

<sup>170</sup>Er(γ,γ'), (γ,pol γ') **1996Ma18,1976Me04**

Type	Author	History	Citation	Literature Cutoff Date
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**1996Ma18:** bremsstrahlung endpoint energy=3.80 MeV; 96.9% <sup>170</sup>Er oxide target; HPGe detector, 3 Ge detectors, true-coaxial HPGe Compton polarimeter with 8-crystal BGO Compton shield; θ=95°, 127°; measured Eγ, integrated cross section, γ anisotropy, γ polarization; deduced Γ<sub>0</sub>, Γ<sub>γ0</sub><sup>2</sup>/Γ, Γ<sub>γ1</sub>/Γ<sub>γ0</sub>, J<sup>π</sup>, K.

**1991Zi01:** measured 1824γ(θ), Γ<sub>γ0</sub><sup>2</sup>/Γ; deduced Γ<sub>γ0</sub>.

**1976Me04:** E(e)=1.6-4.2 MeV bremsstrahlung; 96.9% <sup>170</sup>Er target; measured σ(E; Eγ,θ), θ=98° and 127°, and γ linear polarization.

**1973Me17:** E(e)=1.93 MeV bremsstrahlung; 96.9% <sup>170</sup>Er target; measured Eγ', γ(θ) (θ=98° and 127°), γ linear polarization.

<sup>170</sup>Er Levels

Values of K, deduced by **1996Ma18** from measured Γ<sub>γ1</sub>/Γ<sub>γ0</sub>, are given in comments on the relevant levels.

E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	T <sub>1/2</sub> <sup>#</sup>	Γ <sub>γ0</sub> <sup>2</sup> /Γ (meV) <sup>@</sup>	Comments
0.0	0 <sup>+</sup>			
78.6	2 <sup>+</sup>			J <sup>π</sup> : From Adopted Levels.
1824 & 1	1 <sup>-</sup> &	5.7 <sup>a</sup> fs 5	11.6 10	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 11.4 meV 11 ( <b>1976Me04</b> ) and 12.0 meV 19 ( <b>1996Ma18</b> ). K=0 ( <b>1996Ma18</b> ).
1973 2			0.6 5	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: from <b>1976Me04</b> , assuming J=1.
2039 2	1,2	0.10 ps 3	1.2 3	T <sub>1/2</sub> and (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: if J=1 ( <b>1976Me04</b> ).
2133 2	1	62 fs 9	3.8 4	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 3.7 meV 5 ( <b>1976Me04</b> ) and 3.8 meV 5 ( <b>1996Ma18</b> ).
2685? 2			0.1 9	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: assuming J=1 ( <b>1976Me04</b> ).
2701 2	1	23 fs 3	9.1 12	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 11.5 meV 22 ( <b>1976Me04</b> ) and 8.5 meV 11 ( <b>1996Ma18</b> ). K=1 ( <b>1996Ma18</b> ).
2751 2	(1)	≈0.15 ps	3 1	
2789 2	1 <sup>+</sup>	7.7 fs 5	25.6 13	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 24.4 meV 25 ( <b>1976Me04</b> ) and 26.0 meV 15 ( <b>1996Ma18</b> ). K=(1) ( <b>1996Ma18</b> ).
2897	1		4.7 10	
2930 2	1	39 fs 9	3.3 6	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 3.3 meV 10 ( <b>1976Me04</b> ) and 3.3 meV 7 ( <b>1996Ma18</b> ). K=0 ( <b>1996Ma18</b> ).
2938 2	1	31 fs 5	5.6 7	(Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: weighted average of 5.3 meV 12 ( <b>1976Me04</b> ) and 5.7 meV 8 ( <b>1996Ma18</b> ). K=1 ( <b>1996Ma18</b> ).
2973 2	1,2			
2995 2	1,2			
3019	1		13.7 11	Other (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: 14 meV ( <b>1976Me04</b> ) for unplaced 3019γ.
3064 2	1	3.1 fs 4	12.3 12	Other (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: 14 meV 4 ( <b>1976Me04</b> ). K=0 ( <b>1996Ma18</b> ).
3084	1		4.1 8	
3178	1	7.9 fs 24	4.8 10	K=0 ( <b>1996Ma18</b> ).
3183	1	11 fs 4	3.9 8	K=0 ( <b>1996Ma18</b> ).
3238	1	27 fs 6	7.5 12	K=1 ( <b>1996Ma18</b> ).
3243	1	4.2 fs 6	29 4	Other (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: 32 meV ( <b>1976Me04</b> ) for unplaced 3244γ.
3406 2	1 <sup>(+)</sup>	2.09 fs 10	102 4	Other (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: 100 meV 12 ( <b>1976Me04</b> ). K=1 ( <b>1996Ma18</b> ).
3540	1		38 10	Other (Γ <sub>γ0</sub> ) <sup>2</sup> /Γ: 16 meV ( <b>1976Me04</b> ) for unplaced 3541γ.

