

$^{56}\text{Fe}(\alpha, p\gamma)$ 1970Co21, 1980Ha17

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

Other: 1974Mo02.

1970Co21: $E\alpha=10, 11$ MeV; Ge(Li) and NaI detectors, enriched targets (99.9%), protons detected with annular counter at $\approx 170^\circ$, FWHM=70-100 keV for protons; measured $p\gamma(\theta)$.1974Mo02: $E\alpha=10-14$ MeV; measured $E\gamma, I_\gamma, \gamma\gamma$ coin.1980Ha17: $E\alpha=12$ MeV. Si surface barrier and Ge(Li) detectors. Protons detected in annular counter at 180° ; measured $\sigma(E(p), \theta)$, $p\gamma$ coin for 7 angles between 0° and 90° . ^{59}Co Levels

E(level) [†]	J^π [‡]	Comments
0.0		
1100	$3/2^-$ &	
1190	$9/2, 5/2$	J^π : 9/2 is preferred value (1980Ha17).
1291	$3/2, 5/2$	
1434.5 [#]	$1/2, 3/2$	J^π : 1/2 is preferred value (1980Ha17).
1463	$11/2, 7/2$	
1482	$5/2$	
1744	$7/2$ @	
2059	$7/2$	
2085	$5/2, 3/2$	
2146	$9/2, 13/2$	E(level): 2153 in (p, p' γ) (1980Ha17).
2183	$5/2, 7/2, 11/2$	
2205	$5/2$	
2394	$7/2, 9/2$	
2476	$3/2$ to $9/2$	
2537	$5/2, 7/2, 9/2$	
2581		

[†] From 1970Co21; ΔE unstated. E differs from adopted level energy by typically ≤ 3 keV and never by > 8 keV.[‡] From p- $\gamma(\theta)$ assuming adopted J^π of $3/2^-$ for 1099 level and $7/2^-$ for g.s. (1980Ha17).[#] From 1980Ha17.@ From p-1744 $\gamma(\theta)$, if $J(\text{g.s.})=7/2$ (1970Co21).& p- $\gamma(\theta)$ consistent with $J=3/2$ (1970Co21). $\gamma(^{59}\text{Co})$

$E_i(\text{level})$	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult. [#]	δ [@]	Comments
1100	$3/2^-$	1099.4 2	100	0.0		Q		$\delta(Q, O)=0$ (1980Ha17).
1190	$9/2, 5/2$	1189.6 4	100	0.0		D+Q	+0.21 5	E_γ : γ forms doublet with ^{59}Ni γ in 1974Mo02. δ : weighted average of +0.25 5 (1970Co21) and +0.16 5 (1980Ha17).
1291	$3/2, 5/2$	193	7 4	1100	$3/2^-$			
		1291.6 2	93 4	0.0		Q		$\delta(Q, O)=0$ (1980Ha17).
1434.5	$1/2, 3/2$	335		1100	$3/2^-$			E_γ : From 1980Ha17.
1463	$11/2, 7/2$	273 ^{ad}	<10	1190	$9/2, 5/2$			
		1459.6 2	>90	0.0		Q		$\delta(Q, O)=0$ (1980Ha17).
1482	$5/2$	382.6 2	20 3	1100	$3/2^-$	Q+D	-4 2	$\delta(M1, E2)<0.21$ from RUL and adopted $T_{1/2}$.
		1481.7 2	80 3	0.0		Q+D	-5 +2-5	δ : inconsistent with adopted value.

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$^{56}\text{Fe}(\alpha, p\gamma)$ **1970Co21,1980Ha17 (continued)** $\gamma(^{59}\text{Co})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult. [#]	$\delta^\@$	Comments
1744	7/2	263 554.2 2	9 2 32 2	1482 1190	5/2 9/2,5/2	D(+Q) ^{&} D(+Q)	+0.02 ^{&} 13 +0.011 44	δ : weighted average of +0.02 5 (1970Co21) and -0.02 9 (1980Ha17).
		1744.7 3	59 4	0.0		D+Q	-0.87 +15-22	δ : weighted average of -0.89 +17-25 (1970Co21) and -0.8 +3-4 (1980Ha17).
2059	7/2	315 ^{ad} 581 873 2059 ^a		1744 1482 1190	7/2 5/2 9/2,5/2			I_γ : weak. I_γ : strong.
		0.0		0.0				I_γ : weak.
2085	5/2,3/2	797		1291	3/2,5/2	D(+Q)		δ : -0.5 2 if J(2085)=3/2, +0.04 9 if J=5/2.
		985 ^c 2085		1100	3/2 ⁻			δ : 0 if J(2085)=3/2, -0.07 14 if J=5/2.
2146	9/2,13/2	694.1 2		1463	11/2,7/2	D(+Q)		δ : -0.05 8 if J(2146)=9/2, +0.11 6 if J=13/2.
2183	5/2,7/2,11/2	124 ^{cd}		2059	7/2			E_γ : Tentative placement and reported in this dataset only – not adopted by evaluator.
		439 ^a 996 719 ^a		1744 1190	7/2 9/2,5/2			I_γ : strong.
2205	5/2	913 ^{bb} 1011 ^{ad}		1190 1482	9/2,5/2 5/2	D+Q	+0.09 6	δ : if J(2183)=11/2.
		211 ^{cd} 335 ^a 652 938 1204 ^c 2394 ^a	4 2 15 5 22 6	2183 2059 1744 1463 1190	5/2,7/2,11/2 7/2 7/2 11/2,7/2 9/2,5/2			δ : if J(2394)=9/2.
2394	7/2,9/2	293 ^{cd} 2479	<10 >90	2183 0.0	5/2,7/2,11/2	D+Q	+0.25 8	δ : if J(2394)=9/2.
2476	3/2 to 9/2	354 ^{cd} 796	<20 >80	2183 1744	5/2,7/2,11/2 7/2	D+Q	-0.28 20	δ : if J(2476)=5/2.
2537	5/2,7/2,9/2							δ : -2 +2-30 if J(2537)=3/2, -0.34 15 if J=7/2, +0.22 8 if J=9/2.
2581		1391 ^a 2581 ^a	40 8 60 8	1190	9/2,5/2			

[†] From 1970Co21 (deduced from level separation) if no ΔE is given; from 1974Mo02 otherwise.

[‡] % photon branching (1970Co21).

[#] From $p\text{-}\gamma(\theta)$.

[@] From 1980Ha17, except as noted. For additional mixing ratios corresponding to various J values allowed by $p\text{-}\gamma(\theta)$, see 1980Ha17.

[&] From 1970Co21.

^a From 1970Co21. Transition also observed in $(p,p'\gamma)$ (1980Ha17).

^b Evaluator adopts this placement from 1980Ha17 rather than the tentative placement by 1970Co21 as an 8% 7 branch deexciting the 2394 level.

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${}^{56}\text{Fe}(\alpha, \text{p}\gamma)$ [1970Co21](#), [1980Ha17](#) (continued)

$\gamma({}^{59}\text{Co})$ (continued)

^c From [1970Co21](#). Transition absent in [1980Ha17](#) and in other reactions; consequently, it has been omitted from Adopted Levels, gammas.

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

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Legend

Level Scheme

Intensities: % photon branching from each level

-----► γ Decay (Uncertain)

