Collision-Induced Absorption (CIA) cross-sections

The CIA folder contains two sub- folders: Main-Folder and Alternate-Folder. These two folders contain files of Collision-Induced Absorption data. Each collision system is placed in a file within a single folder with the name of the collision pair. The filename contains the collision system plus the year of the update into HITRAN. The extension for the files names is ".cia" (these are text files). For some data that have been judged to be less reliable, but yet useful in the sense that they are unique, we have relegated them to another folder that we call "Alternate-Folder". The structure of the compilation is given below in Fig. 1. More complete details of the CIA data sets are presented in C. Richard, I.E. Gordon, L.S. Rothman, M. Abel, L. Frommhold, M. Gustafsson, et al, *JQSRT* **113,** 1276-1285 (2012).

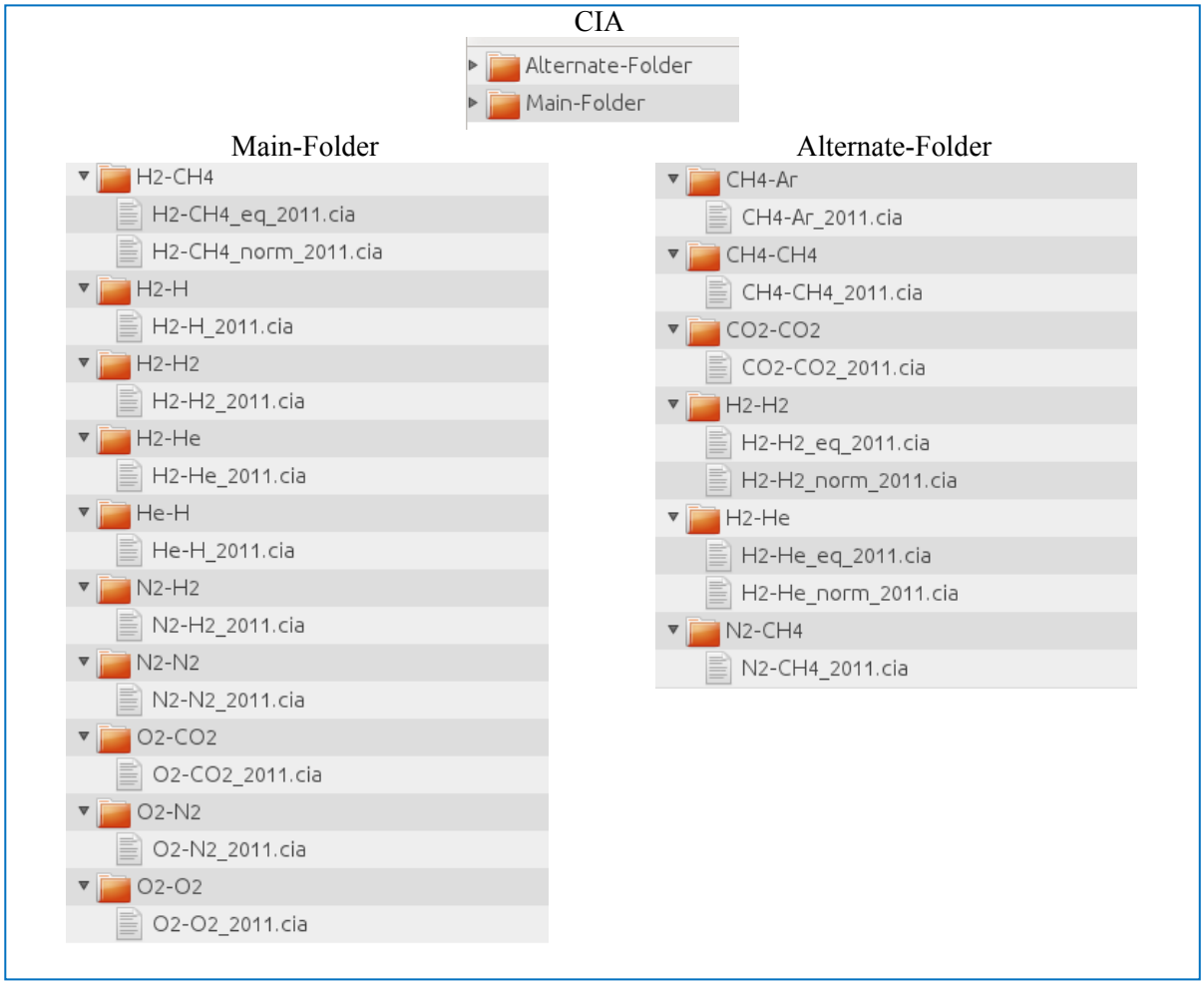

Figure 1. File structure of CIA data

The data sets in the individual files are ordered by wavenumber spectral intervals, and secondly by increasing temperature.

Table 1 on the next page summarizes the data that are presently available, while Fig. 2 illustrates the format of the headers for each individual data set.

Table 1. Summary of the data that form the new CIA section of the HITRAN database

CIA system	Spectral range (cm^{-1})	Temperature range (K)	Number of sets	Band(s)
N_2–N_2	0.02 – 554	40 – 400	10	Roto-translational
	2000 – 2698	228 – 272	5	Fundamental
	1850 – 3000	300 – 362	5	Fundamental
N_2–H_2	0.02 – 1886	40 – 400	10	Roto-translational
N_2–CH_4	0.02 – 1379	40 – 400	10	Roto-translational
H_2–H_2	0.02 – 2400[a]/2400[b]	40 – 400	10	Roto-translational
	20 – 10000	200 – 3000	113	Roto-translational, Fundamental, 1st overtone
H_2–He	0.02 – 2400[a]/2400[b]	40 – 400	10	Roto-translational
