



wwPDB EM Validation Summary Report ⓘ

Mar 12, 2026 – 12:36 PM UTC

PDB ID : 9JOW / pdb_00009jow
EMDB ID : EMD-61687
Title : Cryo-EM structure of the myxol-bound light-driven chloride ion-pumping rhodopsin, NM-R3
Authors : Hosaka, T.; Shirouzu, M.
Deposited on : 2024-09-25
Resolution : 2.48 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

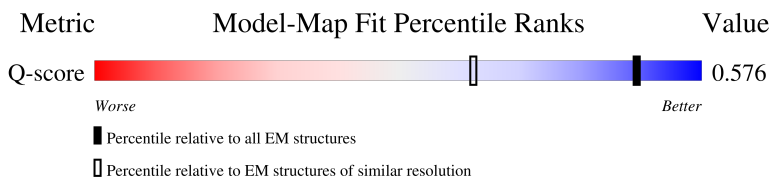
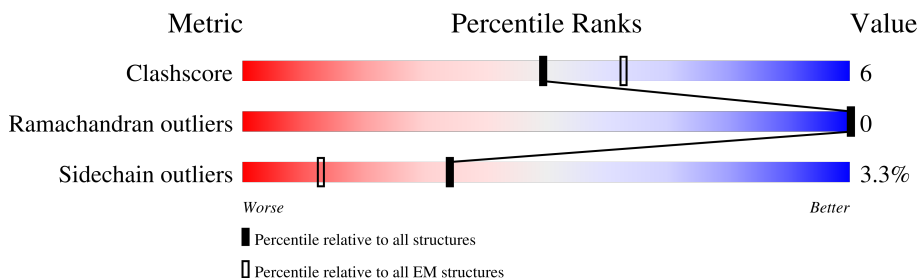
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

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 2.48 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	6178 (1.98 - 2.98)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	279	 83% 10% • 5%
1	B	279	 82% 9% • 5%
1	C	279	 82% 11% • 5%
1	D	279	 81% 12% • 5%

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Mol	Chain	Length	Quality of chain
1	E	279	 A horizontal bar chart showing the quality of chain E. The bar is divided into three segments: green (82%), yellow (11%), and grey (5%). A small red dot is at the beginning of the bar.

2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 11677 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 Chloride pumping rhodopsin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	264	Total 2065	C 1373	N 318	O 359	S 15	0	0
1	B	264	Total 2065	C 1373	N 318	O 359	S 15	0	0
1	C	264	Total 2065	C 1373	N 318	O 359	S 15	0	0
1	D	264	Total 2065	C 1373	N 318	O 359	S 15	0	0
1	E	264	Total 2065	C 1373	N 318	O 359	S 15	0	0

There are 35 discrepancies between the modelled and reference sequences:

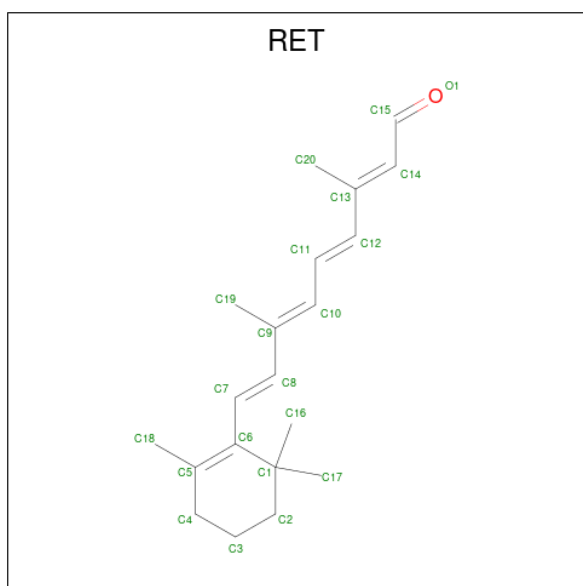
Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	GLY	-	expression tag	UNP W8VZW3
A	-5	SER	-	expression tag	UNP W8VZW3
A	-4	SER	-	expression tag	UNP W8VZW3
A	-3	GLY	-	expression tag	UNP W8VZW3
A	-2	SER	-	expression tag	UNP W8VZW3
A	-1	SER	-	expression tag	UNP W8VZW3
A	0	GLY	-	expression tag	UNP W8VZW3
B	-6	GLY	-	expression tag	UNP W8VZW3
B	-5	SER	-	expression tag	UNP W8VZW3
B	-4	SER	-	expression tag	UNP W8VZW3
B	-3	GLY	-	expression tag	UNP W8VZW3
B	-2	SER	-	expression tag	UNP W8VZW3
B	-1	SER	-	expression tag	UNP W8VZW3
B	0	GLY	-	expression tag	UNP W8VZW3
C	-6	GLY	-	expression tag	UNP W8VZW3
C	-5	SER	-	expression tag	UNP W8VZW3
C	-4	SER	-	expression tag	UNP W8VZW3
C	-3	GLY	-	expression tag	UNP W8VZW3
C	-2	SER	-	expression tag	UNP W8VZW3
C	-1	SER	-	expression tag	UNP W8VZW3

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Chain	Residue	Modelled	Actual	Comment	Reference
C	0	GLY	-	expression tag	UNP W8VZW3
D	-6	GLY	-	expression tag	UNP W8VZW3
D	-5	SER	-	expression tag	UNP W8VZW3
D	-4	SER	-	expression tag	UNP W8VZW3
D	-3	GLY	-	expression tag	UNP W8VZW3
D	-2	SER	-	expression tag	UNP W8VZW3
D	-1	SER	-	expression tag	UNP W8VZW3
D	0	GLY	-	expression tag	UNP W8VZW3
E	-6	GLY	-	expression tag	UNP W8VZW3
E	-5	SER	-	expression tag	UNP W8VZW3
E	-4	SER	-	expression tag	UNP W8VZW3
E	-3	GLY	-	expression tag	UNP W8VZW3
E	-2	SER	-	expression tag	UNP W8VZW3
E	-1	SER	-	expression tag	UNP W8VZW3
E	0	GLY	-	expression tag	UNP W8VZW3

- Molecule 2 is RETINAL (CCD ID: RET) (formula: C₂₀H₂₈O) (labeled as "Ligand of Interest" by depositor).



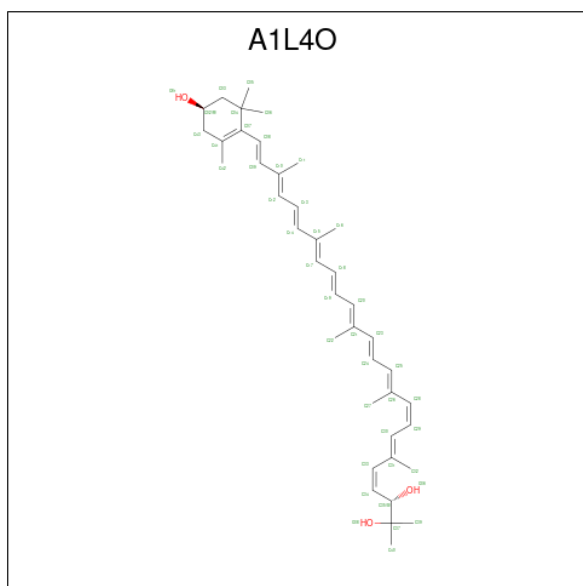
Mol	Chain	Residues	Atoms	AltConf
2	A	1	Total C 20 20	0
2	B	1	Total C 20 20	0
2	C	1	Total C 20 20	0

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Mol	Chain	Residues	Atoms		AltConf
2	D	1	Total	C	0
			20	20	
2	E	1	Total	C	0
			20	20	

- Molecule 3 is (3 {S},4 {Z},6 {E},8 {Z},10 {E},12 {E},14 {E},16 {E},18 {E},20 {E},22 {E},24 {E})-2,6,10,14,19,23-hexamethyl-25-[(4 {R})-2,6,6-trimethyl-4-oxidanyl-cyclohexen-1-yl]pentacos-4,6,8,10,12,14,16,18,20,22,24-undecaene-2,3-diol (CCD ID: A1L4O) (formula: C₄₀H₅₆O₃).

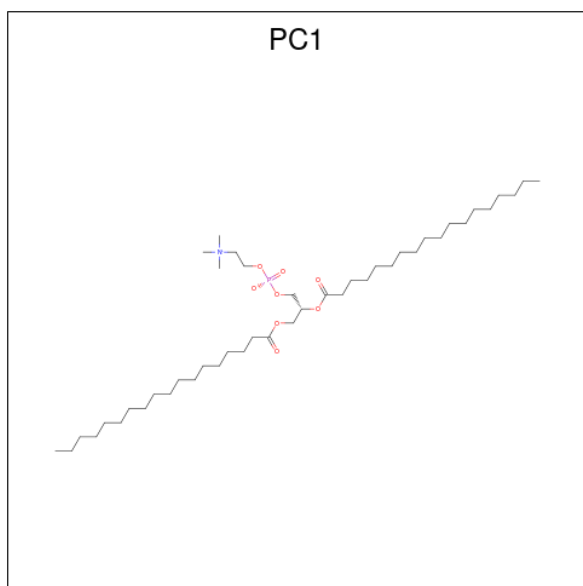


Mol	Chain	Residues	Atoms			AltConf
3	A	1	Total	C	O	0
			43	40	3	
3	B	1	Total	C	O	0
			43	40	3	
3	C	1	Total	C	O	0
			43	40	3	
3	D	1	Total	C	O	0
			43	40	3	
3	E	1	Total	C	O	0
			43	40	3	

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl) (labeled as "Ligand of Interest" by depositor).

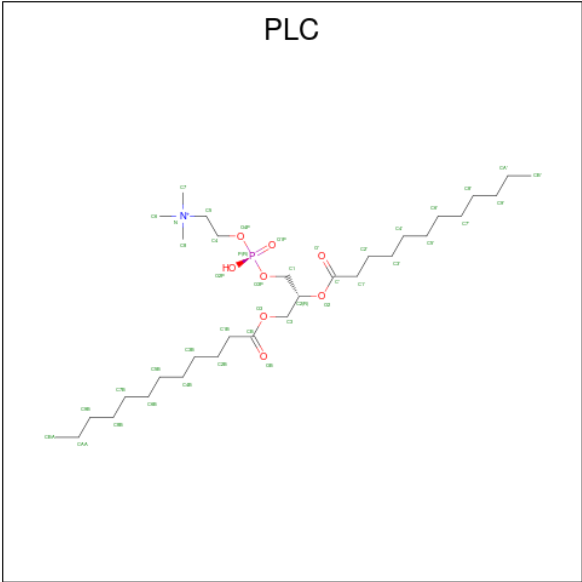
Mol	Chain	Residues	Atoms		AltConf
4	A	2	Total	Cl	0
			2	2	
4	B	2	Total	Cl	0
			2	2	
4	C	2	Total	Cl	0
			2	2	
4	D	2	Total	Cl	0
			2	2	
4	E	2	Total	Cl	0
			2	2	

- Molecule 5 is 1,2-DIACYL-SN-GLYCERO-3-PHOSPHOCHOLINE (CCD ID: PC1) (formula: $C_{44}H_{88}NO_8P$) (labeled as "Ligand of Interest" by depositor).



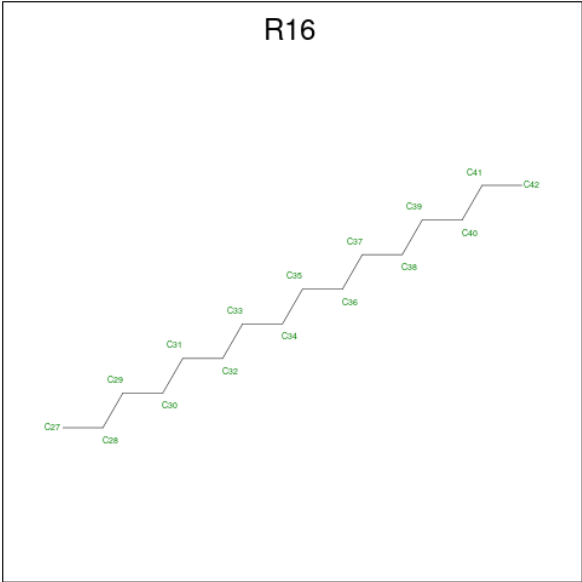
Mol	Chain	Residues	Atoms					AltConf
5	A	1	Total	C	N	O	P	0
			54	44	1	8	1	
5	B	1	Total	C	N	O	P	0
			54	44	1	8	1	
5	C	1	Total	C	N	O	P	0
			54	44	1	8	1	
5	D	1	Total	C	N	O	P	0
			54	44	1	8	1	
5	E	1	Total	C	N	O	P	0
			54	44	1	8	1	

- Molecule 6 is DIUNDECYL PHOSPHATIDYL CHOLINE (CCD ID: PLC) (formula: $C_{32}H_{65}NO_8P$) (labeled as "Ligand of Interest" by depositor).



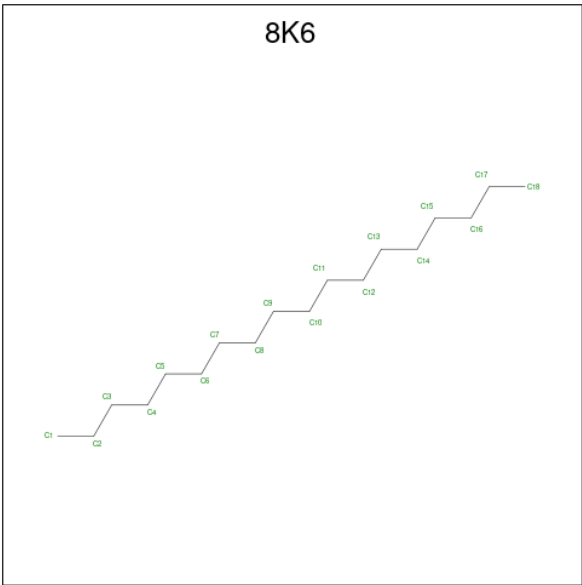
Mol	Chain	Residues	Atoms					AltConf
6	A	1	Total	C	N	O	P	0
			42	32	1	8	1	
6	A	1	Total	C	N	O	P	0
			42	32	1	8	1	
6	B	1	Total	C	N	O	P	0
			42	32	1	8	1	
6	C	1	Total	C	N	O	P	0
			42	32	1	8	1	
6	D	1	Total	C	N	O	P	0
			42	32	1	8	1	

- Molecule 7 is HEXADECANE (CCD ID: R16) (formula: C₁₆H₃₄) (labeled as "Ligand of Interest" by depositor).



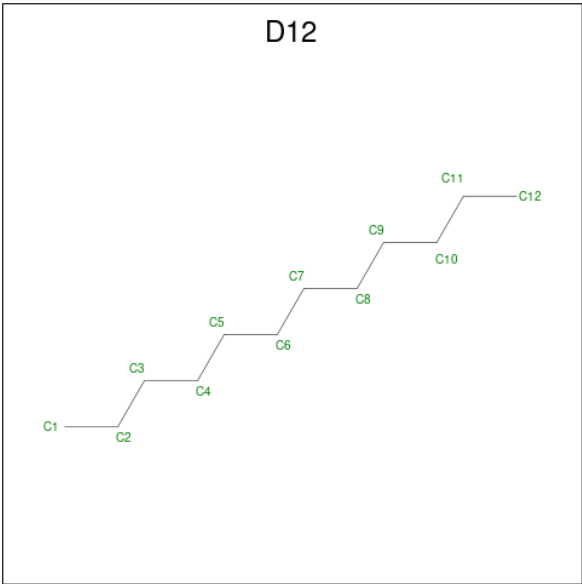
Mol	Chain	Residues	Atoms		AltConf
7	A	1	Total	C	0
			16	16	
7	A	1	Total	C	0
			16	16	
7	A	1	Total	C	0
			16	16	
7	B	1	Total	C	0
			16	16	
7	B	1	Total	C	0
			16	16	
7	B	1	Total	C	0
			16	16	
7	D	1	Total	C	0
			16	16	
7	D	1	Total	C	0
			16	16	
7	D	1	Total	C	0
			16	16	
7	E	1	Total	C	0
			16	16	
7	E	1	Total	C	0
			16	16	

- Molecule 8 is Octadecane (CCD ID: 8K6) (formula: C₁₈H₃₈) (labeled as "Ligand of Interest" by depositor).



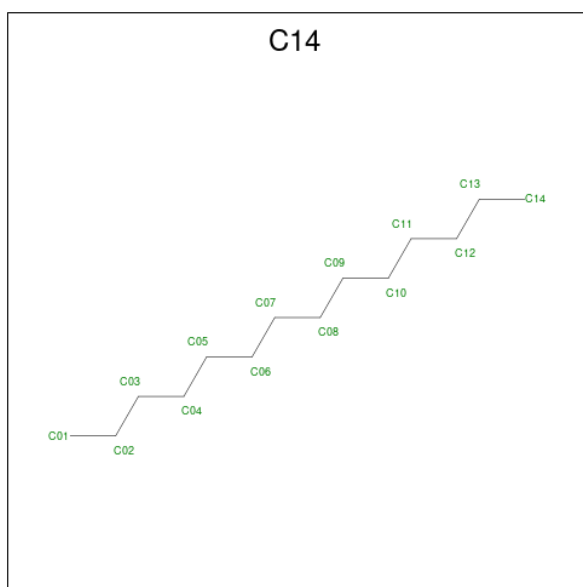
Mol	Chain	Residues	Atoms		AltConf
8	A	1	Total	C	0
			18	18	
8	B	1	Total	C	0
			18	18	
8	C	1	Total	C	0
			18	18	

- Molecule 9 is DODECANE (CCD ID: D12) (formula: C₁₂H₂₆) (labeled as "Ligand of Interest" by depositor).



