



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 9, 2020 – 07:15 PM BST

PDB ID : 2DR0
Title : Crystal structure of human carboxylesterase in complex with taurocholate
Authors : Bencharit, S.; Redinbo, M.R.
Deposited on : 2006-06-02
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)
Xtrriage (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) : 2.13.1

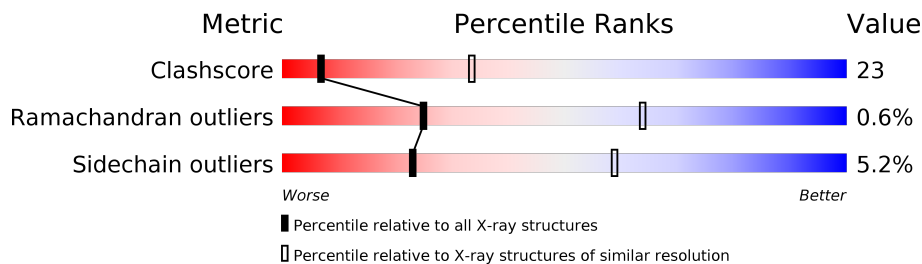
1 Overall quality at a glance

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	542	
1	B	542	
1	C	542	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NAG	C	379	X	-	-	-
5	TCH	A	101	X	-	-	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	TCH	A	102	X	-	X	-
5	TCH	B	201	X	-	-	-
5	TCH	B	202	X	-	X	-
5	TCH	C	301	X	-	-	-
5	TCH	C	302	X	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 12988 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.

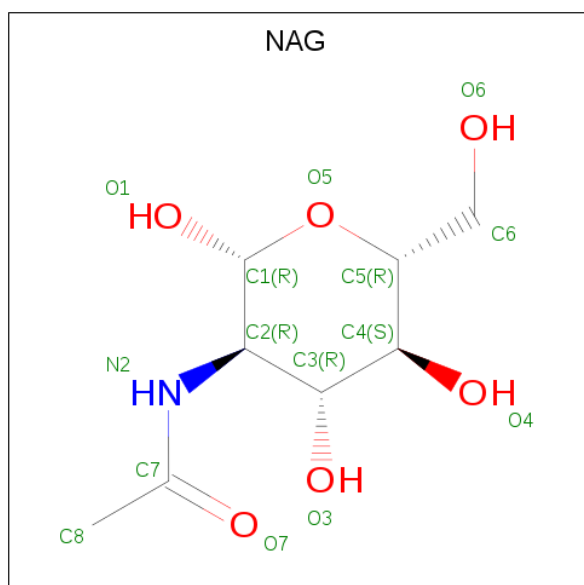
- Molecule 1 is a protein called Liver carboxylesterase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	532	Total 4130	C 2662	N 685	O 763	S 20	0	0	0
1	B	532	Total 4130	C 2662	N 685	O 763	S 20	0	0	0
1	C	532	Total 4130	C 2662	N 685	O 763	S 20	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

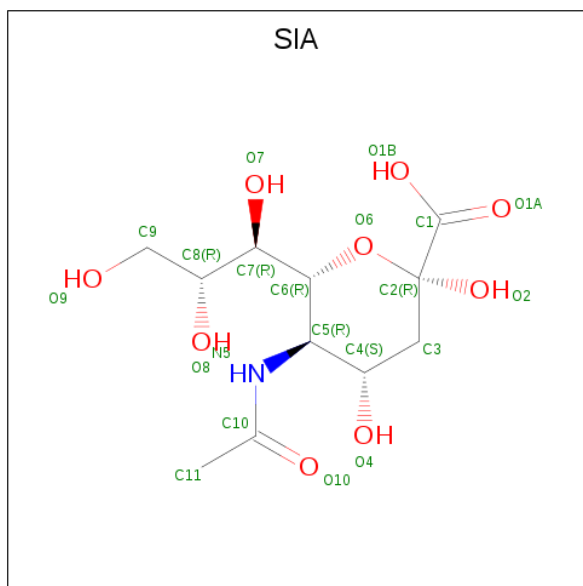
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLN	deletion	UNP P23141
B	?	-	GLN	deletion	UNP P23141
C	?	-	GLN	deletion	UNP P23141

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



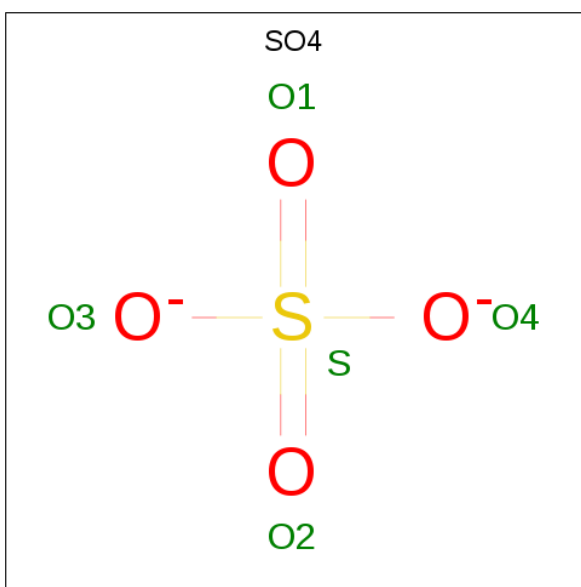
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total 14	C 8	N 1	O 5	0	0
2	B	1	Total 14	C 8	N 1	O 5	0	0
2	C	1	Total 14	C 8	N 1	O 5	0	0

- Molecule 3 is N-acetyl-alpha-neuraminic acid (three-letter code: SIA) (formula: C₁₁H₁₉NO₉).



