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COLLISIONAL EXCITATION OF INTERSTELLAR FORMALDEHYDE

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ABSTRACT

Previous calculations for rates of excitation of ortho-H_2CO by collisions with He have been extended to higher rotational levels and kinetic temperatures to 80 K. Rates for para-H_2CO have also been computed. Pressure-broadening widths for several spectral lines have been obtained from these calculations and are found to agree with recent data within the experimental uncertainty of 10%. Excitation of formaldehyde by collisions with H_2 molecules is also discussed.

Subject headings: interstellar: molecules — molecular processes — transition probabilities

I. INTRODUCTION

Formaldehyde is widely distributed in interstellar space and is readily observed at centimeter and millimeter wavelengths. Its spectrum is that of a slightly asymmetric top, with rotational energy levels labeled by a total angular momentum, J, and its projection, K, on the (C—O) symmetry axis, such that $J \geq K \geq 0$. For $K > 0$, each J, K level is split by the small asymmetry into even- and odd-parity components; however, the splitting is too small to resolve in astrophysical sources except for the $K = 1$ levels. The observed lines at 6 cm and 2 cm correspond to intradoublet ($K = 1$, $\Delta J = 0$) transitions for $J = 1$ and $J = 2$, respectively. The millimeter transitions correspond to $\Delta K = 0$, $\Delta J = 1$ transitions, with the further restriction that only upper-to-upper and lower-to-lower transitions are allowed between the K-doublets. Finally, due to nuclear spin of the symmetrically placed hydrogens, the levels divide into para (even K) and ortho (odd K) species, analogous to the H_2 molecule. Para and ortho forms are not interconverted by radiative transitions or by nonreactive collisions and, for all practical purposes, can be considered as two distinct chemical species in interstellar space.

The observed transitions generally show nonthermal excitation. The most striking example of this is the "anomalous" absorption observed in the centimeter lines—i.e., the excitation temperature of these lines is less than the 3 K background radiation. The millimeter lines, on the other hand, are normally seen in emission. The nonthermal excitation is due to competition between collisional processes, which try to equilibrate all levels with the local kinetic temperature, and radiative processes, which tend to equilibrate all levels with the radiation temperature (generally just the 3 K background radiation at these frequencies). The radiative rates are well known. The rates for collisional excitation, however, are not, but they are proportional to the density and are functions of the kinetic temperature. If the molecular rates are known (and if radiative trapping effects are accounted for in the line formation), the observed excitation temperatures for the various transitions can provide an excellent probe of interstellar densities and kinetic temperatures.

It is not yet possible to obtain the required collision rates experimentally. As early as 1969, however, Townes and Cheung made estimates, based on a simple theoretical model, which accounted for the observed anomalous absorption. Subsequently a number of authors presented more sophisticated calculations, although these still suffered from various approximations. Recently we obtained theoretical rates from an essentially exact, numerical solution of the quantum mechanical equations that describe low energy H_2CO–He collisions (Garrison *et al.* 1975*a*; this article also summarized previous calculations). These rates qualitatively confirm the Townes and Cheung (1969) collisional pump mechanism for anomalous absorption, although they differ in detail. These rates have also now been applied to a number

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of centimeter and millimeter formaldehyde observations in order to infer interstellar densities and kinetic temperatures, with generally reasonable results (Evans and Kutner 1976; Lucas, Encrenaz, and Falgarone 1976; Wilson *et al.* 1976; Downes, Wilson, and Bieging 1976).

Unfortunately, due to computational expense, we were previously able to compute rates only for kinetic temperatures to 20 K, although formaldehyde is observed in many sources thought to be hotter than this. In the present work, theoretical rates are extended to higher collision energies where more levels are energetically accessible. To do this, we have used the coupled states scattering approximation (McGuire and Kouri 1974; Pack 1974) which, although an approximate and computationally simpler scheme, has been shown to be quite accurate when compared with the close coupling calculations done previously (Garrison and Lester 1977). Furthermore, it can be shown that this approximation improves at higher collision energies (Kouri, Heil, and Shimoni 1976). Using this approximation, we have also been able to provide some check on the calculations by computing collision-induced pressure-broadened spectral line widths which can be compared with available experimental data.

Hydrogen molecules are the most abundant species in the interstellar clouds where H_2CO is observed, being 4–5 times more plentiful than the next most abundant species, He atoms. We have argued previously that excitation by low-energy H_2 molecules should be very similar to excitation by He atoms (Garrison *et al.* 1975*a*; Green and Thaddeus 1976). A proper theoretical treatment of H_2CO–H_2 collisions is still prohibitively expensive; however, we can now make a few comments about the differences between H_2 and He excitation.

II. DETAILS OF CALCULATION

For the most part, the current calculations followed our earlier procedures. The intermolecular forces between H_2CO and He were obtained from large-scale Hartree-Fock (Garrison, Lester, and Schaefer 1975) and configuration interaction (Garrison *et al.* 1975*b*) calculations for the electronic wave function. Details of the close coupling (Garrison, Lester, and Miller 1976) and coupled states (Garrison and Lester 1977) scattering methods have been described previously. Coupled states cross sections were found to agree generally to better than about 25% with close coupling values. (It is now known that the choice $l = J$, i.e., the orbital angular momentum equal to the total angular momentum, is the correct one for the coupled states approximation. This was found to give better results than two other possible choices tried by Garrison and Lester [1977], and has been used in all of the present work.) The largest errors are believed due to low-energy resonance structure which cannot be accurately reproduced by the approximation. It has been shown by Kouri, Heil, and Shimoni (1976) that the coupled states method improves at higher collision energies.

In the present work a few small changes have been adopted for numerical convenience. (1) Rather than an analytic fit to the interaction potential, the present calculations employed a numerical tabulation at intermolecular separations $R = 2.4(0.2)18.0$ bohr radii with fifth-order Lagrange interpolation (cf. Green 1977*b*). (2) Rather than exact asymmetric top wave functions, the H_2CO rotational functions were assumed to be those for a (symmetrized) symmetric top. Correspondingly, energy levels were computed for these wave functions using the rotational constants (in cm^{-1}) $A = 1.2955$, $B = 1.1344$, and $C = 9.4060$. Neither of these changes caused significant differences from previous results.

Within the coupled states approximation, scattering calculations for ortho-H_2CO were performed with varying size expansion basis sets of rotational wave functions to check convergence at a few energies. The smallest basis used here, labeled B16, contains the same 16 states employed in the earlier studies: $K = 1$, $J = 1, 5$; $K = 3$, $J = 3, 5$. Basis B20 contained $K = 1, J = 1, 7; K = 3, J = 3, 5$. Basis B24 contained $K = 1, J = 1, 7; K = 3, J = 3, 6; K = 5, J = 5$. And the largest basis, B28, which was used in the final calculations, contained $K = 1$, $J = 1, 9$; $K = 3$, $J = 3, 6$; $K = 5$, $J = 5$. Some selected cross sections at a total energy $E = 95.1668$ K, the highest energy considered in earlier studies, are given in Table 1 as a function of basis set size; from these it is apparent

TABLE 1

BASIS SET DEPENDENCE OF SELECTED CROSS SECTIONS (Å²) AT $E = 95.1668$ K

$i \rightarrow f$	B16	B20	B24	B28
$1_{11} \rightarrow 1_{10}$	6.06	5.78	5.44	5.37
2_{12}	8.89	9.11	9.00	8.81
2_{11}	6.53	6.38	6.42	6.30
3_{13}	4.34	4.62	4.73	4.79
3_{12}	1.13	1.03	1.05	1.01
4_{14}	3.96	3.91	3.94	3.92
4_{13}	1.09	1.08	1.03	1.03
5_{15}	1.89	1.01	1.00	1.00
5_{14}	0.21	0.20	0.15	0.16
6_{16}	...	1.62	1.61	1.77
6_{15}	...	0.16	0.13	0.15
$1_{10} \rightarrow 2_{12}$	7.80	8.47	8.54	8.74
2_{11}	7.08	6.59	6.58	6.40
3_{13}	3.68	3.60	3.68	3.63
3_{12}	3.87	3.80	3.99	3.92
4_{14}	1.99	1.86	1.90	1.94
4_{13}	0.67	0.76	0.66	0.64
5_{15}	3.44	3.49	3.54	3.82
5_{14}	0.51	0.59	0.53	0.54
6_{16}	...	0.55	0.57	0.60
6_{15}	...	0.11	0.09	0.11
$4_{14} \rightarrow 4_{13}$	1.93	1.97	1.95	2.00
5_{15}	10.4	9.82	9.59	9.51
5_{14}	3.29	1.79	1.92	1.85
6_{16}	...	0.99	0.97	1.04
6_{15}	...	0.69	0.70	0.65
$4_{13} \rightarrow 5_{15}$	3.65	2.32	2.32	2.48
5_{14}	15.4	9.90	9.63	9.40
6_{16}	...	2.23	2.23	2.32
6_{15}	...	2.54	2.68	2.77

that the basis used previously was, in fact, adequate to give cross sections within about 10% of the infinite basis limit.

Using the largest (B28) basis, cross sections were calculated for total energies (in K) of 60, 70.1668, 95.1668, 110, 130, 150, 170, 200, 250, 300, 400, and 500. These, plus the earlier close coupling cross sections among the lowest eight levels at 12 energies below 100 K, were numerically integrated over a Boltzmann distribution of collision energies to obtain rate constants at kinetic temperatures to 80 K. The final rate constants are tabulated in Table 4.

For para-H_2CO coupled states calculations were performed which included 21 rotational levels: $K = 0, J = 0, 10$; $K = 2, J = 2, 5$; and $K = 4, J = 4$. Cross sections were obtained at 14 energies in the range 15–450 K. These were integrated over Boltzmann distributions of collision energies to obtain the rates which are tabulated in Table 4.

III. COLLISION-INDUCED PRESSURE BROADENING

Pressure broadening of spectral lines provides a measure of the *total* collisional rate out of the spectroscopic levels. The line width can be related to a generalized collision cross section which can be obtained from a scattering calculation. Therefore, some check on theoretical scattering calculations can be had by comparing computed pressure-broadening cross sections with experimental values. It should be noted that agreement is a necessary, but not a sufficient condition for the accuracy of the calculation, i.e., there is no *unique* relationship between state-to-state cross sections and pressure-broadening cross sections.

Nerf (1975) has presented measurements for several microwave transitions of H_2CO broadened by He and also by H_2 at room temperature. His results appear to be accurate to better than 10%. In an earlier study Rogers and Roberts (1973) reported broadening measurements, also at room temperature, for some lower frequency transitions, but the accuracy of these measurements seems questionable since their data show a number of irregularities.

Because the available experimental data are for room-temperature collisions, it was impractical to perform close coupling scattering calculations for comparison. However, the coupled states method can be extended to this energy range. It has been shown that this approximation is accurate to better than about 5% for a number of systems (Green *et al.* 1977; unpublished results). In fact, it is found to be generally more accurate for this highly averaged quantity than for individual state-to-state cross sections.

We have calculated pressure-broadening cross sections for several spectral lines using the coupled states method. To examine convergence with basis-set size, calculations on ortho-H_2CO were done at a collision energy of 300 K using the B16, B20, and B24 basis sets. These results are presented in Table 2. It appears that the B20 basis set gives results within a few percent of the infinite basis limit. A comparable B21 basis was used for para-H_2CO transitions. Because the experiments measure a Boltzmann distribution of collision energies, we have done calculations with the B20 basis set for collision energies of 150 K and 450 K as well. As seen in Table 3, the pressure-broadening cross sections for this system are only weakly dependent on collision energy in this range. Experimental values are also given in Table 3 for comparison. It is seen that the agreement between theory and experiment is generally excellent—within the 10% experimental errors—except for the 6 cm transition.

TABLE 2

BASIS SET DEPENDENCE OF SELECTED PRESSURE BROADENING CROSS SECTIONS*

Line	B16	B20	B24
1_{11}–2_{12}	33.7	34.7	35.0
1_{10}–2_{11}	33.7	35.0	35.2
2_{12}–3_{13}	...	33.4	33.3
2_{11}–3_{12}	...	33.7	34.0

* Cross sections in Å^2 at a collision energy $E = 300$ K.

IV. EXCITATION BY HYDROGEN

We have argued previously that excitation of H_2CO by low-temperature hydrogen molecules is similar to excitation by He atoms. This is predicated on the assumption that, at low temperatures, hydrogen is essentially all in its lowest $J = 0$ rotational level. On the other hand, if there is no sufficiently rapid mechanism which interconverts the nuclear spin species ortho-H_2 (odd J levels) to para-H_2 (even J levels), the hydrogen will freeze out mainly in the lowest $J = 1$ ortho-H_2 level, which has significantly different collisional properties. However, Dalgarno, Oppenheimer, and Black (1973) have suggested that interaction with protons will provide a mechanism for

TABLE 3

CALCULATED AND EXPERIMENTAL PRESSURE BROADENING CROSS SECTIONS*

LINE	Collision Energy (K)			
	150	300	450	Expt., 300 K
1_{11}–2_{12}	35.9	34.7	34.4	37.5†
1_{10}–2_{11}	36.0	35.0	34.6	36.2†
2_{12}–3_{13}	34.2	33.4	33.3	35.3†
2_{11}–3_{12}	34.3	33.7	33.4	35.9†
1_{11}–1_{10}	36.0	...	34.4	23‡
2_{12}–2_{11}	36.0	...	34.7	35‡
0_{00}–1_{01}	...	32.9	...	...
1_{01}–2_{02}	...	31.6	...	34.5†
2_{02}–3_{03}	...	31.2	...	34.2†

* Cross sections in Å^2. Ortho-H_2CO values computed with the B20 basis set and para-H_2CO values with the B21 basis.

† Nerf (1975) claims an accuracy of 10%.

‡ Rogers and Roberts (1973) do not give error estimates. See discussion in § III.

rapid interconversion of ortho- and para-H_2 in interstellar clouds.

Excitation by H_2 will differ from excitation by He for two reasons. First, H_2 has a smaller reduced mass, and second, the interaction potential will be somewhat different. It is straightforward to change the reduced mass in the scattering calculation. Using the H_2 reduced mass and the H_2CO–He interaction gives cross sections about 15% smaller than those obtained with the He reduced mass. This is due mainly to the smaller reduced mass being less effective in penetrating the centrifugal barrier at higher partial waves. The *rate* of collisional excitation is the cross section times the velocity. Because of its smaller reduced mass the H_2 velocity is some 40% larger than that for He at a given temperature. The effect of changing the reduced mass is thus to increase H_2 excitation rates by about 30% over He values, with little change in the relative rates of different transitions.

The difference between interaction potentials for H_2 and He is more difficult to determine. When H_2 is in its lowest $J = 0$ level and at low temperatures where collisions cannot readily excite it to higher levels, it appears to a very good approximation to be a structureless, spherical particle, like a He atom. Furthermore, since H_2, like He, has two electrons, its interaction potential might be expected to be similar. The major difference is that H_2 is more polarizable than He, leading to somewhat stronger long-range forces and a deeper van der Waals minimum. Also, H_2 is expected to be somewhat larger than He. Based on these considerations, Green and Thaddeus (1976) adapted a theoretical CO–He potential to CO–H_2 scattering; this interaction was able to account for collision-induced broadening of CO microwave and Raman spectra by both H_2 and D_2 (which has the same potential but a different reduced mass) over a range of temperatures. This potential predicted state-to-state rates for excitation by H_2 which were some 50% larger than those for He, but which had rather similar "propensity rules." It seems likely that similar conclusions obtain for excitation of H_2CO.

Nerf (1975) has measured room-temperature pressure broadening of H_2CO by H_2. Using the H_2CO–He potential and the collisional reduced mass appropriate for H_2, we have computed pressure-broadening cross sections. The computed cross sections are about 15% smaller than those for He; the experimental values, on the other hand, are larger by about 60%. This might appear to invalidate the above discussion, but we do not think it does. The discrepancy here between theory and experiment presumably reflects the fact that the room-temperature H_2 used in the experiments is most ortho-H_2 with $J = 1$.

For ortho-H_2 (and for para-H_2 with $J \geq 2$) the interaction potential is significantly different since the H_2 is no longer spherically symmetric. In particular, H_2 has a permanent electric quadrupole moment which gives rise to a long-range interaction with the sizable H_2CO dipole moment. To a first approximation, the effect of this dipole-quadrupole interaction is to enhance *dipole allowed* transitions of H_2CO by roughly a factor of 2 (cf. Green 1977*a*). Therefore, pressure broadening of H_2CO by the normal ortho/para mixture of H_2 is expected to be somewhat larger than broadening by para-H_2 (with most molecules in the $J = 0$ level). It should be possible to observe this effect experimentally, although it has apparently never been looked for. Finally, it should be noted that the same effect in pressure broadening of CO by H_2 will be minimal due to the vanishingly small dipole moment of the CO molecule.

V. CONCLUSIONS

Our previous calculations of excitation rates of ortho-H_2CO by collisions with He have been extended to higher rotational levels and kinetic temperatures to 80 K. Rates for para-H_2CO have now been computed as well. Potential inaccuracies in these calculations can arise from a number of sources, including errors in the theoretical intermolecular forces, truncation of the scattering expansion basis set, inadequacies of the coupled states approximation used for higher collision energies, and numerical errors in the integration over collision energies. It is believed that the major source of error is probably uncertainties in the intermolecular forces, and it is estimated that they may give rise to errors in individual cross sections on the order of 20%. Pressure-broadening cross sections have also been obtained for several spectral lines, and these agree, within the experimental error of 10%, with available data.

It is suggested that excitation by low-temperature para-H_2 (i.e., all molecules in their lowest $J = 0$ level) is faster by about 50% than excitation by He, but that the probabilities for different transitions ("propensity rules") are similar for both collision partners. Excitation by ortho-H_2 ($J = 1$) is expected to lead to significant enhancement of *dipole allowed* transitions of H_2CO.

