State	T_e	ω_e	$\omega_e x_e$	B_e	α_e	D_e (10^{-4} cm^{-1})	r_e (Å)	Observed Transitions: Design.	Observed Transitions: ν_{00}	References
$^1H^{81}Br$										
μ = 0.99542702		D_0^0 = 3.758 eV[a]				I.P. = 11.67 eV[b]				DEC 1976 A
Numerous absorption bands above 114000 cm^{-1}, tentatively assigned to higher members of two Rydberg series starting with L and M and converging to A $^2\Sigma^+$ of HBr^+; I.P.[$A^2\Sigma^+$,v=0] = 123373 cm^{-1} (15.296_4 eV).										(43)
M ($^1\Sigma^+$) (109473)								M← X,	108814	(43)*
L ($^1\Sigma^+$,$^1\Pi$) (104201)								L← X,	103519	(43)*
[1308] v=0...4 observed. Assigned as $4p\sigma\,4p\pi^4\,6s\sigma$.[c]										
[1262] v=0...3 observed. Assigned as $4p\sigma\,4p\pi^4\,5p\sigma$ and/or $5p\pi$.[c]										
Further absorption bands of doubtful assignment between 75200 and 83600 cm^{-1}.										(13)(15)
K ^{1} (83902)		(2518)[e]		[8.195]		[22.0]	[1.437_5]	K← X, R	83847.9[f] Z	(15)
J ^{1} (81243)		(2502)[e]		[8.02_7][g]		[3.6_1]	[1.453]	J← X, R	81180.7[h] Z	(13)*
I ^{1} (80436)		(2525)[e]		[8.16_9][i]		[$10._4$]	[1.440]	I← X, R	80385.6[j] Z	(13)*
g ($^3\Sigma^-$)0^+ t [79253.2]				[7.6_3][k]		[-17]	[1.49]	g← X, R	77940.$_0$ Z	(13)* (36)*
F $^1\Delta$ t [78322.3]				[8.20]			[1.43_7]	F← X, R	77009.1 Z	(36)*
f_1 $^3\Delta_1$ t (76814)		[2299.7] Z		8.02_7	0.21_3		1.453	f_1← X, R	76650.9 Z	(13)(36)*
D $^1\Pi$ u (76310)		[2405.5] Z		8.12_5	0.21		1.444	D← X, R	76199.4 Z	(13)* (36)*
d_0 $^3\Pi_0$ u (76193)		[2418.5] Z		[7.624][l]	(0.32)		[1.490_4]	d_0← X, R	76088.8 Z	(13)(36)*
E ($^1\Sigma^+$)0^+ t [76691]				[7.34][m]			[1.51_9]	E← X, R	75378	(36)
V $^1\Sigma^+$ n (75800)		(790) Bands in emission above 46500 cm^{-1}, in absorption above 75700. Incomplete analysis.						V↔ X,[o] R	(74900)	(14)(36)*
f_2 $^3\Delta_2$ t [75533.8]				[8.67_5][p]		[$16._5$][p]	[1.397]	f_2← X, R	74220.6 Z	(13)(36)*
f_3 $^3\Delta_3$ t [75403.1]		Weak transition.		[7.41]		[-7.6]	[1.51_2]	f_3← X, R	74089.9 Z	(36)*
e $^3\Sigma^+$ t [75053]		Very diffuse, unresolved band.						e← X, R	73740	(36)
d_1 $^3\Pi_1$ u [74855]		Diffuse band, rotational structure unresolved.						d_1← X, R	73542	(13)(36)
d_2 $^3\Pi_2$ u [74753]		Diffuse band, rotational structure unresolved.						d_2← X, R	73440	(13)(36)

