



wwPDB EM Validation Summary Report ⓘ

Mar 10, 2026 – 02:12 PM UTC

PDB ID : 6KHI / pdb_00006khi
EMDB ID : EMD-9989
Title : Supercomplex for cyclic electron transport in cyanobacteria
Authors : Pan, X.; Cao, D.; Xie, F.; Zhang, X.; Li, M.
Deposited on : 2019-07-15
Resolution : 3.00 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

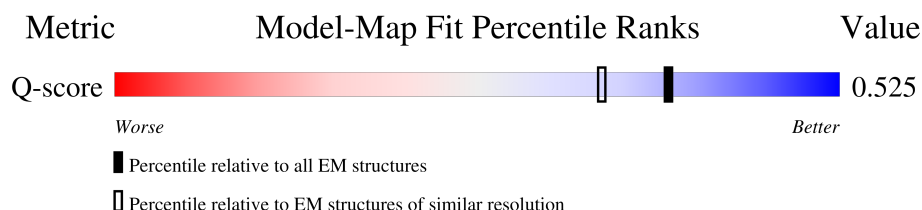
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

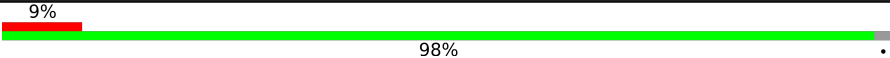
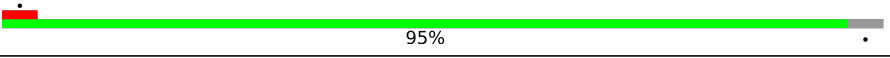
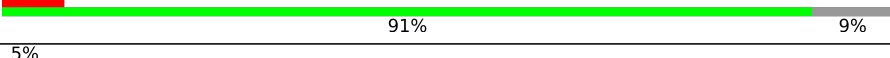
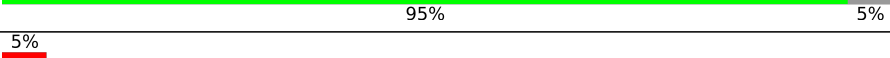
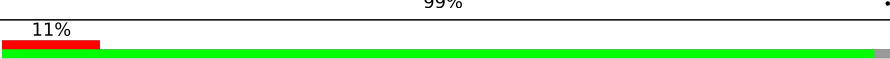
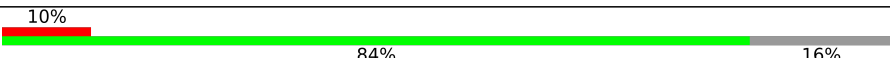
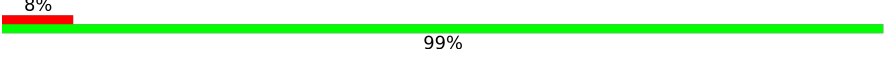
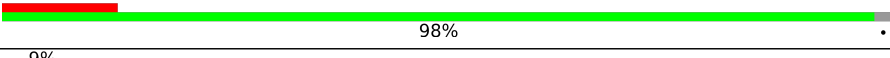
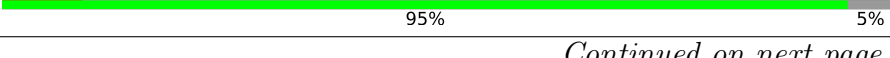
The reported resolution of this entry is 3.00 Å.

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.



Metric	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Q-score	25397	14081 (2.50 - 3.50)

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	372	
2	B	515	
3	C	132	
4	D	529	
5	E	101	
6	F	656	
7	G	200	
8	H	394	
9	I	196	
10	J	168	

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Mol	Chain	Length	Quality of chain
11	K	237	
12	L	76	
13	M	111	
14	N	150	
15	O	70	
16	P	44	
17	Q	45	
18	S	110	
19	V	146	
20	1	98	

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
24	BCR	D	602	-	X	-	-
24	BCR	D	603	-	X	-	-

2 Entry composition

There are 27 unique types of molecules in this entry. The entry contains 32635 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 NAD(P)H-quinone oxidoreductase subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	366	Total	C	N	O	S	0	0
			2821	1893	439	478	11		

- Molecule 2 is a protein called NAD(P)H-quinone oxidoreductase subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	492	Total	C	N	O	S	0	0
			3724	2472	578	658	16		

- Molecule 3 is a protein called NAD(P)H-quinone oxidoreductase subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	120	Total	C	N	O	S	0	0
			971	665	149	153	4		

- Molecule 4 is a protein called NAD(P)H-quinone oxidoreductase chain 4 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	504	Total	C	N	O	S	0	0
			3897	2614	606	655	22		

- Molecule 5 is a protein called NAD(P)H-quinone oxidoreductase subunit 4L.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	100	Total	C	N	O	S	0	0
			775	512	127	133	3		

- Molecule 6 is a protein called NADH dehydrogenase subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	641	Total	C	N	O	S	0	0
			4945	3285	778	845	37		

- Molecule 7 is a protein called NADH-quinone oxidoreductase subunit J.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	169	Total	C	N	O	S	0	0
			1278	855	200	219	4		

- Molecule 8 is a protein called NAD(P)H-quinone oxidoreductase subunit H.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	393	Total	C	N	O	S	0	0
			3177	2048	545	565	19		

- Molecule 9 is a protein called NAD(P)H-quinone oxidoreductase subunit I.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	192	Total	C	N	O	S	0	0
			1537	979	264	281	13		

- Molecule 10 is a protein called NAD(P)H-quinone oxidoreductase subunit J.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	160	Total	C	N	O	S	0	0
			1307	836	222	244	5		

- Molecule 11 is a protein called NAD(P)H-quinone oxidoreductase subunit K.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	205	Total	C	N	O	S	0	0
			1590	1019	275	283	13		

- Molecule 12 is a protein called NAD(P)H-quinone oxidoreductase subunit L.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	74	Total	C	N	O	S	0	0
			595	409	91	94	1		

- Molecule 13 is a protein called NAD(P)H-quinone oxidoreductase subunit M.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	111	Total	C	N	O	S	0	0
			885	551	161	171	2		

- Molecule 14 is a protein called NAD(P)H-quinone oxidoreductase subunit N.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	148	Total	C	N	O	S	0	0
			1165	758	201	205	1		

- Molecule 15 is a protein called NAD(P)H-quinone oxidoreductase subunit O.

Mol	Chain	Residues	Atoms				AltConf	Trace
15	O	68	Total	C	N	O	0	0
			538	349	91	98		

- Molecule 16 is a protein called proton-translocating NADH-quinone dehydrogenase subunit P.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	P	41	Total	C	N	O	S	0	0
			321	212	52	55	2		

- Molecule 17 is a protein called proton-translocating NADH-quinone dehydrogenase subunit Q.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	Q	44	Total	C	N	O	S	0	0
			333	222	53	56	2		

- Molecule 18 is a protein called Tlr0636 protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	S	60	Total	C	N	O	S	0	0
			469	304	74	89	2		

- Molecule 19 is a protein called Tlr0472 protein.

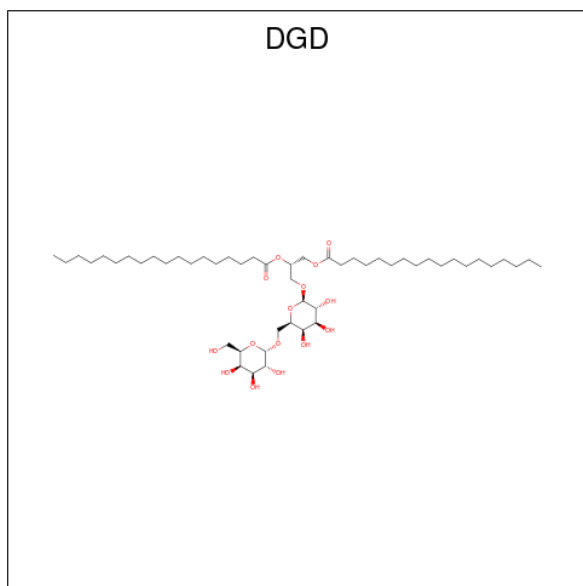
Mol	Chain	Residues	Atoms					AltConf	Trace
19	V	109	Total	C	N	O	S	0	0
			838	545	139	150	4		

- Molecule 20 is a protein called Ferredoxin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	1	98	Total	C	N	O	S	0	0
			756	468	117	165	6		

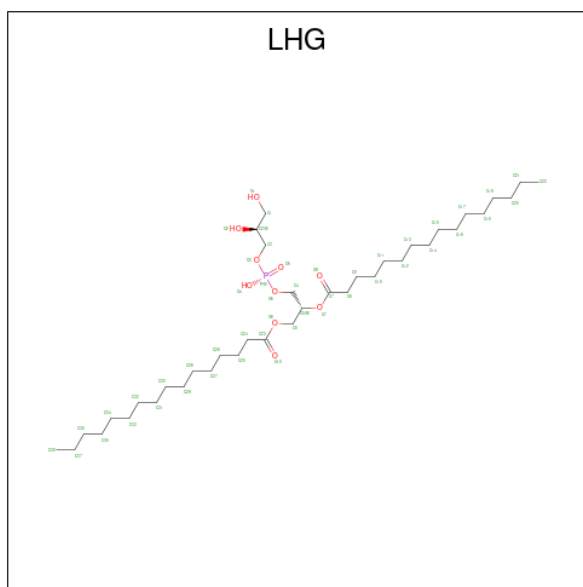
- Molecule 21 is DIGALACTOSYL DIACYL GLYCEROL (DGDG) (CCD ID: DGD) (formula:

C₅₁H₉₆O₁₅) (labeled as "Ligand of Interest" by depositor).



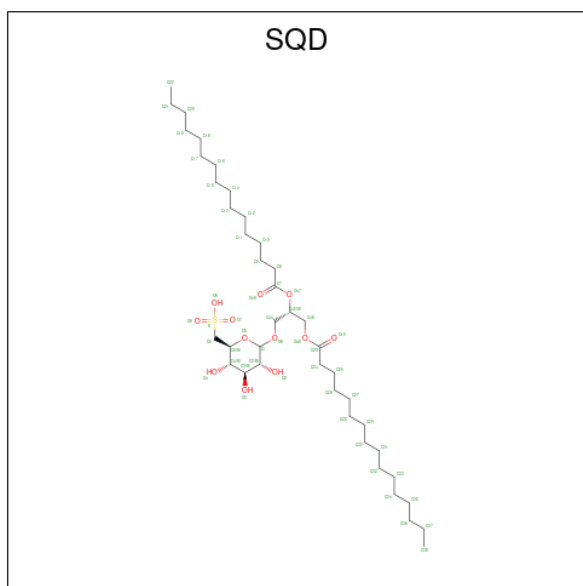
Mol	Chain	Residues	Atoms			AltConf
21	A	1	Total	C	O	0
			62	47	15	
21	A	1	Total	C	O	0
			62	47	15	

- Molecule 22 is 1,2-DIPALMITOYL-PHOSPHATIDYL-GLYCEROLE (CCD ID: LHG) (formula: C₃₈H₇₅O₁₀P) (labeled as "Ligand of Interest" by depositor).



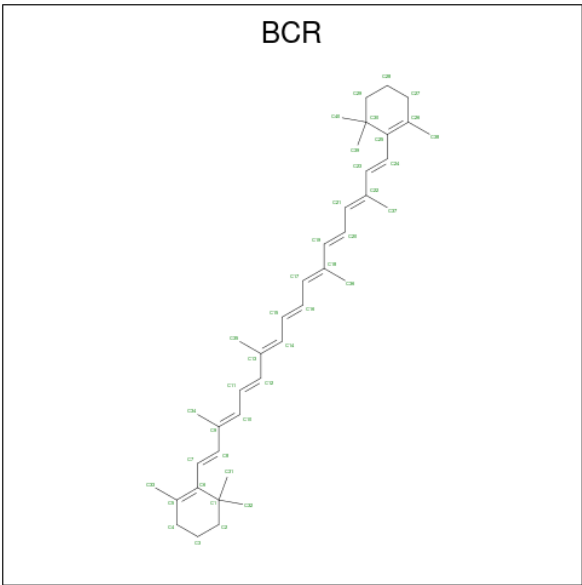
Mol	Chain	Residues	Atoms				AltConf
22	B	1	Total	C	O	P	0
			46	35	10	1	
22	C	1	Total	C	O	P	0
			43	32	10	1	
22	F	1	Total	C	O	P	0
			49	38	10	1	
22	F	1	Total	C	O	P	0
			36	25	10	1	
22	F	1	Total	C	O	P	0
			44	33	10	1	
22	I	1	Total	C	O	P	0
			44	33	10	1	

- Molecule 23 is 1,2-DI-O-ACYL-3-O-[6-DEOXY-6-SULFO-ALPHA-D-GLUCOPYRANOSYL]-SN-GLYCEROL (CCD ID: SQD) (formula: $C_{41}H_{78}O_{12}S$) (labeled as "Ligand of Interest" by depositor).



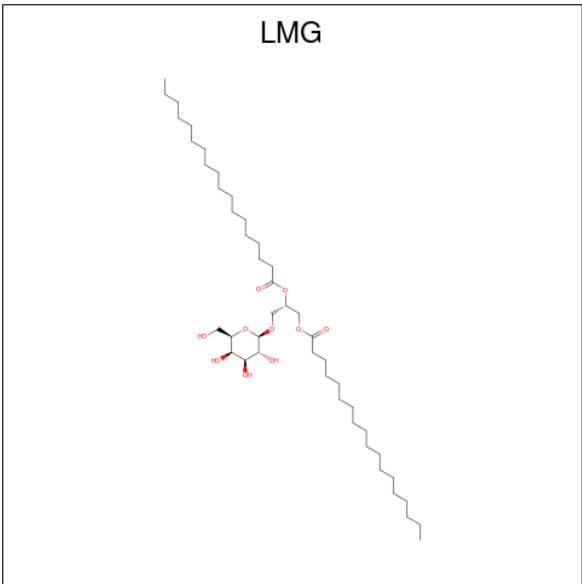
Mol	Chain	Residues	Atoms				AltConf
23	C	1	Total	C	O	S	0
			40	27	12	1	
23	D	1	Total	C	O	S	0
			54	41	12	1	
23	L	1	Total	C	O	S	0
			38	25	12	1	

- Molecule 24 is BETA-CAROTENE (CCD ID: BCR) (formula: $C_{40}H_{56}$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms		AltConf
24	D	1	Total	C	0
			40	40	
24	D	1	Total	C	0
			40	40	

- Molecule 25 is 1,2-DISTEAROYL-MONOGALACTOSYL-DIGLYCERIDE (CCD ID: LMG) (formula: C₄₅H₈₆O₁₀) (labeled as "Ligand of Interest" by depositor).



