

$^{58}\text{Fe}(n,\gamma)$, (pol n, γ) E=thermal 1983VeZZ,1980Ve05,1978Ve06

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

Others: [1971Bo51](#) (Ge(Li), $\Delta E(\gamma)=10$ keV at $E_\gamma=1$ MeV), [2017FiZZ](#).

[1980Ve05,1983VeZZ](#): measured E_γ , I_γ , enriched targets (62%), Ge(Li).

[1978Ve06](#): polarized neutrons, 62.1% ^{58}Fe target, measured E_γ , circular polarization of primary γ rays, Ge(Li).

 ^{59}Fe Levels

E(level) [†]	J^π [‡]	Comments
0.0	$3/2^-$	
287.028 19	$1/2^-$	
472.85 7	$5/2^-$	
568.76 19	$3/2^-$	E(level), J^π : This new level proposed in 2017FiZZ on the basis of population by a primary γ -ray from the $1/2^+$ capture state consistent with $J=1/2,3/2$ and inconsistent with $(5/2)^-$ assigned to the 570.85-keV level. The adopted spin resolves the assignment of $L=1,3$ in (d,p).
570.90 4		
613.05 16		
642.8 3		
726.45 4	$3/2^-$	
1077.82 12		
1162.11 4	$3/2^-$	
1211.37 10		
1569.90 8		
1749.90 15		
1918.94 5	$3/2,5/2^+\#$	
1961.99 5	$1/2^-$	
2162.1 5		
2277.9 4		
2321.06 20		
2348.3 4		
2447.30 6	$3/2,5/2^+\#$	
2493.7 4		
2569.6 4		
2757.04 22		
2810.24 15		
3070.5 4		
3104.4 3		
3159.63 15		
3239.88 22		
3384.55 11		
(6581.01 11)	$1/2^+$	E(level), J^π : capture state; E=S(n) (from 2017Wa10). E(level): 6581.10 5 from least-squares adjustment of E_γ .

[†] From least-squares adjustment of E_γ , omitting 5009 γ . Uncertainty doubled for 280.4 γ from 568.45, 727.4 γ from 726.47, 1062.1 γ from 2810.35, and 5419.50 γ from capture state for fitting and obtained $\chi^2=2.1$; $\chi^2_{\text{critical}}=1.6$.

[‡] From measured circular polarization, assuming $L(d,p)=1$ ([1978Ve06](#)).

[#] Circular polarization data exclude $J=1/2$; $J^\pi=5/2^-$ is highly improbable if Γ_γ of capture state is same as that for ^{57}Fe ([1978Ve06](#)). Level fed by primary γ from $1/2^+$ capture state.

$^{58}\text{Fe}(n,\gamma)$, (pol n, γ) E=thermal **1983VeZZ,1980Ve05,1978Ve06** (continued)

