^{170}Er(^{9}Be,4nγ) 1980Dr06

Type	Author	History Citation	Literature Cutoff Date
Update	M. S. Basunia		31-Jan-2005

E=44 MeV. ^{170}Er enriched metallic targets. Measured Eγ, Iγ, $\gamma\gamma$(t), $\gamma(\theta)$ and ce.
Band structure well interpreted in terms of the rotational model.
The 7/2[633] band is Coriolis coupled with 5/2[642] and 9/2[624] Nilsson orbitals (especially high-spin members of the band).

^{175}Hf Levels

E(level)[†]	J$^\pi$	T$_{1/2}$	Comments
0.0[‡]	5/2$^-$	70 d *2*	
81.5[‡] *2*	7/2$^-$		
125.9[#] *3*	1/2$^-$		
185.8[‡] *2*	9/2$^-$		
196.2[#] *4*	3/2$^-$		
207.4[@] *2*	7/2$^+$		
213.4[#] *4*	5/2$^-$		
258.1[@] *3*	9/2$^+$		
312.4[‡] *3*	11/2$^-$		
335.4[@] *4*	(11/2$^+$)		
375.3[#] *5*	7/2$^-$		
406.2[#] *5*	9/2$^-$		
436.1[@] *4*	(13/2$^+$)		
460.6[‡] *3*	13/2$^-$		
566.4[@] *4*	(15/2$^+$)		
629.8[‡] *3*	15/2$^-$		
654.4[#] *6*	11/2$^-$		
698.6[#] *6*	13/2$^-$		
711.2[@] *4*	(17/2$^+$)		
819.0[‡] *3*	17/2$^-$		
897.0[@] *4*	(19/2$^+$)		
1024.9[#] *7*	15/2$^-$		
1027.2[‡] *4*	19/2$^-$		
1075.7[@] *4*	(21/2$^+$)		
1082.4[#] *7*	17/2$^-$		
1253.5[‡] *4*	21/2$^-$		
1322.6[@] *4*	(23/2$^+$)		
1433.5[&] *4*	(19/2)$^+$	1.10 μs *8*	T$_{1/2}$: nγ(t), $\gamma\gamma$(t).
1476.8[#] *7*	19/2$^-$		
1497.3[‡] *4*	23/2$^-$		
1523.0[@] *5*	(25/2$^+$)		
1545.7[&] *4*	(21/2$^+$)		
1547.6[#] *7*	21/2$^-$		
1647.1 *4*	(21/2)		
1735.6[&] *4*	(23/2$^+$)		
1756.8[‡] *5*	25/2$^-$		
1766.4[a] *5*	(23/2$^-$)	1.16 ns *11*	T$_{1/2}$: beam-γ(t).

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^{170}Er(^{9}Be,4nγ) 1980Dr06 (continued)

^{175}Hf Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	Comments
1836.7[@] *5*	(27/2$^+$)		
1904.7[a] *5*	(25/2$^-$)		
1954.2[&] *5*	(25/2$^+$)		
1999.3[#] *8*	23/2$^-$		
2033.0[‡] *5*	(27/2$^-$)		
2046.1[@] *6*	(29/2$^+$)		
2082.9[#] *8*	25/2$^-$		
2114.4[a] *5*	(27/2$^-$)		
2195.8[&] *5*	(27/2$^+$)		
2321.7[‡] *6*	29/2$^-$		
2360.2[a] *6*	(29/2$^-$)		
2432.2[@] *6*	(31/2$^+$)		
2458.8[&] *5*	(29/2$^+$)		
2579.1[#] *9*	(27/2$^-$)		
2626.6[‡] *6*	(31/2$^-$)		
2634.4[a] *6*	(31/2$^-$)		
2638.3[@] *7*	(33/2$^+$)		
2678.9[#] *9*	(29/2$^-$)		
2742.1[&] *5*	(31/2$^+$)		
2933.1[a] *6*	(33/2$^-$)		
2939.7[‡] *7*	(33/2)		
3015.8[b] *7*	(35/2$^-$)	1.21 μs *15*	$T_{1/2}$: nγ(t), γγ(t).
3044.5[&] *5*	(33/2$^+$)		
3292.0[@] *7*	(37/2$^+$)		
3305.7[b] *7*	(37/2)		
3629.6[b] *7*	(39/2)		
3977.9[b] *8*	(41/2)		