State	T_e	ω_e	$\omega_e x_e$	B_e	α_e	D_e (10^{-4} cm^{-1})	r_e (Å)	Observed Transitions: Design.	Observed Transitions: ν_{00}	References
$^1H^{81}Br$ (continued)										
C $^1\Pi$ v	70578	2552 Z	52	7.89	0.30		1.46_5	C ← X,[q] R	70527.6 Z	(13)(32)*
b_0 $^3\Pi_0$ 0^+ v	(68998)	[2452]		$[7.99_6]$[r]			[1.455]	b_0 ← X, R	68911.2 Z	(13)(32)*
0^- v	(68991)							R	68904[s] H	
b_1 $^3\Pi_1$ v	(67180)	[2444.2] Z		8.14_8[r]	0.29_2		1.442	b_1 ← X, R	67088.4 Z	(13)* (32)*
b_2 $^3\Pi_2$ v	[67663.0]			$[7.80_5]$[r]			[1.473]	b_2 ← X, R	66349.8 Z	(13)(32)*

[1]HBr: [a]From $D_0^0(H_2)$, $D_0^0(Br_2)$, and ΔH_{f0}(HBr; from gaseous H_2, Br_2).
[b]Average value from photoionization (10) and photoelectron spectra (23)(29); refers to X $^2\Pi_{3/2}$ of the ion. A more recent paper (39) gives 11.64_5 eV.
[c]Strongly broadened by preionization; estimated lifetime against preionization 9.5×10^{-15} s (46).
[d]I, J, K correspond to absorption bands with clear analogues in DBr.
[e]From the observed HBr-DBr isotope shift assuming that the observed bands are 0-0 bands.
[f]Band [37] of (15).
[g]Λ-type doubling, $\Delta\nu_{ef} = + 0.14_2 \times J(J+1) - \ldots$; B and D represent average values.
[h]Band [28] of (13). Sharp P, Q, R branches; the Q levels appear to be predissociated for $J \geq 14$.
[i]From R, P branches. $\Delta\nu_{ef} = - 0.041 \times J(J+1)$.
[j]Band [26] of (13).
[k]Perturbed at high J.
[l]Slightly diffuse lines.
[m]Perturbed.
[n]Derived from $H^+ + Br^-$; configuration $\ldots\sigma\pi^4\sigma^*$.
[o]Heavily perturbed extensive band system. Absorption lines above 75923 cm^{-1} are diffuse. B' varies irregularly between 3.4 and 4.5 cm^{-1}.
[p]Average values for the two Λ-type doubling components.
[q]Very strong absorption, lines are diffuse.
[r]Diffuse rotational structure.
[s]Diffuse Q head.
[t]Configuration $\ldots\sigma^2\pi^3 5p\pi$.
[u]Configuration $\ldots\sigma^2\pi^3 5p\sigma$.
[v]Configuration $\ldots\sigma^2\pi^3 5s\sigma$.

State	T_e	ω_e	$\omega_e x_e$	B_e	α_e	D_e (10^{-4} cm^{-1})	r_e (Å)	Observed Transitions: Design.	Observed Transitions: ν_{00}	References
$^1H^{81}Br$ (continued)										
A ($^1\Pi$)	[w]	Continuous absorption starting at ~35000 with maximum at 56400 cm^{-1}.						A ← X		(1)(2)(4)(5)(28)
X $^1\Sigma^+$	0	2648.975[x]	z	45.217$_5$[y]	8.46488$_4$[x]	0.23328[z]	3.457$_5$[a']	1.41443$_5$	Rot.-vibr. sp.[b'c']	(21)
									Rotation spectrum[d'c']	(8)(17)(31)
									Raman sp.[e']	(45)
									Mol. beam el. reson.[f']	(42)

[1] HBr (continued):

[w] Configuration $\ldots\sigma^2\pi^3\sigma^*$.

[x] These are Y_{10} and Y_{01} values; applying Dunham corrections (21) obtain $\omega_e = 2649.21_5$, $B_e = 8.46506_5$. Additional corrections (adiabatic, non-adiabatic) are discussed by (38). The microwave B_0 value of (17) was included in the evaluation of B_e. See also [b'f'].

[y] $\omega_e y_e = -0.0029$.

[z] $+ 0.000873_5(v+\frac{1}{2})^2 - 0.000120(v+\frac{1}{2})^3$.

[a'] $- 0.039_7 \times 10^{-4}(v+\frac{1}{2}) + 0.0038(v+\frac{1}{2})^2$; $H_v = 7.63 \times 10^{-9} - 0.55 \times 10^{-9}(v+\frac{1}{2})$.

