



## wwPDB EM Validation Summary Report ⓘ

Dec 7, 2022 – 01:54 PM JST

PDB ID : 7V2C  
EMDB ID : EMD-31640  
Title : Active state complex I from Q10 dataset  
Authors : Gu, J.K.; Yang, M.J.  
Deposited on : 2021-08-08  
Resolution : 2.90 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:

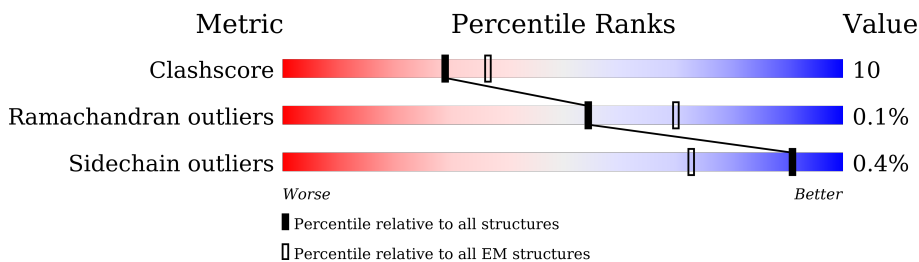
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.3

# 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 2.90 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	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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  $\leq 5\%$ . 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	433	
2	B	176	
3	C	156	
4	E	115	
5	F	86	
6	G	88	
6	X	88	
7	H	112	


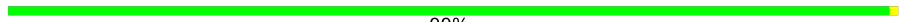










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Mol	Chain	Length	Quality of chain
8	I	112	69% 18% 13%
9	J	342	84% 16%
10	K	43	77% 21%
11	L	125	86% 14%
12	M	690	79% 21%
13	N	144	85% 15%
14	O	217	81% 19%
15	P	208	81% 19%
16	Q	430	80% 20%
17	S	70	86% 14%
18	T	96	88% 12%
19	U	83	94% 6%
20	V	140	87% 13%
21	W	142	89% 11%
22	Y	67	91% 9%
23	Z	80	95% 5%
24	a	138	100%
25	b	126	77% 22%
26	c	156	100%
27	d	175	99%
28	e	104	99%
29	f	49	100%
30	g	121	100%
31	h	105	98%
32	i	347	99%

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Mol	Chain	Length	Quality of chain
33	j	115	 100%
34	k	98	 99%
35	l	606	 99%
36	m	175	 99%
37	n	56	 11% 98%
38	o	128	 98%
39	p	178	 100%
40	r	459	 100%
41	s	318	 99%
42	u	171	 99%
43	v	125	 99%
44	w	320	 100%

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
45	SF4	A	501	-	-	X	-
45	SF4	M	802	-	-	X	-
46	FMN	A	502	-	-	X	-

## 2 Entry composition [i](#)

There are 56 unique types of molecules in this entry. The entry contains 68315 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 NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	433	3330	2103	593	614	20	0	0

- Molecule 2 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	176	1412	887	243	269	13	0	0

- Molecule 3 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	156	1248	794	227	213	14	0	0

- Molecule 4 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	E	115	971	619	179	168	5	0	0

- Molecule 5 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	F	86	687	432	129	124	2	0	0

- Molecule 6 is a protein called Acyl carrier protein, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	G	88	690	446	102	137	5	0	0
6	X	88	694	447	103	139	5	0	0

- Molecule 7 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	H	112	910	588	154	165	3	0	0

- Molecule 8 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	I	97	780	491	147	139	3	0	0

- Molecule 9 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	J	342	2751	1783	481	478	9	0	0

- Molecule 10 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	K	43	366	228	68	69	1	0	0

- Molecule 11 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	L	125	1016	642	181	190	3	0	0

- Molecule 12 is a protein called NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	M	690	5296	3320	923	1014	39	0	0

- Molecule 13 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	N	144	1204	770	218	212	4	0	0

- Molecule 14 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	O	217	1671	1065	281	315	10	0	0

- Molecule 15 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	P	208	1738	1124	298	314	2	0	0

- Molecule 16 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	Q	430	3459	2212	594	629	24	0	0

- Molecule 17 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	S	70	566	364	103	94	5	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
S	53	ARG	CYS	conflict	UNP K7GR43

- Molecule 18 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	T	96	741	452	140	146	3	0	0

- Molecule 19 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	U	83	643	417	110	115	1	0	0

- Molecule 20 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	V	140	1021	651	174	190	6	0	0

- Molecule 21 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	W	142	1161	749	197	206	9	0	0

- Molecule 22 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	Y	67	584	385	95	103	1	0	0

- Molecule 23 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	Z	80	641	418	108	114	1	0	0

- Molecule 24 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial.



Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	a	138	1151	754	195	199	3	0	0

- Molecule 25 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	b	98	819	537	144	137	1	0	0

- Molecule 26 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	c	156	1315	853	213	241	8	0	0

- Molecule 27 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	d	175	1461	916	265	272	8	0	0

- Molecule 28 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	e	104	867	553	142	168	4	0	0

- Molecule 29 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
29	f	49	378	246	65	67	0	0

- Molecule 30 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	g	121	1000	650	173	171	6	0	0

- Molecule 31 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	h	105	867	550	161	150	6	0	0

- Molecule 32 is a protein called NADH-ubiquinone oxidoreductase chain 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	i	347	2710	1782	420	462	46	0	0

- Molecule 33 is a protein called NADH-ubiquinone oxidoreductase chain 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	j	115	914	615	134	158	7	0	0

- Molecule 34 is a protein called NADH-ubiquinone oxidoreductase chain 4L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	k	98	748	493	113	128	14	0	0

- Molecule 35 is a protein called NADH-ubiquinone oxidoreductase chain 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	l	606	4816	3193	746	826	51	0	0

- Molecule 36 is a protein called NADH-ubiquinone oxidoreductase chain 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	m	175	1291	861	188	229	13	0	0

- Molecule 37 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	n	56	479	311	88	79	1	0	0

- Molecule 38 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit

4.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
38	o	128	1062	691	182	189	0	0

- Molecule 39 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
39	p	178	1534	982	279	265	8	0	0

- Molecule 40 is a protein called NADH-ubiquinone oxidoreductase chain 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
40	r	459	3631	2412	572	609	38	0	0

- Molecule 41 is a protein called NADH-ubiquinone oxidoreductase chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	s	318	2508	1678	385	424	21	0	0

- Molecule 42 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
42	u	171	1398	887	250	251	10	0	0

- Molecule 43 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
43	v	124	1028	642	195	182	9	0	0

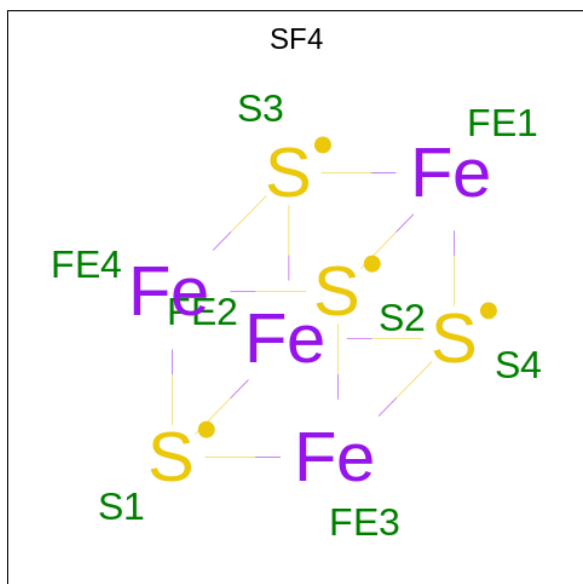
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
v	1	MYR	-	acetylation	UNP F1SCH1

- Molecule 44 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial.

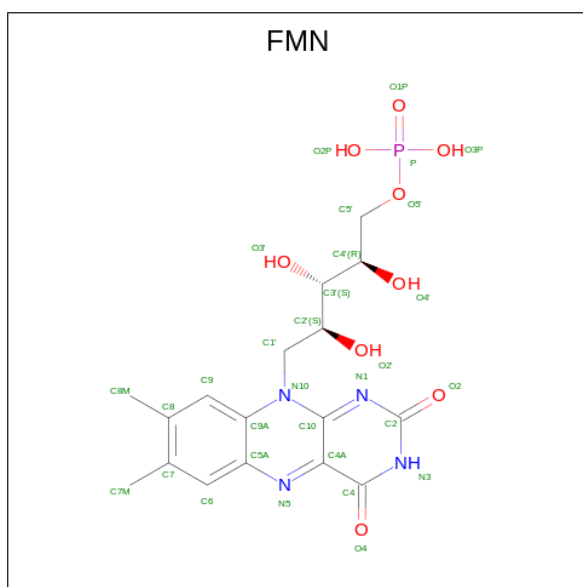
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
44	w	320	2590	1649	440	491	10	0	0

- Molecule 45 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe<sub>4</sub>S<sub>4</sub>) (labeled as "Ligand of Interest" by depositor).



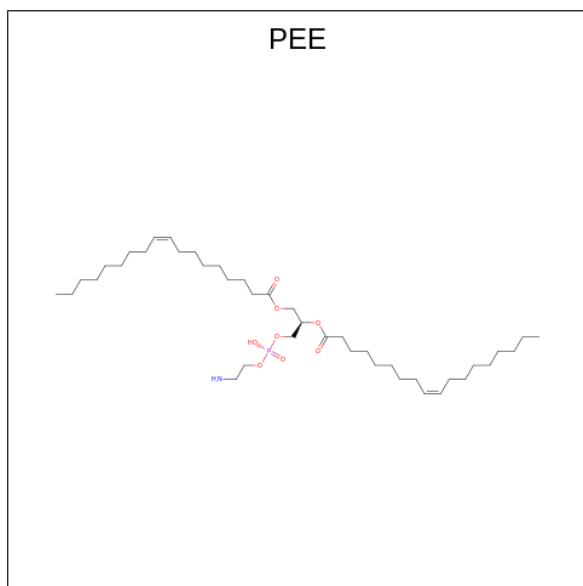
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
45	A	1	8	4	4	0
45	B	1	16	8	8	0
45	B	1	16	8	8	0
45	C	1	8	4	4	0
45	M	1	16	8	8	0
45	M	1	16	8	8	0

- Molecule 46 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
46	A	1	31	17	4	9	1	0

- Molecule 47 is 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine (three-letter code: PEE) (formula:  $C_{41}H_{78}NO_8P$ ) (labeled as "Ligand of Interest" by depositor).



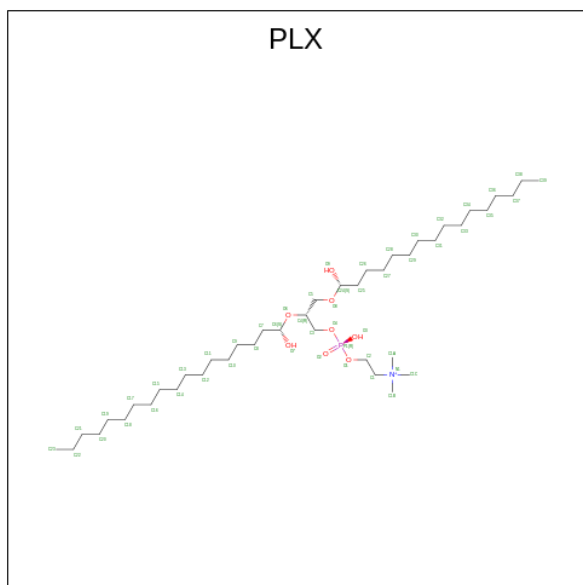
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
47	B	1	51	41	1	8	1	0
47	C	1	47	37	1	8	1	0

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Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
47	Q	1	Total 47	C 37	N 1	O 8	P 1	0
47	W	1	Total 41	C 31	N 1	O 8	P 1	0
47	b	1	Total 46	C 36	N 1	O 8	P 1	0
47	j	1	Total 92	C 72	N 2	O 16	P 2	0
47	j	1	Total 92	C 72	N 2	O 16	P 2	0
47	l	1	Total 91	C 71	N 2	O 16	P 2	0
47	l	1	Total 91	C 71	N 2	O 16	P 2	0
47	r	1	Total 51	C 41	N 1	O 8	P 1	0

- Molecule 48 is (9R,11S)-9-({[(1S)-1-HYDROXYHEXADECYL]OXY}METHYL)-2,2-DIMETHYL-5,7,10-TRIOXA-2LAMBDA 5 -AZA-6LAMBDA 5 -PHOSPHAOCTACOSANE-6,6,11-TRIOL (three-letter code: PLX) (formula: C<sub>42</sub>H<sub>89</sub>NO<sub>8</sub>P) (labeled as "Ligand of Interest" by depositor).



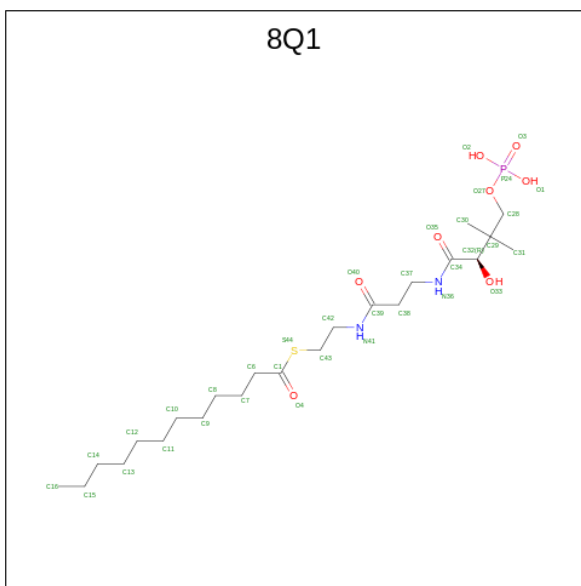
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
48	C	1	Total 52	C 42	N 1	O 8	P 1	0
48	J	1	Total 52	C 42	N 1	O 8	P 1	0

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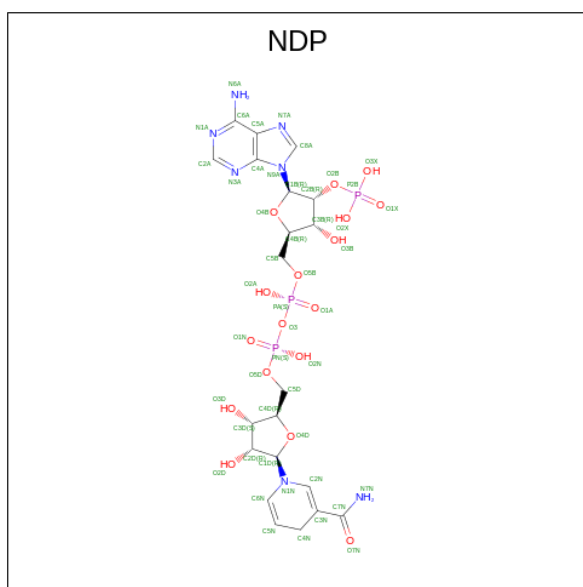
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
48	N	1	Total	C	N	O	P	0
			52	42	1	8	1	
48	g	1	Total	C	N	O	P	0
			52	42	1	8	1	
48	j	1	Total	C	N	O	P	0
			52	42	1	8	1	
48	n	1	Total	C	N	O	P	0
			52	42	1	8	1	
48	r	1	Total	C	N	O	P	0
			104	84	2	16	2	
48	r	1	Total	C	N	O	P	0
			104	84	2	16	2	

- Molecule 49 is S-[2-({N-[(2R)-2-hydroxy-3,3-dimethyl-4-(phosphonoxy)butanoyl]-beta-alanyl}amino)ethyl] dodecanethioate (three-letter code: 8Q1) (formula: C<sub>23</sub>H<sub>45</sub>N<sub>2</sub>O<sub>8</sub>PS) (labeled as "Ligand of Interest" by depositor).



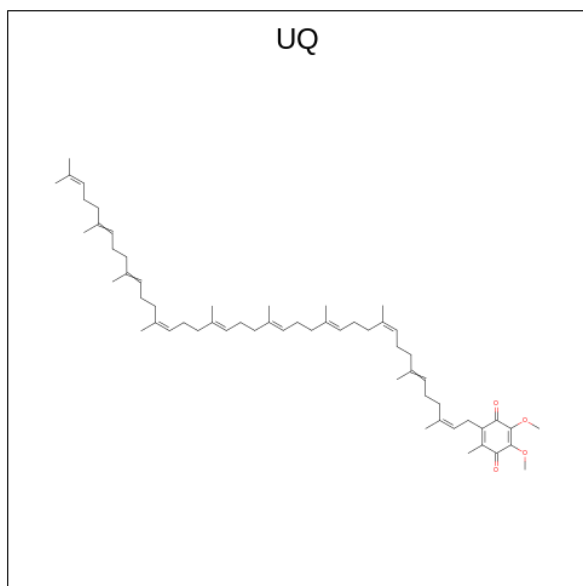
Mol	Chain	Residues	Atoms					AltConf	
			Total	C	N	O	P		S
49	E	1	Total	C	N	O	P	S	0
			35	23	2	8	1	1	
49	X	1	Total	C	N	O	P	S	0
			35	23	2	8	1	1	

- Molecule 50 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: C<sub>21</sub>H<sub>30</sub>N<sub>7</sub>O<sub>17</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
50	J	1	48	21	7	17	3	0

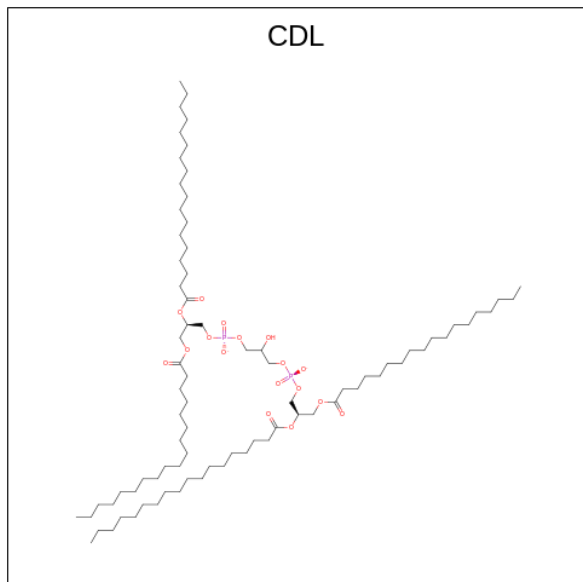
- Molecule 51 is Coenzyme Q10, (2Z,6E,10Z,14E,18E,22E,26Z)-isomer (three-letter code: UQ) (formula:  $C_{59}H_{90}O_4$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
51	J	1	33	29	4	0
51	s	1	63	59	4	0

