



wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 12:26 am BST

PDB ID : 1I41
Title : CYSTATHIONINE GAMMA-SYNTHASE IN COMPLEX WITH THE INHIBITOR APPA
Authors : Steegborn, C.; Laber, B.; Messerschmidt, A.; Huber, R.; Clausen, T.
Deposited on : 2001-02-19
Resolution : 3.20 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

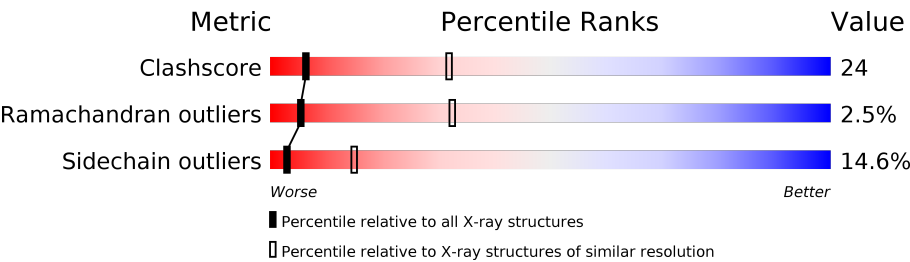
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)



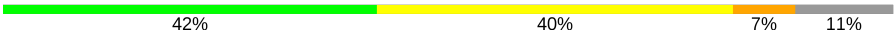
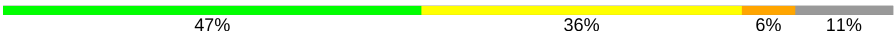
The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	445	<div><div>42%</div><div>40%</div><div>6%</div><div>11%</div></div>
1	B	445	<div><div>44%</div><div>39%</div><div>6%</div><div>11%</div></div>
1	C	445	<div><div>44%</div><div>38%</div><div>7%</div><div>11%</div></div>
1	D	445	<div><div>42%</div><div>40%</div><div>7%</div><div>11%</div></div>
1	E	445	<div><div>43%</div><div>39%</div><div>7%</div><div>11%</div></div>
1	F	445	<div><div>44%</div><div>38%</div><div>8%</div><div>11%</div></div>
1	G	445	<div><div>44%</div><div>39%</div><div>6%</div><div>11%</div></div>
1	H	445	<div><div>42%</div><div>41%</div><div>7%</div><div>11%</div></div>

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Mol	Chain	Length	Quality of chain
1	I	445	 48% 36% 5% 11%
1	J	445	 43% 40% 6% 11%
1	K	445	 42% 40% 7% 11%
1	L	445	 47% 36% 6% 11%

2 Entry composition

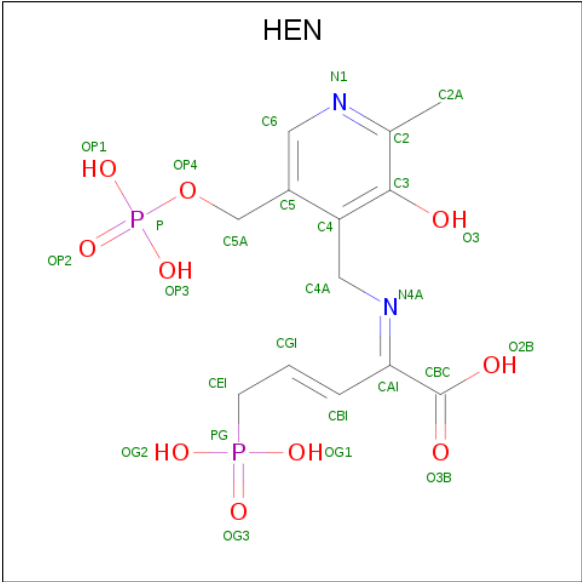
There are 2 unique types of molecules in this entry. The entry contains 36600 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

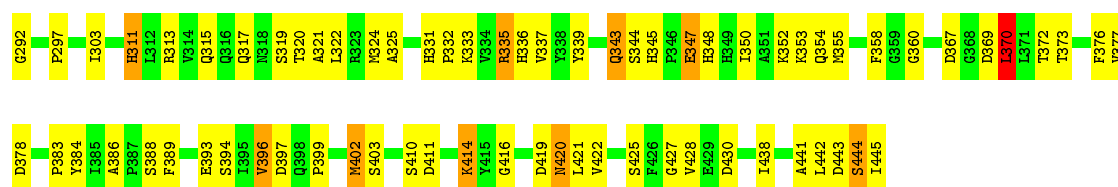
- Molecule 1 is a protein called CYSTATHIONINE GAMMA-SYNTHASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	B	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	C	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	D	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	E	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	F	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	G	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	H	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	I	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	J	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	K	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			
1	L	396	Total	C	N	O	S	0	0	0
			3023	1928	513	566	16			

- Molecule 2 is 2-[(3-HYDROXY-2-METHYL-5-PHOSPHONOOXYMETHYL-PYRIDIN-4-YLMETHYL)-IMINO]-5-PHOSPHONO-PENT-3-ENOIC ACID (three-letter code: HEN) (formula: C₁₃H₁₈N₂O₁₀P₂).

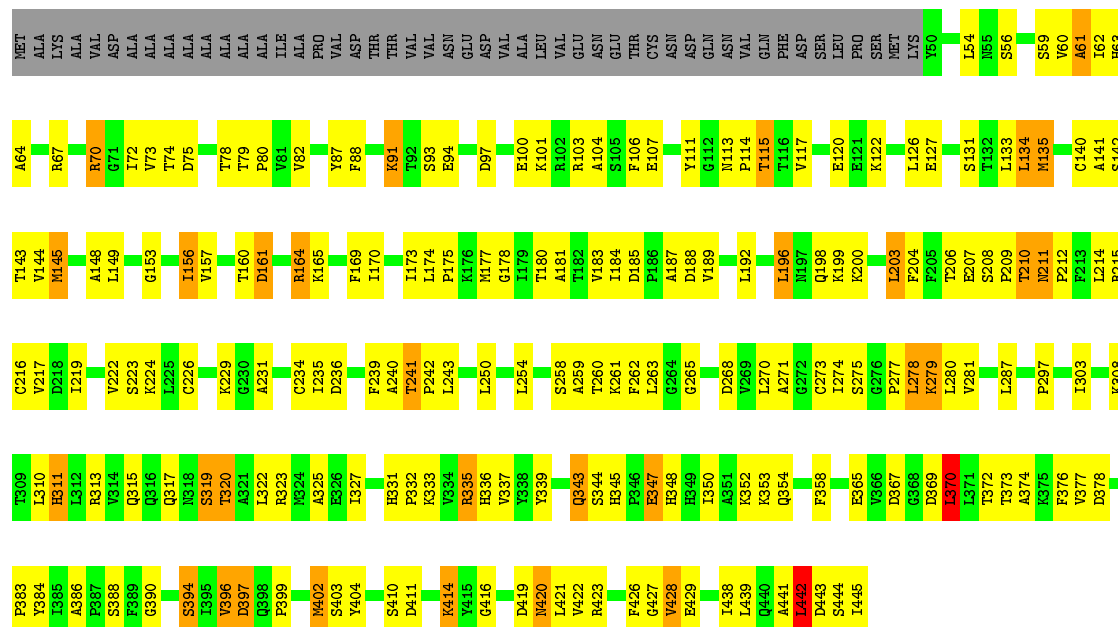


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	B	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	D	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	E	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	F	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	G	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	H	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	I	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	J	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	K	1	Total	C	N	O	P	0	0
			27	13	2	10	2		
2	L	1	Total	C	N	O	P	0	0
			27	13	2	10	2		



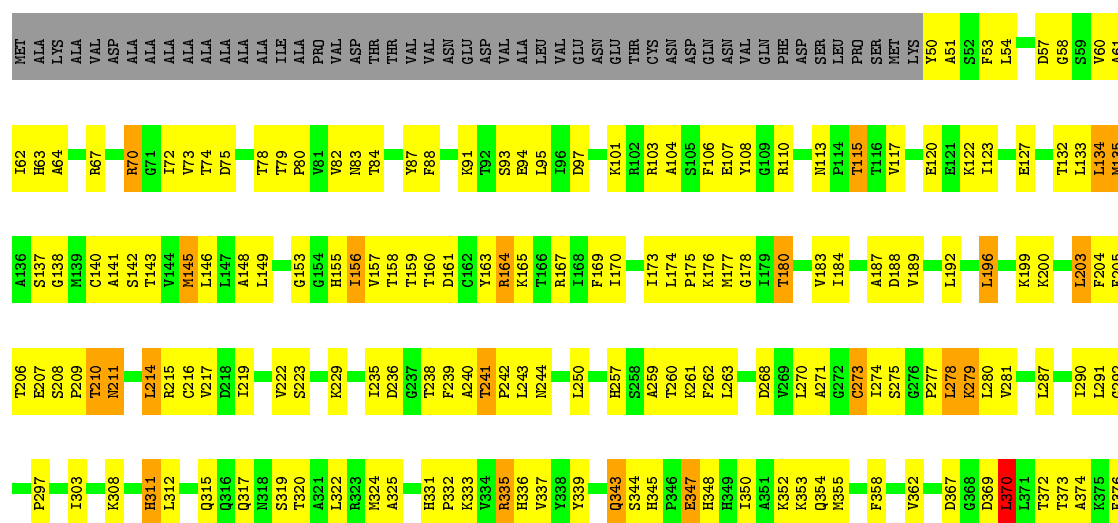
• Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE

Chain C: 44% 38% 7% 11%



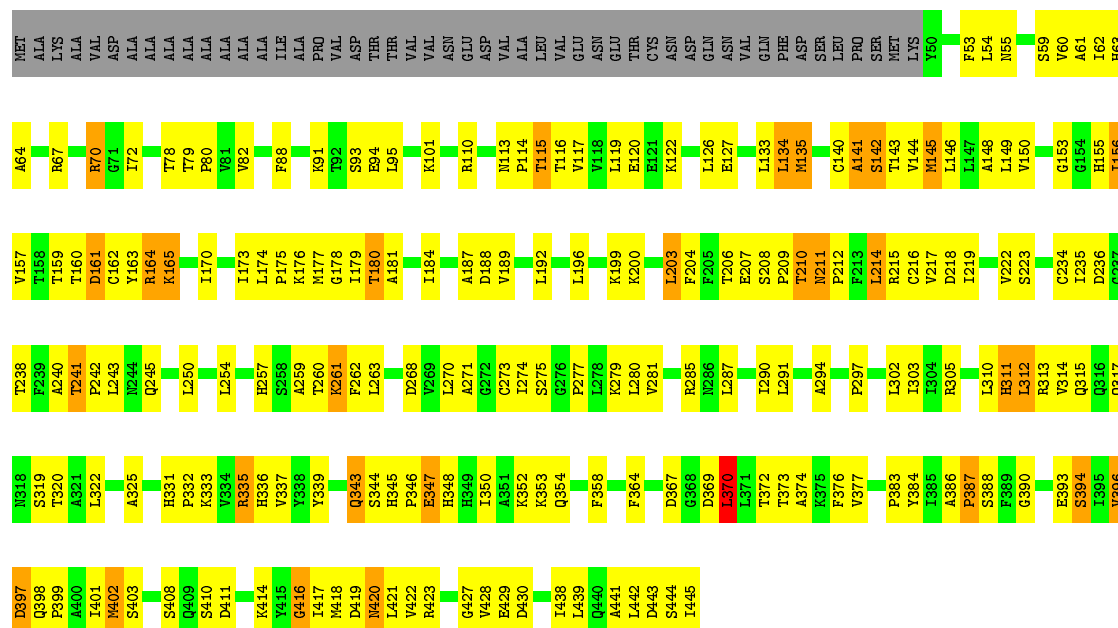
• Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE

Chain D: 42% 40% 7% 11%



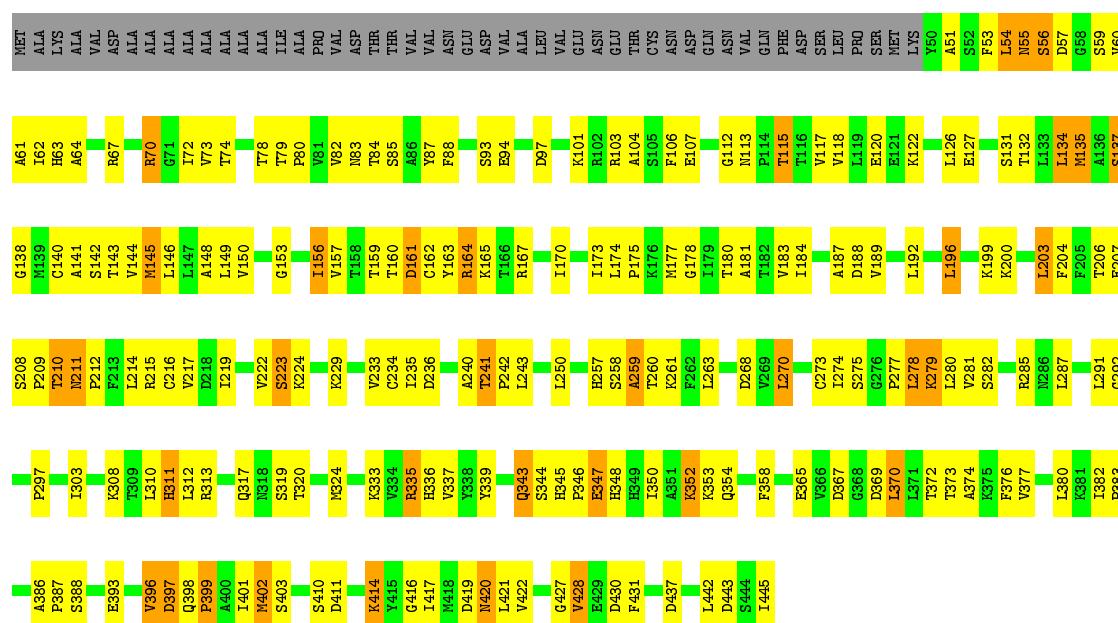
- Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE

Chain E:  43% 39% 7% 11%

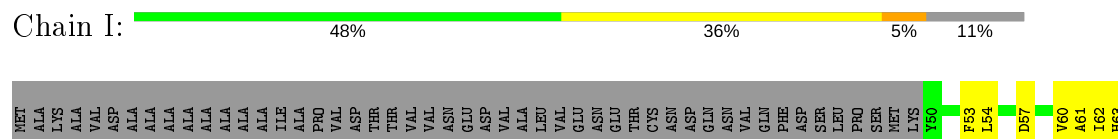


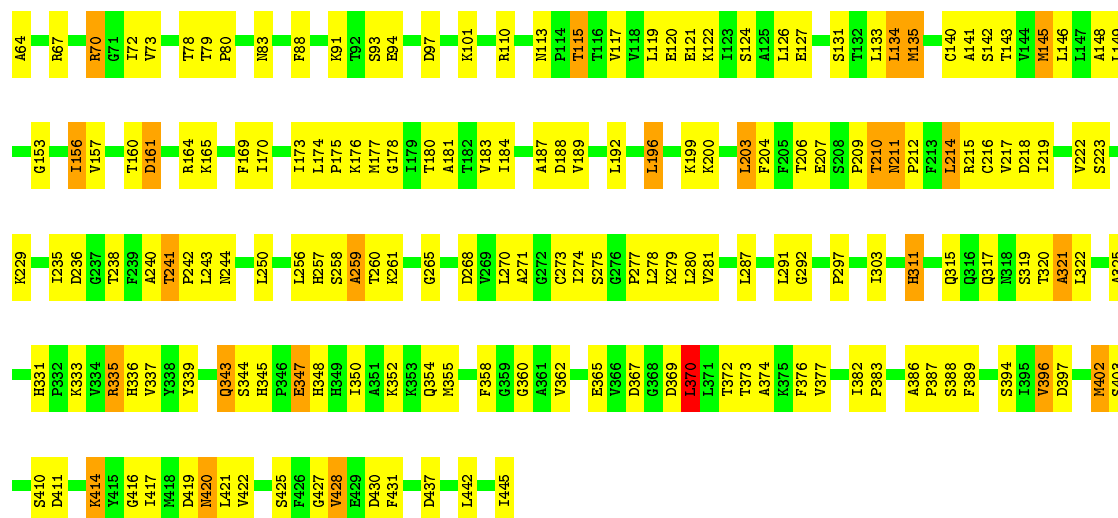
- Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE

Chain F:  44% 38% 8% 11%



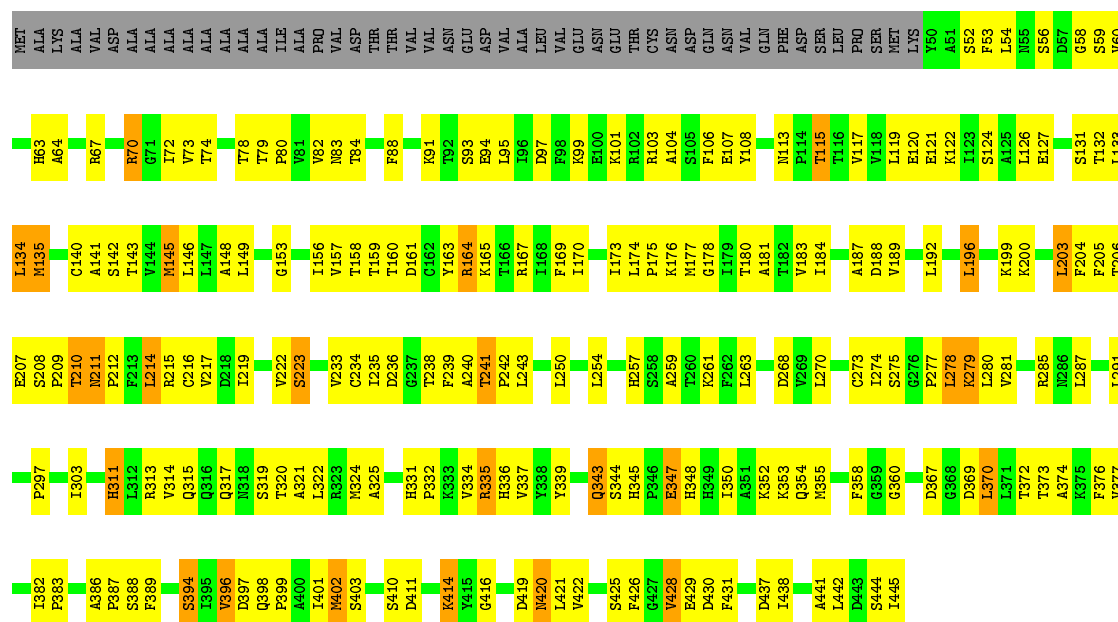
- Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE





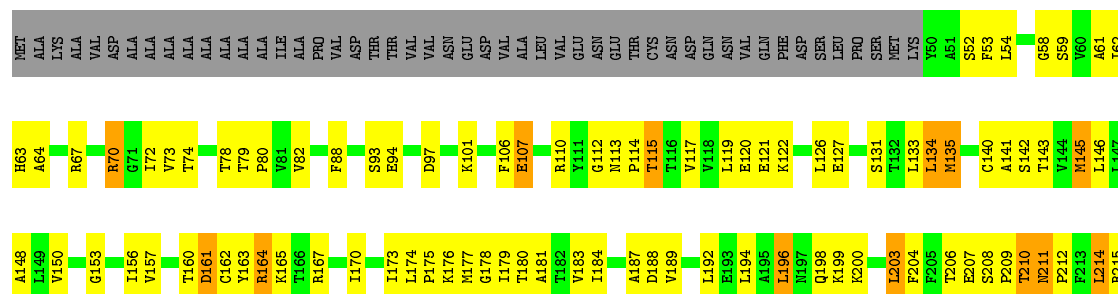
• Molecule 1: CYSTATHIONINE GAMMA-SYNTASE

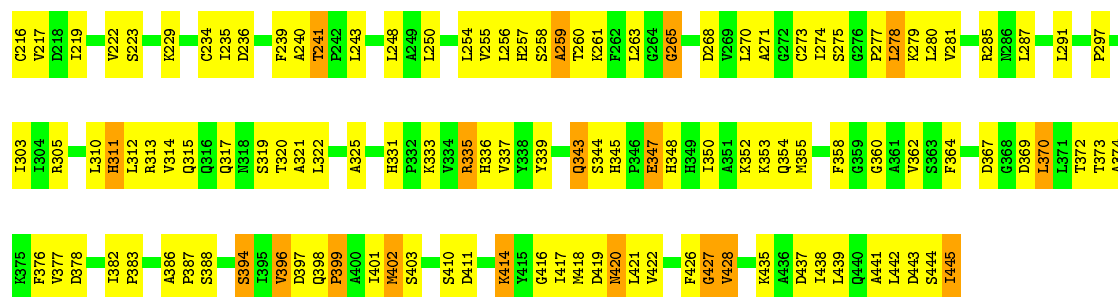
Chain J: 43% 40% 6% 11%



• Molecule 1: CYSTATHIONINE GAMMA-SYNTASE

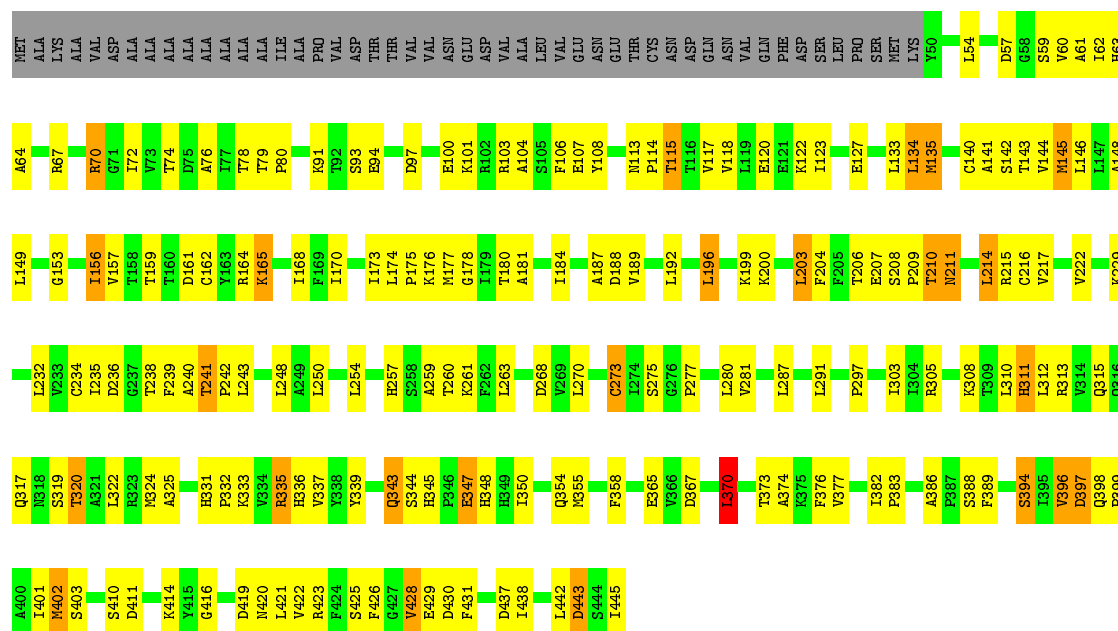
Chain K: 42% 40% 7% 11%





• Molecule 1: CYSTATHIONINE GAMMA-SYNTHASE

Chain L: 47% 36% 6% 11%



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	312.20Å 166.00Å 161.80Å 90.00° 90.20° 90.00°	Depositor
Resolution (Å)	20.00 – 3.20	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-3.20)	Depositor
R_{merge}	0.18	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.239 , 0.272	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	36600	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: HEN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.33	0/3082	0.53	0/4179
1	B	0.31	0/3082	0.52	0/4179
1	C	0.32	0/3082	0.52	0/4179
1	D	0.32	0/3082	0.52	0/4179
1	E	0.33	0/3082	0.53	0/4179
1	F	0.32	0/3082	0.53	0/4179
1	G	0.33	0/3082	0.52	0/4179
1	H	0.33	0/3082	0.53	0/4179
1	I	0.32	0/3082	0.52	0/4179
1	J	0.31	0/3082	0.52	0/4179
1	K	0.31	0/3082	0.52	0/4179
1	L	0.31	0/3082	0.52	0/4179
All	All	0.32	0/36984	0.52	0/50148

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3023	0	3054	164	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3023	0	3054	167	0
1	C	3023	0	3054	159	0
1	D	3023	0	3054	159	0
1	E	3023	0	3054	155	0
1	F	3023	0	3054	160	0
1	G	3023	0	3054	156	0
1	H	3023	0	3054	164	0
1	I	3023	0	3054	141	0
1	J	3023	0	3054	155	0
1	K	3023	0	3054	153	0
1	L	3023	0	3054	131	0
2	A	27	0	12	3	0
2	B	27	0	12	1	0
2	C	27	0	12	0	0
2	D	27	0	12	2	0
2	E	27	0	12	1	0
2	F	27	0	12	1	0
2	G	27	0	12	1	0
2	H	27	0	12	2	0
2	I	27	0	12	2	0
2	J	27	0	12	1	0
2	K	27	0	12	1	0
2	L	27	0	12	1	0
All	All	36600	0	36792	1765	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 24.

The worst 5 of 1765 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:64:ALA:HB3	1:F:122:LYS:HG3	1.44	0.98
1:L:54:LEU:HD22	1:L:59:SER:HB3	1.45	0.97
1:A:145:MET:HE1	1:A:146:LEU:HD23	1.47	0.96
1:A:383:PRO:HB2	1:A:396:VAL:HG22	1.49	0.93
1:H:241:THR:HG22	1:H:243:LEU:H	1.31	0.92

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	394/445 (88%)	322 (82%)	64 (16%)	8 (2%)	7	38
1	B	394/445 (88%)	320 (81%)	63 (16%)	11 (3%)	5	29
1	C	394/445 (88%)	324 (82%)	56 (14%)	14 (4%)	3	23
1	D	394/445 (88%)	331 (84%)	55 (14%)	8 (2%)	7	38
1	E	394/445 (88%)	327 (83%)	56 (14%)	11 (3%)	5	29
1	F	394/445 (88%)	316 (80%)	69 (18%)	9 (2%)	6	34
1	G	394/445 (88%)	332 (84%)	54 (14%)	8 (2%)	7	38
1	H	394/445 (88%)	327 (83%)	61 (16%)	6 (2%)	10	44
1	I	394/445 (88%)	329 (84%)	52 (13%)	13 (3%)	4	25
1	J	394/445 (88%)	328 (83%)	59 (15%)	7 (2%)	8	41
1	K	394/445 (88%)	325 (82%)	57 (14%)	12 (3%)	4	28
1	L	394/445 (88%)	325 (82%)	60 (15%)	9 (2%)	6	34
All	All	4728/5340 (88%)	3906 (83%)	706 (15%)	116 (2%)	5	32