[b'] In absorption the 1-0, 2-0, 3-0, 3-1, 4-0, 5-0, 6-0 bands have been studied (6)(7)(12)(21)(41); in emission 1-0, 2-1, 3-2, 4-3 (11)(20). The constants in the table are from (21), those of (20)(41) are very similar and of comparable accuracy. See also (47). Absolute intensities have been measured (16)(18)(30)(33) and the dipole moment function has been calculated; (40) give for $H^{79}Br$ [D,Å]: $\mu_{e\ell}(r) = +0.788 + 0.315(r-r_e) + 0.575(r-r_e)^2$; see also (24)(34)(37).

[c'] For observations and measurements of pressure-induced bands and pure rotation lines ($\Delta J=2$) see (22)(27). The pressure broadening of the lines has been studied by (16)(25).

[d'] Absolute intensities have been measured by (19).

[e'] Raman cross sections in gaseous HBr.

[f'] The following constants (as well as corresponding values for $H^{79}Br$) are given in (42):
- $\mu_{e\ell}(v=0,J=1) = 0.8265$ D [in a later paper (44) derive 0.8282 D from Stark effect of rotation spectrum];
- quadrupole and other hyperfine coupling constants;
- $g_J = 0.3712$.

These constants supersede earlier values of (9)(17)(26)(31)(35).

State	T_e	ω_e	$\omega_e x_e$	B_e	α_e	D_e (10^{-4} cm^{-1})	r_e (Å)	Observed Transitions: Design.	Observed Transitions: ν_{00}	References
$^2H^{81}Br$		μ = 1.96518641		D_0^0 = 3.804 eV[a]		I.P. = 11.67$_3$ eV[b]				DEC 1976 A
		Numerous absorption bands above 114000 cm^{-1}; see ^{1}HBr.								(13)
M ($^1\Sigma^+$)	(109374)	[1000] v=0...5 observed. } See ^{1}HBr.						M← X,	108937	(13)*
L ($^1\Sigma^+$,$^1\Pi$)	(104141)	[971] v=0...4 observed. }						L← X,	(103690)	(13)*
		Further absorption bands of doubtful assignment between 72000 and 83800 cm^{-1}.								(6)
K[c]	1 (83908)	(1792)[d]		[4.121][e]		[0.80]	[1.442$_8$]	K← X, R	83867.1[f] Z	(6)
J[c]	1 (81248)	(1781)[d]		[4.083][g]		[1.36]	[1.449$_5$]	J← X, R	81202.2[f] Z	(6)*
I[c]	1 (80442)	(1797)[d]		[4.107]		[1.38]	[1.445$_2$]	I← X, R	80403.8[f] Z	(6)
g ($^3\Sigma^-$)0$^+$	(78125)	[1440.$_6$]	Z	[3.79]	(0.40)[h]	[14]	[1.50$_4$]	g← X, R	77908.8 Z	(6)(10)
F $^1\Delta$	[77989.0]			[4.095]			[1.447$_3$]	F← X, R	77052.3 Z	(6)(10)
f_1 $^3\Delta_1$	(76787)	[1657.3]	Z	4.06$_4$	0.07$_6$		1.453	f_1← X, R	76679.2 Z	(6)(10)
D $^1\Pi$	(76280)	[1732.6]	Z	4.128[i]	0.076		1.441$_5$	D← X, R	76209.1 Z	(6)(10)*
d_0 $^3\Pi_0$	[77027.4]			[3.99$_3$][j]			[1.466]	d_0← X, R	76090.7 Z	(10)*
E ($^1\Sigma^+$)0$^+$	(75682)	[1365]	Z	[3.953]	(0.78)[h]		[1.472$_9$]	E← X, R	75428.1 Z	(6)(10)
V $^1\Sigma^+$		Extensive absorption system above 75700 cm^{-1}, incompletely analysed because of strong perturbations. B_v values range from 1.68 to 2.12.						V← X, R		(10)
f_2 $^3\Delta_2$	(74370)	[1660.3]	Z	4.29$_4$	0.097	[2.4]	1.413	f_2← X, R	74263.1 Z	(6)(10)*
f_3 $^3\Delta_3$	[75088.6]	Weak transition.		[3.83]		[-2.1]	[1.49$_7$]	f_3← X, R	74151.9 Z	(10)*
e $^3\Sigma^+$	[74677]	Very diffuse, unresolved band.						e← X,	73740	(10)
d_1 $^3\Pi_1$	[74499]	Diffuse band, rotational structure unresolved.						d_1← X, R	73562	(6)(10)
d_2 $^3\Pi_2$	[74391.5]			[3.906][k]		[0.36]	[1.482]	d_2← X, R	73454.8 Z	(6)(10)*
C $^1\Pi$	70563	1811.2	Z 25.5	4.02[l]	0.10$_5$		1.46$_1$	C← X, R	(70501) H[Q]	(6)(8)*

