



wwPDB EM Validation Summary Report i

Jul 16, 2025 – 12:01 PM JST

PDB ID : 8ZB1 / pdb_00008zb1
EMDB ID : EMD-39894
Title : Cryo-EM structure of the C26-FB1-bound Lac1-Lip1 complex
Authors : Xie, T.; Zhang, Z.; Fang, Q.; Gong, X.
Deposited on : 2024-04-25
Resolution : 2.86 Å(reported)

This is a wwPDB EM 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/EMValidationReportHelp>
with specific help available everywhere you see the i symbol.

The types of validation reports are described at
<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references](#) ①) were used in the production of this report:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

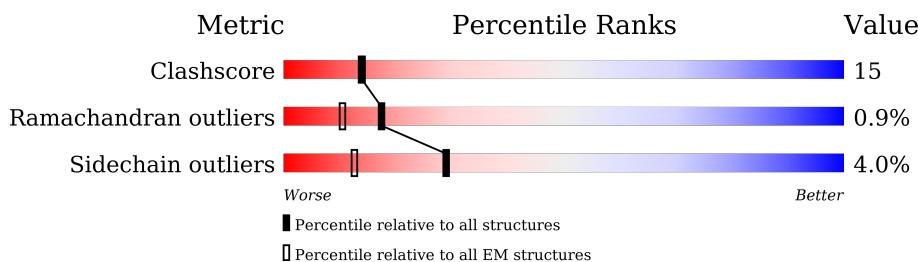
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

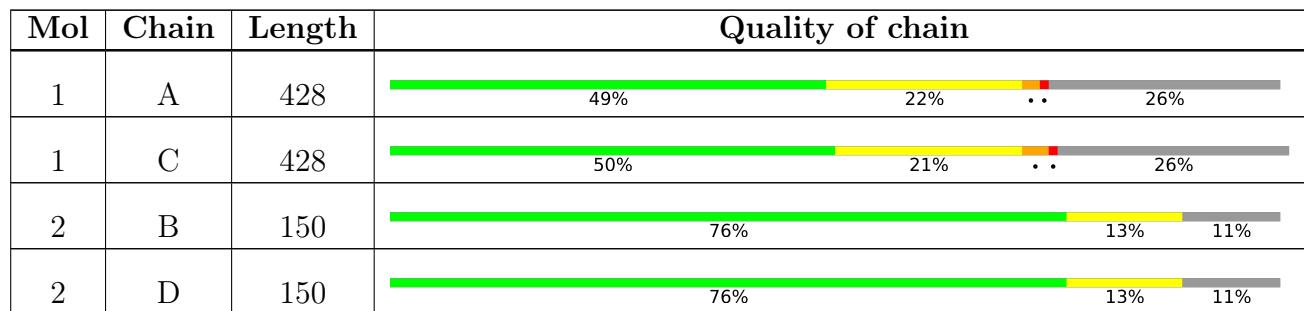
The reported resolution of this entry is 2.86 Å.

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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$



2 Entry composition [\(i\)](#)

There are 4 unique types of molecules in this entry. The entry contains 7756 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Ceramide synthase LAC1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	315	Total	C	N	O	S	0	0
			2636	1783	417	423	13		

Mol	Chain	Residues	Total	C	N	O	S	AltConf	Trace
1	C	315	Total	C	N	O	S	0	0
			2636	1783	417	423	13		

There are 20 discrepancies between the modelled and reference sequences:

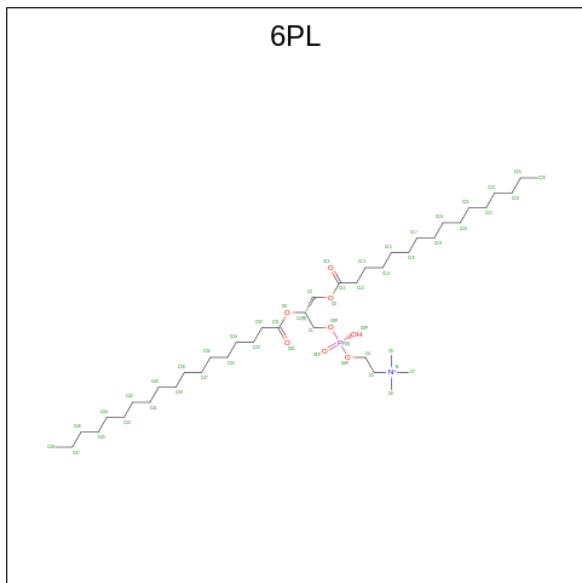
Chain	Residue	Modelled	Actual	Comment	Reference
A	419	LEU	-	expression tag	UNP P28496
A	420	GLU	-	expression tag	UNP P28496
A	421	ASP	-	expression tag	UNP P28496
A	422	TYR	-	expression tag	UNP P28496
A	423	LYS	-	expression tag	UNP P28496
A	424	ASP	-	expression tag	UNP P28496
A	425	ASP	-	expression tag	UNP P28496
A	426	ASP	-	expression tag	UNP P28496
A	427	ASP	-	expression tag	UNP P28496
A	428	LYS	-	expression tag	UNP P28496
C	419	LEU	-	expression tag	UNP P28496
C	420	GLU	-	expression tag	UNP P28496
C	421	ASP	-	expression tag	UNP P28496
C	422	TYR	-	expression tag	UNP P28496
C	423	LYS	-	expression tag	UNP P28496
C	424	ASP	-	expression tag	UNP P28496
C	425	ASP	-	expression tag	UNP P28496
C	426	ASP	-	expression tag	UNP P28496
C	427	ASP	-	expression tag	UNP P28496
C	428	LYS	-	expression tag	UNP P28496

- Molecule 2 is a protein called Ceramide synthase subunit LIP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	133	Total	C	N	O	S	0	0
			1089	703	178	202	6		

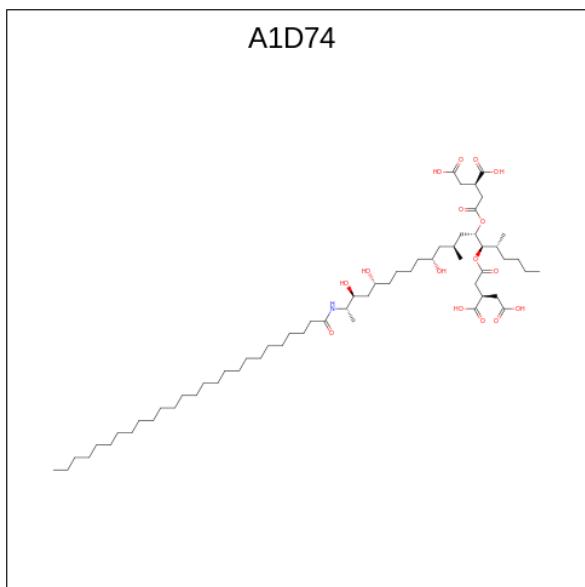
Mol	Chain	Residues	Total	C	N	O	S	AltConf	Trace
2	D	133	Total	C	N	O	S	0	0
			1089	703	178	202	6		

- Molecule 3 is (4S,7R)-4-HYDROXY-N,N,N-TRIMETHYL-9-OXO-7-[(PALMITOYLOXY)METHYL]-3,5,8-TRIOXA-4-PHOSPHAHEXACOSAN-1-AMINIUM 4-OXIDE (CCD ID: 6PL) (formula: C₄₂H₈₅NO₈P).