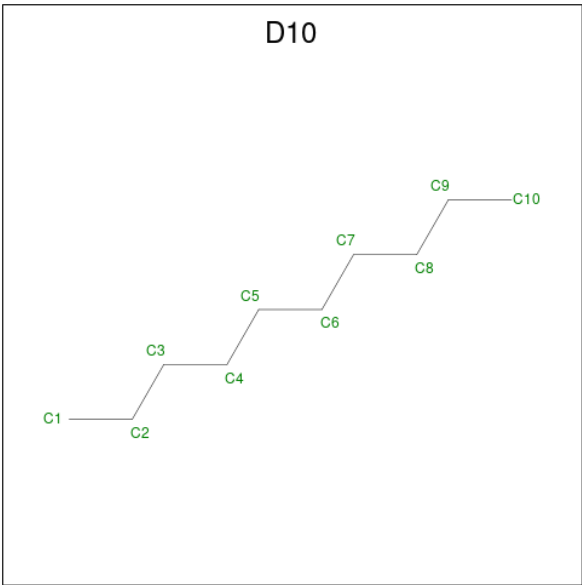
Mol	Chain	Residues	Atoms	AltConf
9	A	1	Total C 12 12	0
9	D	1	Total C 12 12	0
9	E	1	Total C 12 12	0

- Molecule 10 is TETRADECANE (CCD ID: C14) (formula: $C_{14}H_{30}$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	AltConf
10	B	1	Total C 14 14	0
10	B	1	Total C 14 14	0
10	C	1	Total C 14 14	0
10	C	1	Total C 14 14	0
10	E	1	Total C 14 14	0
10	E	1	Total C 14 14	0

- Molecule 11 is DECANE (CCD ID: D10) (formula: $C_{10}H_{22}$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms		AltConf
11	C	1	Total	C	0
			10	10	

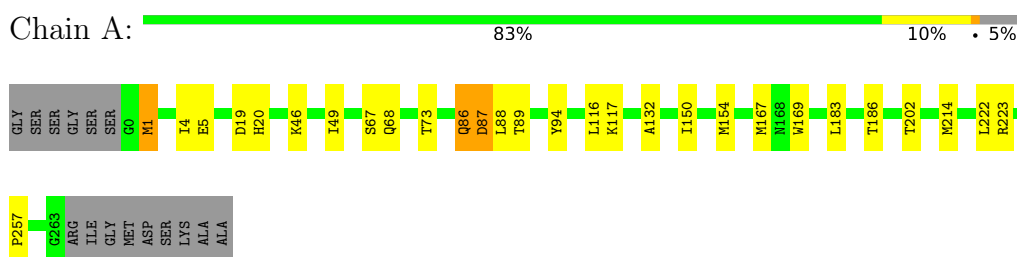
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		AltConf
12	A	36	Total	O	0
			36	36	
12	B	36	Total	O	0
			36	36	
12	C	39	Total	O	0
			39	39	
12	D	37	Total	O	0
			37	37	
12	E	39	Total	O	0
			39	39	

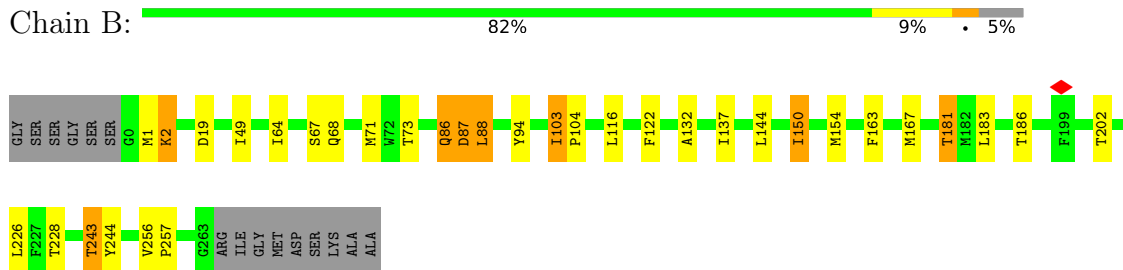
3 Residue-property plots

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 and atom inclusion in map density. 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. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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.

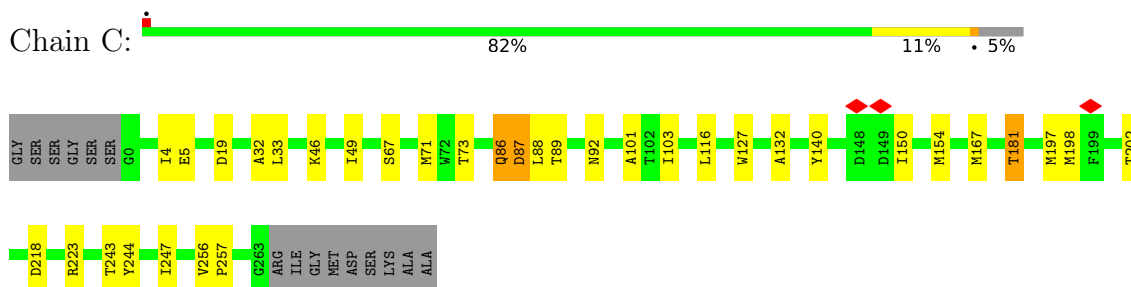
• Molecule 1: Chloride pumping rhodopsin



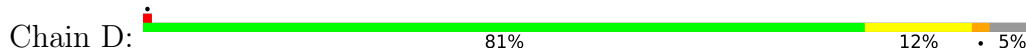
• Molecule 1: Chloride pumping rhodopsin

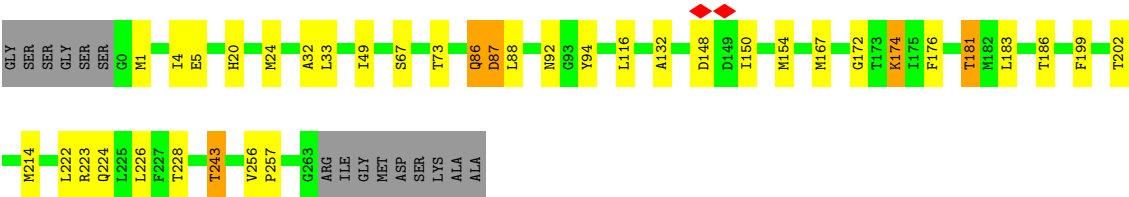


• Molecule 1: Chloride pumping rhodopsin

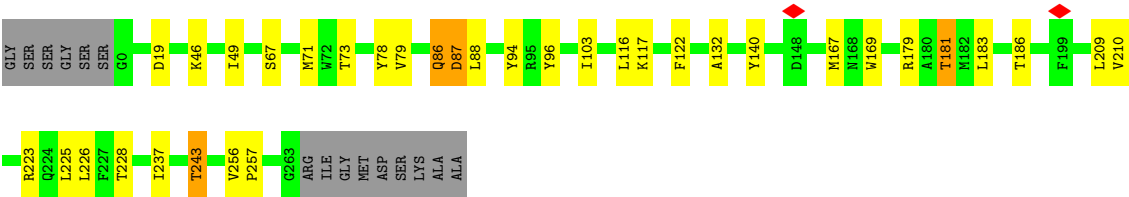
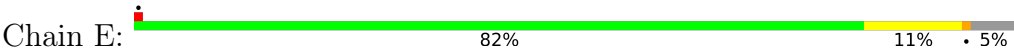


• Molecule 1: Chloride pumping rhodopsin





• Molecule 1: Chloride pumping rhodopsin



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	791219	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60.425	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.127	Depositor
Minimum map value	-0.050	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.008	Depositor
Recommended contour level	0.042	Depositor
Map size (Å)	182.26999, 182.26999, 182.26999	wwPDB
Map dimensions	220, 220, 220	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.8285, 0.8285, 0.8285	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: R16, C14, RET, D12, D10, PC1, A1L4O, CL, PLC, 8K6

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	0.85	0/2117	1.19	6/2886 (0.2%)
1	B	0.85	0/2117	1.20	9/2886 (0.3%)
1	C	0.83	0/2117	1.18	7/2886 (0.2%)
1	D	0.82	0/2117	1.20	8/2886 (0.3%)
1	E	0.83	0/2117	1.19	7/2886 (0.2%)
All	All	0.84	0/10585	1.19	37/14430 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	C	0	1
1	D	0	1
1	E	0	2
All	All	0	5

There are no bond length outliers.

The worst 5 of 37 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	86	GLN	CB-CA-C	-12.28	95.62	111.70
1	C	86	GLN	CB-CA-C	-12.21	95.70	111.70
1	D	86	GLN	CB-CA-C	-12.15	95.79	111.70
1	B	86	GLN	CB-CA-C	-12.12	95.83	111.70
1	E	86	GLN	CB-CA-C	-11.99	95.99	111.70

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	223	ARG	Sidechain
1	C	223	ARG	Sidechain
1	D	223	ARG	Sidechain
1	E	179	ARG	Sidechain
1	E	223	ARG	Sidechain

5.2 Too-close contacts

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	2065	0	2096	19	0
1	B	2065	0	2096	19	0
1	C	2065	0	2096	23	0
1	D	2065	0	2096	19	0
1	E	2065	0	2096	18	0
2	A	20	0	27	3	0
2	B	20	0	27	4	0
2	C	20	0	27	2	0
2	D	20	0	27	2	0
2	E	20	0	27	1	0
3	A	43	0	0	1	0
3	B	43	0	0	0	0
3	C	43	0	0	0	0
3	D	43	0	0	0	0
3	E	43	0	0	2	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
4	D	2	0	0	0	0
4	E	2	0	0	1	0
5	A	54	0	88	5	0
5	B	54	0	88	3	0
5	C	54	0	88	6	0
5	D	54	0	88	3	0
5	E	54	0	88	10	0
6	A	84	0	128	0	0
6	B	42	0	64	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	C	42	0	64	1	0
6	D	42	0	64	0	0
7	A	48	0	102	3	0
7	B	48	0	102	3	0
7	D	48	0	102	5	0
7	E	32	0	68	1	0
8	A	18	0	38	0	0
8	B	18	0	38	1	0
8	C	18	0	38	2	0
9	A	12	0	26	1	0
9	D	12	0	26	1	0
9	E	12	0	26	1	0
10	B	28	0	60	0	0
10	C	28	0	60	4	0
10	E	28	0	60	2	0
11	C	10	0	22	2	0
12	A	36	0	0	0	0
12	B	36	0	0	0	0
12	C	39	0	0	2	0
12	D	37	0	0	0	0
12	E	39	0	0	2	0
All	All	11677	0	12143	134	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 6.

The worst 5 of 134 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)
5:E:306:PC1:H32	5:E:306:PC1:C22	1.60	1.12
5:E:306:PC1:O11	5:E:306:PC1:O32	1.70	1.09
5:E:306:PC1:H221	5:E:306:PC1:C3	1.93	0.97
5:E:306:PC1:H32	5:E:306:PC1:H221	0.97	0.95
5:E:306:PC1:O32	5:E:306:PC1:C1	2.25	0.83

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	262/279 (94%)	256 (98%)	6 (2%)	0	100	100
1	B	262/279 (94%)	257 (98%)	5 (2%)	0	100	100
1	C	262/279 (94%)	256 (98%)	6 (2%)	0	100	100
1	D	262/279 (94%)	256 (98%)	6 (2%)	0	100	100
1	E	262/279 (94%)	256 (98%)	6 (2%)	0	100	100
All	All	1310/1395 (94%)	1281 (98%)	29 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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	216/226 (96%)	209 (97%)	7 (3%)	34	58
1	B	216/226 (96%)	208 (96%)	8 (4%)	30	54
1	C	216/226 (96%)	211 (98%)	5 (2%)	44	69
1	D	216/226 (96%)	207 (96%)	9 (4%)	26	49
1	E	216/226 (96%)	209 (97%)	7 (3%)	34	58
All	All	1080/1130 (96%)	1044 (97%)	36 (3%)	34	58

5 of 36 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	243	THR
1	E	243	THR
1	E	67	SER
1	E	117	LYS
1	B	181	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	29	HIS
1	D	152	GLN
1	E	248	GLN
1	D	109	GLN
1	D	248	GLN

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](#)

Of 54 ligands modelled in this entry, 10 are monoatomic - leaving 44 for Mogul analysis.

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
11	D10	C	309	-	9,9,9	0.17	0	8,8,8	0.20	0
3	A1L4O	B	303	-	42,43,43	0.82	1 (2%)	50,58,58	2.43	18 (36%)
3	A1L4O	E	303	-	42,43,43	0.83	1 (2%)	50,58,58	2.70	20 (40%)
10	C14	B	312	-	13,13,13	0.26	0	12,12,12	0.27	0
7	R16	B	309	-	15,15,15	0.25	0	14,14,14	0.18	0
8	8K6	C	310	-	17,17,17	0.34	0	16,16,16	0.29	0
10	C14	E	308	-	13,13,13	0.29	0	12,12,12	0.25	0
5	PC1	B	306	-	53,53,53	0.81	1 (1%)	59,61,61	0.76	2 (3%)
10	C14	B	308	-	13,13,13	0.32	0	12,12,12	0.23	0
2	RET	C	301	1	20,20,21	3.00	3 (15%)	27,27,28	1.58	7 (25%)
6	PLC	D	307	-	41,41,41	0.45	0	47,49,49	0.61	0
7	R16	D	301	-	15,15,15	0.38	0	14,14,14	0.35	0
2	RET	D	302	1	20,20,21	1.71	3 (15%)	27,27,28	1.57	5 (18%)
10	C14	C	308	-	13,13,13	0.26	0	12,12,12	0.34	0
9	D12	D	310	-	11,11,11	0.17	0	10,10,10	0.14	0
10	C14	E	310	-	13,13,13	0.33	0	12,12,12	0.32	0
8	8K6	B	301	-	17,17,17	0.39	0	16,16,16	0.41	0
3	A1L4O	C	302	-	42,43,43	0.77	0	50,58,58	2.17	15 (30%)
6	PLC	A	306	-	41,41,41	0.50	0	47,49,49	0.62	0
3	A1L4O	D	303	-	42,43,43	0.81	0	50,58,58	2.20	20 (40%)
7	R16	A	308	-	15,15,15	0.16	0	14,14,14	0.17	0
6	PLC	C	306	-	41,41,41	0.52	0	47,49,49	1.13	3 (6%)
2	RET	A	301	1	20,20,21	1.84	4 (20%)	27,27,28	1.49	6 (22%)
7	R16	A	312	-	15,15,15	0.25	0	14,14,14	0.35	0
7	R16	E	309	-	15,15,15	0.19	0	14,14,14	0.15	0
7	R16	A	307	-	15,15,15	0.24	0	14,14,14	0.19	0
5	PC1	C	305	-	53,53,53	0.53	0	59,61,61	0.58	1 (1%)
7	R16	D	309	-	15,15,15	0.19	0	14,14,14	0.23	0
6	PLC	A	311	-	41,41,41	0.47	0	47,49,49	0.54	0
9	D12	A	310	-	11,11,11	0.28	0	10,10,10	0.18	0
6	PLC	B	307	-	41,41,41	0.53	0	47,49,49	0.64	0
5	PC1	D	306	-	53,53,53	0.52	0	59,61,61	0.57	0
7	R16	D	308	-	15,15,15	0.16	0	14,14,14	0.22	0
7	R16	E	301	-	15,15,15	0.22	0	14,14,14	0.29	0
5	PC1	E	306	-	53,53,53	0.61	0	59,61,61	0.92	4 (6%)
8	8K6	A	309	-	17,17,17	0.29	0	16,16,16	0.25	0
9	D12	E	307	-	11,11,11	0.24	0	10,10,10	0.36	0
10	C14	C	307	-	13,13,13	0.28	0	12,12,12	0.29	0
3	A1L4O	A	302	-	42,43,43	0.89	1 (2%)	50,58,58	2.95	21 (42%)
5	PC1	A	305	-	53,53,53	0.61	1 (1%)	59,61,61	0.49	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	R16	B	311	-	15,15,15	0.30	0	14,14,14	0.39	0
2	RET	E	302	1	20,20,21	2.25	4 (20%)	27,27,28	1.61	7 (25%)
7	R16	B	310	-	15,15,15	0.18	0	14,14,14	0.21	0
2	RET	B	302	1	20,20,21	2.27	3 (15%)	27,27,28	1.62	3 (11%)

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
11	D10	C	309	-	-	4/7/7/7	-
3	A1L4O	B	303	-	-	15/41/60/60	0/1/1/1
3	A1L4O	E	303	-	-	13/41/60/60	0/1/1/1
10	C14	B	312	-	-	7/11/11/11	-
7	R16	B	309	-	-	8/13/13/13	-
8	8K6	C	310	-	-	9/15/15/15	-
10	C14	E	308	-	-	8/11/11/11	-
5	PC1	B	306	-	-	31/57/57/57	-
10	C14	B	308	-	-	6/11/11/11	-
2	RET	C	301	1	-	2/13/30/31	0/1/1/1
6	PLC	D	307	-	-	22/45/45/45	-
7	R16	D	301	-	-	8/13/13/13	-
2	RET	D	302	1	-	0/13/30/31	0/1/1/1
10	C14	C	308	-	-	8/11/11/11	-
9	D12	D	310	-	-	5/9/9/9	-
10	C14	E	310	-	-	5/11/11/11	-
8	8K6	B	301	-	-	9/15/15/15	-
3	A1L4O	C	302	-	-	12/41/60/60	0/1/1/1
6	PLC	A	306	-	-	26/45/45/45	-
3	A1L4O	D	303	-	-	9/41/60/60	0/1/1/1
7	R16	A	308	-	-	10/13/13/13	-
6	PLC	C	306	-	-	23/45/45/45	-
2	RET	A	301	1	-	0/13/30/31	0/1/1/1
7	R16	A	312	-	-	9/13/13/13	-
7	R16	E	309	-	-	9/13/13/13	-
7	R16	A	307	-	-	7/13/13/13	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	PC1	C	305	-	-	30/57/57/57	-
7	R16	D	309	-	-	7/13/13/13	-
6	PLC	A	311	-	-	25/45/45/45	-
9	D12	A	310	-	-	7/9/9/9	-
6	PLC	B	307	-	-	24/45/45/45	-
5	PC1	D	306	-	-	34/57/57/57	-
7	R16	D	308	-	-	7/13/13/13	-
7	R16	E	301	-	-	6/13/13/13	-
5	PC1	E	306	-	-	29/57/57/57	-
8	8K6	A	309	-	-	6/15/15/15	-
9	D12	E	307	-	-	4/9/9/9	-
10	C14	C	307	-	-	11/11/11/11	-
3	A1L4O	A	302	-	-	13/41/60/60	0/1/1/1
5	PC1	A	305	-	-	31/57/57/57	-
7	R16	B	311	-	-	11/13/13/13	-
2	RET	E	302	1	-	0/13/30/31	0/1/1/1
7	R16	B	310	-	-	9/13/13/13	-
2	RET	B	302	1	-	0/13/30/31	0/1/1/1

The worst 5 of 22 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	RET	C14-C13	11.78	1.41	1.33
2	B	302	RET	C14-C13	8.85	1.39	1.33
2	E	302	RET	C14-C13	8.16	1.39	1.33
2	A	301	RET	C14-C13	5.89	1.37	1.33
2	D	302	RET	C14-C13	5.71	1.37	1.33

The worst 5 of 132 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	A1L4O	C08-C09-C10	-7.87	114.59	126.23
3	A	302	A1L4O	C24-C25-C26	-7.04	117.40	127.28
3	A	302	A1L4O	C08-C09-C10	-6.89	116.04	126.23
3	A	302	A1L4O	C18-C17-C15	-6.72	117.85	127.28
3	E	303	A1L4O	C09-C08-C07	-6.36	110.01	127.00

There are no chirality outliers.