APPENDIX

The computed excitation rates, in units of cm^3 per second, are tabulated in Table 4 as a function of kinetic temperature and listed by initial rotational level. The rotational levels are given in standard notation for asymmetric rigid rotors. Rates for ortho- and para-H_2CO are given separately. The numbers in parentheses are the power of 10 by which the preceding entry is multiplied.

TABLE 4A

Collision Rate Constants (in units of $cm^3\ s^{-1}$) as a Function of Kinetic Temperature, for Ortho-H_2CO/He

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
1(1, 1) - 1(1, 0)	5.9(-11)	5.0(-11)	4.5(-11)	4.2(-11)	4.0(-11)	3.9(-11)	3.8(-11)	3.7(-11)
1(1, 1) - 2(1, 2)	4.1(-11)	5.2(-11)	5.4(-11)	5.4(-11)	5.4(-11)	5.4(-11)	5.4(-11)	5.4(-11)
1(1, 1) - 2(1, 1)	2.1(-11)	2.8(-11)	3.1(-11)	3.3(-11)	3.6(-11)	3.7(-11)	3.9(-11)	4.1(-11)
1(1, 1) - 3(1, 3)	7.2(-12)	1.5(-11)	2.0(-11)	2.4(-11)	2.6(-11)	2.9(-11)	3.1(-11)	3.2(-11)
1(1, 1) - 3(1, 2)	1.0(-12)	2.6(-12)	3.9(-12)	5.2(-12)	6.4(-12)	7.6(-12)	8.7(-12)	9.7(-12)
1(1, 1) - 4(1, 4)	1.6(-12)	6.6(-12)	1.1(-11)	1.5(-11)	1.7(-11)	2.0(-11)	2.2(-11)	2.3(-11)
1(1, 1) - 4(1, 3)	1.9(-13)	1.3(-12)	2.8(-12)	4.3(-12)	5.8(-12)	7.2(-12)	8.5(-12)	9.8(-12)
1(1, 1) - 5(1, 5)	9.9(-14)	9.6(-13)	2.1(-12)	3.3(-12)	4.3(-12)	5.2(-12)	6.0(-12)	6.7(-12)
1(1, 1) - 5(1, 4)	1.3(-14)	1.6(-13)	4.5(-13)	8.3(-13)	1.3(-12)	1.7(-12)	2.2(-12)	2.7(-12)
1(1, 1) - 6(1, 6)	2.3(-14)	8.0(-13)	2.6(-12)	4.6(-12)	6.6(-12)	8.4(-12)	1.0(-11)	1.1(-11)
1(1, 1) - 6(1, 5)	1.8(-15)	7.4(-14)	2.8(-13)	6.0(-13)	9.8(-13)	1.4(-12)	1.8(-12)	2.3(-12)
1(1, 1) - 7(1, 7)	1.0(-15)	9.0(-14)	4.0(-13)	8.2(-13)	1.3(-12)	1.7(-12)	2.1(-12)	2.5(-12)
1(1, 1) - 7(1, 6)	1.5(-17)	2.9(-15)	1.9(-14)	5.9(-14)	1.3(-13)	2.3(-13)	3.6(-13)	5.2(-13)
1(1, 1) - 8(1, 8)	4.2(-17)	2.1(-14)	1.6(-13)	4.3(-13)	7.8(-13)	1.2(-12)	1.5(-12)	1.9(-12)
1(1, 1) - 8(1, 7)	2.5(-18)	1.3(-15)	1.1(-14)	3.7(-14)	8.0(-14)	1.4(-13)	2.2(-13)	3.2(-13)
1(1, 1) - 3(3, 1)	9.5(-17)	2.2(-14)	1.4(-13)	3.6(-13)	6.4(-13)	9.6(-13)	1.3(-12)	1.6(-12)
1(1, 1) - 3(3, 0)	1.4(-17)	2.8(-15)	1.8(-14)	4.7(-14)	8.7(-14)	1.3(-13)	1.8(-13)	2.4(-13)
1(1, 1) - 4(3, 2)	2.0(-17)	1.0(-14)	6.1(-14)	2.3(-13)	4.4(-13)	6.8(-13)	9.4(-13)	1.2(-12)
1(1, 1) - 4(3, 1)	8.5(-18)	4.3(-15)	3.4(-14)	9.9(-14)	2.0(-13)	3.2(-13)	4.7(-13)	6.4(-13)
1(1, 1) - 5(3, 3)	4.3(-18)	5.5(-15)	5.8(-14)	1.9(-13)	3.8(-13)	6.1(-13)	8.6(-13)	1.1(-12)
1(1, 1) - 5(3, 2)	2.6(-18)	3.6(-15)	3.9(-14)	1.3(-13)	2.7(-13)	4.5(-13)	6.4(-13)	8.4(-13)
1(1, 0) - 1(1, 1)	6.0(-11)	5.1(-11)	4.5(-11)	4.2(-11)	4.0(-11)	3.9(-11)	3.8(-11)	3.7(-11)
1(1, 0) - 2(1, 2)	2.7(-11)	3.5(-11)	3.9(-11)	4.1(-11)	4.3(-11)	4.4(-11)	4.5(-11)	4.6(-11)
1(1, 0) - 2(1, 1)	2.8(-11)	3.5(-11)	3.8(-11)	3.9(-11)	4.0(-11)	4.1(-11)	4.2(-11)	4.2(-11)
1(1, 0) - 3(1, 3)	8.2(-12)	1.6(-11)	1.9(-11)	2.0(-11)	2.1(-11)	2.2(-11)	2.2(-11)	2.3(-11)
1(1, 0) - 3(1, 2)	3.7(-12)	9.8(-12)	1.4(-11)	1.8(-11)	2.1(-11)	2.4(-11)	2.6(-11)	2.8(-11)
1(1, 0) - 4(1, 4)	1.4(-12)	4.9(-12)	7.5(-12)	9.5(-12)	1.1(-11)	1.3(-11)	1.4(-11)	1.5(-11)
1(1, 0) - 4(1, 3)	1.2(-13)	8.7(-13)	1.9(-12)	3.1(-12)	4.2(-12)	5.3(-12)	6.2(-12)	7.1(-12)
1(1, 0) - 5(1, 5)	3.2(-13)	3.3(-12)	7.4(-12)	1.1(-11)	1.4(-11)	1.7(-11)	1.9(-11)	2.0(-11)
1(1, 0) - 5(1, 4)	4.5(-14)	5.1(-13)	1.3(-12)	2.2(-12)	3.1(-12)	3.9(-12)	4.7(-12)	5.5(-12)
1(1, 0) - 6(1, 6)	8.2(-15)	2.8(-13)	6.7(-13)	1.5(-12)	2.1(-12)	2.6(-12)	3.1(-12)	3.5(-12)
1(1, 0) - 6(1, 5)	1.3(-15)	5.1(-14)	1.9(-13)	4.2(-13)	7.2(-13)	1.1(-12)	1.5(-12)	2.0(-12)
1(1, 0) - 7(1, 7)	1.5(-15)	1.4(-13)	6.6(-13)	1.4(-12)	2.3(-12)	3.1(-12)	3.8(-12)	4.5(-12)
1(1, 0) - 7(1, 6)	7.1(-17)	1.3(-14)	6.2(-14)	2.2(-13)	4.3(-13)	7.0(-13)	1.0(-12)	1.3(-12)
1(1, 0) - 8(1, 8)	3.4(-17)	1.5(-14)	1.1(-13)	2.8(-13)	5.0(-13)	7.2(-13)	9.4(-13)	1.2(-12)
1(1, 0) - 8(1, 7)	1.6(-18)	8.0(-16)	6.4(-15)	2.0(-14)	4.4(-14)	8.0(-14)	1.3(-13)	1.9(-13)
1(1, 0) - 3(3, 1)	4.1(-17)	6.1(-15)	3.2(-14)	7.6(-14)	1.3(-13)	2.0(-13)	2.7(-13)	3.4(-13)
1(1, 0) - 3(3, 0)	9.8(-17)	2.4(-14)	1.6(-13)	4.3(-13)	8.0(-13)	1.2(-12)	1.7(-12)	2.2(-12)
1(1, 0) - 4(3, 2)	1.3(-17)	6.9(-15)	5.6(-14)	1.6(-13)	3.1(-13)	4.8(-13)	6.6(-13)	8.3(-13)
1(1, 0) - 4(3, 1)	2.4(-17)	1.3(-14)	1.0(-13)	2.9(-13)	5.5(-13)	8.6(-13)	1.2(-12)	1.5(-12)
1(1, 0) - 5(3, 3)	1.2(-18)	1.2(-15)	1.2(-14)	3.6(-14)	7.0(-14)	1.1(-13)	1.5(-13)	2.0(-13)
1(1, 0) - 5(3, 2)	4.6(-18)	5.8(-15)	6.3(-14)	2.1(-13)	4.3(-13)	7.1(-13)	1.0(-12)	1.4(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
2(1, 2) - 1(1, 1)	4.8(-11)	4.4(-11)	4.0(-11)	3.9(-11)	3.7(-11)	3.7(-11)	3.6(-11)	3.5(-11)
2(1, 2) - 1(1, 0)	3.1(-11)	2.9(-11)	2.9(-11)	2.9(-11)	3.0(-11)	3.0(-11)	3.0(-11)	3.0(-11)
2(1, 2) - 2(1, 1)	4.5(-11)	3.4(-11)	2.8(-11)	2.5(-11)	2.3(-11)	2.2(-11)	2.1(-11)	2.1(-11)
2(1, 2) - 3(1, 3)	2.6(-11)	4.1(-11)	4.8(-11)	5.2(-11)	5.5(-11)	5.7(-11)	5.8(-11)	5.9(-11)
2(1, 2) - 3(1, 2)	5.4(-12)	9.8(-12)	1.3(-11)	1.5(-11)	1.7(-11)	1.8(-11)	2.0(-11)	2.1(-11)
2(1, 2) - 4(1, 4)	2.5(-12)	6.7(-12)	1.0(-11)	1.3(-11)	1.6(-11)	1.8(-11)	2.0(-11)	2.2(-11)
2(1, 2) - 4(1, 3)	3.8(-13)	1.8(-12)	3.1(-12)	4.2(-12)	5.2(-12)	6.0(-12)	6.9(-12)	7.6(-12)
2(1, 2) - 5(1, 5)	3.1(-13)	2.2(-12)	4.5(-12)	6.6(-12)	8.6(-12)	1.0(-11)	1.2(-11)	1.3(-11)
2(1, 2) - 5(1, 4)	9.8(-14)	8.3(-13)	1.8(-12)	2.9(-12)	3.8(-12)	4.8(-12)	5.6(-12)	6.4(-12)
2(1, 2) - 6(1, 6)	2.1(-14)	4.8(-13)	1.3(-12)	2.2(-12)	3.0(-12)	3.8(-12)	4.4(-12)	5.0(-12)
2(1, 2) - 6(1, 5)	2.9(-15)	8.9(-14)	3.1(-13)	6.0(-13)	9.4(-13)	1.3(-12)	1.7(-12)	2.0(-12)
2(1, 2) - 7(1, 7)	4.2(-15)	2.8(-13)	1.1(-12)	2.3(-12)	3.4(-12)	4.5(-12)	5.5(-12)	6.4(-12)
2(1, 2) - 7(1, 6)	1.5(-16)	2.2(-14)	1.2(-13)	3.1(-13)	5.5(-13)	8.3(-13)	1.1(-12)	1.4(-12)
2(1, 2) - 8(1, 8)	5.1(-17)	1.8(-14)	1.3(-13)	3.7(-13)	6.8(-13)	1.0(-12)	1.4(-12)	1.8(-12)
2(1, 2) - 8(1, 7)	2.8(-18)	1.1(-15)	5.0(-15)	2.8(-14)	5.9(-14)	1.0(-13)	1.6(-13)	2.3(-13)
2(1, 2) - 3(3, 1)	8.7(-17)	1.3(-14)	7.3(-14)	1.8(-13)	3.2(-13)	4.8(-13)	6.5(-13)	8.2(-13)
2(1, 2) - 3(3, 0)	6.9(-17)	1.4(-14)	6.5(-14)	2.3(-13)	4.1(-13)	6.1(-13)	8.2(-13)	1.0(-12)
2(1, 2) - 4(3, 2)	5.4(-17)	2.0(-14)	1.5(-13)	4.0(-13)	7.5(-13)	1.2(-12)	1.6(-12)	2.1(-12)
2(1, 2) - 4(3, 1)	4.8(-18)	2.0(-15)	1.5(-14)	4.4(-14)	8.3(-14)	1.3(-13)	1.7(-13)	2.2(-13)
2(1, 2) - 5(3, 3)	1.0(-17)	9.6(-15)	5.4(-14)	3.0(-13)	6.1(-13)	9.8(-13)	1.4(-12)	1.8(-12)
2(1, 2) - 5(3, 2)	1.3(-16)	1.1(-15)	5.9(-15)	3.0(-14)	5.8(-14)	9.1(-14)	1.3(-13)	1.6(-13)
2(1, 1) - 1(1, 1)	2.6(-11)	2.4(-11)	2.4(-11)	2.4(-11)	2.5(-11)	2.5(-11)	2.6(-11)	2.7(-11)
2(1, 1) - 1(1, 0)	3.4(-11)	3.0(-11)	2.9(-11)	2.8(-11)	2.8(-11)	2.8(-11)	2.8(-11)	2.8(-11)
2(1, 1) - 2(1, 2)	4.8(-11)	3.5(-11)	2.9(-11)	2.5(-11)	2.3(-11)	2.2(-11)	2.1(-11)	2.1(-11)
2(1, 1) - 3(1, 3)	1.8(-11)	2.1(-11)	2.3(-11)	2.4(-11)	2.5(-11)	2.6(-11)	2.6(-11)	2.7(-11)
2(1, 1) - 3(1, 2)	2.1(-11)	3.4(-11)	3.8(-11)	4.0(-11)	4.2(-11)	4.3(-11)	4.4(-11)	4.5(-11)
2(1, 1) - 4(1, 4)	3.3(-12)	9.0(-12)	1.3(-11)	1.5(-11)	1.7(-11)	1.8(-11)	2.0(-11)	2.0(-11)
2(1, 1) - 4(1, 3)	1.2(-12)	5.3(-12)	5.1(-12)	1.2(-11)	1.5(-11)	1.8(-11)	2.0(-11)	2.3(-11)
2(1, 1) - 5(1, 5)	2.6(-13)	1.8(-12)	3.8(-12)	4.9(-12)	6.0(-12)	6.9(-12)	7.7(-12)	8.3(-12)
2(1, 1) - 5(1, 4)	1.3(-13)	1.1(-12)	2.4(-12)	3.7(-12)	4.9(-12)	6.0(-12)	6.9(-12)	7.8(-12)
2(1, 1) - 6(1, 6)	5.3(-14)	1.3(-12)	3.7(-12)	6.2(-12)	8.4(-12)	1.0(-11)	1.2(-11)	1.4(-11)
2(1, 1) - 6(1, 5)	1.0(-14)	2.9(-13)	5.1(-13)	1.7(-12)	2.5(-12)	3.3(-12)	4.0(-12)	4.7(-12)
2(1, 1) - 7(1, 7)	2.1(-15)	1.4(-13)	5.5(-13)	1.1(-12)	1.7(-12)	2.3(-12)	2.8(-12)	3.3(-12)
2(1, 1) - 7(1, 6)	1.7(-16)	2.4(-14)	1.4(-13)	3.5(-13)	6.6(-13)	1.0(-12)	1.5(-12)	1.9(-12)
2(1, 1) - 8(1, 8)	1.1(-16)	3.6(-14)	2.5(-13)	6.4(-13)	1.1(-12)	1.7(-12)	2.2(-12)	2.7(-12)
2(1, 1) - 8(1, 7)	1.1(-17)	4.6(-15)	3.6(-14)	1.1(-13)	2.1(-13)	3.4(-13)	5.0(-13)	6.7(-13)
2(1, 1) - 3(3, 1)	1.0(-16)	1.9(-14)	1.1(-13)	2.9(-13)	5.1(-13)	7.6(-13)	1.0(-12)	1.3(-12)
2(1, 1) - 3(3, 0)	1.0(-16)	1.7(-14)	1.0(-13)	2.5(-13)	4.4(-13)	6.5(-13)	8.6(-13)	1.1(-12)
2(1, 1) - 4(3, 2)	1.8(-17)	7.3(-15)	5.4(-14)	1.5(-13)	2.8(-13)	4.4(-13)	6.0(-13)	7.7(-13)
2(1, 1) - 4(3, 1)	4.9(-17)	1.9(-14)	1.4(-13)	4.0(-13)	7.6(-13)	1.2(-12)	1.7(-12)	2.2(-12)
2(1, 1) - 5(3, 3)	2.7(-18)	2.2(-15)	2.0(-14)	6.3(-14)	1.2(-13)	2.0(-13)	2.8(-13)	3.6(-13)
2(1, 1) - 5(3, 2)	7.3(-18)	6.3(-15)	6.0(-14)	1.9(-13)	3.9(-13)	6.3(-13)	9.0(-13)	1.2(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
3(1, 3) - 1(1, 1)	1.7(-11)	1.5(-11)	1.5(-11)	1.5(-11)	1.6(-11)	1.6(-11)	1.7(-11)	1.7(-11)
3(1, 3) - 1(1, 0)	1.5(-11)	1.6(-11)	1.4(-11)	1.3(-11)	1.3(-11)	1.2(-11)	1.2(-11)	1.2(-11)
3(1, 3) - 2(1, 2)	5.0(-11)	4.9(-11)	4.8(-11)	4.8(-11)	4.8(-11)	4.8(-11)	4.8(-11)	4.8(-11)
3(1, 3) - 2(1, 1)	2.7(-11)	2.4(-11)	2.2(-11)	2.2(-11)	2.2(-11)	2.2(-11)	2.2(-11)	2.2(-11)
3(1, 3) - 3(1, 2)	2.9(-11)	2.5(-11)	2.1(-11)	1.9(-11)	1.8(-11)	1.7(-11)	1.6(-11)	1.6(-11)
3(1, 3) - 4(1, 4)	1.8(-11)	3.2(-11)	4.0(-11)	4.4(-11)	4.8(-11)	5.0(-11)	5.2(-11)	5.3(-11)
3(1, 3) - 4(1, 3)	2.2(-12)	5.6(-12)	7.8(-12)	9.6(-12)	1.1(-11)	1.2(-11)	1.4(-11)	1.5(-11)
3(1, 3) - 5(1, 5)	5.7(-13)	2.8(-12)	5.4(-12)	7.8(-12)	1.0(-11)	1.2(-11)	1.4(-11)	1.5(-11)
3(1, 3) - 5(1, 4)	2.5(-13)	1.2(-12)	2.2(-12)	3.1(-12)	3.8(-12)	4.5(-12)	5.1(-12)	5.7(-12)
3(1, 3) - 6(1, 6)	6.6(-14)	1.0(-12)	2.7(-12)	4.4(-12)	6.1(-12)	7.7(-12)	9.3(-12)	1.1(-11)
3(1, 3) - 6(1, 5)	2.9(-14)	4.8(-13)	1.2(-12)	2.1(-12)	2.8(-12)	3.6(-12)	4.3(-12)	4.9(-12)
3(1, 3) - 7(1, 7)	4.9(-15)	1.9(-13)	6.5(-13)	1.2(-12)	1.8(-12)	2.4(-12)	2.9(-12)	3.4(-12)
3(1, 3) - 7(1, 6)	5.4(-16)	4.6(-14)	2.1(-13)	4.4(-13)	7.2(-13)	9.9(-13)	1.3(-12)	1.5(-12)
3(1, 3) - 8(1, 8)	3.3(-16)	7.0(-14)	4.0(-13)	9.4(-13)	1.6(-12)	2.2(-12)	2.9(-12)	3.5(-12)
3(1, 3) - 8(1, 7)	2.8(-17)	7.3(-15)	5.0(-14)	1.4(-13)	2.6(-13)	4.2(-13)	5.9(-13)	7.7(-13)
3(1, 3) - 3(3, 1)	1.7(-16)	1.9(-14)	5.4(-14)	2.2(-13)	3.7(-13)	5.2(-13)	6.8(-13)	8.4(-13)
3(1, 3) - 3(3, 0)	1.3(-16)	1.5(-14)	7.7(-14)	1.9(-13)	3.4(-13)	5.0(-13)	6.8(-13)	8.7(-13)