[†] From a least-squares fit to γ-ray energies, using ΔE=0.3 keV (average of 0.15, for strong lines, and 0.35, for weaker lines) for all γ rays.
[‡] 5/2[512] band.
[#] 1/2[521] band.
[@] 7/2[633] band.
[&] K^π=19/2$^+$ band ; 3-quasiparticle intrinsic band, 7/2[633]n coupled to π^2 5/2[402]⊗7/2[404] (1549-keV ^{174}Hf state).
[a] K^π=23/2$^-$ band ; 3-quasiparticle intrinsic band, 7/2[633]n coupled to π^2 7/2[404]⊗9/2[514] (1797-keV ^{174}Hf state).
[b] K^π=(35/2$^-$) band ; 5-quasiparticle intrinsic band, 7/2[633]n coupled to π^2 7/2[404]⊗9/2[514]+ν^2 7/2[514]⊗9/2[624].

γ(^{175}Hf)

E_γ[†]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f
70.3		196.2	3/2$^-$	125.9	1/2$^-$
72.3	8.9 *25*	258.1	9/2$^+$	185.8	9/2$^-$
77.2	15 *3*	335.4	(11/2$^+$)	258.1	9/2$^+$
81.4	22 *4*	81.5	7/2$^-$	0.0	5/2$^-$
82.7	<0.8	3015.8	(35/2$^-$)	2933.1	(33/2$^-$)

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^{170}Er(^{9}Be,4nγ) 1980Dr06 (continued)

γ(^{175}Hf) (continued)