5 of 519 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302	A1L4O	C33-C34-C35-C37
3	A	302	A1L4O	C34-C35-C37-C39
3	A	302	A1L4O	C34-C35-C37-C40
3	A	302	A1L4O	C34-C35-C37-O38
3	A	302	A1L4O	O36-C35-C37-C39

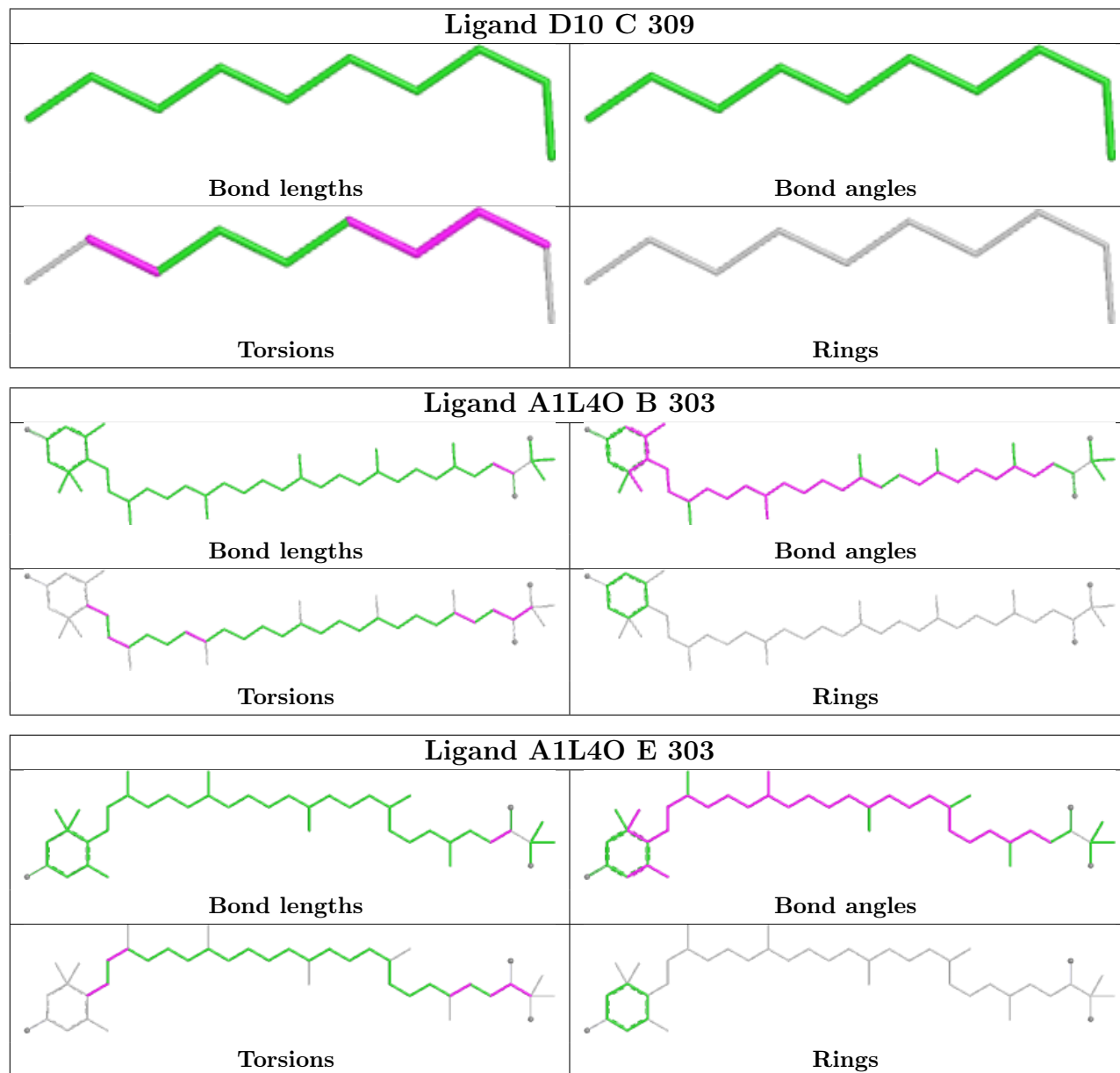
There are no ring outliers.

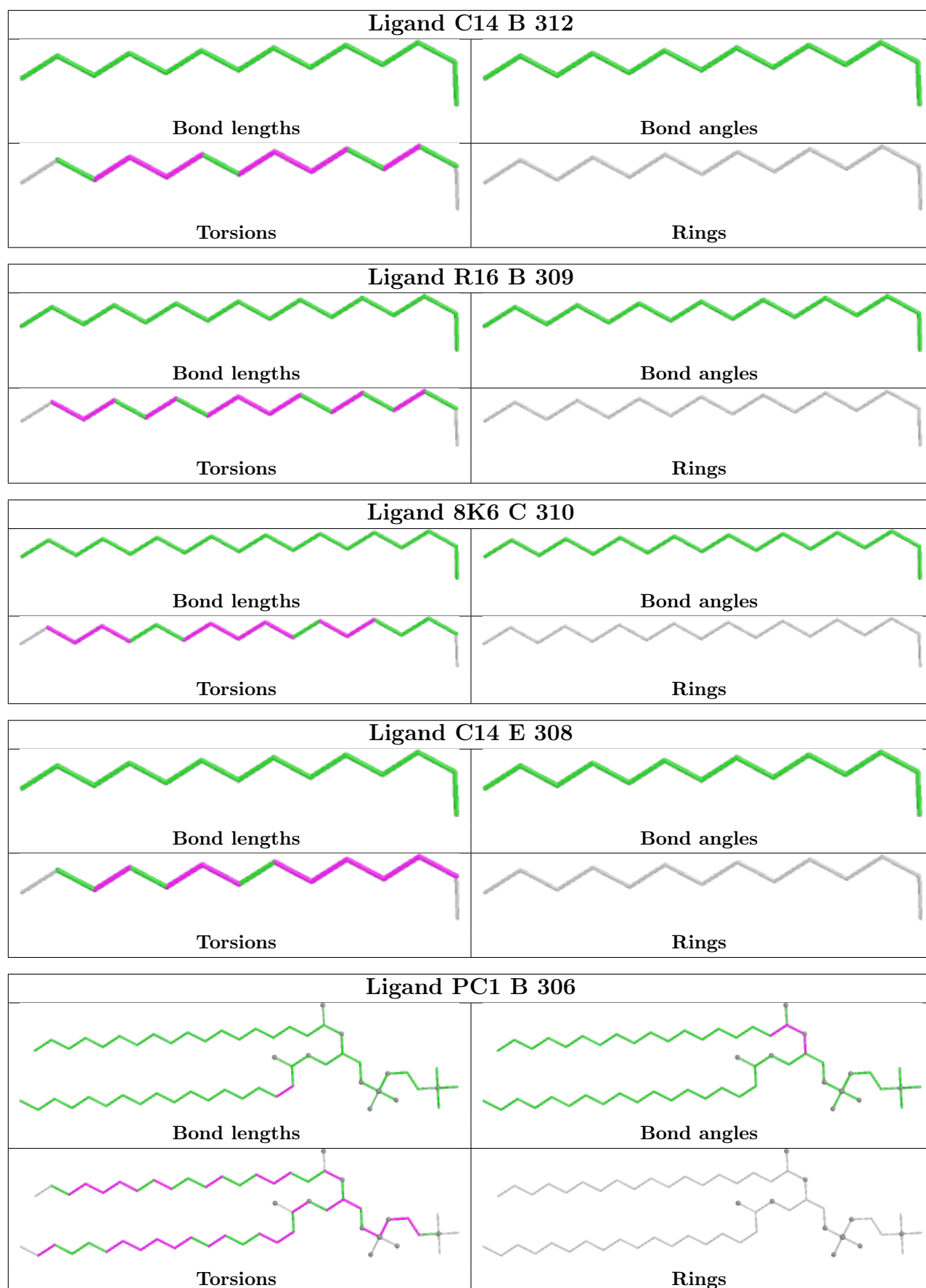
29 monomers are involved in 63 short contacts:

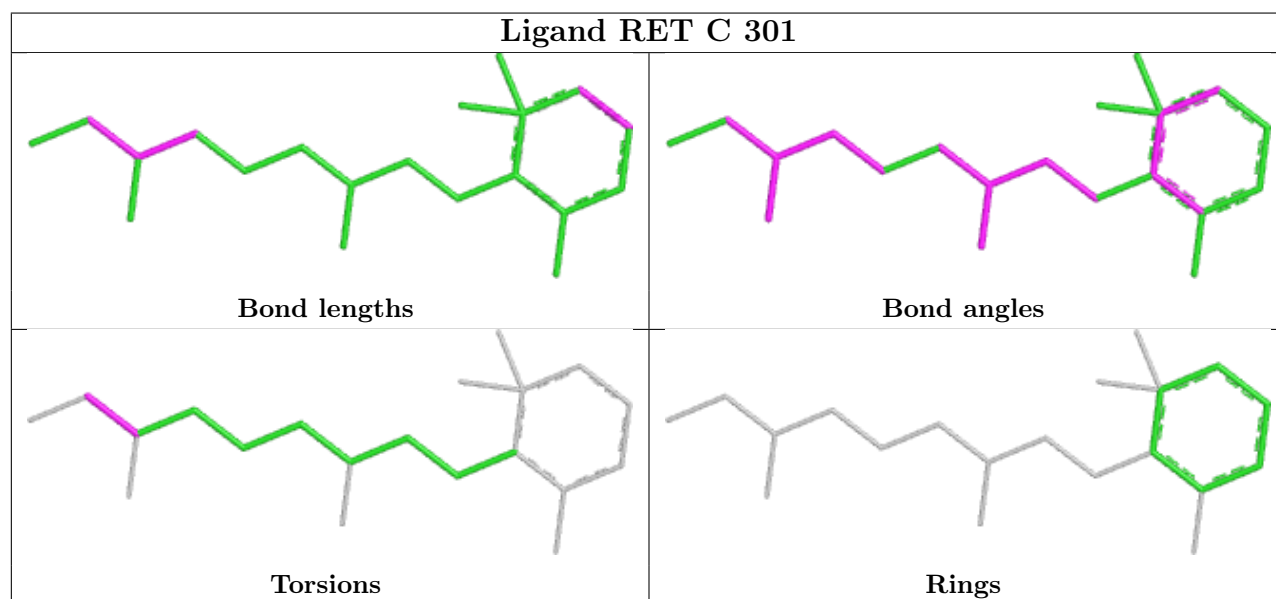
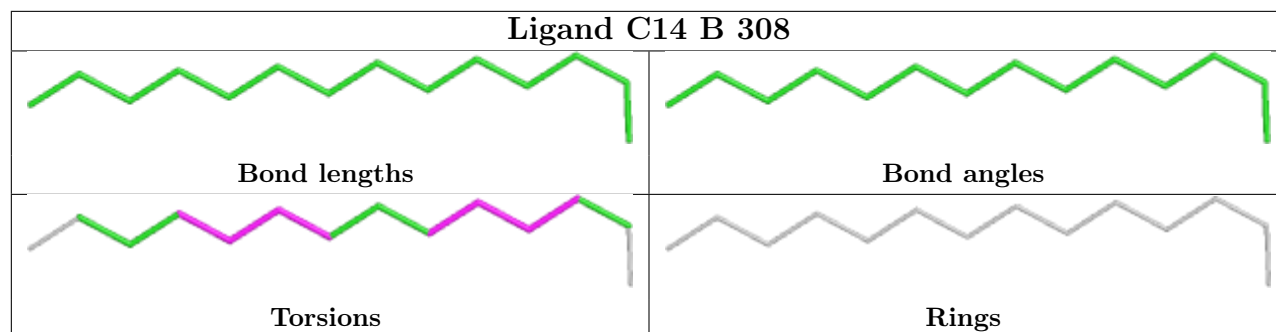
Mol	Chain	Res	Type	Clashes	Symm-Clashes
11	C	309	D10	2	0
3	E	303	A1L4O	2	0
8	C	310	8K6	2	0
5	B	306	PC1	3	0
2	C	301	RET	2	0
7	D	301	R16	3	0
2	D	302	RET	2	0
10	C	308	C14	2	0
9	D	310	D12	1	0
10	E	310	C14	2	0
8	B	301	8K6	1	0
6	C	306	PLC	1	0
2	A	301	RET	3	0
7	A	312	R16	3	0
5	C	305	PC1	6	0
9	A	310	D12	1	0
6	B	307	PLC	2	0
5	D	306	PC1	3	0
7	D	308	R16	2	0
7	E	301	R16	1	0
5	E	306	PC1	10	0
9	E	307	D12	1	0
10	C	307	C14	2	0
3	A	302	A1L4O	1	0
5	A	305	PC1	5	0
7	B	311	R16	2	0
2	E	302	RET	1	0
7	B	310	R16	1	0
2	B	302	RET	4	0

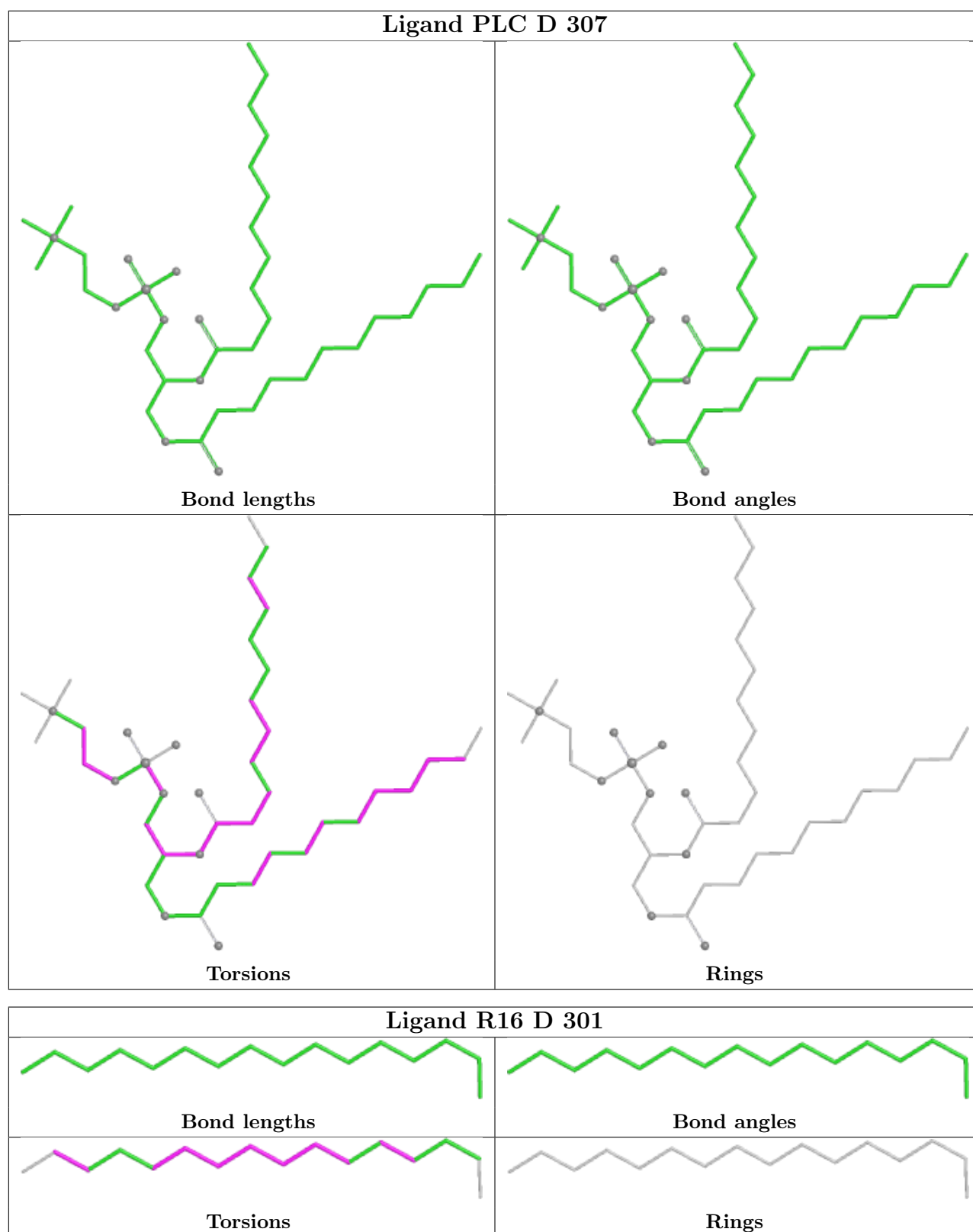
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