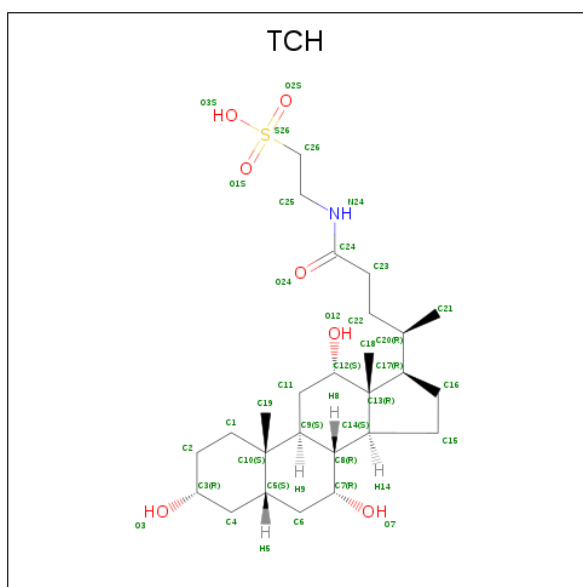
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	Total 21	C 11	N 1	O 9	0	0
3	B	1	Total 21	C 11	N 1	O 9	0	0
3	C	1	Total 21	C 11	N 1	O 9	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		

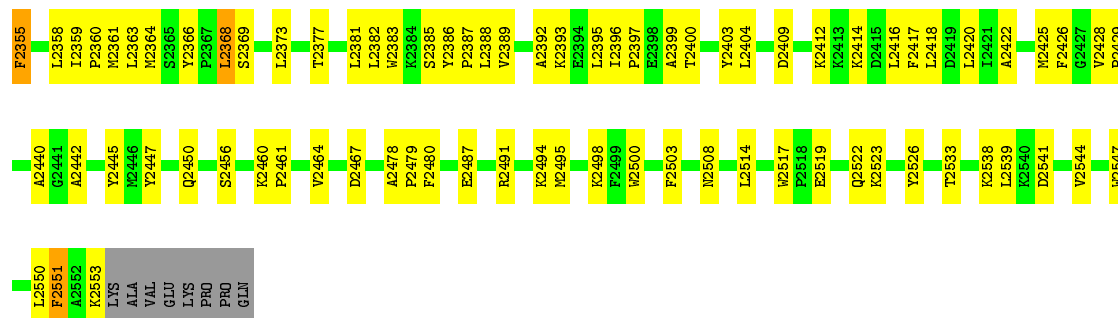
- Molecule 5 is TAUROCHOLIC ACID (three-letter code: TCH) (formula: $C_{26}H_{45}NO_7S$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
5	A	1	Total	C	N	O	S	0	0
			35	26	1	7	1		
5	A	1	Total	C	N	O	S	0	0
			35	26	1	7	1		
5	B	1	Total	C	N	O	S	0	0
			35	26	1	7	1		
5	B	1	Total	C	N	O	S	0	0
			35	26	1	7	1		
5	C	1	Total	C	N	O	S	0	0
			35	26	1	7	1		
5	C	1	Total	C	N	O	S	0	0
			35	26	1	7	1		

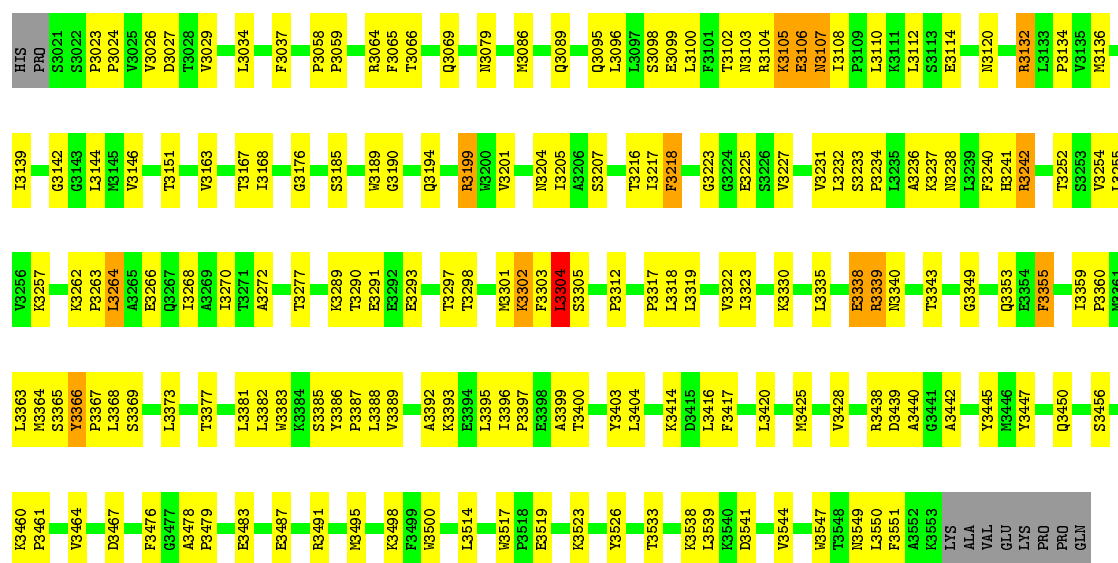
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	104	Total	O	0	0
			104	104		
6	B	72	Total	O	0	0
			72	72		
6	C	77	Total	O	0	0
			77	77		



