



## wwPDB EM Validation Summary Report ⓘ

Aug 31, 2025 – 12:27 AM JST

PDB ID : 9LXC / pdb\_00009lxc  
EMDB ID : EMD-63473  
Title : Cryo-EM structure of the P2X1 receptor bound to NF449  
Authors : Qiang, Y.; Chen, K.  
Deposited on : 2025-02-17  
Resolution : 3.10 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](mailto: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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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The following versions of software and data (see [references ⓘ](#)) 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) : 2.45.1

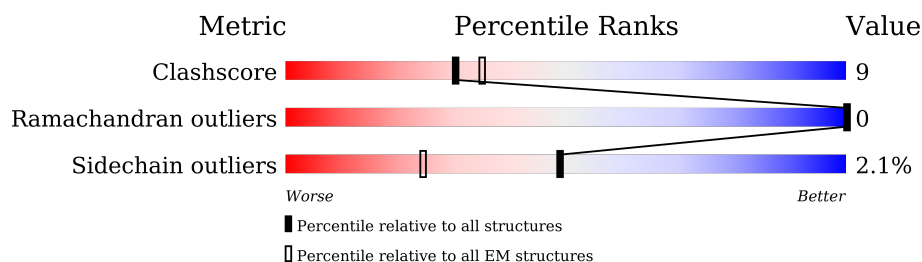
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.10 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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	326	 82% 16% •
1	B	326	 78% 17% 5%
1	C	326	 73% 25% ••

## 2 Entry composition [i](#)

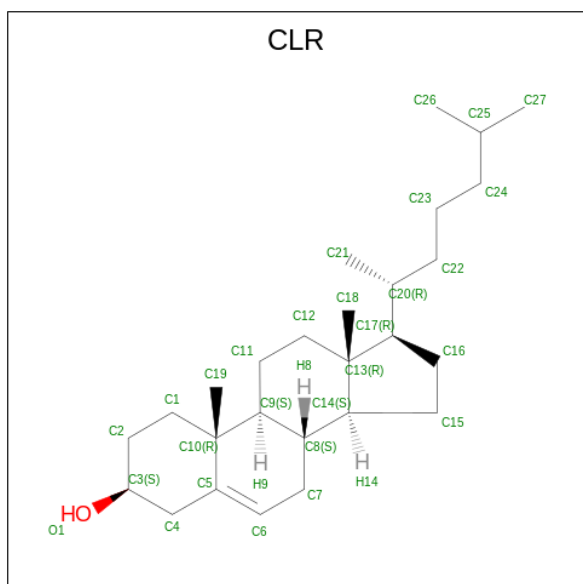
There are 3 unique types of molecules in this entry. The entry contains 7461 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 P2X purinoceptor 1.

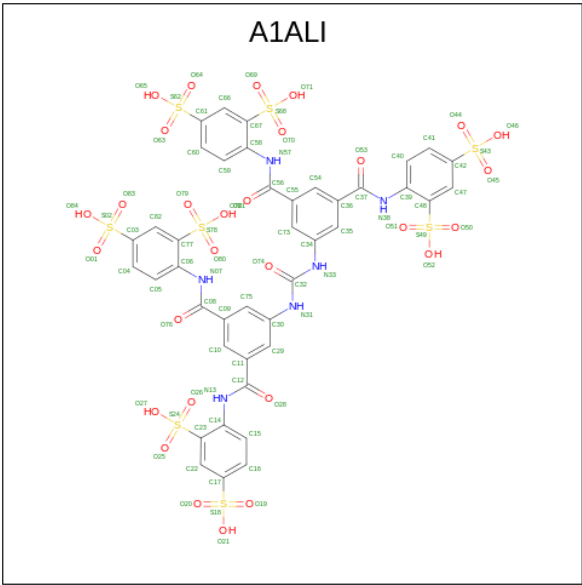
Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	319	Total	C	N	O	S	0	0
			2362	1506	412	433	11		
1	B	311	Total	C	N	O	S	0	0
			2319	1491	400	416	12		
1	C	324	Total	C	N	O	S	0	0
			2444	1564	427	440	13		