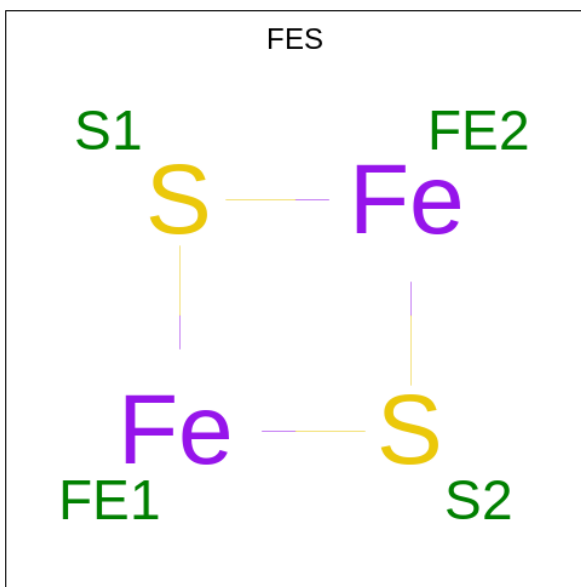


- Molecule 52 is CARDIOLIPIN (three-letter code: CDL) (formula:  $C_{81}H_{156}O_{17}P_2$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
52	J	1	Total 89	C 70	O 17	P 2	0
52	N	1	Total 51	C 32	O 17	P 2	0
52	V	1	Total 194	C 156	O 34	P 4	0
52	V	1	Total 194	C 156	O 34	P 4	0
52	a	1	Total 100	C 81	O 17	P 2	0
52	i	1	Total 68	C 49	O 17	P 2	0
52	l	1	Total 199	C 161	O 34	P 4	0
52	l	1	Total 199	C 161	O 34	P 4	0
52	m	1	Total 100	C 81	O 17	P 2	0
52	r	1	Total 100	C 81	O 17	P 2	0
52	u	1	Total 55	C 36	O 17	P 2	0

- Molecule 53 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula:  $Fe_2S_2$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
53	M	1	4	2	2	0
53	O	1	4	2	2	0

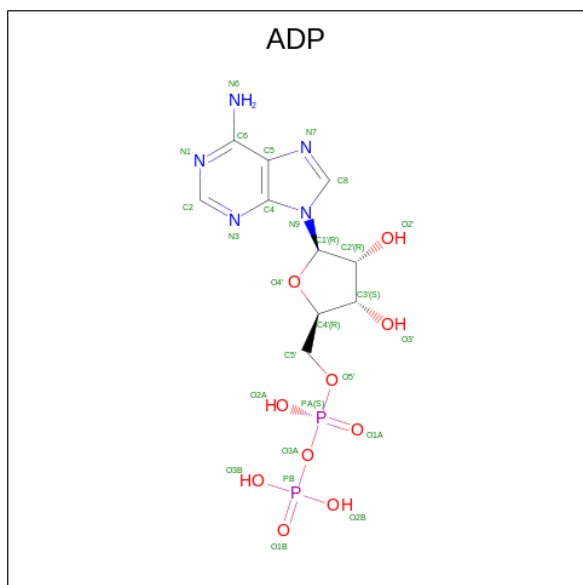
- Molecule 54 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
54	M	1	1	1	0

- Molecule 55 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
55	T	1	1	1	0

- Molecule 56 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).

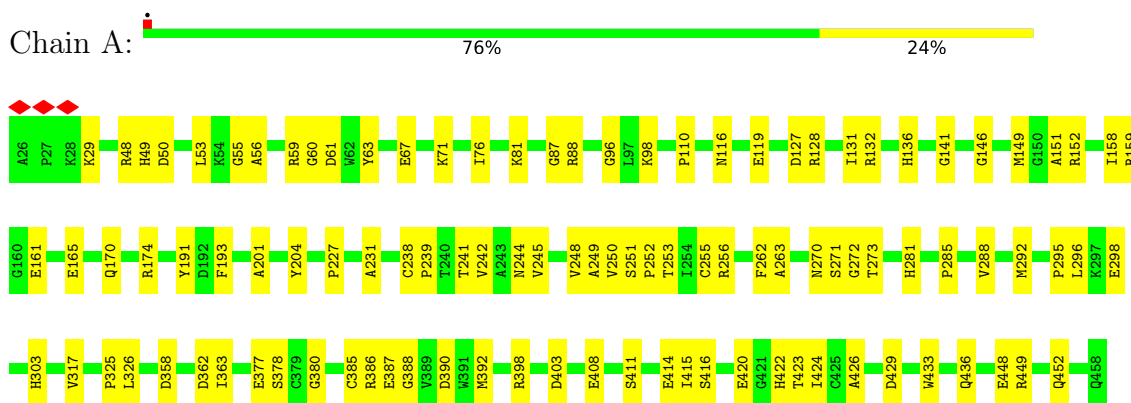


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
56	w	1	27	10	5	10	2	0

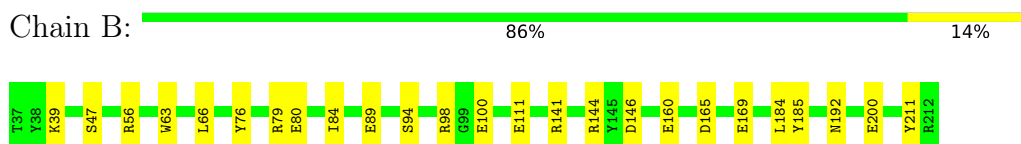
### 3 Residue-property plots [i](#)

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.

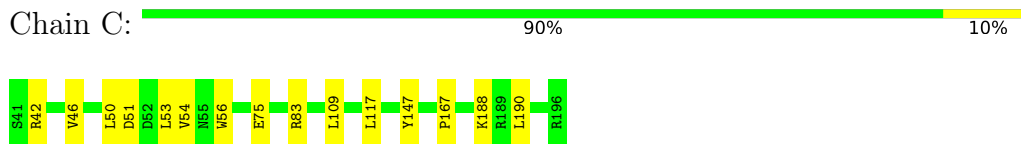
- Molecule 1: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial



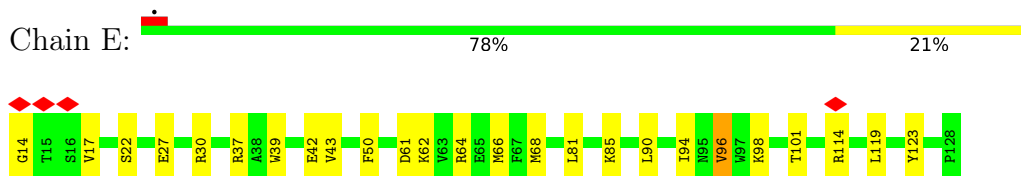
- Molecule 2: NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial



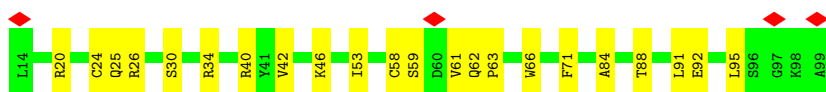
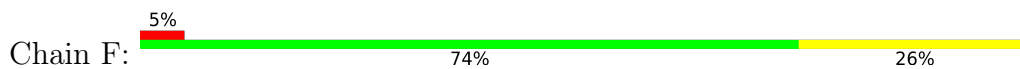
- Molecule 3: NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial



- Molecule 4: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6



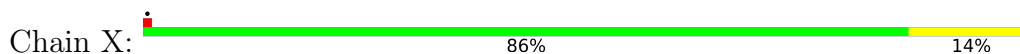
- Molecule 5: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2



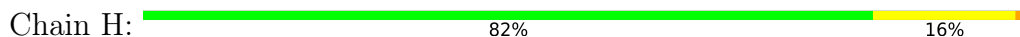
- Molecule 6: Acyl carrier protein, mitochondrial



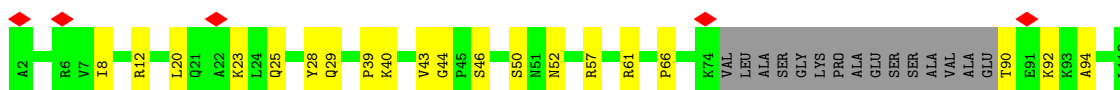
- Molecule 6: Acyl carrier protein, mitochondrial



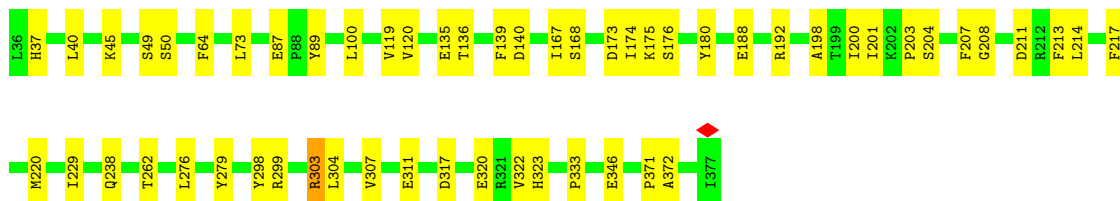
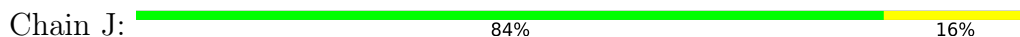
- Molecule 7: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5



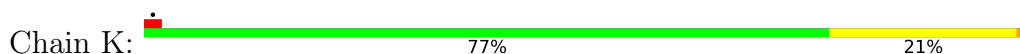
- Molecule 8: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7

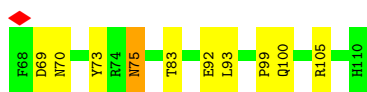


- Molecule 9: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial

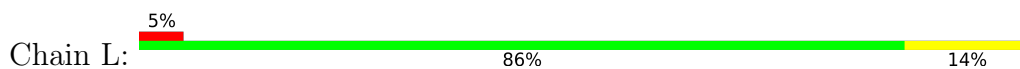


- Molecule 10: NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial

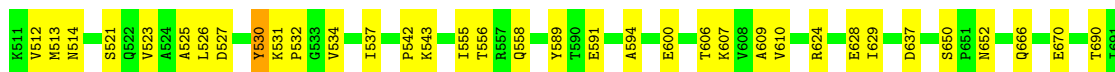
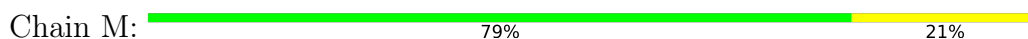




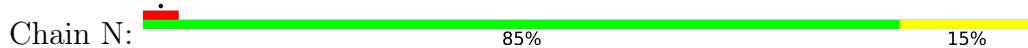
- Molecule 11: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial



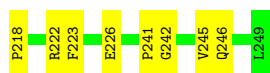
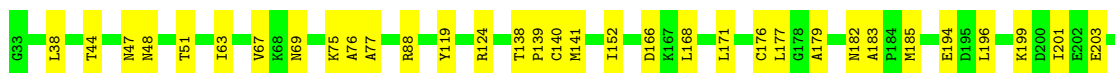
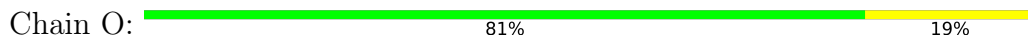
- Molecule 12: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial




- Molecule 13: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12

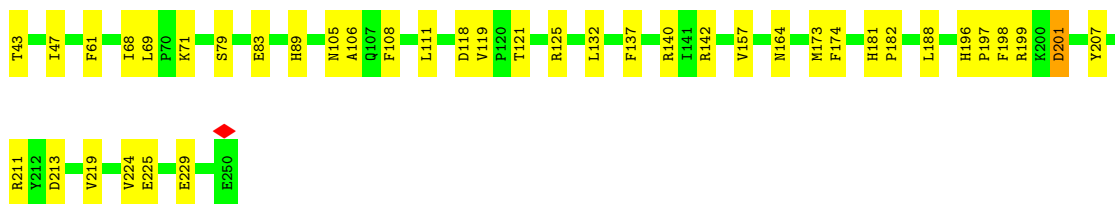


- Molecule 14: NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial




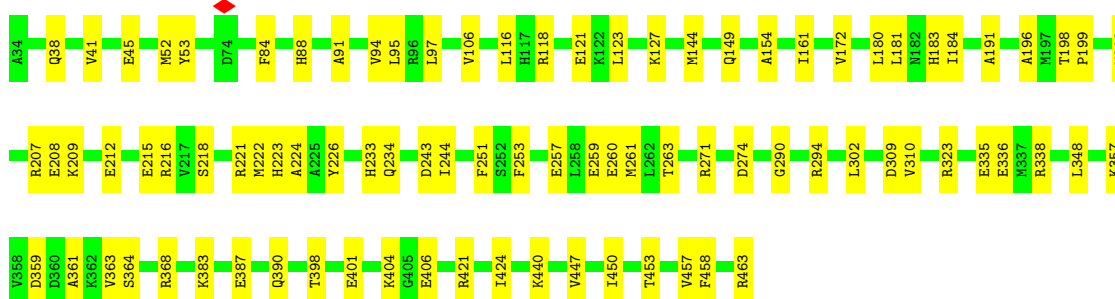
- Molecule 15: NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial

Chain P:  81% 19%




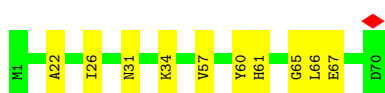
- Molecule 16: NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial

Chain Q:  80% 20%




- Molecule 17: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1

Chain S:  86% 14%



- Molecule 18: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial

Chain T:  88% 12%




- Molecule 19: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3

Chain U:  94% 6%

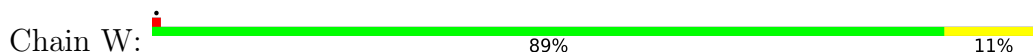


- Molecule 20: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11

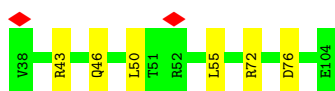
Chain V:  87% 13%



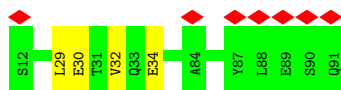
- Molecule 21: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13



- Molecule 22: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial



- Molecule 23: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3

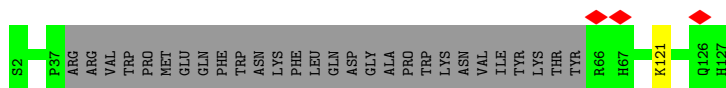
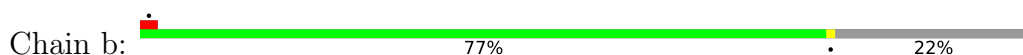


- Molecule 24: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial



There are no outlier residues recorded for this chain.

- Molecule 25: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6



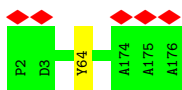
- Molecule 26: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial



- Molecule 27: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10

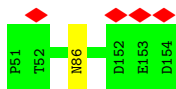


Chain d:  99%



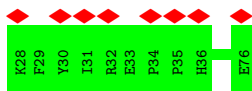
- Molecule 28: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

Chain e:  99%



- Molecule 29: NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial

Chain f:  100%



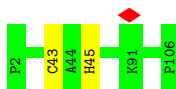
- Molecule 30: NADH dehydrogenase [ubiquinone] 1 subunit C2

Chain g:  100%

There are no outlier residues recorded for this chain.

- Molecule 31: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5

Chain h:  98%



- Molecule 32: NADH-ubiquinone oxidoreductase chain 2

Chain i:  99%



- Molecule 33: NADH-ubiquinone oxidoreductase chain 3

Chain j:  100%

There are no outlier residues recorded for this chain.

- Molecule 34: NADH-ubiquinone oxidoreductase chain 4L

Chain k:  99%



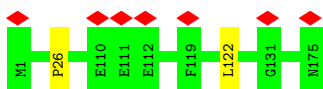
- Molecule 35: NADH-ubiquinone oxidoreductase chain 5

Chain l:  99%



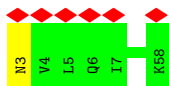
- Molecule 36: NADH-ubiquinone oxidoreductase chain 6

Chain m:  99%



- Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1

Chain n:  11% 98%



- Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4

Chain o:  98%



- Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9

Chain p:  100%

There are no outlier residues recorded for this chain.

