WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

May 22, 2020 – 04:58 am BST

PDB ID	:	1KPH
Title	:	Crystal Structure of mycolic acid cyclopropane synthase CmaA1 complexed with SAH and DDDMAB
Authors	:	Huang, C.-C.; Smith, C.V.; Jacobs Jr., W.R.; Glickman, M.S.; Sacchettini, J.C.; TB Structural Genomics Consortium (TBSGC)
Deposited on	:	2001-12-30
Resolution	:	2.00 Å(reported)

The following versions of software and data (see references (i)) 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 2.00 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.

Percentile relative to all X-ray structures

Percentile relative to X-ray structures of similar resolution
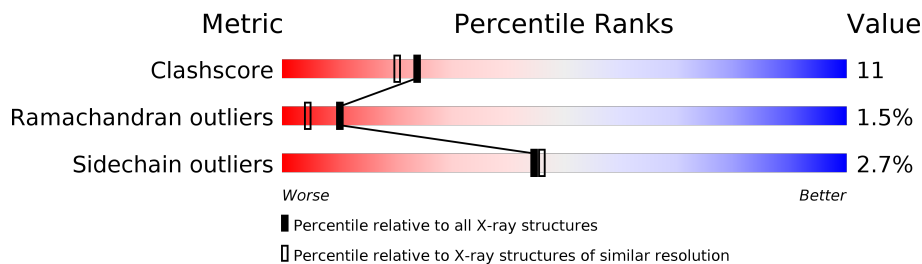
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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 <=5%

Note EDS was not executed.

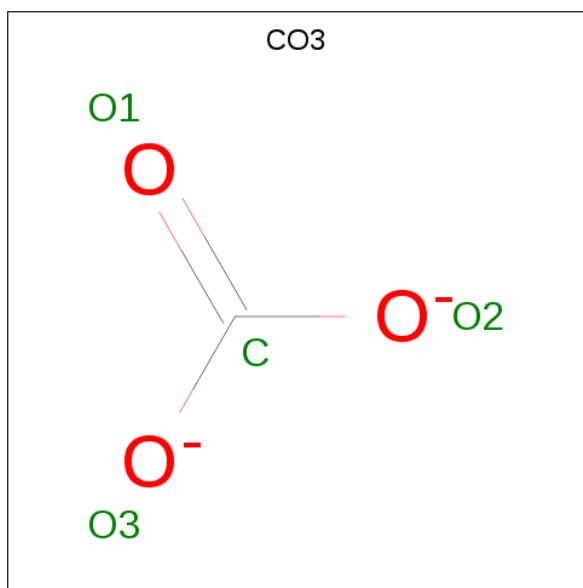| Mol	Chain	Length	Quality of chain
1	A	287	71% 25%
1	B	287	80% 18%
1	C	287	78% 21%
1	D	287	79% 18%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 10001 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 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	283	Total	C	N	O	S	0	0	0
			2252	1443	386	409	14			
1	B	285	Total	C	N	O	S	0	0	0
			2269	1452	388	415	14			
1	C	285	Total	C	N	O	S	0	0	0
			2269	1452	388	415	14			
1	D	285	Total	C	N	O	S	0	0	0
			2269	1452	388	415	14			

- Molecule 2 is CARBONATE ION (three-letter code: CO3) (formula: CO_3).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	1	3		
2	B	1	Total	C	O	0	0
			4	1	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	C	1	Total C O 4 1 3			0	0
2	D	1	Total C O 4 1 3			0	0

- Molecule 3 is S-ADENOSYL-L-HOMOCYSTEINE (three-letter code: SAH) (formula: $C_{14}H_{20}N_6O_5S$).

SAH
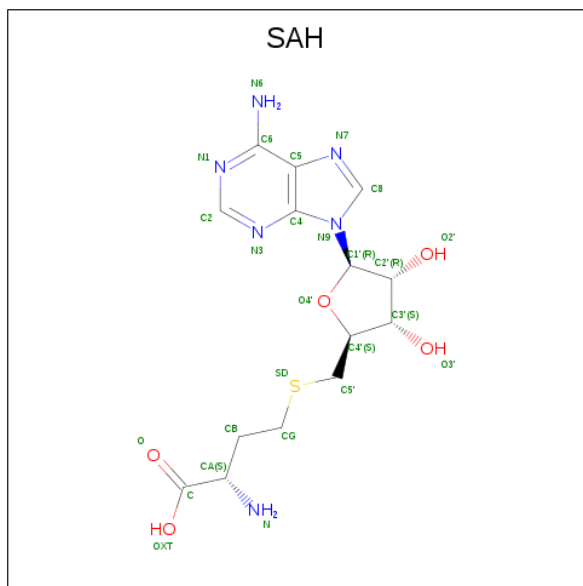
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total C N O 24 14 6 4					0	0
3	B	1	Total C N O S 26 14 6 5 1					0	0
3	C	1	Total C N O S 26 14 6 5 1					0	0
3	D	1	Total C N O S 26 14 6 5 1					0	0