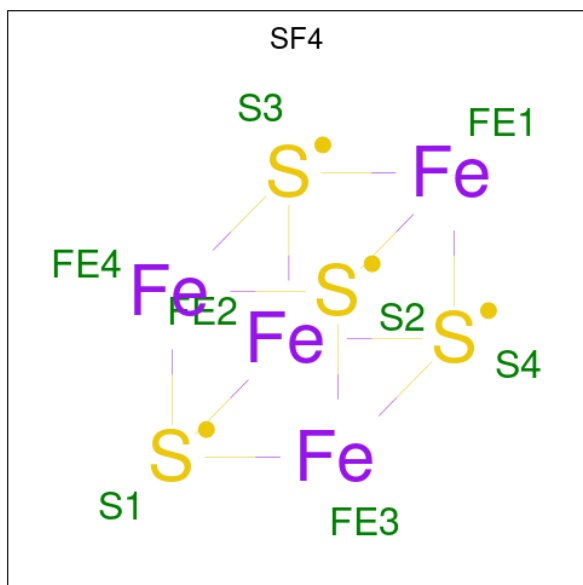
Mol	Chain	Residues	Atoms			AltConf
25	F	1	Total	C	O	0
			47	37	10	

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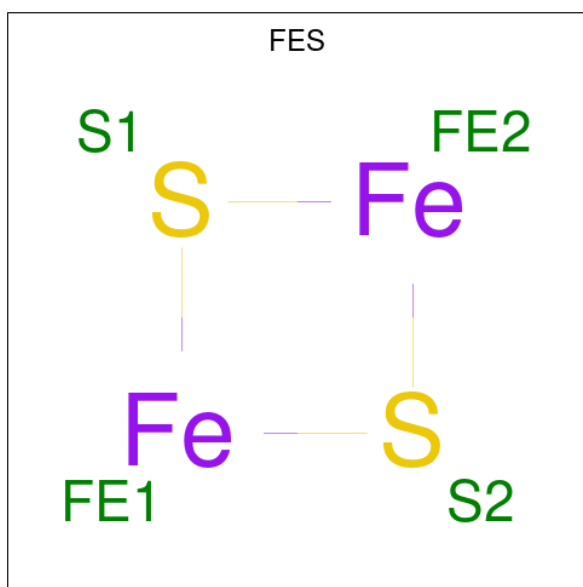
Mol	Chain	Residues	Atoms			AltConf
25	F	1	Total	C	O	0
			40	30	10	

- Molecule 26 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
26	I	1	Total	Fe	S	0
			8	4	4	
26	I	1	Total	Fe	S	0
			8	4	4	
26	K	1	Total	Fe	S	0
			8	4	4	

- Molecule 27 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe_2S_2) (labeled as "Ligand of Interest" by depositor).

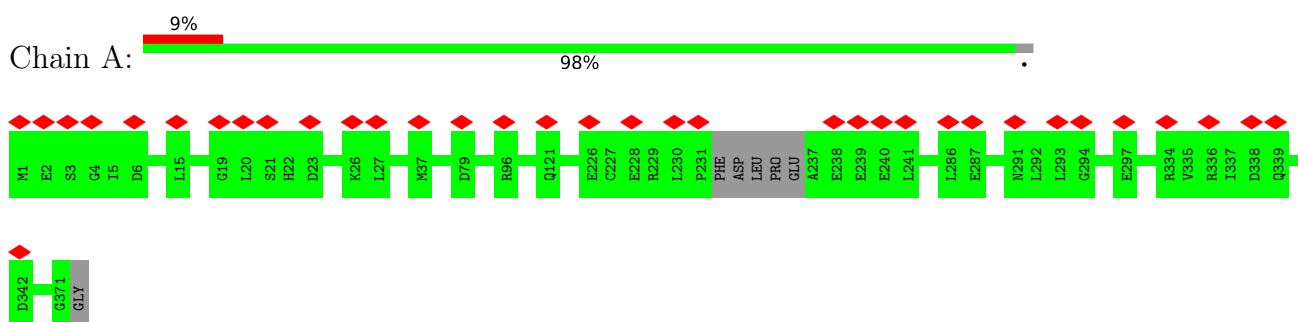


Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
27	1	1	4	2	2	0

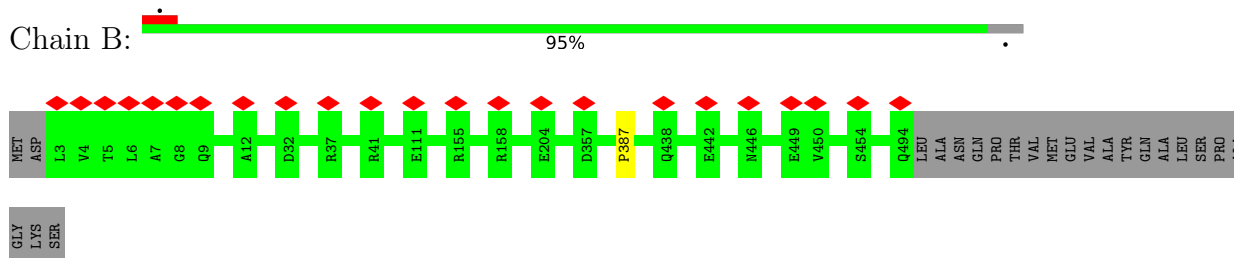
3 Residue-property plots

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 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.

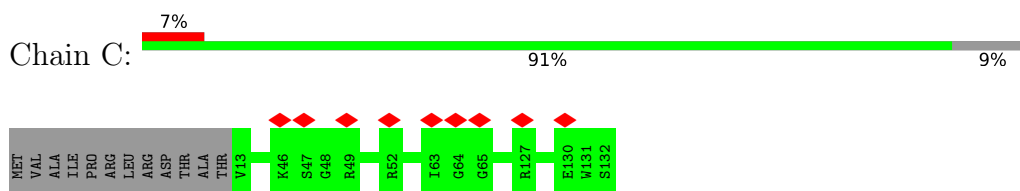
- Molecule 1: NAD(P)H-quinone oxidoreductase subunit 1



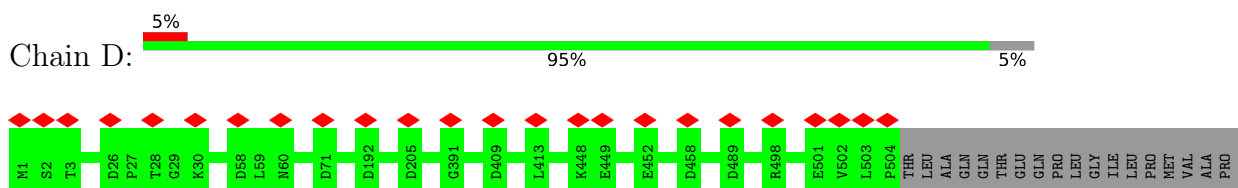
- Molecule 2: NAD(P)H-quinone oxidoreductase subunit 2



- Molecule 3: NAD(P)H-quinone oxidoreductase subunit 3



- Molecule 4: NAD(P)H-quinone oxidoreductase chain 4 1



LEU
LYS
ALA
ASN
ALA
GLN

- Molecule 5: NAD(P)H-quinone oxidoreductase subunit 4L

Chain E: 5% 99%

MET Q2 E73 D89 N97 L98 L99 K100 W101

- Molecule 6: NADH dehydrogenase subunit 5

Chain F: 11% 98%

MET E2 L20 E31 K35 L67 N80 D90 K169 F187 T202 A206 D210 E214 N217 T218 G219 L220 L221 L225 D252 H265 E368 H373 D376 L377 L403 V408 P409 P410 F411 L433 L437 T438 A439 E455

Q456 K457 P462 P463 E464 R465 Q466 GLU HIS HIS ASP HIS HIS SER HIS A476 A477 V478 E481 F502 F507 N508 G519 E520 E521 LYS VAL ALA GLU HIS A527 V528 D529 L530 T531 E532 F533 L534 I535 G538 S539 S540 M546 K557 G558 T559 P560 S561 A564 I565

A566 K567 A568 D583 E603 V604 D605 D610 T616 E625 Q655 T656

- Molecule 7: NADH-quinone oxidoreductase subunit J

Chain G: 10% 84% 16%

MET D2 D30 R84 E85 T86 Y87 T88 P91 G92 R93 W94 L95 R96 Q97 G98 S124 D130 R167 E168 L169 V170 LEU PRO GLU PRO PRO ILE LEU GLY GLU GLU VAL VAL PRO PRO LEU GLU ARG ARG ARG PRO PRO VAL ALA LEU SER LYS

- Molecule 8: NAD(P)H-quinone oxidoreductase subunit H

Chain H: 8% 99%

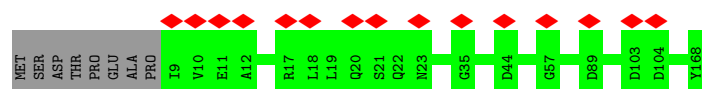
MET F2 K3 M22 H23 D33 G34 E35 D71 D124 Q128 T129 F130 F131 F132 Y133 D181 D188 E191 R192 L193 I194 T195 F198 R202 D247 W248 D249 E255 D261 G299 A300 R301 K314 K315 L316 D359 R371 D377 R394

- Molecule 9: NAD(P)H-quinone oxidoreductase subunit I

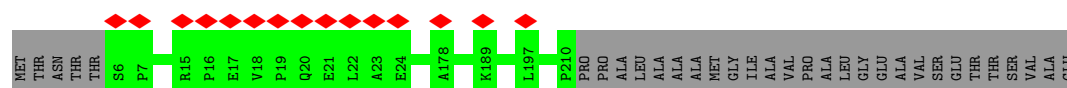
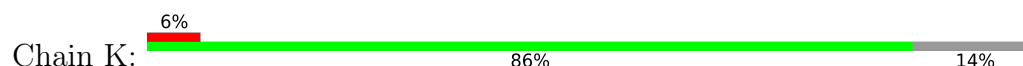
Chain I: 13% 98%

MET LYS F3 L4 M5 Q6 I7 T8 N9 Y10 A11 K12 E13 Q16 K19 Q23 D30 E37 L88 R89 E159 D172 A175 M189 T190 A191 K192 S193 S194 GLU ASN

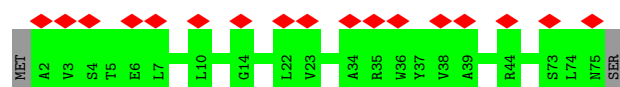
- Molecule 10: NAD(P)H-quinone oxidoreductase subunit J



- Molecule 11: NAD(P)H-quinone oxidoreductase subunit K



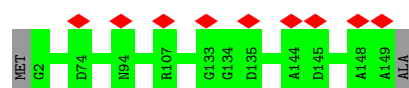
- Molecule 12: NAD(P)H-quinone oxidoreductase subunit L



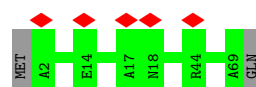
- Molecule 13: NAD(P)H-quinone oxidoreductase subunit M



- Molecule 14: NAD(P)H-quinone oxidoreductase subunit N

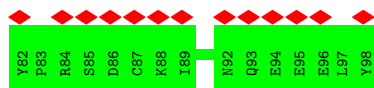


- Molecule 15: NAD(P)H-quinone oxidoreductase subunit O



- Molecule 16: proton-translocating NADH-quinone dehydrogenase subunit P





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	152003	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 ($e^-/\text{\AA}^2$)	60.0	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.417	Depositor
Minimum map value	-0.117	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.007	Depositor
Recommended contour level	0.06	Depositor
Map size (Å)	416.0, 416.0, 416.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.04, 1.04, 1.04	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: DGD, SQD, SF4, LHG, FES, LMG, BCR

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	0.25	0/2891	0.56	0/3949
2	B	0.25	0/3810	0.52	1/5198 (0.0%)
3	C	0.25	0/1001	0.61	0/1365
4	D	0.25	0/4004	0.49	0/5464
5	E	0.22	0/785	0.45	0/1067
6	F	0.23	0/5087	0.51	0/6930
7	G	0.22	0/1304	0.44	0/1786
8	H	0.28	1/3260 (0.0%)	0.56	0/4417
9	I	0.29	0/1575	0.58	0/2135
10	J	0.22	0/1343	0.52	0/1829
11	K	0.31	0/1630	0.63	0/2218
12	L	0.21	0/615	0.52	0/842
13	M	0.21	0/901	0.54	0/1222
14	N	0.22	0/1197	0.50	0/1628
15	O	0.21	0/550	0.50	0/748
16	P	0.24	0/330	0.51	0/448
17	Q	0.17	0/342	0.38	0/466
18	S	0.22	0/478	0.55	2/652 (0.3%)
19	V	0.24	0/857	0.60	0/1155
20	1	0.20	0/766	0.46	0/1039
All	All	0.25	1/32726 (0.0%)	0.53	3/44558 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	H	129	THR	C-N	5.79	1.38	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
18	S	43	MET	CA-C-N	5.70	132.43	121.54
18	S	43	MET	C-N-CA	5.70	132.43	121.54
2	B	387	PRO	N-CA-C	5.24	117.10	110.70

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

5.3.2 Protein sidechains [i](#)

There are no protein residues with a non-rotameric sidechain to report in this entry.