Eγ[†]	Iγ[#]	Ei(level)	J^{π}_i	E_f	J^{π}_f	Mult.[‡]	δ[‡]
87.5	≈1.3	213.4	5/2−	125.9	1/2−		
100.6	24.6 *10*	436.1	(13/2+)	335.4	(11/2+)	D+Q	
101.3	≤3.0	1647.1	(21/2)	1545.7	(21/2+)		
104.2	16.8 *8*	185.8	9/2−	81.5	7/2−	D+Q	
112.0	16.5[@] *20*	1545.7	(21/2+)	1433.5	(19/2)+		
119.3	6.5 *11*	1766.4	(23/2−)	1647.1	(21/2)	D+Q	
125.9[n]	100[n]	125.9	1/2−	0.0	5/2−		
125.9[no]	100[n]	207.4	7/2+	81.5	7/2−		
126.5[n]	100[n]	312.4	11/2−	185.8	9/2−		
130.3	25.1 *10*	566.4	(15/2+)	436.1	(13/2+)	D+Q	
138.0	14.1 *8*	1904.7	(25/2−)	1766.4	(23/2−)	D+Q	
144.9	27.5 *12*	711.2	(17/2+)	566.4	(15/2+)	D+Q	
148.2	20.4 *9*	460.6	13/2−	312.4	11/2−	D+Q	
169.1	13.8 *7*	629.8	15/2−	460.6	13/2−	D+Q	
178.0	24.2 *25*	436.1	(13/2+)	258.1	9/2+		
178.9	<14.5[b]	1075.7	(21/2+)	897.0	(19/2+)		
179.1	<14.5[b]	375.3	7/2−	196.2	3/2−		
185.8	<21.5[c]	185.8	9/2−	0.0	5/2−		
185.9	<21.5[c]	897.0	(19/2+)	711.2	(17/2+)		
189.1	13.7 *20*	819.0	17/2−	629.8	15/2−	D+Q	
189.9	21.3 *24*	1735.6	(23/2+)	1545.7	(21/2+)	D+Q	+0.25 *+7−13*
192.8	15.4 *8*	406.2	9/2−	213.4	5/2−	Q	
[x]203.2[a]	9.9 *7*						
207.5[n]	151[n] *6*	207.4	7/2+	0.0	5/2−		
207.5[n]	151[n] *6*	1027.2	19/2−	819.0	17/2−		
209.7	18.6 *13*	2114.4	(27/2−)	1904.7	(25/2−)		
213.8	<8.0[@]	1647.1	(21/2)	1433.5	(19/2)+		
218.6	11.2 *7*	1954.2	(25/2+)	1735.6	(23/2+)	D+Q	+0.36 *6*
220.7	26.4 *10*	1766.4	(23/2−)	1545.7	(21/2+)		
226.0	11.7 *6*	1253.5	21/2−	1027.2	19/2−	D+Q	
231.0	<51.3[d]	312.4	11/2−	81.5	7/2−		
231.1	<51.3[d]	566.4	(15/2+)	335.4	(11/2+)		
241.7	5.7 *7*	2195.8	(27/2+)	1954.2	(25/2+)	D+Q	+0.39 *+10−8*
243.7	1.5 *3*	1497.3	23/2−	1253.5	21/2−		
246.0	14.3 *20*	2360.2	(29/2−)	2114.4	(27/2−)		
246.8	4.7 *8*	1322.6	(23/2+)	1075.7	(21/2+)		
263.2	7.1 *4*	2458.8	(29/2+)	2195.8	(27/2+)	D+Q	+0.30 *+11−8*
274.2	<82.3[e]	2634.4	(31/2−)	2360.2	(29/2−)		
274.9	<82.3[e]	460.6	13/2−	185.8	9/2−		
275.1	<82.3[e]	711.2	(17/2+)	436.1	(13/2+)		
279.1	34[@] *4*	654.4	11/2−	375.3	7/2−		
283.3	1.44 *15*	2742.1	(31/2+)	2458.8	(29/2+)	D+Q	
290.1	5.6 *4*	3305.7	(37/2)	3015.8	(35/2−)	D+Q	
292.4	13.9 *8*	698.6	13/2−	406.2	9/2−	Q	
298.7	6.4 *4*	2933.1	(33/2−)	2634.4	(31/2−)		
302.2[n]	6.9[n] *6*	1735.6	(23/2+)	1433.5	(19/2)+		
302.2[n]	6.9[n] *6*	3044.5	(33/2+)	2742.1	(31/2+)		
317.5	27.0 *10*	629.8	15/2−	312.4	11/2−	Q	
324.0	2.9 *2*	3629.6	(39/2)	3305.7	(37/2)	D+Q	
330.7	32.4 *9*	897.0	(19/2+)	566.4	(15/2+)	Q	
348.3[n]	1.8[n] *4*	2114.4	(27/2−)	1766.4	(23/2−)		
348.3[n]	1.8[n] *4*	3977.9	(41/2)	3629.6	(39/2)		

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^{170}Er(^{9}Be,4nγ) 1980Dr06 (continued)

γ(^{175}Hf) (continued)