- Molecule 40: NADH-ubiquinone oxidoreductase chain 4

Chain r:  100%



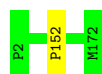
- Molecule 41: NADH-ubiquinone oxidoreductase chain 1

Chain s:  99%



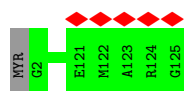
- Molecule 42: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

Chain u:  99%



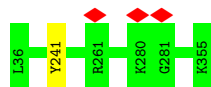
- Molecule 43: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7

Chain v:  99%



- Molecule 44: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial

Chain w:  100%



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	252573	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 ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.211	Depositor
Minimum map value	-0.081	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.018	Depositor
Map size ( $\text{\AA}$ )	354.48602, 354.48602, 354.48602	wwPDB
Map dimensions	330, 330, 330	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.0742, 1.0742, 1.0742	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: FES, 8Q1, 2MR, CDL, FMN, ZN, MG, PEE, PLX, NDP, ADP, SF4, UQ

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	0.27	0/3406	0.49	0/4603
2	B	0.31	0/1443	0.50	0/1952
3	C	0.29	0/1279	0.51	0/1730
4	E	0.26	0/995	0.51	0/1340
5	F	0.29	0/698	0.60	0/940
6	G	0.26	0/702	0.60	0/952
6	X	0.27	0/705	0.47	0/954
7	H	0.25	0/929	0.45	0/1258
8	I	0.26	0/798	0.53	0/1079
9	J	0.27	0/2828	0.47	0/3834
10	K	0.25	0/377	0.48	0/509
11	L	0.25	0/1039	0.51	0/1403
12	M	0.26	0/5384	0.51	0/7295
13	N	0.26	0/1245	0.51	0/1694
14	O	0.26	0/1711	0.49	0/2328
15	P	0.29	0/1789	0.51	0/2436
16	Q	0.30	0/3538	0.50	0/4796
17	S	0.25	0/581	0.48	0/781
18	T	0.26	0/755	0.51	0/1018
19	U	0.25	0/664	0.43	0/912
20	V	0.25	0/1042	0.47	0/1411
21	W	0.27	0/1192	0.49	0/1610
22	Y	0.26	0/610	0.44	0/836
23	Z	0.28	0/660	0.49	0/892
24	a	0.27	0/1184	0.49	0/1603
25	b	0.26	0/844	0.50	0/1149
26	c	0.27	0/1371	0.46	0/1875
27	d	0.26	0/1494	0.51	0/2015
28	e	0.26	0/891	0.49	0/1210
29	f	0.26	0/386	0.44	0/523
30	g	0.28	0/1031	0.49	0/1394
31	h	0.26	0/889	0.54	0/1190

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
32	i	0.27	0/2773	0.47	0/3768
33	j	0.26	0/938	0.41	0/1281
34	k	0.27	0/759	0.47	0/1029
35	l	0.27	0/4947	0.45	0/6728
36	m	0.30	0/1323	0.48	1/1797 (0.1%)
37	n	0.25	0/491	0.51	0/663
38	o	0.27	0/1092	0.50	0/1481
39	p	0.26	0/1590	0.48	0/2155
40	r	0.27	0/3723	0.47	0/5078
41	s	0.28	0/2581	0.49	0/3529
42	u	0.26	0/1436	0.49	0/1938
43	v	0.25	0/1052	0.51	0/1411
44	w	0.26	0/2650	0.47	0/3588
All	All	0.27	0/67815	0.49	1/91968 (0.0%)

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
25	b	0	1
32	i	0	1
All	All	0	3

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
36	m	122	LEU	CA-CB-CG	5.10	127.02	115.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	227	PRO	Peptide
25	b	121	LYS	Peptide
32	i	255	PRO	Peptide

## 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	3330	0	3292	92	0
2	B	1412	0	1363	32	0
3	C	1248	0	1254	16	0
4	E	971	0	975	23	0
5	F	687	0	700	16	0
6	G	690	0	669	32	0
6	X	694	0	674	12	0
7	H	910	0	950	14	0
8	I	780	0	808	25	0
9	J	2751	0	2773	48	0
10	K	366	0	338	11	0
11	L	1016	0	1016	17	0
12	M	5296	0	5328	115	0
13	N	1204	0	1162	21	0
14	O	1671	0	1673	34	0
15	P	1738	0	1693	44	0
16	Q	3459	0	3396	74	0
17	S	566	0	561	9	0
18	T	741	0	702	10	0
19	U	643	0	642	4	0
20	V	1021	0	1025	9	0
21	W	1161	0	1144	14	0
22	Y	584	0	529	3	0
23	Z	641	0	620	2	0
24	a	1151	0	1164	0	0
25	b	819	0	835	0	0
26	c	1315	0	1208	0	0
27	d	1461	0	1429	0	0
28	e	867	0	817	0	0
29	f	378	0	356	0	0
30	g	1000	0	994	0	0
31	h	867	0	871	0	0
32	i	2710	0	2874	0	0
33	j	914	0	951	0	0
34	k	748	0	799	0	0
35	l	4816	0	4955	0	0
36	m	1291	0	1265	0	0

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
37	n	479	0	486	0	0
38	o	1062	0	1072	0	0
39	p	1534	0	1470	0	0
40	r	3631	0	3839	0	0
41	s	2508	0	2607	0	0
42	u	1398	0	1374	0	0
43	v	1028	0	982	0	0
44	w	2590	0	2553	0	0
45	A	8	0	0	2	0
45	B	16	0	0	0	0
45	C	8	0	0	0	0
45	M	16	0	0	6	0
46	A	31	0	19	14	0
47	B	51	0	82	2	0
47	C	47	0	71	3	0
47	Q	47	0	71	16	0
47	W	41	0	59	5	0
47	b	46	0	69	0	0
47	j	92	0	141	0	0
47	l	91	0	136	0	0
47	r	51	0	82	0	0
48	C	52	0	88	15	0
48	J	52	0	88	0	0
48	N	52	0	88	0	0
48	g	52	0	88	0	0
48	j	52	0	88	0	0
48	n	52	0	88	0	0
48	r	104	0	176	0	0
49	E	35	0	0	1	0
49	X	35	0	0	6	0
50	J	48	0	26	0	0
51	J	33	0	39	10	0
51	s	63	0	90	0	0
52	J	89	0	125	8	0
52	N	51	0	46	11	0
52	V	194	0	294	6	0
52	a	100	0	156	0	0
52	i	68	0	80	0	0
52	l	199	0	307	0	0
52	m	100	0	156	0	0
52	r	100	0	156	0	0
52	u	55	0	54	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
53	M	4	0	0	1	0
53	O	4	0	0	0	0
54	M	1	0	0	0	0
55	T	1	0	0	0	0
56	w	27	0	11	0	0
All	All	68315	0	69162	639	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 10.

The worst 5 of 639 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)
6:X:112:SER:CB	49:X:201:8Q1:O1	1.66	1.42
4:E:30:ARG:HH21	6:G:133:ILE:HD13	1.12	1.13
17:S:31:ASN:ND2	17:S:60:TYR:OH	1.88	1.07
48:C:303:PLX:H212	48:C:303:PLX:H172	1.36	1.06
2:B:98:ARG:HB3	2:B:169:GLU:OE1	1.53	1.05

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	431/433 (100%)	410 (95%)	21 (5%)	0	100	100
2	B	174/176 (99%)	171 (98%)	3 (2%)	0	100	100
3	C	154/156 (99%)	147 (96%)	7 (4%)	0	100	100
4	E	113/115 (98%)	110 (97%)	2 (2%)	1 (1%)	17	48
5	F	84/86 (98%)	81 (96%)	3 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
6	G	86/88 (98%)	78 (91%)	6 (7%)	2 (2%)	6	23
6	X	86/88 (98%)	80 (93%)	6 (7%)	0	100	100
7	H	110/112 (98%)	103 (94%)	5 (4%)	2 (2%)	8	29
8	I	93/112 (83%)	80 (86%)	13 (14%)	0	100	100
9	J	340/342 (99%)	327 (96%)	13 (4%)	0	100	100
10	K	41/43 (95%)	40 (98%)	1 (2%)	0	100	100
11	L	123/125 (98%)	121 (98%)	2 (2%)	0	100	100
12	M	688/690 (100%)	664 (96%)	24 (4%)	0	100	100
13	N	142/144 (99%)	138 (97%)	4 (3%)	0	100	100
14	O	215/217 (99%)	204 (95%)	10 (5%)	1 (0%)	29	61
15	P	206/208 (99%)	198 (96%)	8 (4%)	0	100	100
16	Q	427/430 (99%)	413 (97%)	14 (3%)	0	100	100
17	S	68/70 (97%)	63 (93%)	4 (6%)	1 (2%)	10	34
18	T	94/96 (98%)	94 (100%)	0	0	100	100
19	U	81/83 (98%)	78 (96%)	3 (4%)	0	100	100
20	V	138/140 (99%)	136 (99%)	2 (1%)	0	100	100
21	W	140/142 (99%)	136 (97%)	4 (3%)	0	100	100
22	Y	65/67 (97%)	63 (97%)	2 (3%)	0	100	100
23	Z	78/80 (98%)	74 (95%)	4 (5%)	0	100	100
24	a	136/138 (99%)	132 (97%)	4 (3%)	0	100	100
25	b	94/126 (75%)	91 (97%)	3 (3%)	0	100	100
26	c	154/156 (99%)	141 (92%)	13 (8%)	0	100	100
27	d	173/175 (99%)	165 (95%)	8 (5%)	0	100	100
28	e	102/104 (98%)	94 (92%)	8 (8%)	0	100	100
29	f	47/49 (96%)	41 (87%)	6 (13%)	0	100	100
30	g	119/121 (98%)	112 (94%)	7 (6%)	0	100	100
31	h	103/105 (98%)	100 (97%)	3 (3%)	0	100	100
32	i	345/347 (99%)	330 (96%)	14 (4%)	1 (0%)	41	71
33	j	113/115 (98%)	108 (96%)	5 (4%)	0	100	100
34	k	96/98 (98%)	93 (97%)	3 (3%)	0	100	100
35	l	604/606 (100%)	574 (95%)	30 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
36	m	173/175 (99%)	164 (95%)	8 (5%)	1 (1%)	25	58
37	n	54/56 (96%)	53 (98%)	1 (2%)	0	100	100
38	o	126/128 (98%)	121 (96%)	5 (4%)	0	100	100
39	p	176/178 (99%)	170 (97%)	6 (3%)	0	100	100
40	r	457/459 (100%)	450 (98%)	7 (2%)	0	100	100
41	s	316/318 (99%)	305 (96%)	11 (4%)	0	100	100
42	u	169/171 (99%)	164 (97%)	4 (2%)	1 (1%)	25	58
43	v	122/125 (98%)	118 (97%)	4 (3%)	0	100	100
44	w	318/320 (99%)	304 (96%)	14 (4%)	0	100	100
All	All	8174/8313 (98%)	7839 (96%)	325 (4%)	10 (0%)	54	82

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
6	G	138	LEU
7	H	108	PRO
17	S	66	LEU
6	G	133	ILE
14	O	76	ALA

### 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	346/346 (100%)	346 (100%)	0	100	100
2	B	151/151 (100%)	151 (100%)	0	100	100
3	C	132/132 (100%)	132 (100%)	0	100	100
4	E	107/107 (100%)	107 (100%)	0	100	100
5	F	75/76 (99%)	75 (100%)	0	100	100
6	G	75/81 (93%)	73 (97%)	2 (3%)	44	77
6	X	76/81 (94%)	76 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
7	H	99/99 (100%)	98 (99%)	1 (1%)	76	92
8	I	87/97 (90%)	86 (99%)	1 (1%)	73	92
9	J	296/296 (100%)	294 (99%)	2 (1%)	84	95
10	K	42/42 (100%)	41 (98%)	1 (2%)	49	79
11	L	113/113 (100%)	112 (99%)	1 (1%)	78	93
12	M	580/580 (100%)	577 (100%)	3 (0%)	88	96
13	N	130/130 (100%)	130 (100%)	0	100	100
14	O	183/183 (100%)	183 (100%)	0	100	100
15	P	190/190 (100%)	189 (100%)	1 (0%)	88	96
16	Q	370/370 (100%)	370 (100%)	0	100	100
17	S	57/58 (98%)	57 (100%)	0	100	100
18	T	79/79 (100%)	79 (100%)	0	100	100
19	U	69/69 (100%)	69 (100%)	0	100	100
20	V	101/101 (100%)	101 (100%)	0	100	100
21	W	121/123 (98%)	121 (100%)	0	100	100
22	Y	62/62 (100%)	62 (100%)	0	100	100
23	Z	62/62 (100%)	62 (100%)	0	100	100
24	a	121/121 (100%)	121 (100%)	0	100	100
25	b	90/119 (76%)	90 (100%)	0	100	100
26	c	141/141 (100%)	141 (100%)	0	100	100
27	d	155/155 (100%)	154 (99%)	1 (1%)	86	96
28	e	96/96 (100%)	95 (99%)	1 (1%)	76	92
29	f	36/45 (80%)	36 (100%)	0	100	100
30	g	108/108 (100%)	108 (100%)	0	100	100
31	h	93/93 (100%)	91 (98%)	2 (2%)	52	81
32	i	311/311 (100%)	310 (100%)	1 (0%)	92	98
33	j	100/100 (100%)	100 (100%)	0	100	100
34	k	85/85 (100%)	84 (99%)	1 (1%)	71	91
35	l	540/540 (100%)	536 (99%)	4 (1%)	84	95
36	m	130/141 (92%)	130 (100%)	0	100	100
37	n	53/53 (100%)	52 (98%)	1 (2%)	57	84

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
38	o	113/113 (100%)	111 (98%)	2 (2%)	59	85
39	p	159/159 (100%)	159 (100%)	0	100	100
40	r	410/410 (100%)	408 (100%)	2 (0%)	88	96
41	s	275/275 (100%)	272 (99%)	3 (1%)	73	92
42	u	153/153 (100%)	153 (100%)	0	100	100
43	v	104/111 (94%)	104 (100%)	0	100	100
44	w	283/283 (100%)	282 (100%)	1 (0%)	91	97
All	All	7159/7240 (99%)	7128 (100%)	31 (0%)	91	97

5 of 31 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
31	h	43	CYS
41	s	201	THR
34	k	53	PHE
41	s	212	ASN
38	o	129	TYR

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

Mol	Chain	Res	Type
31	h	98	HIS
35	l	67	HIS
42	u	163	HIS
33	j	10	ASN
35	l	139	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](#)

1 non-standard protein/DNA/RNA residue is 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
16	2MR	Q	118	16	10,12,13	1.97	1 (10%)	5,13,15	5.97	3 (60%)

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
16	2MR	Q	118	16	-	2/10/13/15	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	Q	118	2MR	CZ-NE	5.58	1.46	1.34

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
16	Q	118	2MR	NE-CZ-NH2	12.23	130.69	119.48
16	Q	118	2MR	CD-NE-CZ	4.08	131.05	123.41
16	Q	118	2MR	CQ2-NH2-CZ	3.14	130.81	123.86

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
16	Q	118	2MR	NE-CD-CG-CB
16	Q	118	2MR	CA-CB-CG-CD

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 46 ligands modelled in this entry, 2 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
52	CDL	r	504	-	99,99,99	1.08	8 (8%)	105,111,111	0.87	4 (3%)
46	FMN	A	502	-	33,33,33	1.40	5 (15%)	48,50,50	1.28	7 (14%)
45	SF4	M	802	12	0,12,12	-	-	-	-	-
52	CDL	a	201	-	99,99,99	1.09	8 (8%)	105,111,111	0.87	4 (3%)
48	PLX	r	502	-	51,51,51	1.14	4 (7%)	55,59,59	0.58	1 (1%)
50	NDP	J	401	-	45,52,52	2.23	4 (8%)	53,80,80	1.75	11 (20%)
53	FES	M	803	12	0,4,4	-	-	-	-	-
52	CDL	l	703	-	99,99,99	0.91	4 (4%)	105,111,111	1.08	7 (6%)
48	PLX	C	303	-	51,51,51	0.62	0	55,59,59	0.67	0
45	SF4	M	801	12	0,12,12	-	-	-	-	-
45	SF4	B	302	2	0,12,12	-	-	-	-	-
47	PEE	C	302	-	46,46,50	1.21	6 (13%)	49,51,55	0.99	2 (4%)
51	UQ	J	402	-	33,33,63	3.44	9 (27%)	40,43,79	2.80	13 (32%)
52	CDL	V	201	-	93,93,99	1.11	8 (8%)	99,105,111	0.87	4 (4%)
45	SF4	C	301	3	0,12,12	-	-	-	-	-
47	PEE	B	303	-	50,50,50	1.16	6 (12%)	53,55,55	0.98	2 (3%)
52	CDL	u	201	-	54,54,99	1.23	4 (7%)	60,66,111	1.24	5 (8%)
48	PLX	J	403	-	51,51,51	1.14	3 (5%)	55,59,59	0.59	1 (1%)
52	CDL	i	401	-	67,67,99	1.12	4 (5%)	73,79,111	1.22	6 (8%)
47	PEE	r	501	-	50,50,50	1.16	5 (10%)	53,55,55	0.96	2 (3%)
47	PEE	j	201	-	50,50,50	1.15	6 (12%)	53,55,55	0.98	2 (3%)
49	8Q1	E	201	-	31,34,34	2.06	6 (19%)	40,43,43	1.70	11 (27%)
47	PEE	b	201	-	45,45,50	1.22	6 (13%)	48,50,55	0.99	2 (4%)
47	PEE	l	701	-	39,39,50	1.31	6 (15%)	41,44,55	1.04	2 (4%)
52	CDL	l	702	-	98,98,99	1.09	8 (8%)	104,110,111	0.90	4 (3%)
48	PLX	n	101	-	51,51,51	1.15	4 (7%)	55,59,59	0.59	1 (1%)
45	SF4	B	301	2	0,12,12	-	-	-	-	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
45	SF4	A	501	1	0,12,12	-	-	-		
49	8Q1	X	201	-	31,34,34	1.70	6 (19%)	40,43,43	1.57	6 (15%)
47	PEE	W	201	-	40,40,50	1.13	5 (12%)	43,45,55	1.01	2 (4%)
47	PEE	Q	501	-	46,46,50	1.20	6 (13%)	49,51,55	1.01	2 (4%)
52	CDL	N	202	-	50,50,99	1.28	4 (8%)	56,62,111	1.29	5 (8%)
48	PLX	r	503	-	51,51,51	1.14	4 (7%)	55,59,59	0.59	1 (1%)
52	CDL	V	202	-	99,99,99	1.08	8 (8%)	105,111,111	0.88	4 (3%)
52	CDL	m	201	-	99,99,99	1.08	8 (8%)	105,111,111	0.85	4 (3%)
48	PLX	N	201	-	51,51,51	1.14	4 (7%)	55,59,59	0.60	1 (1%)
51	UQ	s	501	-	63,63,63	3.63	15 (23%)	76,79,79	3.21	31 (40%)
53	FES	O	301	14	0,4,4	-	-	-		
48	PLX	j	203	-	51,51,51	1.15	4 (7%)	55,59,59	0.59	1 (1%)
56	ADP	w	401	-	24,29,29	3.12	6 (25%)	29,45,45	1.45	5 (17%)
52	CDL	J	404	-	88,88,99	1.13	8 (9%)	94,100,111	0.92	4 (4%)
47	PEE	l	704	-	50,50,50	1.16	6 (12%)	53,55,55	0.98	2 (3%)
48	PLX	g	201	-	51,51,51	1.13	3 (5%)	55,59,59	0.65	1 (1%)
47	PEE	j	202	-	40,40,50	1.15	5 (12%)	43,45,55	1.02	2 (4%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
52	CDL	r	504	-	-	59/110/110/110	-
46	FMN	A	502	-	-	7/18/18/18	0/3/3/3
45	SF4	M	802	12	-	-	0/6/5/5
52	CDL	a	201	-	-	56/110/110/110	-
48	PLX	r	502	-	-	24/55/55/55	-
50	NDP	J	401	-	-	10/30/77/77	0/5/5/5
53	FES	M	803	12	-	-	0/1/1/1
52	CDL	l	703	-	-	38/110/110/110	-
48	PLX	C	303	-	-	16/55/55/55	-
45	SF4	M	801	12	-	-	0/6/5/5
45	SF4	B	302	2	-	-	0/6/5/5
47	PEE	C	302	-	-	25/50/50/54	-
51	UQ	J	402	-	-	17/27/51/87	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
52	CDL	V	201	-	-	53/104/104/110	-
47	PEE	B	303	-	-	28/54/54/54	-
52	CDL	u	201	-	-	23/65/65/110	-
45	SF4	C	301	3	-	-	0/6/5/5
48	PLX	J	403	-	-	35/55/55/55	-
52	CDL	i	401	-	-	33/78/78/110	-
47	PEE	r	501	-	-	23/54/54/54	-
47	PEE	j	201	-	-	27/54/54/54	-
49	8Q1	E	201	-	-	23/41/41/41	-
47	PEE	b	201	-	-	24/49/49/54	-
47	PEE	l	701	-	-	25/43/43/54	-
52	CDL	l	702	-	-	57/109/109/110	-
48	PLX	n	101	-	-	26/55/55/55	-
45	SF4	B	301	2	-	-	0/6/5/5
45	SF4	A	501	1	-	-	0/6/5/5
49	8Q1	X	201	-	-	14/41/41/41	-
47	PEE	W	201	-	-	24/44/44/54	-
47	PEE	Q	501	-	-	27/50/50/54	-
52	CDL	N	202	-	-	21/61/61/110	-
48	PLX	r	503	-	-	26/55/55/55	-
52	CDL	V	202	-	-	61/110/110/110	-
52	CDL	m	201	-	-	61/110/110/110	-
48	PLX	N	201	-	-	28/55/55/55	-
51	UQ	s	501	-	-	32/63/87/87	0/1/1/1
56	ADP	w	401	-	-	4/12/32/32	0/3/3/3
48	PLX	j	203	-	-	30/55/55/55	-
53	FES	O	301	14	-	-	0/1/1/1
52	CDL	J	404	-	-	48/99/99/110	-
47	PEE	l	704	-	-	29/54/54/54	-
48	PLX	g	201	-	-	29/55/55/55	-
47	PEE	j	202	-	-	25/44/44/54	-

The worst 5 of 206 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
50	J	401	NDP	P2B-O2B	12.43	1.82	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
51	s	501	UQ	C18-C19	9.56	1.55	1.33
51	J	402	UQ	C18-C19	9.55	1.55	1.33
51	s	501	UQ	C13-C14	9.24	1.55	1.33
51	J	402	UQ	C13-C14	9.21	1.55	1.33

The worst 5 of 162 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
51	J	402	UQ	C7-C8-C9	-8.04	113.41	126.79
51	s	501	UQ	C7-C8-C9	-7.84	113.75	126.79
50	J	401	NDP	PN-O3-PA	-7.11	108.43	132.83
51	s	501	UQ	C42-C43-C44	-6.49	112.04	127.66
51	s	501	UQ	C12-C13-C14	-6.39	112.27	127.66

There are no chirality outliers.