$\gamma(^{59}\text{Fe})$						
E_γ^\dagger	$I_\gamma^{\ddagger b}$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
280.4 3	0.38 12	568.76	3/2 ⁻	287.028	1/2 ⁻	E_γ, I_γ : From 1980Ve05 (unplaced). 2017FiZZ placed on the basis of level energy difference.
287.03 2	59 3	287.028	1/2 ⁻	0.0	3/2 ⁻	
^x 374.7 4	0.08 3					
^x 379.1 4	0.05 2					
439.43 4	0.75 4	726.45	3/2 ⁻	287.028	1/2 ⁻	
465.0 2	0.23 4	1077.82		613.05		
472.83 7	1.54 10	472.85	5/2 ⁻	0.0	3/2 ⁻	E_γ, I_γ : From 2017FiZZ . I_γ scaled with respect to $I_\gamma(287.03\gamma)=59$ of this dataset.
537.4 7	0.04 2	1749.90		1211.37		
^x 552.5 5	0.08 3					
568.98 21	0.55 1	568.76	3/2 ⁻	0.0	3/2 ⁻	E_γ, I_γ : From 2017FiZZ . I_γ scaled with respect to $I_\gamma(287.03\gamma)=59$ of this dataset. The 568.52- and 570.84-keV doublet has been resolved.
570.87 4	4.9 3	570.90		0.0	3/2 ⁻	E_γ : The 568.52- and 570.84-keV doublet has been resolved (2017FiZZ).
591.20 3	3.26 13	1162.11	3/2 ⁻	570.90		
^x 605.38 17	0.42 4					
610.7 2	0.35 5	3104.4		2493.7		
613.1 3	0.20 5	613.05		0.0	3/2 ⁻	
627.3 3	0.10 2	3384.55		2757.04		
642.9 3	0.09 2	642.8		0.0	3/2 ⁻	
^x 670.6 4	0.07 2					
688.6 5	0.10 3	1162.11	3/2 ⁻	472.85	5/2 ⁻	
697.19 16	0.42 5	2447.30	3/2,5/2 ⁺	1749.90		
^x 699.7 2	0.36 4					
^x 710.9 4	0.14 4					
727.4 3	20.2 8	726.45	3/2 ⁻	0.0	3/2 ⁻	
756.92 12	0.25 3	1918.94	3/2,5/2 ⁺	1162.11	3/2 ⁻	
^x 767.0 6	0.06 2					
^x 776.9 8	0.05 2					
826.9 4	0.07 2	3104.4		2277.9		
841.24 12	0.77 6	1918.94	3/2,5/2 ⁺	1077.82		
875.12 5	0.95 1	1162.11	3/2 ⁻	287.028	1/2 ⁻	
^x 968.9 9	0.04 2					
^x 1048.8 5	0.10 3					
^x 1059.1 10	0.05 3					
1062.1 5	0.10 3	2810.24		1749.90		
1136.9 3	0.16 3	2348.3		1211.37		
1162.17 8	0.48 4	1162.11	3/2 ⁻	0.0	3/2 ⁻	
1192.50 5	0.73 4	1918.94	3/2,5/2 ⁺	726.45	3/2 ⁻	
1211.24 11	1.95 12	1211.37		0.0	3/2 ⁻	
1235.54 4	2.36 9	1961.99	1/2 ⁻	726.45	3/2 ⁻	
^x 1273.6 3	0.21 4					
^x 1323.3 2	0.08 3					
1348.4 3	0.23 8	1961.99	1/2 ⁻	613.05		
^x 1376.2 9	0.06 3					
^x 1468.3 4	0.11 3					
^x 1477.3 4	0.11 3					
1544.8 9	0.08 4	2757.04		1211.37		
1548.8 8	0.07 3	2162.1		613.05		
1551.7 10	0.06 3	2277.9		726.45	3/2 ⁻	
1569.88 8	0.70 4	1569.90		0.0	3/2 ⁻	
1598.79 16	0.59 4	2810.24		1211.37		
^x 1647.6 3	0.36 6					
1719.9 7	0.72 14	2447.30	3/2,5/2 ⁺	726.45	3/2 ⁻	

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$^{58}\text{Fe}(n,\gamma)$, (pol n,γ) E=thermal 1983VeZZ,1980Ve05,1978Ve06 (continued) $\gamma(^{59}\text{Fe})$ (continued)

E_γ †	I_γ ‡b	E_i (level)	J_i^π	E_f	J_f^π
^x 1722.1 4	0.73 14				
1730.3 8	0.11 4	2810.24		1077.82	
1749.5 3	0.08 1	1749.90		0.0	3/2 ⁻
^x 1904.3 6	0.07 2				
1918.71 8	5.69 17	1918.94	3/2,5/2 ⁺	0.0	3/2 ⁻
1956.8 5	0.15 4	2569.6		613.05	
1961.92 18	0.84 18	1961.99	1/2 ⁻	0.0	3/2 ⁻
2084.0 3	0.19 2	2810.24		726.45	3/2 ⁻
^x 2091.0 3	0.40 12				
^x 2103.0 3	0.23 3				
^x 2138.20 14	0.37 2				
2160.20 6	2.31 7	2447.30	3/2,5/2 ⁺	287.028	1/2 ⁻
^x 2240.9 3	0.14 2				
2279.3 8	0.05 2	2277.9		0.0	3/2 ⁻
2322.4 6	0.28 5	2321.06		0.0	3/2 ⁻
^x 2339.7 3	0.13 1				
^x 2361.62 14	0.32 4				
2428.6 10	0.06 2	3070.5		642.8	
2447.8 2	0.25 2	2447.30	3/2,5/2 ⁺	0.0	3/2 ⁻
2494.3 8	0.05 2	2493.7		0.0	3/2 ⁻
^x 2505.1 # 7	0.08 2				
2533.2 3	0.24 2	3104.4		570.90	
^x 2578.4 7	0.10 2				
^x 2635.4 2	0.22 2				
^x 2751.6 2	0.33 8				
2872.57 15	0.30 9	3159.63		287.028	1/2 ⁻
^x 2896.4 5	0.08 2				
^x 2908.6 2	0.62 2				
^x 2916.2 7	0.06 1				
^x 2948.2 3	0.30 2				
^x 2966.6 3	0.18 2				
^x 3057.1 7	0.05 2				
3070.4 & 4	0.10 3	3070.5		0.0	3/2 ⁻
^x 3081.4 3	0.16 3				
3097.9 9	0.07 2	3384.55		287.028	1/2 ⁻
^x 3108.4 5	0.57 5				
^x 3114.0 2	1.0 3				
^x 3129.2 7	0.06 2				
3196.41 10	0.10 5	(6581.01)	1/2 ⁺	3384.55	
^x 3200.3 8	0.08 3				
3239.5 3	1.00 5	3239.88		0.0	3/2 ⁻
^x 3337.1 10	0.04 3				
3340.8 3	1.06 5	(6581.01)	1/2 ⁺	3239.88	
3422.6 8	0.06 2	(6581.01)	1/2 ⁺	3159.63	
3477.8 13	0.06 2	(6581.01)	1/2 ⁺	3104.4	
^x 3502.2 3	0.43 7				
3513 2	0.04 2	(6581.01)	1/2 ⁺	3070.5	
^x 3523.4 5	0.12 5				
^x 3532.1 3	0.22 2				
^x 3590.0 5	0.33 3				
^x 3664.4 7	0.19 7				
^x 3757.3 9	0.08 2				
3770.5 4	0.33 4	(6581.01)	1/2 ⁺	2810.24	
3824.0 3	0.13 2	(6581.01)	1/2 ⁺	2757.04	
^x 3862 2	0.06 3				
4011.5 4	0.71 11	(6581.01)	1/2 ⁺	2569.6	

