^{180}Hf(pol d,p),^{180}Hf(d,p) 2002Bo41,1968Ri07

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 106, 367 (2005)	31-Aug-2005

2002Bo41,2002Pr08: ^{180}Hf(pol d,p), E=24 MeV; enriched target; Q3D magnetic spectrograph; position sensitive E-ΔE detector, FWHM=5-6 keV; measured $\sigma(\theta)$, $A_y(\theta)$ from 11°−45°; DWBA.

1968Ri07: ^{180}Hf(d,p), E=10 MeV; magnetic spectrograph with track detectors; $\sigma(\theta)$, DWBA. Measured proton spectra.

Cross sections from 2002Bo41 in μb/sr are given under comments; the first value corresponds to 14° and the second to 35°, unless otherwise stated. When only one value is given, it is at 35°, unless otherwise stated.

^{181}Hf Levels

E(level)[†]	Jπ[‡]	L[†]	S_{lj}[#]	Comments
0.0[&]	1/2−	1[m]	0.015[o]	dσ/dΩ=65,13.
45.97[&] 9	3/2−	1	0.153	dσ/dΩ=813,283.
66[@]		4[l]		
98.38[&] 9	5/2−	3	0.204	dσ/dΩ=790,328.
168[@]				
203.94[&] 13	7/2−	3	0.023	dσ/dΩ=83,53.
251.86[a] 8	3/2−	1	0.058	dσ/dΩ=272,123.
303.6[&] 3	9/2−	5	0.01[o]	dσ/dΩ=23,31.
329.15[a] 9	5/2−	3	0.169	dσ/dΩ=746,265.
441.09[a] 14	7/2−	3	0.061	dσ/dΩ=353,147.
466[&]	11/2−			E(level): contaminated by ^{179}Hf.
573.7[a] 3	9/2−	5[m]	0.01[o]	dσ/dΩ=24,15.
594.9[h] 5	9/2+	4	0.003[o]	dσ/dΩ=9,5.
619.9[&] 3	(13/2−)	[m]		dσ/dΩ=23,10.
663.57[c] 11	7/2−	3	0.202	dσ/dΩ=1306,530.
687[@]				
750.7[a] 4	11/2−	5	0.004[o]	dσ/dΩ=12,16.
758.63 21	13/2+	6	0.110	dσ/dΩ=48,135. Proposed configuration=11/2[615] (2002Bo41).
801.2[c] 3	9/2−	5(+6)	0.015	dσ/dΩ=14,20.
835[&] 1	(15/2−)	[m]		dσ/dΩ=2.
905.5[d] 3	7/2−	3	0.0016	dσ/dΩ=13,5.
931.3[a] 5	13/2−	[m]		dσ/dΩ=5,6.
964.8[c] 3	11/2−	[m]		dσ/dΩ=14,12.
1010.2[h] 4	(13/2+)	(6)	0.02	dσ/dΩ=20.
1031.7[d] 4	9/2−	5	0.018	dσ/dΩ=17,12.
1057[@]		1[l]		
1127[c]	(13/2−)			E(level): contaminated by ^{179}Hf. dσ/dΩ=3.
1157.0[b] 3	7/2−	3	0.026	dσ/dΩ=172,81.
1234[@]				
1260[@]		(1)[l]		
1286.5[b] 5	9/2−	[m]		dσ/dΩ=8,7.
1321.79[e] 9	3/2−	1	0.146	dσ/dΩ=595,346.
1356.2[k] 3	(3/2−)	(1)[m]	0.006[o]	dσ/dΩ=22,6.
1397.1[e] 3	5/2−	3	0.021	L=1 from 1968Ri07. dσ/dΩ=146,42.