5 of 1088 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
46	A	502	FMN	N10-C1'-C2'-O2'
46	A	502	FMN	N10-C1'-C2'-C3'
46	A	502	FMN	C1'-C2'-C3'-O3'
46	A	502	FMN	C1'-C2'-C3'-C4'
47	B	303	PEE	C11-C10-O2-C2

There are no ring outliers.

16 monomers are involved in 106 short contacts:

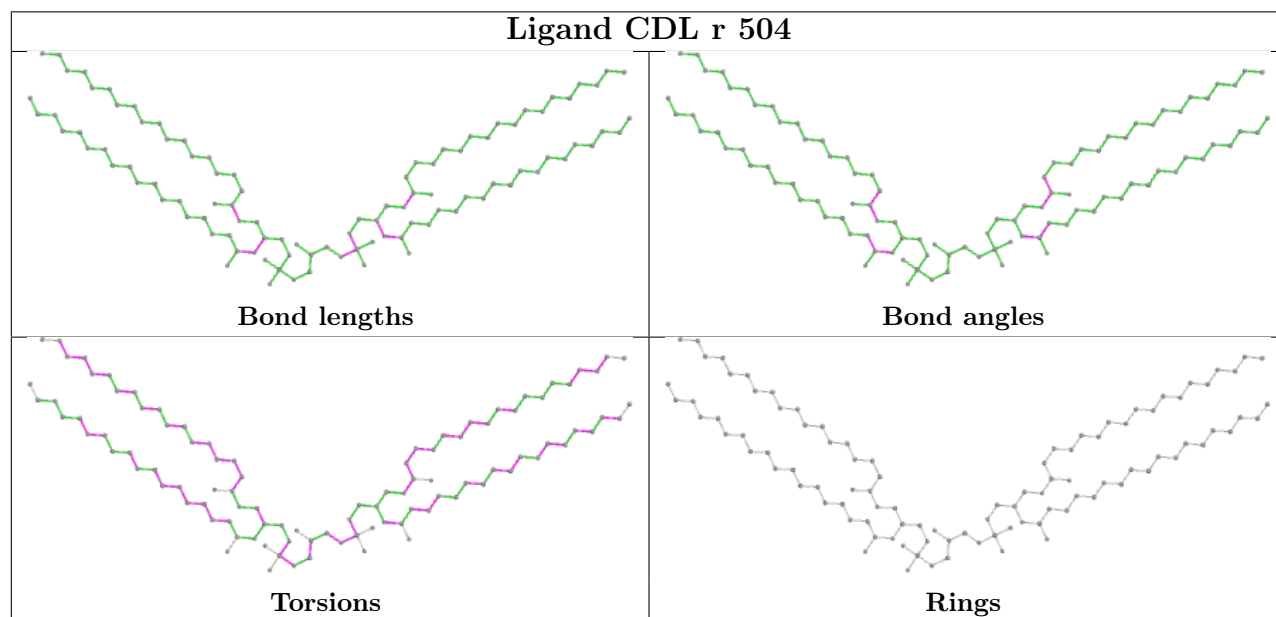
Mol	Chain	Res	Type	Clashes	Symm-Clashes
46	A	502	FMN	14	0
45	M	802	SF4	6	0
53	M	803	FES	1	0
48	C	303	PLX	15	0
47	C	302	PEE	3	0
51	J	402	UQ	10	0
52	V	201	CDL	3	0
47	B	303	PEE	2	0
49	E	201	8Q1	1	0
45	A	501	SF4	2	0
49	X	201	8Q1	6	0
47	W	201	PEE	5	0
47	Q	501	PEE	16	0

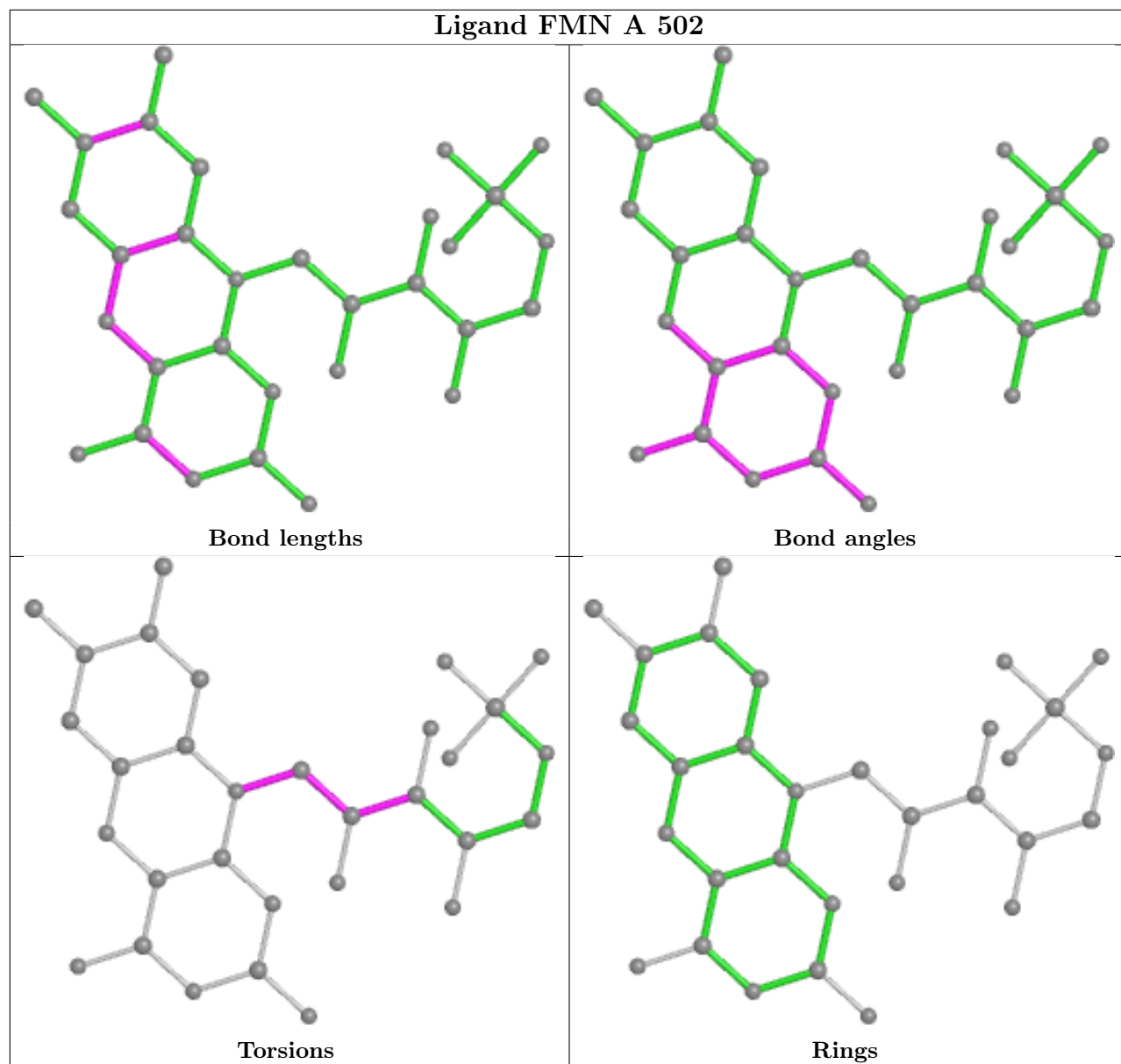
*Continued on next page...*

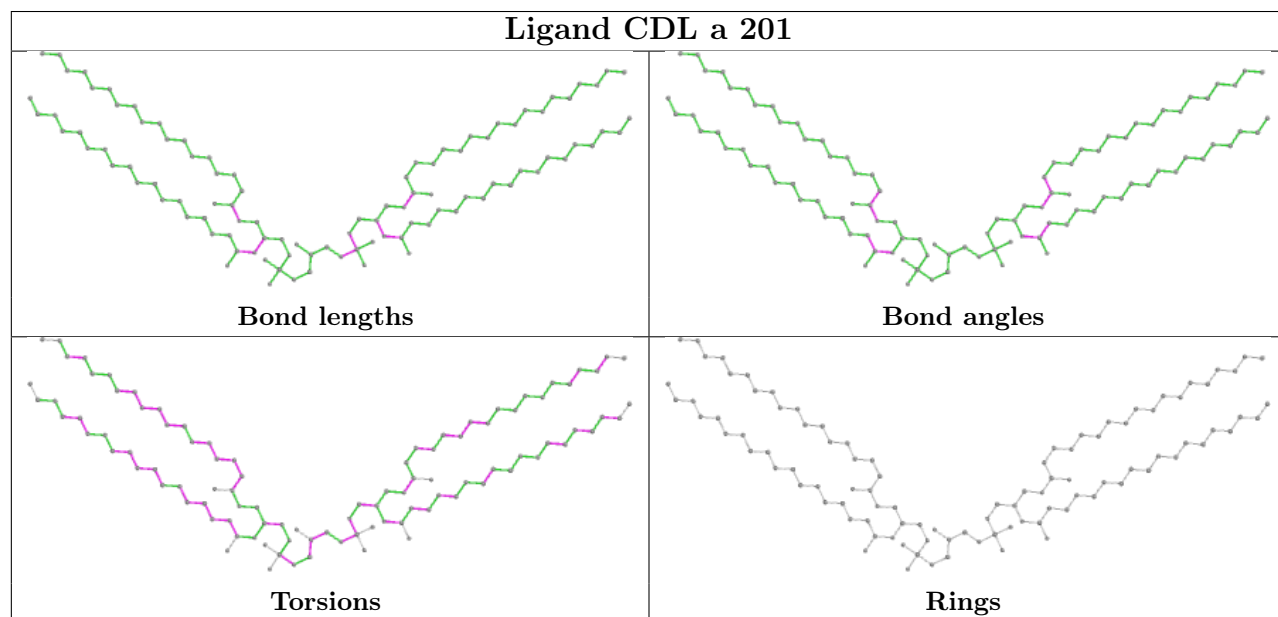
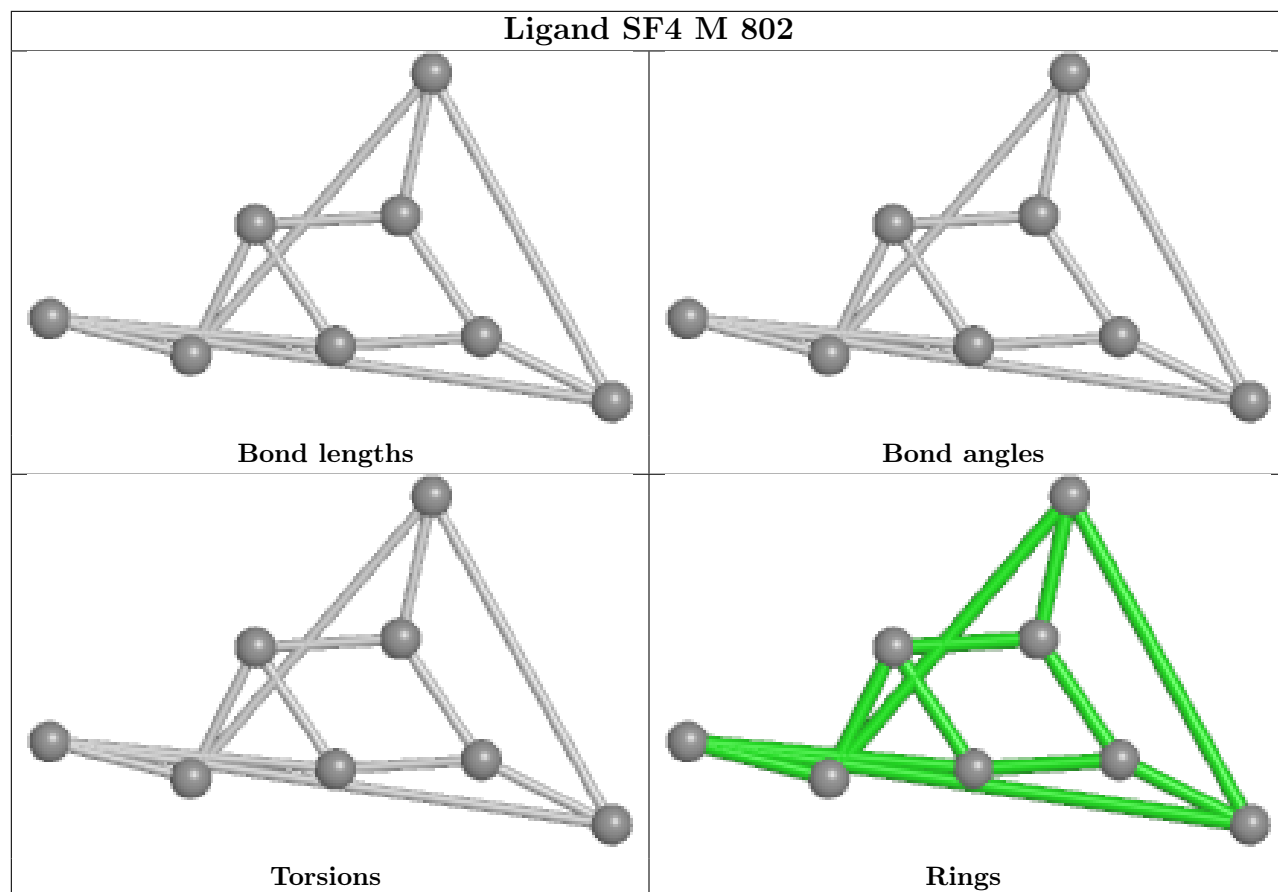
*Continued from previous page...*

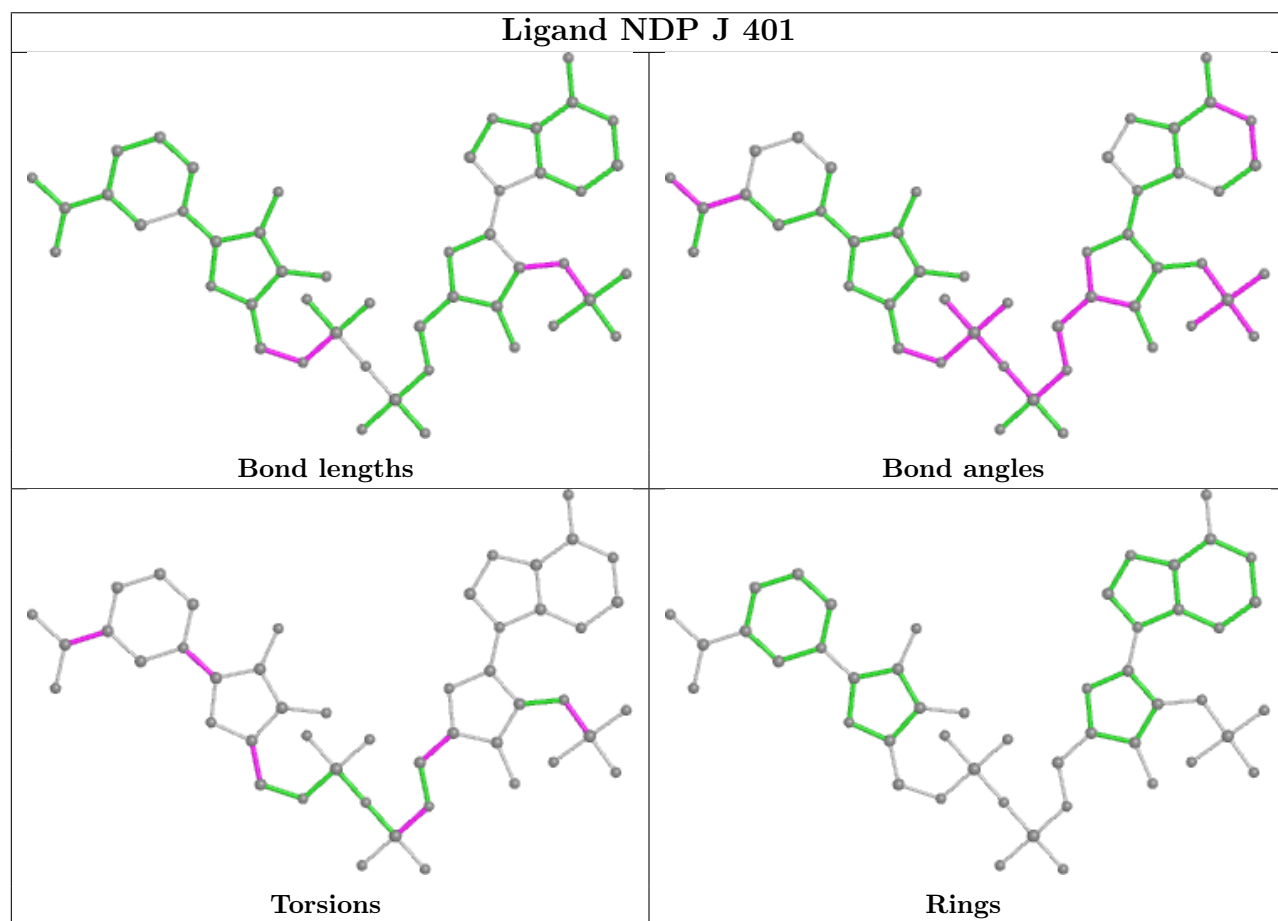
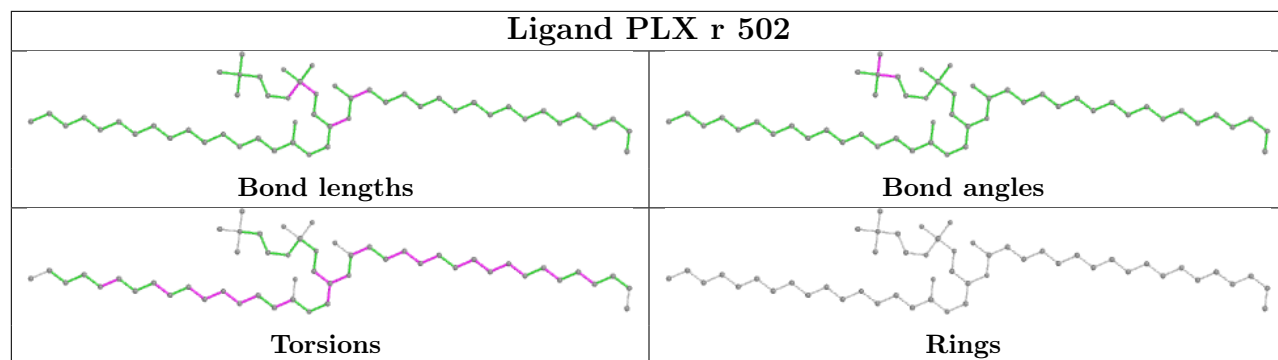
Mol	Chain	Res	Type	Clashes	Symm-Clashes
52	N	202	CDL	11	0
52	V	202	CDL	3	0
52	J	404	CDL	8	0