- Molecule 2 is CHOLESTEROL (CCD ID: CLR) (formula:  $C_{27}H_{46}O$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
2	A	1	Total	C	O	0
			28	27	1	
2	B	1	Total	C	O	0
			28	27	1	
2	C	1	Total	C	O	0
			28	27	1	

- Molecule 3 is 4,4',4'',4'''-{carbonylbis[azanediy]benzene-5,1,3-triylbis(carbonylazanediy)]}tetra(benzene-1,3-disulfonic acid) (CCD ID: A1ALI) (formula: C<sub>41</sub>H<sub>32</sub>N<sub>6</sub>O<sub>29</sub>S<sub>8</sub>) (labeled as "Ligand of Interest" by depositor).

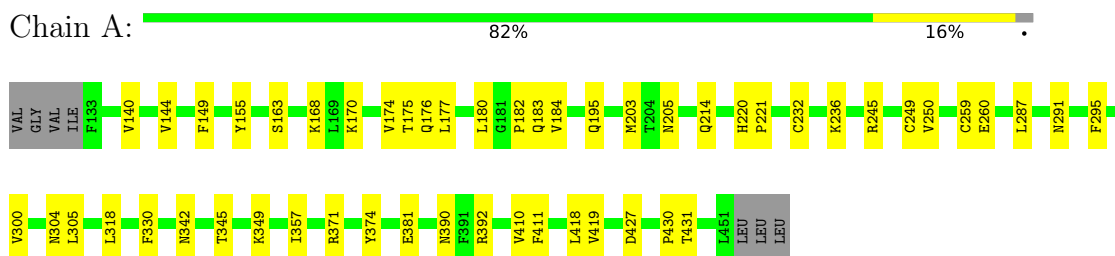


Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total	C	N	O	S	0
			84	41	6	29	8	
3	B	1	Total	C	N	O	S	0
			84	41	6	29	8	
3	C	1	Total	C	N	O	S	0
			84	41	6	29	8	

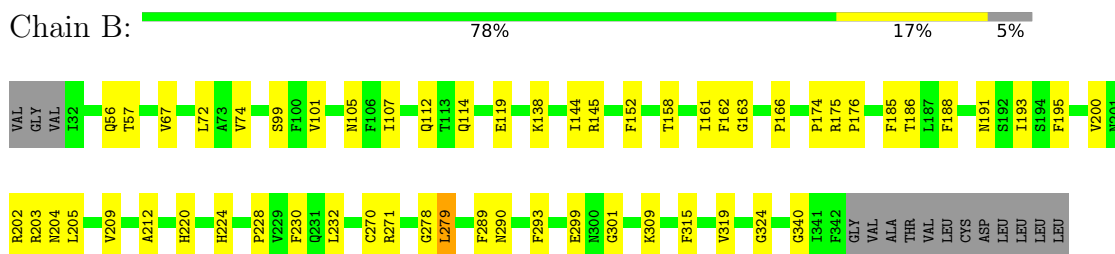
### 3 Residue-property plots

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.