Mol	Chain	Residues	Atoms			AltConf
3	A	1	Total	C		0
			18	18		
3	A	1	Total	C		0
			18	18		
3	B	1	Total	C	O	P
			40	31	8	1
3	C	1	Total	C		0
			18	18		
3	C	1	Total	C		0
			18	18		
3	D	1	Total	C	O	P
			40	31	8	1

- Molecule 4 is (2 {R})-2-[2-[(5 {R},6 {R},7 {S},9 {S},11 {R},16 {R},18 {S},19 {S})-6-[(3 {R})-3-carboxy-5-oxidanyl-5-oxidanylidene-pentanoyl]oxy-19-(hexacosanoylamino)-5,9-dimethyl-11,16,18-tris(oxidanyl)icosan-7-yl]oxy-2-oxidanylidene-ethyl]butanedioic acid (CCD ID: A1D74) (formula: C₆₀H₁₀₉NO₁₆) (labeled as "Ligand of Interest" by depositor).

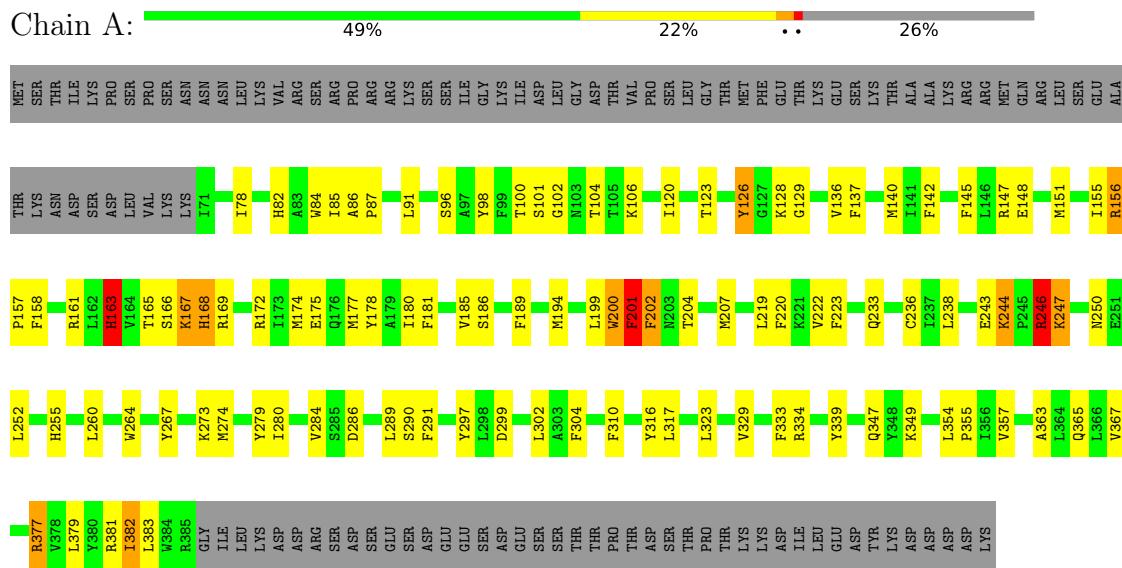


Mol	Chain	Residues	Atoms	AltConf
4	A	1	Total C N O 77 60 1 16	0
4	C	1	Total C N O 77 60 1 16	0

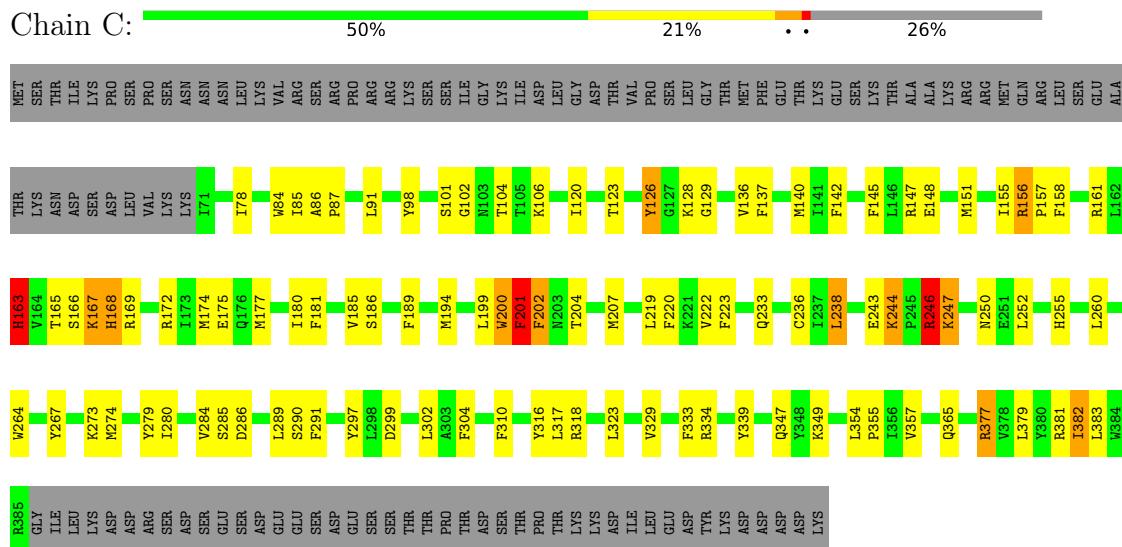
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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.