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](#)

19 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
27	FES	1	101	20	0,4,4	-	-	-		
22	LHG	F	702	-	48,48,48	0.91	4 (8%)	51,54,54	1.09	2 (3%)
23	SQD	L	101	-	36,38,54	2.13	9 (25%)	46,49,65	5.43	9 (19%)
22	LHG	F	705	-	43,43,48	0.96	4 (9%)	46,49,54	1.09	2 (4%)
24	BCR	D	603	-	41,41,41	4.21	18 (43%)	56,56,56	5.31	33 (58%)
22	LHG	B	601	-	45,45,48	0.94	4 (8%)	48,51,54	1.10	2 (4%)
25	LMG	F	701	-	47,47,55	0.87	3 (6%)	55,55,63	1.42	7 (12%)
25	LMG	F	703	-	40,40,55	0.92	2 (5%)	48,48,63	1.25	4 (8%)
23	SQD	D	601	-	52,54,54	1.85	10 (19%)	62,65,65	4.69	6 (9%)
22	LHG	I	201	-	43,43,48	0.95	4 (9%)	46,49,54	1.09	2 (4%)
26	SF4	I	203	9	0,12,12	-	-	-		
26	SF4	I	202	9	0,12,12	-	-	-		
22	LHG	F	704	-	35,35,48	1.05	4 (11%)	38,41,54	1.16	2 (5%)
26	SF4	K	301	11	0,12,12	-	-	-		
22	LHG	C	202	-	42,42,48	0.97	4 (9%)	45,48,54	1.10	2 (4%)
24	BCR	D	602	-	41,41,41	4.22	18 (43%)	56,56,56	5.45	36 (64%)
21	DGD	A	401	-	63,63,67	1.23	6 (9%)	77,77,81	1.17	4 (5%)
23	SQD	C	201	-	38,40,54	2.12	10 (26%)	48,51,65	5.31	6 (12%)
21	DGD	A	402	-	63,63,67	1.24	7 (11%)	77,77,81	1.18	4 (5%)

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
27	FES	1	101	20	-	-	0/1/1/1
22	LHG	F	702	-	-	25/53/53/53	-
23	SQD	L	101	-	-	22/33/53/69	0/1/1/1
22	LHG	F	705	-	-	22/48/48/53	-
24	BCR	D	603	-	-	15/29/63/63	0/2/2/2
22	LHG	B	601	-	-	22/50/50/53	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
25	LMG	F	701	-	-	23/42/62/70	0/1/1/1
25	LMG	F	703	-	-	13/35/55/70	0/1/1/1
23	SQD	D	601	-	-	26/49/69/69	0/1/1/1
22	LHG	I	201	-	-	19/48/48/53	-
26	SF4	I	203	9	-	-	0/6/5/5
26	SF4	I	202	9	-	-	0/6/5/5
22	LHG	F	704	-	-	18/40/40/53	-
26	SF4	K	301	11	-	-	0/6/5/5
22	LHG	C	202	-	-	22/47/47/53	-
24	BCR	D	602	-	-	16/29/63/63	0/2/2/2
21	DGD	A	401	-	-	25/51/91/95	0/2/2/2
23	SQD	C	201	-	-	16/35/55/69	0/1/1/1
21	DGD	A	402	-	-	15/51/91/95	0/2/2/2

The worst 5 of 107 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
24	D	602	BCR	C26-C25	12.93	1.56	1.34
24	D	603	BCR	C26-C25	12.76	1.55	1.34
24	D	602	BCR	C5-C6	12.40	1.55	1.34
24	D	603	BCR	C5-C6	11.61	1.54	1.34
24	D	602	BCR	C10-C9	8.52	1.55	1.35

The worst 5 of 121 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
23	D	601	SQD	O9-S-C6	23.77	142.25	106.76
23	C	201	SQD	O9-S-C6	23.75	142.22	106.76
23	L	101	SQD	O9-S-C6	23.72	142.17	106.76
23	C	201	SQD	O7-S-C6	-22.26	73.52	106.76
23	D	601	SQD	O7-S-C6	-22.16	73.66	106.76

There are no chirality outliers.

5 of 299 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
22	B	601	LHG	C3-O3-P-O5
22	B	601	LHG	C4-O6-P-O3
22	B	601	LHG	C4-O6-P-O4

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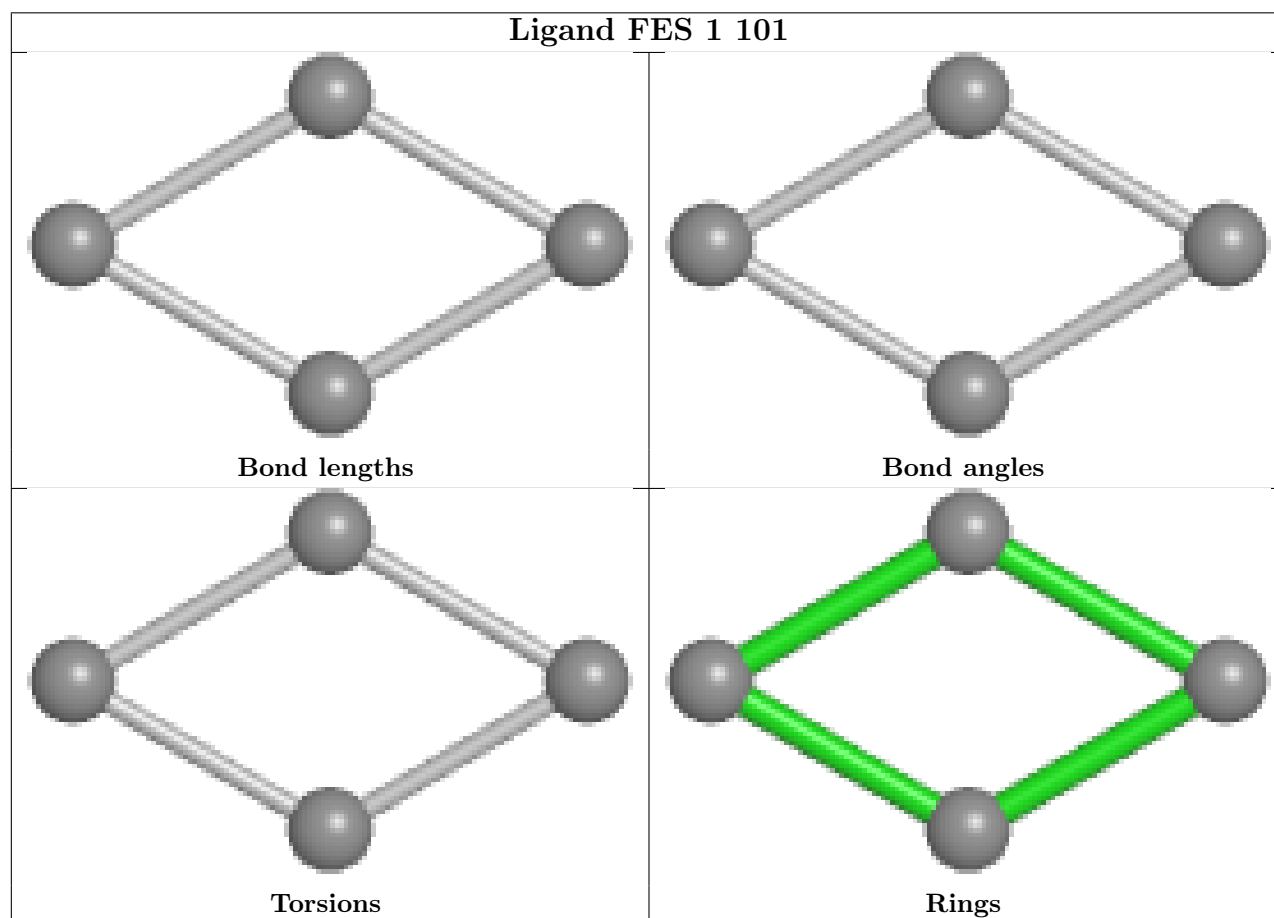
Continued from previous page...

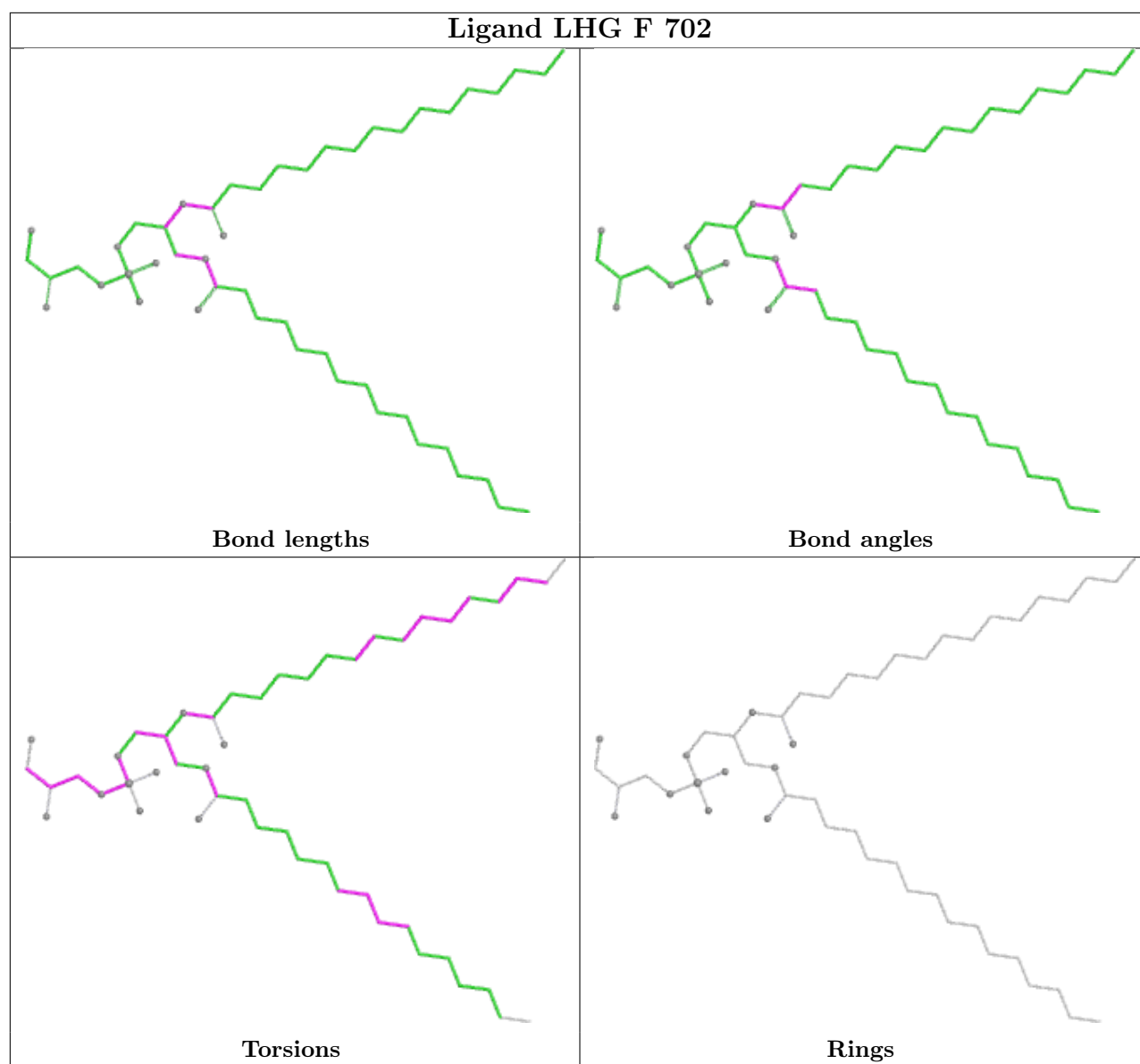
Mol	Chain	Res	Type	Atoms
22	B	601	LHG	C4-O6-P-O5
22	C	202	LHG	O1-C1-C2-O2

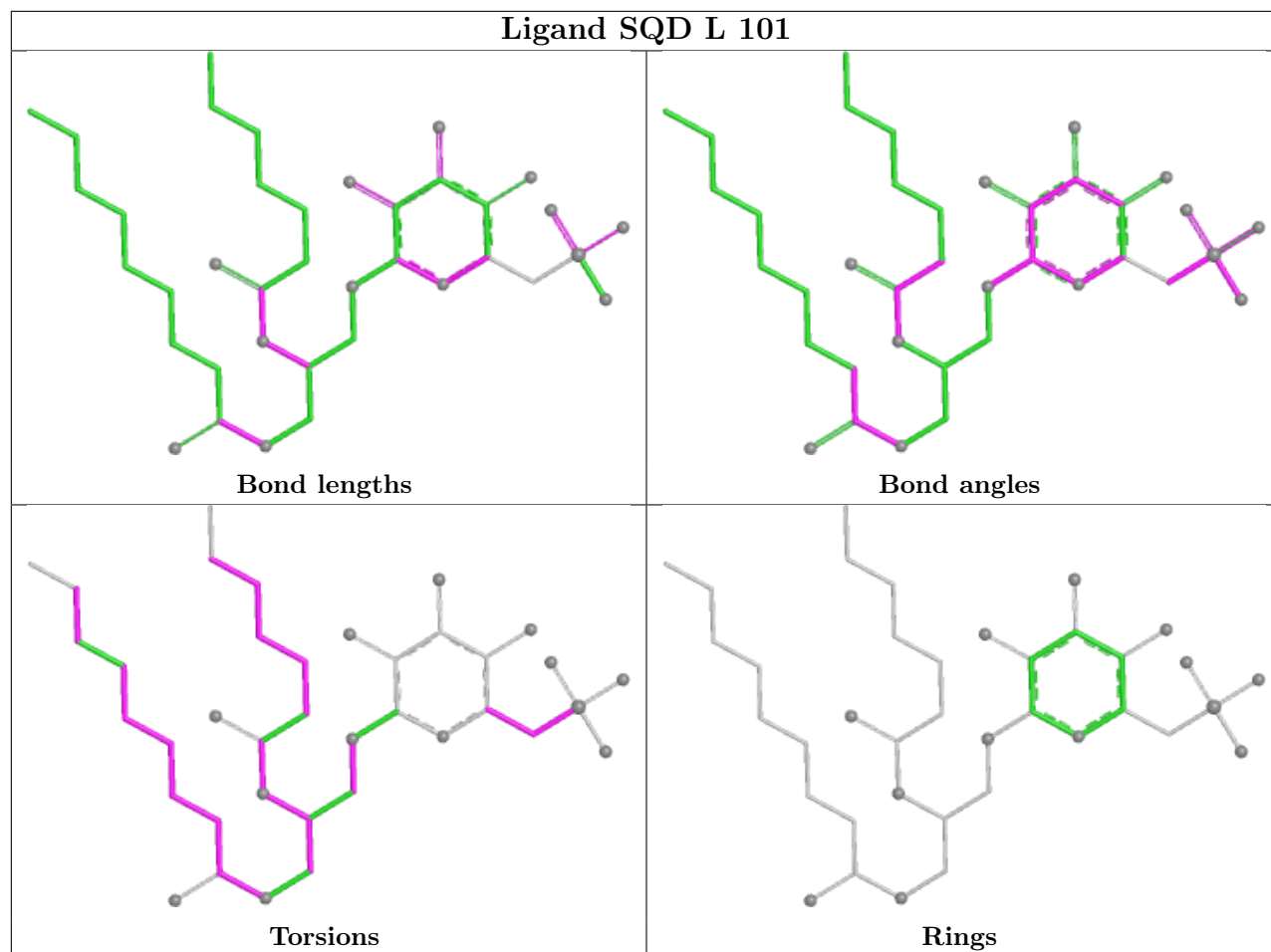
There are no ring outliers.