3(1, 3) - 4(3, 2)	9.0(-17)	2.0(-14)	1.2(-13)	3.1(-13)	5.4(-13)	7.9(-13)	1.0(-12)	1.3(-12)
3(1, 3) - 4(3, 1)	7.5(-17)	1.8(-14)	1.1(-13)	2.7(-13)	4.8(-13)	7.0(-13)	9.3(-13)	1.1(-12)
3(1, 3) - 5(3, 3)	2.2(-17)	1.2(-14)	1.0(-13)	3.1(-13)	6.1(-13)	9.8(-13)	1.4(-12)	1.8(-12)
3(1, 3) - 5(3, 2)	7.9(-18)	4.6(-15)	4.0(-14)	1.2(-13)	2.3(-13)	3.6(-13)	4.9(-13)	6.3(-13)
3(1, 2) - 1(1, 1)	2.7(-12)	2.8(-12)	3.1(-12)	3.5(-12)	4.0(-12)	4.4(-12)	4.8(-12)	5.2(-12)
3(1, 2) - 1(1, 0)	9.7(-12)	1.0(-11)	1.1(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.4(-11)	1.5(-11)
3(1, 2) - 2(1, 2)	1.2(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)
3(1, 2) - 2(1, 1)	4.5(-11)	4.2(-11)	3.9(-11)	3.8(-11)	3.7(-11)	3.7(-11)	3.7(-11)	3.7(-11)
3(1, 2) - 3(1, 3)	3.3(-11)	2.7(-11)	2.2(-11)	2.0(-11)	1.8(-11)	1.7(-11)	1.7(-11)	1.6(-11)
3(1, 2) - 4(1, 4)	1.1(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)	1.8(-11)	1.9(-11)
3(1, 2) - 4(1, 3)	9.5(-12)	2.3(-11)	3.1(-11)	3.6(-11)	3.9(-11)	4.1(-11)	4.3(-11)	4.4(-11)
3(1, 2) - 5(1, 5)	1.3(-12)	5.1(-12)	6.4(-12)	1.1(-11)	1.3(-11)	1.5(-11)	1.6(-11)	1.7(-11)
3(1, 2) - 5(1, 4)	1.0(-12)	4.5(-12)	7.9(-12)	1.1(-11)	1.4(-11)	1.6(-11)	1.9(-11)	2.1(-11)
3(1, 2) - 6(1, 6)	7.3(-14)	9.8(-13)	2.3(-12)	3.4(-12)	4.4(-12)	5.2(-12)	6.0(-12)	6.6(-12)
3(1, 2) - 6(1, 5)	5.2(-14)	8.3(-13)	2.2(-12)	3.6(-12)	5.0(-12)	6.3(-12)	7.5(-12)	8.5(-12)
3(1, 2) - 7(1, 7)	1.4(-14)	5.3(-13)	1.8(-12)	3.4(-12)	4.9(-12)	6.2(-12)	7.4(-12)	8.4(-12)
3(1, 2) - 7(1, 6)	1.8(-15)	1.3(-13)	5.6(-13)	1.2(-12)	1.9(-12)	2.6(-12)	3.3(-12)	4.0(-12)
3(1, 2) - 8(1, 8)	2.5(-16)	4.9(-14)	2.8(-13)	6.7(-13)	1.1(-12)	1.6(-12)	2.1(-12)	2.5(-12)
3(1, 2) - 8(1, 7)	4.7(-17)	1.1(-14)	6.8(-14)	1.8(-13)	3.5(-13)	5.7(-13)	8.3(-13)	1.1(-12)
3(1, 2) - 3(3, 1)	3.5(-16)	4.1(-14)	2.1(-13)	5.0(-13)	8.4(-13)	1.2(-12)	1.6(-12)	1.9(-12)
3(1, 2) - 3(3, 0)	2.8(-16)	3.0(-14)	1.5(-13)	3.5(-13)	5.8(-13)	8.2(-13)	1.1(-12)	1.3(-12)
3(1, 2) - 4(3, 2)	9.3(-17)	2.2(-14)	1.4(-13)	3.7(-13)	6.7(-13)	1.0(-12)	1.4(-12)	1.8(-12)
3(1, 2) - 4(3, 1)	4.5(-17)	1.1(-14)	7.3(-14)	2.0(-13)	3.7(-13)	5.7(-13)	7.9(-13)	1.0(-12)
3(1, 2) - 5(3, 3)	1.1(-17)	5.8(-15)	4.9(-14)	1.5(-13)	2.9(-13)	4.7(-13)	6.6(-13)	8.7(-13)
3(1, 2) - 5(3, 2)	1.9(-17)	9.5(-15)	7.6(-14)	2.2(-13)	4.4(-13)	6.9(-13)	9.8(-13)	1.3(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
4(1, 4) - 1(1, 1)	1.1(-11)	1.0(-11)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)
4(1, 4) - 1(1, 0)	9.3(-12)	7.4(-12)	6.8(-12)	6.7(-12)	6.8(-12)	7.0(-12)	7.1(-12)	7.3(-12)
4(1, 4) - 2(1, 2)	1.5(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.5(-11)	1.6(-11)
4(1, 4) - 2(1, 1)	1.8(-11)	1.6(-11)	1.5(-11)	1.5(-11)	1.5(-11)	1.5(-11)	1.5(-11)	1.5(-11)
4(1, 4) - 3(1, 3)	5.5(-11)	4.9(-11)	4.8(-11)	4.8(-11)	4.9(-11)	4.9(-11)	4.9(-11)	4.9(-11)
4(1, 4) - 3(1, 2)	3.0(-11)	2.0(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)
4(1, 4) - 4(1, 3)	7.9(-12)	9.4(-12)	9.6(-12)	9.8(-12)	9.9(-12)	1.0(-11)	1.0(-11)	1.1(-11)
4(1, 4) - 5(1, 5)	9.5(-12)	2.3(-11)	3.2(-11)	3.8(-11)	4.2(-11)	4.5(-11)	4.8(-11)	5.0(-11)
4(1, 4) - 5(1, 4)	2.0(-12)	4.6(-12)	6.3(-12)	7.7(-12)	8.9(-12)	1.0(-11)	1.1(-11)	1.2(-11)
4(1, 4) - 6(1, 6)	1.9(-13)	1.7(-12)	3.6(-12)	5.7(-12)	7.7(-12)	9.6(-12)	1.1(-11)	1.3(-11)
4(1, 4) - 6(1, 5)	1.0(-13)	8.6(-13)	1.7(-12)	2.4(-12)	3.0(-12)	3.5(-12)	3.9(-12)	4.3(-12)
4(1, 4) - 7(1, 7)	2.2(-14)	4.7(-13)	1.4(-12)	2.4(-12)	3.4(-12)	4.4(-12)	5.3(-12)	6.2(-12)
4(1, 4) - 7(1, 6)	6.1(-15)	2.4(-13)	7.9(-13)	1.4(-12)	2.1(-12)	2.7(-12)	3.3(-12)	3.8(-12)
4(1, 4) - 8(1, 8)	6.5(-16)	6.7(-14)	3.1(-13)	6.6(-13)	1.0(-12)	1.4(-12)	1.8(-12)	2.2(-12)
4(1, 4) - 8(1, 7)	1.6(-16)	2.1(-14)	1.1(-13)	2.6(-13)	4.4(-13)	6.4(-13)	8.5(-13)	1.1(-12)
4(1, 4) - 3(3, 1)	6.3(-16)	3.4(-14)	1.4(-13)	2.9(-13)	4.6(-13)	6.4(-13)	8.2(-13)	1.0(-12)
4(1, 4) - 3(3, 0)	5.3(-16)	3.4(-14)	1.5(-13)	3.3(-13)	5.3(-13)	7.3(-13)	9.3(-13)	1.1(-12)
4(1, 4) - 4(3, 2)	1.5(-16)	2.0(-14)	1.1(-13)	2.6(-13)	4.6(-13)	6.7(-13)	8.8(-13)	1.1(-12)
4(1, 4) - 4(3, 1)	3.6(-16)	4.4(-14)	2.2(-13)	5.0(-13)	8.4(-13)	1.2(-12)	1.5(-12)	1.9(-12)
4(1, 4) - 5(3, 3)	4.1(-17)	1.1(-14)	7.3(-14)	1.9(-13)	3.4(-13)	5.0(-13)	6.6(-13)	8.2(-13)
4(1, 4) - 5(3, 2)	8.5(-17)	2.6(-14)	1.9(-13)	5.1(-13)	9.6(-13)	1.5(-12)	2.0(-12)	2.6(-12)
4(1, 3) - 1(1, 1)	1.7(-12)	2.3(-12)	2.8(-12)	3.3(-12)	3.7(-12)	4.1(-12)	4.5(-12)	4.9(-12)
4(1, 3) - 1(1, 0)	1.0(-12)	1.5(-12)	1.9(-12)	2.3(-12)	2.7(-12)	3.0(-12)	3.3(-12)	3.5(-12)
4(1, 3) - 2(1, 2)	2.9(-12)	3.6(-12)	4.1(-12)	4.4(-12)	4.8(-12)	5.2(-12)	5.5(-12)	5.9(-12)
4(1, 3) - 2(1, 1)	8.1(-12)	1.0(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)
4(1, 3) - 3(1, 3)	8.3(-12)	9.6(-12)	1.0(-11)	1.1(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.4(-11)
4(1, 3) - 3(1, 2)	3.1(-11)	3.7(-11)	3.9(-11)	4.0(-11)	4.0(-11)	4.1(-11)	4.1(-11)	4.1(-11)
4(1, 3) - 4(1, 4)	1.0(-11)	1.1(-11)	1.0(-11)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)
4(1, 3) - 5(1, 5)	3.4(-12)	6.8(-12)	9.0(-12)	1.0(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.3(-11)
4(1, 3) - 5(1, 4)	9.7(-12)	2.2(-11)	3.0(-11)	3.6(-11)	3.9(-11)	4.2(-11)	4.4(-11)	4.5(-11)
4(1, 3) - 6(1, 6)	4.9(-13)	3.3(-12)	6.2(-12)	8.5(-12)	1.0(-11)	1.2(-11)	1.3(-11)	1.4(-11)
4(1, 3) - 6(1, 5)	5.2(-13)	3.7(-12)	7.1(-12)	1.0(-11)	1.3(-11)	1.5(-11)	1.7(-11)	1.9(-11)
4(1, 3) - 7(1, 7)	3.7(-14)	6.5(-13)	1.7(-12)	2.8(-12)	3.8(-12)	4.6(-12)	5.3(-12)	6.0(-12)
4(1, 3) - 7(1, 6)	1.4(-14)	5.1(-13)	1.7(-12)	3.2(-12)	4.7(-12)	6.2(-12)	7.6(-12)	8.9(-12)
4(1, 3) - 8(1, 8)	2.1(-15)	2.0(-13)	5.0(-13)	1.9(-12)	2.9(-12)	3.9(-12)	4.8(-12)	5.6(-12)
4(1, 3) - 8(1, 7)	5.6(-16)	6.3(-14)	3.0(-13)	6.8(-13)	1.1(-12)	1.5(-12)	2.0(-12)	2.4(-12)
4(1, 3) - 3(3, 1)	9.6(-16)	5.3(-14)	2.2(-13)	4.5(-13)	7.1(-13)	9.7(-13)	1.2(-12)	1.4(-12)
4(1, 3) - 3(3, 0)	1.9(-15)	1.1(-13)	4.3(-13)	8.6(-13)	1.3(-12)	1.8(-12)	2.2(-12)	2.6(-12)
4(1, 3) - 4(3, 2)	1.5(-16)	1.9(-14)	1.1(-13)	2.8(-13)	5.0(-13)	7.5(-13)	1.0(-12)	1.3(-12)
4(1, 3) - 4(3, 1)	1.9(-16)	2.2(-14)	1.1(-13)	2.7(-13)	4.6(-13)	6.8(-13)	9.0(-13)	1.1(-12)
4(1, 3) - 5(3, 3)	7.3(-17)	1.8(-14)	1.2(-13)	3.1(-13)	5.7(-13)	8.7(-13)	1.2(-12)	1.5(-12)
4(1, 3) - 5(3, 2)	3.5(-17)	8.8(-15)	5.6(-14)	1.4(-13)	2.5(-13)	3.8(-13)	5.0(-13)	6.3(-13)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
5(1, 5) - 1(1, 1)	3.1(-12)	2.8(-12)	2.8(-12)	2.9(-12)	3.0(-12)	3.1(-12)	3.2(-12)	3.3(-12)
5(1, 5) - 1(1, 0)	9.7(-12)	9.5(-12)	9.8(-12)	9.9(-12)	1.0(-11)	1.0(-11)	1.0(-11)	1.0(-11)
5(1, 5) - 2(1, 2)	8.1(-12)	7.6(-12)	7.8(-12)	8.3(-12)	8.8(-12)	9.2(-12)	9.6(-12)	1.0(-11)
5(1, 5) - 2(1, 1)	6.8(-12)	6.1(-12)	6.0(-12)	6.0(-12)	6.1(-12)	6.1(-12)	6.2(-12)	6.2(-12)
5(1, 5) - 3(1, 3)	7.6(-12)	8.2(-12)	9.4(-12)	1.1(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.4(-11)
5(1, 5) - 3(1, 2)	1.5(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.5(-11)	1.5(-11)	1.5(-11)	1.6(-11)
5(1, 5) - 4(1, 4)	4.2(-11)	4.3(-11)	4.5(-11)	4.7(-11)	4.8(-11)	4.9(-11)	5.0(-11)	5.0(-11)
5(1, 5) - 4(1, 3)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)
5(1, 5) - 5(1, 4)	7.8(-12)	7.6(-12)	7.8(-12)	8.1(-12)	8.4(-12)	8.6(-12)	9.0(-12)	9.3(-12)
5(1, 5) - 6(1, 6)	5.4(-12)	1.8(-11)	2.7(-11)	3.3(-11)	3.7(-11)	4.0(-11)	4.2(-11)	4.3(-11)
5(1, 5) - 6(1, 5)	1.1(-12)	3.8(-12)	5.6(-12)	6.9(-12)	8.0(-12)	8.9(-12)	9.6(-12)	1.0(-11)
5(1, 5) - 7(1, 7)	1.1(-13)	1.1(-12)	2.5(-12)	3.9(-12)	5.2(-12)	6.4(-12)	7.5(-12)	8.7(-12)
5(1, 5) - 7(1, 6)	3.0(-14)	4.7(-13)	1.1(-12)	1.7(-12)	2.2(-12)	2.6(-12)	2.9(-12)	3.2(-12)
5(1, 5) - 8(1, 8)	5.2(-15)	2.5(-13)	9.1(-13)	1.8(-12)	2.7(-12)	3.7(-12)	4.7(-12)	5.6(-12)
5(1, 5) - 8(1, 7)	2.6(-15)	1.4(-13)	5.0(-13)	9.6(-13)	1.4(-12)	1.9(-12)	2.3(-12)	2.8(-12)
5(1, 5) - 3(3, 1)	3.6(-15)	8.8(-14)	2.7(-13)	4.7(-13)	6.7(-13)	8.4(-13)	1.0(-12)	1.1(-12)
5(1, 5) - 3(3, 0)	4.4(-15)	1.2(-13)	3.7(-13)	6.6(-13)	9.4(-13)	1.2(-12)	1.4(-12)	1.6(-12)
5(1, 5) - 4(3, 2)	1.1(-15)	5.7(-14)	2.3(-13)	4.8(-13)	7.6(-13)	1.1(-12)	1.4(-12)	1.7(-12)
5(1, 5) - 4(3, 1)	1.2(-15)	6.6(-14)	2.7(-13)	5.6(-13)	8.8(-13)	1.2(-12)	1.5(-12)	1.8(-12)
5(1, 5) - 5(3, 3)	1.2(-16)	1.7(-14)	9.0(-14)	2.2(-13)	3.8(-13)	5.6(-13)	7.5(-13)	9.5(-13)
5(1, 5) - 5(3, 2)	5.3(-16)	6.7(-14)	3.5(-13)	8.3(-13)	1.4(-12)	2.1(-12)	2.7(-12)	3.3(-12)
5(1, 4) - 1(1, 1)	5.5(-13)	5.5(-13)	6.6(-13)	8.0(-13)	9.5(-13)	1.1(-12)	1.2(-12)	1.4(-12)
5(1, 4) - 1(1, 0)	1.5(-12)	1.7(-12)	1.9(-12)	2.1(-12)	2.3(-12)	2.5(-12)	2.7(-12)	2.8(-12)
5(1, 4) - 2(1, 2)	3.6(-12)	3.4(-12)	3.6(-12)	3.9(-12)	4.2(-12)	4.5(-12)	4.8(-12)	5.1(-12)
5(1, 4) - 2(1, 1)	4.5(-12)	4.2(-12)	4.6(-12)	5.0(-12)	5.3(-12)	5.6(-12)	5.9(-12)	6.1(-12)
5(1, 4) - 3(1, 3)	4.7(-12)	4.3(-12)	4.4(-12)	4.6(-12)	4.8(-12)	5.0(-12)	5.3(-12)	5.5(-12)
5(1, 4) - 3(1, 2)	1.7(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)	1.9(-11)	2.0(-11)
5(1, 4) - 4(1, 4)	1.3(-11)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.3(-11)
5(1, 4) - 4(1, 3)	4.9(-11)	4.4(-11)	4.5(-11)	4.6(-11)	4.6(-11)	4.6(-11)	4.7(-11)	4.7(-11)
5(1, 4) - 5(1, 5)	1.1(-11)	9.0(-12)	8.8(-12)	8.8(-12)	9.0(-12)	9.2(-12)	9.4(-12)	9.7(-12)
5(1, 4) - 6(1, 6)	2.1(-12)	5.6(-12)	7.7(-12)	9.2(-12)	1.0(-11)	1.1(-11)	1.2(-11)	1.3(-11)
5(1, 4) - 6(1, 5)	6.5(-12)	2.0(-11)	2.9(-11)	3.5(-11)	4.0(-11)	4.3(-11)	4.5(-11)	4.7(-11)
5(1, 4) - 7(1, 7)	3.0(-13)	2.2(-12)	4.5(-12)	6.5(-12)	8.1(-12)	9.4(-12)	1.1(-11)	1.1(-11)
5(1, 4) - 7(1, 6)	1.7(-13)	2.3(-12)	5.3(-12)	8.1(-12)	1.1(-11)	1.3(-11)	1.5(-11)	1.7(-11)
5(1, 4) - 8(1, 8)	9.4(-15)	3.6(-13)	1.2(-12)	2.1(-12)	2.9(-12)	3.7(-12)	4.4(-12)	5.0(-12)
5(1, 4) - 8(1, 7)	7.5(-15)	3.3(-13)	1.2(-12)	2.2(-12)	3.3(-12)	4.4(-12)	5.5(-12)	6.5(-12)
5(1, 4) - 3(3, 1)	1.1(-14)	2.5(-13)	7.6(-13)	1.3(-12)	1.9(-12)	2.4(-12)	2.8(-12)	3.2(-12)
5(1, 4) - 3(3, 0)	6.1(-15)	1.3(-13)	3.7(-13)	6.4(-13)	9.2(-13)	1.2(-12)	1.4(-12)	1.6(-12)
5(1, 4) - 4(3, 2)	8.1(-16)	4.3(-14)	1.7(-13)	3.6(-13)	5.7(-13)	7.8(-13)	9.9(-13)	1.2(-12)