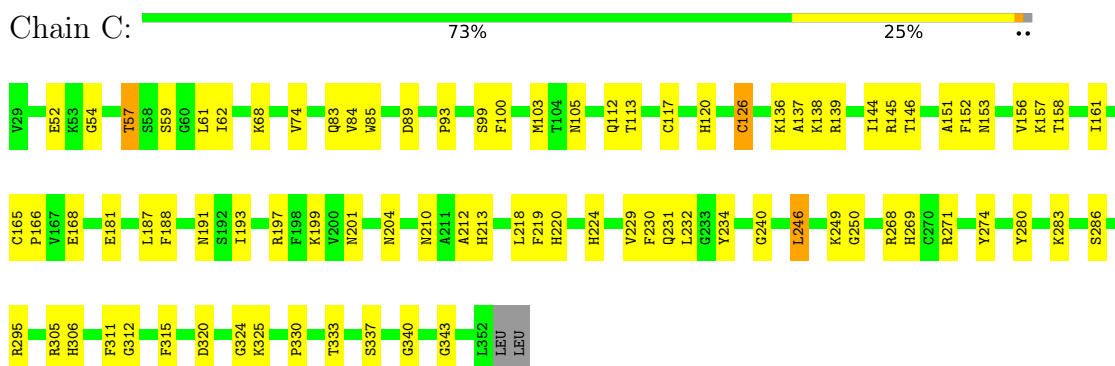
- Molecule 1: P2X purinoceptor 1



- Molecule 1: P2X purinoceptor 1



- Molecule 1: P2X purinoceptor 1



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	391273	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	70	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1500	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: A1ALI, CLR

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	0.10	0/2421	0.30	0/3297
1	B	0.14	0/2379	0.37	0/3239
1	C	0.11	0/2505	0.34	0/3402
All	All	0.12	0/7305	0.34	0/9938

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	2362	0	2166	39	0
1	B	2319	0	2165	36	0
1	C	2444	0	2311	58	0
2	A	28	0	46	1	0
2	B	28	0	46	1	0
2	C	28	0	46	1	0
3	A	84	0	0	6	0
3	B	84	0	0	5	0
3	C	84	0	0	2	0
All	All	7461	0	6780	125	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 9.

The worst 5 of 125 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:278:GLY:O	1:B:279:LEU:HB2	1.77	0.84
1:B:145:ARG:HG2	1:B:161:ILE:HG22	1.64	0.79
1:B:340:GLY:HA3	1:C:340:GLY:HA2	1.68	0.75
1:B:340:GLY:HA2	1:C:343:GLY:HA3	1.71	0.73
1:A:203:MET:HG3	1:A:410:VAL:HG13	1.71	0.72

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	317/326 (97%)	293 (92%)	24 (8%)	0	100	100
1	B	309/326 (95%)	263 (85%)	46 (15%)	0	100	100
1	C	322/326 (99%)	277 (86%)	45 (14%)	0	100	100
All	All	948/978 (97%)	833 (88%)	115 (12%)	0	100	100

There are no Ramachandran outliers to report.

### 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	232/280 (83%)	231 (100%)	1 (0%)	89	94
1	B	231/280 (82%)	224 (97%)	7 (3%)	36	64
1	C	247/280 (88%)	240 (97%)	7 (3%)	38	66
All	All	710/840 (84%)	695 (98%)	15 (2%)	49	72

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	293	PHE
1	C	246	LEU
1	C	57	THR
1	C	268	ARG
1	C	146	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	296	HIS
1	C	98	ASN
1	C	296	HIS
1	C	231	GLN
1	B	224	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 oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

6 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	A1ALI	B	502	-	85,89,89	1.63	18 (21%)	129,141,141	1.49	28 (21%)
3	A1ALI	C	502	-	85,89,89	1.63	17 (20%)	129,141,141	1.37	26 (20%)
2	CLR	C	501	-	31,31,31	0.36	0	48,48,48	0.52	0
3	A1ALI	A	502	-	85,89,89	1.64	20 (23%)	129,141,141	1.56	27 (20%)
2	CLR	B	501	-	31,31,31	0.39	0	48,48,48	0.66	1 (2%)
2	CLR	A	501	-	31,31,31	0.38	0	48,48,48	0.56	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	A1ALI	B	502	-	-	33/88/88/88	0/6/6/6
3	A1ALI	C	502	-	-	30/88/88/88	0/6/6/6
2	CLR	C	501	-	-	1/10/68/68	0/4/4/4
3	A1ALI	A	502	-	-	27/88/88/88	0/6/6/6
2	CLR	B	501	-	-	9/10/68/68	0/4/4/4
2	CLR	A	501	-	-	3/10/68/68	0/4/4/4