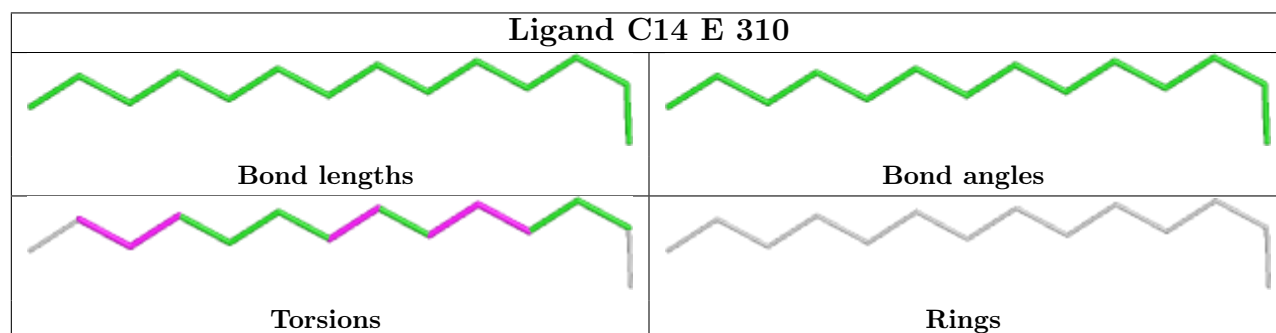
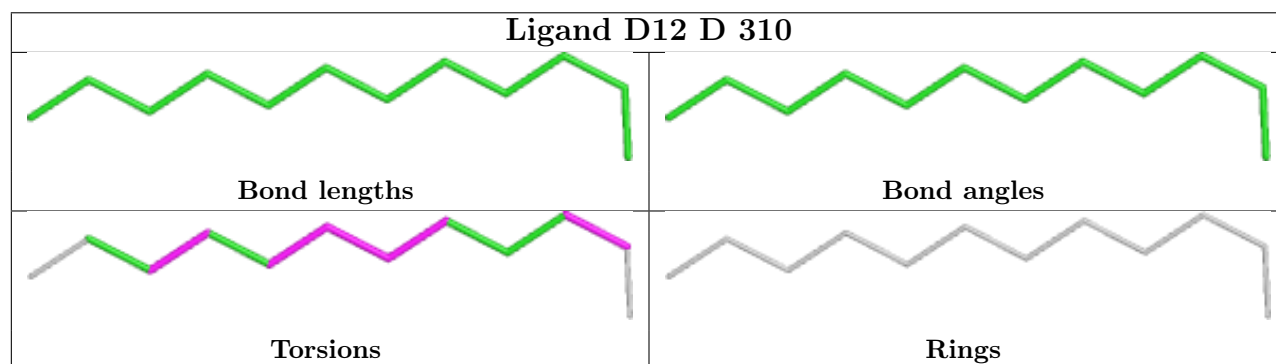
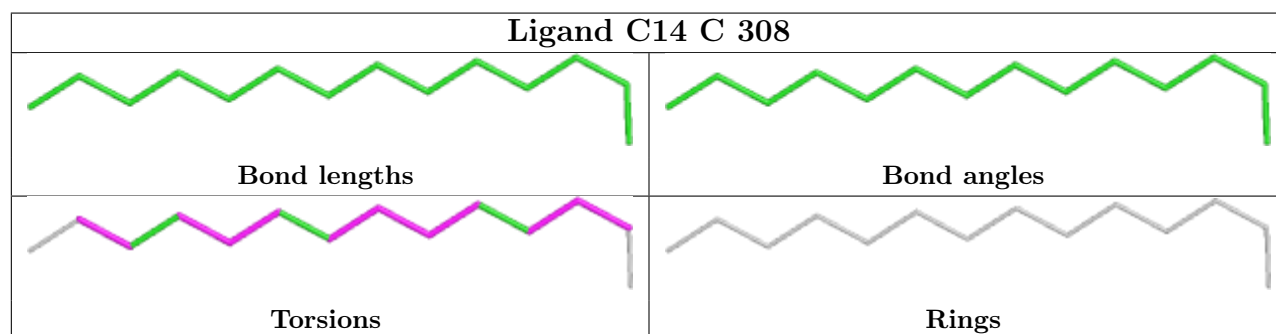
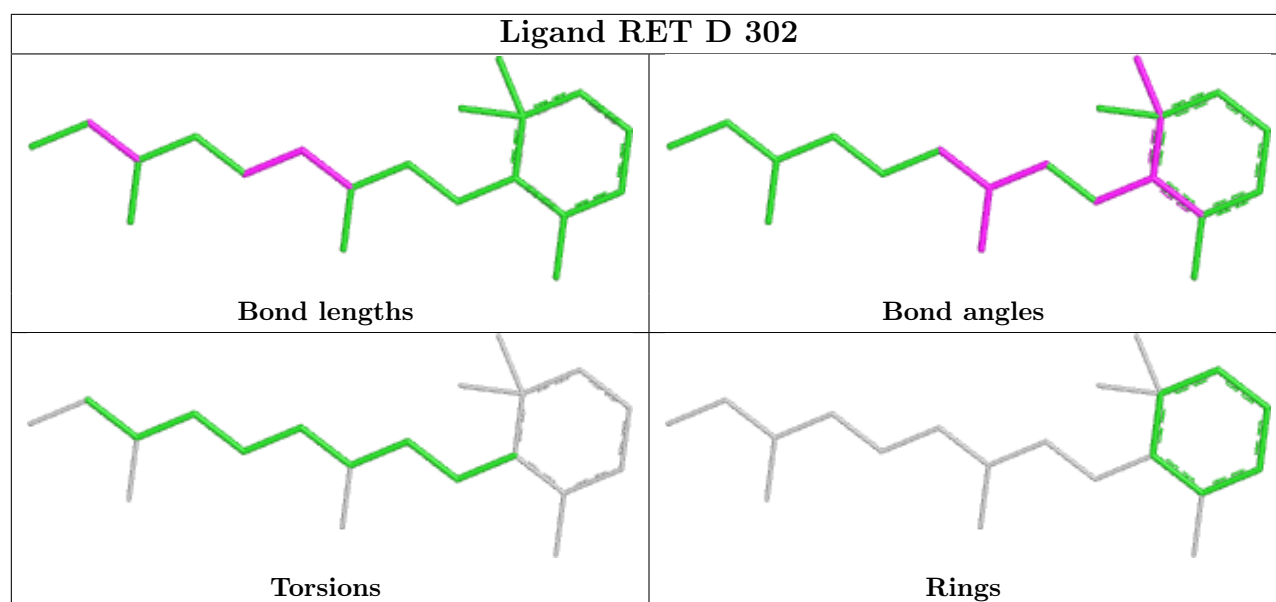
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. 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.

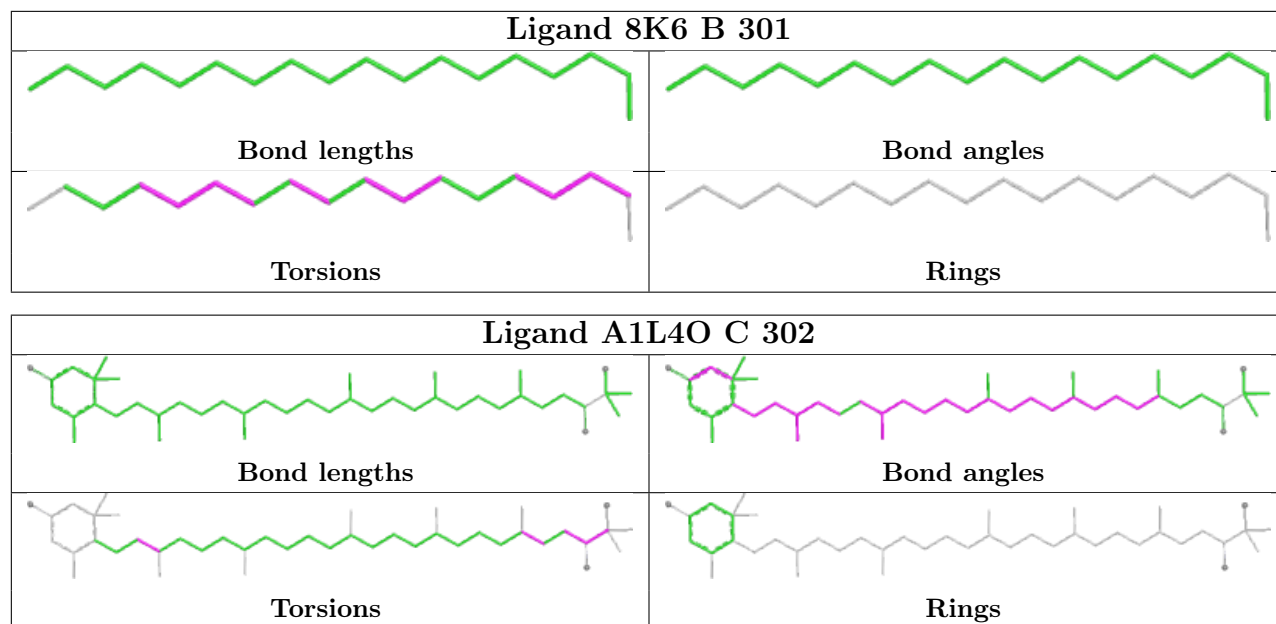


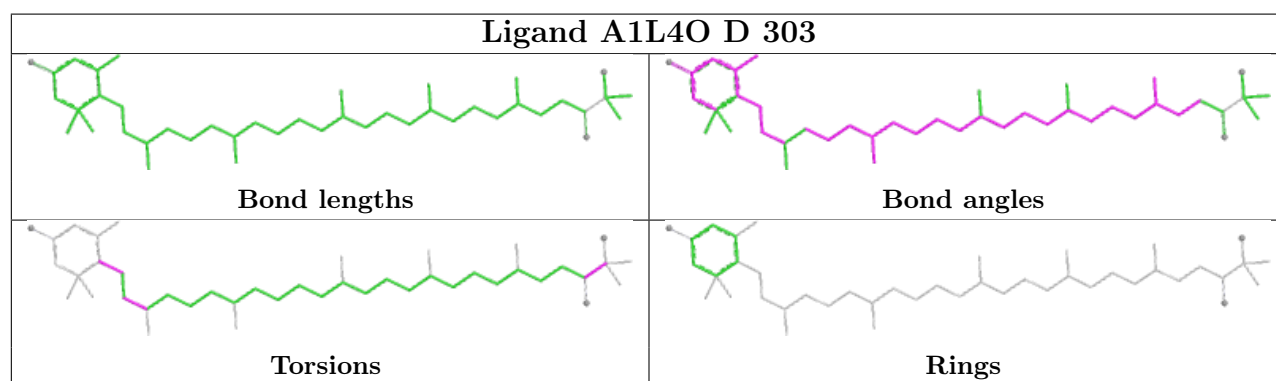
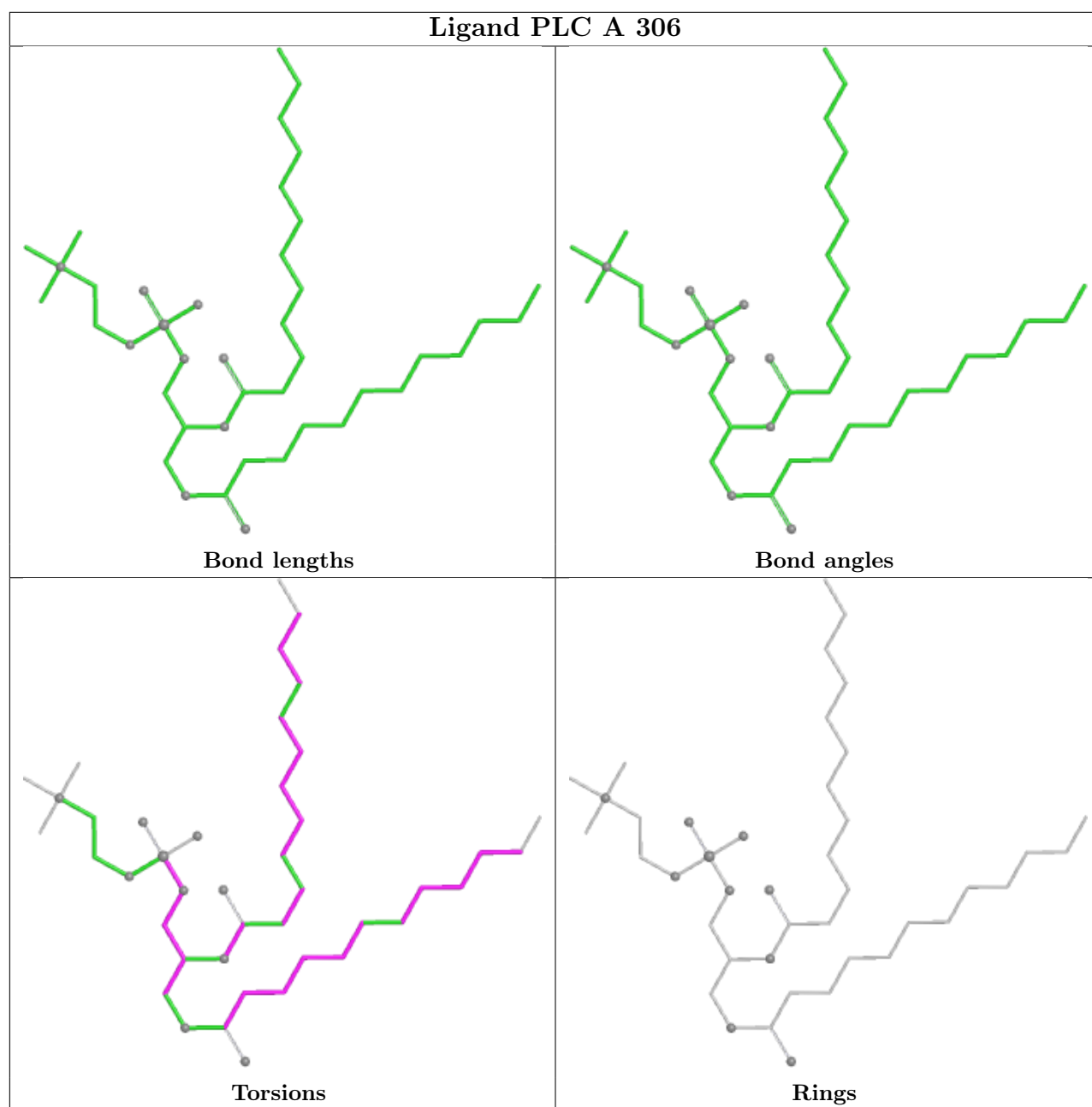


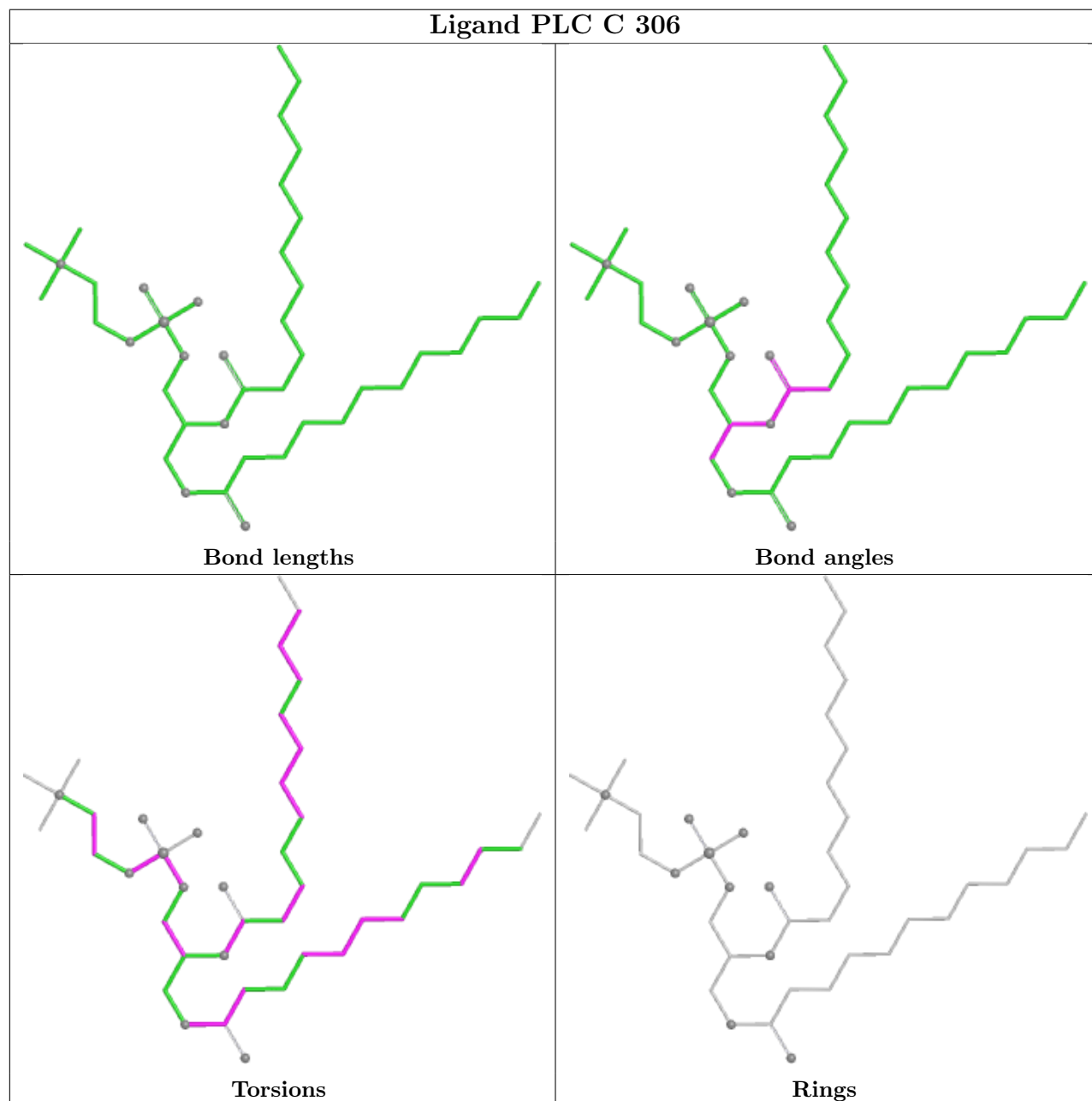
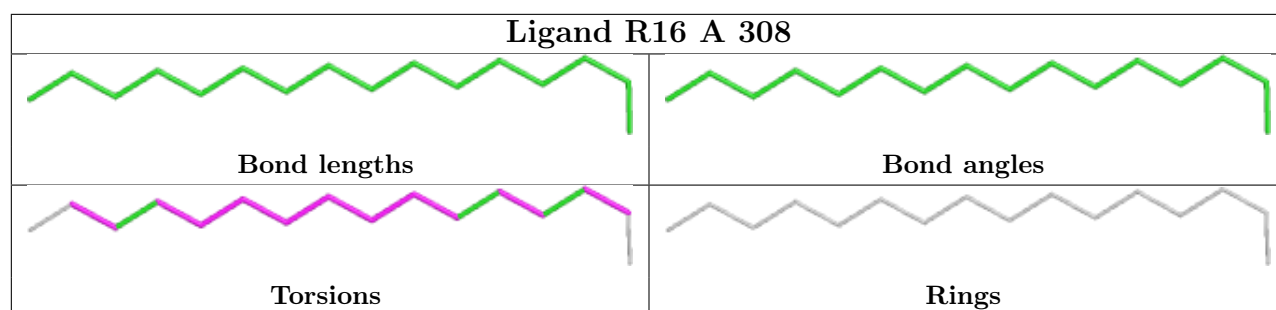