5(1, 4) - 4(3, 1)	1.8(-15)	8.5(-14)	3.2(-13)	6.3(-13)	9.8(-13)	1.3(-12)	1.7(-12)	2.0(-12)
5(1, 4) - 5(3, 3)	1.8(-16)	2.2(-14)	1.2(-13)	2.9(-13)	5.1(-13)	7.7(-13)	1.0(-12)	1.3(-12)
5(1, 4) - 5(3, 2)	3.0(-16)	3.2(-14)	1.5(-13)	3.4(-13)	5.6(-13)	7.9(-13)	1.0(-12)	1.2(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
6(1, 6) - 1(1, 1)	4.7(-12)	5.5(-12)	5.7(-12)	5.8(-12)	5.9(-12)	6.0(-12)	6.1(-12)	6.1(-12)
6(1, 6) - 1(1, 0)	1.6(-12)	1.9(-12)	1.9(-12)	1.9(-12)	1.9(-12)	1.9(-12)	1.9(-12)	1.9(-12)
6(1, 6) - 2(1, 2)	3.5(-12)	3.9(-12)	3.9(-12)	3.9(-12)	3.9(-12)	4.0(-12)	4.0(-12)	4.1(-12)
6(1, 6) - 2(1, 1)	8.5(-12)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)
6(1, 6) - 3(1, 3)	5.8(-12)	7.1(-12)	7.8(-12)	8.4(-12)	9.1(-12)	9.7(-12)	1.0(-11)	1.1(-11)
6(1, 6) - 3(1, 2)	5.5(-12)	6.2(-12)	6.3(-12)	6.3(-12)	6.4(-12)	6.4(-12)	6.5(-12)	6.6(-12)
6(1, 6) - 4(1, 4)	5.6(-12)	7.4(-12)	6.7(-12)	9.9(-12)	1.1(-11)	1.2(-11)	1.3(-11)	1.5(-11)
6(1, 6) - 4(1, 3)	1.1(-11)	1.3(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.5(-11)	1.5(-11)	1.5(-11)
6(1, 6) - 5(1, 5)	3.5(-11)	4.2(-11)	4.5(-11)	4.6(-11)	4.7(-11)	4.7(-11)	4.7(-11)	4.7(-11)
6(1, 6) - 5(1, 4)	9.4(-12)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)
6(1, 6) - 6(1, 5)	4.4(-12)	5.7(-12)	6.2(-12)	6.4(-12)	6.6(-12)	6.7(-12)	6.8(-12)	6.9(-12)
6(1, 6) - 7(1, 7)	4.6(-12)	1.6(-11)	2.5(-11)	3.1(-11)	3.6(-11)	3.9(-11)	4.2(-11)	4.4(-11)
6(1, 6) - 7(1, 6)	4.9(-13)	2.8(-12)	4.7(-12)	6.1(-12)	7.3(-12)	8.2(-12)	9.1(-12)	9.8(-12)
6(1, 6) - 8(1, 8)	3.6(-14)	6.6(-13)	1.8(-12)	3.1(-12)	4.3(-12)	5.6(-12)	6.9(-12)	8.1(-12)
6(1, 6) - 8(1, 7)	1.9(-14)	3.5(-13)	9.1(-13)	1.5(-12)	2.0(-12)	2.4(-12)	2.8(-12)	3.1(-12)
6(1, 6) - 3(3, 1)	3.7(-14)	3.6(-13)	8.0(-13)	1.2(-12)	1.5(-12)	1.8(-12)	2.1(-12)	2.3(-12)
6(1, 6) - 3(3, 0)	2.5(-14)	2.4(-13)	5.4(-13)	8.3(-13)	1.1(-12)	1.3(-12)	1.5(-12)	1.7(-12)
6(1, 6) - 4(3, 2)	9.0(-15)	1.8(-13)	5.1(-13)	9.0(-13)	1.3(-12)	1.7(-12)	2.0(-12)	2.4(-12)
6(1, 6) - 4(3, 1)	5.2(-15)	1.2(-13)	4.0(-13)	7.6(-13)	1.2(-12)	1.6(-12)	1.9(-12)	2.3(-12)
6(1, 6) - 5(3, 3)	2.1(-15)	1.0(-13)	3.8(-13)	7.5(-13)	1.2(-12)	1.6(-12)	2.0(-12)	2.4(-12)
6(1, 6) - 5(3, 2)	1.5(-15)	6.9(-14)	2.6(-13)	5.4(-13)	8.7(-13)	1.2(-12)	1.6(-12)	2.0(-12)
6(1, 5) - 1(1, 1)	5.9(-13)	6.4(-13)	7.3(-13)	8.4(-13)	9.6(-13)	1.1(-12)	1.2(-12)	1.3(-12)
6(1, 5) - 1(1, 0)	4.3(-13)	4.4(-13)	4.9(-13)	5.9(-13)	7.0(-13)	8.4(-13)	9.8(-13)	1.1(-12)
6(1, 5) - 2(1, 2)	7.9(-13)	9.2(-13)	1.1(-12)	1.2(-12)	1.4(-12)	1.5(-12)	1.6(-12)	1.8(-12)
6(1, 5) - 2(1, 1)	2.7(-12)	2.8(-12)	3.1(-12)	3.3(-12)	3.5(-12)	3.7(-12)	3.9(-12)	4.1(-12)
6(1, 5) - 3(1, 3)	4.1(-12)	4.2(-12)	4.3(-12)	4.5(-12)	4.7(-12)	4.9(-12)	5.1(-12)	5.3(-12)
6(1, 5) - 3(1, 2)	6.4(-12)	6.7(-12)	7.1(-12)	7.6(-12)	8.0(-12)	8.4(-12)	8.7(-12)	9.1(-12)
6(1, 5) - 4(1, 4)	4.9(-12)	4.9(-12)	4.8(-12)	4.8(-12)	4.8(-12)	4.9(-12)	4.9(-12)	5.0(-12)
6(1, 5) - 4(1, 3)	1.9(-11)	1.9(-11)	1.9(-11)	1.9(-11)	1.9(-11)	2.0(-11)	2.0(-11)	2.1(-11)
6(1, 5) - 5(1, 5)	1.2(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)
6(1, 5) - 5(1, 4)	4.8(-11)	5.0(-11)	5.1(-11)	5.1(-11)	5.2(-11)	5.2(-11)	5.2(-11)	5.2(-11)
6(1, 5) - 6(1, 6)	7.1(-12)	7.3(-12)	7.2(-12)	7.2(-12)	7.2(-12)	7.3(-12)	7.3(-12)	7.4(-12)
6(1, 5) - 7(1, 7)	2.1(-12)	5.0(-12)	6.7(-12)	7.9(-12)	8.7(-12)	9.4(-12)	9.9(-12)	1.0(-11)
6(1, 5) - 7(1, 6)	3.1(-12)	1.5(-11)	2.5(-11)	3.2(-11)	3.7(-11)	4.0(-11)	4.3(-11)	4.5(-11)
6(1, 5) - 8(1, 8)	1.1(-13)	1.4(-12)	3.1(-12)	4.7(-12)	5.9(-12)	7.0(-12)	7.9(-12)	8.6(-12)
6(1, 5) - 8(1, 7)	1.1(-13)	1.6(-12)	4.0(-12)	6.2(-12)	8.1(-12)	9.9(-12)	1.2(-11)	1.3(-11)
6(1, 5) - 3(3, 1)	3.7(-14)	2.7(-13)	5.6(-13)	8.5(-13)	1.1(-12)	1.4(-12)	1.6(-12)	1.8(-12)
6(1, 5) - 3(3, 0)	5.4(-14)	4.5(-13)	1.0(-12)	1.6(-12)	2.1(-12)	2.6(-12)	3.1(-12)	3.5(-12)
6(1, 5) - 4(3, 2)	2.3(-14)	3.9(-13)	1.0(-12)	1.6(-12)	2.2(-12)	2.7(-12)	3.1(-12)	3.5(-12)
6(1, 5) - 4(3, 1)	1.2(-14)	2.0(-13)	5.3(-13)	8.8(-13)	1.2(-12)	1.5(-12)	1.7(-12)	2.0(-12)
6(1, 5) - 5(3, 3)	1.7(-15)	6.7(-14)	2.4(-13)	4.8(-13)	7.3(-13)	9.8(-13)	1.2(-12)	1.4(-12)
6(1, 5) - 5(3, 2)	2.2(-15)	8.3(-14)	3.0(-13)	5.8(-13)	8.9(-13)	1.2(-12)	1.5(-12)	1.8(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
7(1, 7) - 1(1, 1)	1.9(-12)	1.7(-12)	1.7(-12)	1.6(-12)	1.6(-12)	1.6(-12)	1.5(-12)	1.5(-12)
7(1, 7) - 1(1, 0)	2.6(-12)	2.7(-12)	2.7(-12)	2.8(-12)	2.8(-12)	2.8(-12)	2.8(-12)	2.8(-12)
7(1, 7) - 2(1, 2)	6.5(-12)	6.4(-12)	6.3(-12)	6.3(-12)	6.2(-12)	6.2(-12)	6.1(-12)	6.2(-12)
7(1, 7) - 2(1, 1)	3.1(-12)	3.0(-12)	3.0(-12)	3.0(-12)	3.0(-12)	3.1(-12)	3.1(-12)	3.1(-12)
7(1, 7) - 3(1, 3)	3.9(-12)	3.7(-12)	3.6(-12)	3.7(-12)	3.8(-12)	3.9(-12)	4.0(-12)	4.1(-12)
7(1, 7) - 3(1, 2)	9.4(-12)	9.5(-12)	9.7(-12)	9.8(-12)	9.8(-12)	9.8(-12)	9.8(-12)	9.8(-12)
7(1, 7) - 4(1, 4)	5.8(-12)	5.9(-12)	6.2(-12)	6.6(-12)	6.9(-12)	7.3(-12)	7.6(-12)	7.9(-12)
7(1, 7) - 4(1, 3)	7.7(-12)	7.2(-12)	7.2(-12)	7.3(-12)	7.3(-12)	7.3(-12)	7.4(-12)	7.4(-12)
7(1, 7) - 5(1, 5)	6.7(-12)	7.3(-12)	7.9(-12)	8.5(-12)	9.1(-12)	9.7(-12)	1.0(-11)	1.1(-11)
7(1, 7) - 5(1, 4)	1.3(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.4(-11)	1.4(-11)	1.4(-11)
7(1, 7) - 6(1, 6)	4.3(-11)	4.5(-11)	4.7(-11)	4.9(-11)	5.0(-11)	5.0(-11)	5.1(-11)	5.1(-11)
7(1, 7) - 6(1, 5)	1.2(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)
7(1, 7) - 7(1, 6)	2.3(-12)	4.2(-12)	5.0(-12)	5.4(-12)	5.7(-12)	6.0(-12)	6.2(-12)	6.5(-12)
7(1, 7) - 8(1, 8)	2.5(-12)	1.3(-11)	2.3(-11)	3.0(-11)	3.4(-11)	3.8(-11)	4.1(-11)	4.3(-11)
7(1, 7) - 8(1, 7)	4.1(-13)	2.4(-12)	4.2(-12)	5.5(-12)	6.6(-12)	7.5(-12)	8.3(-12)	9.1(-12)
7(1, 7) - 3(3, 1)	2.0(-13)	6.9(-13)	1.2(-12)	1.7(-12)	2.1(-12)	2.5(-12)	2.8(-12)	3.0(-12)
7(1, 7) - 3(3, 0)	2.5(-13)	8.4(-13)	1.4(-12)	1.8(-12)	2.2(-12)	2.5(-12)	2.8(-12)	3.0(-12)
7(1, 7) - 4(3, 2)	7.2(-14)	5.4(-13)	1.2(-12)	1.9(-12)	2.5(-12)	3.0(-12)	3.5(-12)	4.0(-12)
7(1, 7) - 4(3, 1)	5.4(-14)	3.5(-13)	7.0(-13)	1.1(-12)	1.4(-12)	1.7(-12)	2.1(-12)	2.4(-12)
7(1, 7) - 5(3, 3)	2.7(-14)	3.9(-13)	9.8(-13)	1.6(-12)	2.3(-12)	2.9(-12)	3.4(-12)	3.9(-12)
7(1, 7) - 5(3, 2)	1.1(-14)	1.5(-13)	4.1(-13)	7.2(-13)	1.1(-12)	1.4(-12)	1.8(-12)	2.2(-12)
7(1, 6) - 1(1, 1)	5.5(-14)	7.7(-14)	1.0(-13)	1.4(-13)	1.8(-13)	2.3(-13)	2.9(-13)	3.5(-13)
7(1, 6) - 1(1, 0)	2.4(-13)	3.5(-13)	4.3(-13)	5.1(-13)	6.1(-13)	7.1(-13)	8.1(-13)	9.0(-13)
7(1, 6) - 2(1, 2)	4.5(-13)	6.8(-13)	8.4(-13)	9.9(-13)	1.1(-12)	1.3(-12)	1.4(-12)	1.5(-12)
7(1, 6) - 2(1, 1)	4.9(-13)	7.2(-13)	9.2(-13)	1.1(-12)	1.3(-12)	1.6(-12)	1.8(-12)	2.0(-12)
7(1, 6) - 3(1, 3)	8.2(-13)	1.2(-12)	1.4(-12)	1.6(-12)	1.7(-12)	1.8(-12)	1.9(-12)	2.0(-12)
7(1, 6) - 3(1, 2)	2.4(-12)	3.3(-12)	3.7(-12)	4.0(-12)	4.3(-12)	4.6(-12)	4.8(-12)	5.0(-12)
7(1, 6) - 4(1, 4)	3.1(-12)	4.2(-12)	4.5(-12)	4.7(-12)	4.8(-12)	5.0(-12)	5.1(-12)	5.3(-12)
7(1, 6) - 4(1, 3)	5.6(-12)	7.9(-12)	9.0(-12)	9.8(-12)	1.0(-11)	1.1(-11)	1.2(-11)	1.2(-11)
7(1, 6) - 5(1, 5)	3.4(-12)	4.3(-12)	4.4(-12)	4.4(-12)	4.4(-12)	4.4(-12)	4.4(-12)	4.4(-12)
7(1, 6) - 5(1, 4)	1.4(-11)	1.7(-11)	1.9(-11)	1.9(-11)	2.0(-11)	2.1(-11)	2.1(-11)	2.2(-11)
7(1, 6) - 6(1, 6)	8.7(-12)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)
7(1, 6) - 6(1, 5)	3.4(-11)	4.6(-11)	5.0(-11)	5.2(-11)	5.3(-11)	5.3(-11)	5.4(-11)	5.4(-11)
7(1, 6) - 7(1, 7)	4.4(-12)	5.8(-12)	6.2(-12)	6.4(-12)	6.5(-12)	6.6(-12)	6.8(-12)	7.0(-12)
7(1, 6) - 8(1, 8)	1.1(-12)	4.0(-12)	6.0(-12)	7.3(-12)	8.4(-12)	9.3(-12)	1.0(-11)	1.1(-11)
7(1, 6) - 8(1, 7)	3.3(-12)	1.5(-11)	2.4(-11)	3.0(-11)	3.5(-11)	4.0(-11)	4.3(-11)	4.6(-11)
7(1, 6) - 3(3, 1)	3.4(-13)	7.9(-13)	1.3(-12)	1.7(-12)	2.2(-12)	2.7(-12)	3.1(-12)	3.5(-12)
7(1, 6) - 3(3, 0)	2.8(-13)	5.5(-13)	7.8(-13)	1.0(-12)	1.2(-12)	1.4(-12)	1.6(-12)	1.8(-12)
7(1, 6) - 4(3, 2)	1.8(-13)	8.8(-13)	1.5(-12)	2.0(-12)	2.4(-12)	2.8(-12)	3.0(-12)	3.3(-12)
7(1, 6) - 4(3, 1)	2.6(-13)	1.3(-12)	2.3(-12)	3.2(-12)	3.9(-12)	4.4(-12)	4.9(-12)	5.4(-12)
7(1, 6) - 5(3, 3)	4.4(-14)	4.7(-13)	1.1(-12)	1.7(-12)	2.3(-12)	2.8(-12)	3.2(-12)	3.7(-12)
7(1, 6) - 5(3, 2)	2.9(-14)	3.1(-13)	7.0(-13)	1.1(-12)	1.5(-12)	1.9(-12)	2.3(-12)	2.6(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
8(1, 8) - 1(1, 1)	1.0(-12)	1.4(-12)	1.4(-12)	1.5(-12)	1.5(-12)	1.5(-12)	1.5(-12)	1.5(-12)
8(1, 8) - 1(1, 0)	8.1(-13)	9.9(-13)	9.9(-13)	9.6(-13)	9.3(-13)	9.1(-13)	9.0(-13)	9.0(-13)
8(1, 8) - 2(1, 2)	1.0(-12)	1.4(-12)	1.6(-12)	1.8(-12)	1.9(-12)	2.0(-12)	2.1(-12)	2.1(-12)
8(1, 8) - 2(1, 1)	2.0(-12)	2.7(-12)	2.9(-12)	3.0(-12)	3.1(-12)	3.1(-12)	3.1(-12)	3.1(-12)
8(1, 8) - 3(1, 3)	3.5(-12)	4.6(-12)	4.8(-12)	4.9(-12)	4.9(-12)	5.0(-12)	5.0(-12)	5.1(-12)
8(1, 8) - 3(1, 2)	2.3(-12)	3.0(-12)	3.2(-12)	3.4(-12)	3.5(-12)	3.6(-12)	3.6(-12)	3.7(-12)
8(1, 8) - 4(1, 4)	2.3(-12)	2.9(-12)	3.0(-12)	3.1(-12)	3.2(-12)	3.3(-12)	3.4(-12)	3.5(-12)
8(1, 8) - 4(1, 3)	5.7(-12)	7.7(-12)	8.2(-12)	8.5(-12)	8.6(-12)	8.6(-12)	8.6(-12)	8.7(-12)
8(1, 8) - 5(1, 5)	4.1(-12)	5.6(-12)	6.3(-12)	6.8(-12)	7.4(-12)	7.9(-12)	8.4(-12)	8.8(-12)
8(1, 8) - 5(1, 4)	5.2(-12)	6.7(-12)	7.1(-12)	7.2(-12)	7.3(-12)	7.4(-12)	7.4(-12)	7.5(-12)
8(1, 8) - 6(1, 6)	4.4(-12)	6.4(-12)	7.4(-12)	8.3(-12)	9.2(-12)	1.0(-11)	1.1(-11)	1.2(-11)
8(1, 8) - 6(1, 5)	8.0(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)
8(1, 8) - 7(1, 7)	3.3(-11)	4.6(-11)	4.9(-11)	5.1(-11)	5.2(-11)	5.3(-11)	5.3(-11)	5.4(-11)
8(1, 8) - 7(1, 6)	7.6(-12)	9.9(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.2(-11)
8(1, 8) - 8(1, 7)	2.6(-12)	3.9(-12)	4.3(-12)	4.5(-12)	4.7(-12)	4.8(-12)	4.8(-12)	4.9(-12)
8(1, 8) - 3(3, 1)	8.0(-13)	1.3(-12)	1.7(-12)	2.1(-12)	2.4(-12)	2.7(-12)	2.9(-12)	3.1(-12)
8(1, 8) - 3(3, 0)	7.7(-13)	1.4(-12)	1.8(-12)	2.2(-12)	2.6(-12)	2.9(-12)	3.1(-12)	3.3(-12)
8(1, 8) - 4(3, 2)	4.6(-13)	8.4(-13)	1.2(-12)	1.5(-12)	1.9(-12)	2.2(-12)	2.5(-12)	2.8(-12)
8(1, 8) - 4(3, 1)	8.5(-13)	1.6(-12)	2.1(-12)	2.5(-12)	2.8(-12)	3.1(-12)	3.3(-12)	3.5(-12)