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$^{58}\text{Fe}(n,\gamma)$, (pol n, γ) E=thermal 1983VeZZ,1980Ve05,1978Ve06 (continued) $\gamma(^{59}\text{Fe})$ (continued)

E_γ^\dagger	$I_\gamma^{\ddagger b}$	$E_i(\text{level})$	J_i^π	E_f	J_f^π
^x 4035.7 7	0.07 2				
^x 4072.5 3	0.18 7				
^x 4114.2 10	0.12 3				
^x 4126.0 8	0.13 3				
4133.4 @ 2	3.58 18	(6581.01)	1/2 ⁺	2447.30	3/2,5/2 ⁺
^x 4164.3 5	0.31 4				
4260.0 2	0.39 3	(6581.01)	1/2 ⁺	2321.06	
4418.7 5	0.49 5	(6581.01)	1/2 ⁺	2162.1	
^x 4508.0 4	0.45 7				
4618.86 12	3.4 6	(6581.01)	1/2 ⁺	1961.99	1/2 ⁻
^x 4628.7 8	0.33 3				
4661.81 16	8.2 10	(6581.01)	1/2 ⁺	1918.94	3/2,5/2 ⁺
^x 4729.5 14	0.07 3				
^x 4757.8 2	0.42 6				
^x 4763.8 8	0.17 3				
^x 4923.2 4	0.21 4				
5009.2 ^{ac} 6	0.37 11	(6581.01)	1/2 ⁺	1569.90	
^x 5136 2	0.07 4				
^x 5204.3 13	0.11 4				
5369.1 3	0.33 10	(6581.01)	1/2 ⁺	1211.37	
^x 5375.4 11	0.26 7				
^x 5383.3 7	0.19 8				
5419.5 2	7.1 11	(6581.01)	1/2 ⁺	1162.11	3/2 ⁻
^x 5565.3 5	0.40 5				
^x 5573.9 6	0.36 6				
^x 5611.7 10	0.28 6				
^x 5672.2 7	0.17 3				
5854.25 9	14.9 15	(6581.01)	1/2 ⁺	726.45	3/2 ⁻
6012.7 7	0.54 10	(6581.01)	1/2 ⁺	568.76	3/2 ⁻
^x 6097.0 5	0.19 4				
^x 6104.4 8	0.23 7				
^x 6228.4 13	0.20 9				
6293.63 10	47 5	(6581.01)	1/2 ⁺	287.028	1/2 ⁻
6580.89 11	3.4 4	(6581.01)	1/2 ⁺	0.0	3/2 ⁻

[†] As given by 1980Ve05, 1983VeZZ, except otherwise noted. ΔE is statistical; a systematic uncertainty of 25 ppm should be added in quadrature to allow for uncertainty in energy calibration.

[‡] Normalized such that $\sum I_\gamma E_\gamma = 100 \times Q$. Statistical errors are shown here; systematic error estimated to be 10% (1980Ve05). With this normalization, Σ (primary I_γ) = 92%.

