sup>-</sup> )	4823.9	(15 <sup>-</sup> )	Q	$R_{\text{ang}}=1.03$ 14.
1129.6 3	4.2 5	3384.8	(11 <sup>-</sup> )	2255.1	(10 <sup>+</sup> )		
1227.88 4	20.3 14	3483.0	(12 <sup>+</sup> )	2255.1	(10 <sup>+</sup> )	E2	$R_{\text{ang}}=0.97$ 12. Pol=+1.5 11.
1404.1 4	10.1 9	1841.8	(8 <sup>+</sup> )	437.7	(6 <sup>+</sup> )	E2	$R_{\text{ang}}=1.22$ 14. Pol=+1.4 12.

<sup>†</sup> Ordering of the 478-537 cascade is uncertain.

<sup>‡</sup> Ordering of the 419-526 cascade is uncertain.

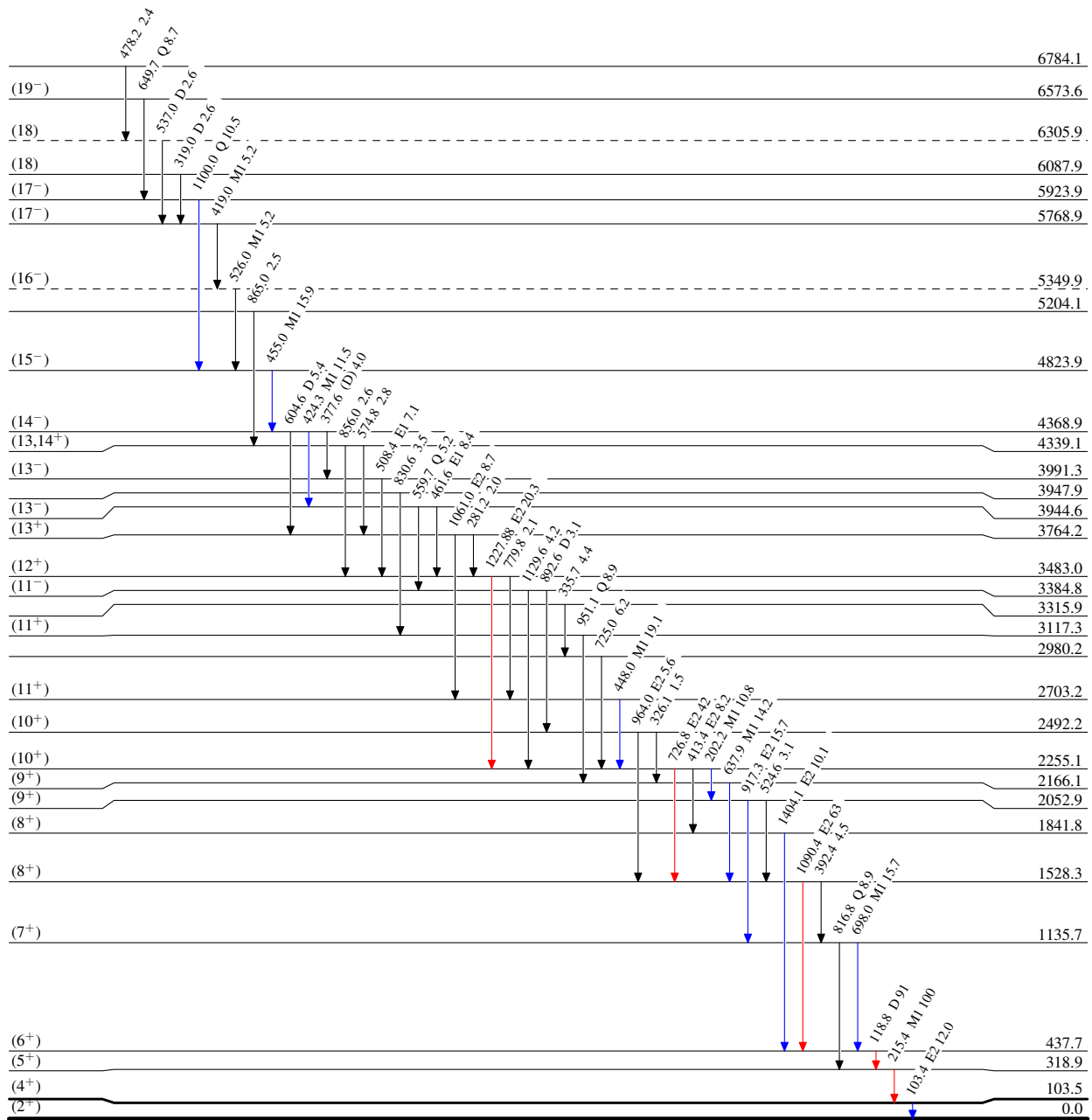
<sup>54</sup>Fe(<sup>58</sup>Ni,αpnγ) 2005So06,1999So08