8(1, 8) - 5(3, 3)	1.7(-13)	7.5(-13)	1.4(-12)	2.0(-12)	2.6(-12)	3.2(-12)	3.6(-12)	4.0(-12)
8(1, 8) - 5(3, 2)	2.2(-13)	8.4(-13)	1.4(-12)	1.8(-12)	2.1(-12)	2.5(-12)	2.8(-12)	3.0(-12)
8(1, 7) - 1(1, 1)	1.4(-13)	1.3(-13)	1.4(-13)	1.5(-13)	1.8(-13)	2.1(-13)	2.4(-13)	2.8(-13)
8(1, 7) - 1(1, 0)	8.8(-14)	7.9(-14)	7.7(-14)	8.3(-14)	9.7(-14)	1.2(-13)	1.4(-13)	1.6(-13)
8(1, 7) - 2(1, 2)	1.3(-13)	1.4(-13)	1.4(-13)	1.6(-13)	1.9(-13)	2.2(-13)	2.6(-13)	3.0(-13)
8(1, 7) - 2(1, 1)	5.1(-13)	5.3(-13)	5.6(-13)	6.1(-13)	6.7(-13)	7.4(-13)	8.1(-13)	8.7(-13)
8(1, 7) - 3(1, 3)	6.9(-13)	7.3(-13)	8.0(-13)	8.8(-13)	9.8(-13)	1.1(-12)	1.2(-12)	1.3(-12)
8(1, 7) - 3(1, 2)	1.0(-12)	9.9(-13)	1.0(-12)	1.1(-12)	1.3(-12)	1.4(-12)	1.6(-12)	1.8(-12)
8(1, 7) - 4(1, 4)	1.3(-12)	1.4(-12)	1.4(-12)	1.5(-12)	1.6(-12)	1.7(-12)	1.8(-12)	1.9(-12)
8(1, 7) - 4(1, 3)	3.5(-12)	3.7(-12)	3.7(-12)	3.7(-12)	3.8(-12)	3.9(-12)	4.0(-12)	4.1(-12)
8(1, 7) - 5(1, 5)	4.8(-12)	4.7(-12)	4.6(-12)	4.5(-12)	4.6(-12)	4.6(-12)	4.7(-12)	4.8(-12)
8(1, 7) - 5(1, 4)	9.5(-12)	9.4(-12)	9.4(-12)	9.6(-12)	9.9(-12)	1.0(-11)	1.1(-11)	1.1(-11)
8(1, 7) - 6(1, 6)	5.3(-12)	5.1(-12)	5.0(-12)	4.9(-12)	4.9(-12)	4.9(-12)	5.0(-12)	5.0(-12)
8(1, 7) - 6(1, 5)	1.9(-11)	1.9(-11)	1.8(-11)	1.8(-11)	1.8(-11)	1.9(-11)	1.9(-11)	2.0(-11)
8(1, 7) - 7(1, 7)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)	1.2(-11)
8(1, 7) - 7(1, 6)	5.3(-11)	5.4(-11)	5.5(-11)	5.5(-11)	5.6(-11)	5.6(-11)	5.7(-11)	5.8(-11)
8(1, 7) - 8(1, 8)	6.0(-12)	6.0(-12)	5.7(-12)	5.6(-12)	5.5(-12)	5.5(-12)	5.5(-12)	5.5(-12)
8(1, 7) - 3(3, 1)	6.2(-13)	6.3(-13)	7.2(-13)	8.4(-13)	9.8(-13)	1.1(-12)	1.3(-12)	1.4(-12)
8(1, 7) - 3(3, 0)	5.8(-13)	7.3(-13)	9.7(-13)	1.3(-12)	1.6(-12)	1.9(-12)	2.1(-12)	2.4(-12)
8(1, 7) - 4(3, 2)	2.4(-12)	2.8(-12)	3.3(-12)	3.8(-12)	4.3(-12)	4.7(-12)	5.0(-12)	5.3(-12)
8(1, 7) - 4(3, 1)	2.2(-12)	2.4(-12)	2.6(-12)	2.9(-12)	3.1(-12)	3.4(-12)	3.6(-12)	3.8(-12)
8(1, 7) - 5(3, 3)	7.8(-13)	1.9(-12)	2.6(-12)	3.2(-12)	3.6(-12)	4.0(-12)	4.3(-12)	4.6(-12)
8(1, 7) - 5(3, 2)	8.1(-13)	2.3(-12)	3.4(-12)	4.3(-12)	4.9(-12)	5.5(-12)	6.0(-12)	6.3(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
3(3, 1) - 1(1, 1)	3.0(-12)	2.5(-12)	2.5(-12)	2.5(-12)	2.6(-12)	2.7(-12)	2.7(-12)	2.8(-12)
3(3, 1) - 1(1, 0)	1.3(-12)	7.0(-13)	5.6(-13)	5.3(-13)	5.3(-13)	5.5(-13)	5.7(-13)	5.9(-13)
3(3, 1) - 2(1, 2)	2.3(-12)	1.8(-12)	1.7(-12)	1.8(-12)	1.9(-12)	2.0(-12)	2.1(-12)	2.2(-12)
3(3, 1) - 2(1, 1)	2.5(-12)	2.5(-12)	2.7(-12)	2.8(-12)	2.9(-12)	3.1(-12)	3.2(-12)	3.4(-12)
3(3, 1) - 3(1, 3)	2.3(-12)	2.2(-12)	2.2(-12)	2.3(-12)	2.4(-12)	2.6(-12)	2.7(-12)	2.8(-12)
3(3, 1) - 3(1, 2)	4.1(-12)	4.4(-12)	4.8(-12)	5.2(-12)	5.5(-12)	5.7(-12)	6.0(-12)	6.2(-12)
3(3, 1) - 4(1, 4)	2.8(-12)	2.6(-12)	2.7(-12)	2.8(-12)	3.0(-12)	3.2(-12)	3.4(-12)	3.6(-12)
3(3, 1) - 4(1, 3)	3.4(-12)	3.6(-12)	3.9(-12)	4.2(-12)	4.5(-12)	4.7(-12)	4.8(-12)	5.0(-12)
3(3, 1) - 5(1, 5)	3.6(-12)	3.5(-12)	3.6(-12)	3.7(-12)	3.8(-12)	3.9(-12)	4.0(-12)	4.0(-12)
3(3, 1) - 5(1, 4)	7.9(-12)	8.5(-12)	9.2(-12)	9.7(-12)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)
3(3, 1) - 6(1, 6)	5.7(-12)	6.1(-12)	6.5(-12)	6.7(-12)	6.9(-12)	7.1(-12)	7.3(-12)	7.4(-12)
3(3, 1) - 6(1, 5)	3.6(-12)	3.6(-12)	3.9(-12)	4.2(-12)	4.6(-12)	4.8(-12)	5.1(-12)	5.4(-12)
3(3, 1) - 7(1, 7)	3.3(-12)	4.2(-12)	5.1(-12)	6.0(-12)	6.8(-12)	7.4(-12)	8.0(-12)	8.4(-12)
3(3, 1) - 7(1, 6)	3.0(-12)	3.4(-12)	4.3(-12)	5.3(-12)	6.3(-12)	7.2(-12)	8.1(-12)	8.9(-12)
3(3, 1) - 8(1, 8)	1.0(-12)	2.3(-12)	3.4(-12)	4.3(-12)	5.1(-12)	5.8(-12)	6.4(-12)	7.0(-12)
3(3, 1) - 8(1, 7)	3.4(-13)	7.3(-13)	1.1(-12)	1.4(-12)	1.8(-12)	2.1(-12)	2.5(-12)	2.8(-12)
3(3, 1) - 3(3, 0)	8.7(-11)	9.0(-11)	9.2(-11)	9.2(-11)	9.1(-11)	9.0(-11)	8.9(-11)	8.8(-11)
3(3, 1) - 4(3, 2)	8.8(-12)	1.9(-11)	2.5(-11)	2.9(-11)	3.1(-11)	3.3(-11)	3.5(-11)	3.6(-11)
3(3, 1) - 4(3, 1)	3.3(-12)	8.3(-12)	1.2(-11)	1.4(-11)	1.6(-11)	1.8(-11)	2.0(-11)	2.2(-11)
3(3, 1) - 5(3, 3)	5.0(-13)	2.3(-12)	3.7(-12)	4.9(-12)	5.8(-12)	6.7(-12)	7.4(-12)	8.2(-12)
3(3, 1) - 5(3, 2)	5.6(-13)	2.9(-12)	5.2(-12)	7.0(-12)	8.4(-12)	9.7(-12)	1.1(-11)	1.2(-11)
3(3, 0) - 1(1, 1)	4.3(-13)	3.3(-13)	3.2(-13)	3.3(-13)	3.5(-13)	3.7(-13)	3.9(-13)	4.1(-13)
3(3, 0) - 1(1, 0)	3.0(-12)	2.8(-12)	2.8(-12)	3.0(-12)	3.2(-12)	3.4(-12)	3.6(-12)	3.8(-12)
3(3, 0) - 2(1, 2)	1.8(-12)	2.0(-12)	2.1(-12)	2.3(-12)	2.4(-12)	2.5(-12)	2.6(-12)	2.7(-12)
3(3, 0) - 2(1, 1)	2.5(-12)	2.3(-12)	2.4(-12)	2.5(-12)	2.6(-12)	2.7(-12)	2.7(-12)	2.8(-12)
3(3, 0) - 3(1, 3)	1.8(-12)	1.7(-12)	1.8(-12)	2.0(-12)	2.2(-12)	2.5(-12)	2.7(-12)	2.8(-12)
3(3, 0) - 3(1, 2)	3.2(-12)	3.3(-12)	3.5(-12)	3.6(-12)	3.8(-12)	3.9(-12)	4.0(-12)	4.2(-12)
3(3, 0) - 4(1, 4)	2.4(-12)	2.6(-12)	2.9(-12)	3.2(-12)	3.5(-12)	3.7(-12)	3.8(-12)	4.0(-12)
3(3, 0) - 4(1, 3)	6.6(-12)	7.2(-12)	7.7(-12)	8.0(-12)	8.3(-12)	8.5(-12)	8.7(-12)	8.9(-12)
3(3, 0) - 5(1, 5)	4.4(-12)	4.7(-12)	5.0(-12)	5.2(-12)	5.4(-12)	5.5(-12)	5.6(-12)	5.7(-12)
3(3, 0) - 5(1, 4)	4.3(-12)	4.2(-12)	4.4(-12)	4.7(-12)	4.9(-12)	5.1(-12)	5.2(-12)	5.4(-12)
3(3, 0) - 6(1, 6)	3.9(-12)	4.1(-12)	4.4(-12)	4.7(-12)	4.9(-12)	5.1(-12)	5.3(-12)	5.4(-12)
3(3, 0) - 6(1, 5)	5.2(-12)	6.0(-12)	7.0(-12)	8.0(-12)	8.8(-12)	9.5(-12)	1.0(-11)	1.1(-11)
3(3, 0) - 7(1, 7)	4.3(-12)	5.1(-12)	5.8(-12)	6.5(-12)	7.1(-12)	7.6(-12)	8.0(-12)	8.3(-12)
3(3, 0) - 7(1, 6)	2.5(-12)	2.4(-12)	2.7(-12)	3.1(-12)	3.5(-12)	3.9(-12)	4.3(-12)	4.7(-12)
3(3, 0) - 8(1, 8)	9.8(-13)	2.4(-12)	3.6(-12)	4.6(-12)	5.5(-12)	6.2(-12)	6.9(-12)	7.5(-12)
3(3, 0) - 8(1, 7)	3.2(-13)	8.4(-13)	1.4(-12)	2.1(-12)	2.8(-12)	3.5(-12)	4.2(-12)	4.9(-12)
3(3, 0) - 3(3, 1)	8.7(-11)	9.0(-11)	9.2(-11)	9.2(-11)	9.1(-11)	9.0(-11)	8.9(-11)	8.8(-11)
3(3, 0) - 4(3, 2)	3.5(-12)	8.6(-12)	1.2(-11)	1.5(-11)	1.7(-11)	1.9(-11)	2.0(-11)	2.2(-11)
3(3, 0) - 4(3, 1)	9.0(-12)	1.9(-11)	2.5(-11)	2.9(-11)	3.2(-11)	3.4(-11)	3.5(-11)	3.6(-11)
3(3, 0) - 5(3, 3)	5.4(-13)	2.8(-12)	5.1(-12)	7.0(-12)	8.6(-12)	1.0(-11)	1.1(-11)	1.2(-11)
3(3, 0) - 5(3, 2)	4.7(-13)	2.1(-12)	3.5(-12)	4.5(-12)	5.4(-12)	6.2(-12)	7.0(-12)	7.7(-12)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
4(3, 2) - 1(1, 1)	1.9(-12)	1.8(-12)	1.8(-12)	1.8(-12)	1.8(-12)	1.8(-12)	1.9(-12)	1.9(-12)
4(3, 2) - 1(1, 0)	1.3(-12)	1.2(-12)	1.2(-12)	1.3(-12)	1.3(-12)	1.3(-12)	1.3(-12)	1.3(-12)
4(3, 2) - 2(1, 2)	4.5(-12)	4.3(-12)	4.3(-12)	4.4(-12)	4.5(-12)	4.7(-12)	4.9(-12)	5.1(-12)
4(3, 2) - 2(1, 1)	1.4(-12)	1.5(-12)	1.6(-12)	1.6(-12)	1.7(-12)	1.8(-12)	1.8(-12)	1.9(-12)
4(3, 2) - 3(1, 3)	3.8(-12)	3.7(-12)	3.6(-12)	3.7(-12)	3.7(-12)	3.8(-12)	3.8(-12)	3.9(-12)
4(3, 2) - 3(1, 2)	3.4(-12)	3.7(-12)	3.9(-12)	4.2(-12)	4.5(-12)	4.8(-12)	5.1(-12)	5.3(-12)
4(3, 2) - 4(1, 4)	2.1(-12)	2.4(-12)	2.6(-12)	2.9(-12)	3.1(-12)	3.3(-12)	3.4(-12)	3.6(-12)
4(3, 2) - 4(1, 3)	1.7(-12)	2.1(-12)	2.5(-12)	2.9(-12)	3.2(-12)	3.6(-12)	3.9(-12)	4.1(-12)
4(3, 2) - 5(1, 5)	3.3(-12)	3.6(-12)	3.8(-12)	4.2(-12)	4.5(-12)	4.8(-12)	5.1(-12)	5.4(-12)
4(3, 2) - 5(1, 4)	1.8(-12)	2.2(-12)	2.6(-12)	2.8(-12)	3.1(-12)	3.3(-12)	3.5(-12)	3.7(-12)
4(3, 2) - 6(1, 6)	4.4(-12)	4.7(-12)	5.1(-12)	5.6(-12)	6.0(-12)	6.4(-12)	6.8(-12)	7.1(-12)
4(3, 2) - 6(1, 5)	7.0(-12)	8.1(-12)	8.6(-12)	9.0(-12)	9.3(-12)	9.5(-12)	9.7(-12)	1.0(-11)
4(3, 2) - 7(1, 7)	3.8(-12)	5.1(-12)	6.2(-12)	7.3(-12)	8.3(-12)	9.0(-12)	9.7(-12)	1.0(-11)
4(3, 2) - 7(1, 6)	4.9(-12)	6.0(-12)	6.5(-12)	6.9(-12)	7.1(-12)	7.4(-12)	7.6(-12)	7.8(-12)
4(3, 2) - 8(1, 8)	1.8(-12)	2.3(-12)	2.9(-12)	3.5(-12)	4.2(-12)	4.7(-12)	5.3(-12)	5.8(-12)
4(3, 2) - 8(1, 7)	4.2(-12)	5.1(-12)	6.1(-12)	7.0(-12)	7.9(-12)	8.7(-12)	9.4(-12)	9.9(-12)
4(3, 2) - 3(3, 1)	2.8(-11)	3.0(-11)	3.1(-11)	3.2(-11)	3.2(-11)	3.3(-11)	3.3(-11)	3.3(-11)
4(3, 2) - 3(3, 0)	1.1(-11)	1.3(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)	1.9(-11)	2.0(-11)
4(3, 2) - 4(3, 1)	6.3(-11)	6.5(-11)	6.5(-11)	6.4(-11)	6.4(-11)	6.3(-11)	6.3(-11)	6.2(-11)
4(3, 2) - 5(3, 3)	7.5(-12)	1.9(-11)	2.7(-11)	3.2(-11)	3.5(-11)	3.8(-11)	4.0(-11)	4.1(-11)
4(3, 2) - 5(3, 2)	1.4(-12)	4.4(-12)	7.0(-12)	9.1(-12)	1.1(-11)	1.3(-11)	1.4(-11)	1.5(-11)
4(3, 1) - 1(1, 1)	8.4(-13)	7.9(-13)	7.6(-13)	7.7(-13)	8.1(-13)	8.7(-13)	9.4(-13)	1.0(-12)
4(3, 1) - 1(1, 0)	2.3(-12)	2.3(-12)	2.3(-12)	2.3(-12)	2.3(-12)	2.3(-12)	2.4(-12)	2.5(-12)
4(3, 1) - 2(1, 2)	4.0(-13)	4.3(-13)	4.6(-13)	4.8(-13)	5.0(-13)	5.2(-13)	5.3(-13)	5.4(-13)
4(3, 1) - 2(1, 1)	3.8(-12)	3.9(-12)	4.1(-12)	4.3(-12)	4.5(-12)	4.8(-12)	5.0(-12)	5.3(-12)
4(3, 1) - 3(1, 3)	3.2(-12)	3.2(-12)	3.2(-12)	3.3(-12)	3.3(-12)	3.4(-12)	3.4(-12)	3.5(-12)
4(3, 1) - 3(1, 2)	1.6(-12)	1.8(-12)	2.0(-12)	2.3(-12)	2.5(-12)	2.7(-12)	2.9(-12)	3.0(-12)
4(3, 1) - 4(1, 4)	5.0(-12)	5.2(-12)	5.3(-12)	5.5(-12)	5.7(-12)	5.8(-12)	6.0(-12)	6.2(-12)
4(3, 1) - 4(1, 3)	2.1(-12)	2.4(-12)	2.6(-12)	2.8(-12)	3.0(-12)	3.2(-12)	3.4(-12)	3.6(-12)
4(3, 1) - 5(1, 5)	3.7(-12)	4.1(-12)	4.5(-12)	4.9(-12)	5.2(-12)	5.5(-12)	5.7(-12)	6.0(-12)
4(3, 1) - 5(1, 4)	4.1(-12)	4.4(-12)	4.7(-12)	5.0(-12)	5.4(-12)	5.7(-12)	6.0(-12)	6.4(-12)
4(3, 1) - 6(1, 6)	2.6(-12)	3.3(-12)	4.0(-12)	4.7(-12)	5.4(-12)	5.9(-12)	6.4(-12)	6.8(-12)
4(3, 1) - 6(1, 5)	3.5(-12)	4.2(-12)	4.5(-12)	4.8(-12)	5.0(-12)	5.2(-12)	5.4(-12)	5.6(-12)
4(3, 1) - 7(1, 7)	2.9(-12)	3.3(-12)	3.7(-12)	4.2(-12)	4.7(-12)	5.2(-12)	5.6(-12)	6.1(-12)
4(3, 1) - 7(1, 6)	7.1(-12)	8.8(-12)	9.9(-12)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.3(-11)
4(3, 1) - 8(1, 8)	3.4(-12)	4.4(-12)	5.1(-12)	5.7(-12)	6.2(-12)	6.6(-12)	7.0(-12)	7.3(-12)
4(3, 1) - 8(1, 7)	3.9(-12)	4.3(-12)	4.8(-12)	5.3(-12)	5.8(-12)	6.3(-12)	6.7(-12)	7.1(-12)
4(3, 1) - 3(3, 1)	1.0(-11)	1.3(-11)	1.4(-11)	1.6(-11)	1.7(-11)	1.8(-11)	1.9(-11)	2.0(-11)
4(3, 1) - 3(3, 0)	2.8(-11)	3.1(-11)	3.1(-11)	3.2(-11)	3.3(-11)	3.3(-11)	3.3(-11)	3.4(-11)
4(3, 1) - 4(3, 2)	6.3(-11)	6.5(-11)	6.5(-11)	6.4(-11)	6.4(-11)	6.3(-11)	6.3(-11)	6.2(-11)
4(3, 1) - 5(3, 3)	1.1(-12)	3.6(-12)	5.9(-12)	8.0(-12)	9.7(-12)	1.1(-11)	1.3(-11)	1.4(-11)
4(3, 1) - 5(3, 2)	7.3(-12)	1.9(-11)	2.7(-11)	3.2(-11)	3.5(-11)	3.8(-11)	4.0(-11)	4.2(-11)