Assignment in 1980Ve05 as a 3071-571 transition is in error (1983VeZZ).

@ From 1983VeZZ; value misprinted in 1980Ve05.

& Placement from 1983VeZZ.

^a E_γ is 2 keV away from value expected based on secondary E_γ , and primary γ not expected based on adopted J^π of final level. Evaluator, therefore, suspects γ may be misplaced and shows placement as tentative. Also not listed in 2017FiZZ.

^b Intensity per 100 neutron captures.

^c Placement of transition in the level scheme is uncertain.

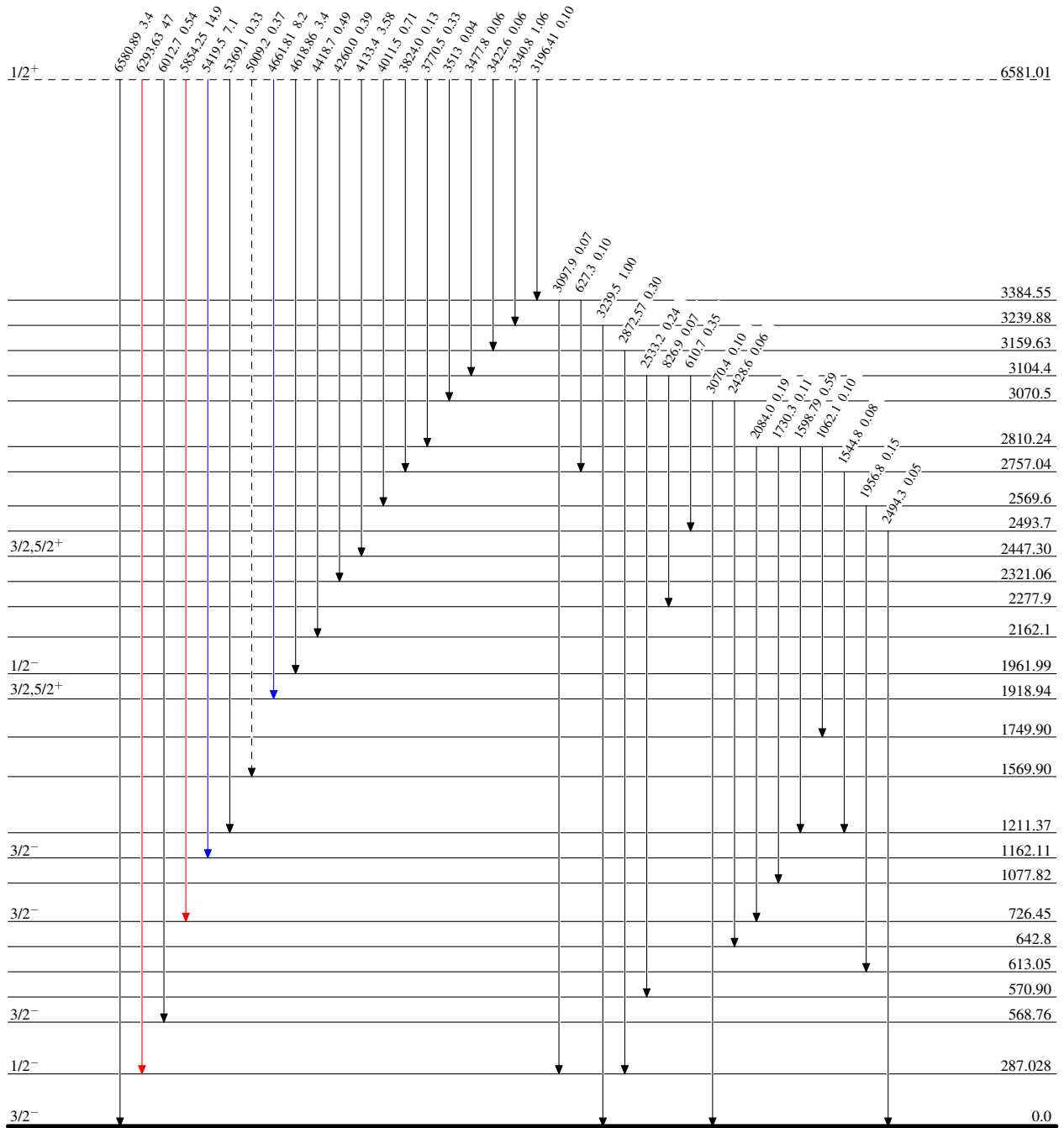
^x γ ray not placed in level scheme.