5 of 116 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	188	ASP
1	B	188	ASP
1	C	188	ASP
1	D	164	ARG
1	D	188	ASP

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	327/364 (90%)	278 (85%)	49 (15%)	3	14
1	B	327/364 (90%)	283 (86%)	44 (14%)	4	18
1	C	327/364 (90%)	275 (84%)	52 (16%)	2	12
1	D	327/364 (90%)	279 (85%)	48 (15%)	3	14
1	E	327/364 (90%)	276 (84%)	51 (16%)	2	12
1	F	327/364 (90%)	274 (84%)	53 (16%)	2	11
1	G	327/364 (90%)	282 (86%)	45 (14%)	3	16
1	H	327/364 (90%)	279 (85%)	48 (15%)	3	14
1	I	327/364 (90%)	284 (87%)	43 (13%)	4	19
1	J	327/364 (90%)	281 (86%)	46 (14%)	3	16
1	K	327/364 (90%)	279 (85%)	48 (15%)	3	14
1	L	327/364 (90%)	283 (86%)	44 (14%)	4	18
All	All	3924/4368 (90%)	3353 (85%)	571 (15%)	3	15

5 of 571 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	161	ASP
1	G	223	SER
1	L	70	ARG
1	F	200	LYS
1	F	402	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	211	ASN
1	G	343	GLN
1	K	343	GLN
1	G	63	HIS
1	H	63	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	HEN	L	511	-	24,27,27	2.95	11 (45%)	29,39,39	2.17	10 (34%)
2	HEN	A	500	-	24,27,27	3.01	12 (50%)	29,39,39	2.36	10 (34%)
2	HEN	K	510	-	24,27,27	3.02	12 (50%)	29,39,39	2.10	11 (37%)
2	HEN	H	507	-	24,27,27	2.99	12 (50%)	29,39,39	2.15	10 (34%)
2	HEN	G	506	-	24,27,27	2.86	12 (50%)	29,39,39	2.08	10 (34%)
2	HEN	D	503	-	24,27,27	3.04	11 (45%)	29,39,39	2.16	11 (37%)
2	HEN	B	501	-	24,27,27	2.89	12 (50%)	29,39,39	2.07	10 (34%)
2	HEN	I	508	-	24,27,27	2.87	12 (50%)	29,39,39	2.21	12 (41%)
2	HEN	C	502	-	24,27,27	2.88	11 (45%)	29,39,39	2.20	11 (37%)
2	HEN	E	504	-	24,27,27	3.36	13 (54%)	29,39,39	2.28	11 (37%)
2	HEN	J	509	-	24,27,27	3.17	12 (50%)	29,39,39	2.20	10 (34%)
2	HEN	F	505	-	24,27,27	2.91	12 (50%)	29,39,39	2.15	11 (37%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HEN	L	511	-	-	6/17/22/22	0/1/1/1
2	HEN	A	500	-	-	5/17/22/22	0/1/1/1
2	HEN	K	510	-	-	5/17/22/22	0/1/1/1
2	HEN	H	507	-	-	8/17/22/22	0/1/1/1
2	HEN	G	506	-	-	7/17/22/22	0/1/1/1
2	HEN	D	503	-	-	6/17/22/22	0/1/1/1
2	HEN	B	501	-	-	9/17/22/22	0/1/1/1
2	HEN	I	508	-	-	6/17/22/22	0/1/1/1
2	HEN	C	502	-	-	7/17/22/22	0/1/1/1
2	HEN	E	504	-	-	8/17/22/22	0/1/1/1
2	HEN	J	509	-	-	6/17/22/22	0/1/1/1
2	HEN	F	505	-	-	9/17/22/22	0/1/1/1

The worst 5 of 142 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	508	HEN	C5-C4	6.87	1.50	1.40
2	E	504	HEN	PG-CEI	6.78	1.90	1.79
2	E	504	HEN	C5-C4	6.73	1.49	1.40
2	L	511	HEN	C5-C4	6.70	1.49	1.40
2	K	510	HEN	C5-C4	6.69	1.49	1.40

The worst 5 of 127 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	504	HEN	C2A-C2-C3	5.72	127.95	120.89
2	J	509	HEN	C2A-C2-C3	5.51	127.69	120.89
2	A	500	HEN	C2A-C2-C3	5.49	127.67	120.89
2	A	500	HEN	PG-CEI-CGI	-5.45	102.84	114.02
2	I	508	HEN	C2A-C2-C3	5.44	127.61	120.89

There are no chirality outliers.

5 of 82 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	L	511	HEN	C3-C4-C4A-N4A
2	L	511	HEN	C5-C4-C4A-N4A
2	L	511	HEN	N4A-CAI-CBI-CGI
2	L	511	HEN	CBC-CAI-CBI-CGI
2	L	511	HEN	CGI-CEI-PG-OG3

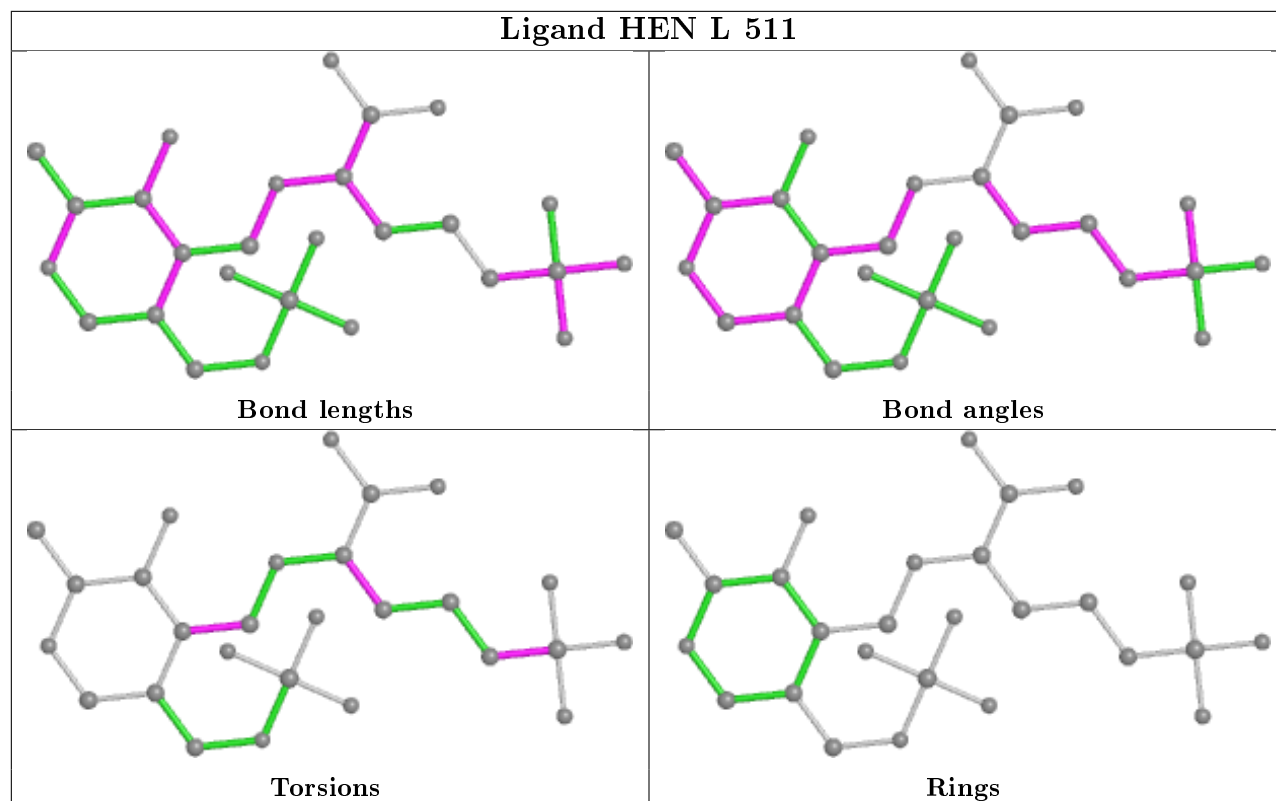
There are no ring outliers.