TABLE 4A—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K	80.0 K
5(3, 3) - 1(1, 1)	2.0(-12)	1.9(-12)	1.9(-12)	1.9(-12)	1.8(-12)	1.8(-12)	1.8(-12)	1.8(-12)
5(3, 3) - 1(1, 0)	5.2(-13)	4.4(-13)	3.8(-13)	3.5(-13)	3.4(-13)	3.3(-13)	3.3(-13)	3.3(-13)
5(3, 3) - 2(1, 2)	4.0(-12)	4.0(-12)	4.1(-12)	4.2(-12)	4.3(-12)	4.3(-12)	4.5(-12)	4.6(-12)
5(3, 3) - 2(1, 1)	9.9(-13)	9.1(-13)	8.7(-13)	8.5(-13)	8.6(-13)	8.6(-13)	8.7(-13)	8.9(-13)
5(3, 3) - 3(1, 3)	4.3(-12)	4.3(-12)	4.4(-12)	4.7(-12)	4.9(-12)	5.1(-12)	5.4(-12)	5.6(-12)
5(3, 3) - 3(1, 2)	1.9(-12)	1.9(-12)	2.0(-12)	2.1(-12)	2.3(-12)	2.4(-12)	2.5(-12)	2.6(-12)
5(3, 3) - 4(1, 4)	2.7(-12)	2.6(-12)	2.6(-12)	2.6(-12)	2.6(-12)	2.7(-12)	2.7(-12)	2.8(-12)
5(3, 3) - 4(1, 3)	3.8(-12)	3.8(-12)	3.8(-12)	4.0(-12)	4.2(-12)	4.5(-12)	4.7(-12)	5.0(-12)
5(3, 3) - 5(1, 5)	1.8(-12)	2.0(-12)	2.2(-12)	2.4(-12)	2.6(-12)	2.8(-12)	3.0(-12)	3.2(-12)
5(3, 3) - 5(1, 4)	1.9(-12)	2.2(-12)	2.6(-12)	2.9(-12)	3.3(-12)	3.6(-12)	3.9(-12)	4.2(-12)
5(3, 3) - 6(1, 6)	4.9(-12)	5.2(-12)	5.5(-12)	5.9(-12)	6.2(-12)	6.6(-12)	6.9(-12)	7.3(-12)
5(3, 3) - 6(1, 5)	2.5(-12)	2.7(-12)	3.0(-12)	3.3(-12)	3.6(-12)	3.8(-12)	4.0(-12)	4.1(-12)
5(3, 3) - 7(1, 7)	6.8(-12)	7.2(-12)	7.6(-12)	8.2(-12)	8.7(-12)	9.3(-12)	9.8(-12)	1.0(-11)
5(3, 3) - 7(1, 6)	5.7(-12)	6.3(-12)	6.8(-12)	7.2(-12)	7.7(-12)	8.1(-12)	8.5(-12)	8.8(-12)
5(3, 3) - 8(1, 8)	3.2(-12)	4.1(-12)	5.0(-12)	5.9(-12)	6.7(-12)	7.4(-12)	8.0(-12)	8.5(-12)
5(3, 3) - 8(1, 7)	6.4(-12)	6.8(-12)	7.1(-12)	7.5(-12)	7.9(-12)	8.2(-12)	8.5(-12)	8.8(-12)
5(3, 3) - 3(3, 1)	7.4(-12)	6.9(-12)	6.7(-12)	6.8(-12)	6.9(-12)	7.2(-12)	7.4(-12)	7.7(-12)
5(3, 3) - 3(3, 0)	8.0(-12)	8.7(-12)	9.3(-12)	9.8(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)
5(3, 3) - 4(3, 2)	3.5(-11)	3.8(-11)	3.9(-11)	4.0(-11)	4.1(-11)	4.2(-11)	4.2(-11)	4.2(-11)
5(3, 3) - 4(3, 1)	5.0(-12)	7.1(-12)	8.7(-12)	1.0(-11)	1.1(-11)	1.2(-11)	1.4(-11)	1.5(-11)
5(3, 3) - 5(3, 2)	4.3(-11)	4.5(-11)	4.6(-11)	4.6(-11)	4.6(-11)	4.7(-11)	4.7(-11)	4.7(-11)
5(3, 2) - 1(1, 1)	1.3(-12)	1.3(-12)	1.3(-12)	1.3(-12)	1.3(-12)	1.3(-12)	1.4(-12)	1.4(-12)
5(3, 2) - 1(1, 0)	2.1(-12)	2.0(-12)	2.0(-12)	2.0(-12)	2.1(-12)	2.1(-12)	2.2(-12)	2.2(-12)
5(3, 2) - 2(1, 2)	5.2(-13)	4.7(-13)	4.3(-13)	4.1(-13)	4.1(-13)	4.0(-13)	4.0(-13)	4.0(-13)
5(3, 2) - 2(1, 1)	2.8(-12)	2.6(-12)	2.5(-12)	2.6(-12)	2.7(-12)	2.8(-12)	2.9(-12)	3.0(-12)
5(3, 2) - 3(1, 3)	1.6(-12)	1.6(-12)	1.7(-12)	1.8(-12)	1.8(-12)	1.9(-12)	1.9(-12)	1.9(-12)
5(3, 2) - 3(1, 2)	3.3(-12)	3.1(-12)	3.1(-12)	3.2(-12)	3.4(-12)	3.6(-12)	3.7(-12)	3.9(-12)
5(3, 2) - 4(1, 4)	5.6(-12)	6.1(-12)	6.5(-12)	7.0(-12)	7.5(-12)	7.9(-12)	8.3(-12)	8.7(-12)
5(3, 2) - 4(1, 3)	1.8(-12)	1.8(-12)	1.8(-12)	1.9(-12)	1.9(-12)	2.0(-12)	2.0(-12)	2.1(-12)
5(3, 2) - 5(1, 5)	7.8(-12)	8.2(-12)	8.7(-12)	9.2(-12)	9.7(-12)	1.0(-11)	1.1(-11)	1.1(-11)
5(3, 2) - 5(1, 4)	3.2(-12)	3.3(-12)	3.4(-12)	3.5(-12)	3.6(-12)	3.7(-12)	3.8(-12)	3.9(-12)
5(3, 2) - 6(1, 6)	3.6(-12)	3.6(-12)	3.8(-12)	4.2(-12)	4.7(-12)	5.1(-12)	5.6(-12)	6.1(-12)
5(3, 2) - 6(1, 5)	3.1(-12)	3.4(-12)	3.7(-12)	4.0(-12)	4.3(-12)	4.6(-12)	4.8(-12)	5.1(-12)
5(3, 2) - 7(1, 7)	2.7(-12)	2.8(-12)	3.2(-12)	3.6(-12)	4.1(-12)	4.7(-12)	5.2(-12)	5.7(-12)
5(3, 2) - 7(1, 6)	3.8(-12)	4.1(-12)	4.4(-12)	4.8(-12)	5.2(-12)	5.6(-12)	6.0(-12)	6.4(-12)
5(3, 2) - 8(1, 8)	4.1(-12)	4.5(-12)	4.8(-12)	5.2(-12)	5.5(-12)	5.8(-12)	6.1(-12)	6.4(-12)
5(3, 2) - 8(1, 7)	6.7(-12)	8.1(-12)	9.1(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)
5(3, 2) - 3(3, 1)	8.3(-12)	9.0(-12)	9.4(-12)	9.7(-12)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)
5(3, 2) - 3(3, 0)	6.9(-12)	6.5(-12)	6.3(-12)	6.3(-12)	6.5(-12)	6.7(-12)	7.0(-12)	7.3(-12)
5(3, 2) - 4(3, 2)	6.6(-12)	8.7(-12)	1.0(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)
5(3, 2) - 4(3, 1)	3.4(-11)	3.7(-11)	3.9(-11)	4.0(-11)	4.1(-11)	4.2(-11)	4.2(-11)	4.3(-11)
5(3, 2) - 5(3, 3)	4.3(-11)	4.5(-11)	4.6(-11)	4.6(-11)	4.6(-11)	4.7(-11)	4.7(-11)	4.7(-11)