The worst 5 of 55 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	502	A1ALI	C12-N13	4.12	1.46	1.35
3	A	502	A1ALI	C32-N31	4.12	1.46	1.37
3	B	502	A1ALI	C32-N33	4.03	1.45	1.37
3	C	502	A1ALI	C32-N31	4.01	1.45	1.37
3	B	502	A1ALI	C32-N31	4.01	1.45	1.37

The worst 5 of 82 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	A1ALI	N33-C32-N31	7.58	125.74	112.49
3	A	502	A1ALI	C34-N33-C32	-5.83	114.68	126.61
3	B	502	A1ALI	N33-C32-N31	5.58	122.24	112.49
3	B	502	A1ALI	C30-N31-C32	-4.80	116.80	126.61
3	C	502	A1ALI	C11-C12-N13	4.54	125.91	115.92

There are no chirality outliers.

5 of 103 torsion outliers are listed below:

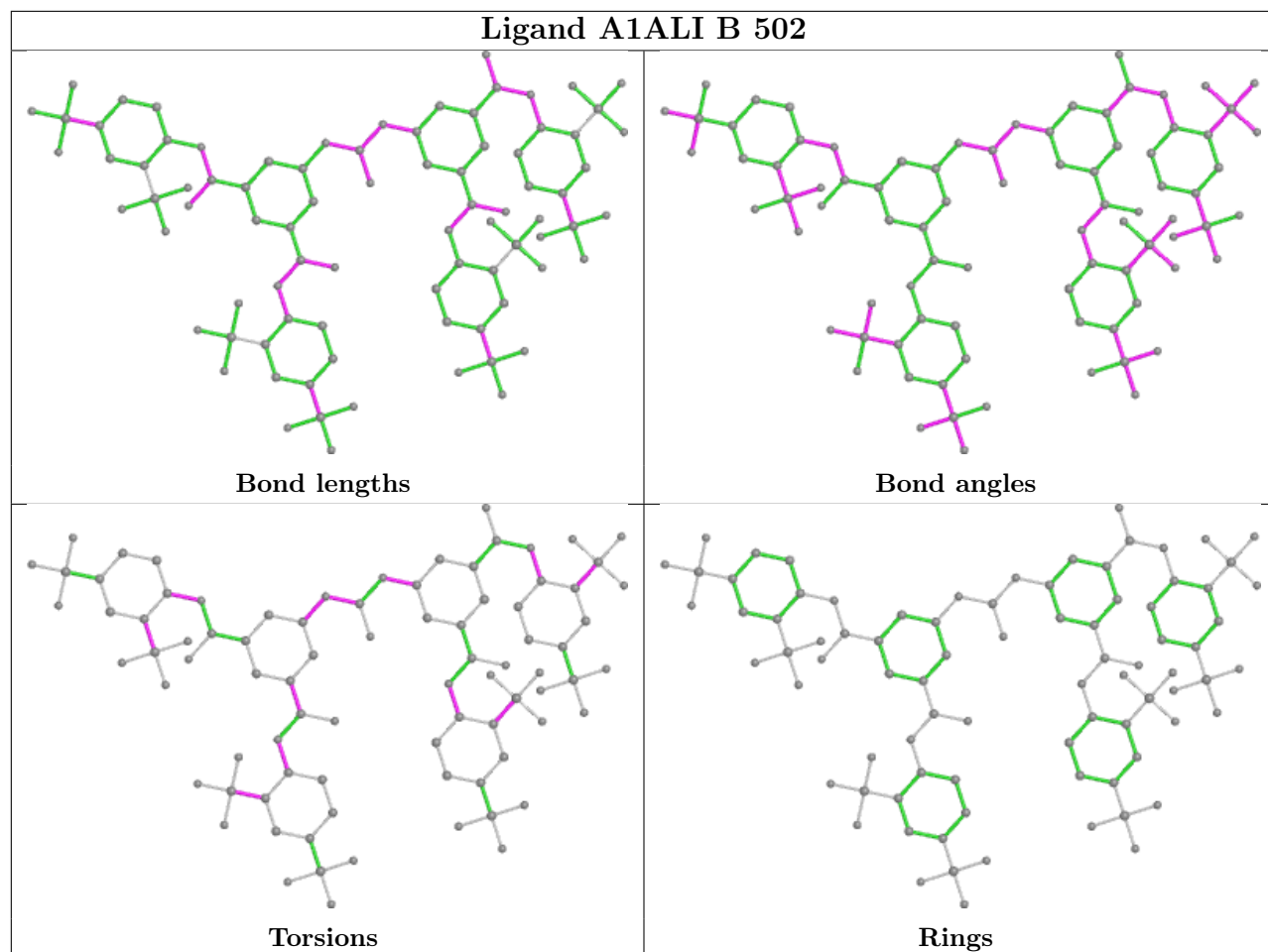
Mol	Chain	Res	Type	Atoms
3	A	502	A1ALI	C22-C23-S24-O25
3	A	502	A1ALI	C22-C23-S24-O26
3	A	502	A1ALI	C22-C23-S24-O27
3	A	502	A1ALI	C14-C23-S24-O25
3	A	502	A1ALI	C47-C48-S49-O50