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<sup>170</sup>Er( $\gamma, \gamma'$ ), ( $\gamma, \text{pol } \gamma'$ ) **1996Ma18, 1976Me04 (continued)**

<sup>170</sup>Er Levels (continued)

E(level) <sup>†</sup>	J $\pi$ <sup>‡</sup>	T <sub>1/2</sub> <sup>#</sup>	$\Gamma_{\gamma 0}^2/\Gamma$ (meV) <sup>@</sup>	Comments
3554	1		13.6 28	
3566	1	4.9 fs 8	46 7	K=1 (1996Ma18).
3572	1		11 3	
3623	1	3.3 fs 12	24.5 27	K=0 (1996Ma18).
3695	1		36.7 26	Other ( $\Gamma_{\gamma 0}$ ) <sup>2</sup> / $\Gamma$ : 30 meV (1976Me04) for unplaced 3697 $\gamma$ .

<sup>†</sup> From 1996Ma18 if  $\Delta E$  unstated, from 1976Me04 if  $\Delta E=2$ .

<sup>‡</sup> J from  $\gamma(\theta)$  and  $\pi$  from  $\gamma$  linear polarization, except as noted; only states having J=1 or 2 can be excited (1976Me04).

<sup>#</sup> Deduced from  $\Gamma_{\gamma 0}^2/\Gamma$  and adopted  $\gamma$ -ray branching assuming  $\Gamma=\Gamma_{\gamma 0}+\Gamma_{\gamma 1}$ ; consequently, these represent upper limits for any level which has significant branching to states other than the ground or first excited states.

<sup>@</sup> From 1996Ma18, except as noted. Calculated by evaluator from integrated cross section data of 1996Ma18 assuming J indicated, unless indicated otherwise.

<sup>&</sup> From 1973Me17.

<sup>a</sup> From weighted average of  $\Gamma=0.080$  eV 7 (from adopted  $\Gamma_{\gamma 0}/\Gamma$  and  $(\Gamma_{\gamma 0})^2/\Gamma=11.6$  meV 10 (1973Me17, 1996Ma18)) and 0.094 eV 7 (from  $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=1.64$  7 and  $\Gamma_{\gamma 0}=35.8$  meV 24 (1991Zi01)).

$\gamma(^{170}\text{Er})$

E <sub>i</sub> (level)	J <sub>i</sub> $\pi$	E $\gamma$ <sup>‡</sup>	I $\gamma$ <sup>†</sup>	E <sub>f</sub>	J <sub>f</sub> $\pi$	Mult. <sup>#</sup>	Comments
1824	1 <sup>-</sup>	1745	163 5	78.6	2 <sup>+</sup>		E $\gamma$ : from 1973Me17. Branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=1.64$ 8 (1996Ma18), 1.63 7 (1976Me04).
		1824 1	100 <sup>&amp;</sup> <sup>@</sup>	0.0	0 <sup>+</sup>	E1 <sup>&amp;</sup>	E $\gamma$ : from 1991Zi01.
1973		1973		0.0	0 <sup>+</sup>		
2039	1,2	1960	93 10	78.6	2 <sup>+</sup>		Branching: from Adopted Gammas.
		2039	100 10	0.0	0 <sup>+</sup>		
2133	1	2054	39 10	78.6	2 <sup>+</sup>		Branching: from $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}$ in 1976Me04.
		2133	100	0.0	0 <sup>+</sup>	D	
2685?		2685 <sup>a</sup>	<sup>@</sup>	0.0	0 <sup>+</sup>		
2701	1	2622	48 6	78.6	2 <sup>+</sup>		Branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=0.48$ 7 (1996Ma18), 0.49 13 (1976Me04).
		2701	100	0.0	0 <sup>+</sup>	D	
2751	(1)	2672		78.6	2 <sup>+</sup>		
		2751	$\approx 100$	0.0	0 <sup>+</sup>	(D)	
2789	1 <sup>+</sup>	2710	52 5	78.6	2 <sup>+</sup>		Branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=0.59$ 6 (1996Ma18), 0.49 4 (1976Me04).
		2789	100	0.0	0 <sup>+</sup>	M1	
2897	1	2897		0.0	0 <sup>+</sup>	D	
2930	1	2851	88 20	78.6	2 <sup>+</sup>		Other $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}$ : 1.0 8 (1976Me04).
		2930	100	0.0	0 <sup>+</sup>	D	
2938	1	2859	61 13	78.6	2 <sup>+</sup>		Branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=0.60$ 14 (1996Ma18), 0.67 28 (1976Me04).
		2938	100	0.0	0 <sup>+</sup>	D	
2973	1,2	2973		0.0	0 <sup>+</sup>		
2995	1,2	2995		0.0	0 <sup>+</sup>		
3019	1	3019		0.0	0 <sup>+</sup>	D	
3064	1	2985	244 23	78.6	2 <sup>+</sup>		Branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=2.48$ 24 (1996Ma18), 2.0 8 (1976Me04).
		3064	100	0.0	0 <sup>+</sup>	D	
3084	1	3084		0.0	0 <sup>+</sup>	D	