Eγ [†]	Iγ [#]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]
358.0	<48.9 [f]	1433.5	(19/2)+	1075.7	(21/2+)	
358.4	<48.9 [f]	819.0	17/2−	460.6	13/2−	
364.5	30.6 *12*	1075.7	(21/2+)	711.2	(17/2+)	Q
370.5	8.5 *16*	1024.9	15/2−	654.4	11/2−	
383.8	11.7 *5*	1082.4	17/2−	698.6	13/2−	Q
397.4	19.3 *9*	1027.2	19/2−	629.8	15/2−	Q
408.6	≤7.3 [@]	1954.2	(25/2+)	1545.7	(21/2+)	
425.7	18.4 *7*	1322.6	(23/2+)	897.0	(19/2+)	Q
434.6	14.2 *6*	1253.5	21/2−	819.0	17/2−	Q
447.3	20.5 *7*	1523.0	(25/2+)	1075.7	(21/2+)	Q
451.9	4.0 *5*	1476.8	19/2−	1024.9	15/2−	
455.3	≤1.3	2360.2	(29/2−)	1904.7	(25/2−)	
460.0	≤1.3	2195.8	(27/2+)	1735.6	(23/2+)	
465.2	7.3 *14*	1547.6	21/2−	1082.4	17/2−	
470.3	10.4 *5*	1497.3	23/2−	1027.2	19/2−	Q
503.3	12.4 *14*	1756.8	25/2−	1253.5	21/2−	Q
504.6	2.2 *7*	2458.8	(29/2+)	1954.2	(25/2+)	
514.1	≤11.1	1836.7	(27/2+)	1322.6	(23/2+)	
520.0	3.3 *4*	2634.4	(31/2−)	2114.4	(27/2−)	
522.5	<12.9 [g]	1999.3	23/2−	1476.8	19/2−	
523.1	<12.9 [g]	2046.1	(29/2+)	1523.0	(25/2+)	
535.3	<18.6 [h]	2082.9	25/2−	1547.6	21/2−	
535.7	<18.6 [h]	2033.0	(27/2−)	1497.3	23/2−	
536.3	<18.6 [h]	1433.5	(19/2)+	897.0	(19/2+)	
546.1	<4.9	2742.1	(31/2+)	2195.8	(27/2+)	
564.9	7.9 *4*	2321.7	29/2−	1756.8	25/2−	Q
572.9	3.9 *3*	2933.1	(33/2−)	2360.2	(29/2−)	
579.8	2.1 *2*	2579.1	(27/2−)	1999.3	23/2−	
585.9	≤1.0	3044.5	(33/2+)	2458.8	(29/2+)	
592.2	3.2 *4*	2638.3	(33/2+)	2046.1	(29/2+)	
593.6	<8.1 [i&]	2626.6	(31/2−)	2033.0	(27/2−)	
595.5	<8.1 [i&]	2432.2	(31/2+)	1836.7	(27/2+)	
596.0	<8.1 [i&]	2678.9	(29/2−)	2082.9	25/2−	
613.6 [o]	≤1.1	3629.6	(39/2)	3015.8	(35/2−)	
614.5	17.7 *4*	1433.5	(19/2)+	819.0	17/2−	E1 [j]
618	<4.2 [m]	2939.7	(33/2)	2321.7	29/2−	
653.7	1.3 *2*	3292.0	(37/2+)	2638.3	(33/2+)	
722.2	42.0 *18*	1433.5	(19/2)+	711.2	(17/2+)	M1 [k]
866.9	15.6 *5*	1433.5	(19/2)+	566.4	(15/2+)	E2 [l]

† Uncertainties range from 0.15 keV for the strong lines, to 0.35 keV for partially resolved weaker lines.
‡ From γ(θ).
\# Relative Iγ measured at θ=55°.
@ Contaminated by impurity line.
& Contains contamination from Ge(n,n′).
a Precedes 1433-keV isomer.
b Iγ(178.9γ + 179.1γ)=14.5 *20*.
c Iγ(185.8γ + 185.9γ)=21.5 *14*.
d Iγ(231.0γ + 231.1γ)=51.3 *15*.

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^{170}Er(^{9}Be,4nγ) 1980Dr06 (continued)

γ(^{175}Hf) (continued)