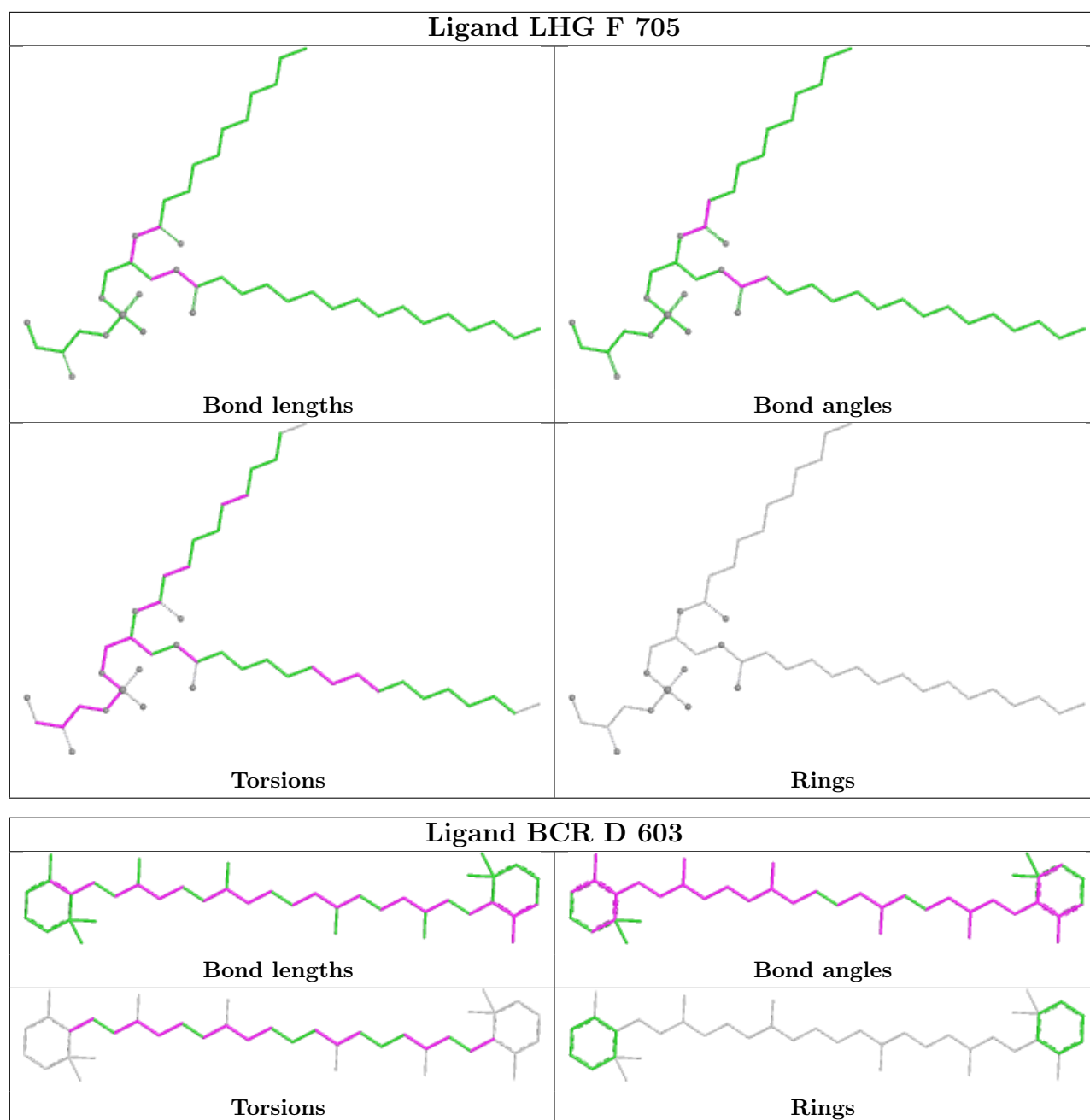
No monomer is involved in short contacts.

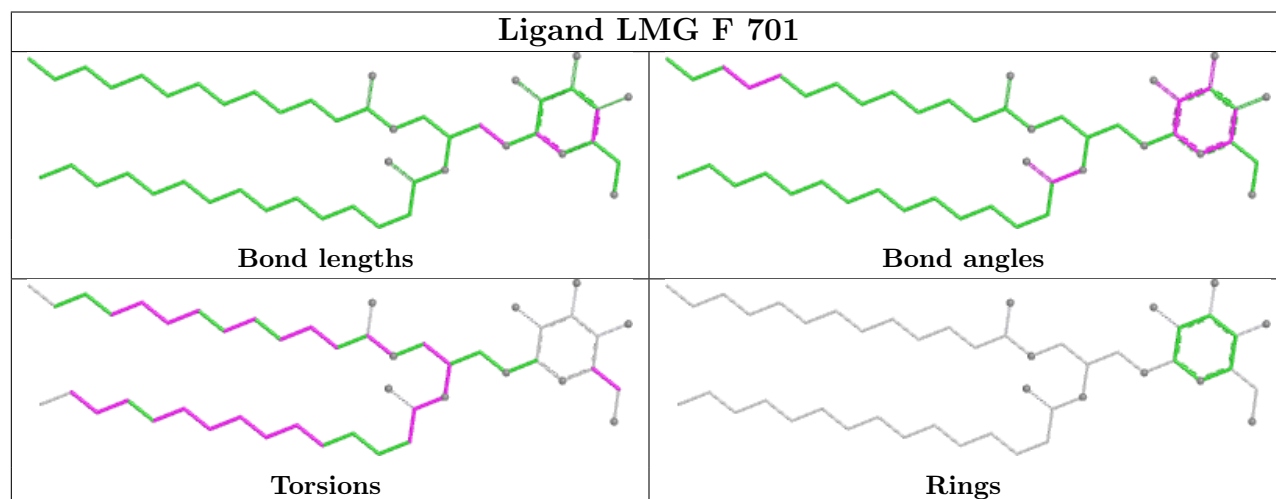
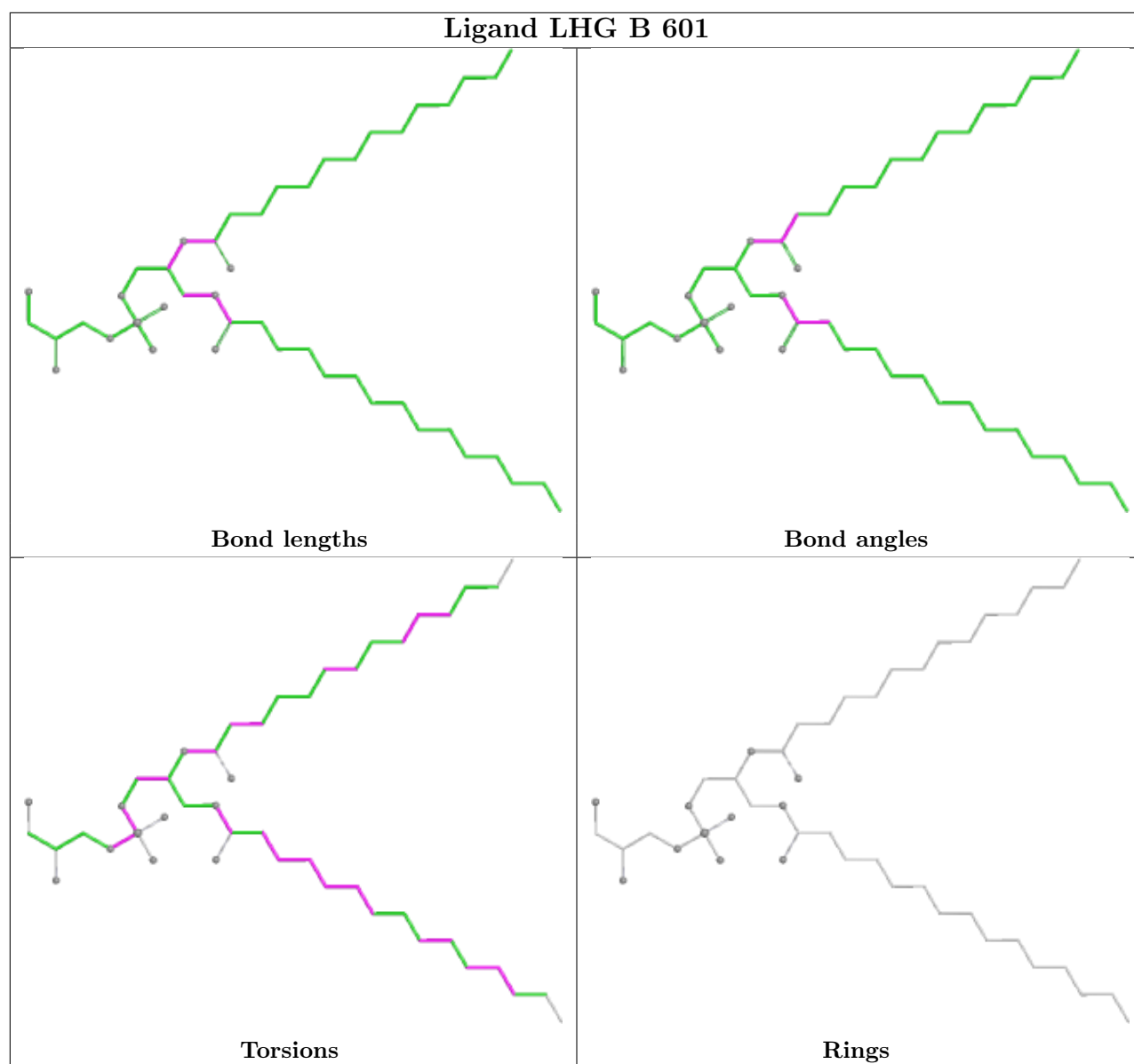
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

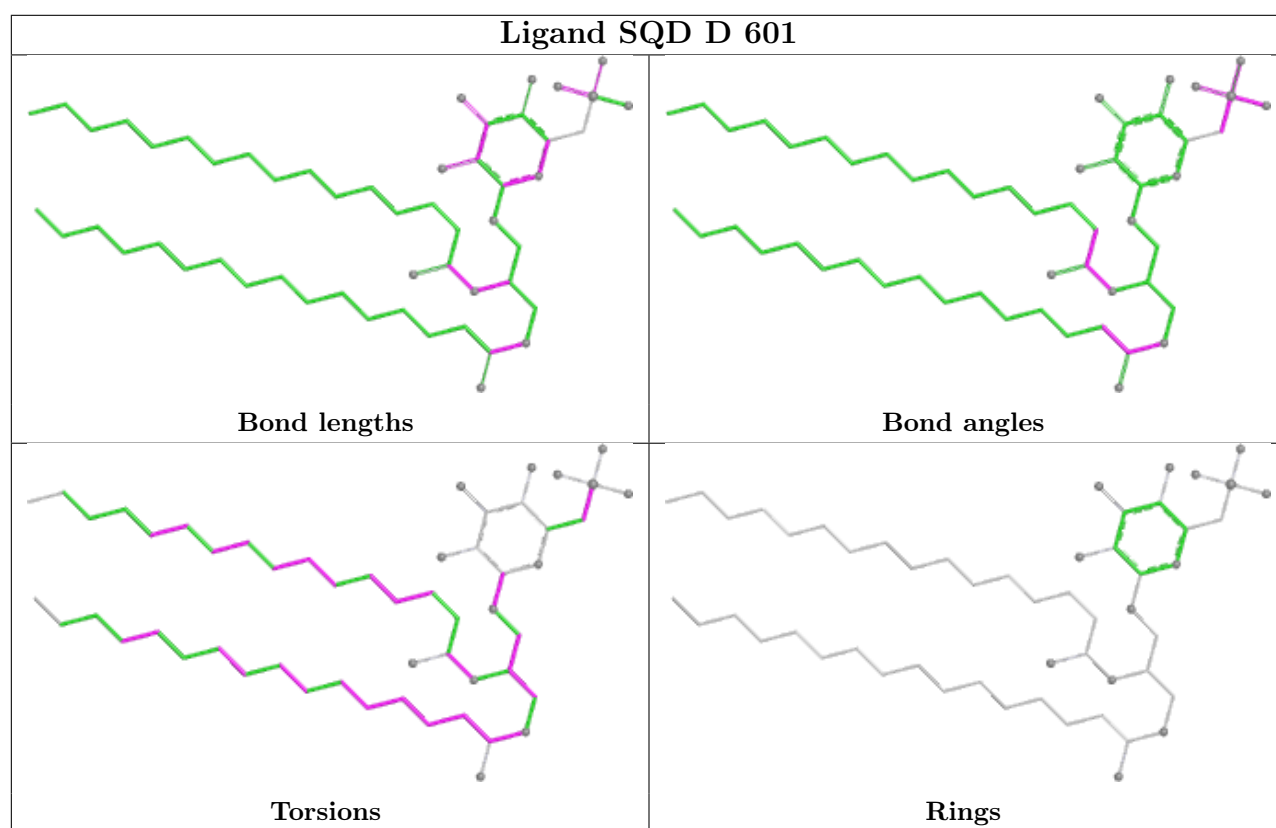
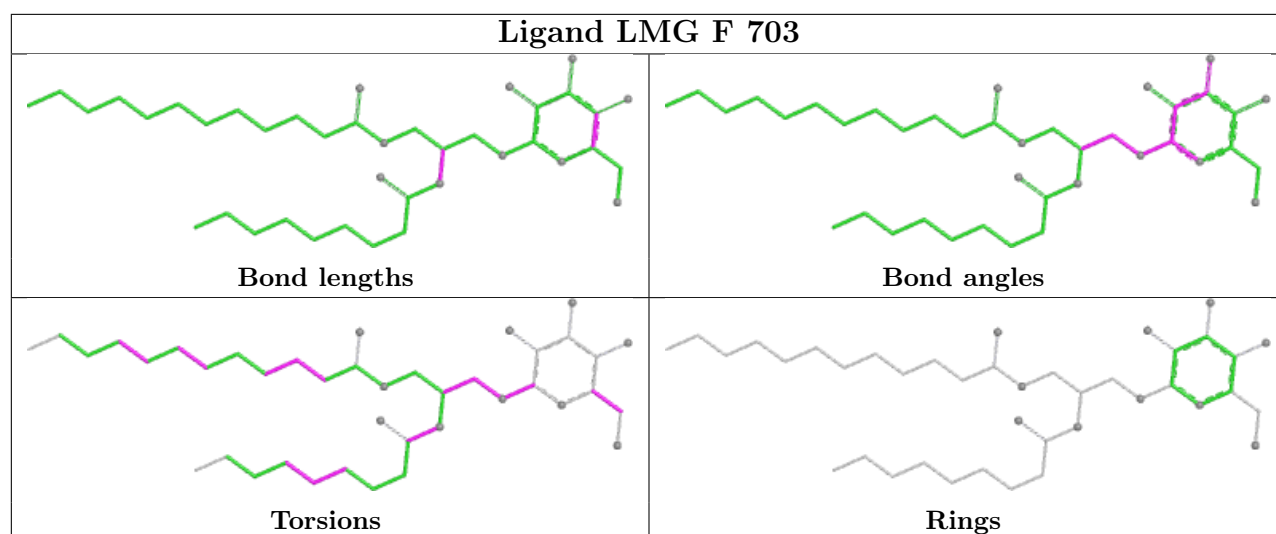