TABLE 4B

Collision Rate Constants (in units of $cm^3 s^{-1}$) as a Function of Kinetic Temperature, for Para-H_2CO/He

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K
0(0, 0) - 1(0, 1)	7.1(-11)	9.0(-11)	9.5(-11)	9.6(-11)	9.6(-11)	9.5(-11)	9.4(-11)
0(0, 0) - 2(0, 2)	1.7(-11)	3.5(-11)	4.7(-11)	5.5(-11)	6.1(-11)	6.6(-11)	6.9(-11)
0(0, 0) - 3(0, 3)	2.2(-12)	6.5(-12)	9.5(-12)	1.2(-11)	1.4(-11)	1.5(-11)	1.6(-11)
0(0, 0) - 4(0, 4)	1.0(-12)	4.4(-12)	7.0(-12)	8.9(-12)	1.1(-11)	1.2(-11)	1.3(-11)
0(0, 0) - 5(0, 5)	4.6(-14)	7.8(-13)	2.0(-12)	3.3(-12)	4.7(-12)	6.2(-12)	7.8(-12)
0(0, 0) - 6(0, 6)	9.5(-16)	3.8(-14)	1.4(-13)	3.0(-13)	5.5(-13)	8.7(-13)	1.2(-12)
0(0, 0) - 7(0, 7)	2.3(-16)	3.4(-14)	1.8(-13)	4.2(-13)	7.4(-13)	1.1(-12)	1.5(-12)
0(0, 0) - 8(0, 8)	1.3(-17)	6.9(-15)	5.2(-14)	1.4(-13)	2.7(-13)	4.0(-13)	5.4(-13)
0(0, 0) - 2(2, 1)	3.5(-18)	4.4(-17)	1.0(-16)	1.6(-16)	2.0(-16)	2.4(-16)	2.8(-16)
0(0, 0) - 2(2, 0)	4.5(-14)	9.6(-13)	2.7(-12)	4.7(-12)	6.4(-12)	8.0(-12)	9.5(-12)
0(0, 0) - 3(2, 2)	1.7(-18)	3.4(-17)	7.2(-17)	9.6(-17)	1.1(-16)	1.2(-16)	1.2(-16)
0(0, 0) - 3(2, 1)	1.3(-14)	4.7(-13)	1.5(-12)	2.8(-12)	4.0(-12)	5.2(-12)	6.2(-12)
0(0, 0) - 4(2, 3)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)
0(0, 0) - 4(2, 2)	2.0(-15)	1.7(-13)	7.4(-13)	1.5(-12)	2.4(-12)	3.3(-12)	4.2(-12)
1(0, 1) - 0(0, 0)	3.4(-11)	3.6(-11)	3.5(-11)	3.5(-11)	3.4(-11)	3.4(-11)	3.3(-11)
1(0, 1) - 2(0, 2)	4.1(-11)	5.7(-11)	6.3(-11)	6.5(-11)	6.6(-11)	6.7(-11)	6.7(-11)
1(0, 1) - 3(0, 3)	4.3(-12)	1.3(-11)	2.0(-11)	2.5(-11)	3.0(-11)	3.4(-11)	3.7(-11)
1(0, 1) - 4(0, 4)	7.6(-13)	3.2(-12)	5.5(-12)	7.6(-12)	9.5(-12)	1.1(-11)	1.3(-11)
1(0, 1) - 5(0, 5)	6.7(-14)	8.6(-13)	2.1(-12)	3.3(-12)	4.6(-12)	5.8(-12)	6.9(-12)
1(0, 1) - 6(0, 6)	6.8(-15)	2.3(-13)	7.4(-13)	1.3(-12)	2.0(-12)	2.7(-12)	3.5(-12)
1(0, 1) - 7(0, 7)	1.7(-16)	2.0(-14)	1.0(-13)	2.3(-13)	3.9(-13)	5.7(-13)	7.7(-13)
1(0, 1) - 8(0, 8)	1.9(-17)	8.5(-15)	6.6(-14)	1.9(-13)	3.8(-13)	6.1(-13)	8.7(-13)
1(0, 1) - 2(2, 1)	4.6(-14)	8.2(-13)	2.2(-12)	3.5(-12)	4.7(-12)	5.8(-12)	6.7(-12)
1(0, 1) - 2(2, 0)	3.5(-14)	4.8(-13)	1.1(-12)	1.7(-12)	2.2(-12)	2.7(-12)	3.0(-12)
1(0, 1) - 3(2, 2)	5.6(-15)	2.0(-13)	6.4(-13)	1.1(-12)	1.6(-12)	2.1(-12)	2.5(-12)
1(0, 1) - 3(2, 1)	1.5(-14)	4.5(-13)	1.4(-12)	2.5(-12)	3.6(-12)	4.7(-12)	5.7(-12)
1(0, 1) - 4(2, 3)	7.8(-16)	5.0(-14)	2.0(-13)	4.0(-13)	6.2(-13)	8.4(-13)	1.1(-12)
1(0, 1) - 4(2, 2)	5.0(-15)	3.1(-13)	1.2(-12)	2.4(-12)	3.5(-12)	4.6(-12)	5.7(-12)
2(0, 2) - 0(0, 0)	9.7(-12)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.6(-11)
2(0, 2) - 1(0, 1)	4.9(-11)	4.8(-11)	4.7(-11)	4.7(-11)	4.6(-11)	4.5(-11)	4.4(-11)
2(0, 2) - 3(0, 3)	2.3(-11)	4.0(-11)	4.7(-11)	5.1(-11)	5.2(-11)	5.3(-11)	5.4(-11)
2(0, 2) - 4(0, 4)	2.0(-12)	6.9(-12)	1.1(-11)	1.5(-11)	1.8(-11)	2.1(-11)	2.3(-11)
2(0, 2) - 5(0, 5)	1.7(-13)	1.6(-12)	3.5(-12)	5.3(-12)	7.0(-12)	8.7(-12)	1.0(-11)
2(0, 2) - 6(0, 6)	1.1(-14)	2.9(-13)	9.1(-13)	1.7(-12)	2.5(-12)	3.3(-12)	4.2(-12)
2(0, 2) - 7(0, 7)	1.2(-15)	1.1(-13)	5.0(-13)	1.1(-12)	1.7(-12)	2.4(-12)	3.1(-12)
2(0, 2) - 8(0, 8)	3.6(-17)	1.1(-14)	6.6(-14)	1.8(-13)	3.5(-13)	5.6(-13)	8.2(-13)
2(0, 2) - 2(2, 1)	7.6(-14)	9.1(-13)	2.1(-12)	3.2(-12)	4.1(-12)	4.9(-12)	5.6(-12)
2(0, 2) - 2(2, 0)	8.6(-14)	9.2(-13)	2.0(-12)	3.0(-12)	3.8(-12)	4.6(-12)	5.2(-12)
2(0, 2) - 3(2, 2)	3.2(-14)	7.3(-13)	2.1(-12)	3.5(-12)	4.8(-12)	6.0(-12)	7.2(-12)
2(0, 2) - 3(2, 1)	2.6(-14)	5.0(-13)	1.3(-12)	2.1(-12)	2.9(-12)	3.5(-12)	4.1(-12)
2(0, 2) - 4(2, 3)	6.3(-15)	2.8(-13)	9.7(-13)	1.8(-12)	2.6(-12)	3.4(-12)	4.1(-12)
2(0, 2) - 4(2, 2)	4.6(-15)	1.8(-13)	6.1(-13)	1.1(-12)	1.6(-12)	2.1(-12)	2.6(-12)

TABLE 4B—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K
3(0, 3) - 0(0, 0)	2.6(-12)	2.6(-12)	2.7(-12)	2.8(-12)	2.9(-12)	3.0(-12)	3.1(-12)
3(0, 3) - 1(0, 1)	1.1(-11)	1.3(-11)	1.5(-11)	1.7(-11)	1.8(-11)	1.9(-11)	2.0(-11)
3(0, 3) - 2(0, 2)	4.6(-11)	4.9(-11)	4.8(-11)	4.7(-11)	4.6(-11)	4.5(-11)	4.5(-11)
3(0, 3) - 4(0, 4)	1.8(-11)	3.4(-11)	4.1(-11)	4.5(-11)	4.7(-11)	4.8(-11)	4.9(-11)
3(0, 3) - 5(0, 5)	7.4(-13)	4.1(-12)	7.5(-12)	1.1(-11)	1.3(-11)	1.6(-11)	1.9(-11)
3(0, 3) - 6(0, 6)	7.1(-14)	1.0(-12)	2.5(-12)	4.1(-12)	5.5(-12)	6.9(-12)	8.2(-12)
3(0, 3) - 7(0, 7)	1.5(-15)	8.8(-14)	3.6(-13)	7.9(-13)	1.3(-12)	2.0(-12)	2.7(-12)
3(0, 3) - 8(0, 8)	2.6(-16)	4.8(-14)	2.6(-13)	6.3(-13)	1.1(-12)	1.7(-12)	2.3(-12)
3(0, 3) - 2(2, 1)	1.7(-13)	1.2(-12)	2.3(-12)	3.2(-12)	4.0(-12)	4.6(-12)	5.1(-12)
3(0, 3) - 2(2, 0)	3.0(-13)	1.9(-12)	3.6(-12)	4.9(-12)	5.8(-12)	6.5(-12)	7.1(-12)
3(0, 3) - 3(2, 2)	8.6(-14)	1.1(-12)	2.6(-12)	3.9(-12)	5.1(-12)	6.0(-12)	6.9(-12)
3(0, 3) - 3(2, 1)	7.6(-14)	9.0(-13)	2.0(-12)	3.1(-12)	3.9(-12)	4.8(-12)	5.5(-12)
3(0, 3) - 4(2, 3)	2.2(-14)	5.9(-13)	1.8(-12)	3.1(-12)	4.4(-12)	5.7(-12)	6.9(-12)
3(0, 3) - 4(2, 2)	1.4(-14)	2.9(-13)	7.4(-13)	1.2(-12)	1.5(-12)	1.8(-12)	2.1(-12)
4(0, 4) - 0(0, 0)	3.8(-12)	2.8(-12)	2.5(-12)	2.4(-12)	2.4(-12)	2.4(-12)	2.4(-12)
4(0, 4) - 1(0, 1)	5.5(-12)	5.2(-12)	5.3(-12)	5.6(-12)	5.9(-12)	6.4(-12)	6.9(-12)
4(0, 4) - 2(0, 2)	1.3(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)
4(0, 4) - 3(0, 3)	5.6(-11)	5.3(-11)	5.1(-11)	4.9(-11)	4.8(-11)	4.7(-11)	4.7(-11)
4(0, 4) - 5(0, 5)	8.0(-12)	2.3(-11)	3.2(-11)	3.7(-11)	4.0(-11)	4.2(-11)	4.4(-11)
4(0, 4) - 6(0, 6)	4.4(-13)	2.9(-12)	5.5(-12)	7.8(-12)	9.9(-12)	1.2(-11)	1.4(-11)
4(0, 4) - 7(0, 7)	1.9(-14)	5.3(-13)	1.6(-12)	2.8(-12)	4.0(-12)	5.3(-12)	6.5(-12)
4(0, 4) - 8(0, 8)	4.6(-16)	4.4(-14)	2.0(-13)	4.7(-13)	8.2(-13)	1.2(-12)	1.6(-12)
4(0, 4) - 2(2, 1)	1.1(-12)	3.7(-12)	5.5(-12)	6.8(-12)	7.6(-12)	8.3(-12)	8.9(-12)
4(0, 4) - 2(2, 0)	7.3(-13)	2.3(-12)	3.4(-12)	4.1(-12)	4.5(-12)	4.9(-12)	5.2(-12)
4(0, 4) - 3(2, 2)	1.9(-13)	1.1(-12)	2.1(-12)	2.8(-12)	3.5(-12)	4.0(-12)	4.5(-12)
4(0, 4) - 3(2, 1)	3.4(-13)	2.2(-12)	4.0(-12)	5.5(-12)	6.8(-12)	7.8(-12)	8.8(-12)
4(0, 4) - 4(2, 3)	9.6(-14)	1.2(-12)	2.8(-12)	4.2(-12)	5.3(-12)	6.4(-12)	7.3(-12)
4(0, 4) - 4(2, 2)	9.1(-14)	1.1(-12)	2.4(-12)	3.4(-12)	4.3(-12)	5.2(-12)	5.9(-12)
5(0, 5) - 0(0, 0)	8.3(-13)	9.8(-13)	1.0(-12)	1.1(-12)	1.2(-12)	1.4(-12)	1.5(-12)
5(0, 5) - 1(0, 1)	2.5(-12)	2.7(-12)	2.9(-12)	3.1(-12)	3.3(-12)	3.6(-12)	3.8(-12)
5(0, 5) - 2(0, 2)	5.2(-12)	6.0(-12)	6.4(-12)	6.9(-12)	7.4(-12)	8.0(-12)	8.6(-12)
5(0, 5) - 3(0, 3)	1.1(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)	1.8(-11)
5(0, 5) - 4(0, 4)	3.8(-11)	4.5(-11)	4.7(-11)	4.7(-11)	4.7(-11)	4.6(-11)	4.6(-11)
5(0, 5) - 6(0, 6)	6.6(-12)	2.0(-11)	3.0(-11)	3.6(-11)	4.0(-11)	4.3(-11)	4.6(-11)
5(0, 5) - 7(0, 7)	1.5(-13)	1.6(-12)	3.4(-12)	5.2(-12)	7.2(-12)	9.2(-12)	1.1(-11)
5(0, 5) - 8(0, 8)	1.2(-14)	4.5(-13)	1.5(-12)	2.8(-12)	4.3(-12)	5.9(-12)	7.5(-12)
5(0, 5) - 2(2, 1)	3.2(-12)	3.9(-12)	4.2(-12)	4.4(-12)	4.7(-12)	4.9(-12)	5.1(-12)
5(0, 5) - 2(2, 0)	4.7(-12)	6.7(-12)	7.8(-12)	8.5(-12)	9.0(-12)	9.4(-12)	9.7(-12)
5(0, 5) - 3(2, 2)	1.9(-12)	4.8(-12)	6.6(-12)	7.7(-12)	8.5(-12)	9.1(-12)	9.8(-12)
5(0, 5) - 3(2, 1)	1.4(-12)	3.7(-12)	5.1(-12)	5.9(-12)	6.6(-12)	7.1(-12)	7.5(-12)
5(0, 5) - 4(2, 3)	2.3(-13)	1.3(-12)	2.3(-12)	3.0(-12)	3.6(-12)	4.1(-12)	4.5(-12)
5(0, 5) - 4(2, 2)	5.9(-13)	3.1(-12)	5.4(-12)	7.0(-12)	8.2(-12)	9.2(-12)	1.0(-11)