- Molecule 1: Ceramide synthase LAC1



- Molecule 1: Ceramide synthase LAC1



- Molecule 2: Ceramide synthase subunit LIP1

Chain B:  76% 13% 11%

MET	SER	GLN	PRO	THR	PRO	ILE	ILE	THR	THR	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	P18	I29	I34	E38	Y39	F40	Q60	V64	D76	E80	I88	E93	P94	N95	L99	Y114	K120	V129	G130	L137	L141	M150
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- Molecule 2: Ceramide synthase subunit LIP1

Chain D:  76% 13% 11%

MET	SER	GLN	PRO	THR	PRO	ILE	ILE	THR	THR	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	SER	ALA	ALA	LYS	PRO	LYS	LYS	P18	I29	I34	E38	Y39	F40	Q60	V64	D76	E80	I88	E93	P94	N95	L99	Y114	K120	V129	G130	L137	L141	M150
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4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	275501	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

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: 6PL, A1D74

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	0.69	9/2726 (0.3%)	0.71	6/3710 (0.2%)
1	C	0.68	9/2726 (0.3%)	0.71	6/3710 (0.2%)
2	B	0.25	0/1122	0.46	0/1523
2	D	0.25	0/1122	0.46	0/1523
All	All	0.59	18/7696 (0.2%)	0.64	12/10466 (0.1%)

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	201	PHE	CA-C	-15.16	1.32	1.52
1	C	201	PHE	CA-C	-15.14	1.32	1.52
1	A	200	TRP	C-O	-10.98	1.10	1.24
1	C	200	TRP	C-O	-10.97	1.10	1.24
1	C	201	PHE	C-O	-10.17	1.11	1.24

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	200	TRP	CA-C-N	9.79	140.24	121.54
1	C	200	TRP	C-N-CA	9.79	140.24	121.54
1	A	200	TRP	CA-C-N	9.79	140.24	121.54
1	A	200	TRP	C-N-CA	9.79	140.24	121.54
1	C	201	PHE	N-CA-CB	7.09	122.47	110.49

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	2636	0	2623	99	0
1	C	2636	0	2623	99	0
2	B	1089	0	1045	17	0
2	D	1089	0	1045	15	0
3	A	36	0	70	5	0
3	B	40	0	56	4	0
3	C	36	0	70	6	0
3	D	40	0	56	4	0
4	A	77	0	0	7	0
4	C	77	0	0	7	0
All	All	7756	0	7588	237	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 15.

The worst 5 of 237 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:279:TYR:CE1	4:C:503:A1D74:C19	2.31	1.14
1:A:279:TYR:CE1	4:A:503:A1D74:C19	2.31	1.14
2:B:40:PHE:HB2	3:B:201:6PL:H182	1.07	1.03
2:D:40:PHE:HB2	3:D:201:6PL:H182	1.07	1.03
1:C:382:ILE:HG23	1:C:383:LEU:HD22	1.46	0.96

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 PDB entries followed by that with respect to all EM entries.