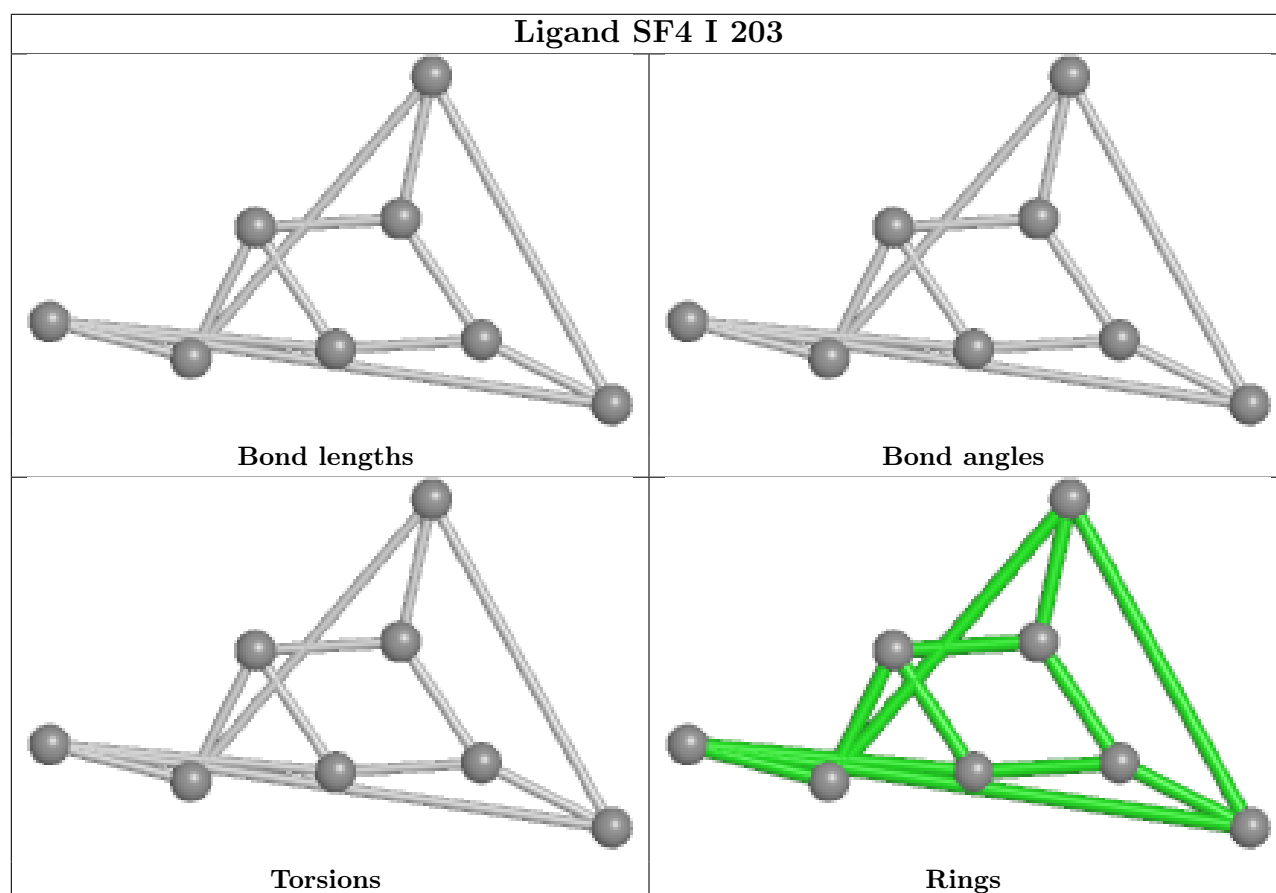
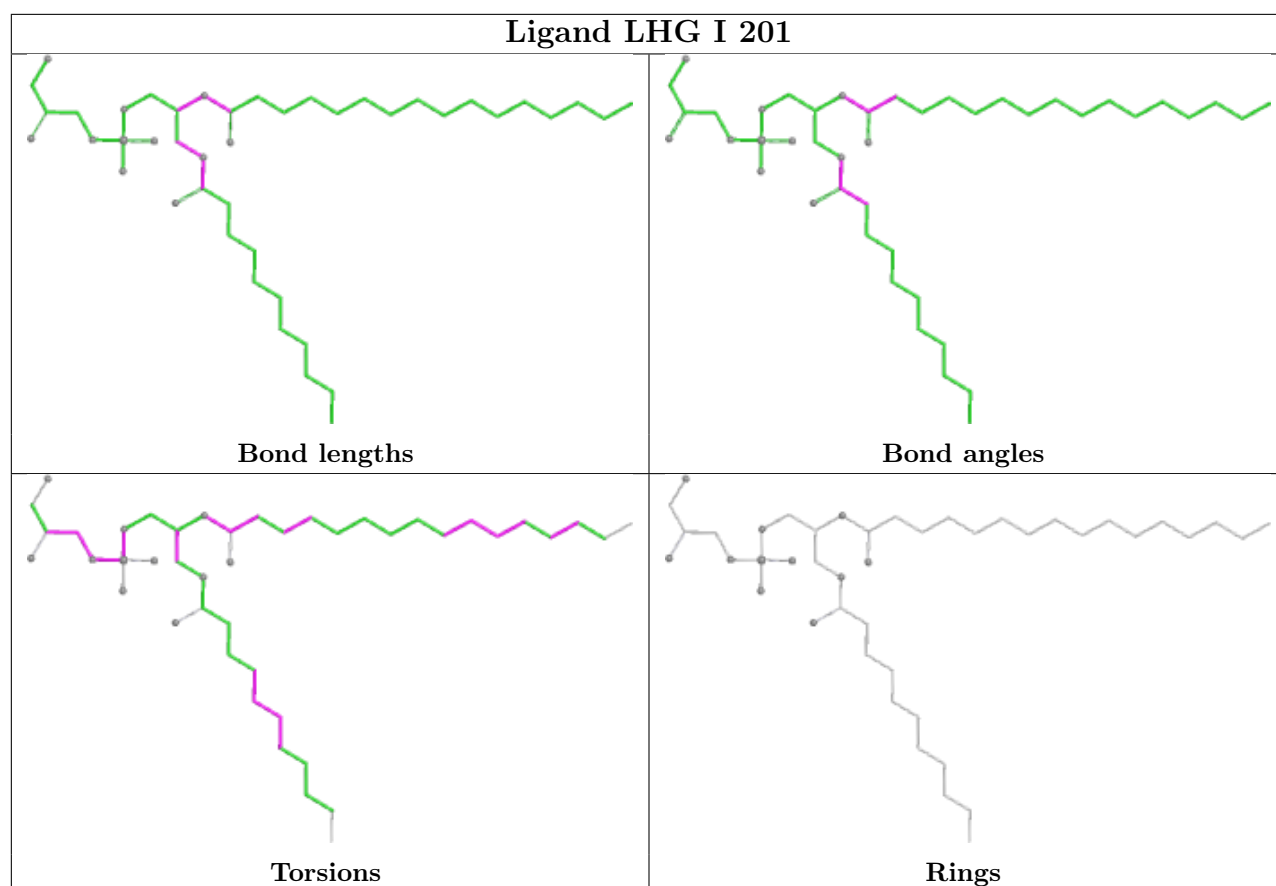


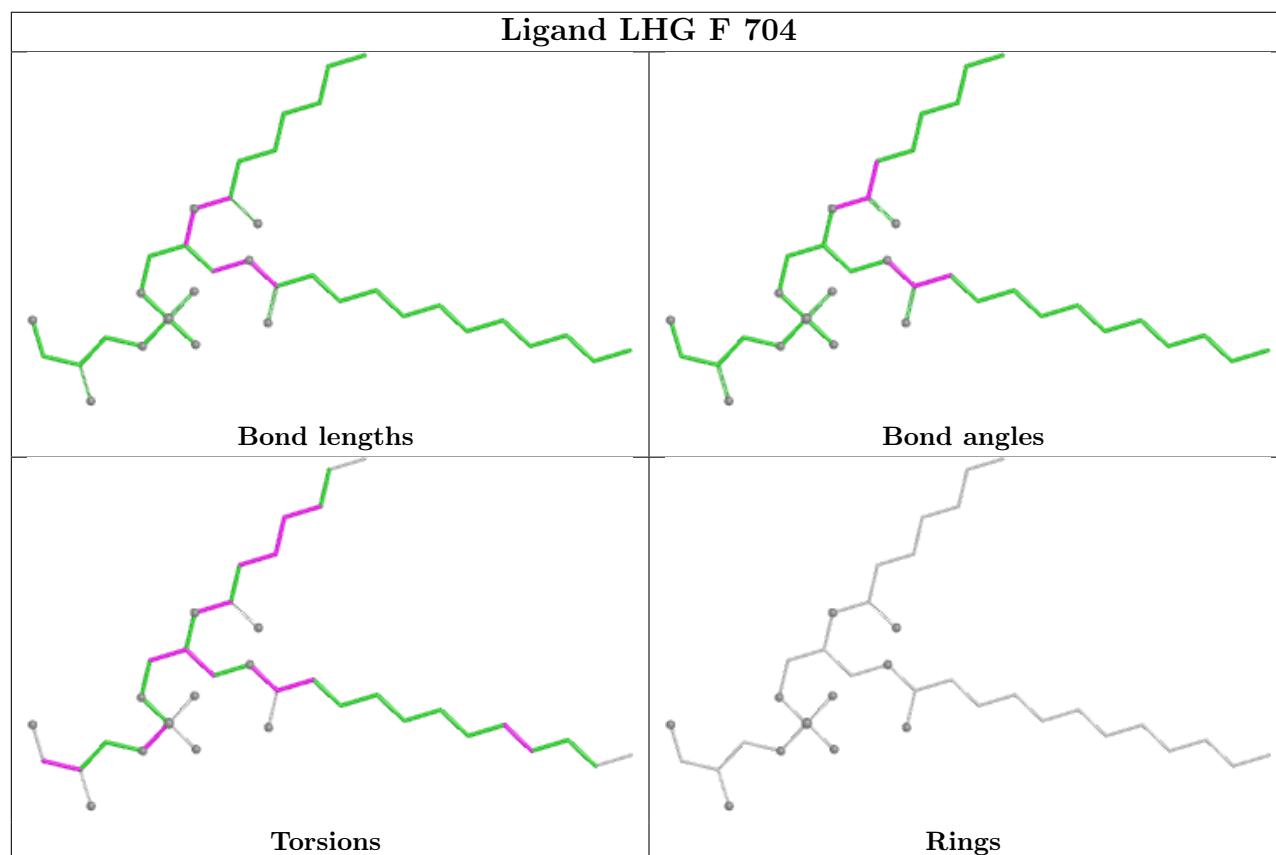
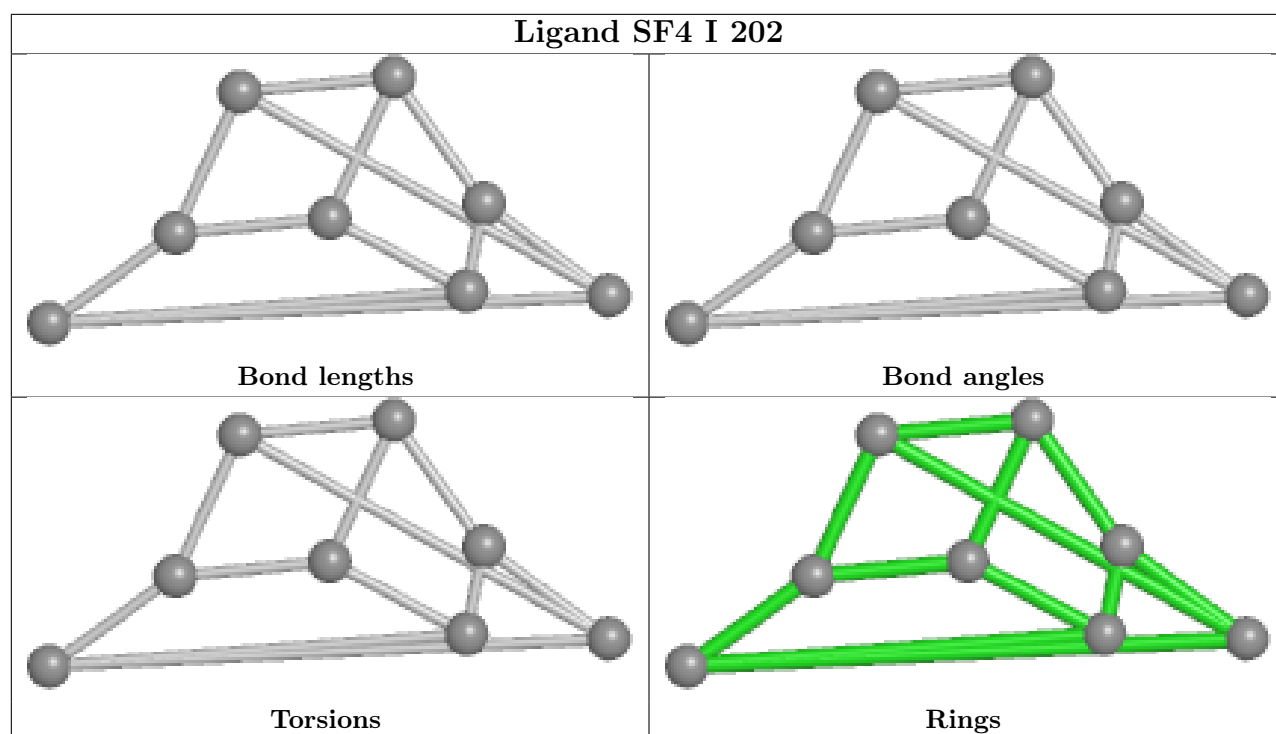