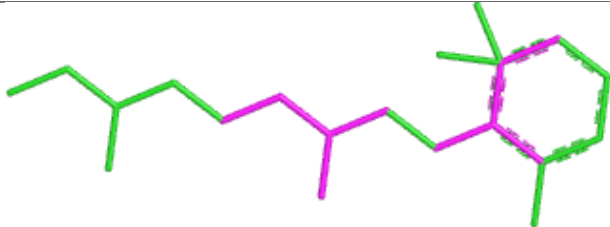
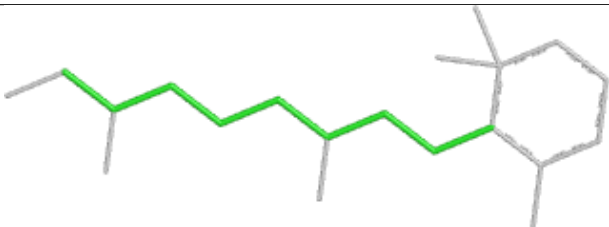
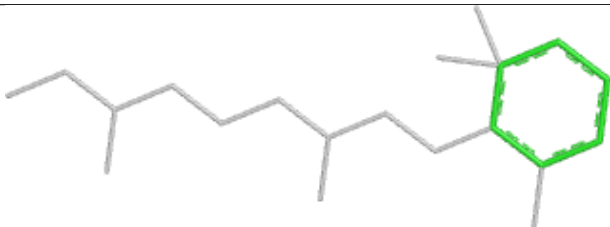


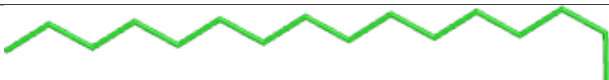
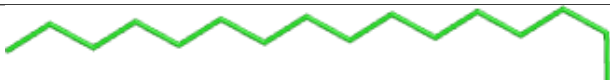
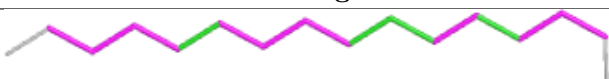
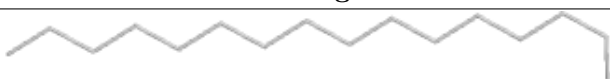


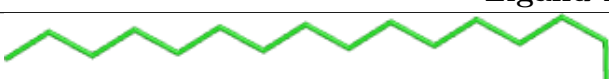
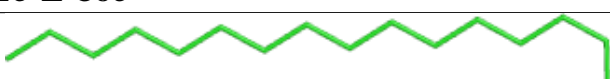
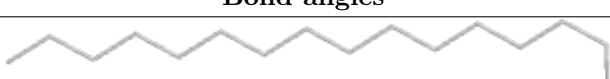


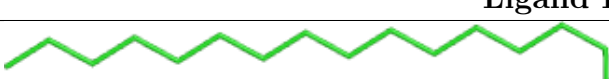
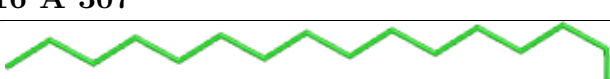
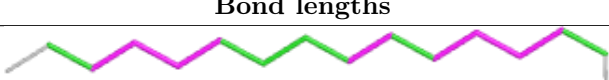
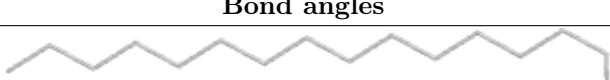


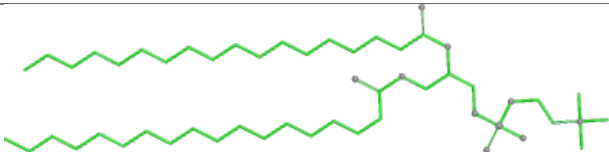
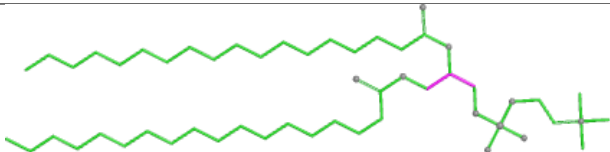
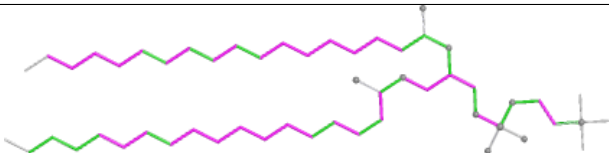
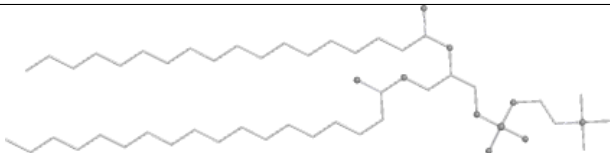
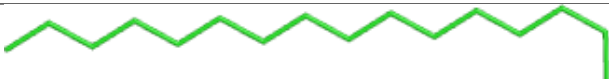
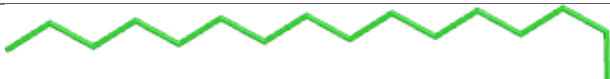
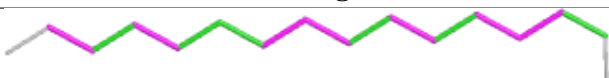


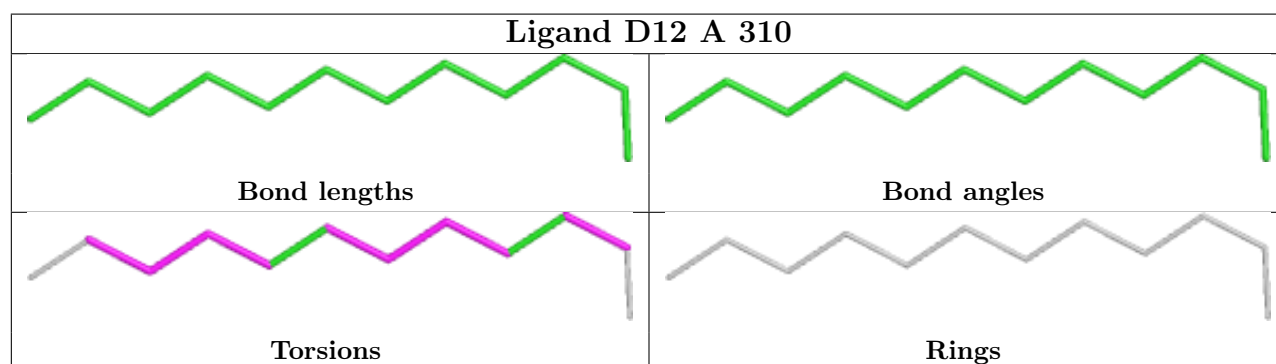
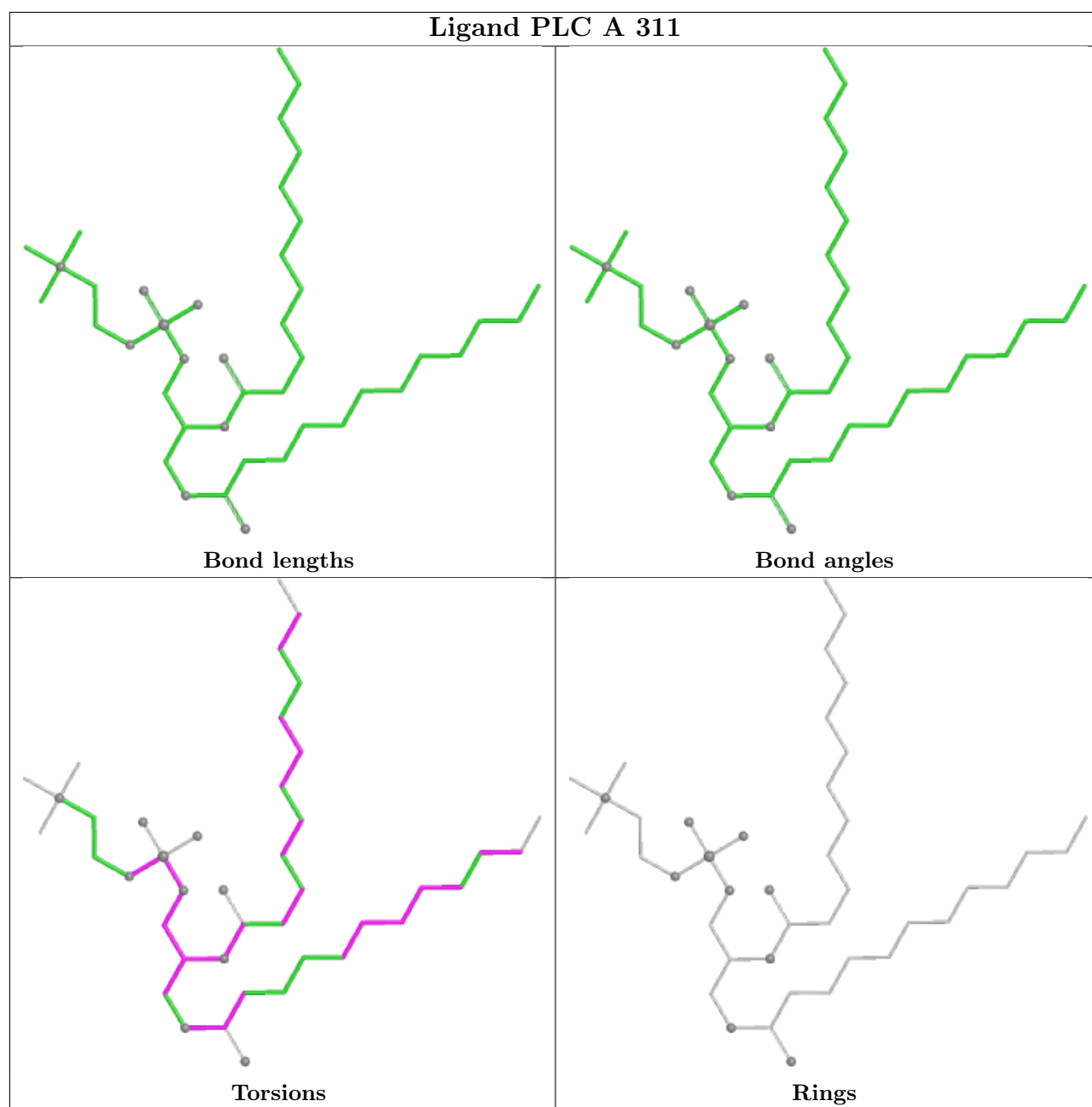
Ligand RET A 301	
	
Bond lengths	Bond angles
	
Torsions	Rings

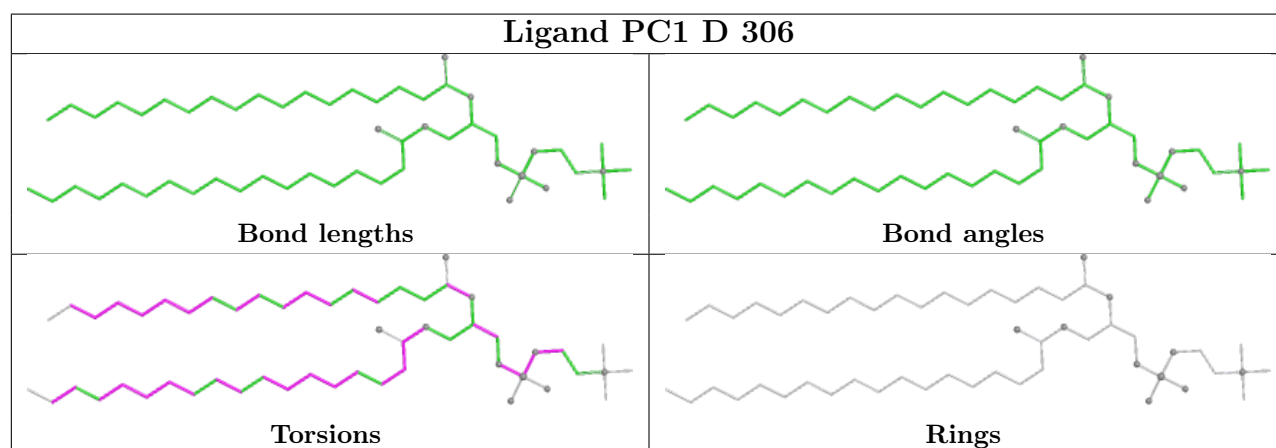
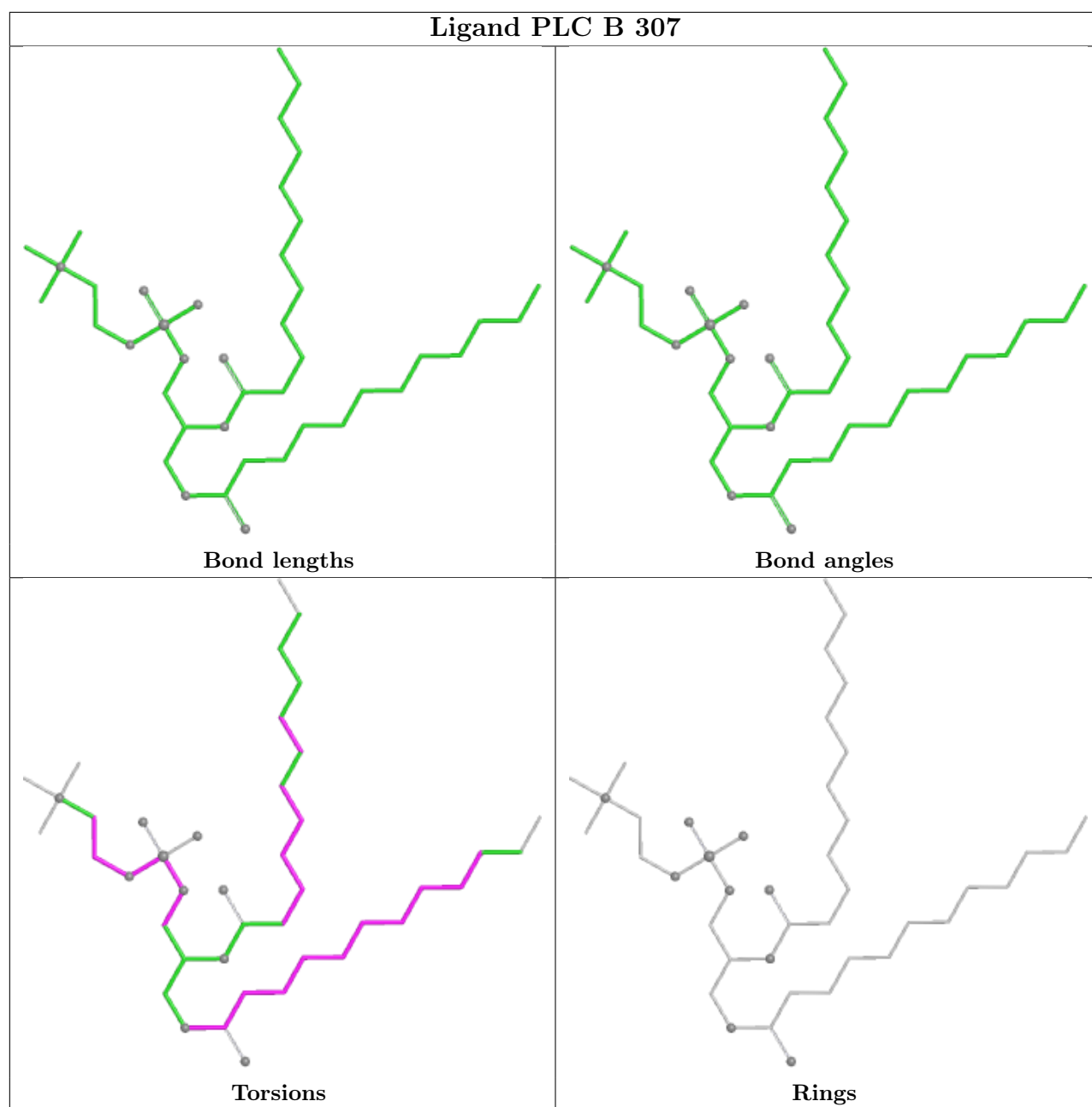
Ligand R16 A 312	
	