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	313/428 (73%)	289 (92%)	20 (6%)	4 (1%)	10 22
1	C	313/428 (73%)	288 (92%)	21 (7%)	4 (1%)	10 22
2	B	131/150 (87%)	125 (95%)	6 (5%)	0	100 100
2	D	131/150 (87%)	125 (95%)	6 (5%)	0	100 100
All	All	888/1156 (77%)	827 (93%)	53 (6%)	8 (1%)	17 29

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	163	HIS
1	A	202	PHE
1	A	246	ARG
1	C	163	HIS
1	C	202	PHE

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 PDB entries followed by that with respect to all EM entries.

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	279/391 (71%)	264 (95%)	15 (5%)	18 37
1	C	279/391 (71%)	264 (95%)	15 (5%)	18 37
2	B	120/135 (89%)	119 (99%)	1 (1%)	79 90
2	D	120/135 (89%)	119 (99%)	1 (1%)	79 90
All	All	798/1052 (76%)	766 (96%)	32 (4%)	29 51

5 of 32 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	377	ARG
1	C	381	ARG
1	A	377	ARG
1	A	299	ASP

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Mol	Chain	Res	Type
1	C	382	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	347	GLN
2	D	113	HIS
2	D	139	GLN
2	B	139	GLN
1	C	163	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 oligosaccharides in this entry.

5.6 Ligand geometry [\(i\)](#)

8 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
3	6PL	D	201	-	39,39,51	1.07	2 (5%)	43,44,59	1.14	4 (9%)
3	6PL	C	501	-	17,17,51	0.22	0	16,16,59	0.63	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	6PL	C	502	-	17,17,51	0.22	0	16,16,59	0.62	0
4	A1D74	A	503	-	76,76,76	1.12	6 (7%)	89,92,92	1.33	12 (13%)
3	6PL	A	501	-	17,17,51	0.22	0	16,16,59	0.63	0
3	6PL	B	201	-	39,39,51	1.07	2 (5%)	43,44,59	1.14	4 (9%)
4	A1D74	C	503	-	76,76,76	1.12	6 (7%)	89,92,92	1.33	12 (13%)
3	6PL	A	502	-	17,17,51	0.22	0	16,16,59	0.62	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
3	6PL	D	201	-	-	15/41/41/55	-
3	6PL	C	501	-	-	10/15/15/55	-
3	6PL	C	502	-	-	11/15/15/55	-
4	A1D74	A	503	-	-	41/96/96/96	-
3	6PL	A	501	-	-	10/15/15/55	-
3	6PL	B	201	-	-	15/41/41/55	-
4	A1D74	C	503	-	-	41/96/96/96	-
3	6PL	A	502	-	-	11/15/15/55	-

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	503	A1D74	C26-N28	5.43	1.45	1.34
4	C	503	A1D74	C26-N28	5.43	1.45	1.34
3	B	201	6PL	O3-C11	4.28	1.45	1.33
3	D	201	6PL	O3-C11	4.28	1.45	1.33
3	B	201	6PL	O2-C31	4.13	1.45	1.34

The worst 5 of 32 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	503	A1D74	O47-C48-C49	4.65	120.01	111.46
4	C	503	A1D74	O47-C48-C49	4.65	120.01	111.46
4	C	503	A1D74	O66-C67-C69	4.63	119.97	111.46
4	A	503	A1D74	O66-C67-C69	4.61	119.93	111.46
3	B	201	6PL	O2-C31-C32	3.92	119.94	111.50

There are no chirality outliers.