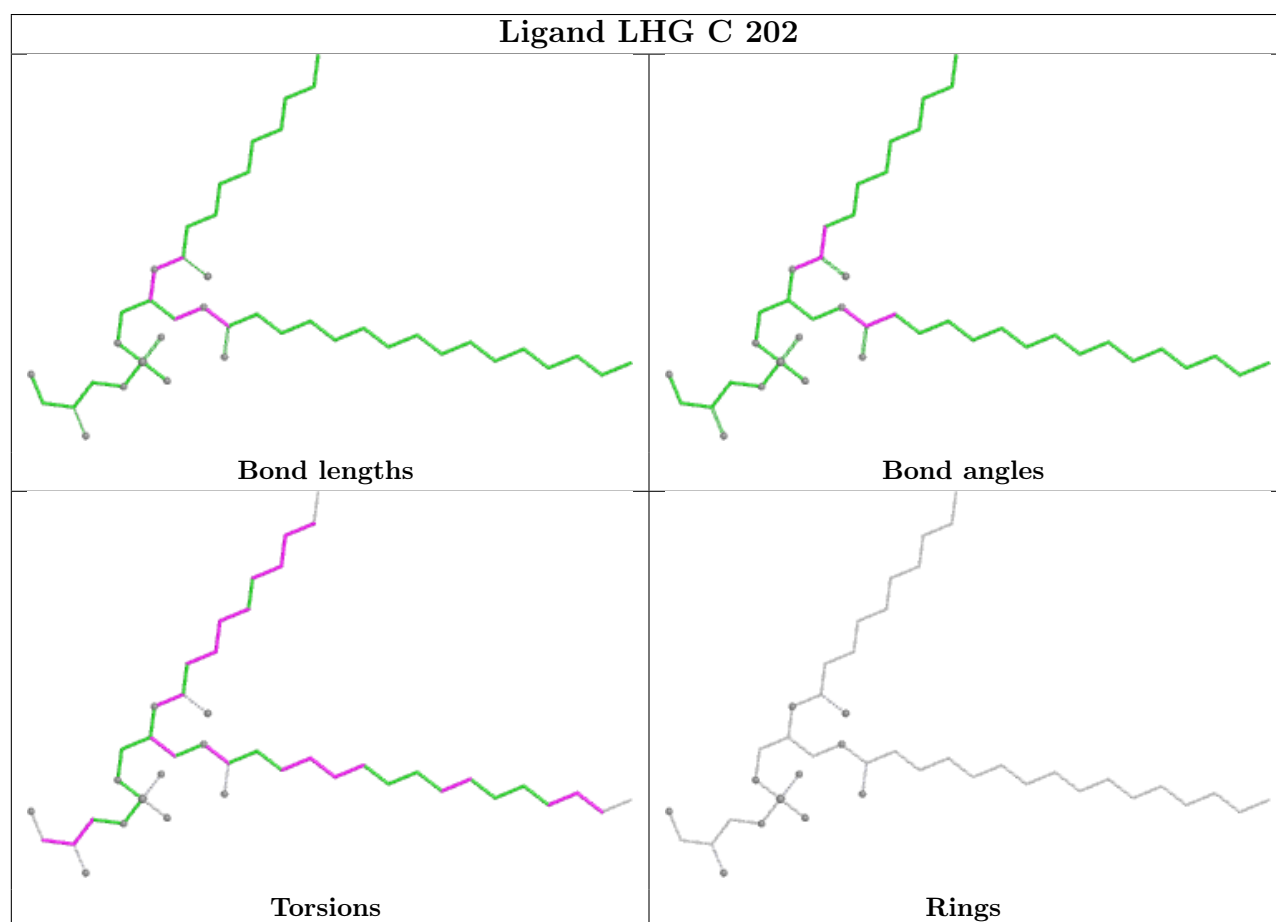
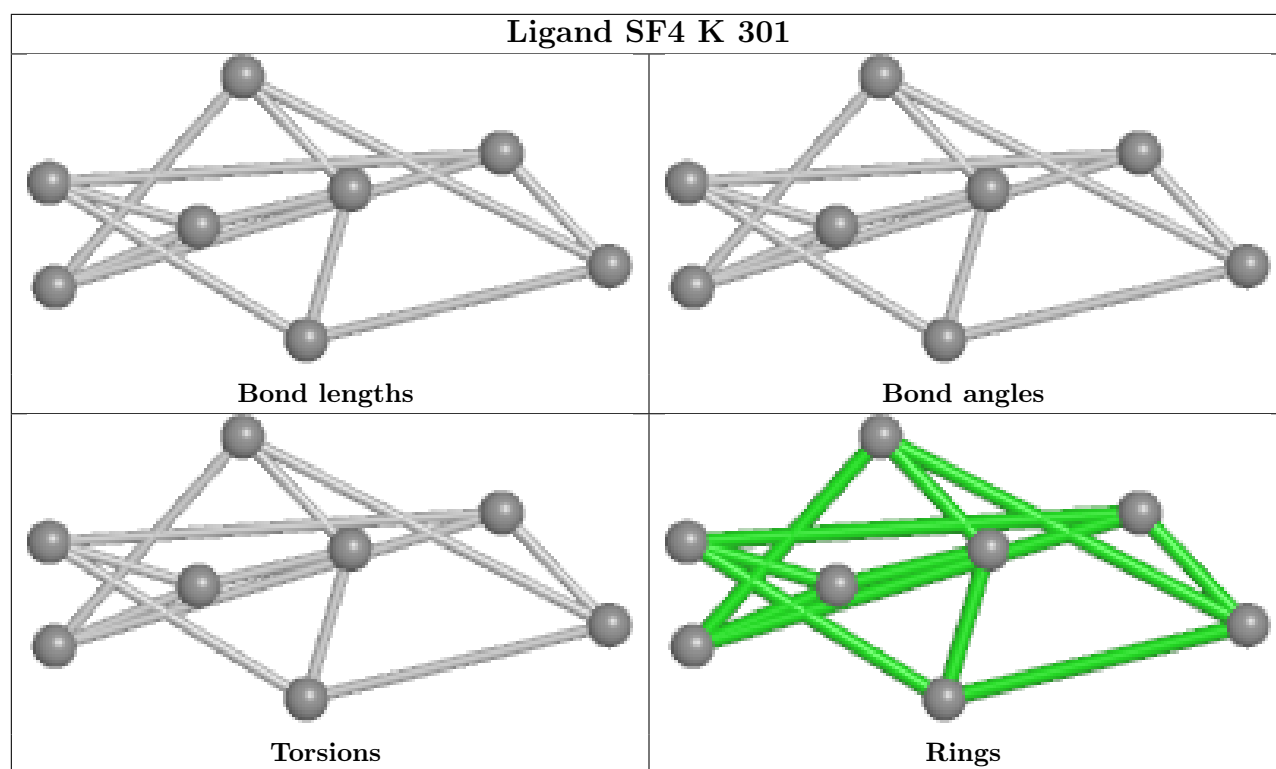


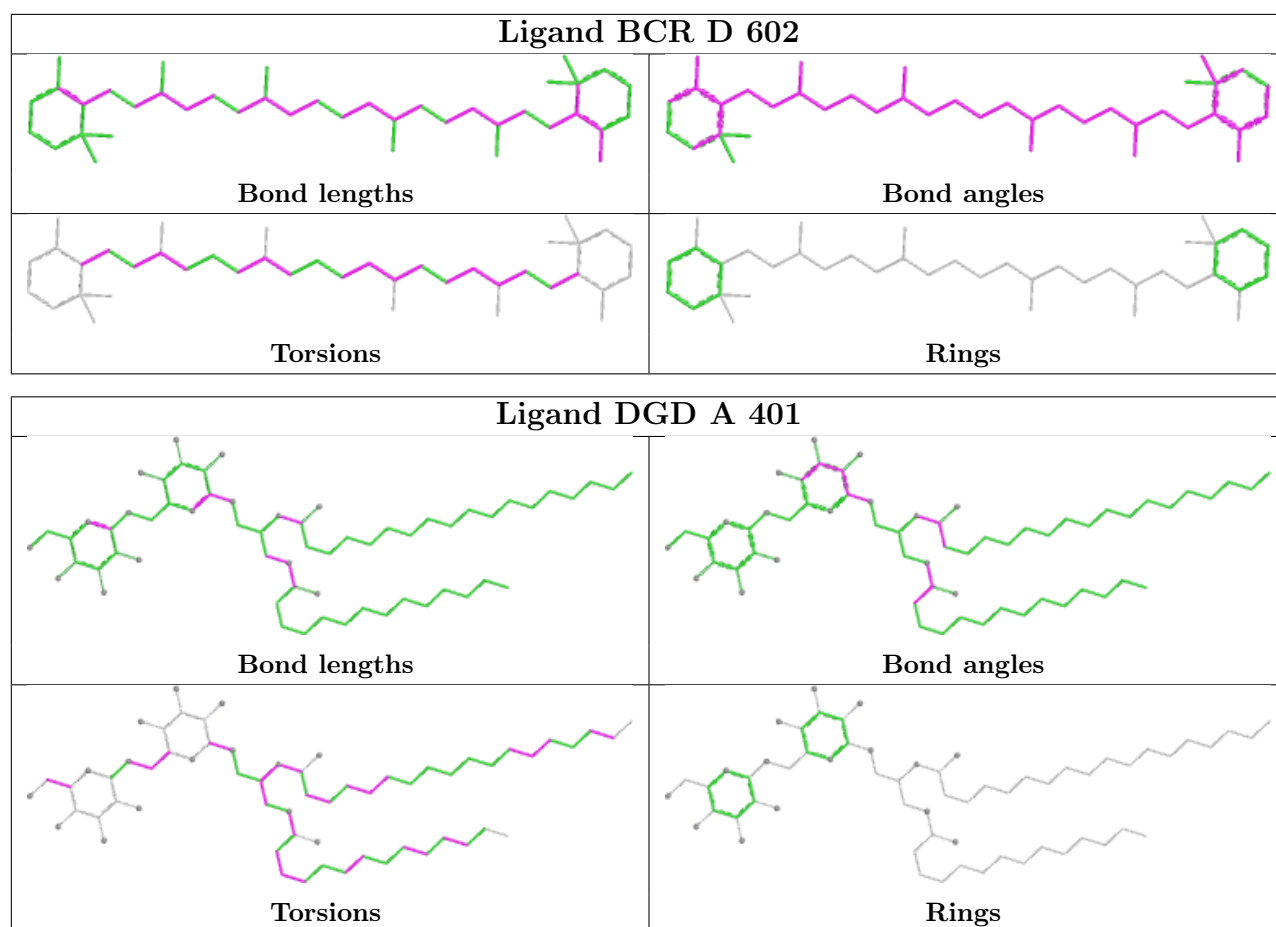


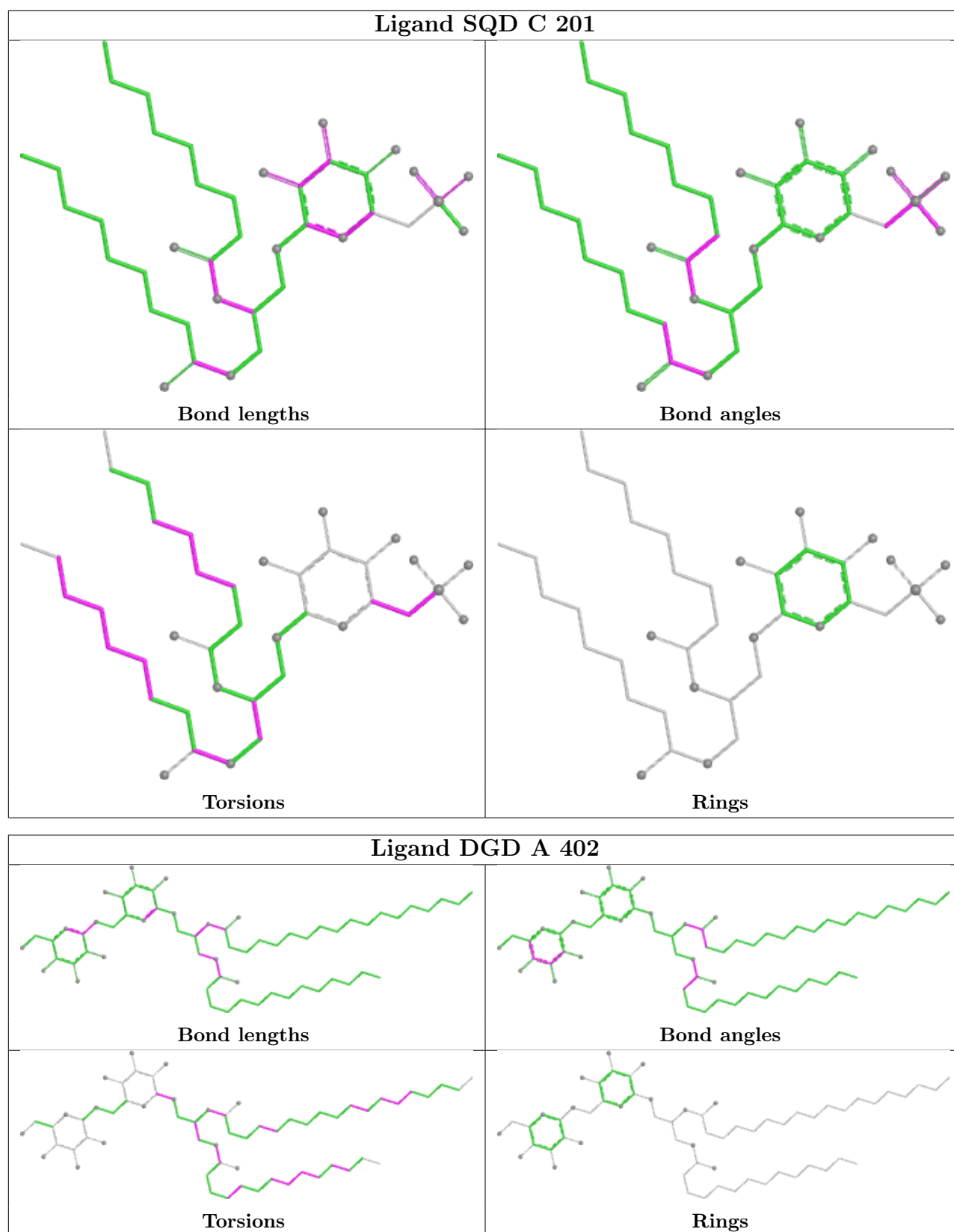












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

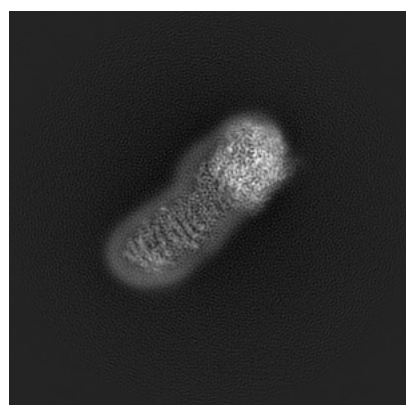
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-9989. These allow visual inspection of the internal detail of the map and identification of artifacts.