There are no ring outliers.

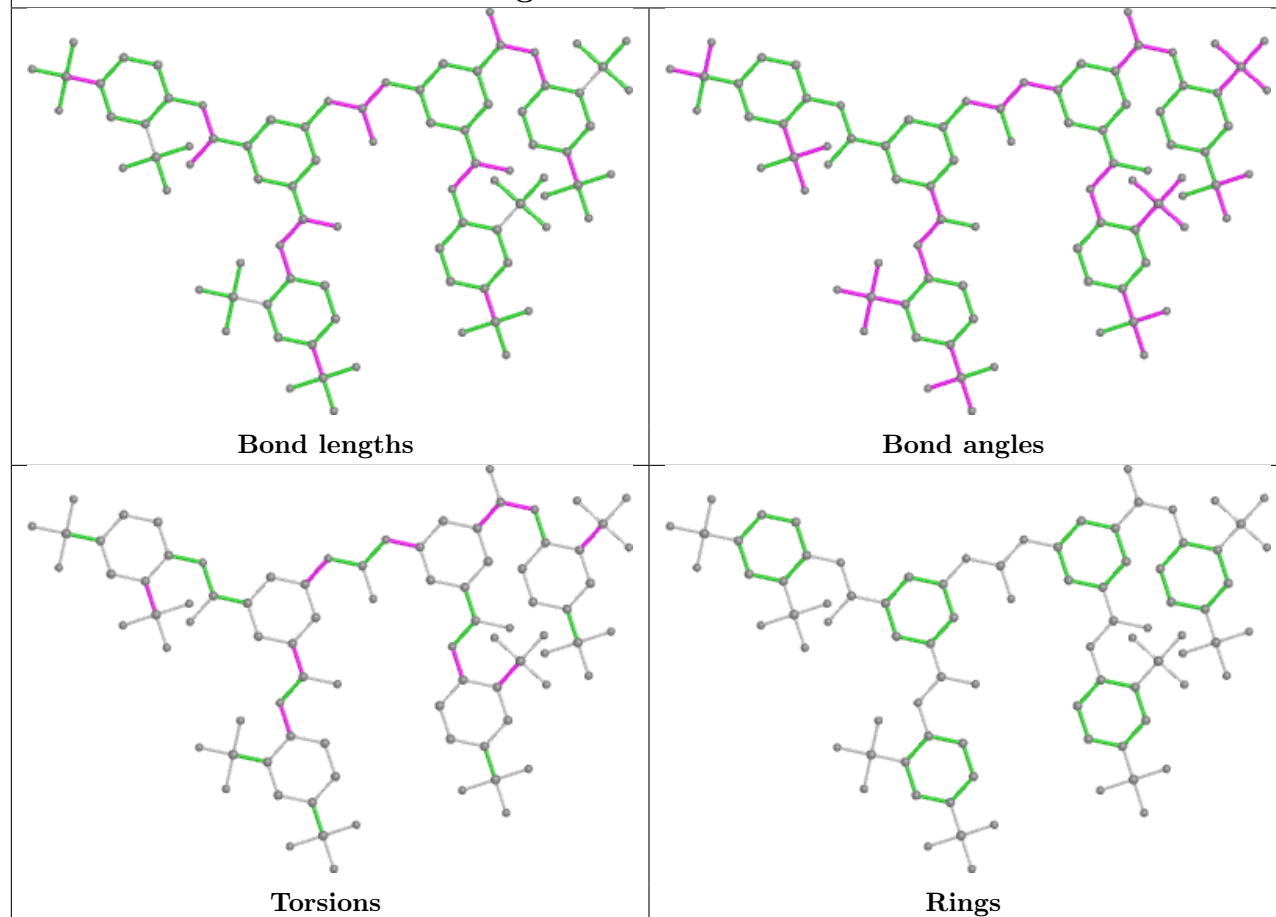
6 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	502	A1ALI	5	0
3	C	502	A1ALI	2	0
2	C	501	CLR	1	0
3	A	502	A1ALI	6	0
2	B	501	CLR	1	0
2	A	501	CLR	1	0