5 of 154 torsion outliers are listed below:

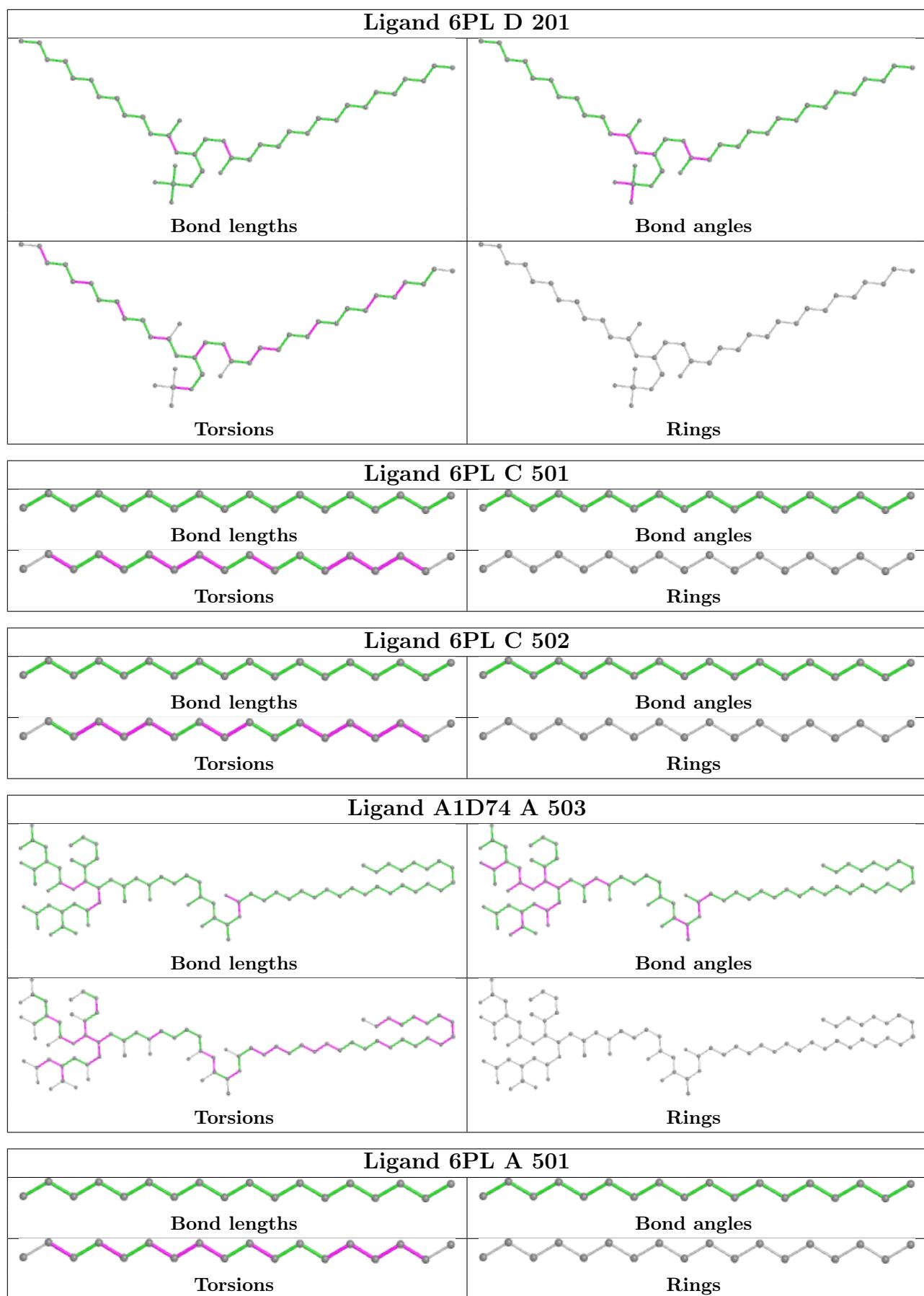
Mol	Chain	Res	Type	Atoms
4	A	503	A1D74	C43-C45-C46-O47
4	A	503	A1D74	C59-C46-O47-C48
4	A	503	A1D74	C31-C33-C34-C36
4	A	503	A1D74	C31-C33-C34-O35
4	A	503	A1D74	C49-C48-O47-C46