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^{180}Hf(pol d,p),^{180}Hf(d,p) 2002Bo41,1968Ri07 (continued)

^{181}Hf Levels (continued)

E(level)[†]	Jπ[‡]	L[†]	S_{lj}[#]	Comments
1400.7[k] 4	(7/2−)	3,(2)[n]	≈0.01	dσ/dΩ=46,20.
1424.3 2	5/2−	3	0.025	dσ/dΩ=140,50. Proposed configuration=5/2[503] (2002Bo41).
1435.5 4				dσ/dΩ=15,7.
1444.2[q] 6				dσ/dΩ=6,7.
1452.2[g] 2	5/2+	2	0.212	L=1 from 1968Ri07. dσ/dΩ=1473,583.
1466[@]		(1,2)[l]		
1494.2[k] 3	1/2−	(1)[m]	0.03[o]	L=1 from 1968Ri07. dσ/dΩ=108,105.
1497.1[q] 5				dσ/dΩ=68.
1505.2[j] 2	5/2+	2	0.061	L=3 from 1968Ri07. dσ/dΩ=426,171.
1520.2[g] 2	9/2+	4	0.338	L=3 from 1968Ri07. dσ/dΩ=863,488.
1543[@]				
1568.4 5				dσ/dΩ=10,6.
1574.7[j] 3	9/2+	4	0.014	dσ/dΩ=32,18.
1586[@]				
1616.0[g] 3	3/2+	2	0.012	dσ/dΩ=58,18.
1628.4[f] 3	1/2−	1	0.165	L=3 from 1968Ri07. dσ/dΩ=351,198.
1641.9 4	1/2−,3/2+	(1,2,3)		dσ/dΩ=18,9.
1656.8[j] 3	3/2+	2	0.017	L=(3) from 1968Ri07. dσ/dΩ=65,28.
1667.5[g] 11	(13/2+)		≈0.003	dσ/dΩ=3.
1682.3[f] 3	3/2−	1	0.029	dσ/dΩ=116,79.
1696.5 3	9/2−	5	0.157	dσ/dΩ=94,122. Proposed configuration=9/2[505] (2002Bo41).
1705.5 4	(1/2+)	(0)	0.012[o]	L=(3) from 1968Ri07. dσ/dΩ=12,12.
1726.5[k] 3	(5/2−)	(3)[m]	0.03[o]	dσ/dΩ=99,40.
1735.9 3	3/2−	1,(2)	0.012	L=1 from 1968Ri07. dσ/dΩ=81,35.
1746.1[f] 3	5/2−	3	0.013	dσ/dΩ=79,25.
1766.4 4	(5/2−)	(2,3)[m]		L=1 from 1968Ri07. dσ/dΩ=17,9.
1774.9[p] 4	5/2−	3	0.002[o]	dσ/dΩ=24,9.
1799.8 4	5/2−	3	0.006[o]	dσ/dΩ=45,21.
1808.2 4	3/2+	2[n]	0.011[o]	L=(3) from 1968Ri07. dσ/dΩ=46 (17°),23.
1813.2 4		mn		dσ/dΩ=78 (17°),23.
1834.3 4	5/2−	2,3	0.017	dσ/dΩ=85 (17°),30 (40°). Possible configuration=1/2[770]+1/2[501] (2002Bo41).
1846.9 3	3/2−	1	0.045	dσ/dΩ=204,135.
1865.1 5	1/2,3/2	(2)		dσ/dΩ=15 (40°). L=3 from 1968Ri07.
1873.8 3	5/2−	3	0.039	dσ/dΩ=103.
1885.8[j] 5	(7/2+)	(4)[n]	≈0.001	dσ/dΩ=10,5. L=(3) from 1968Ri07.
1894.0 5	1/2−,3/2−	(1)[n]	≈0.004[o]	dσ/dΩ=21,4.
1908.3 3	(5/2+)	2		dσ/dΩ=68,36.
1921.0[ip] 3	(3/2+)	(2)	≈0.01	dσ/dΩ=61,25 (40°).