Bond lengths	Bond angles
	
Torsions	Rings

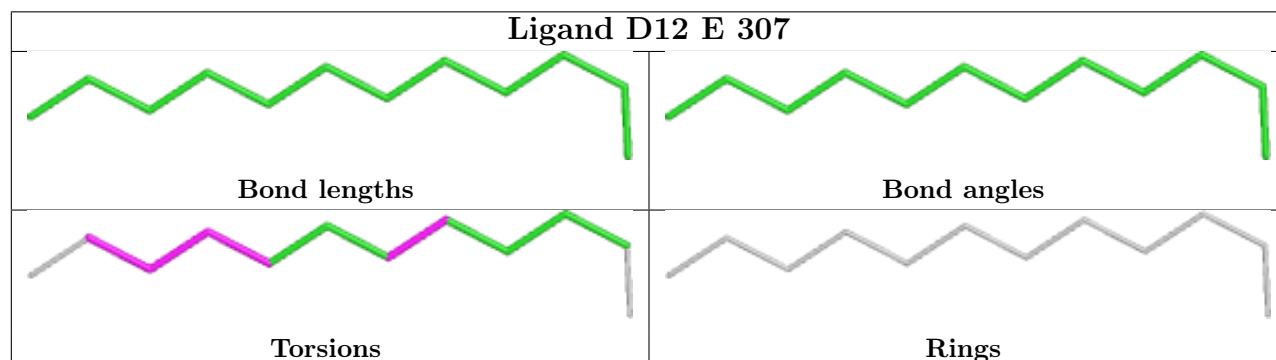
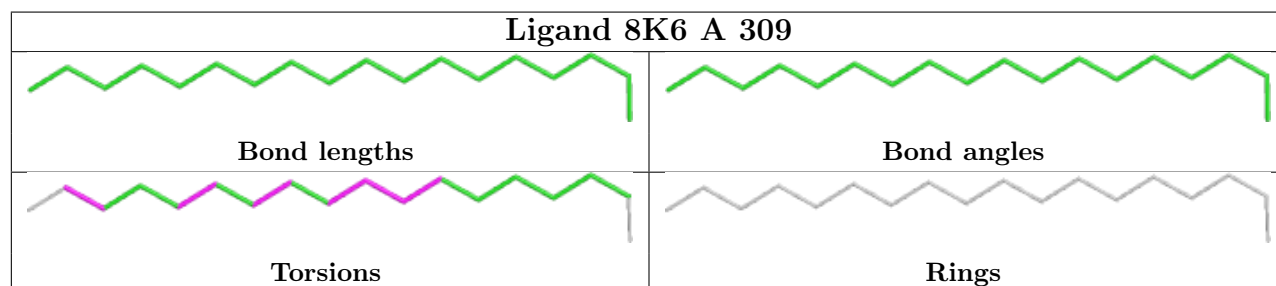
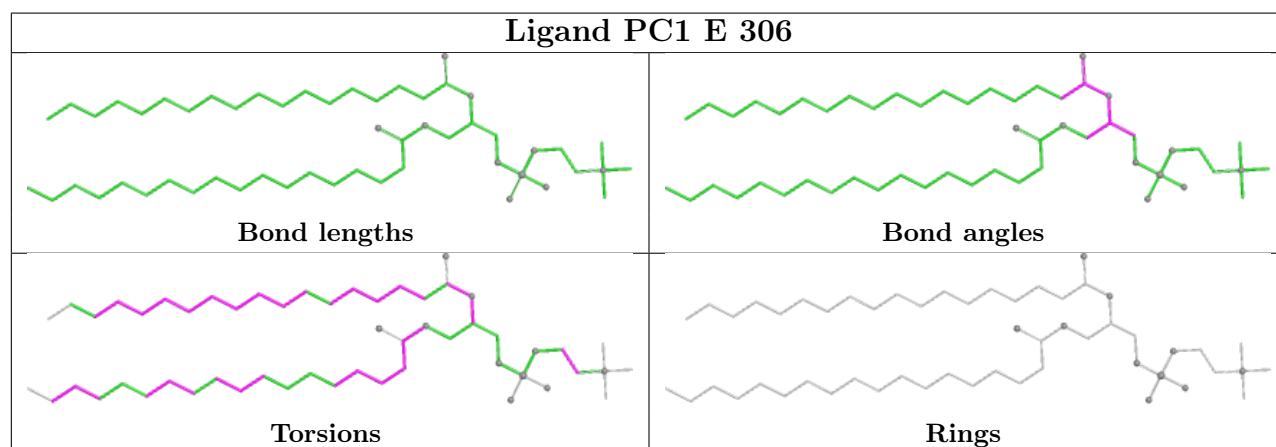
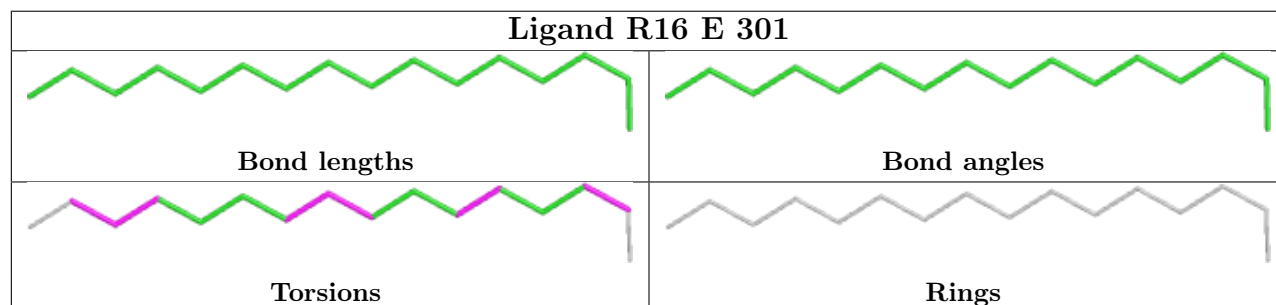
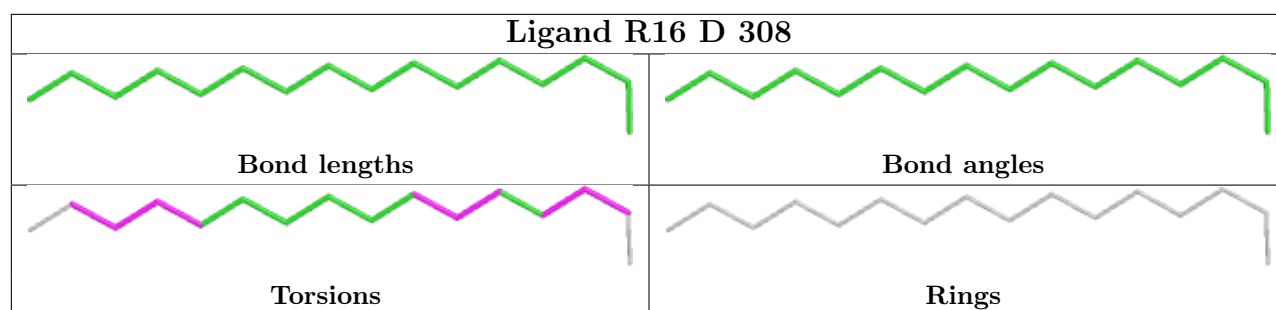
Ligand R16 E 309	
	
Bond lengths	Bond angles
	
Torsions	Rings

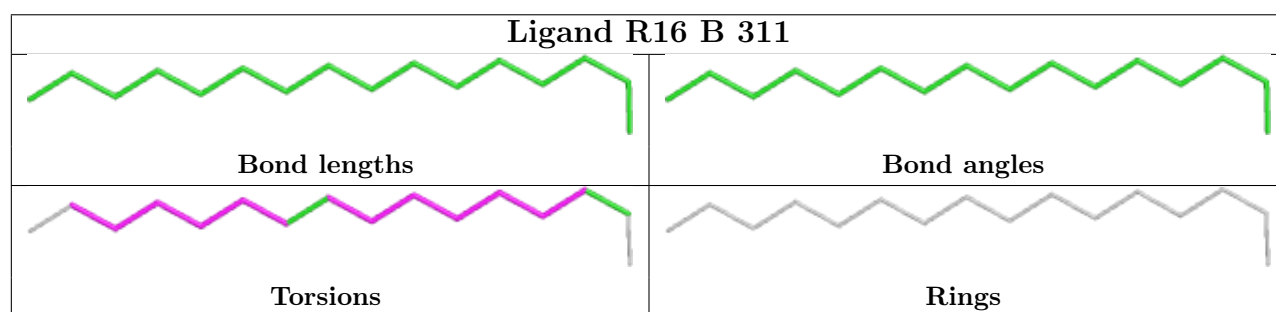
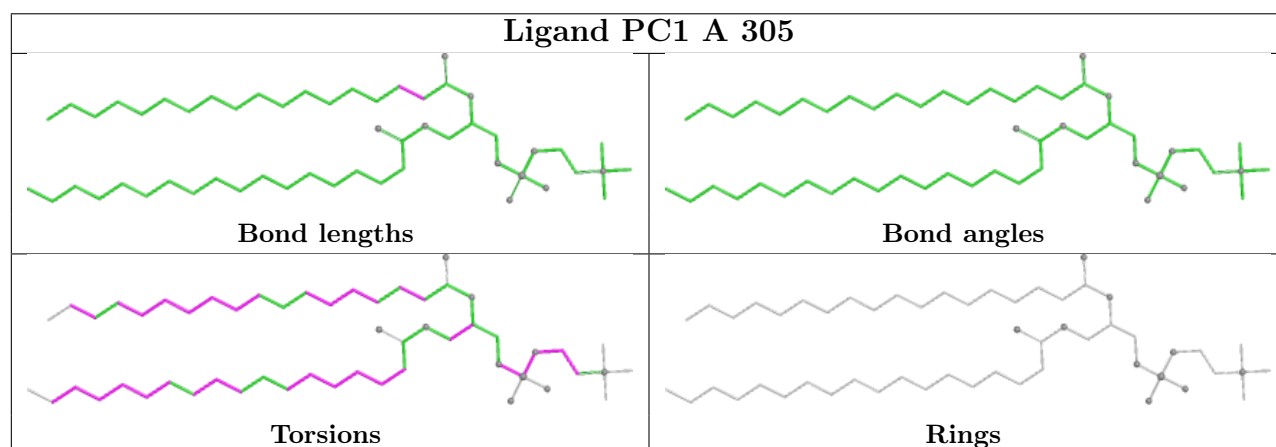
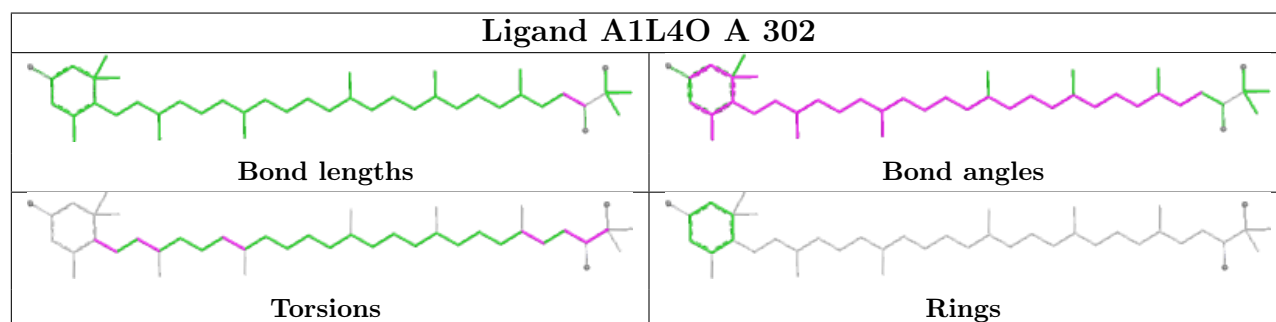
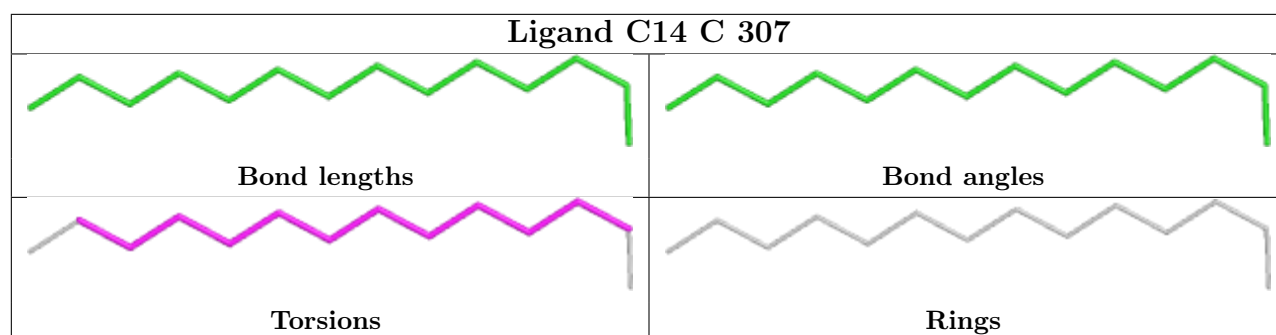
Ligand R16 A 307	
	
Bond lengths	Bond angles
	
Torsions	Rings

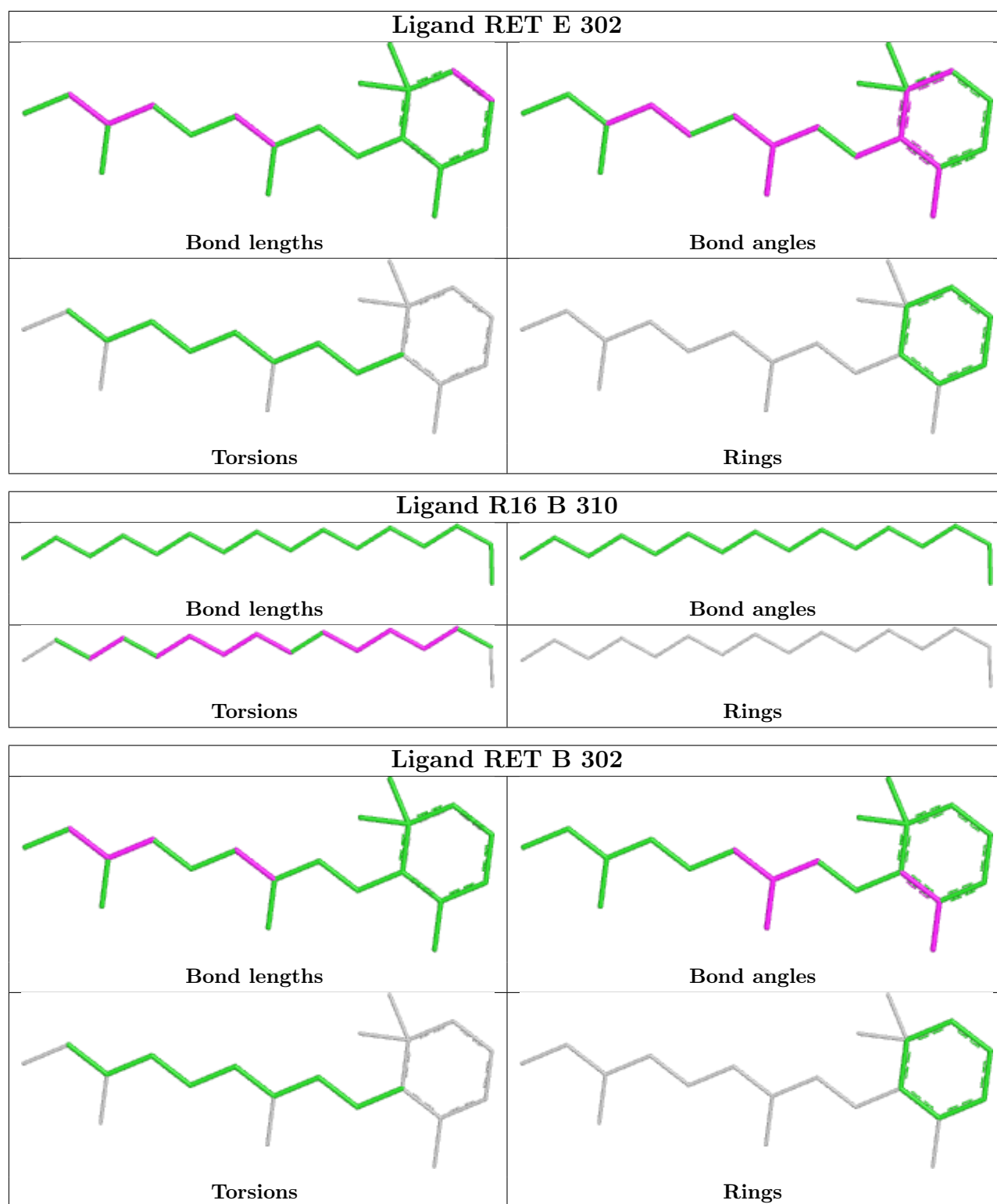
Ligand PC1 C 305	
 Bond lengths	 Bond angles
 Torsions	 Rings
Ligand R16 D 309	
 Bond lengths	 Bond angles
 Torsions	 Rings











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.

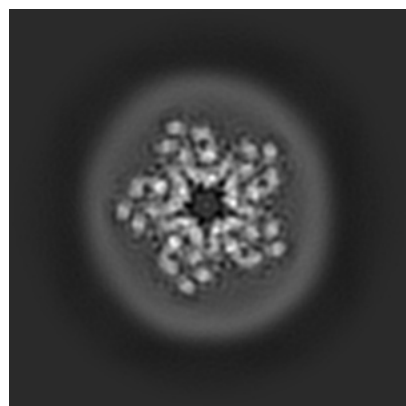
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-61687. These allow visual inspection of the internal detail of the map and identification of artifacts.

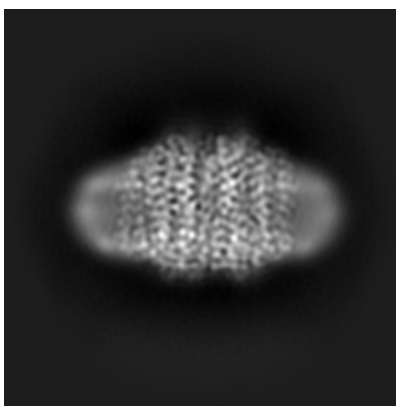
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

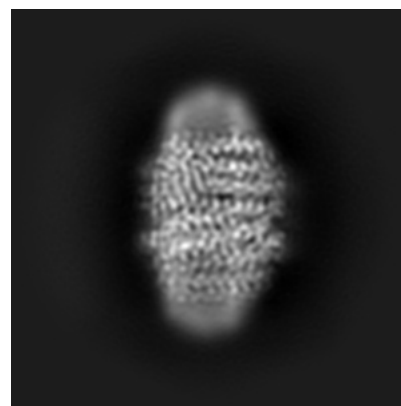
6.1.1 Primary map



X

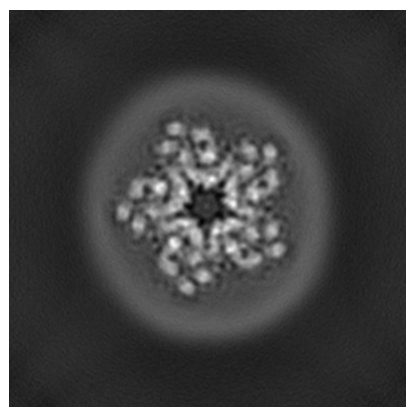


Y

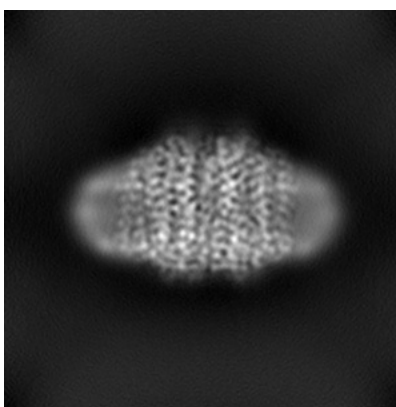


Z

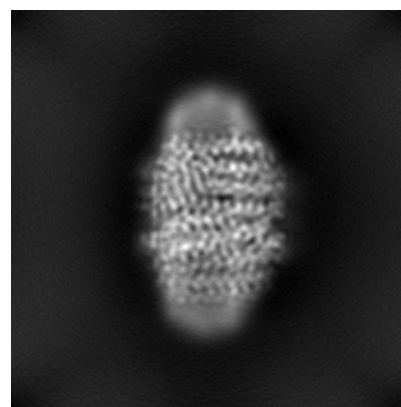
6.1.2 Raw map



X



Y

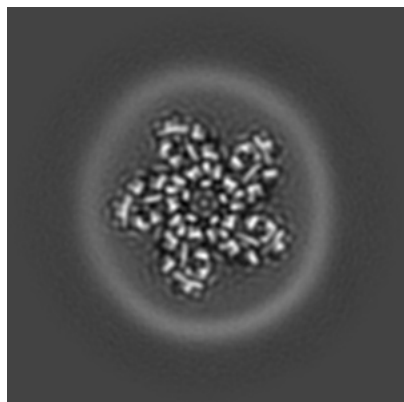


Z

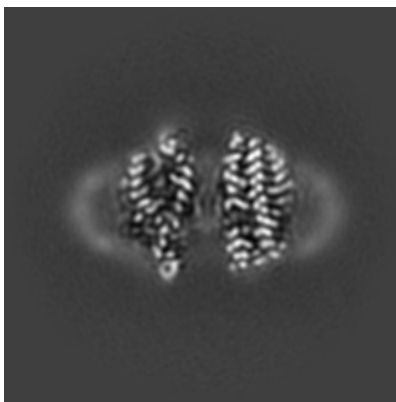
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