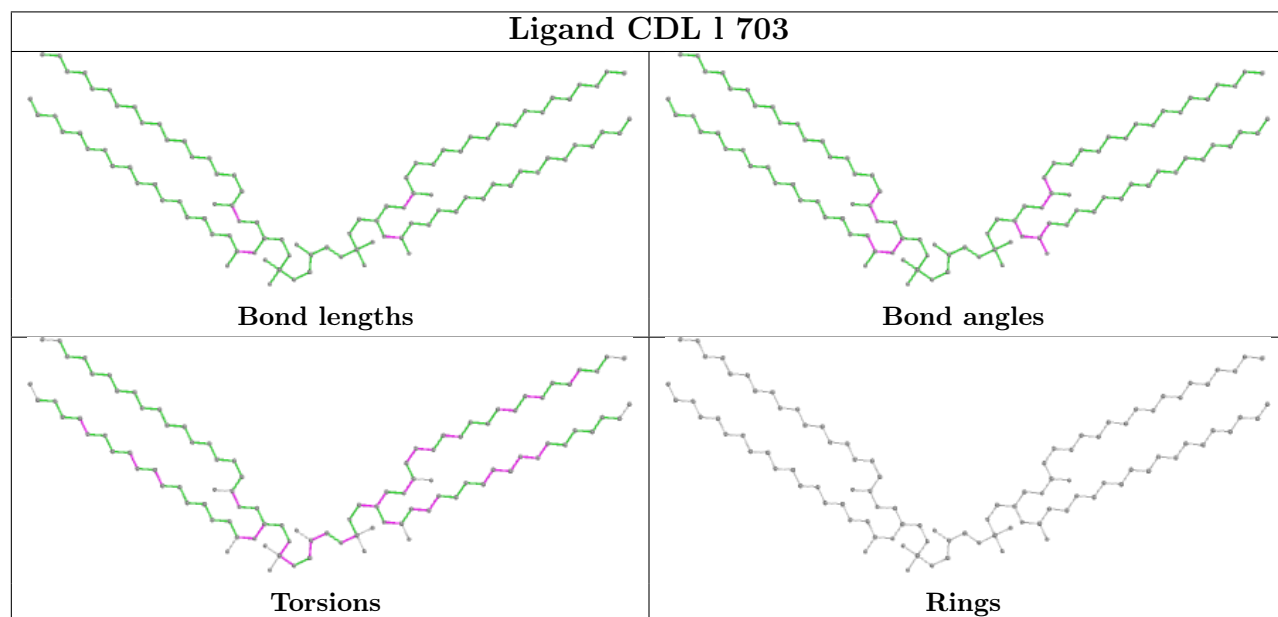
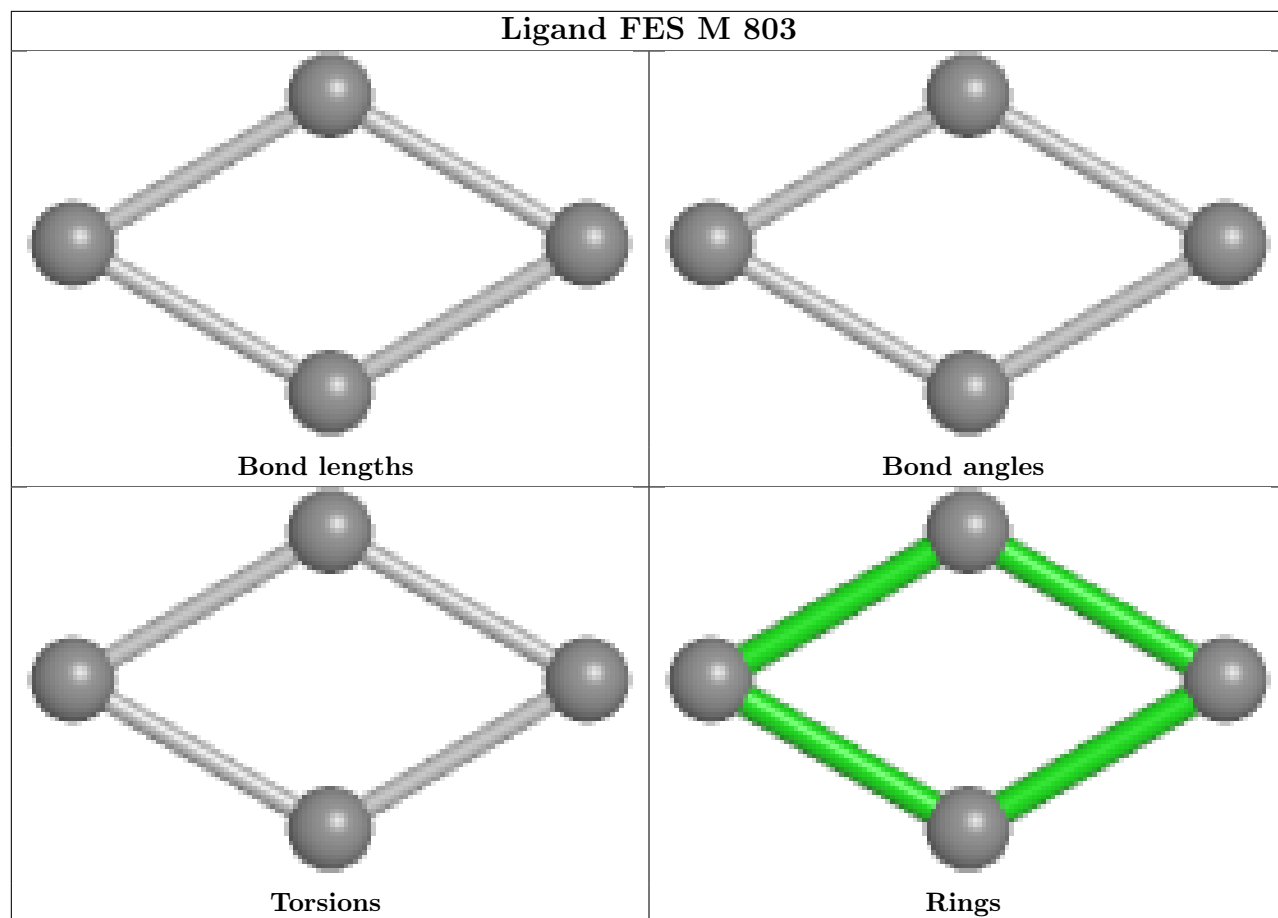
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

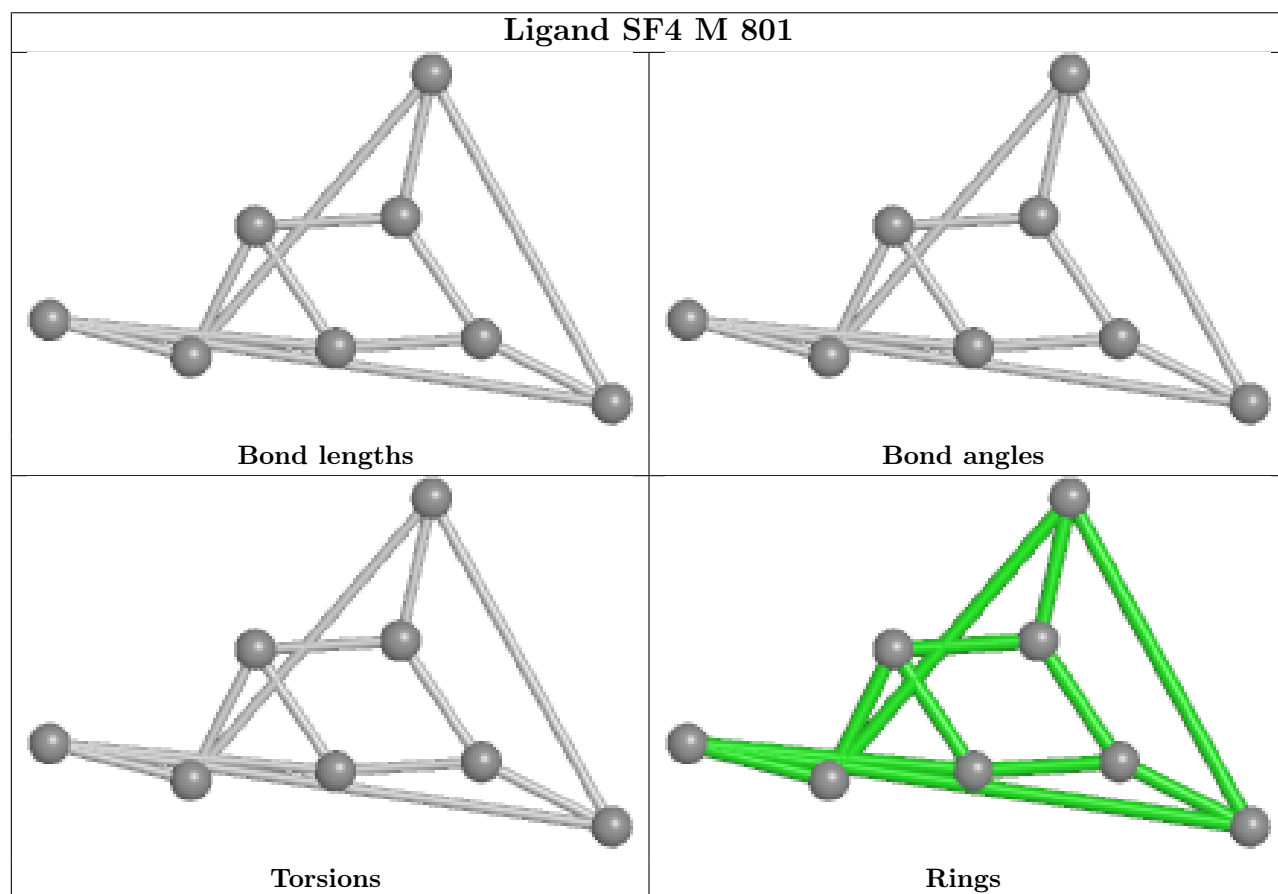
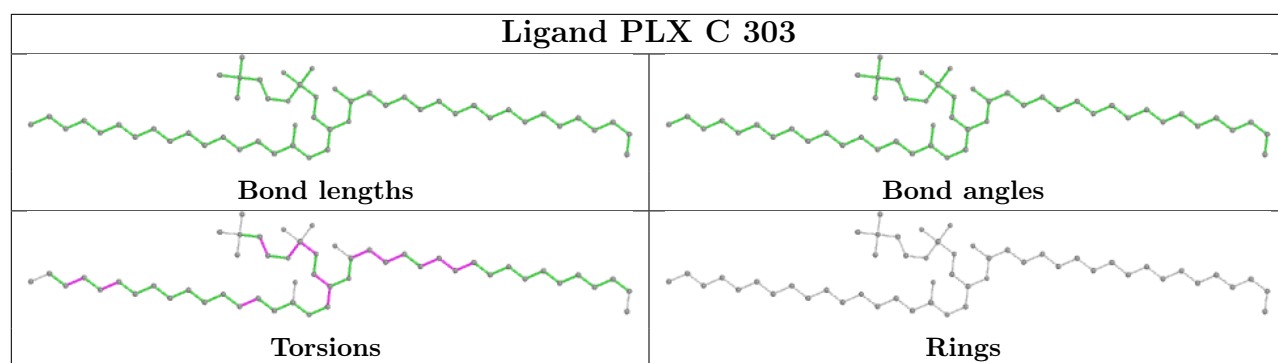




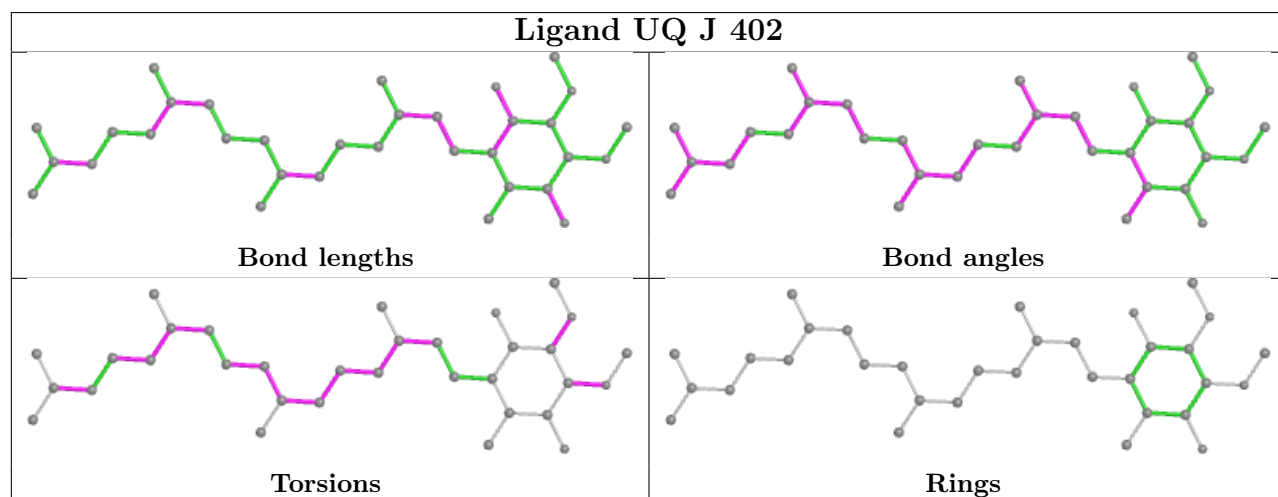
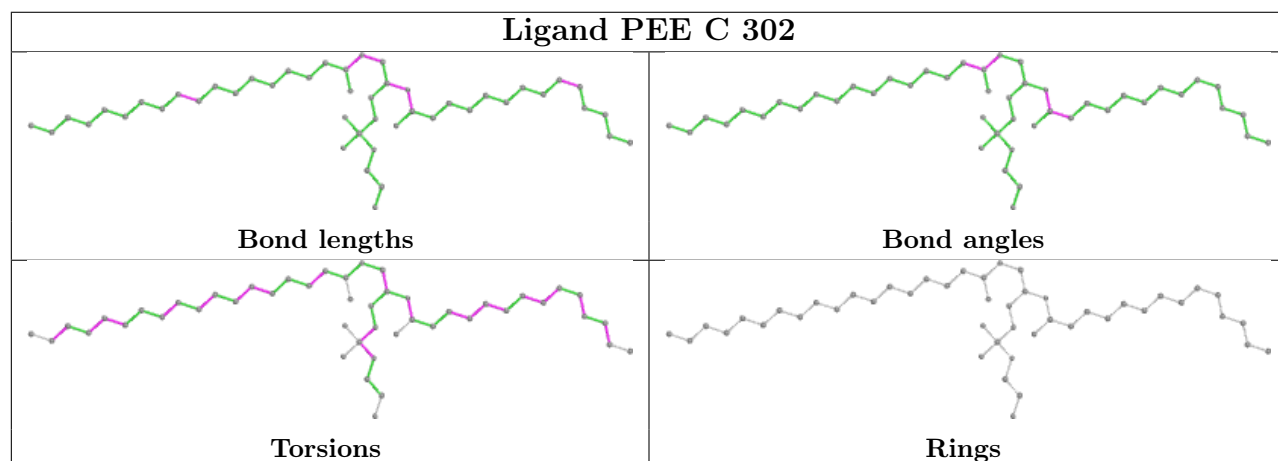
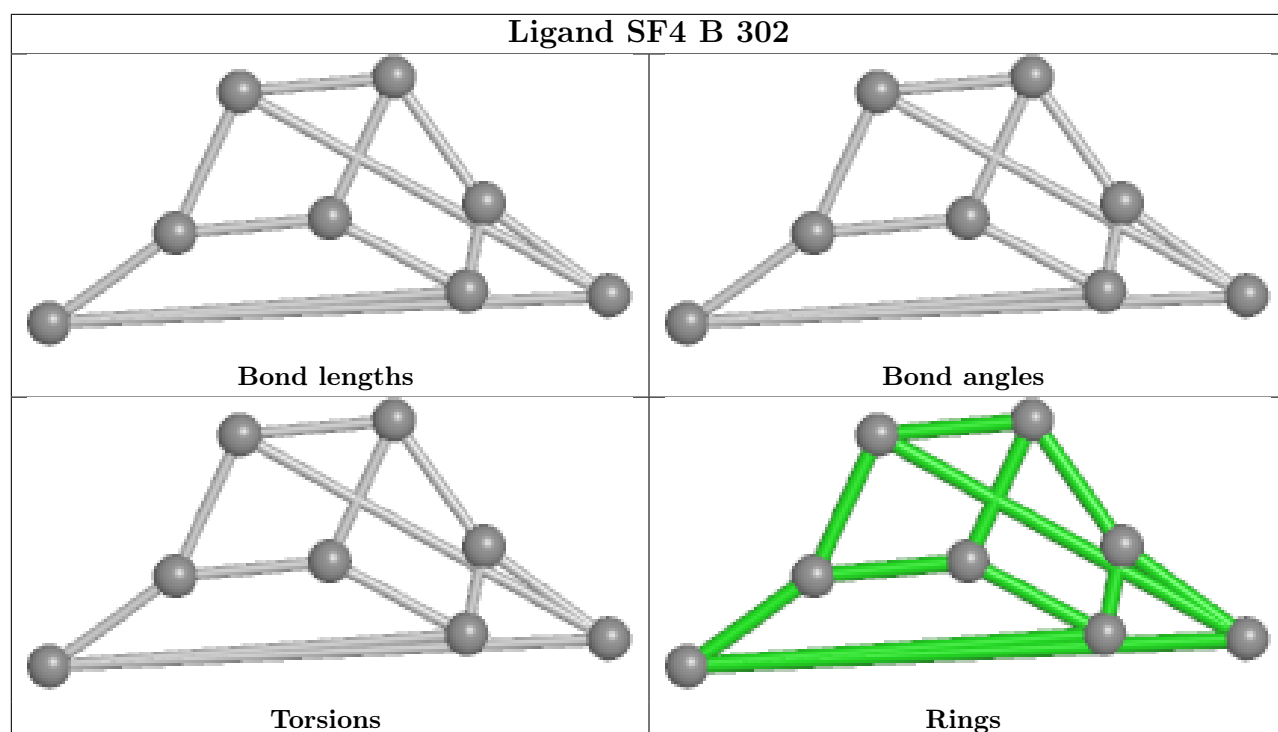