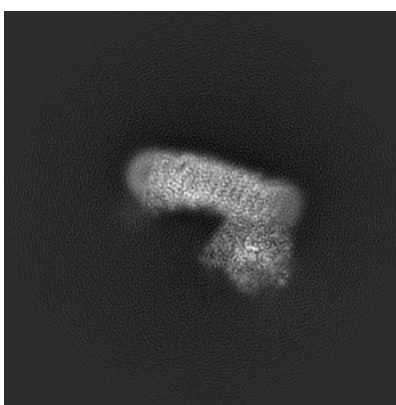
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

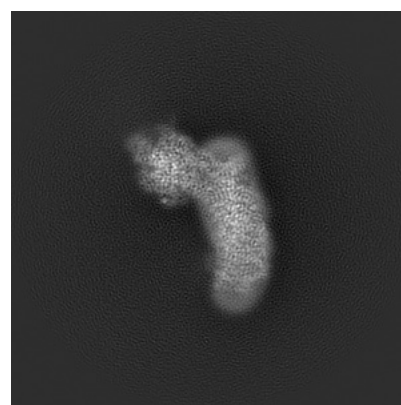
6.1.1 Primary map



X



Y

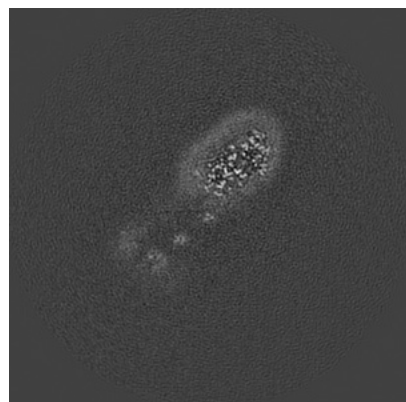


Z

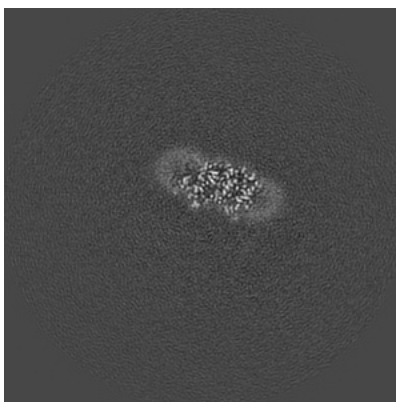
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

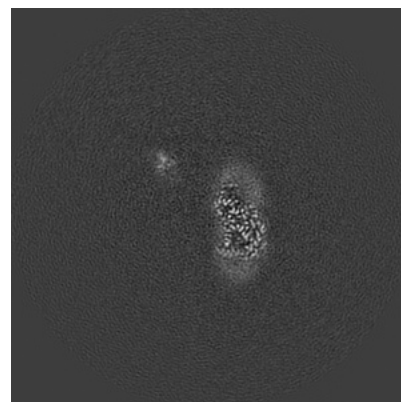
6.2.1 Primary map



X Index: 200



Y Index: 200

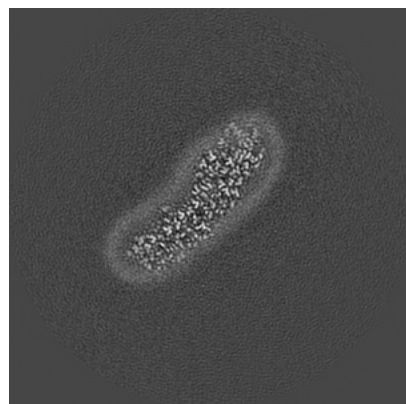


Z Index: 200

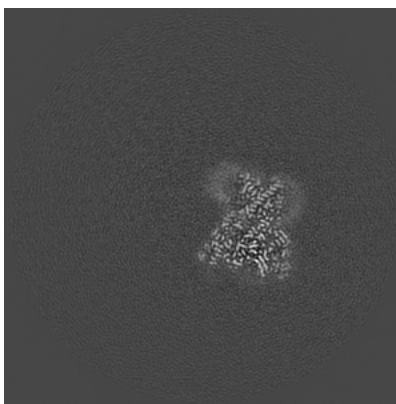
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

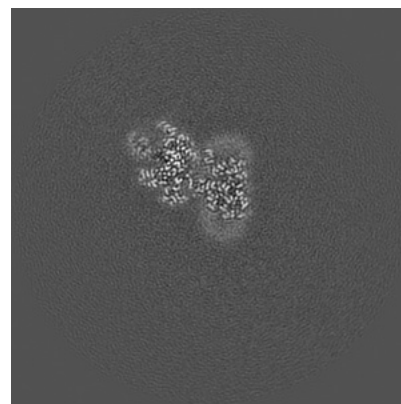
6.3.1 Primary map



X Index: 221



Y Index: 246

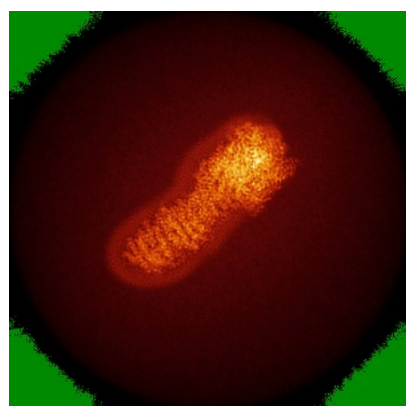


Z Index: 242

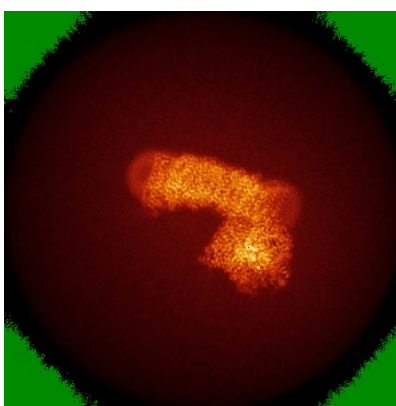
The images above show the largest variance slices of the map in three orthogonal directions.

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

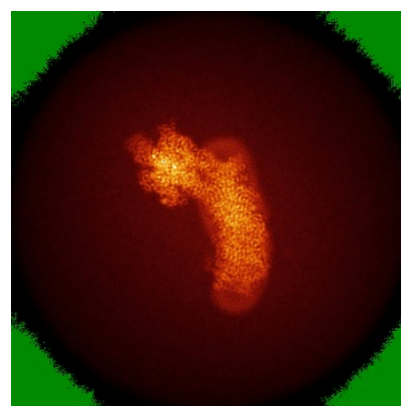
6.4.1 Primary map



X



Y

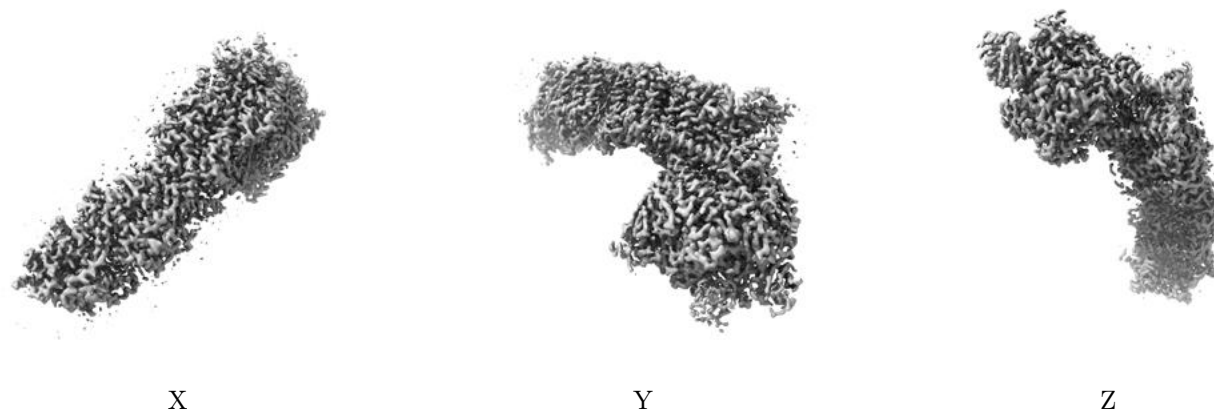


Z

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](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.06. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

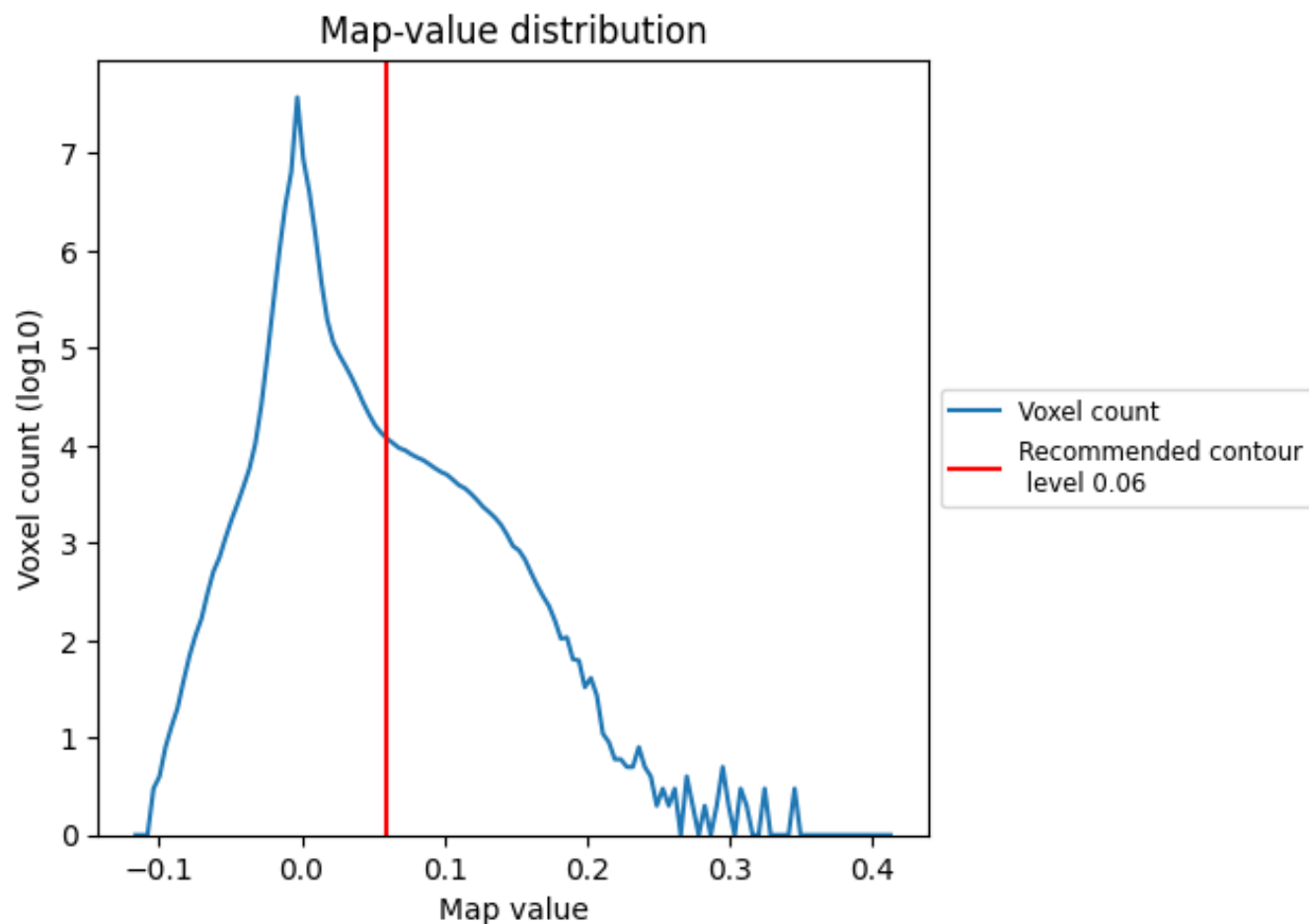
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

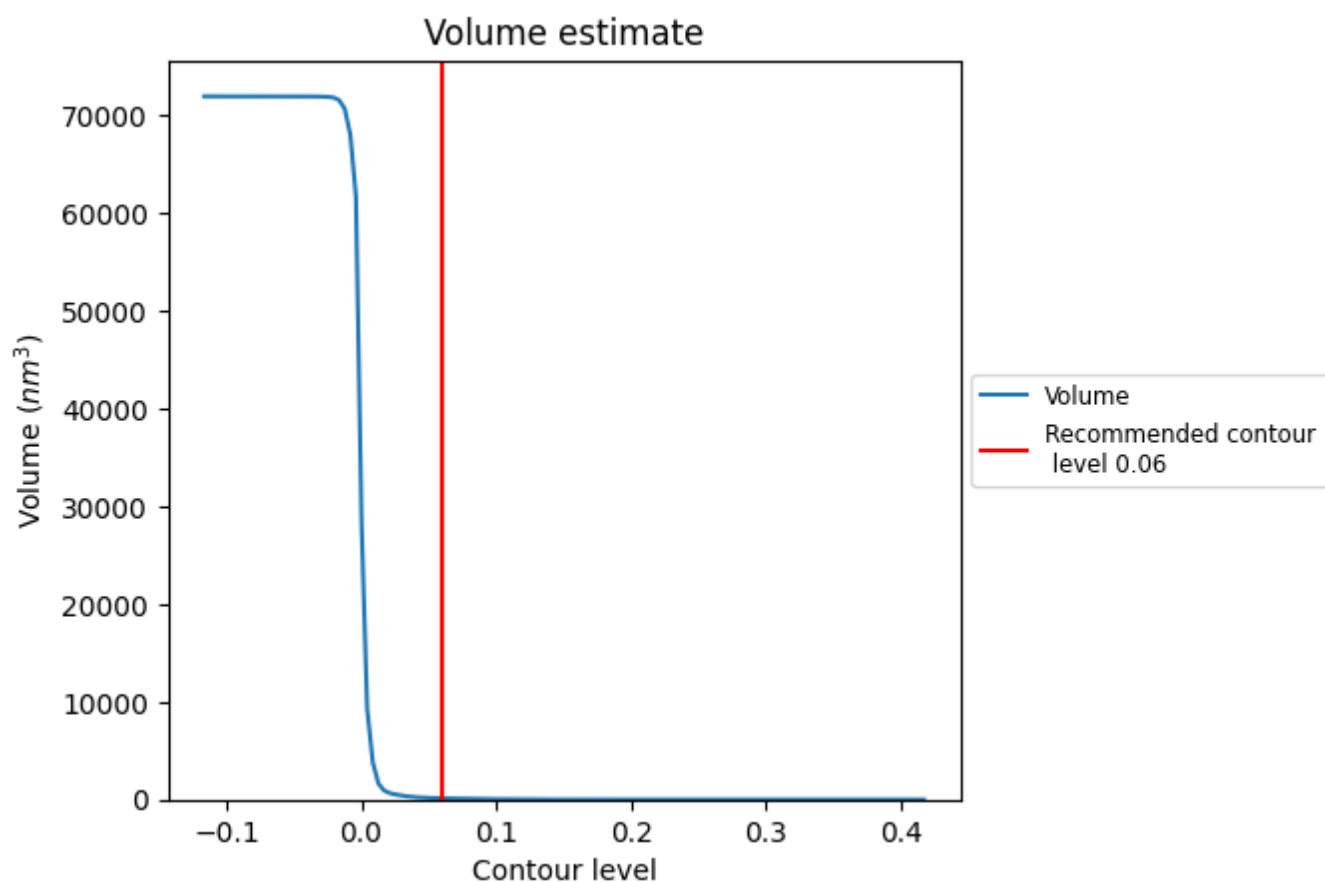
This section contains the results of statistical analysis of the map.