[e] Iγ(274.2γ + 274.9γ + 275.1γ)=82.3 *27*.
[f] Iγ(358.0γ + 358.4γ)=48.9 *13*.
[g] Iγ(522.5γ + 523.1γ)=12.9 *7*.
[h] Iγ(535.3γ + 535.7γ + 536.6γ)=18.6 *24*.
[i] Iγ(593.6γ + 595.5γ + 596.0γ)=8.1 *3*.
[j] From α(K)exp=0.0037 *9*.
[k] From α(K)exp=0.0156 *15*, α(L)exp=0.0021 *3* and α(M)exp=0.0009 *3*.
[l] From α(K)exp=0.0048 *6*.
[m] Authors quote <3.6 *6*.
[n] Multiply placed with undivided intensity.
[o] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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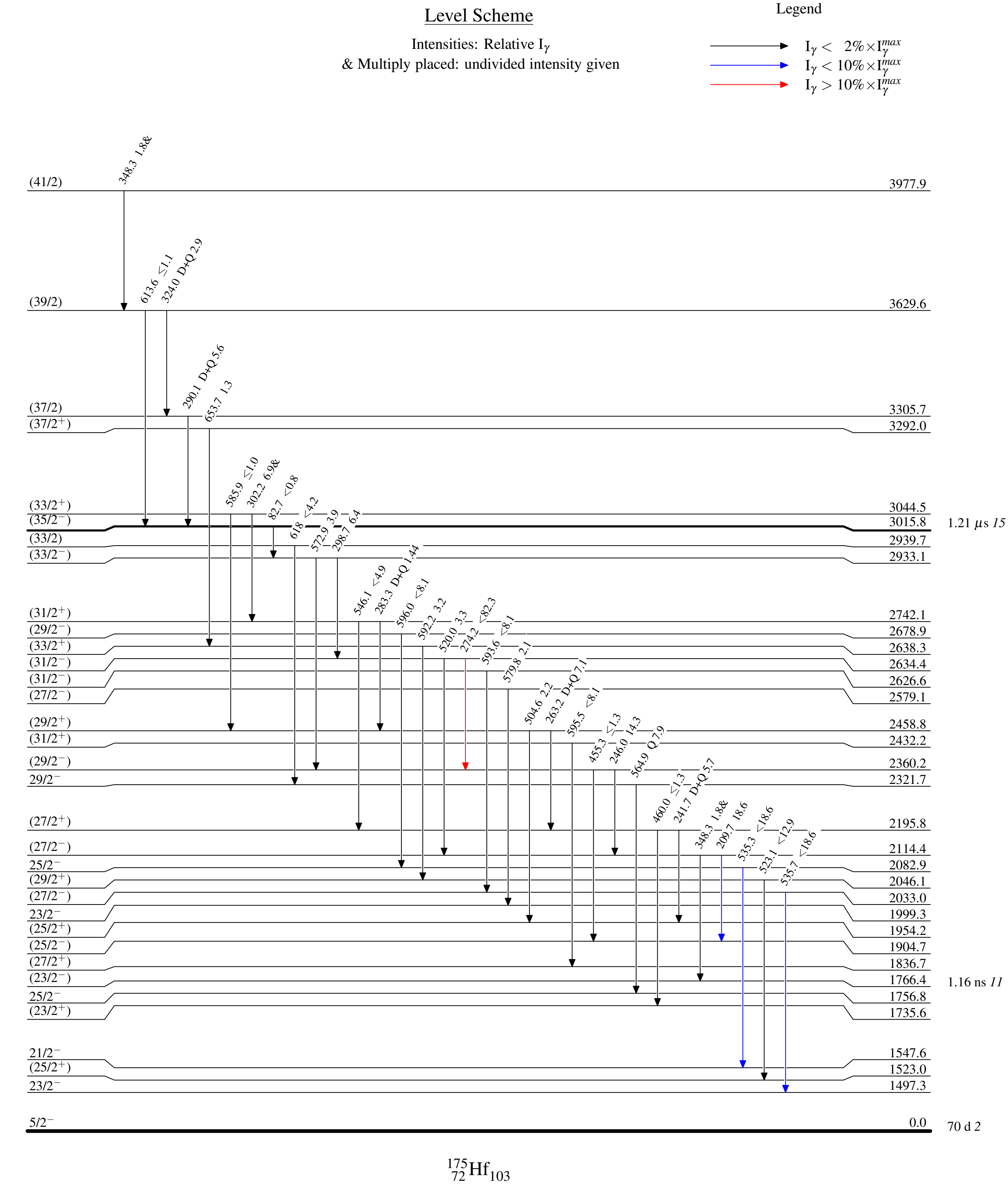
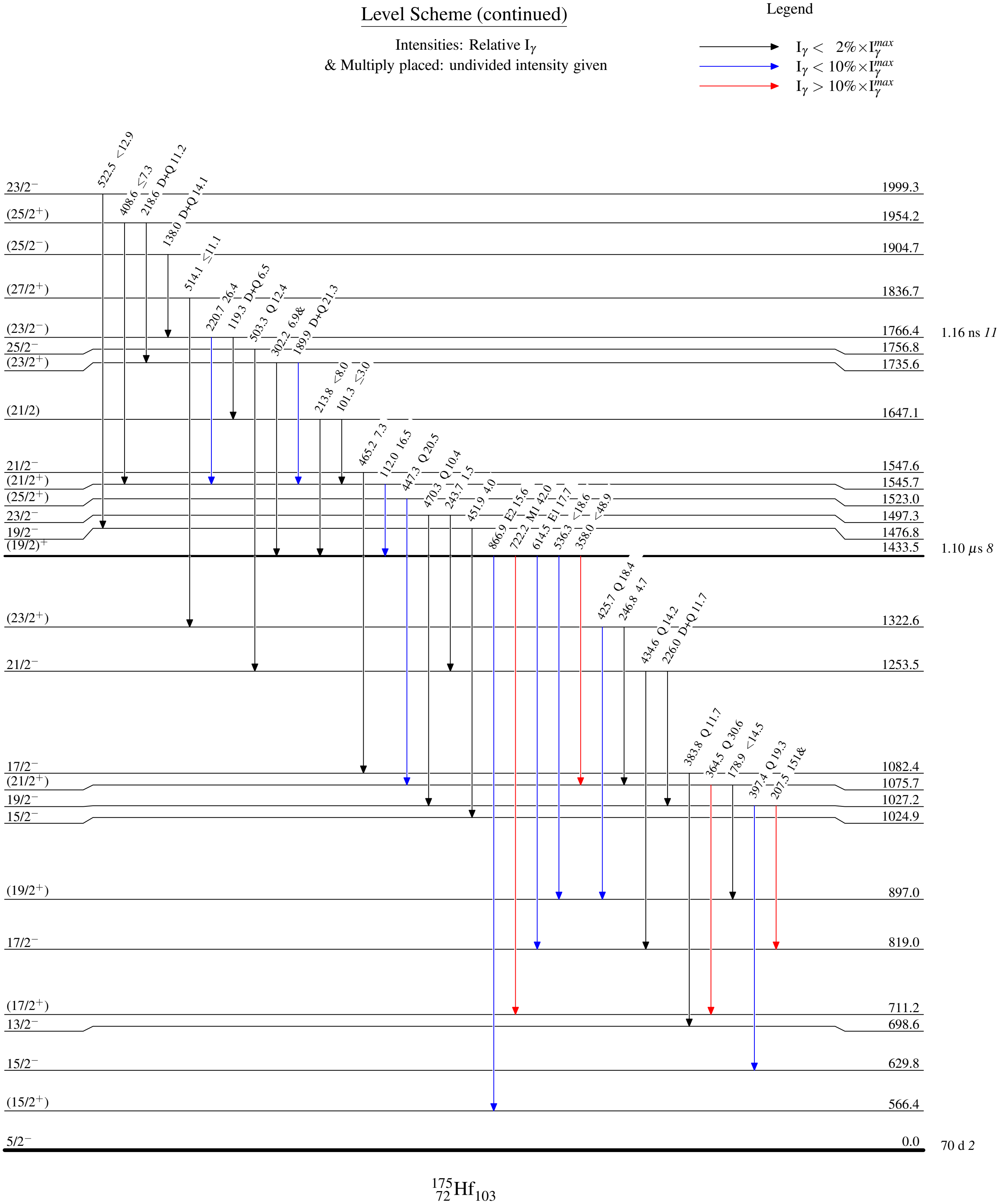