TABLE 4B—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K
6(0, 6) - 0(0, 0)	1.1(-13)	1.2(-13)	1.2(-13)	1.5(-13)	1.8(-13)	2.3(-13)	2.7(-13)
6(0, 6) - 1(0, 1)	1.7(-12)	1.7(-12)	1.7(-12)	1.8(-12)	1.9(-12)	2.0(-12)	2.2(-12)
6(0, 6) - 2(0, 2)	2.3(-12)	2.6(-12)	2.9(-12)	3.1(-12)	3.4(-12)	3.6(-12)	3.9(-12)
6(0, 6) - 3(0, 3)	7.3(-12)	7.5(-12)	7.8(-12)	8.1(-12)	8.5(-12)	8.9(-12)	9.4(-12)
6(0, 6) - 4(0, 4)	1.4(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.5(-11)	1.6(-11)	1.7(-11)
6(0, 6) - 5(0, 5)	4.5(-11)	4.9(-11)	5.0(-11)	5.1(-11)	5.1(-11)	5.2(-11)	5.2(-11)
6(0, 6) - 7(0, 7)	4.8(-12)	1.8(-11)	2.8(-11)	3.4(-11)	3.9(-11)	4.3(-11)	4.6(-11)
6(0, 6) - 8(0, 8)	7.1(-14)	9.5(-13)	2.1(-12)	3.3(-12)	4.5(-12)	5.7(-12)	6.9(-12)
6(0, 6) - 2(2, 1)	4.7(-12)	5.6(-12)	6.2(-12)	6.7(-12)	7.1(-12)	7.5(-12)	7.9(-12)
6(0, 6) - 2(2, 0)	2.0(-12)	2.2(-12)	2.5(-12)	2.7(-12)	3.0(-12)	3.2(-12)	3.4(-12)
6(0, 6) - 3(2, 2)	8.2(-12)	8.4(-12)	8.3(-12)	8.2(-12)	8.1(-12)	8.0(-12)	8.0(-12)
6(0, 6) - 3(2, 1)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)
6(0, 6) - 4(2, 3)	3.9(-12)	7.3(-12)	8.8(-12)	9.6(-12)	1.0(-11)	1.1(-11)	1.1(-11)
6(0, 6) - 4(2, 2)	3.4(-12)	6.0(-12)	7.0(-12)	7.5(-12)	7.8(-12)	8.2(-12)	8.5(-12)
7(0, 7) - 0(0, 0)	2.7(-13)	3.0(-13)	3.1(-13)	3.3(-13)	3.5(-13)	3.8(-13)	4.0(-13)
7(0, 7) - 1(0, 1)	4.3(-13)	4.5(-13)	4.6(-13)	4.8(-13)	5.2(-13)	5.5(-13)	6.0(-13)
7(0, 7) - 2(0, 2)	2.5(-12)	3.0(-12)	3.1(-12)	3.1(-12)	3.3(-12)	3.4(-12)	3.7(-12)
7(0, 7) - 3(0, 3)	1.5(-12)	1.9(-12)	2.2(-12)	2.5(-12)	2.9(-12)	3.4(-12)	3.9(-12)
7(0, 7) - 4(0, 4)	6.3(-12)	7.4(-12)	7.7(-12)	8.1(-12)	8.5(-12)	9.1(-12)	9.6(-12)
7(0, 7) - 5(0, 5)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.6(-11)
7(0, 7) - 6(0, 6)	4.8(-11)	5.4(-11)	5.5(-11)	5.5(-11)	5.5(-11)	5.6(-11)	5.7(-11)
7(0, 7) - 8(0, 8)	5.0(-12)	2.0(-11)	3.0(-11)	3.8(-11)	4.4(-11)	5.0(-11)	5.4(-11)
7(0, 7) - 2(2, 1)	1.9(-12)	2.1(-12)	2.2(-12)	2.2(-12)	2.2(-12)	2.3(-12)	2.4(-12)
7(0, 7) - 2(2, 0)	3.7(-12)	3.9(-12)	3.9(-12)	3.9(-12)	4.0(-12)	4.2(-12)	4.3(-12)
7(0, 7) - 3(2, 2)	8.4(-12)	9.6(-12)	9.8(-12)	9.8(-12)	9.9(-12)	1.0(-11)	1.0(-11)
7(0, 7) - 3(2, 1)	4.0(-12)	4.3(-12)	4.3(-12)	4.3(-12)	4.4(-12)	4.5(-12)	4.7(-12)
7(0, 7) - 4(2, 3)	9.3(-12)	9.7(-12)	9.5(-12)	9.5(-12)	9.7(-12)	1.0(-11)	1.0(-11)
7(0, 7) - 4(2, 2)	1.4(-11)	1.5(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.4(-11)
8(0, 8) - 0(0, 0)	2.3(-13)	2.2(-13)	2.0(-13)	2.0(-13)	2.0(-13)	1.9(-13)	1.9(-13)
8(0, 8) - 1(0, 1)	6.9(-13)	6.9(-13)	6.8(-13)	7.2(-13)	7.7(-13)	8.3(-13)	8.8(-13)
8(0, 8) - 2(0, 2)	1.1(-12)	1.0(-12)	9.2(-13)	9.4(-13)	1.0(-12)	1.1(-12)	1.2(-12)
8(0, 8) - 3(0, 3)	3.8(-12)	3.7(-12)	3.5(-12)	3.6(-12)	3.7(-12)	4.0(-12)	4.3(-12)
8(0, 8) - 4(0, 4)	2.2(-12)	2.2(-12)	2.2(-12)	2.4(-12)	2.7(-12)	2.9(-12)	3.2(-12)
8(0, 8) - 5(0, 5)	1.2(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.4(-11)
8(0, 8) - 6(0, 6)	1.0(-11)	1.0(-11)	9.3(-12)	9.4(-12)	9.9(-12)	1.0(-11)	1.1(-11)
8(0, 8) - 7(0, 7)	7.3(-11)	7.1(-11)	6.7(-11)	6.7(-11)	6.8(-11)	7.0(-11)	7.1(-11)
8(0, 8) - 2(2, 1)	2.6(-12)	2.8(-12)	2.7(-12)	2.8(-12)	2.9(-12)	3.0(-12)	3.2(-12)
8(0, 8) - 2(2, 0)	2.5(-12)	2.4(-12)	2.3(-12)	2.2(-12)	2.3(-12)	2.4(-12)	2.4(-12)
8(0, 8) - 3(2, 2)	2.3(-12)	2.4(-12)	2.5(-12)	2.8(-12)	3.2(-12)	3.5(-12)	3.8(-12)
8(0, 8) - 3(2, 1)	5.4(-12)	5.2(-12)	5.0(-12)	5.0(-12)	5.1(-12)	5.3(-12)	5.5(-12)
8(0, 8) - 4(2, 3)	1.2(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)
8(0, 8) - 4(2, 2)	7.0(-12)	6.7(-12)	6.2(-12)	6.2(-12)	6.2(-12)	6.4(-12)	6.5(-12)

TABLE 4B—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K
2(2, 1) - 0(0, 0)	2.2(-16)	1.6(-16)	1.4(-16)	1.3(-16)	1.3(-16)	1.3(-16)	1.3(-16)
2(2, 1) - 1(0, 1)	6.4(-12)	7.4(-12)	7.9(-12)	8.2(-12)	8.4(-12)	8.6(-12)	8.7(-12)
2(2, 1) - 2(0, 2)	8.7(-12)	9.6(-12)	1.0(-11)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)
2(2, 1) - 3(0, 3)	9.2(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.2(-11)
2(2, 1) - 4(0, 4)	1.9(-11)	2.0(-11)	2.1(-11)	2.1(-11)	2.2(-11)	2.2(-11)	2.2(-11)
2(2, 1) - 5(0, 5)	1.2(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)
2(2, 1) - 6(0, 6)	2.5(-12)	6.6(-12)	9.6(-12)	1.2(-11)	1.3(-11)	1.5(-11)	1.6(-11)
2(2, 1) - 7(0, 7)	1.0(-13)	8.5(-13)	1.7(-12)	2.4(-12)	3.0(-12)	3.5(-12)	4.1(-12)
2(2, 1) - 8(0, 8)	1.0(-14)	3.1(-13)	9.4(-13)	1.7(-12)	2.5(-12)	3.3(-12)	4.1(-12)
2(2, 1) - 2(2, 0)	7.2(-11)	7.1(-11)	7.0(-11)	6.9(-11)	6.8(-11)	6.7(-11)	6.6(-11)
2(2, 1) - 3(2, 2)	1.3(-11)	2.7(-11)	3.4(-11)	3.8(-11)	4.0(-11)	4.2(-11)	4.3(-11)
2(2, 1) - 3(2, 1)	4.8(-12)	1.2(-11)	1.6(-11)	1.9(-11)	2.1(-11)	2.4(-11)	2.5(-11)
2(2, 1) - 4(2, 3)	1.2(-12)	4.8(-12)	7.2(-12)	8.9(-12)	1.0(-11)	1.2(-11)	1.3(-11)
2(2, 1) - 4(2, 2)	5.6(-13)	2.4(-12)	3.8(-12)	4.9(-12)	5.8(-12)	6.6(-12)	7.5(-12)
2(2, 0) - 0(0, 0)	2.9(-12)	3.4(-12)	3.7(-12)	3.9(-12)	4.1(-12)	4.2(-12)	4.3(-12)
2(2, 0) - 1(0, 1)	4.6(-12)	4.3(-12)	4.1(-12)	4.0(-12)	4.0(-12)	3.9(-12)	3.9(-12)
2(2, 0) - 2(0, 2)	9.7(-12)	9.8(-12)	9.8(-12)	9.8(-12)	9.9(-12)	1.0(-11)	1.0(-11)
2(2, 0) - 3(0, 3)	1.6(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.7(-11)
2(2, 0) - 4(0, 4)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)
2(2, 0) - 5(0, 5)	1.7(-11)	1.9(-11)	2.0(-11)	2.1(-11)	2.2(-11)	2.2(-11)	2.3(-11)
2(2, 0) - 6(0, 6)	1.1(-12)	2.6(-12)	3.8(-12)	4.8(-12)	5.6(-12)	6.4(-12)	7.0(-12)
2(2, 0) - 7(0, 7)	2.0(-13)	1.6(-12)	3.0(-12)	4.3(-12)	5.4(-12)	6.4(-12)	7.3(-12)
2(2, 0) - 8(0, 8)	9.2(-15)	2.7(-13)	7.9(-13)	1.4(-12)	2.0(-12)	2.6(-12)	3.1(-12)
2(2, 0) - 2(2, 1)	7.2(-11)	7.1(-11)	7.0(-11)	6.9(-11)	6.8(-11)	6.7(-11)	6.6(-11)
2(2, 0) - 3(2, 2)	6.8(-12)	1.5(-11)	2.0(-11)	2.3(-11)	2.5(-11)	2.6(-11)	2.8(-11)
2(2, 0) - 3(2, 1)	1.2(-11)	2.4(-11)	3.0(-11)	3.2(-11)	3.4(-11)	3.5(-11)	3.6(-11)
2(2, 0) - 4(2, 3)	1.3(-12)	5.3(-12)	8.2(-12)	1.0(-11)	1.2(-11)	1.3(-11)	1.4(-11)
2(2, 0) - 4(2, 2)	5.6(-13)	2.5(-12)	4.2(-12)	5.6(-12)	6.9(-12)	8.2(-12)	9.5(-12)
3(2, 2) - 0(0, 0)	2.3(-16)	1.4(-16)	1.0(-16)	7.5(-17)	6.1(-17)	5.2(-17)	4.6(-17)
3(2, 2) - 1(0, 1)	1.6(-12)	2.1(-12)	2.4(-12)	2.5(-12)	2.5(-12)	2.6(-12)	2.7(-12)
3(2, 2) - 2(0, 2)	7.3(-12)	9.3(-12)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)
3(2, 2) - 3(0, 3)	9.7(-12)	1.2(-11)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.4(-11)
3(2, 2) - 4(0, 4)	6.6(-12)	7.6(-12)	8.0(-12)	8.3(-12)	8.6(-12)	8.9(-12)	9.2(-12)
3(2, 2) - 5(0, 5)	1.4(-11)	1.7(-11)	1.7(-11)	1.8(-11)	1.8(-11)	1.9(-11)	1.9(-11)
3(2, 2) - 6(0, 6)	8.9(-12)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.4(-11)	1.4(-11)
3(2, 2) - 7(0, 7)	9.1(-13)	4.6(-12)	7.8(-12)	1.0(-11)	1.2(-11)	1.3(-11)	1.4(-11)
3(2, 2) - 8(0, 8)	1.8(-14)	3.2(-13)	9.0(-13)	1.6(-12)	2.4(-12)	3.2(-12)	4.0(-12)
3(2, 2) - 2(2, 1)	2.7(-11)	3.3(-11)	3.4(-11)	3.5(-11)	3.5(-11)	3.5(-11)	3.6(-11)
3(2, 2) - 2(2, 0)	1.4(-11)	1.9(-11)	2.1(-11)	2.1(-11)	2.2(-11)	2.2(-11)	2.3(-11)
3(2, 2) - 3(2, 1)	3.2(-11)	3.8(-11)	4.0(-11)	4.0(-11)	4.0(-11)	4.0(-11)	4.1(-11)
3(2, 2) - 4(2, 3)	9.4(-12)	2.4(-11)	3.2(-11)	3.6(-11)	3.9(-11)	4.1(-11)	4.3(-11)
3(2, 2) - 4(2, 2)	2.2(-12)	6.5(-12)	9.3(-12)	1.1(-11)	1.3(-11)	1.5(-11)	1.6(-11)

TABLE 4B—*Continued*

INITIAL - FINAL	10.0 K	20.0 K	30.0 K	40.0 K	50.0 K	60.0 K	70.0 K
3(2, 1) - 0(0, 0)	1.7(-12)	2.0(-12)	2.1(-12)	2.2(-12)	2.2(-12)	2.3(-12)	2.3(-12)
3(2, 1) - 1(0, 1)	4.1(-12)	4.8(-12)	5.2(-12)	5.4(-12)	5.6(-12)	5.9(-12)	6.2(-12)
3(2, 1) - 2(0, 2)	5.9(-12)	6.4(-12)	6.5(-12)	6.5(-12)	6.5(-12)	6.6(-12)	6.7(-12)
3(2, 1) - 3(0, 3)	8.5(-12)	9.5(-12)	9.8(-12)	9.9(-12)	1.0(-11)	1.0(-11)	1.1(-11)
3(2, 1) - 4(0, 4)	1.2(-11)	1.5(-11)	1.6(-11)	1.6(-11)	1.7(-11)	1.7(-11)	1.8(-11)
3(2, 1) - 5(0, 5)	1.1(-11)	1.3(-11)	1.3(-11)	1.4(-11)	1.4(-11)	1.4(-11)	1.5(-11)
3(2, 1) - 6(0, 6)	1.3(-11)	1.8(-11)	2.0(-11)	2.1(-11)	2.2(-11)	2.3(-11)	2.3(-11)
3(2, 1) - 7(0, 7)	4.4(-13)	2.1(-12)	3.4(-12)	4.4(-12)	5.2(-12)	5.9(-12)	6.5(-12)
3(2, 1) - 8(0, 8)	4.1(-14)	7.1(-13)	1.8(-12)	2.9(-12)	3.9(-12)	4.9(-12)	5.8(-12)
3(2, 1) - 2(2, 1)	9.8(-12)	1.4(-11)	1.7(-11)	1.8(-11)	1.9(-11)	2.0(-11)	2.1(-11)
3(2, 1) - 2(2, 0)	2.4(-11)	2.9(-11)	3.0(-11)	3.0(-11)	3.0(-11)	3.0(-11)	3.0(-11)
3(2, 1) - 3(2, 2)	3.2(-11)	3.8(-11)	4.0(-11)	4.0(-11)	4.0(-11)	4.0(-11)	4.1(-11)
3(2, 1) - 4(2, 3)	2.3(-12)	7.0(-12)	1.0(-11)	1.3(-11)	1.5(-11)	1.7(-11)	1.9(-11)
3(2, 1) - 4(2, 2)	9.6(-12)	2.6(-11)	3.5(-11)	4.1(-11)	4.4(-11)	4.7(-11)	4.9(-11)
4(2, 3) - 0(0, 0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)	0.0(0)
4(2, 3) - 1(0, 1)	6.8(-13)	8.5(-13)	9.2(-13)	9.6(-13)	9.9(-13)	1.0(-12)	1.1(-12)
4(2, 3) - 2(0, 2)	4.5(-12)	5.6(-12)	5.9(-12)	6.0(-12)	6.1(-12)	6.3(-12)	6.4(-12)
4(2, 3) - 3(0, 3)	7.7(-12)	9.8(-12)	1.1(-11)	1.1(-11)	1.2(-11)	1.2(-11)	1.3(-11)
4(2, 3) - 4(0, 4)	1.1(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.4(-11)	1.4(-11)	1.4(-11)
4(2, 3) - 5(0, 5)	5.6(-12)	7.1(-12)	7.6(-12)	7.8(-12)	8.0(-12)	8.2(-12)	8.4(-12)
4(2, 3) - 6(0, 6)	1.4(-11)	1.6(-11)	1.7(-11)	1.7(-11)	1.7(-11)	1.8(-11)	1.8(-11)
4(2, 3) - 7(0, 7)	3.2(-12)	7.3(-12)	9.4(-12)	1.1(-11)	1.2(-11)	1.3(-11)	1.4(-11)
4(2, 3) - 8(0, 8)	2.8(-13)	2.4(-12)	4.8(-12)	6.8(-12)	8.6(-12)	1.0(-11)	1.1(-11)
4(2, 3) - 2(2, 1)	8.0(-12)	9.0(-12)	9.1(-12)	9.1(-12)	9.3(-12)	9.7(-12)	1.0(-11)
4(2, 3) - 2(2, 0)	8.3(-12)	1.0(-11)	1.0(-11)	1.0(-11)	1.0(-11)	1.1(-11)	1.1(-11)
4(2, 3) - 3(2, 2)	3.0(-11)	3.7(-11)	3.9(-11)	4.0(-11)	4.0(-11)	4.1(-11)	4.1(-11)
4(2, 3) - 3(2, 1)	7.1(-12)	1.1(-11)	1.3(-11)	1.4(-11)	1.5(-11)	1.7(-11)	1.8(-11)
4(2, 3) - 4(2, 2)	2.2(-11)	2.6(-11)	2.6(-11)	2.6(-11)	2.6(-11)	2.7(-11)	2.8(-11)
4(2, 2) - 0(0, 0)	8.4(-13)	1.1(-12)	1.3(-12)	1.3(-12)	1.4(-12)	1.4(-12)	1.5(-12)
4(2, 2) - 1(0, 1)	4.4(-12)	5.3(-12)	5.6(-12)	5.6(-12)	5.7(-12)	5.7(-12)	5.8(-12)
4(2, 2) - 2(0, 2)	3.3(-12)	3.7(-12)	3.7(-12)	3.7(-12)	3.8(-12)	3.9(-12)	4.1(-12)
4(2, 2) - 3(0, 3)	4.9(-12)	4.8(-12)	4.4(-12)	4.2(-12)	4.0(-12)	3.9(-12)	3.9(-12)
4(2, 2) - 4(0, 4)	1.0(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.1(-11)	1.2(-11)
4(2, 2) - 5(0, 5)	1.4(-11)	1.7(-11)	1.8(-11)	1.8(-11)	1.8(-11)	1.8(-11)	1.9(-11)
4(2, 2) - 6(0, 6)	1.2(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.3(-11)	1.4(-11)	1.4(-11)
4(2, 2) - 7(0, 7)	4.8(-12)	1.1(-11)	1.4(-11)	1.6(-11)	1.7(-11)	1.8(-11)	1.9(-11)
4(2, 2) - 8(0, 8)	1.7(-13)	1.4(-12)	2.7(-12)	3.9(-12)	4.9(-12)	5.8(-12)	6.6(-12)
4(2, 2) - 2(2, 1)	3.6(-12)	4.5(-12)	4.8(-12)	5.0(-12)	5.2(-12)	5.5(-12)	5.9(-12)
4(2, 2) - 2(2, 0)	3.6(-12)	4.7(-12)	5.2(-12)	5.7(-12)	6.3(-12)	6.8(-12)	7.5(-12)
4(2, 2) - 3(2, 2)	7.0(-12)	1.0(-11)	1.2(-11)	1.2(-11)	1.3(-11)	1.4(-11)	1.5(-11)
4(2, 2) - 3(2, 1)	3.0(-11)	4.1(-11)	4.4(-11)	4.5(-11)	4.6(-11)	4.6(-11)	4.7(-11)
4(2, 2) - 4(2, 3)	2.2(-11)	2.6(-11)	2.6(-11)	2.6(-11)	2.6(-11)	2.7(-11)	2.8(-11)

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