11 monomers are involved in 16 short contacts:

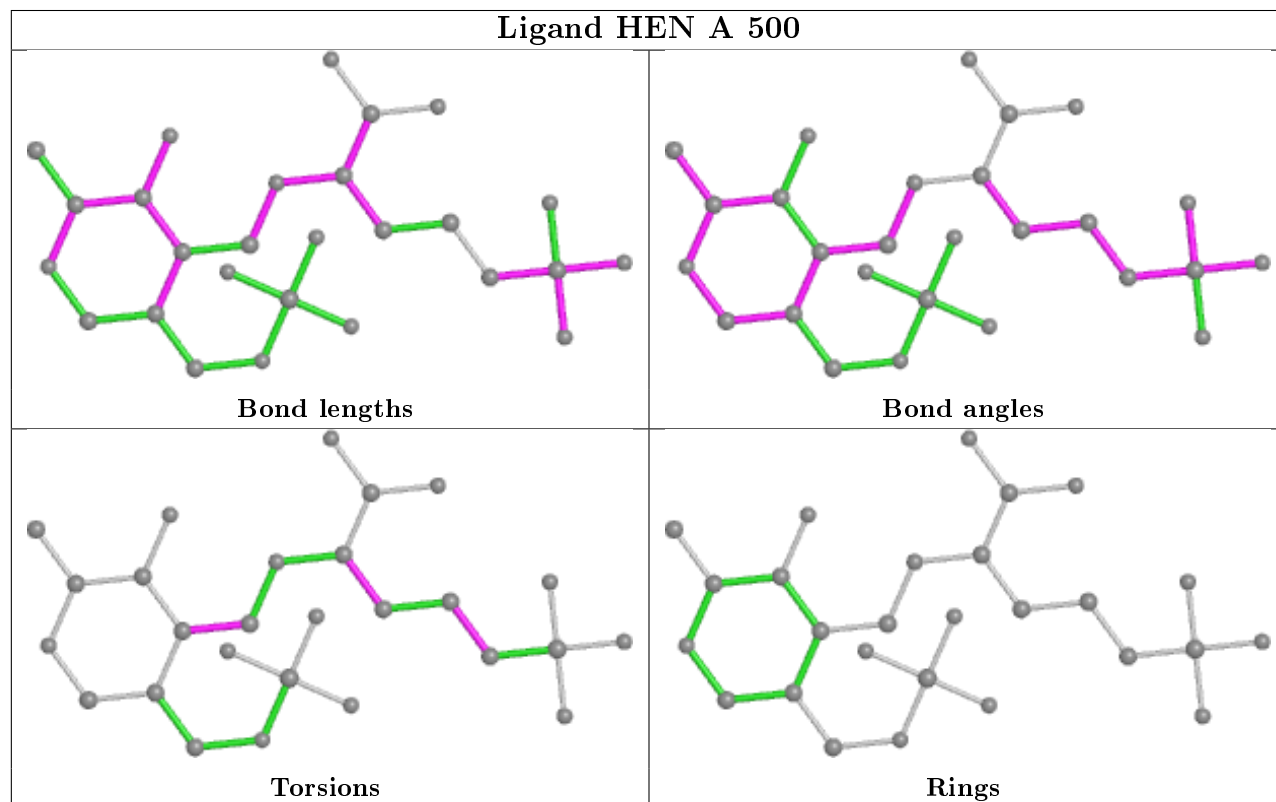
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	L	511	HEN	1	0
2	A	500	HEN	3	0
2	K	510	HEN	1	0
2	H	507	HEN	2	0
2	G	506	HEN	1	0
2	D	503	HEN	2	0
2	B	501	HEN	1	0
2	I	508	HEN	2	0
2	E	504	HEN	1	0
2	J	509	HEN	1	0
2	F	505	HEN	1	0

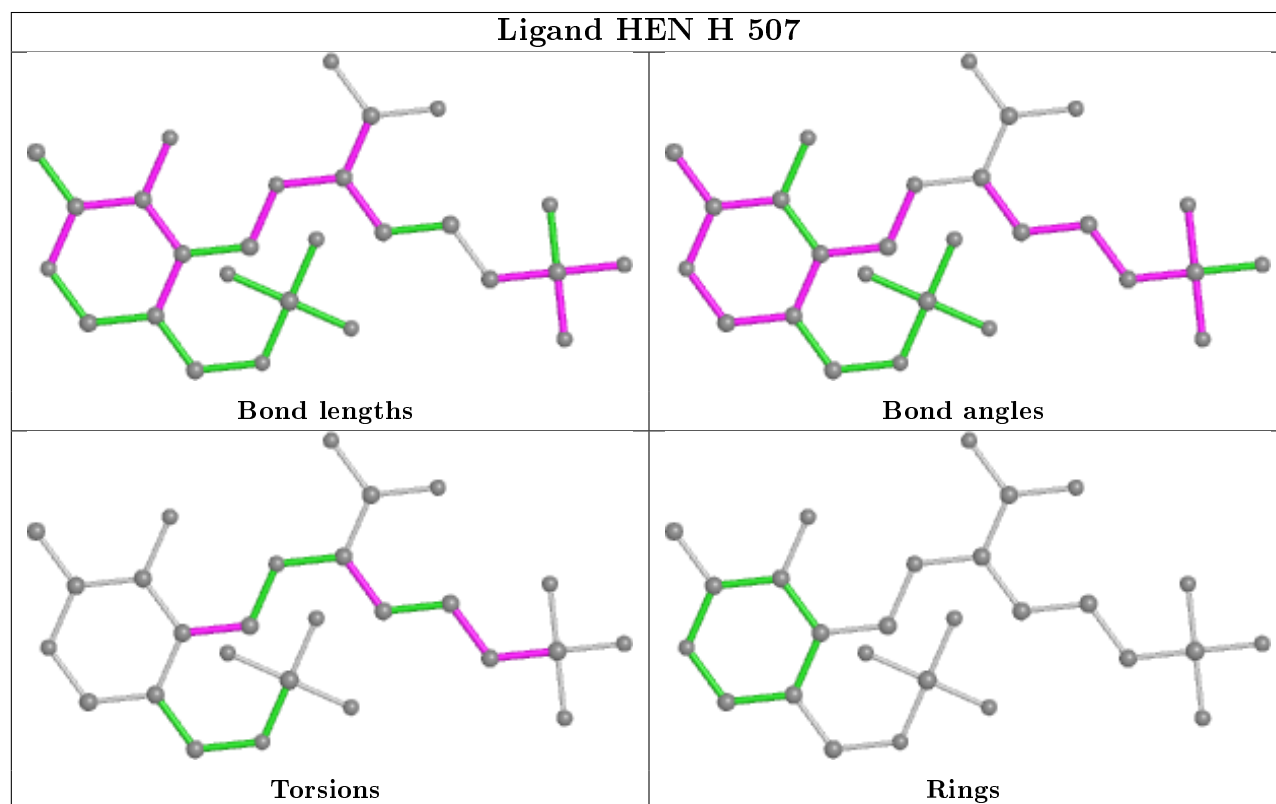
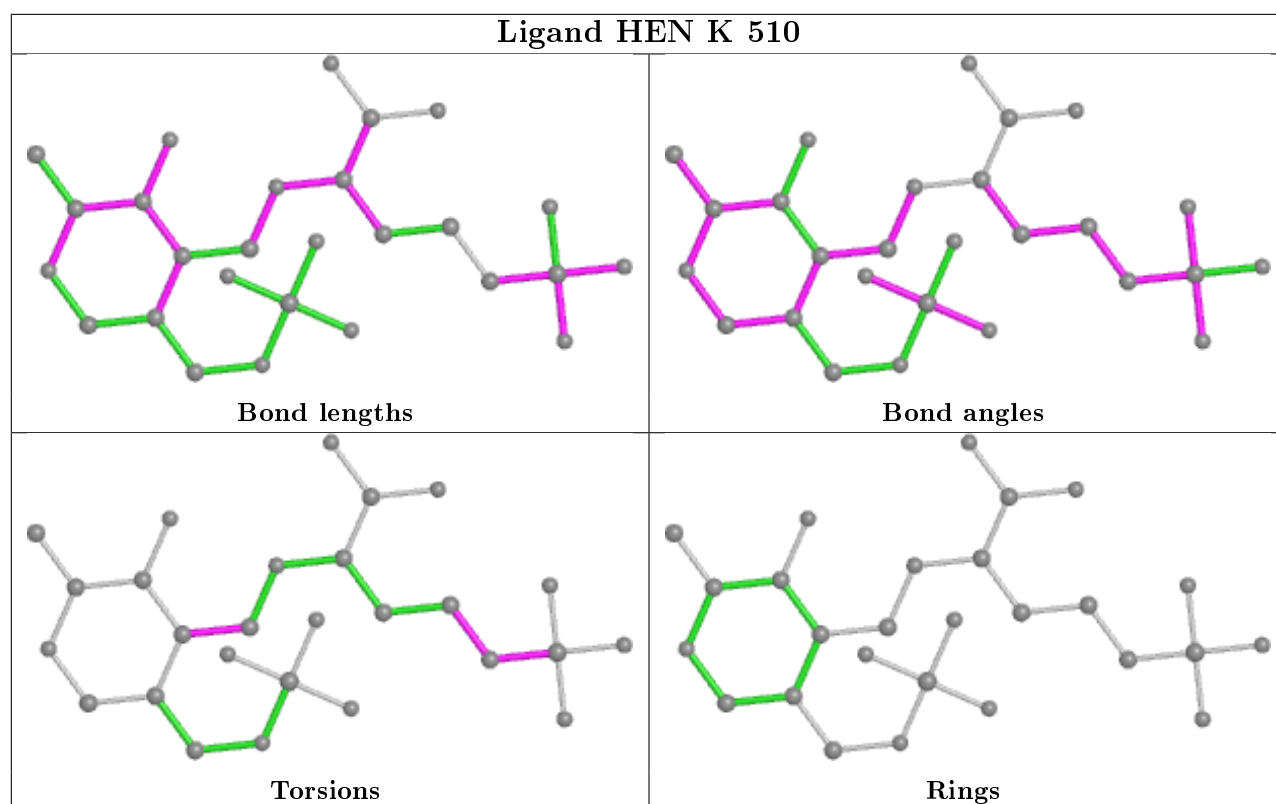
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