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.

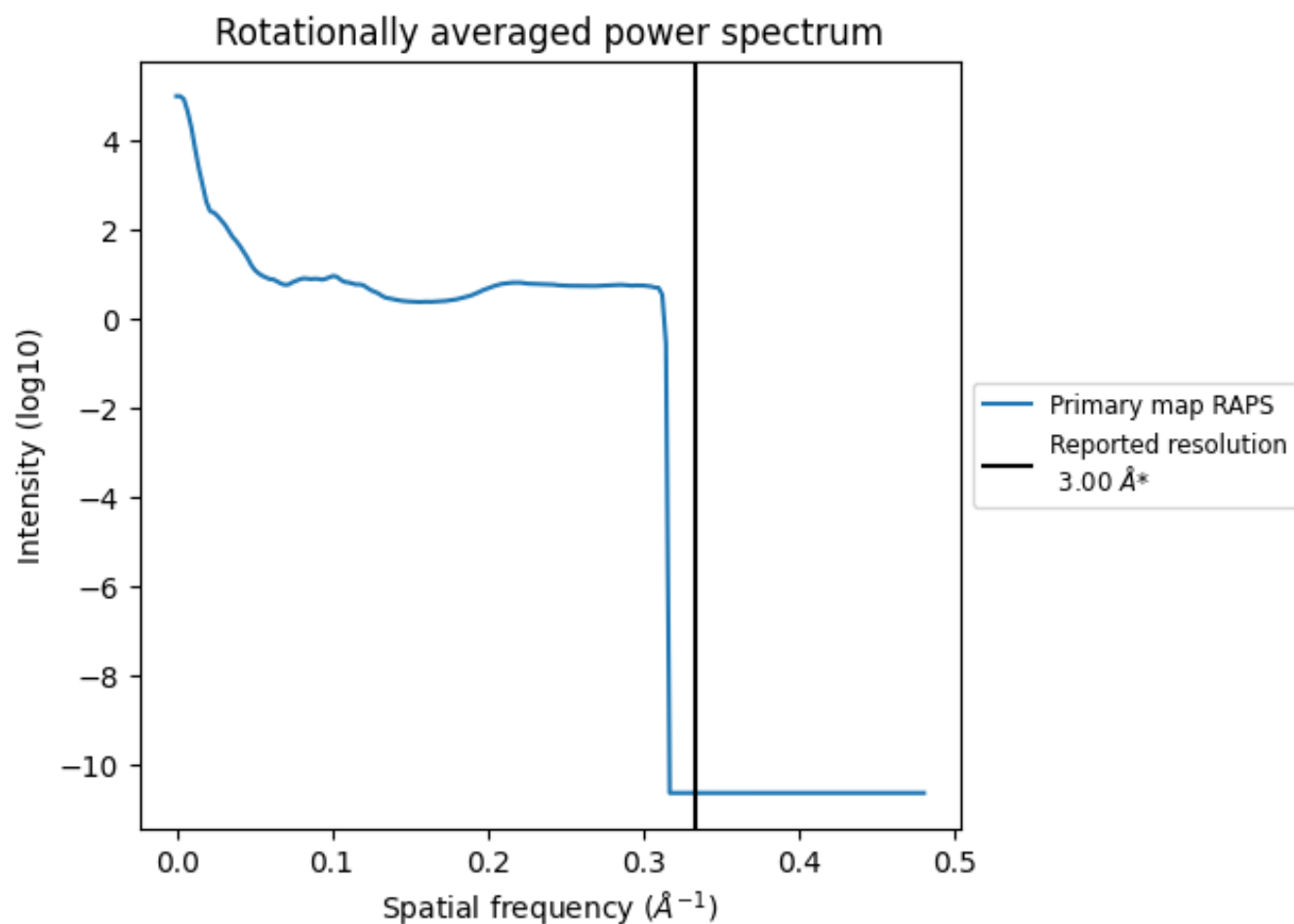
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 132 nm³; this corresponds to an approximate mass of 120 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 0.333 Å⁻¹

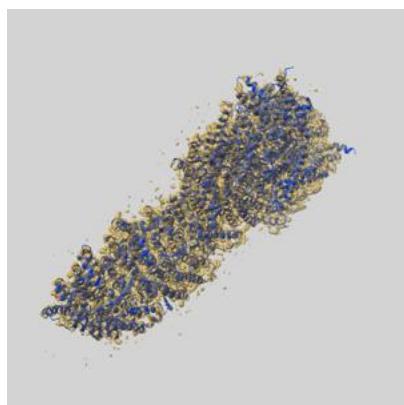
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

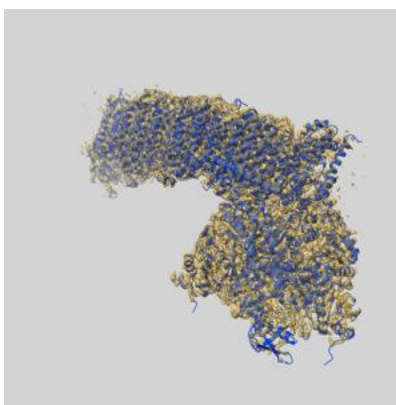
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-9989 and PDB model 6KHI. Per-residue inclusion information can be found in section [3](#) on page [12](#).

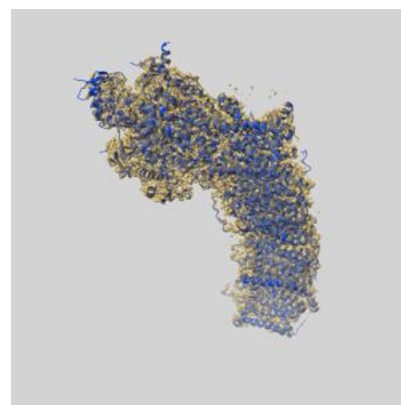
9.1 Map-model overlay [i](#)



X



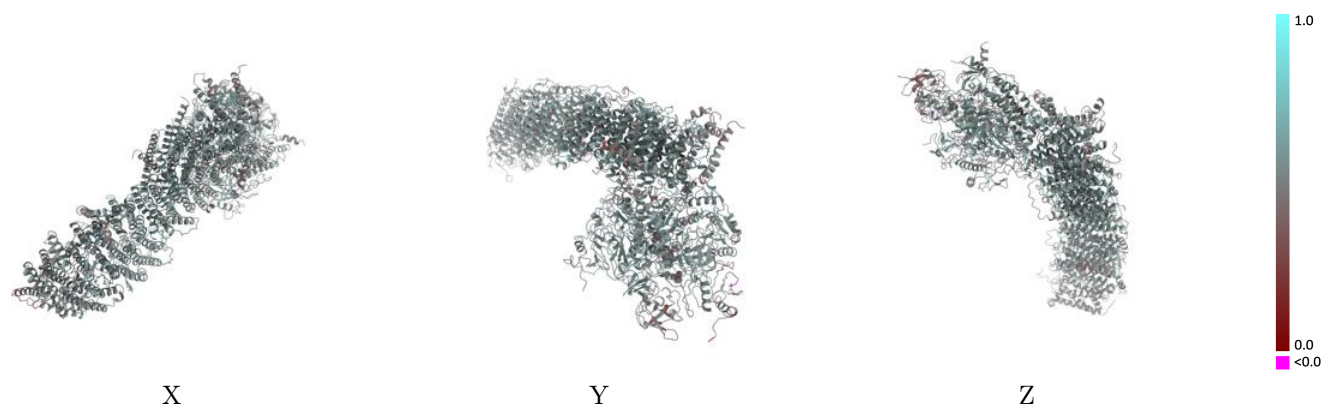
Y



Z

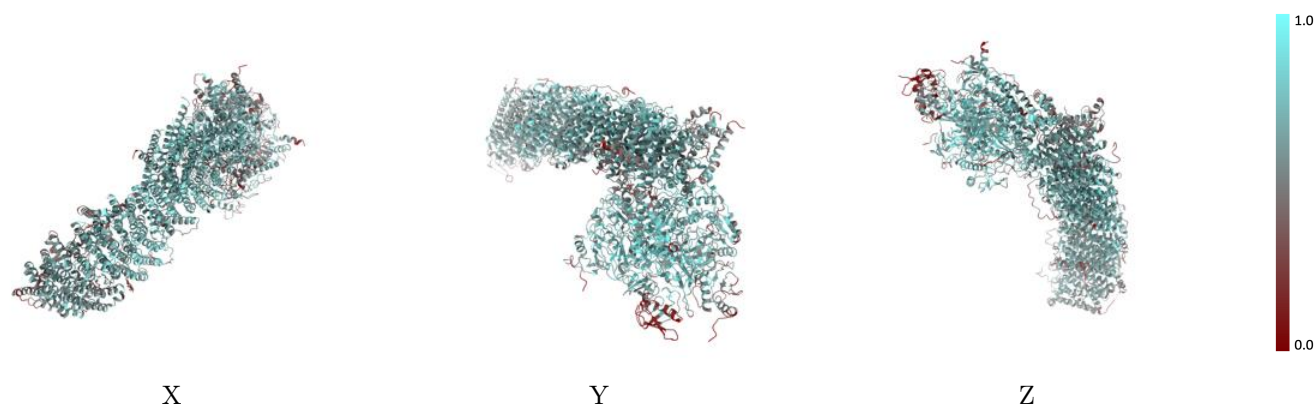
The images above show the 3D surface view of the map at the recommended contour level 0.06 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



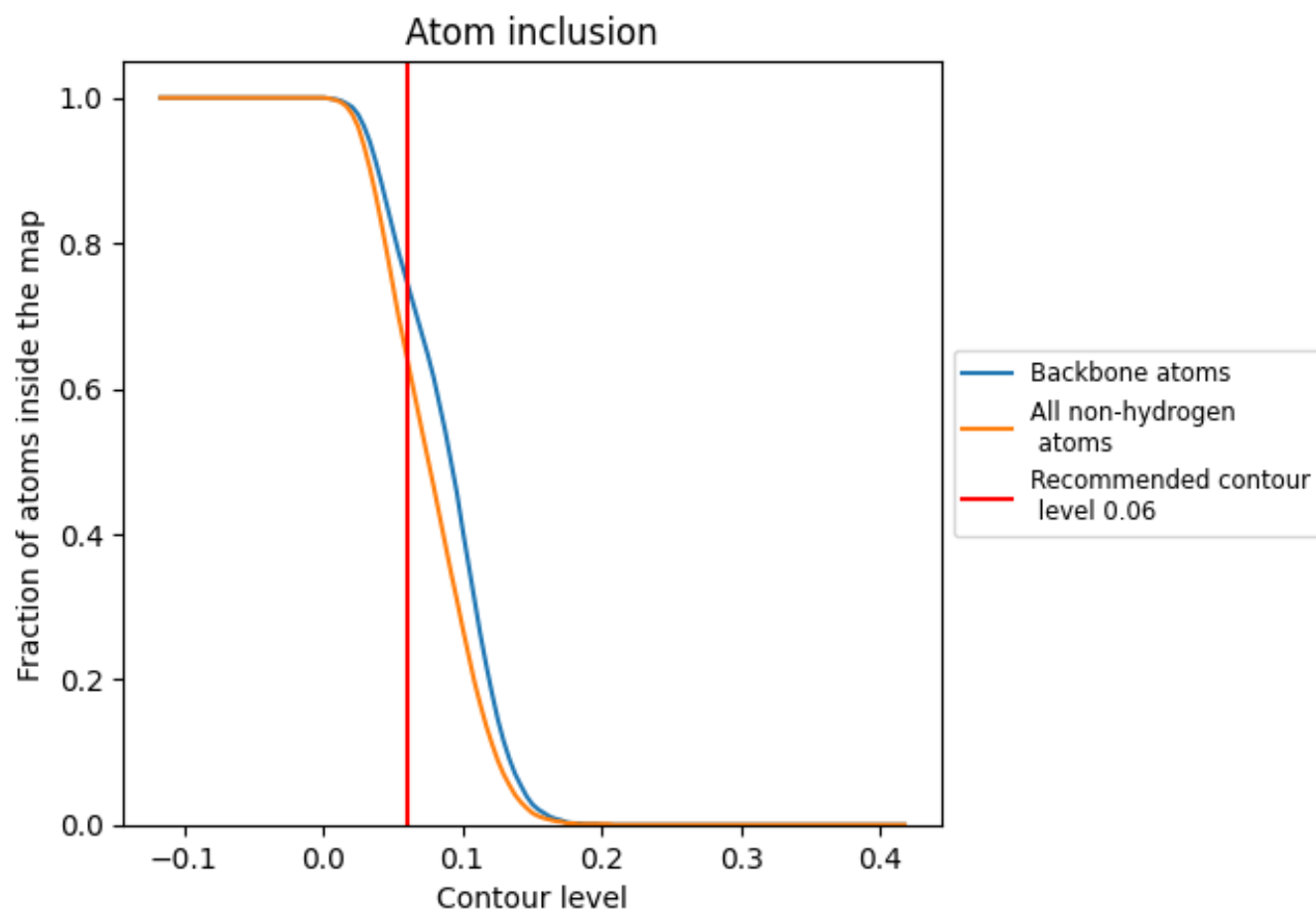
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.06).

9.4 Atom inclusion [i](#)



At the recommended contour level, 75% of all backbone atoms, 64% 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 (0.06) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6450	 0.5250
1	 0.2890	 0.4610
A	 0.6410	 0.5260
B	 0.6920	 0.5410
C	 0.6360	 0.5270
D	 0.6890	 0.5390
E	 0.6890	 0.5400
F	 0.5890	 0.5040
G	 0.6340	 0.5320
H	 0.6850	 0.5330
I	 0.6710	 0.5260
J	 0.6840	 0.5260
K	 0.7160	 0.5400
L	 0.5840	 0.5040
M	 0.6970	 0.5330
N	 0.6970	 0.5370
O	 0.6710	 0.5540
P	 0.6810	 0.5310
Q	 0.4480	 0.4860
S	 0.6140	 0.5260
V	 0.4640	 0.4610