Level Scheme

Intensities: Relative I<sub>γ</sub>

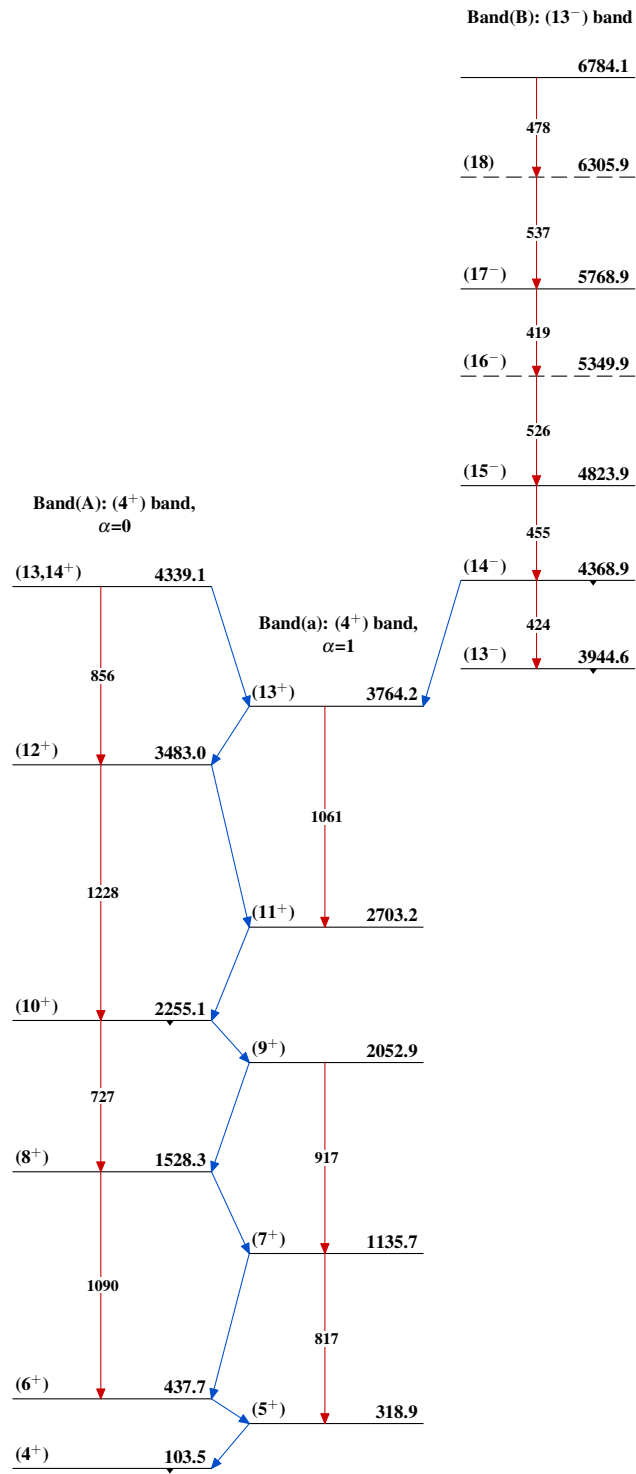
Legend

- I<sub>γ</sub> < 2% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> < 10% × I<sub>γ</sub><sup>max</sup>
- I<sub>γ</sub> > 10% × I<sub>γ</sub><sup>max</sup>



232 ns 2I

<sup>106</sup>Sb<sub>55</sub>

$^{54}\text{Fe}(^{58}\text{Ni},\alpha\text{pn}\gamma)$  2005So06,1999So08 $^{106}_{51}\text{Sb}_{55}$