- Molecule 4 is DIDECYL-DIMETHYL-AMMONIUM (three-letter code: 10A) (formula: $C_{22}H_{48}N$).
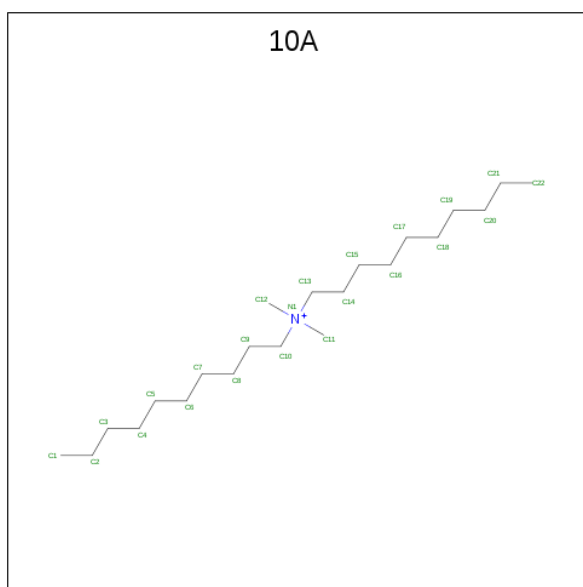
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 23	C 22	N 1	0	0
4	B	1	Total 23	C 22	N 1	0	0
4	C	1	Total 23	C 22	N 1	0	0
4	D	1	Total 23	C 22	N 1	0	0

- Molecule 5 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	156	Total 156	O 156	0	0
5	B	185	Total 185	O 185	0	0
5	C	210	Total 210	O 210	0	0
5	D	181	Total 181	O 181	0	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
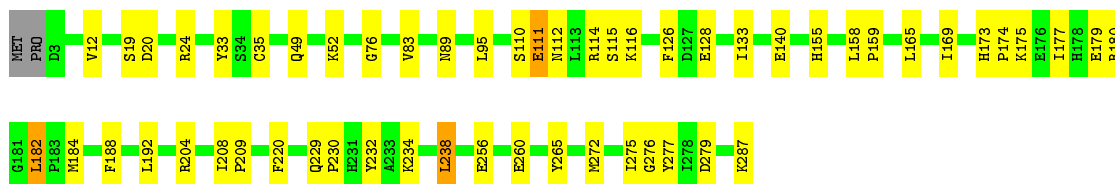
Note EDS was not executed.

• Molecule 1: CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1

Chain A:
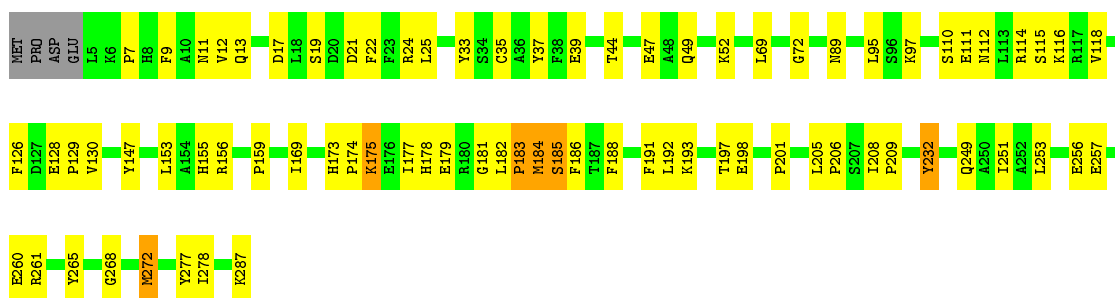
• Molecule 1: CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1

Chain B:

• Molecule 1: CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1

Chain C:

• Molecule 1: CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1

Chain D:

MET PRO D3 E4 L5 K6 P7 V12 S19 D20 R24 Y33 S34 C35 T44 E47 A48 Q49 K52 A77 T78 M79 V83 N89 L95 V103 V107 N112 L113 R114 S115 L119 F126 D127 E128 I136 L165 L166 H167 P174 K175

E176 I177 H178 E179 R180 G181 L182 P183 M184 S185 F186 T187 F188 L192 V196 L205 I208 P209 M210 Q229 P230 H231 Y232 L243 Q249 M263 K264 Y265 L266 T267 E271 Y277 K287
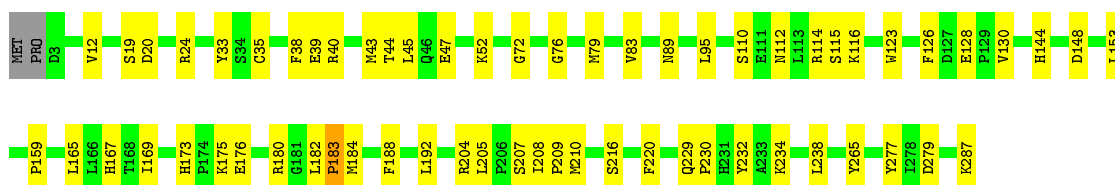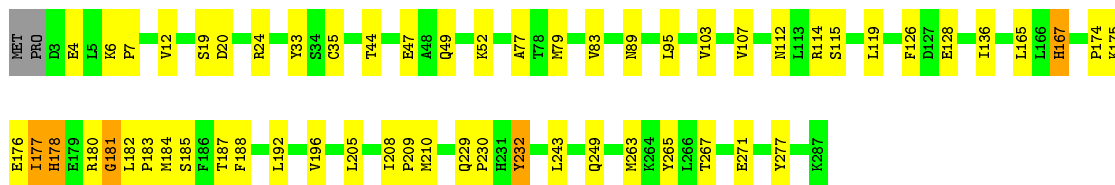
4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α, β, γ	77.62Å 77.62Å 174.88Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.83 – 2.00	Depositor
% Data completeness (in resolution range)	97.0 (29.83-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.03	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.194 , 0.240	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	10001	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: CO3, SAH, 10A

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	0.31	0/2306	0.56	0/3122
1	B	0.32	0/2323	0.59	1/3145 (0.0%)
1	C	0.34	0/2323	0.59	1/3145 (0.0%)
1	D	0.33	0/2323	0.58	0/3145
All	All	0.33	0/9275	0.58	2/12557 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	76	GLY	N-CA-C	5.46	126.76	113.10
1	B	76	GLY	N-CA-C	5.33	126.43	113.10

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	2252	0	2216	67	0
1	B	2269	0	2226	45	0
1	C	2269	0	2226	43	0
1	D	2269	0	2226	49	0
2	A	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	4	0	0	0	0
2	C	4	0	0	0	0
2	D	4	0	0	0	0
3	A	24	0	15	2	0
3	B	26	0	19	0	0
3	C	26	0	19	1	0
3	D	26	0	19	0	0
4	A	23	0	48	4	0
4	B	23	0	48	6	0
4	C	23	0	48	3	0
4	D	23	0	48	1	0
5	A	156	0	0	1	0
5	B	185	0	0	1	0
5	C	210	0	0	2	0
5	D	181	0	0	5	0
All	All	10001	0	9158	205	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 11.

The worst 5 of 205 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:B:89:ASN:HD22	1:B:115:SER:H	1.26	0.83
1:A:205:LEU:HG	4:A:1901:10A:H31	1.62	0.82
1:A:173:HIS:HB3	1:A:175:LYS:NZ	1.98	0.78
1:A:175:LYS:HZ3	1:A:175:LYS:HB2	1.49	0.78
1:C:234:LYS:O	1:C:238:LEU:HD13	1.86	0.76

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	281/287 (98%)	269 (96%)	8 (3%)	4 (1%)	11	5
1	B	283/287 (99%)	273 (96%)	6 (2%)	4 (1%)	11	5
1	C	283/287 (99%)	267 (94%)	12 (4%)	4 (1%)	11	5
1	D	283/287 (99%)	270 (95%)	8 (3%)	5 (2%)	8	3
All	All	1130/1148 (98%)	1079 (96%)	34 (3%)	17 (2%)	10	4

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	19	SER
1	A	185	SER
1	C	19	SER
1	C	180	ARG
1	C	182	LEU