⁵⁸Fe(n,γ), (pol n,γ) E=thermal 1983VeZZ,1980Ve05,1978Ve06

Legend

Level Scheme
Intensities: Relative I_γ

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - - γ Decay (Uncertain)



⁵⁹Fe₃₃

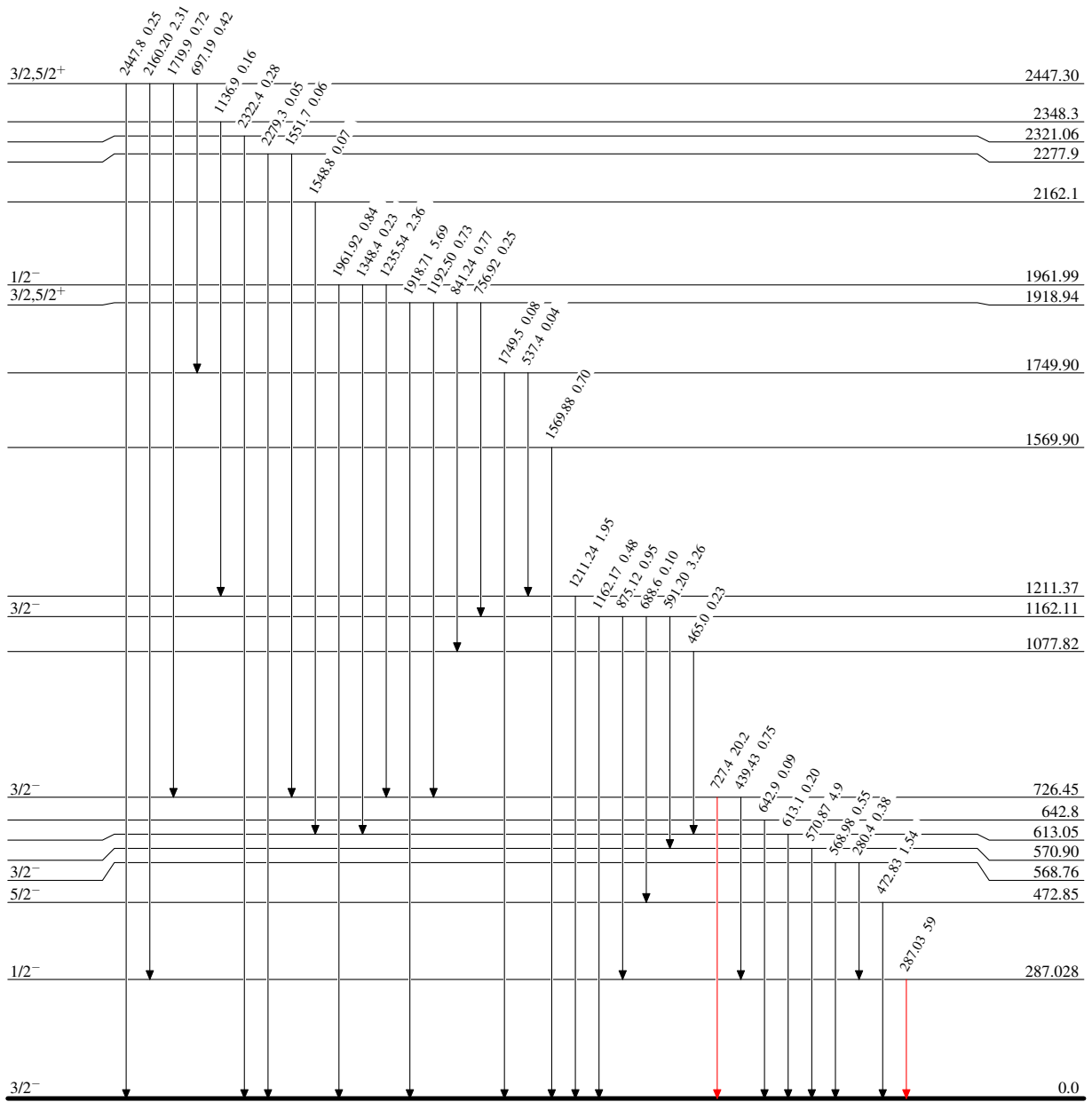
$^{58}\text{Fe}(n,\gamma)$, (pol n, γ) E=thermal 1983VeZZ,1980Ve05,1978Ve06

Level Scheme (continued)

Intensities: Relative I_γ

Legend

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



$^{59}\text{Fe}_{33}$