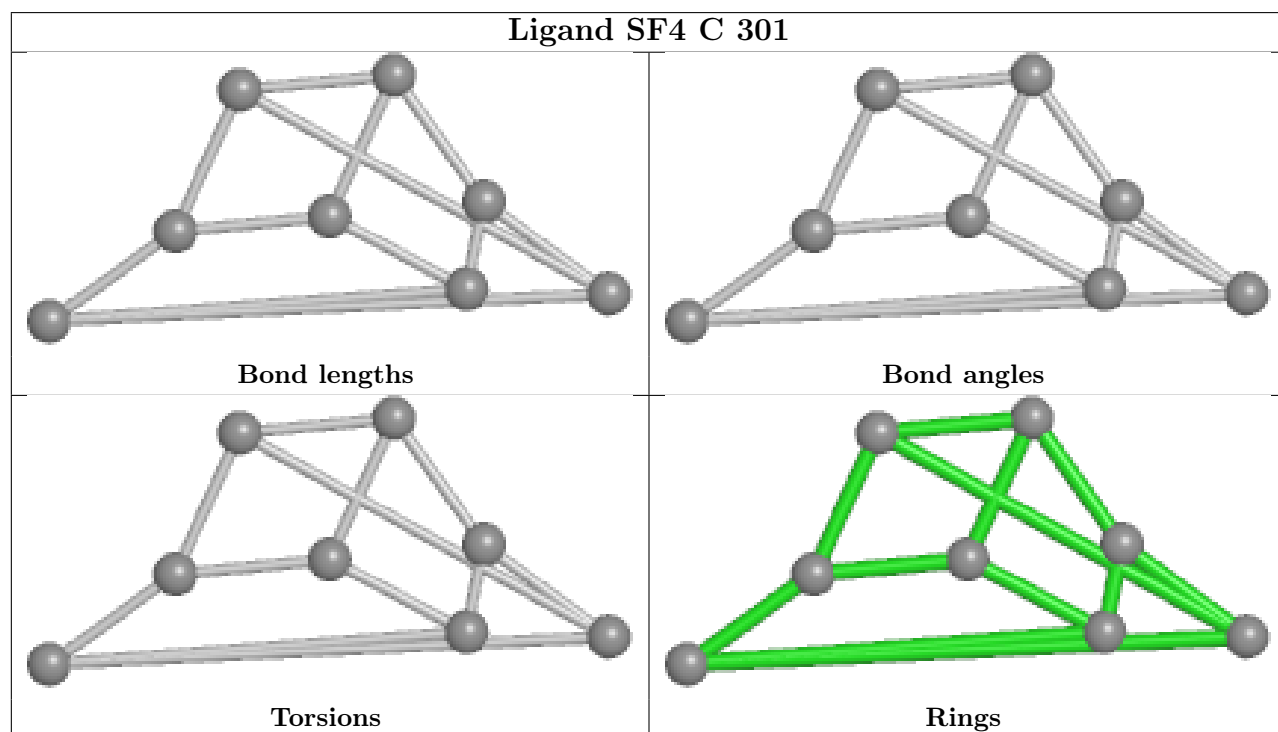
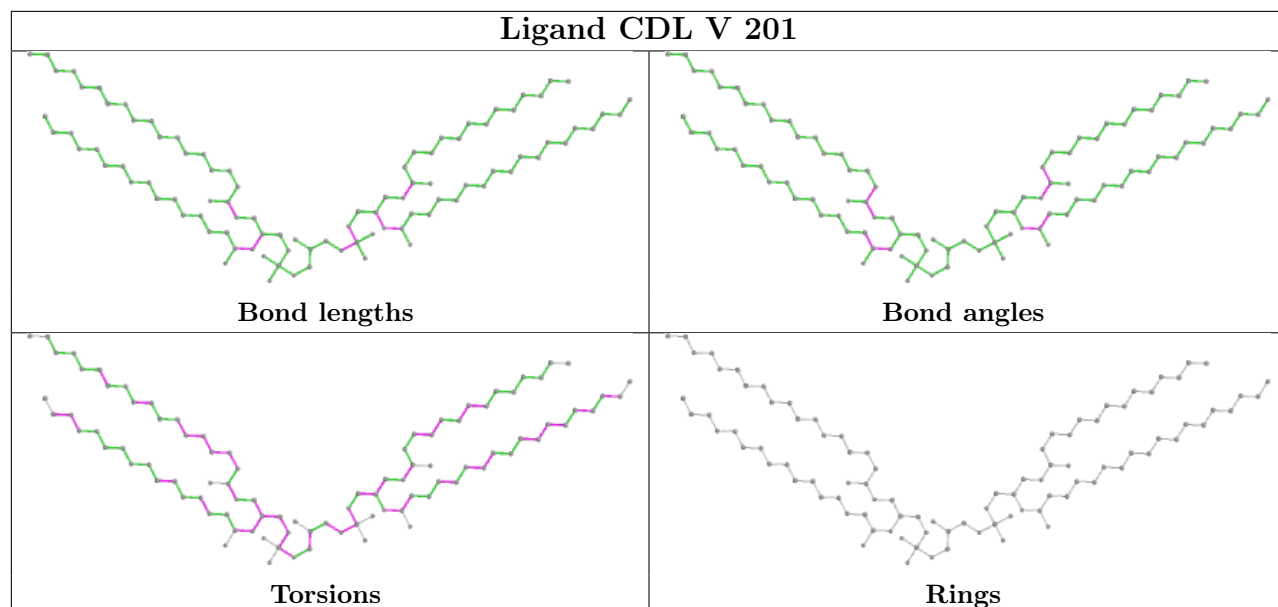