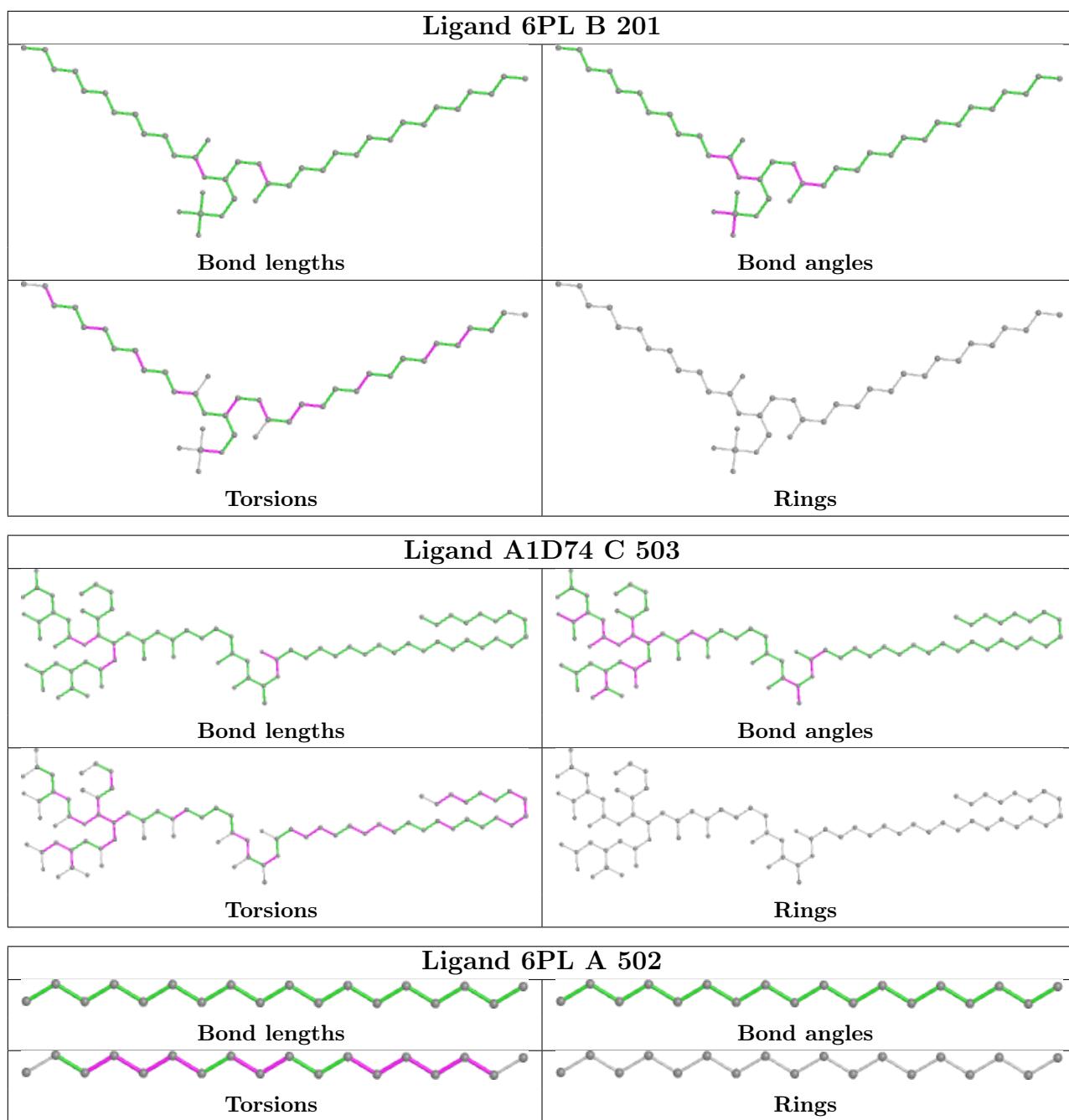
There are no ring outliers.

8 monomers are involved in 33 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	201	6PL	4	0
3	C	501	6PL	4	0
3	C	502	6PL	2	0
4	A	503	A1D74	7	0
3	A	501	6PL	4	0
3	B	201	6PL	4	0
4	C	503	A1D74	7	0
3	A	502	6PL	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.





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.