	20 – 20000	200 – 9900	334	Roto-translational, Fundamental, 1st to 4th overtone
H_2–CH_4	0.02 – 1946[a]/1946[b]	40 – 400	10	Roto-translational
H_2–H	100 – 10000	1000 – 2500	4	Roto-translational, Fundamental, 1st overtone
He–H	50 – 11000	1500 – 10000	10	Roto-translational
O_2–O_2	1150 – 1950	193 – 353	15	Fundamental
	7450 – 8487	253 – 296	3	$a^1\Delta_g \leftarrow X\,^3\Sigma_g^-$ (0–0)
	9001 – 9997	296	1	$a^1\Delta_g \leftarrow X\,^3\Sigma_g^-$ (1–0)
	12600 – 13839	200 – 300[c]	1	A Band
	14996 – 29790	294	1	$a^1\Delta_g + a^1\Delta_g$, $b^1\Sigma_g^+ + a^1\Delta_g$, and $b^1\Sigma_g^+ + b^1\Sigma_g^+$
O_2–N_2	7500 – 8600	200 – 295	7	$a^1\Delta_g \leftarrow X\,^3\Sigma_g^-$ (0–0)
	9000 – 10000	200 – 295	5	$a^1\Delta_g \leftarrow X\,^3\Sigma_g^-$ (1–0)
	12600 – 13839	200 – 300[c]	1	A Band
O_2–CO_2	12600 – 13839	200 – 300[c]	1	A Band
CO_2–CO_2	1 – 250	200 – 800	7	Roto-translational
CH_4–CH_4	0.02 – 990	40 – 400	10	Roto-translational
CH_4–Ar	1 – 697	70 – 296	5	Roto-translational

Systems highlighted in orange are provided in the main folder, while systems highlighted in green are provided in the alternate folder.

[a] refers to the "equilibrium" data

[b] refers to the "normal" data

[c] in this specific case, data between 200 and 300 K are the same and the temperature chosen for HITRAN is 296 K (room-temperature)

The definition and units have been described in the article about CIA data sets mentioned above. The sets have a header that provides information to the user and the format is given below:

Chemical symbol	Wavenumber Minimum	Wavenumber Maximum	Number of pts.	Temp. [K]	Maximum CIA	Res.	Comments	Ref No
20	10	10	7	7	10	6	27	3

10 20 30 40 50 60 70 80 90 100

Figure 2. Header used for CIA. The chemical symbol and comments are right adjusted; the resolution is in cm^{-1} (a flag of value –.999 has been employed in the cases where the values are not available).