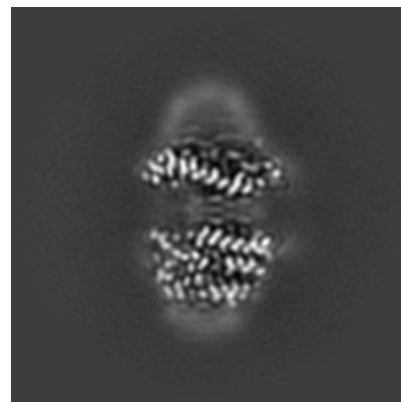
6.2.1 Primary map



X Index: 110

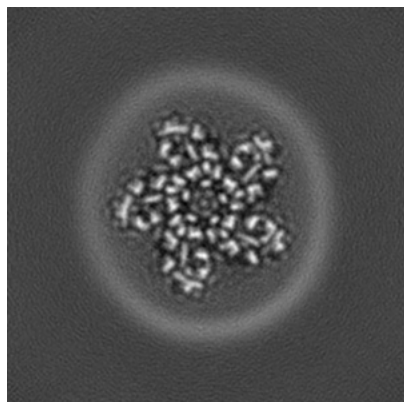


Y Index: 110

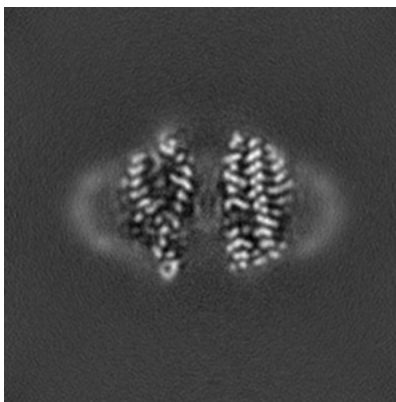


Z Index: 110

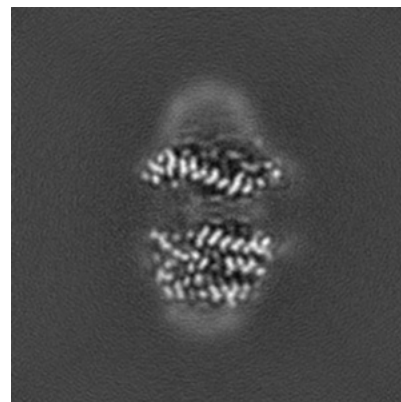
6.2.2 Raw map



X Index: 110



Y Index: 110

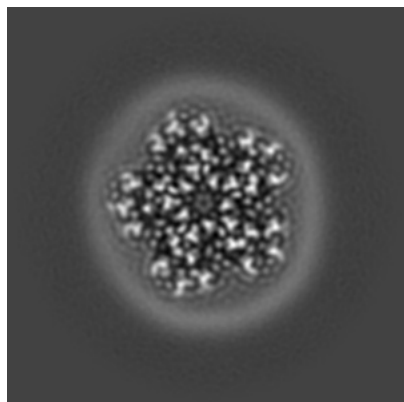


Z Index: 110

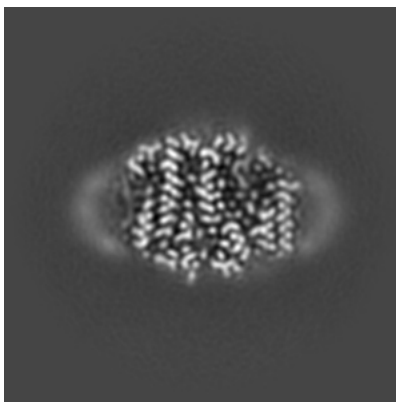
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

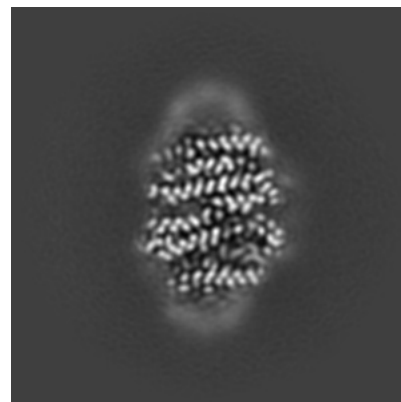
6.3.1 Primary map



X Index: 122

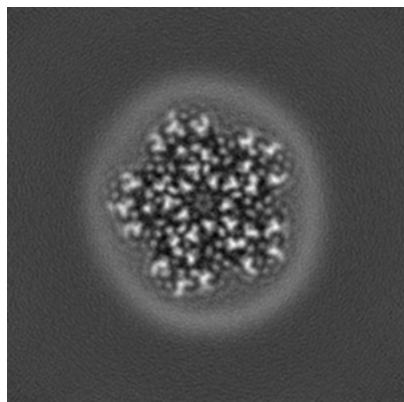


Y Index: 90

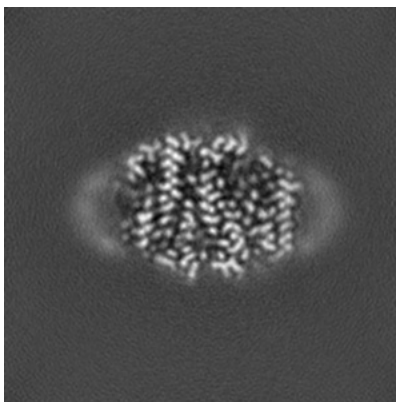


Z Index: 100

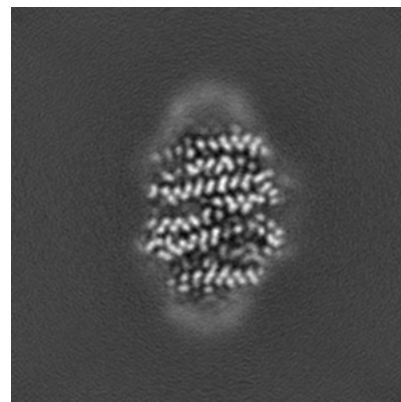
6.3.2 Raw map



X Index: 122



Y Index: 91

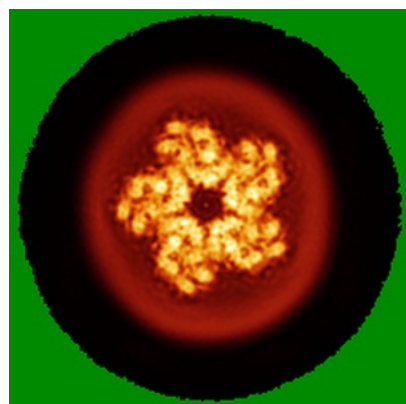


Z Index: 100

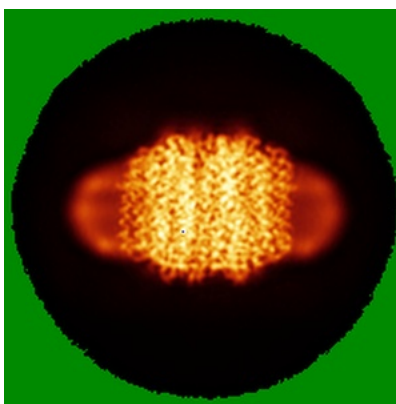
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

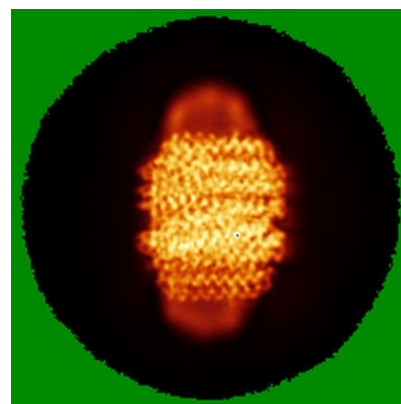
6.4.1 Primary map



X

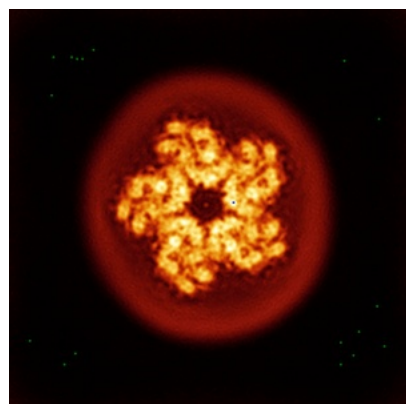


Y

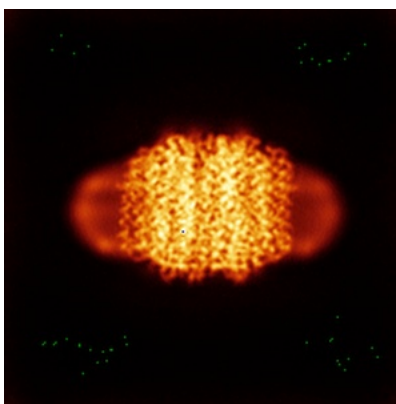


Z

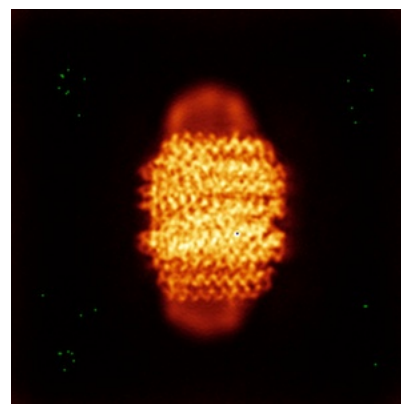
6.4.2 Raw map



X



Y



Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

This section was not generated.

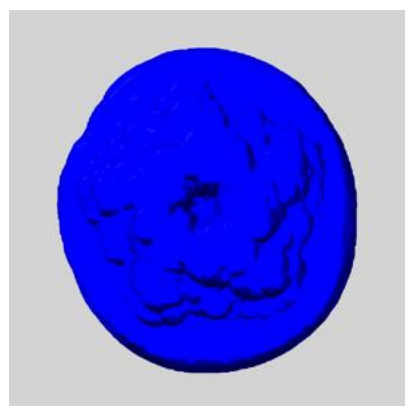
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

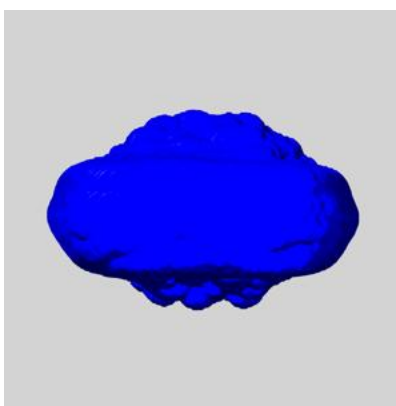
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

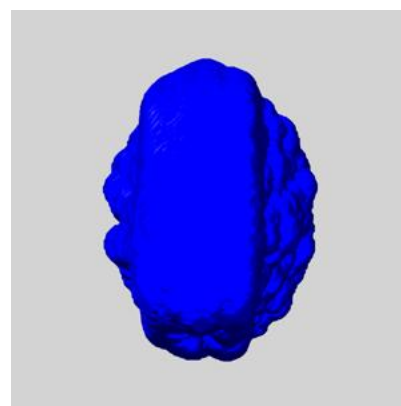
6.6.1 emd_61687_msk_1.map [i](#)



X



Y

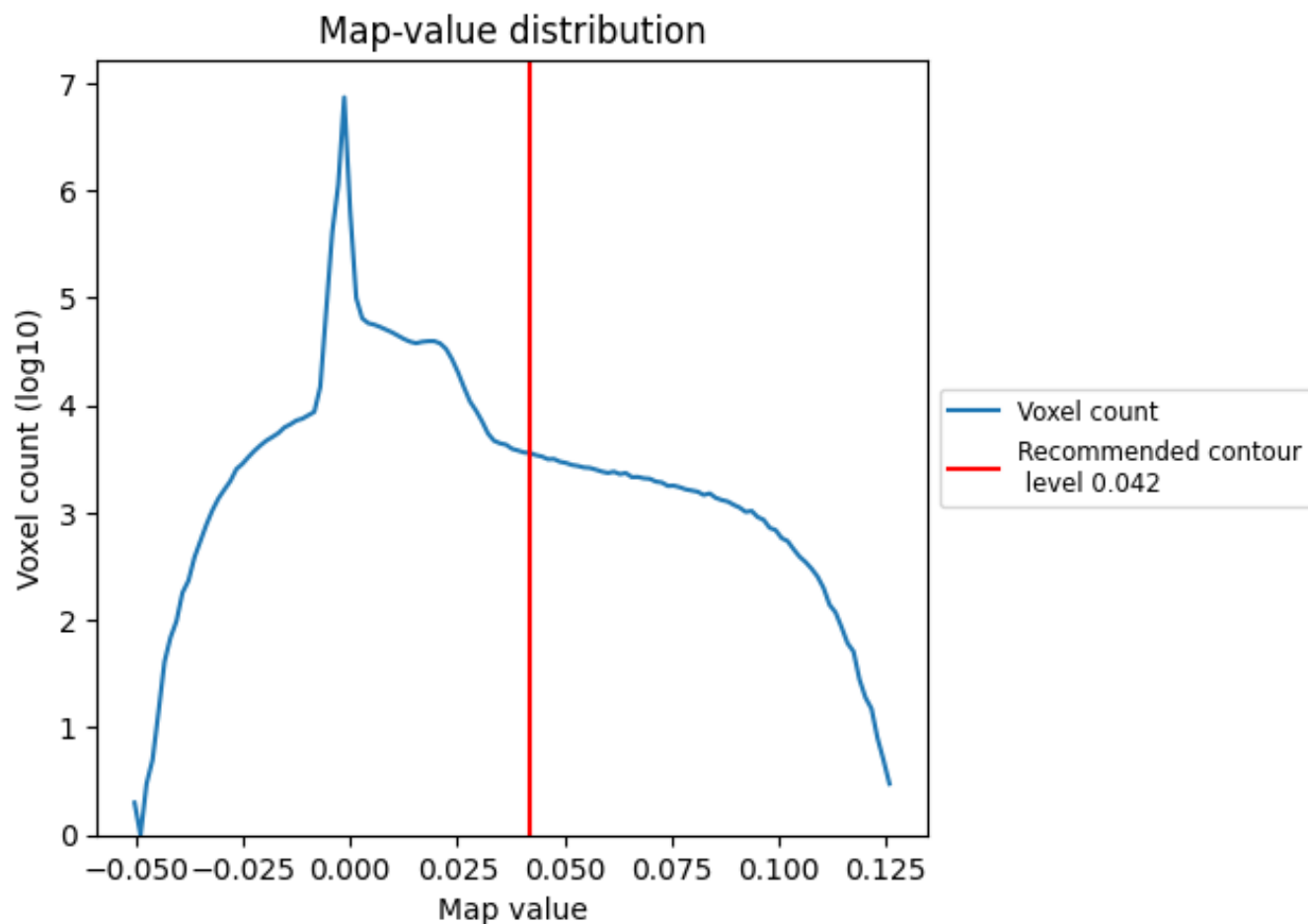


Z

7 Map analysis [i](#)

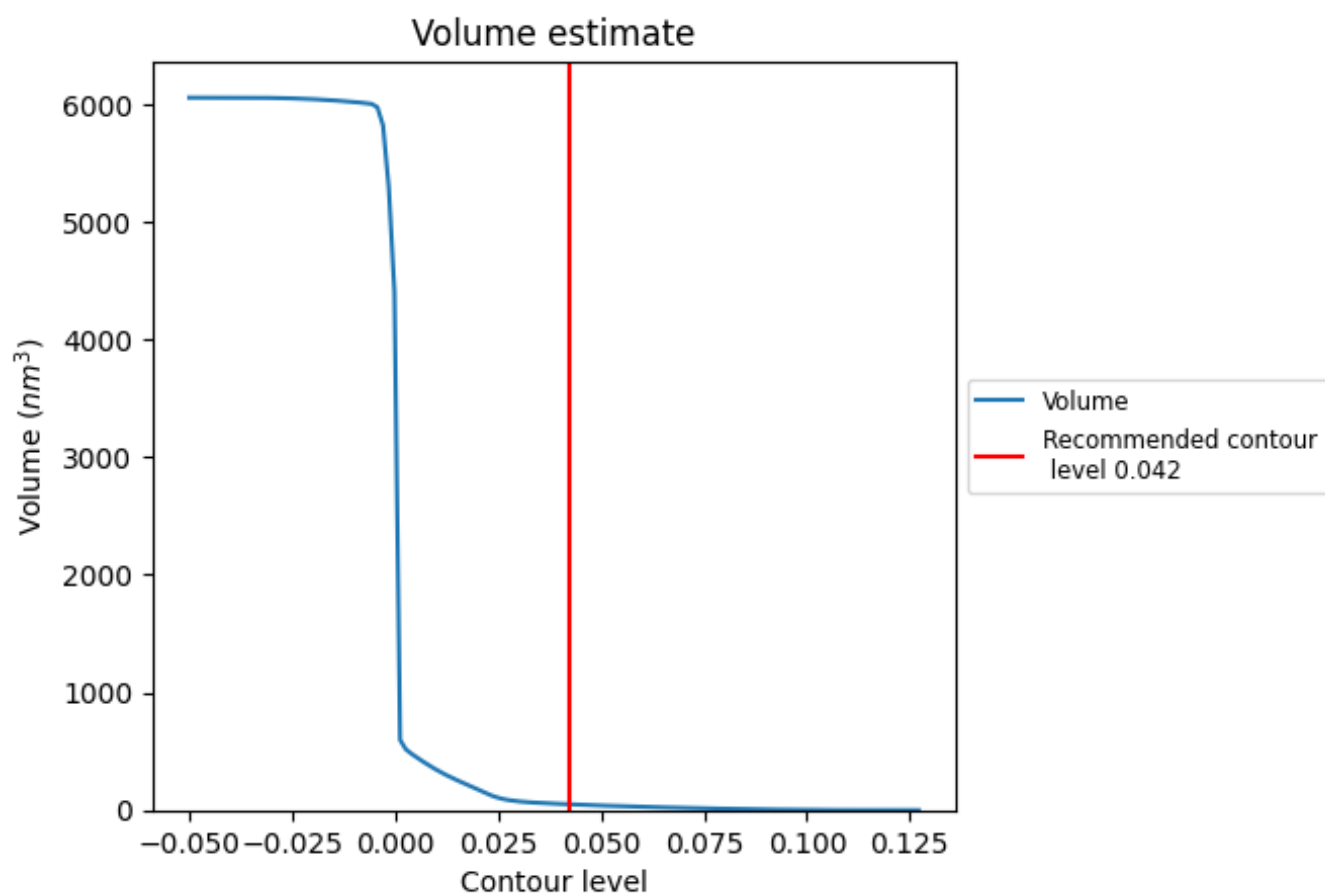
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