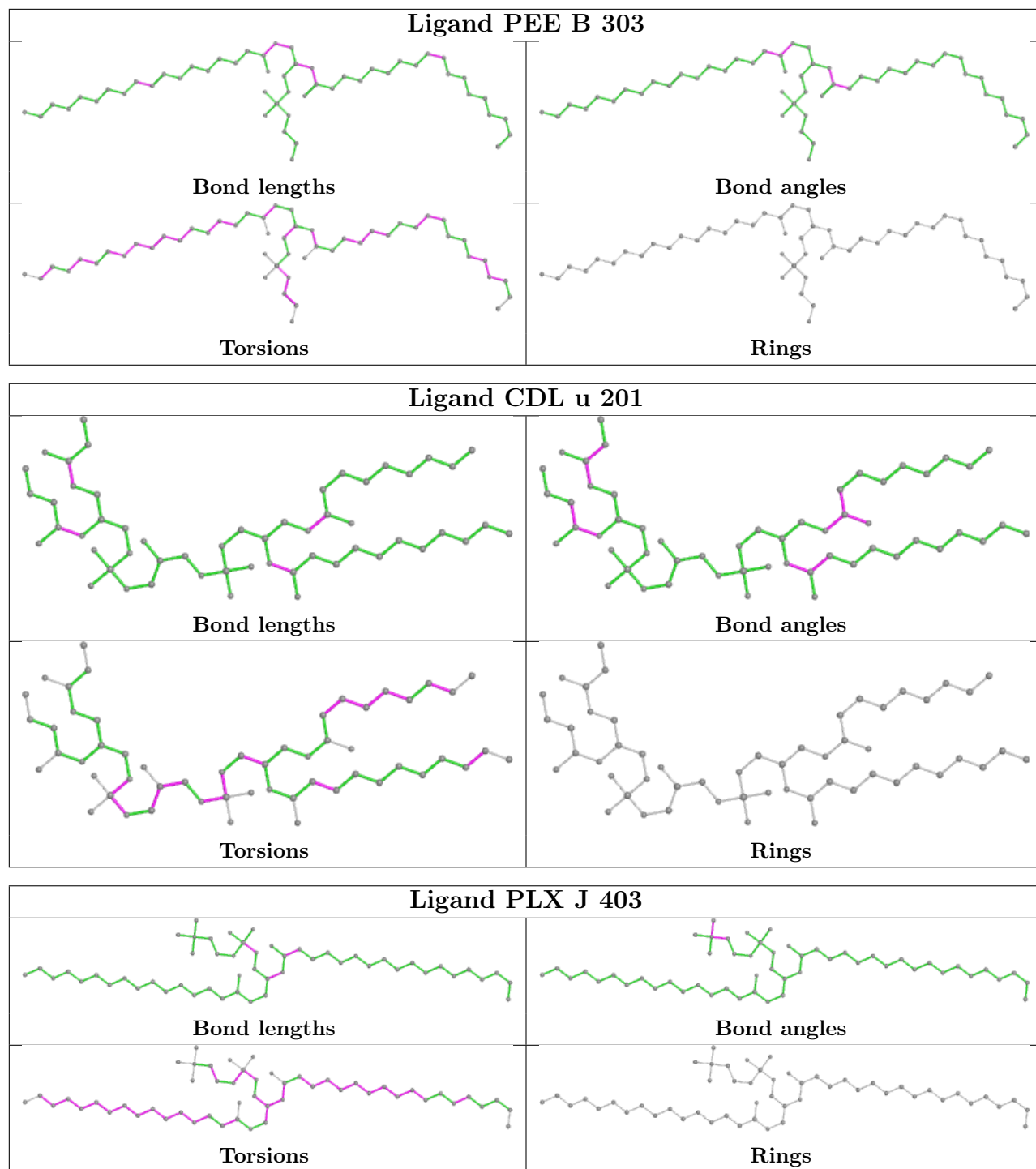


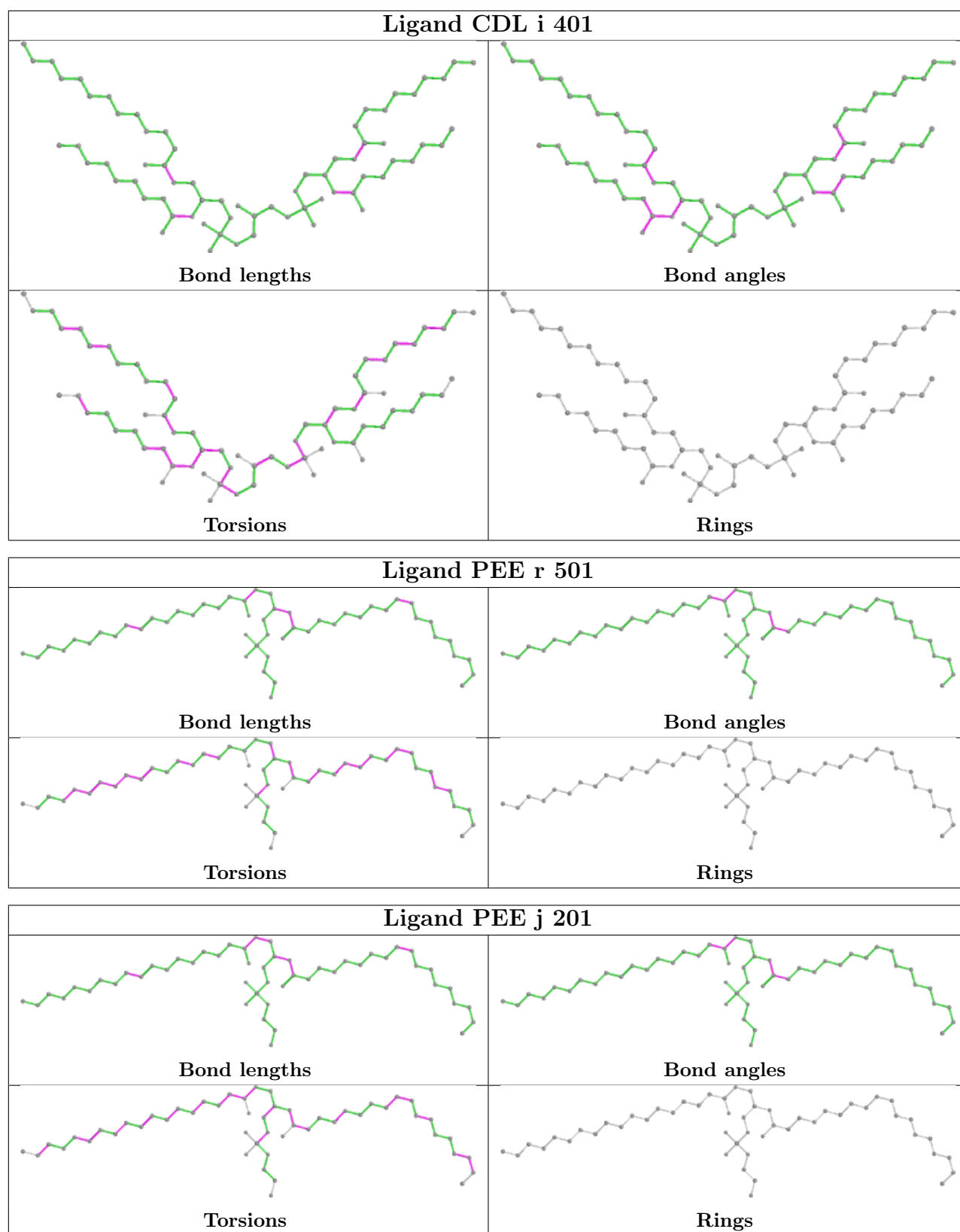


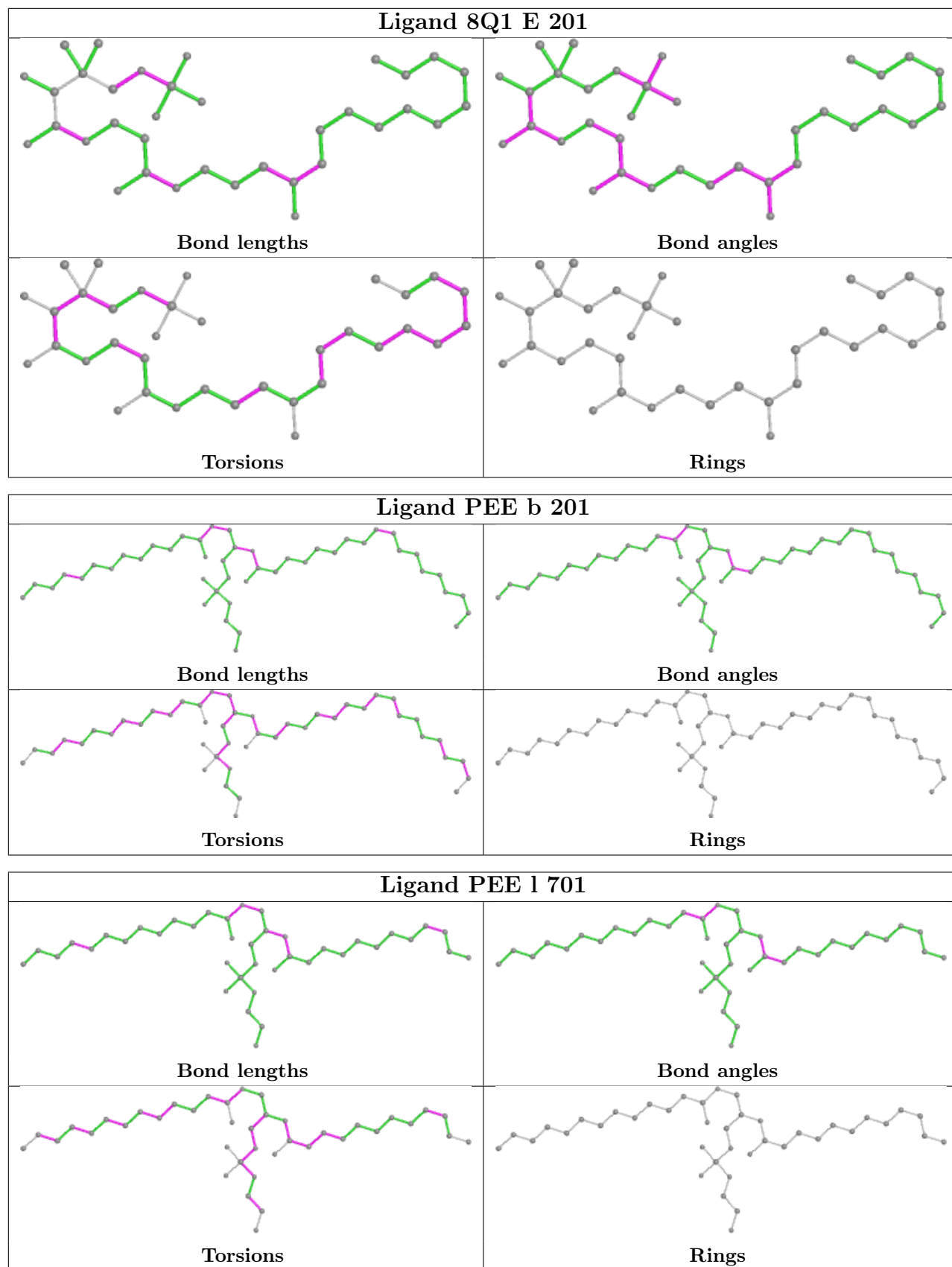


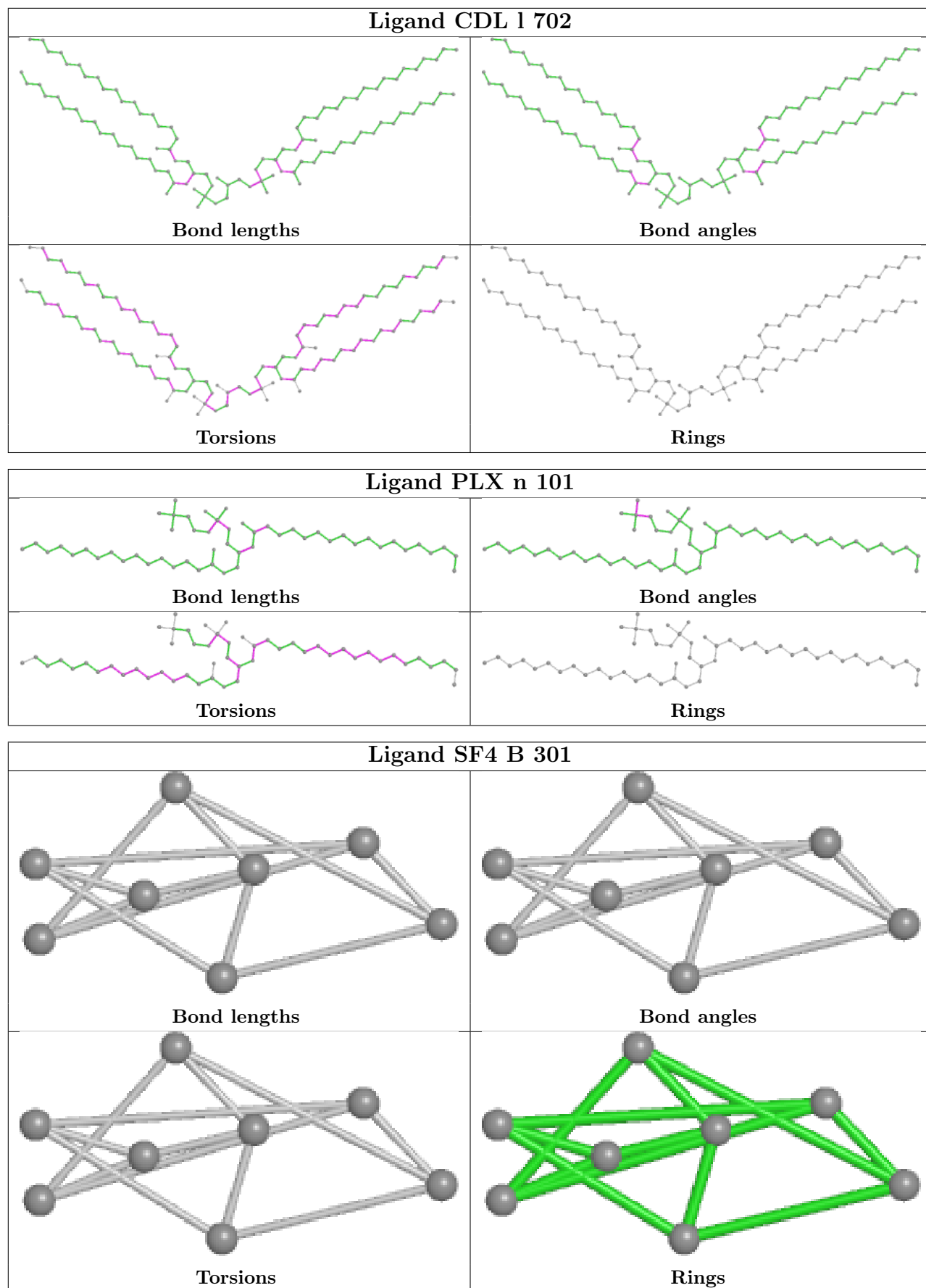


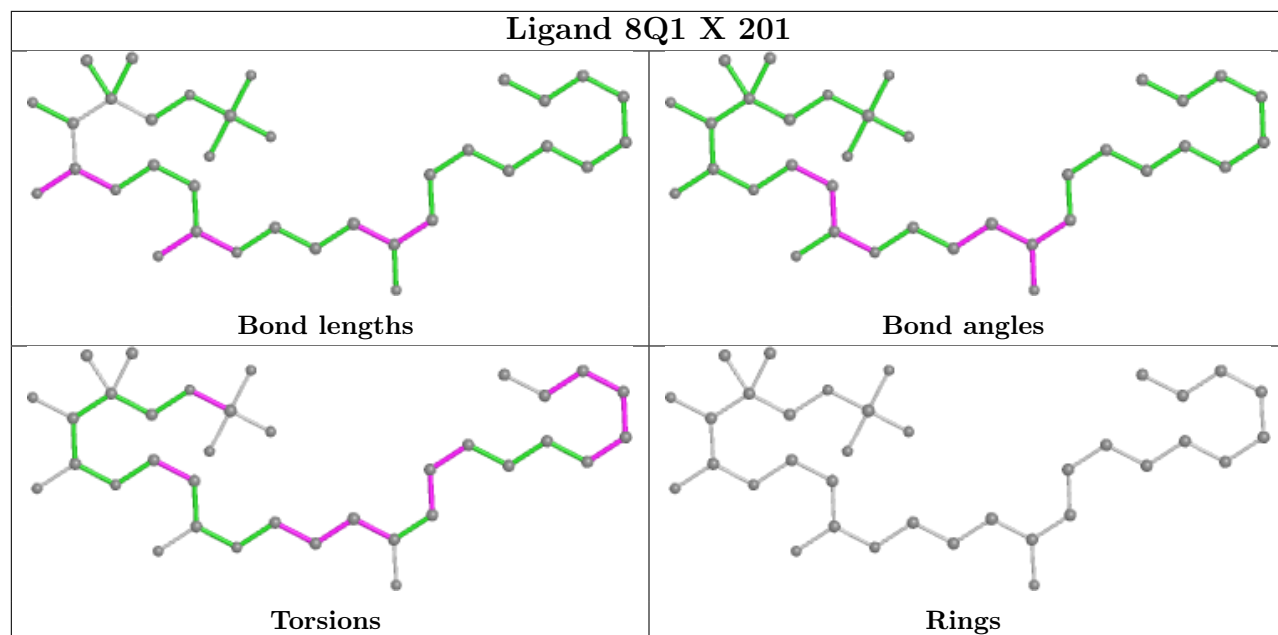
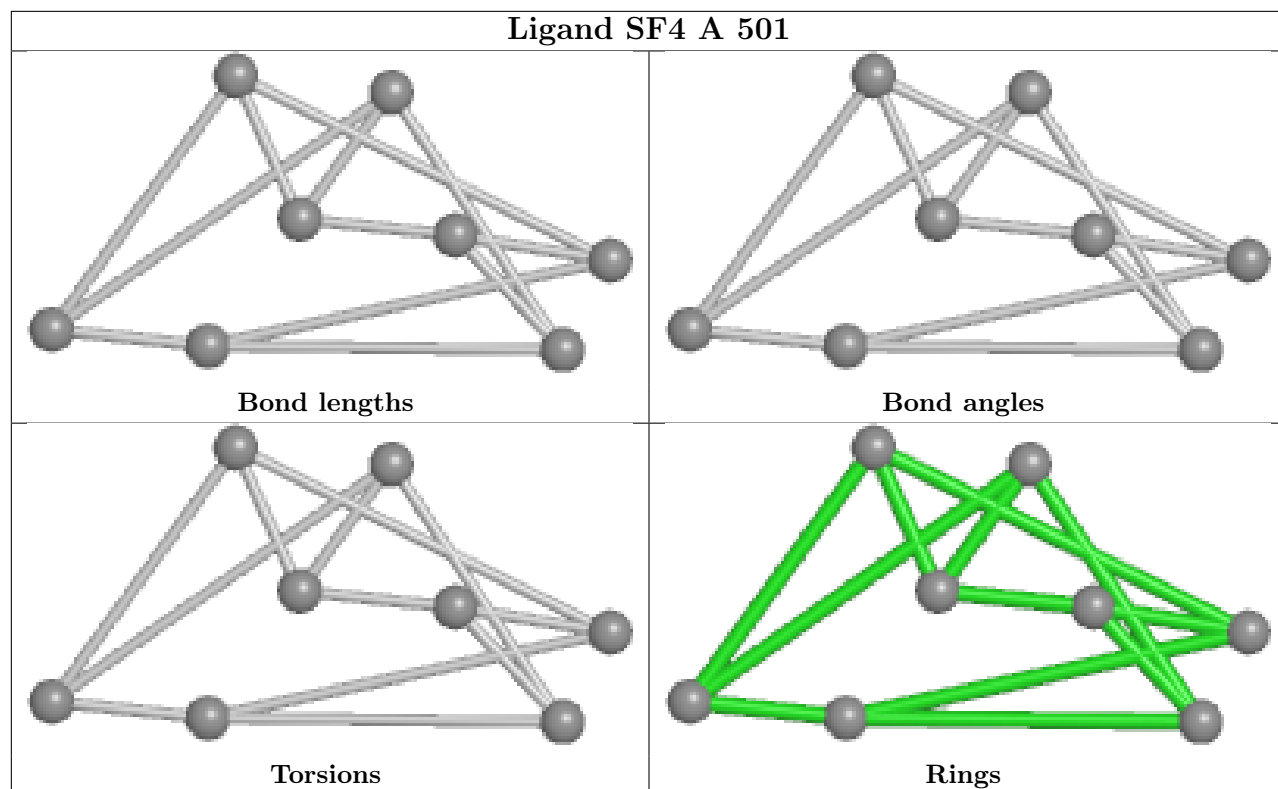


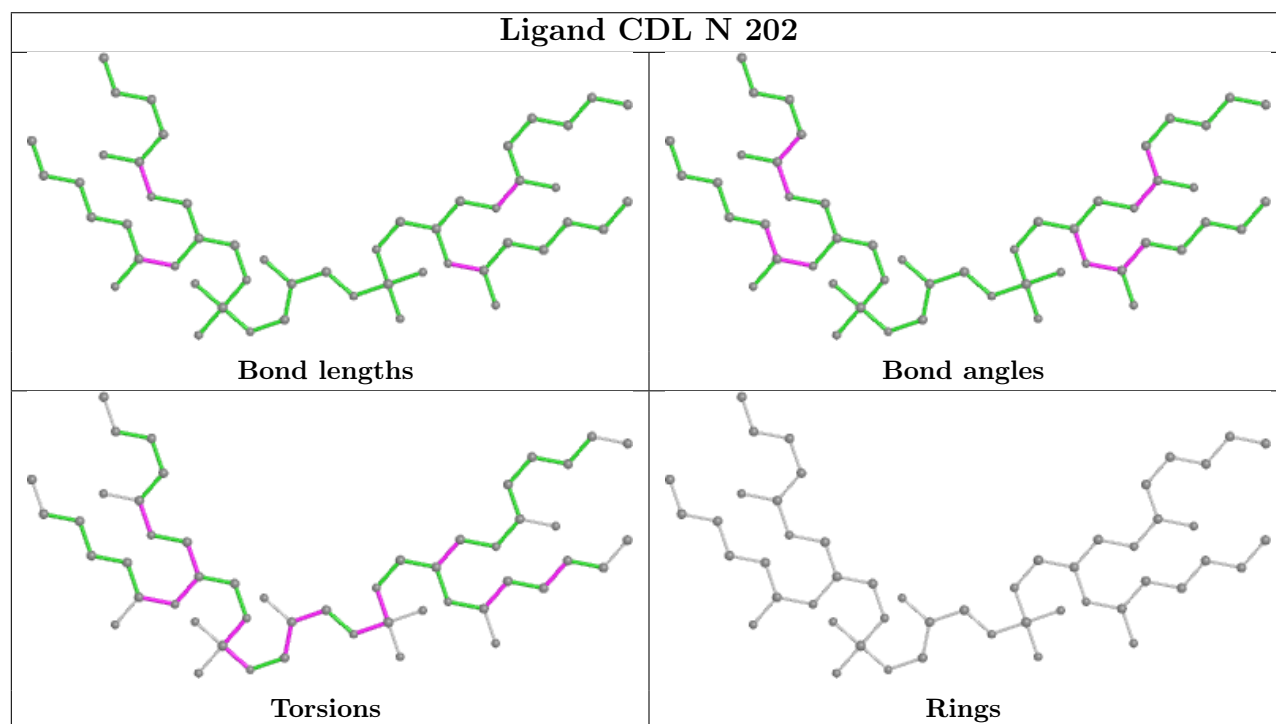
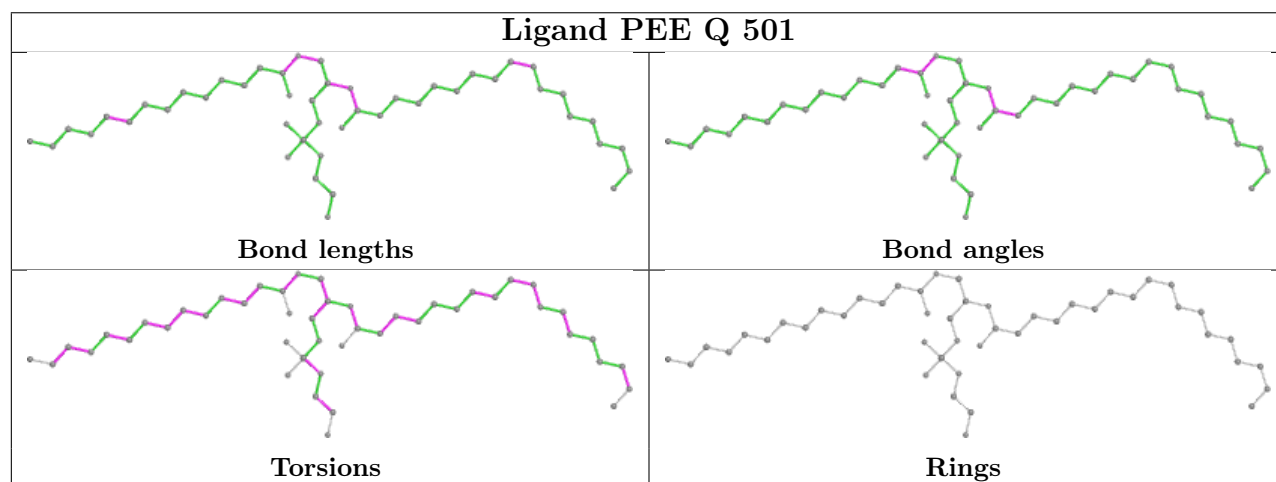
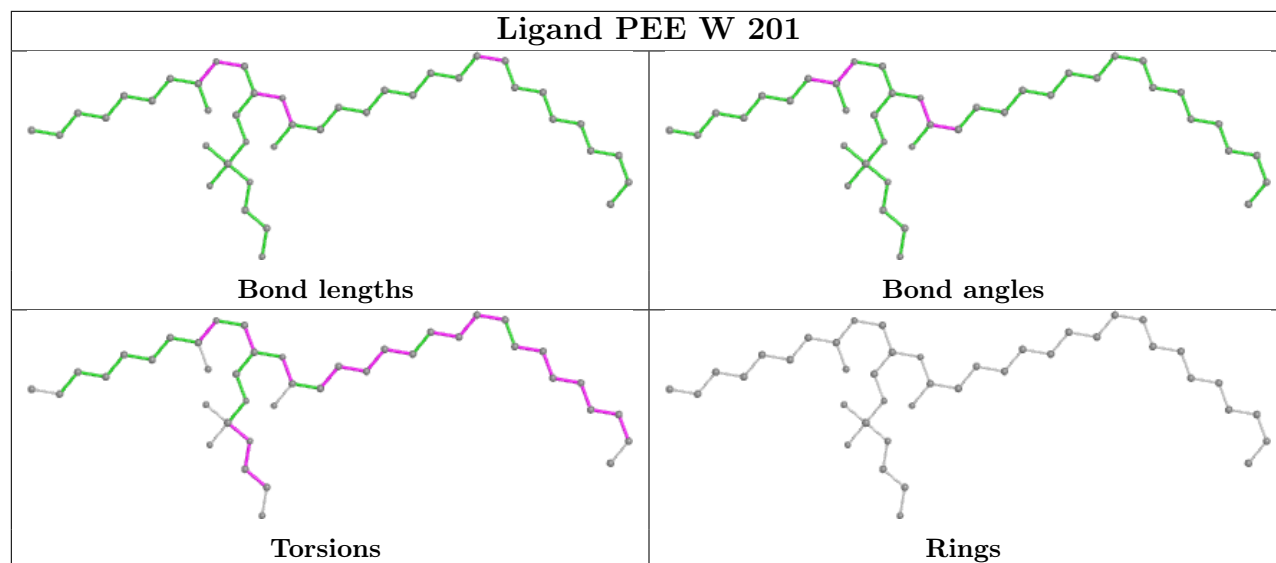