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^{180}Hf(pol d,p),^{180}Hf(d,p) 2002Bo41,1968Ri07 (continued)

^{181}Hf Levels (continued)

E(level)[†]	Jπ[‡]	L[†]	S_{lj}[#]	Comments
1943.2 *6*	1/2,3/2			dσ/dΩ=4.
1950.8 *6*	(1/2⁻)	*n*		L=5 from 1968Ri07. dσ/dΩ=21,9 (40°).
1955.7 *3*	(5/2⁺)	(1,2)*n*		dσ/dΩ=95,52.
1985.2*i* *3*	5/2⁺	2	0.029	dσ/dΩ=193,63.
2026.0 *4*				dσ/dΩ=12,9.
2034.3*f* *3*	1/2⁻	1	0.056	dσ/dΩ=112,73.
2053.2*r* *9*			0.009*o*	dσ/dΩ=10,11. Possible configuration=11/2[651] (2002Bo41).
2082.3*f* *3*	3/2⁻	1*m*		dσ/dΩ=32,25.
2096.6*i* *5*	(7/2⁺)	(4)	≈0.008	dσ/dΩ=17,5.
2109.7 *4*				dσ/dΩ=37,16.
2120.6 *4*				dσ/dΩ=10,7.
2128.8 *4*				dσ/dΩ=23,11.
2148.4 *3*	1/2⁻,3/2⁺	1,2		dσ/dΩ=37,18.
2160.1 *3*	3/2⁺,(5/2⁻)	2,3		dσ/dΩ=106,49.
2175.5*f* *6*	(11/2⁻)		≈0.01	dσ/dΩ=10,6.
2194.4 *3*	3/2⁻	1		dσ/dΩ=48,25.
2200.6*i* *3*	9/2⁺	4	0.083	dσ/dΩ=259,156.
2214.9*f* *3*	1/2⁻	1	0.055	dσ/dΩ=148,64.
2224.0 *5*	(3/2⁻,5/2⁺)	1,2,(3)*n*		dσ/dΩ=29 (17°),11.
2230.2 *4*		(4)		dσ/dΩ=43,17.
2247.0*f* *3*	1/2⁻	1	0.141	dσ/dΩ=399,177.
2254.5 *3*	(3/2⁺,5/2⁻)	(2,3)		dσ/dΩ=447,176.
2272.4 *7*	3/2⁻			dσ/dΩ=8.
2282.4*f* *3*	(3/2⁻)	(1)	0.01*o*	dσ/dΩ=43,35.
2294.1 *4*	11/2⁻,13/2⁺	5,6		dσ/dΩ=12 (17°),35.
2310.2 *4*		3,4		dσ/dΩ=50 (17°),25.
2323.6 *4*	(3/2⁻)	(1)*m*		dσ/dΩ=22 (17°),25.
2341.7*r* *12*	1/2,3/2			dσ/dΩ=47 (14°).
2351.3*p* *3*	(3/2⁻)	(1)*m*		dσ/dΩ=60,16.
2364.5 *5*	(3/2⁻)	(1)	≈0.007	dσ/dΩ=29 (17°),17 (40°).
2374.2*p* *9*				dσ/dΩ=36 (17°),27 (40°).
2398.8 *3*	(3/2⁻)	(1)	0.01*o*	dσ/dΩ=67,18 (40°).
2407.3 *3*	(3/2⁻)	(1)	≈0.008	dσ/dΩ=56,14 (40°).
2441.3*p* *3*	1/2,3/2			dσ/dΩ=28,12 (40°).
2448.2 *3*	1/2⁻,3/2			dσ/dΩ=34,11.
2458.9 *3*				dσ/dΩ=48,18 (40°).
2499.1 *5*				dσ/dΩ=34,11.
2509.1 *8*	1/2,3/2			dσ/dΩ=16 (17°),9.
2515.5*e* *3*	3/2⁻	1	0.025	dσ/dΩ=109,65.
2533.9 *5*				dσ/dΩ=20,7.
2559.1 *6*				dσ/dΩ=18,8.
2572.7*p* *7*	3/2⁻	1		dσ/dΩ=43,21.
2588.2 *5*	(3/2⁺)	(2)		dσ/dΩ=29,18.
2597.2*e* *5*	5/2⁻	3		dσ/dΩ=83,31.
2616.8 *4*		(1),2,3		dσ/dΩ=43,27.
2626.6 *4*	(1/2⁻),3/2⁻	(1)		dσ/dΩ=35,21.
2639.0 *4*	(1/2⁻),3/2	(1)*m*		dσ/dΩ=55,42.
2659.8 *4*		(1,2)		dσ/dΩ=59,37.
2673.3 *6*	(1/2⁻,3/2⁻)	(1)*m*		dσ/dΩ=17,12.
2684.9 *4*	(3/2⁻)	(1)		dσ/dΩ=102,45.
2691.6 *5*	(3/2⁺)	(2)*n*		dσ/dΩ=26 (17°),18.