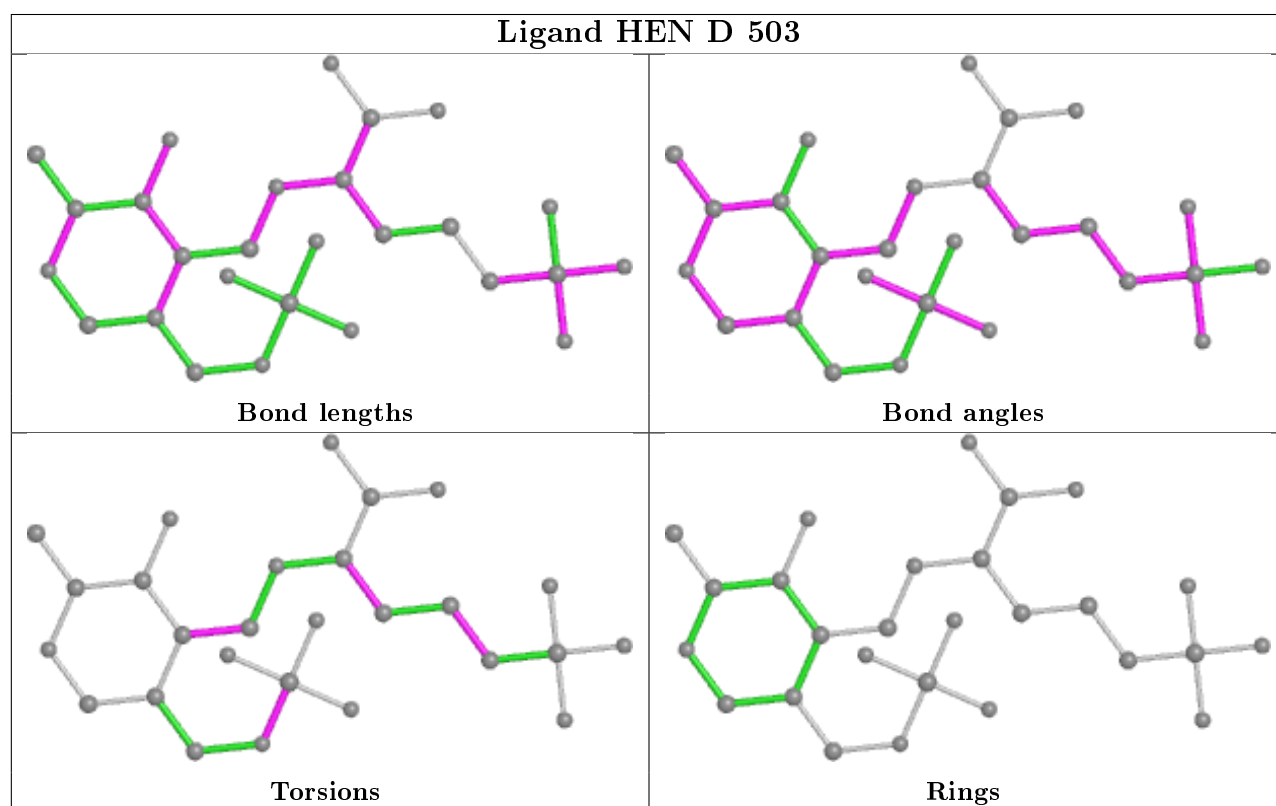
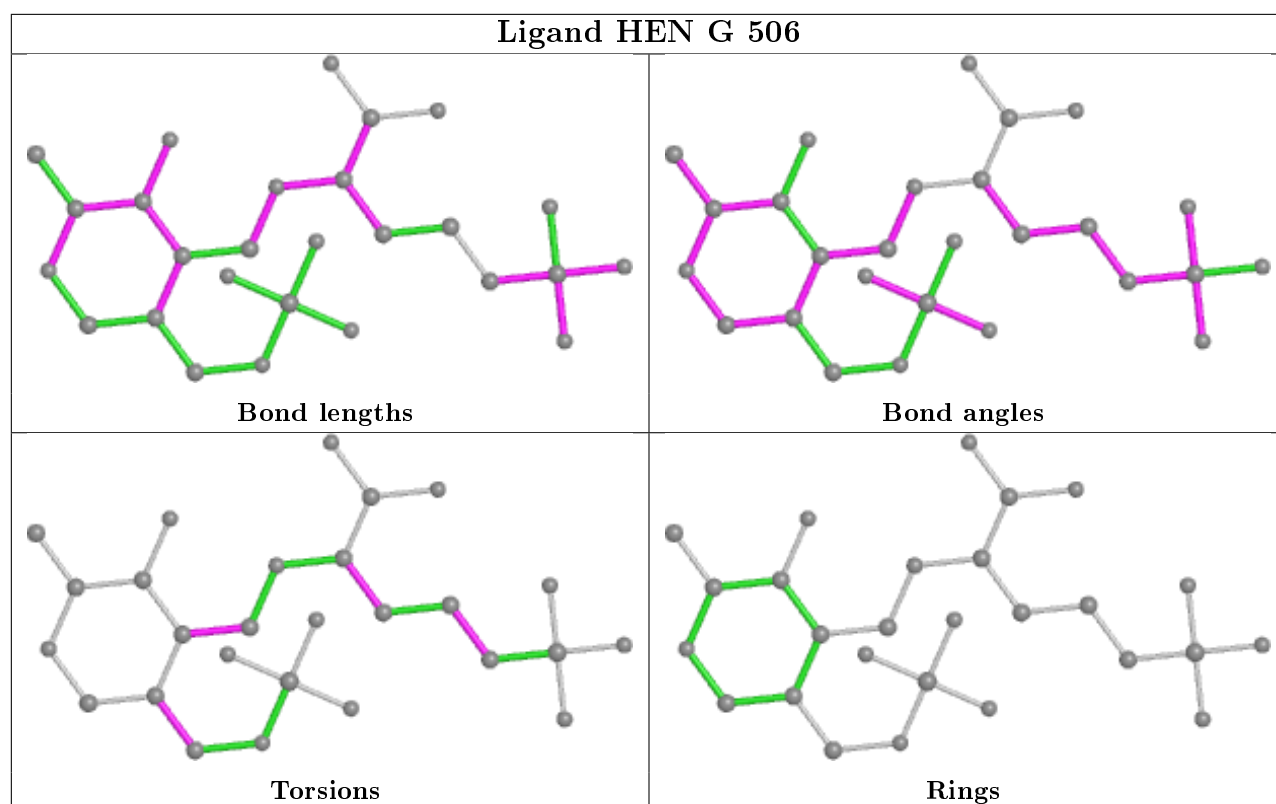
Ligand HEN L 511