- Molecule 1: Liver carboxylesterase 1

Chain C: 66% 30%



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	55.42Å 179.95Å 201.09Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.61 – 3.20	Depositor
% Data completeness (in resolution range)	98.6 (30.61-3.20)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.14	Depositor
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.219 , 0.255	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	12988	wwPDB-VP
Average B, all atoms (Å ²)	26.0	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: SIA, NAG, TCH, SO4

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	0.49	2/4236 (0.0%)	0.61	0/5754
1	B	0.44	0/4236	0.61	2/5754 (0.0%)
1	C	0.46	1/4236 (0.0%)	0.61	1/5754 (0.0%)
All	All	0.46	3/12708 (0.0%)	0.61	3/17262 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1549	ASN	CG-OD1	-9.65	1.02	1.24
1	A	1549	ASN	CG-ND2	-9.52	1.09	1.32
1	C	3549	ASN	CG-OD1	-5.01	1.12	1.24

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	2303	PHE	N-CA-C	6.79	129.34	111.00
1	C	3304	LEU	CA-CB-CG	-6.53	100.29	115.30
1	B	2304	LEU	CA-CB-CG	-5.45	102.77	115.30

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	4130	0	4130	179	0
1	B	4130	0	4131	197	0
1	C	4130	0	4130	210	0
2	A	14	0	13	1	0
2	B	14	0	13	0	0
2	C	14	0	13	0	0
3	A	21	0	18	2	0
3	B	21	0	18	6	0
3	C	21	0	18	5	0
4	A	10	0	0	0	0
4	B	10	0	0	0	0
4	C	10	0	0	1	0
5	A	70	0	87	31	0
5	B	70	0	87	39	0
5	C	70	0	87	48	0
6	A	104	0	0	11	0
6	B	72	0	0	13	0
6	C	77	0	0	11	0
All	All	12988	0	12745	589	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 23.

The worst 5 of 589 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:C:3252:THR:HG21	5:C:302:TCH:O3	1.33	1.22
1:A:1304:LEU:HD13	5:A:102:TCH:C18	1.69	1.22
1:C:3255:LEU:HG	5:C:302:TCH:H2	1.15	1.13
1:C:3301:MET:HB2	1:C:3303:PHE:CZ	1.87	1.08
1:C:3255:LEU:HG	5:C:302:TCH:C2	1.84	1.08

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	530/542 (98%)	473 (89%)	54 (10%)	3 (1%)	25	64
1	B	530/542 (98%)	473 (89%)	53 (10%)	4 (1%)	19	58
1	C	530/542 (98%)	467 (88%)	60 (11%)	3 (1%)	25	64
All	All	1590/1626 (98%)	1413 (89%)	167 (10%)	10 (1%)	25	64

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	3302	LYS
1	B	2185	SER
1	C	3185	SER
1	C	3304	LEU
1	A	1185	SER

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	448/457 (98%)	423 (94%)	25 (6%)	21	57
1	B	448/457 (98%)	426 (95%)	22 (5%)	25	61
1	C	448/457 (98%)	425 (95%)	23 (5%)	24	60
All	All	1344/1371 (98%)	1274 (95%)	70 (5%)	23	59

5 of 70 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	2132	ARG
1	B	2339	ARG
1	C	3366	TYR
1	B	2151	THR
1	B	2242	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1030	HIS
1	C	3030	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

18 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$
4	SO4	B	285	-	4,4,4	0.31	0	6,6,6	0.15	0
3	SIA	C	382	-	18,21,21	0.98	1 (5%)	21,31,31	0.70	1 (4%)
4	SO4	A	184	-	4,4,4	0.27	0	6,6,6	0.15	0
4	SO4	A	284	-	4,4,4	0.33	0	6,6,6	0.19	0
4	SO4	C	384	-	4,4,4	0.33	0	6,6,6	0.21	0
2	NAG	B	279	1	14,14,15	0.81	1 (7%)	17,19,21	0.71	0
4	SO4	C	185	-	4,4,4	0.33	0	6,6,6	0.17	0
5	TCH	B	201	-	38,38,38	2.79	20 (52%)	59,60,60	3.75	35 (59%)
5	TCH	A	102	-	38,38,38	2.96	18 (47%)	59,60,60	8.78	41 (69%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	A	179	1	14,14,15	0.62	0	17,19,21	0.66	0
3	SIA	A	182	-	18,21,21	0.87	0	21,31,31	0.89	1 (4%)
2	NAG	C	379	1	14,14,15	0.77	0	17,19,21	0.82	1 (5%)
5	TCH	B	202	-	38,38,38	2.97	17 (44%)	59,60,60	8.78	42 (71%)
5	TCH	C	301	-	38,38,38	2.81	19 (50%)	59,60,60	3.77	39 (66%)
5	TCH	A	101	-	38,38,38	2.76	19 (50%)	59,60,60	3.76	34 (57%)
5	TCH	C	302	-	38,38,38	3.33	19 (50%)	59,60,60	8.87	42 (71%)
3	SIA	B	282	-	18,21,21	1.18	2 (11%)	21,31,31	1.48	2 (9%)
4	SO4	B	385	-	4,4,4	0.34	0	6,6,6	0.26	0