^{170}Er(^{9}Be,4nγ) 1980Dr06

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given



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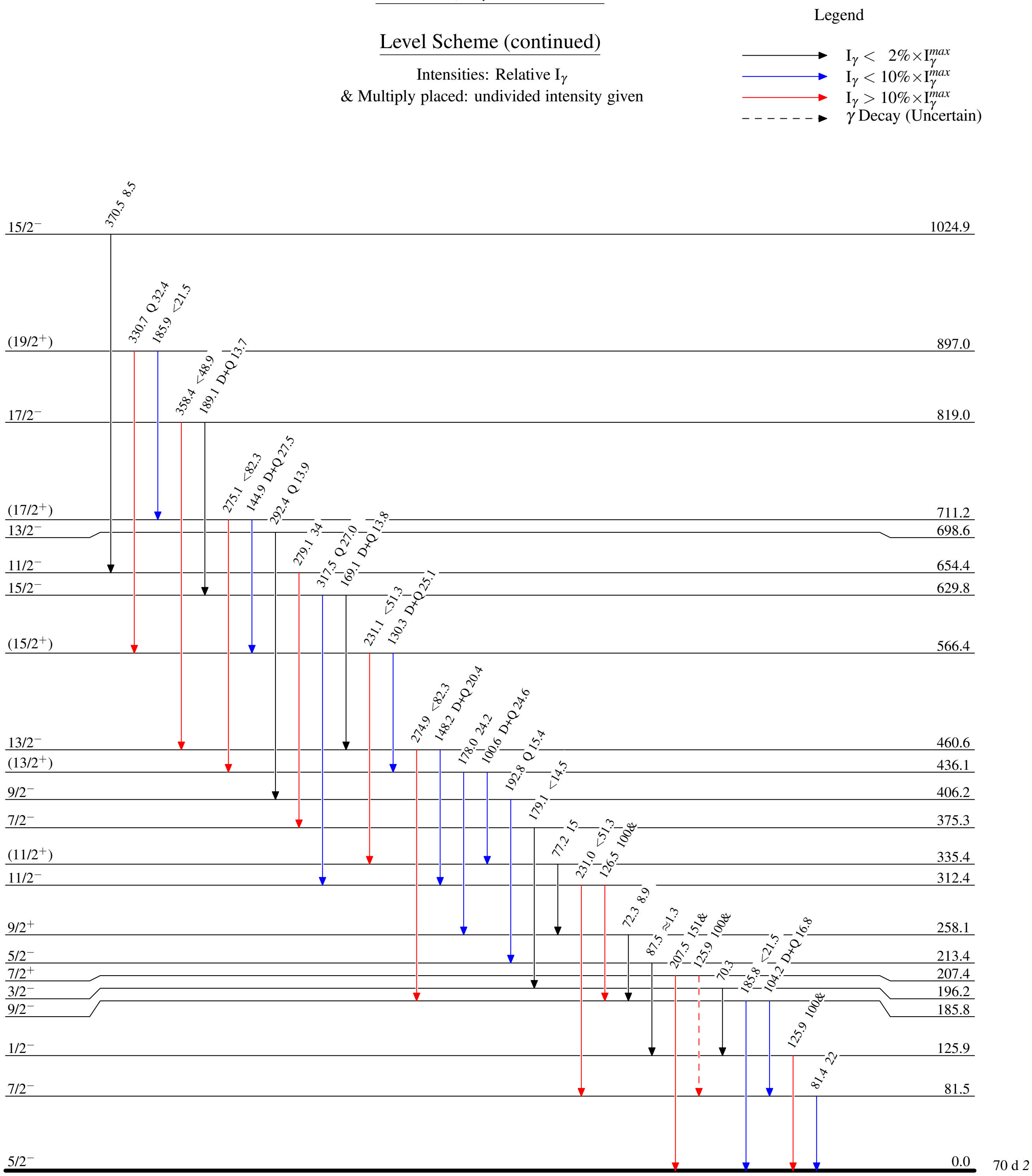
Level Scheme (continued)

Intensities: Relative I_γ

& Multiply placed: undivided intensity given



$^{175}_{72}Hf_{103}$