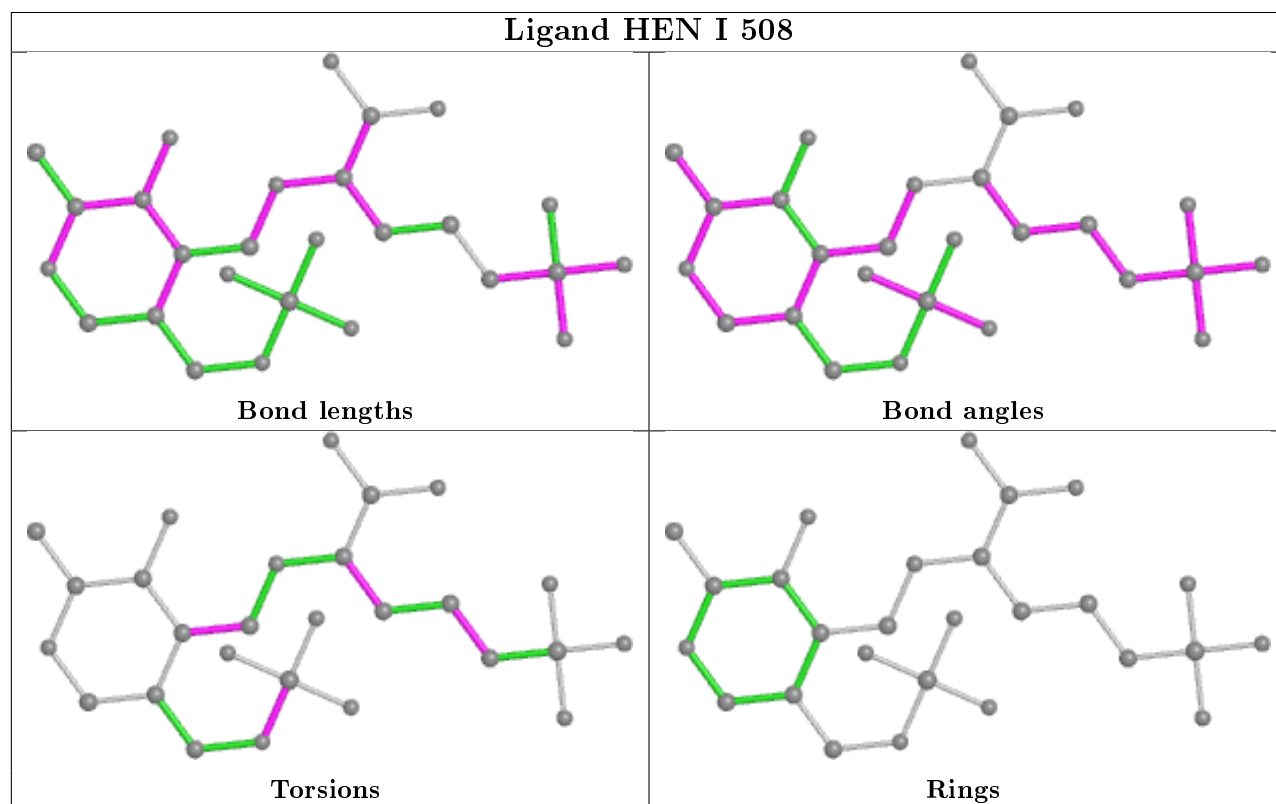
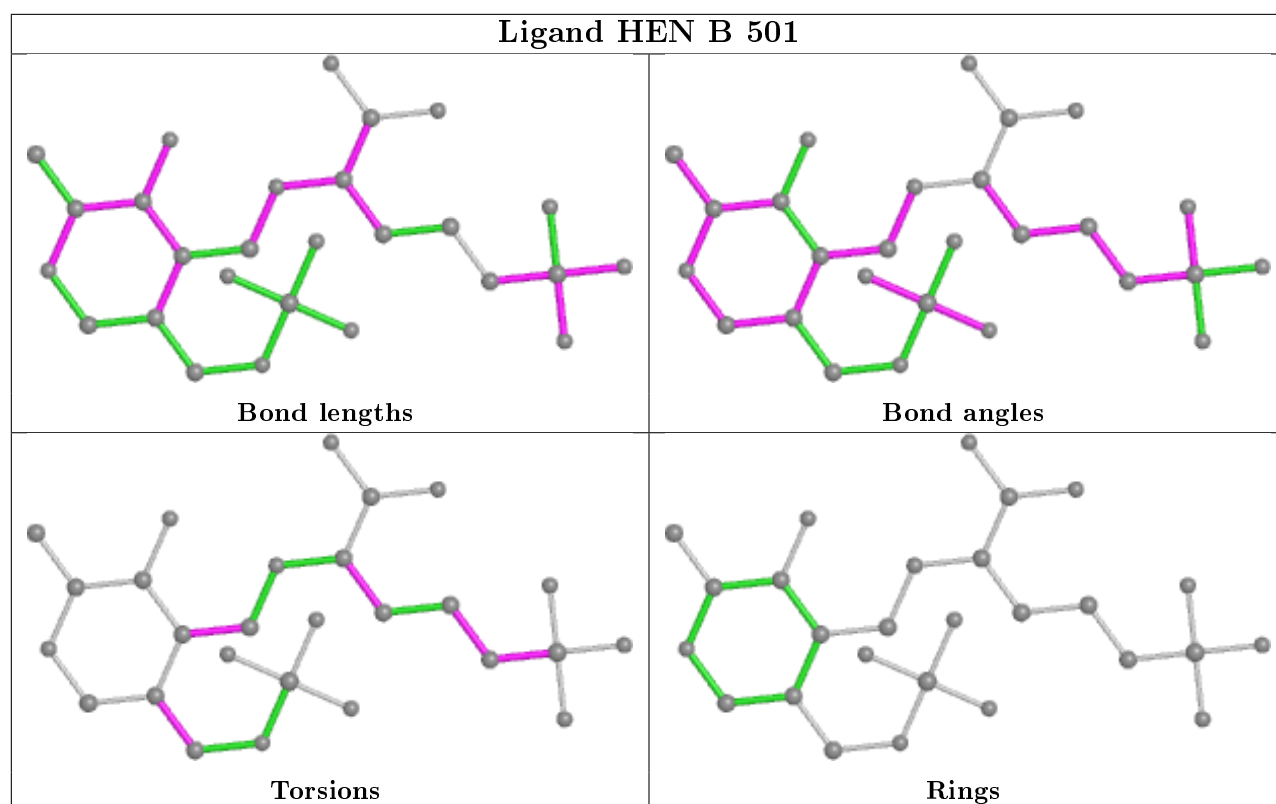


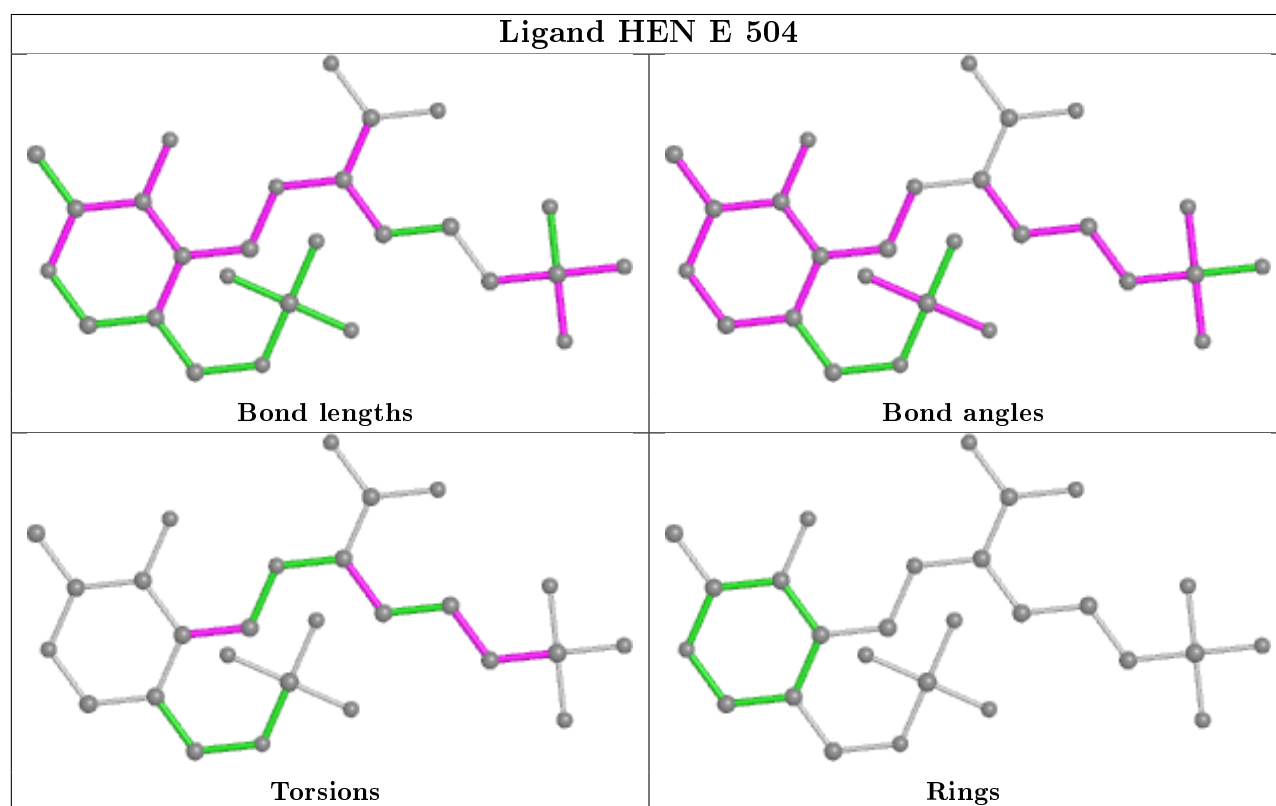
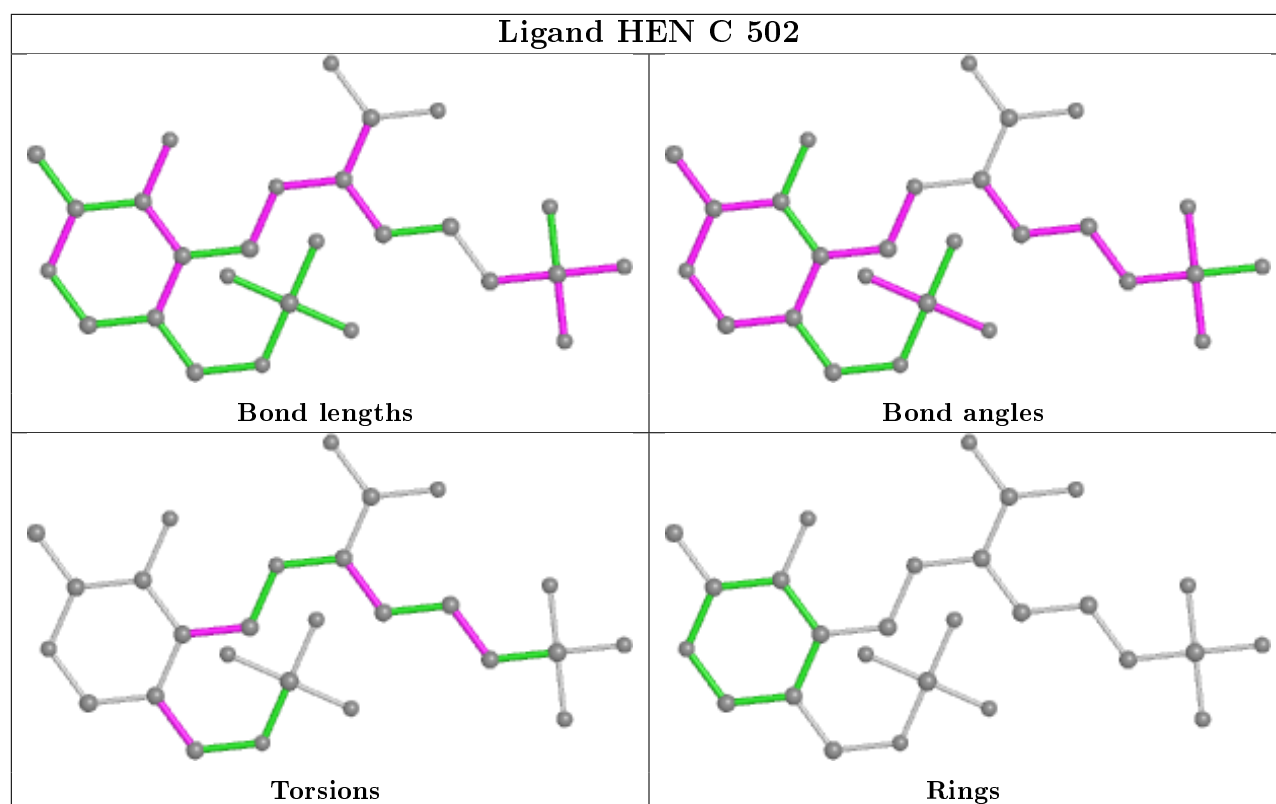
Ligand HEN A 500