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
5	TCH	A	102	-	4/4/13/14	9/16/81/81	0/4/4/4
2	NAG	A	179	1	-	4/6/23/26	0/1/1/1
2	NAG	B	279	1	-	2/6/23/26	0/1/1/1
3	SIA	A	182	-	-	6/14/38/38	0/1/1/1
5	TCH	B	201	-	4/4/13/14	9/16/81/81	0/4/4/4
5	TCH	C	301	-	4/4/13/14	9/16/81/81	0/4/4/4
3	SIA	C	382	-	-	9/14/38/38	0/1/1/1
2	NAG	C	379	1	1/1/5/7	6/6/23/26	0/1/1/1
5	TCH	B	202	-	4/4/13/14	10/16/81/81	0/4/4/4
5	TCH	A	101	-	4/4/13/14	9/16/81/81	0/4/4/4
5	TCH	C	302	-	4/4/13/14	8/16/81/81	0/4/4/4
3	SIA	B	282	-	-	7/14/38/38	0/1/1/1

The worst 5 of 116 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	302	TCH	C23-C24	9.80	1.69	1.51
5	A	102	TCH	O24-C24	7.43	1.38	1.23
5	B	201	TCH	C13-C12	6.42	1.64	1.54
5	C	301	TCH	C13-C12	6.38	1.64	1.54
5	C	301	TCH	C11-C12	6.19	1.63	1.53

The worst 5 of 238 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	A	102	TCH	O2S-S26-C26	55.55	173.81	106.92
5	B	202	TCH	O2S-S26-C26	54.96	173.09	106.92
5	C	302	TCH	O2S-S26-C26	53.54	171.39	106.92
5	C	302	TCH	O1S-S26-C26	-15.57	88.17	106.92
5	A	102	TCH	O1S-S26-C26	-15.08	88.76	106.92

5 of 25 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
5	C	302	TCH	C5
5	C	302	TCH	C3
5	C	302	TCH	C20
5	C	302	TCH	C9
5	B	201	TCH	C5

5 of 88 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	302	TCH	O24-C24-N24-C25
5	C	302	TCH	N24-C25-C26-S26
5	C	302	TCH	C25-C26-S26-O1S
2	B	279	NAG	O7-C7-N2-C2
3	A	182	SIA	C5-C6-C7-C8

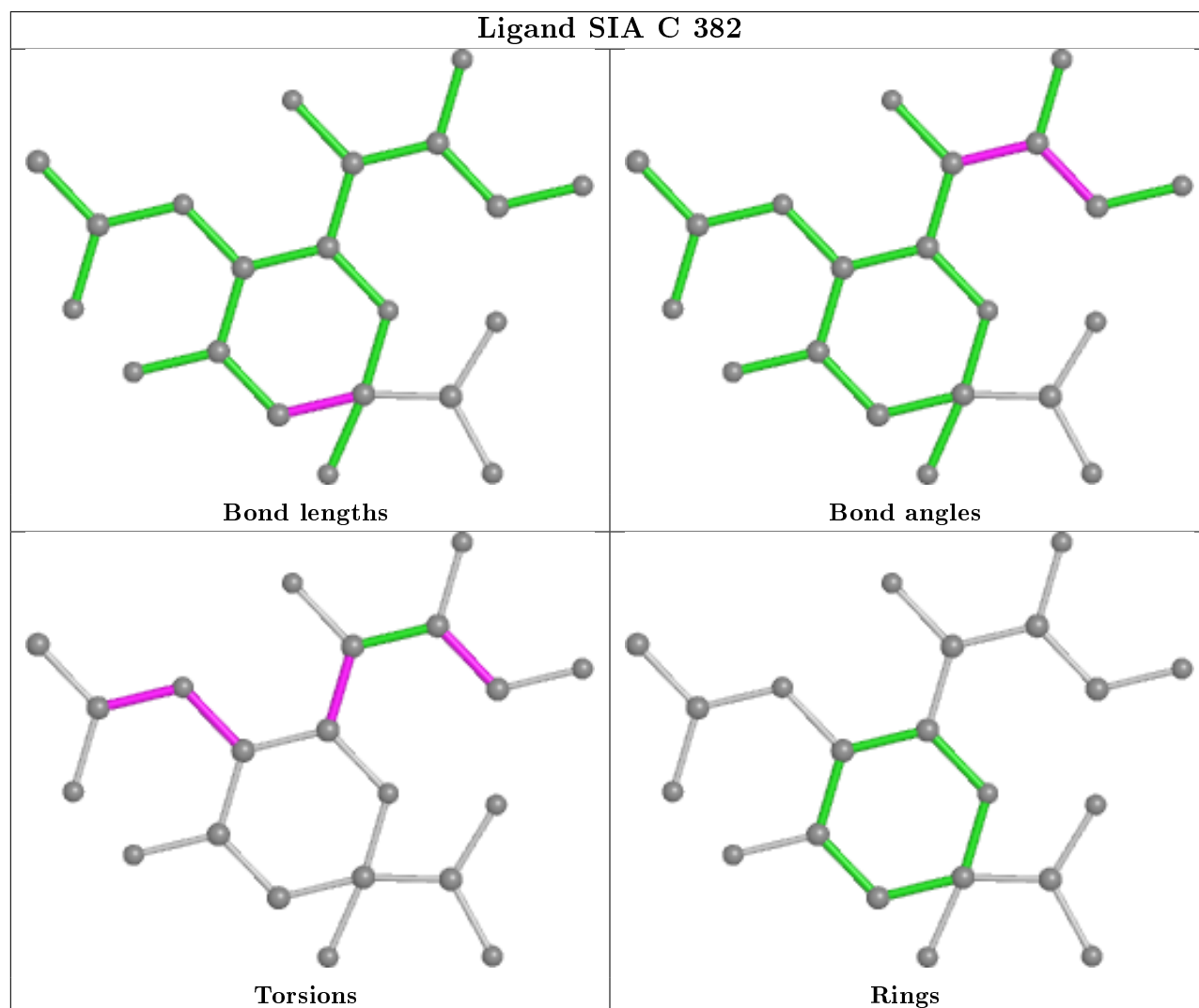
There are no ring outliers.