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	239/243 (98%)	231 (97%)	8 (3%)	38	37
1	B	241/243 (99%)	234 (97%)	7 (3%)	42	43
1	C	241/243 (99%)	236 (98%)	5 (2%)	53	57
1	D	241/243 (99%)	235 (98%)	6 (2%)	47	49
All	All	962/972 (99%)	936 (97%)	26 (3%)	44	46

5 of 26 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	204	ARG
1	B	265	TYR
1	D	232	TYR
1	B	232	TYR
1	B	238	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	112	ASN
1	C	31	GLN
1	D	112	ASN
1	B	246	ASN
1	C	13	GLN

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	#$|Z| > 2$
4	10A	D	4901	-	22,22,22	0.59	0	24,24,24	1.36	3 (12%)
3	SAH	C	3900	-	21,28,28	1.47	6 (28%)	20,40,40	0.97	0
2	CO3	C	3902	-	0,3,3	0.00	-	0,3,3	0.00	-
2	CO3	B	2902	-	0,3,3	0.00	-	0,3,3	0.00	-
4	10A	B	2901	-	22,22,22	0.59	0	24,24,24	1.23	2 (8%)
4	10A	C	3901	-	22,22,22	0.62	0	24,24,24	1.21	2 (8%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
3	SAH	D	4900	-	21,28,28	1.51	6 (28%)	20,40,40	0.97	0
4	10A	A	1901	-	22,22,22	0.57	0	24,24,24	1.33	2 (8%)
3	SAH	B	2900	-	21,28,28	1.53	6 (28%)	20,40,40	0.94	0
2	CO3	D	4902	-	0,3,3	0.00	-	0,3,3	0.00	-
3	SAH	A	1900	-	22,25,28	1.80	7 (31%)	18,35,40	1.16	1 (5%)
2	CO3	A	1902	-	0,3,3	0.00	-	0,3,3	0.00	-

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
4	10A	D	4901	-	-	1/22/22/22	-
3	SAH	C	3900	-	-	0/7/31/31	0/3/3/3
4	10A	C	3901	-	-	0/22/22/22	-
3	SAH	D	4900	-	-	0/7/31/31	0/3/3/3
4	10A	A	1901	-	-	0/22/22/22	-
3	SAH	B	2900	-	-	0/7/31/31	0/3/3/3
4	10A	B	2901	-	-	0/22/22/22	-
3	SAH	A	1900	-	-	1/4/24/31	0/3/3/3

The worst 5 of 25 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1900	SAH	OXT-C	-4.17	1.24	1.42
3	A	1900	SAH	C6-C5	3.16	1.55	1.43
3	C	3900	SAH	C6-C5	3.11	1.54	1.43
3	A	1900	SAH	O4'-C1'	3.07	1.45	1.41
3	B	2900	SAH	C6-C5	3.06	1.54	1.43

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1901	10A	C14-C13-N1	3.50	122.78	115.38
4	D	4901	10A	C9-C10-N1	3.46	122.71	115.38
4	C	3901	10A	C9-C10-N1	3.42	122.61	115.38
4	B	2901	10A	C9-C10-N1	3.39	122.56	115.38
4	A	1901	10A	C9-C10-N1	3.33	122.43	115.38

There are no chirality outliers.

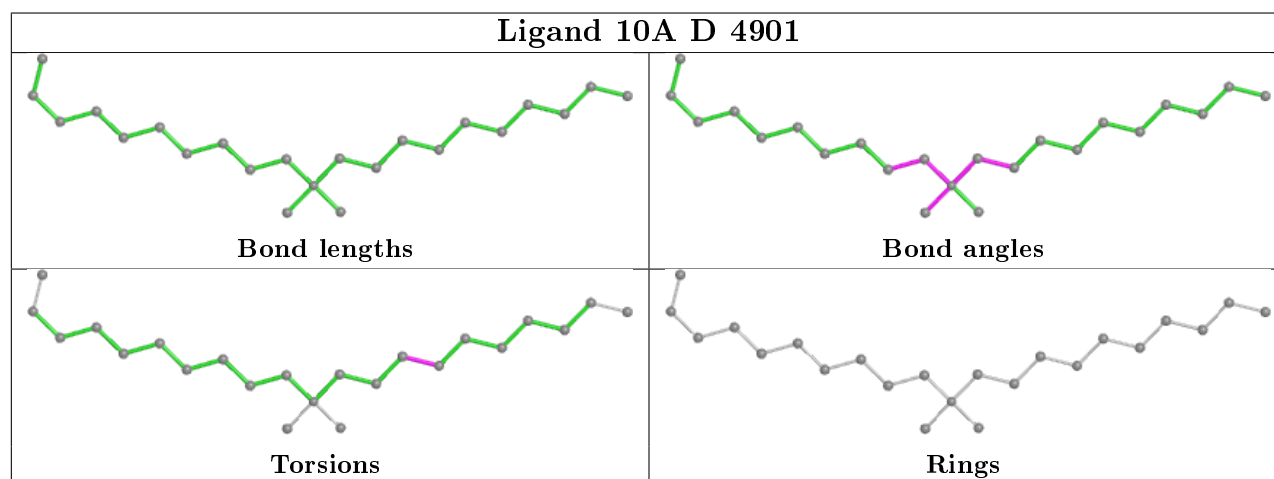All (2) torsion outliers are listed below:

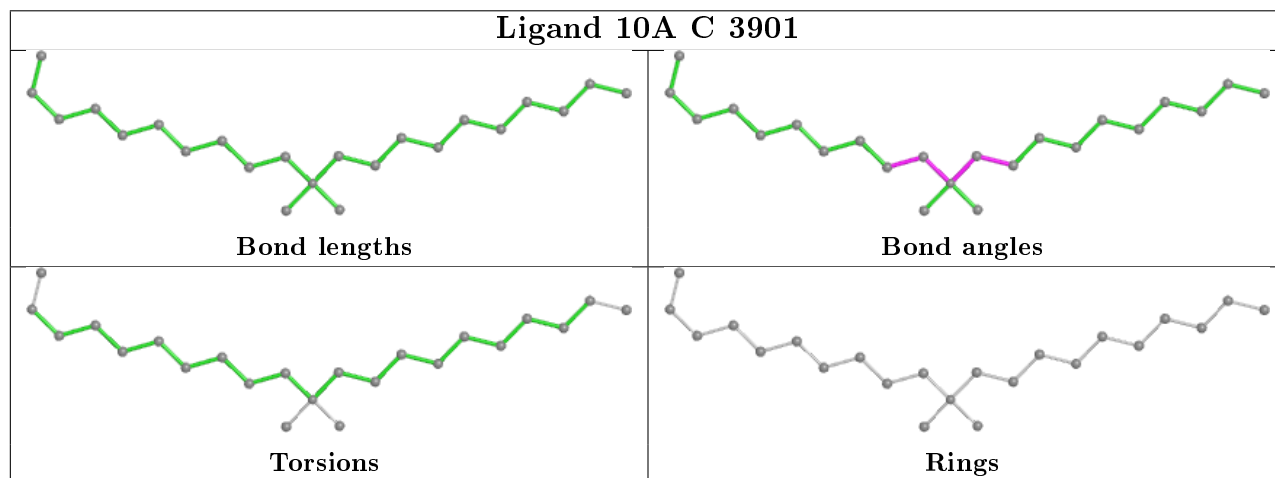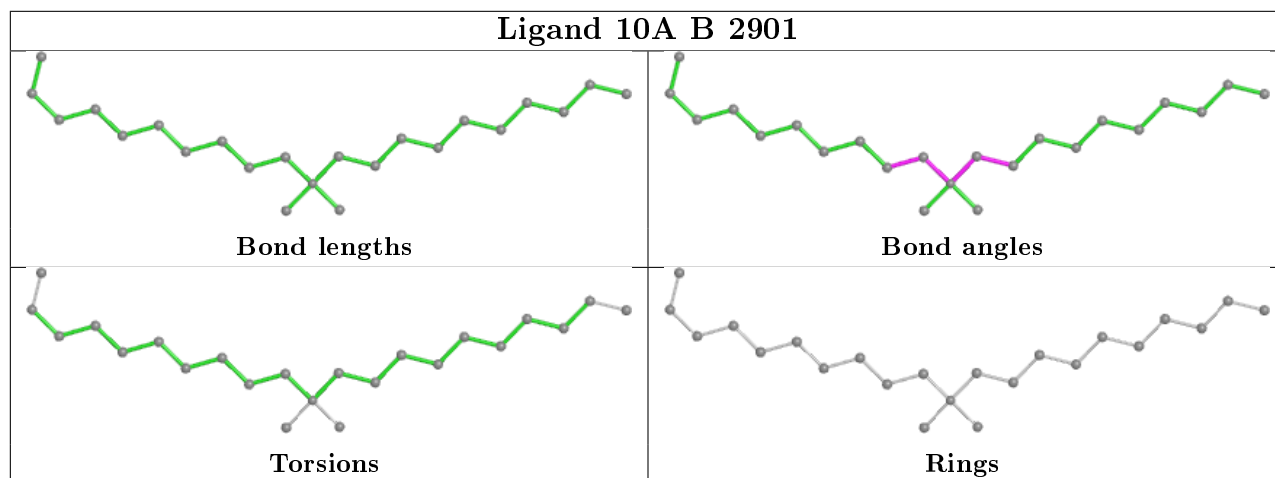