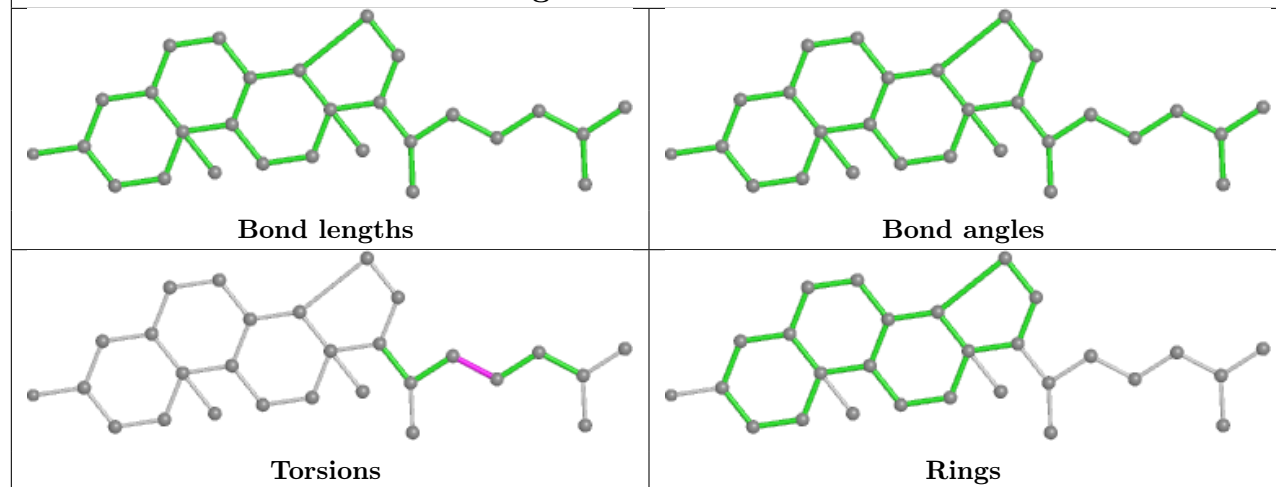
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.