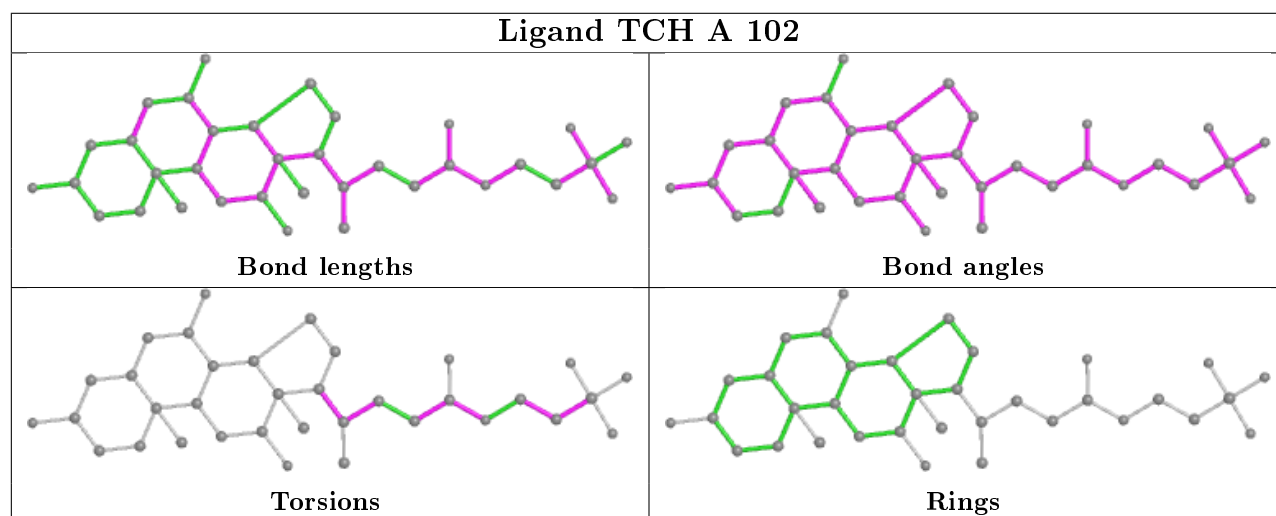
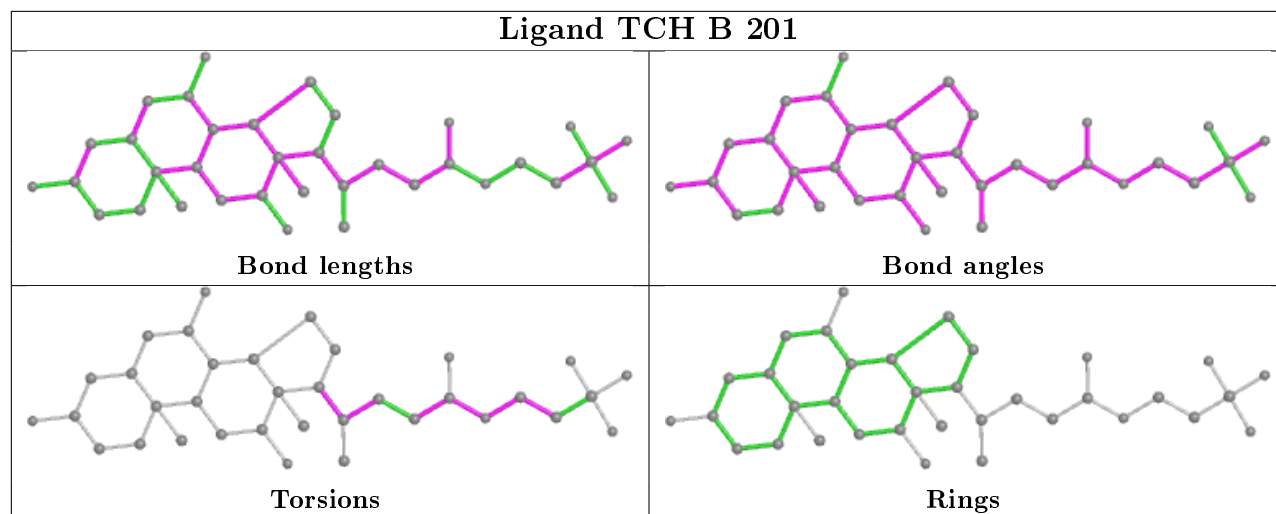
11 monomers are involved in 133 short contacts:

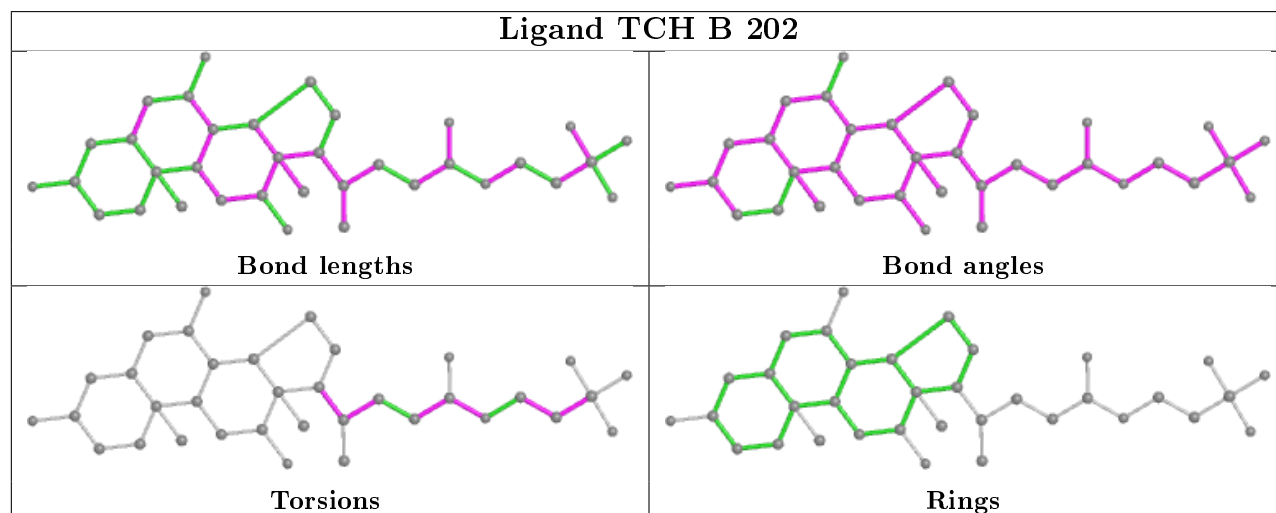
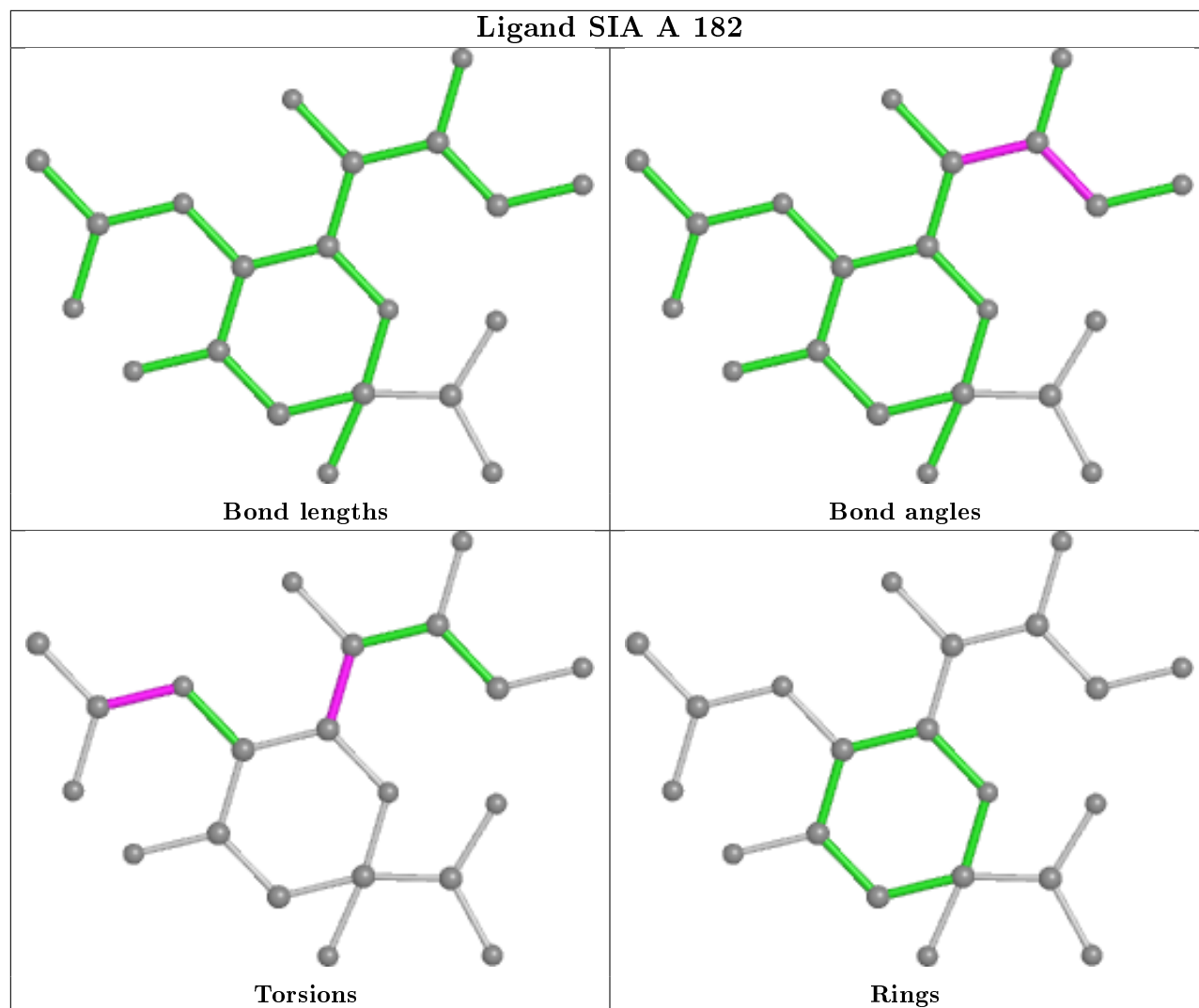
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	382	SIA	5	0
4	C	185	SO4	1	0
5	B	201	TCH	5	0
5	A	102	TCH	26	0
2	A	179	NAG	1	0
3	A	182	SIA	2	0
5	B	202	TCH	34	0
5	C	301	TCH	7	0
5	A	101	TCH	5	0
5	C	302	TCH	41	0
3	B	282	SIA	6	0