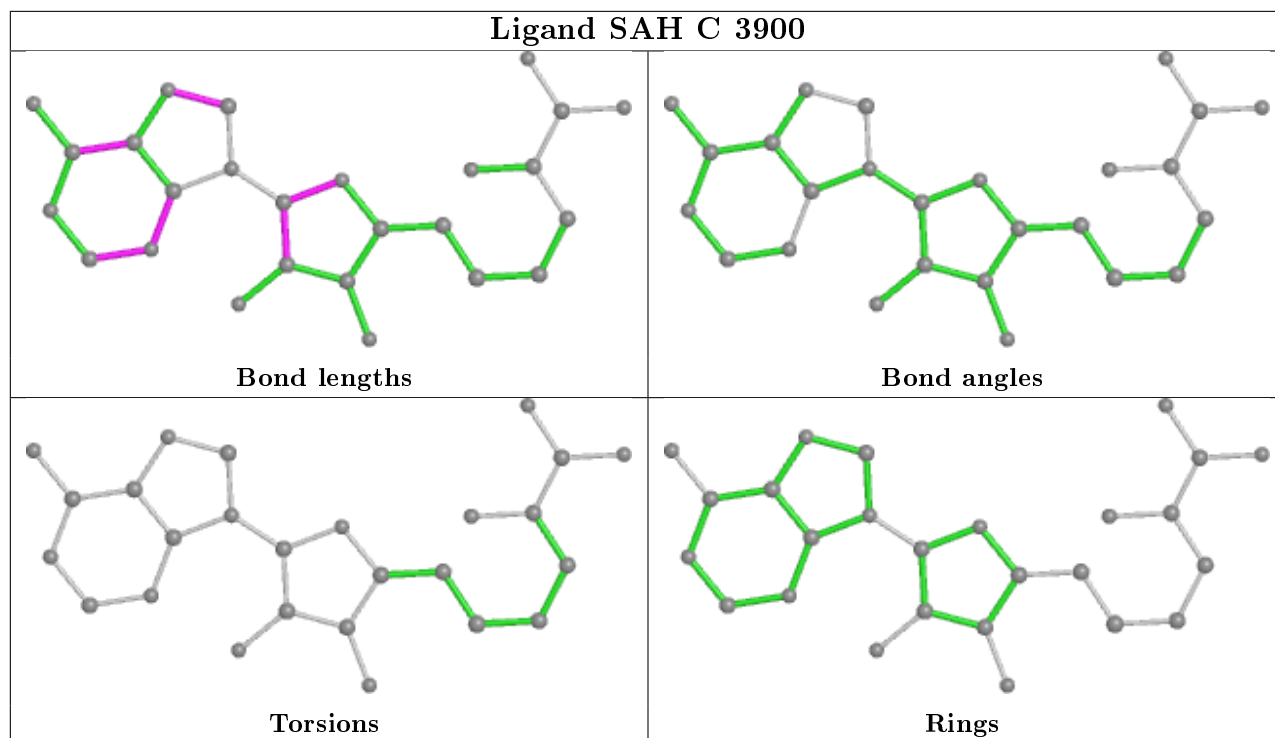| Mol	Chain	Res	Type	Atoms
4	D	4901	10A	C14-C15-C16-C17
3	A	1900	SAH	OXT-C-CA-N