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$^{170}\text{Er}(\gamma, \gamma'), (\gamma, \text{pol } \gamma')$  **1996Ma18, 1976Me04 (continued)** $\gamma(^{170}\text{Er})$  (continued)

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma^\ddagger$	$I_\gamma^\dagger$	$E_f$	$J_f^\pi$	Mult. <sup>#</sup>	Comments
3178	1	3099	247 54	78.6	2 <sup>+</sup>		$\gamma$ observed, but unplaced in 1976Me04.
		3178	100	0.0	0 <sup>+</sup>	D	
3183	1	3104	220 54	78.6	2 <sup>+</sup>		
		3183	100	0.0	0 <sup>+</sup>	D	
3238	1	3159	51 17	78.6	2 <sup>+</sup>		
		3238	100	0.0	0 <sup>+</sup>	D	
3243	1	3164	93 8	78.6	2 <sup>+</sup>		$\gamma$ observed, but unplaced in 1976Me04.
		3243	100	0.0	0 <sup>+</sup>	D	
3406	1 <sup>(+)</sup>	3327	46.1 23	78.6	2 <sup>+</sup>		$I_\gamma$ : branching: from weighted average of $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}=0.466$ 28 (1996Ma18), 0.45 4 (1976Me04). Mult.: $\Delta\pi=(\text{no})$ (1996Ma18).
		3406	100	0.0	0 <sup>+</sup>	D	
3540	1	3540		0.0	0 <sup>+</sup>	D	
3554	1	3554		0.0	0 <sup>+</sup>	D	
3566	1	3487	42 8	78.6	2 <sup>+</sup>		
		3566	100	0.0	0 <sup>+</sup>	D	
3572	1	3572		0.0	0 <sup>+</sup>	D	
3623	1	3544	140 60	78.6	2 <sup>+</sup>		
		3623	100	0.0	0 <sup>+</sup>	D	
3695	1	3616		78.6	2 <sup>+</sup>		Intensity undetermined; $\gamma$ overlaps another line (1996Ma18).
		3695		0.0	0 <sup>+</sup>	D	

<sup>†</sup> Relative branching, based on measured  $\Gamma_{\gamma 1}/\Gamma_{\gamma 0}$ . Calculated by evaluator from  $R=(\Gamma_{\gamma 1}/\Gamma_{\gamma 0})(E_{\gamma 0}/E_{\gamma 1})^3$  in 1996Ma18, except as noted.

<sup>‡</sup> From  $E(\text{level})$  difference, except for 1824 $\gamma$  (from 1991Zi01). Presumably  $\Delta E_\gamma \leq 2$  keV for transitions from levels given in 1976Me04 since authors indicate  $\Delta E(\text{level})=2$  keV. 1996Ma18 do not state uncertainty, but their level energies are within 1 keV of those from 1976Me04 for levels reported in both studies.

<sup>#</sup>  $\Delta J$  from  $\gamma$  anisotropy (1996Ma18), except as noted.  $\Delta\pi$  from linear polarization (1976Me04).

@ Weak.

& From 1973Me17.

<sup>a</sup> Placement of transition in the level scheme is uncertain.

<sup>x</sup>  $\gamma$  ray not placed in level scheme.

$^{170}\text{Er}(\gamma, \gamma'), (\gamma, \text{pol } \gamma')$  1996Ma18, 1976Me04

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----►  $\gamma$  Decay (Uncertain)