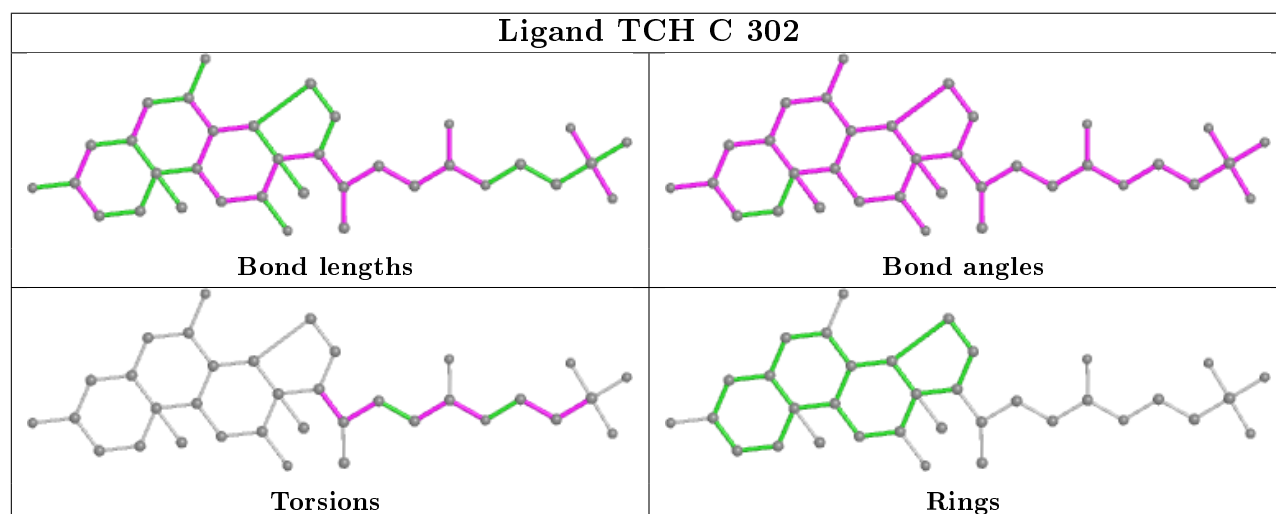
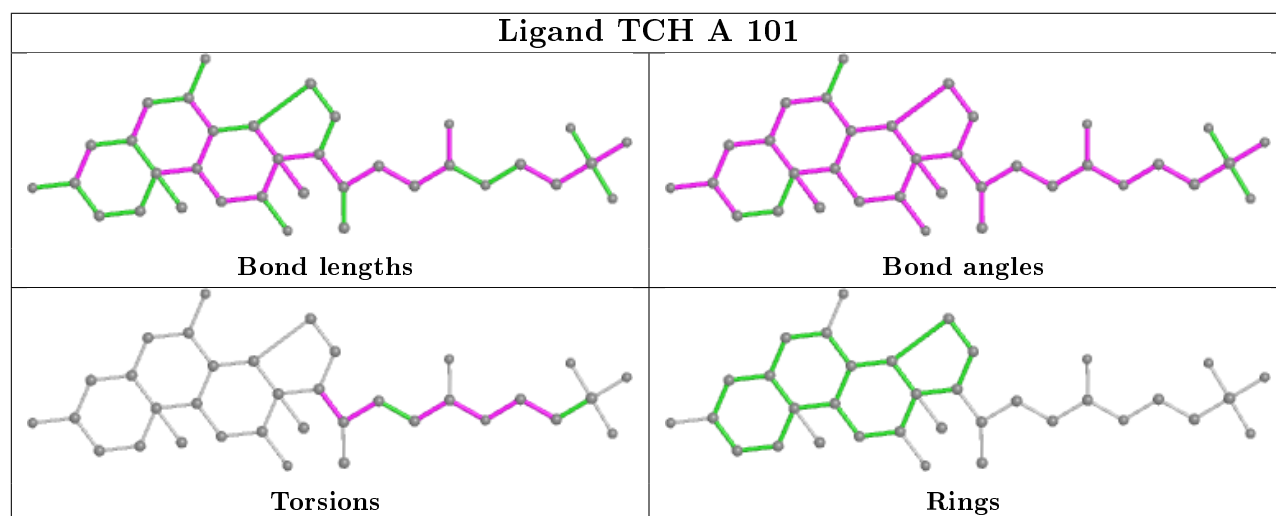
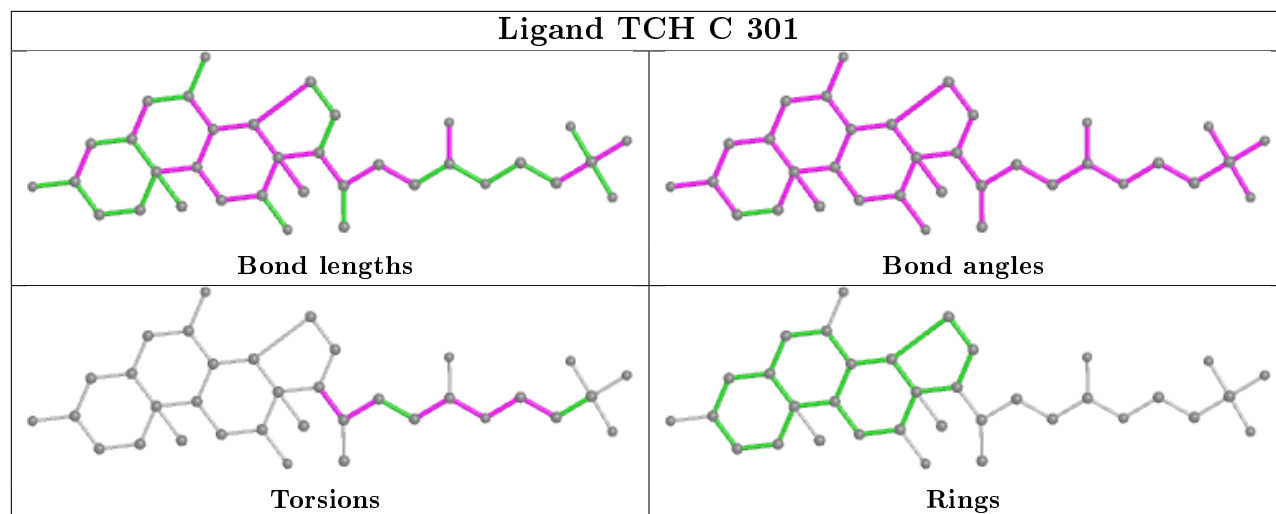
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