State	T_e	ω_e	$\omega_e x_e$	B_e	α_e	D_e (10^{-4} cm^{-1})	r_e (Å)	Observed Transitions: Design.	Observed Transitions: ν_{00}	References
$^2H^{81}Br$ (continued)										
b_0 $^3\Pi_0$ 0^+	[69837.1]			[4.08_2]^m			[1.450]	$b_0 \leftarrow X$,	R 68900.4 Z R (68895)	(6)* (8)*
$^3\Pi_0$ 0^-	[69832]	Unresolved Q branch, assignment uncertain.								
b_1 $^3\Pi_1$	67113.$_9$	1814	Z 27	4.10^n	0.09		1.44_6	$b_1 \leftarrow X$,	R 67077.5 Z	(6)(8)
b_2 $^3\Pi_2$	[67290.7]			[4.01_8]^m			[1.461]	$b_2 \leftarrow X$,	R 66354.0 Z	(6)(8)
A ($^1\Pi$)		Continuous absorption beginning at ~39000 cm^{-1}.						$A \leftarrow X$,		(1)
X $^1\Sigma^+$	0	1884.75	Z 22.71$_8$	[4.245596]^p	0.083$_8$	[0.8832]^p	1.4145	Rot.-vibr. sp.^{q} Rotation spectrum^r		(2)(5) (3)(4)(9)(12)
		1839.33 = 1884.75 - 2(22.71)								

^{2}HBr: [a] From D_0^0(^{1}HBr).
[b] From the photoelectron sp. (11) of the isotopic mixture.
[c] See [d] of ^{1}HBr.
[d] See [e] of ^{1}HBr.
[e] Ω-type doubling, $\Delta\nu_{ef} \approx + 0.0371\,J(J+1)$.
[f] Bands {35}, {27}, {26} of (6).
[g] Ω-type doubling, $\Delta\nu_{ef} = + 0.0314\,J(J+1)$.
[h] v=0 and 1 only; v=1 is perturbed.
[i] From P, R branches. $B_0(Q) = 4.109$.
[j] From P, R branches. $B_0(Q) = 3.92_6$.
[k] Branches are slightly diffuse.
[l] Diffuse rotational structure; v=0...4.
[m] Slightly diffuse lines.
[n] v=2, 3 diffuse. Slightly diffuse lines for v=0, 1.
[o] $\omega_e y_e = - 0.010_6$.
[p] Microwave value (9)(12).
[q] 1-0, 2-0, 3-0 bands in absorption (2), Δv=1 sequence in emission (5).
[r] $\mu_{e\ell}$(v=0) = 0.8233 D from Stark effect of 1-0 line (12).
Quadrupole and other hyperfine coupling const. (7)(9)(12).

(1) See ref. (1) of ^{1}HBr.
(2) Keller, Nielsen, JCP 22, 294 (1954).
(3) Palik, JCP 23, 217 (1955).
(4) Cowan, Gordy, PR 111, 209 (1958)
(5) See ref. (11) of ^{1}HBr.
(6) See ref. (15) of ^{1}HBr.
(7) See ref. (26) of ^{1}HBr.
(8) See ref. (32) of ^{1}HBr.
(9) De Lucia, Helminger, Gordy, PR A 3, 1849 (1971).
(10) See ref. (36) of ^{1}HBr.
(11) See ref. (39) of ^{1}HBr.
(12) See ref. (44) of ^{1}HBr.
(13) See ref. (43) of ^{1}HBr.