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^{180}Hf(pol d,p),^{180}Hf(d,p) 2002Bo41,1968Ri07 (continued)

^{181}Hf Levels (continued)

E(level)[†]	Jπ[‡]	L[†]	S_{lj}[#]	Comments
2739.7 *6*	(1/2⁻,3/2⁺)	(1,2)		dσ/dΩ=59 (17°),32.
2751.6 *6*				dσ/dΩ=24.
2764.8 *6*	1/2⁻,3/2			dσ/dΩ=15.
2795.8 *6*	3/2	(1,2)		dσ/dΩ=49,19.
2815.9 *6*	(9/2⁺)	(4,5)	≈0.02	dσ/dΩ=40,44.
2846.9 *6*				dσ/dΩ=29,23.
2866.7 *6*	1/2,3/2	(1,2)		dσ/dΩ=68,37.
2901.2 *6*	(7/2⁻)	(2,3)		dσ/dΩ=62,29.
2916.2 *7*	(1/2⁻,3/2⁻)	(1)		dσ/dΩ=32,28.
2932.8 *7*	(3/2⁺)	(2)		dσ/dΩ=54,22.
2951.4 *7*	(1/2⁻,3/2⁺)	(1,2)		dσ/dΩ=33,15.
2985.5 *7*	(1/2⁻,3/2⁺)	(1,2)		dσ/dΩ=79,49.
3002.0 *6*	(3/2⁻)	(1)		dσ/dΩ=54,26.
3051.6 *8*	(3/2⁻)	(1)		dσ/dΩ=51,28.
3096.4 *8*	(1/2⁻)	(1)		dσ/dΩ=42,24.

[†] From 2002Bo41, unless otherwise noted. The authors may have underestimated the energy uncertainties, for many level energies do not agree with the values obtained in the Adopted Levels within the quoted errors.

[‡] Assigned by the authors of 2002Bo41 based on band structures, and the DWBA and Coupled Channel calculations fitting the angular distributions and the analyzing power in the ^{181}Hf(pol d,p) work (2002Bo41).

[#] $S_{lj}=(d\sigma/d\Omega)_{exp}/\sigma_{lj}$(DWBA) (2002Bo41).

[@] From 1968Ri07 only, not in Adopted Levels. Energy listed is recalculated by evaluator to remove the possible discrepancies in calibration.

[&] Proposed configuration=1/2[510] (2002Bo41).

[a] Proposed configuration=3/2[512] (2002Bo41).

[b] Proposed configuration=5/2[512] (2002Bo41).

[c] Proposed configuration=7/2[503] (2002Bo41).

[d] Proposed configuration=7/2[514] (2002Bo41).

[e] Proposed configuration=3/2[501] (2002Bo41).

[f] Proposed configuration=1/2[501] (2002Bo41).

[g] Proposed configuration=1/2[651] (2002Bo41).

[h] Proposed configuration=9/2[624] (2002Bo41).

[i] Proposed configuration=3/2[642] (2002Bo41).

[j] Proposed configuration=1/2[660] (2002Bo41).

[k] Possible configuration=1/2[770] (2002Bo41).

[l] From 1968Ri07 only.

[m] CCBA (2002Bo41).

[n] Poorly resolved in $\sigma(\theta)$ measurements (2002Bo41).

[o] Upper limit of direct contribution.

[p] Probable doublet (2002Bo41).

[q] Seen only at few angles (2002Bo41).

[r] Unresolved, poor statistics (2002Bo41).