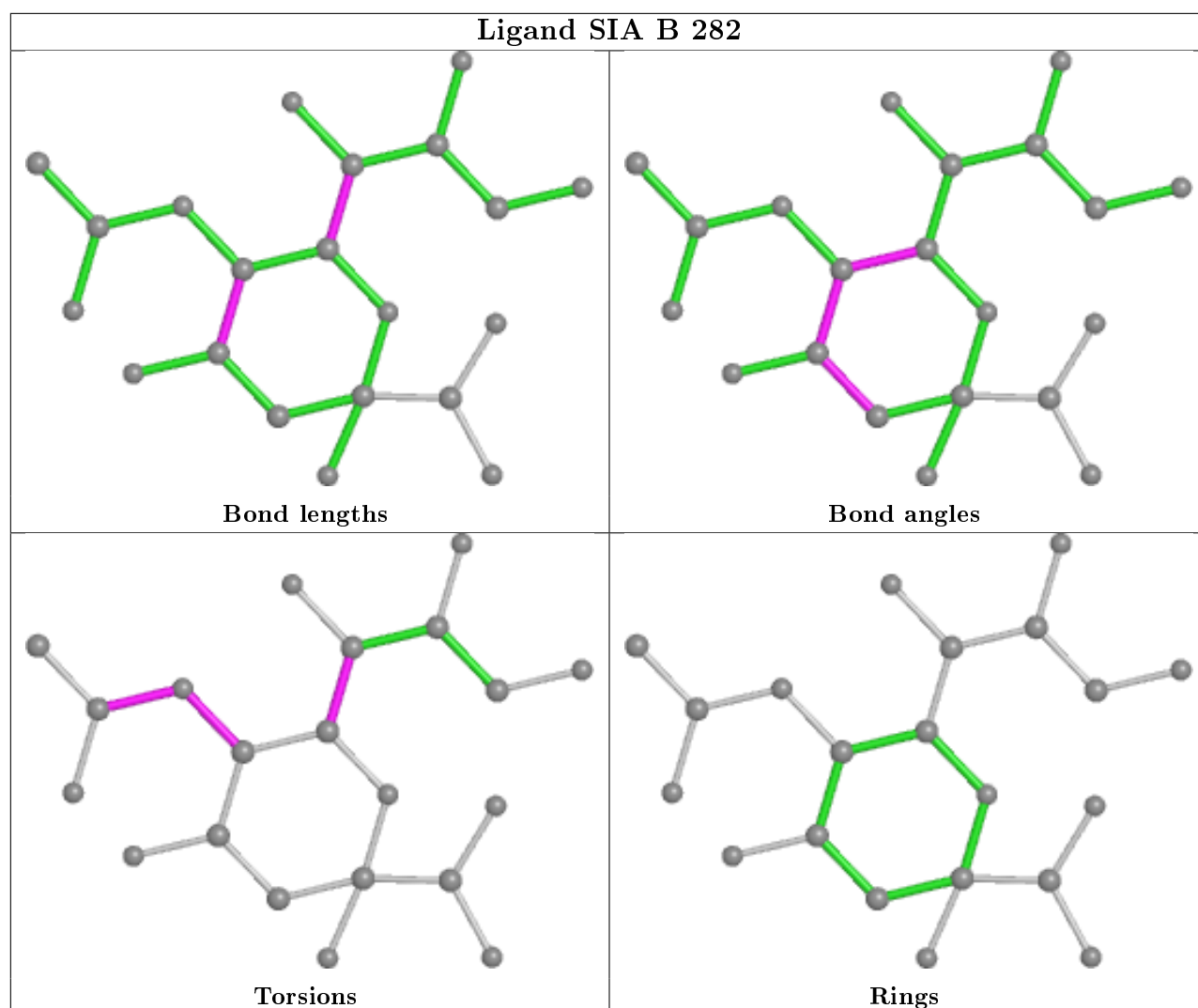
bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 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.











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

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.