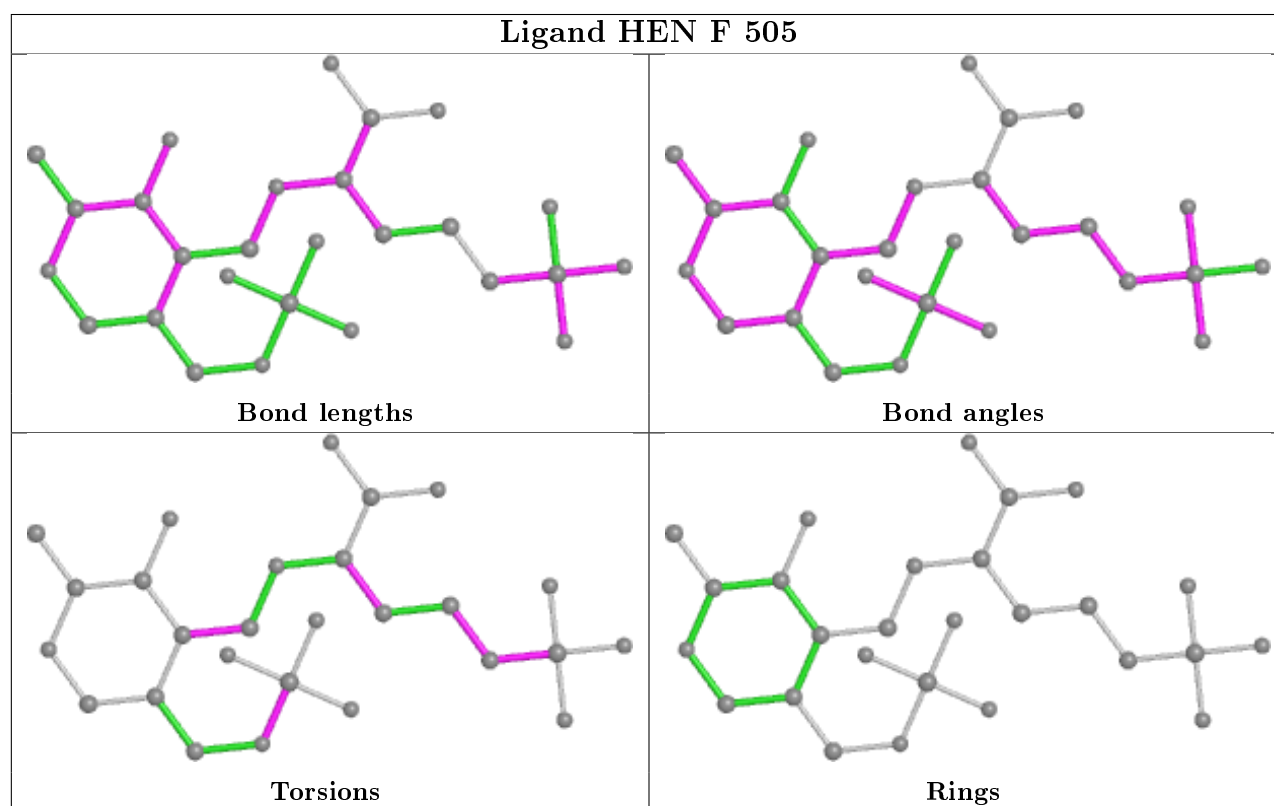
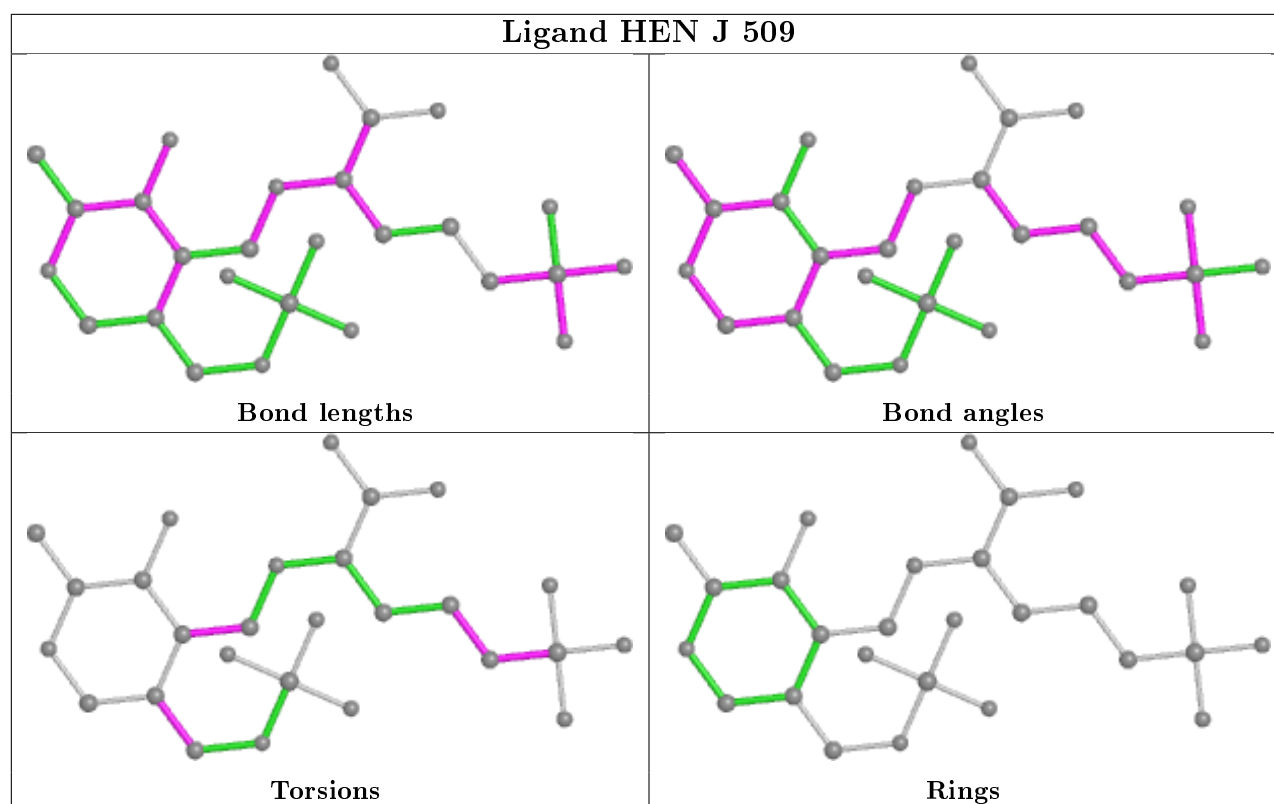












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

6.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.