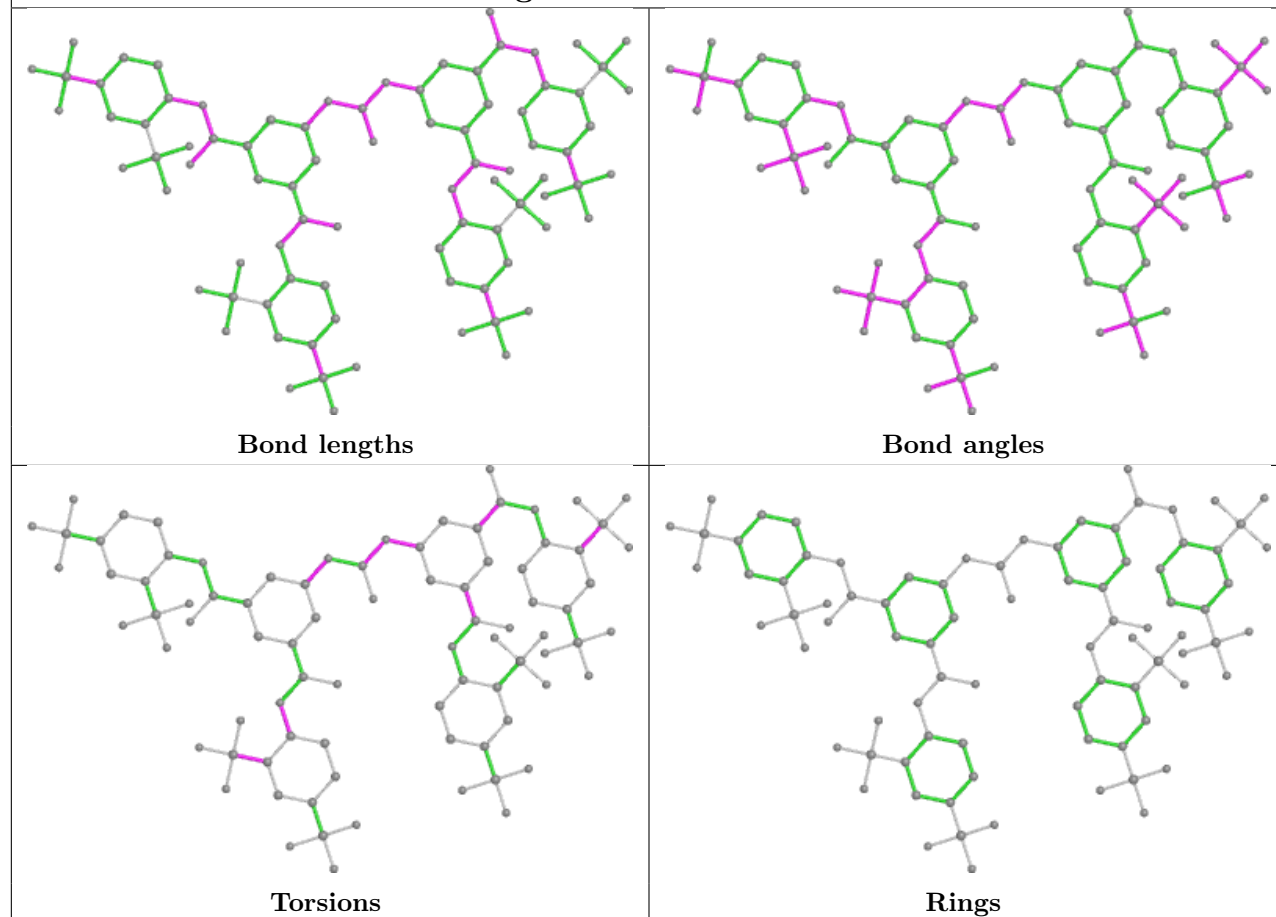
## Ligand A1ALI C 502



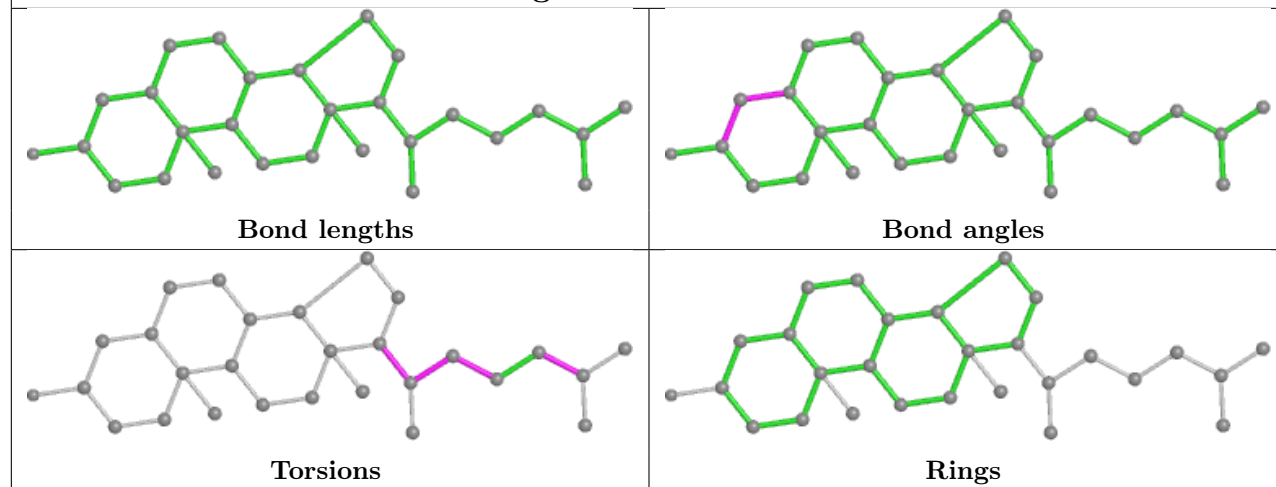
## Ligand CLR C 501