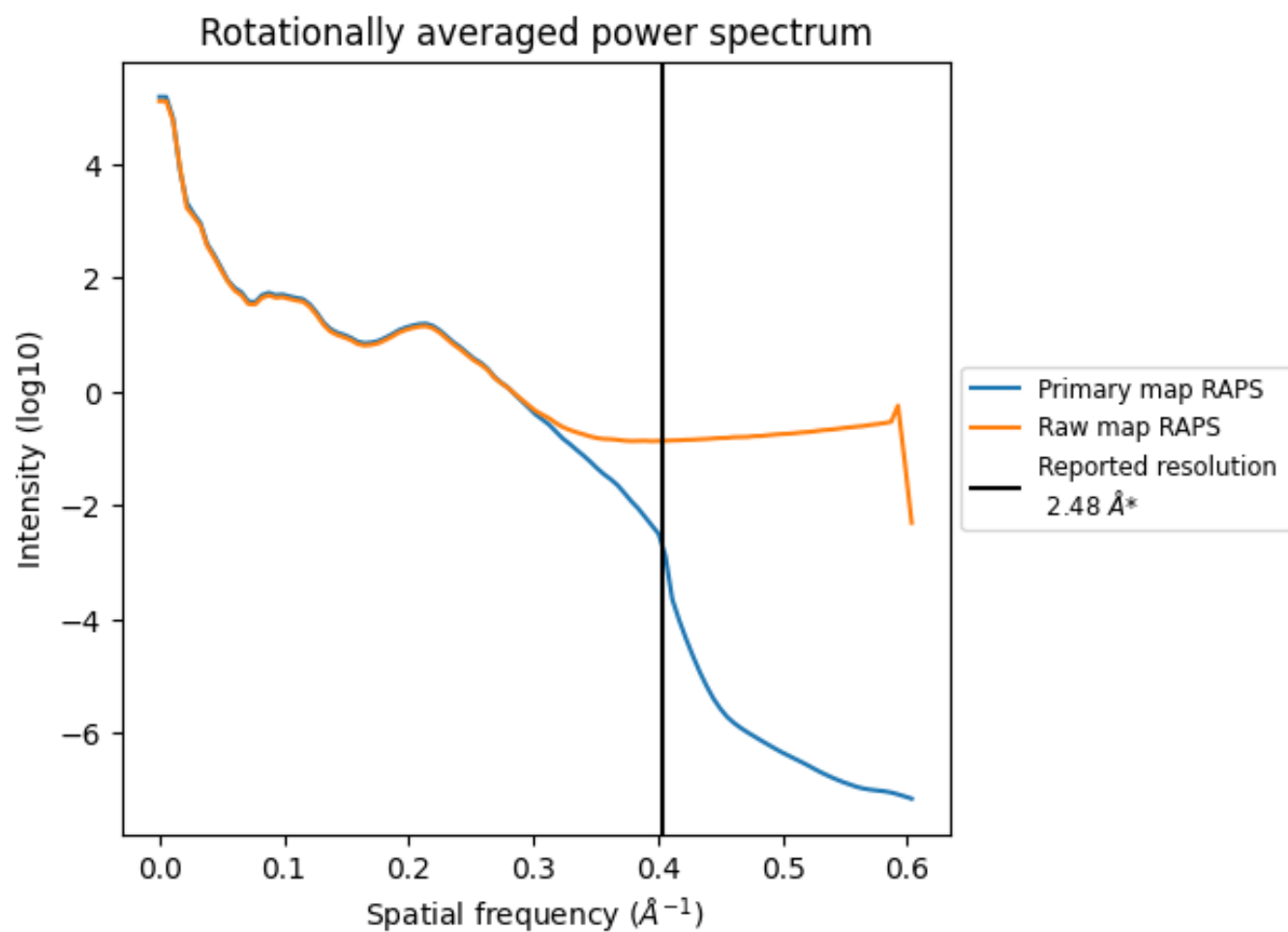
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 50 nm³; this corresponds to an approximate mass of 45 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum ⓘ

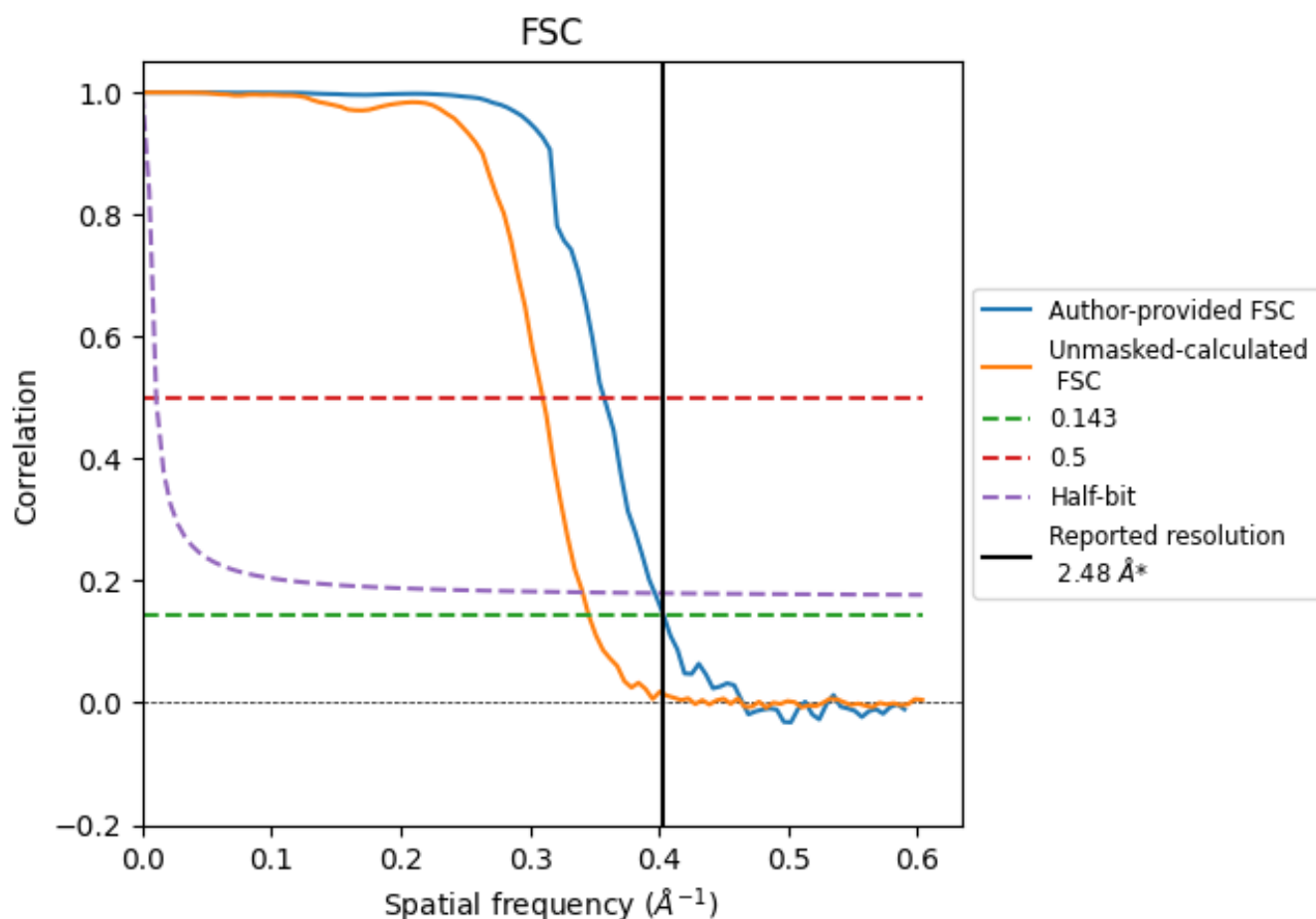


*Reported resolution corresponds to spatial frequency of $0.403 \text{ \AA}^{-1}$

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.403 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

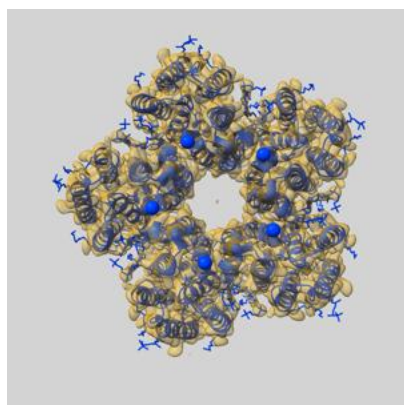
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.48	-	-
Author-provided FSC curve	2.48	2.80	2.52
Unmasked-calculated*	2.89	3.23	2.94

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 2.89 differs from the reported value 2.48 by more than 10 %

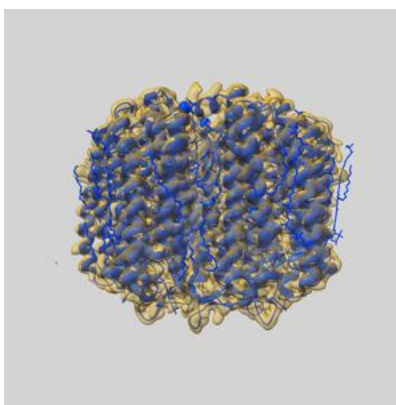
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-61687 and PDB model 9JOW. Per-residue inclusion information can be found in section [3](#) on page [13](#).

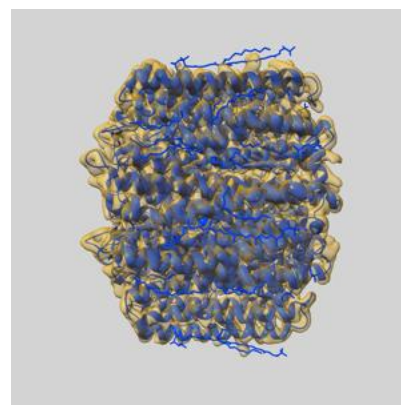
9.1 Map-model overlay [i](#)



X



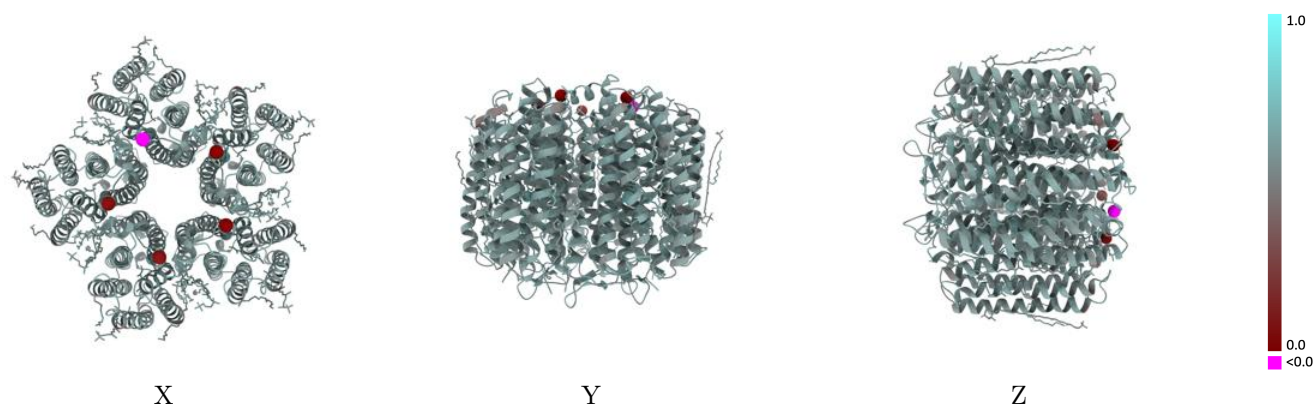
Y



Z

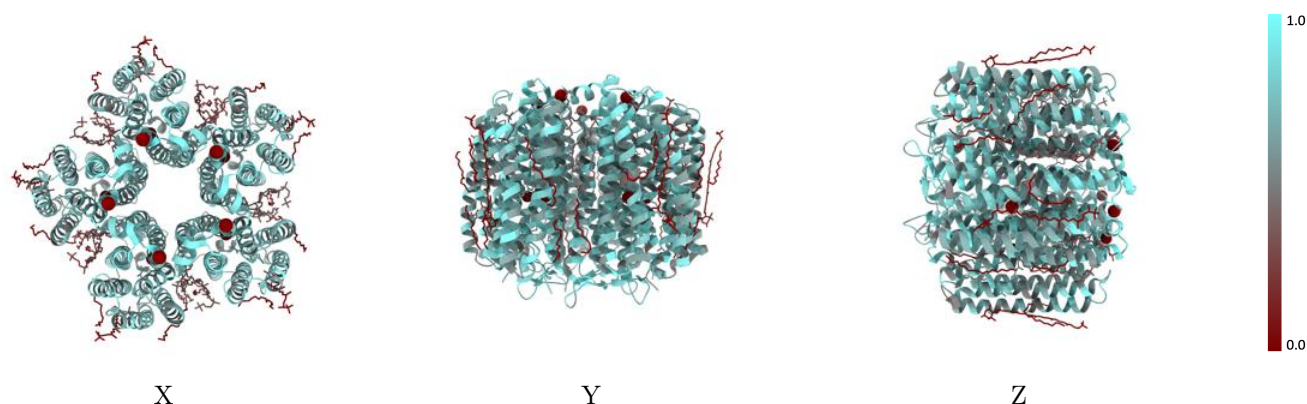
The images above show the 3D surface view of the map at the recommended contour level 0.042 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



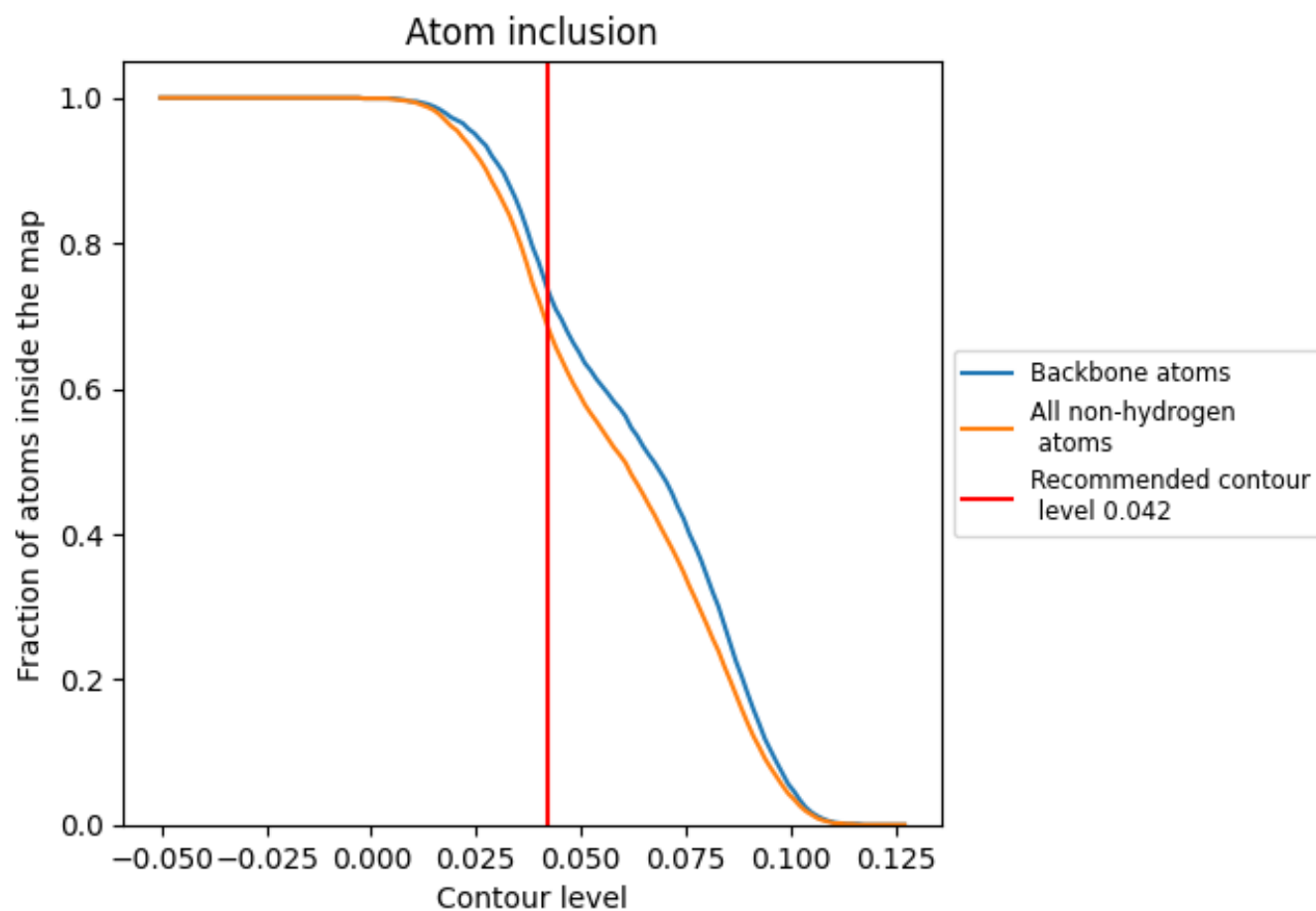
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.042).

9.4 Atom inclusion ⓘ



At the recommended contour level, 74% of all backbone atoms, 69% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.042) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6870	0.5760
A	0.6990	0.5780
B	0.6890	0.5760
C	0.6830	0.5750
D	0.6880	0.5760
E	0.7040	0.5740