There are no ring outliers.

6 monomers are involved in 17 short contacts:

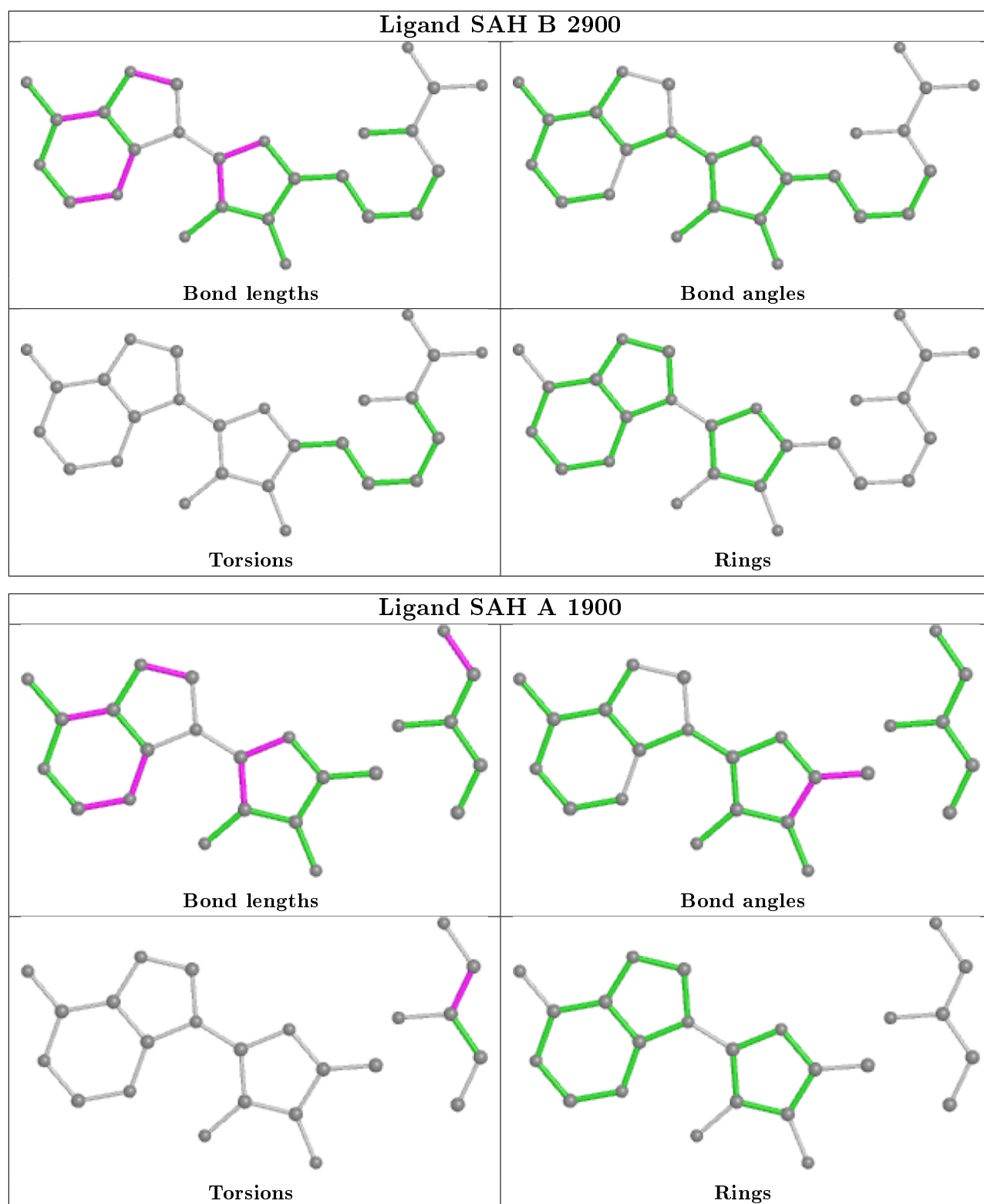| Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	4901	10A	1	0
3	C	3900	SAH	1	0
4	B	2901	10A	6	0
4	C	3901	10A	3	0
4	A	1901	10A	4	0
3	A	1900	SAH	2	0

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 then 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 10A D 4901

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH C 3900

Bond lengths

Bond angles

Torsions

Rings

Ligand 10A B 2901

Bond lengths

Bond angles

Torsions

Rings

Ligand 10A C 3901

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH D 4900

Bond lengths

Bond angles

Torsions

Rings

Ligand 10A A 1901

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH B 2900

Bond lengths

Bond angles

Torsions

Rings

Ligand SAH A 1900

Bond lengths

Bond angles

Torsions

Rings

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 (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.