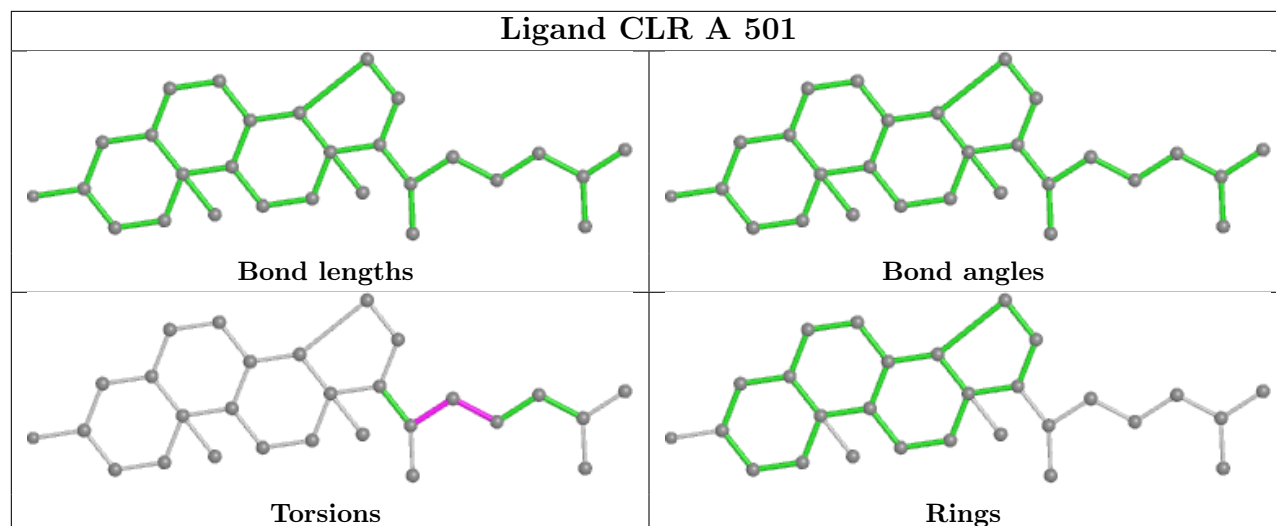


## Ligand A1ALI A 502



## Ligand CLR B 501





## 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.