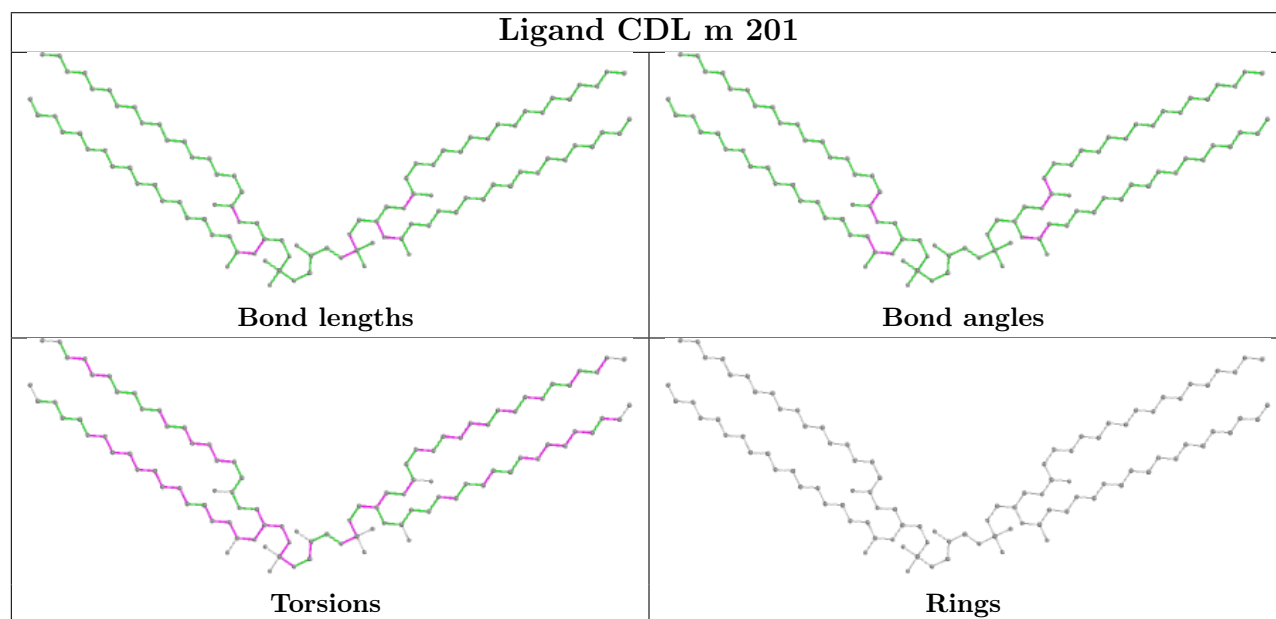
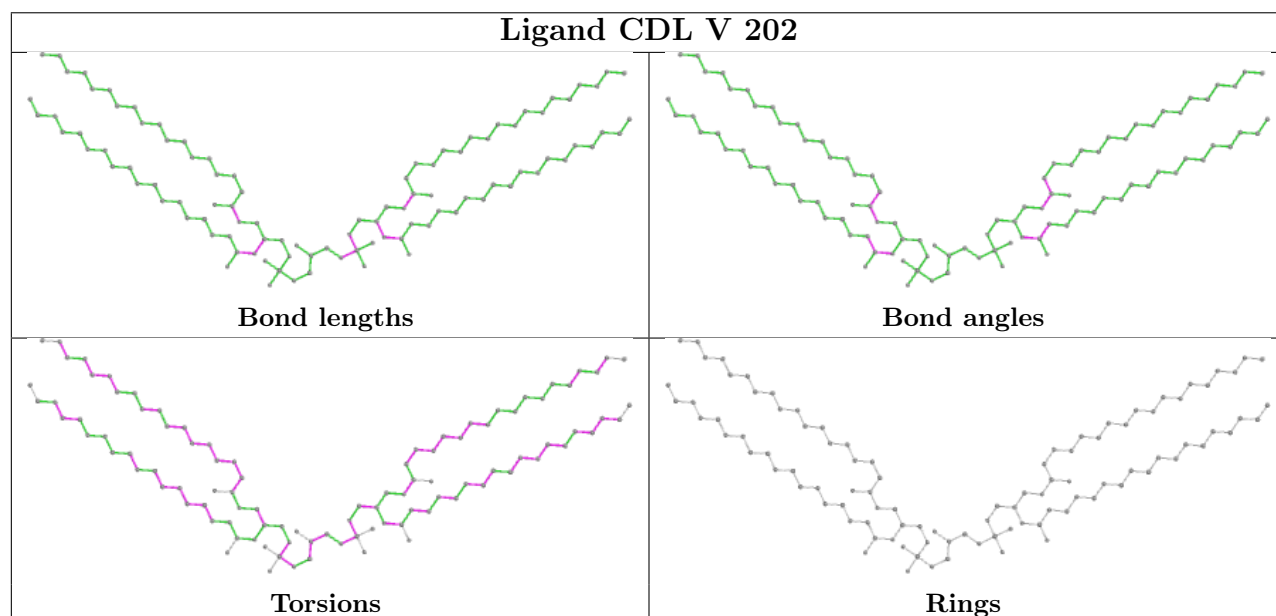
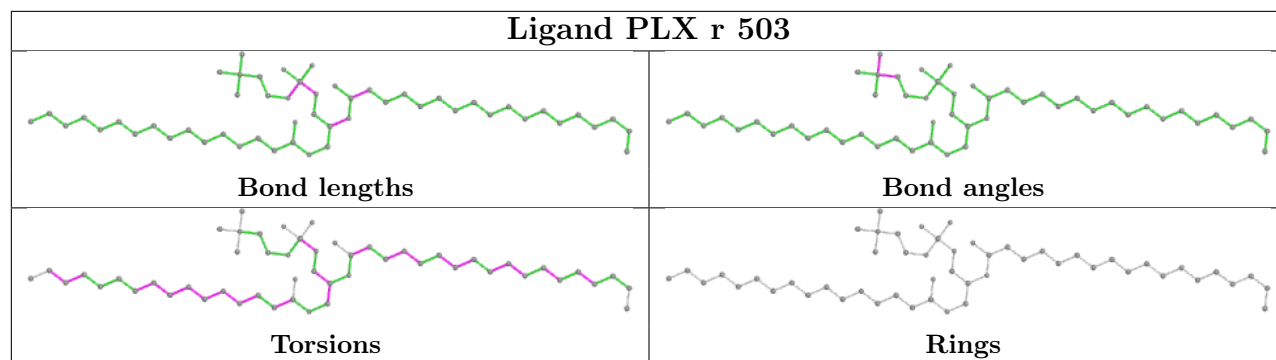


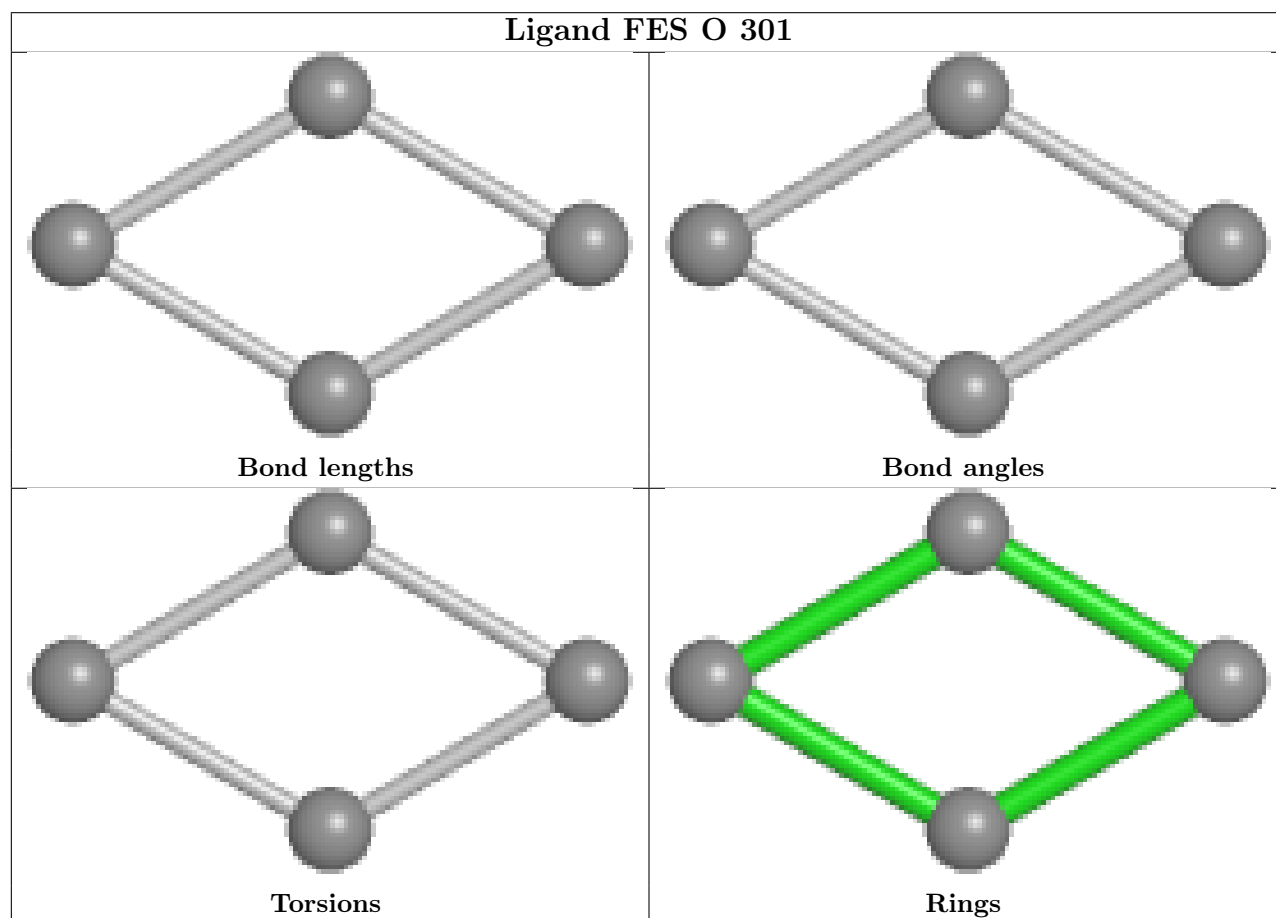
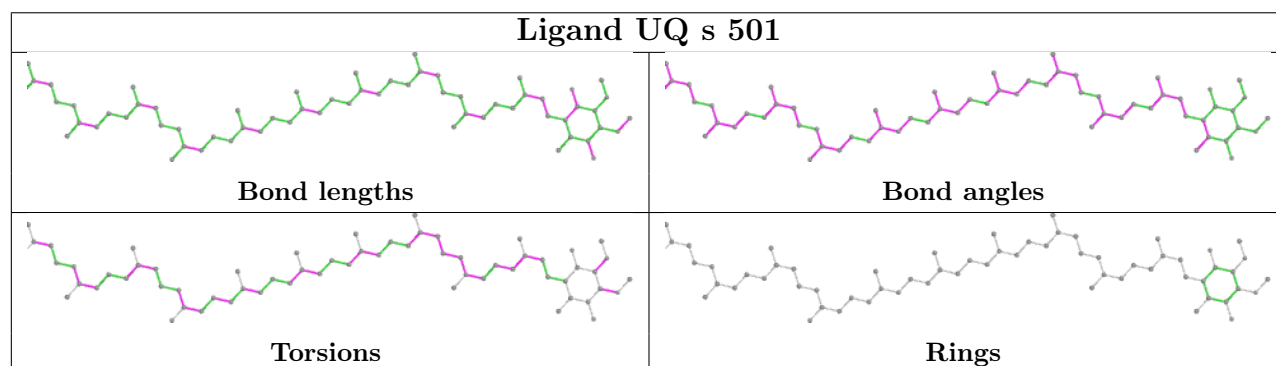
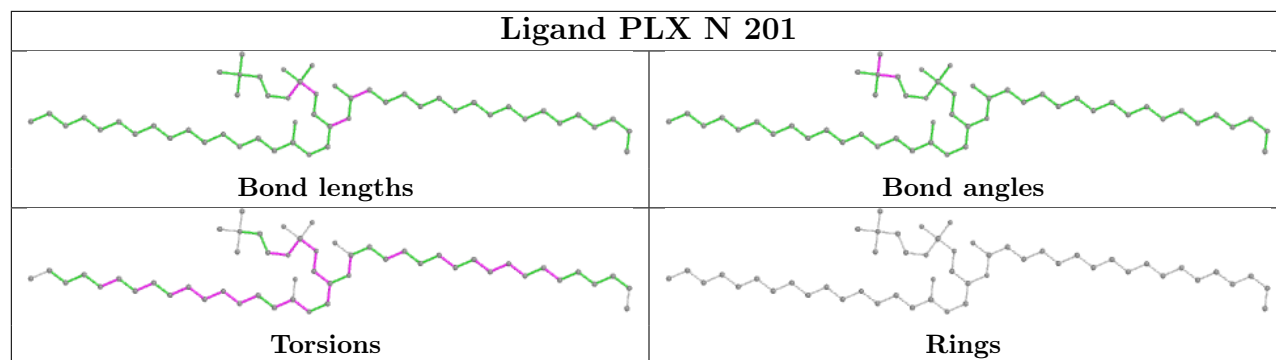


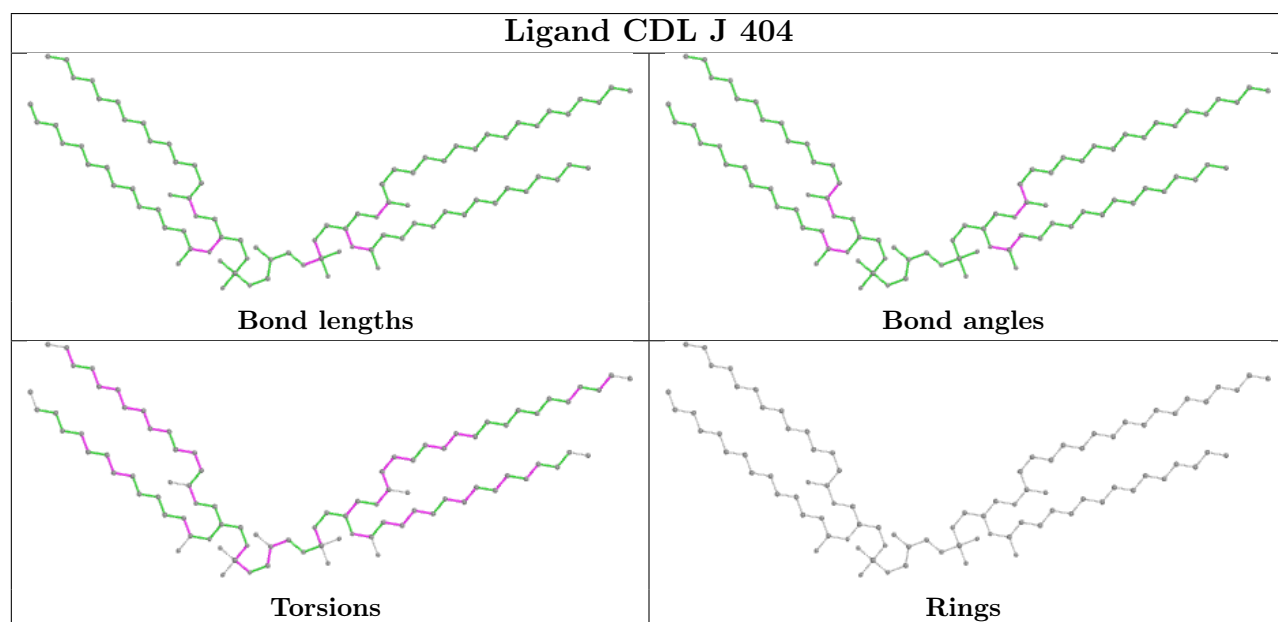
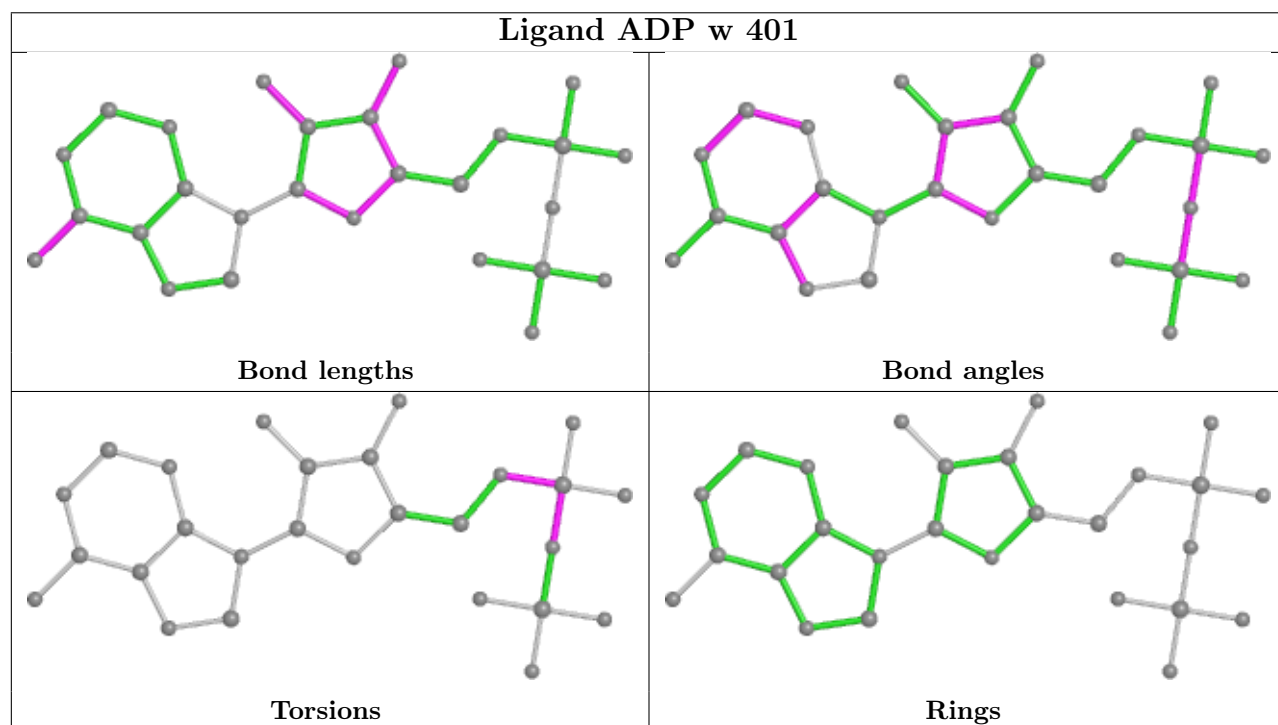
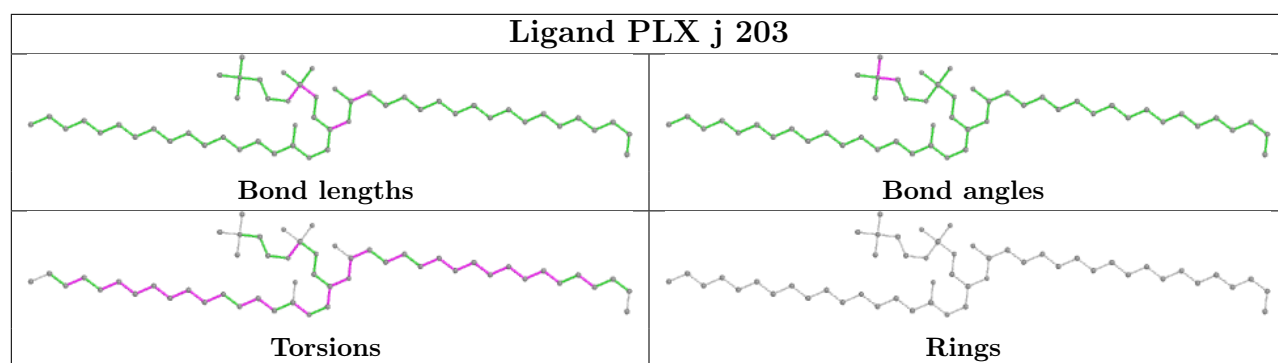


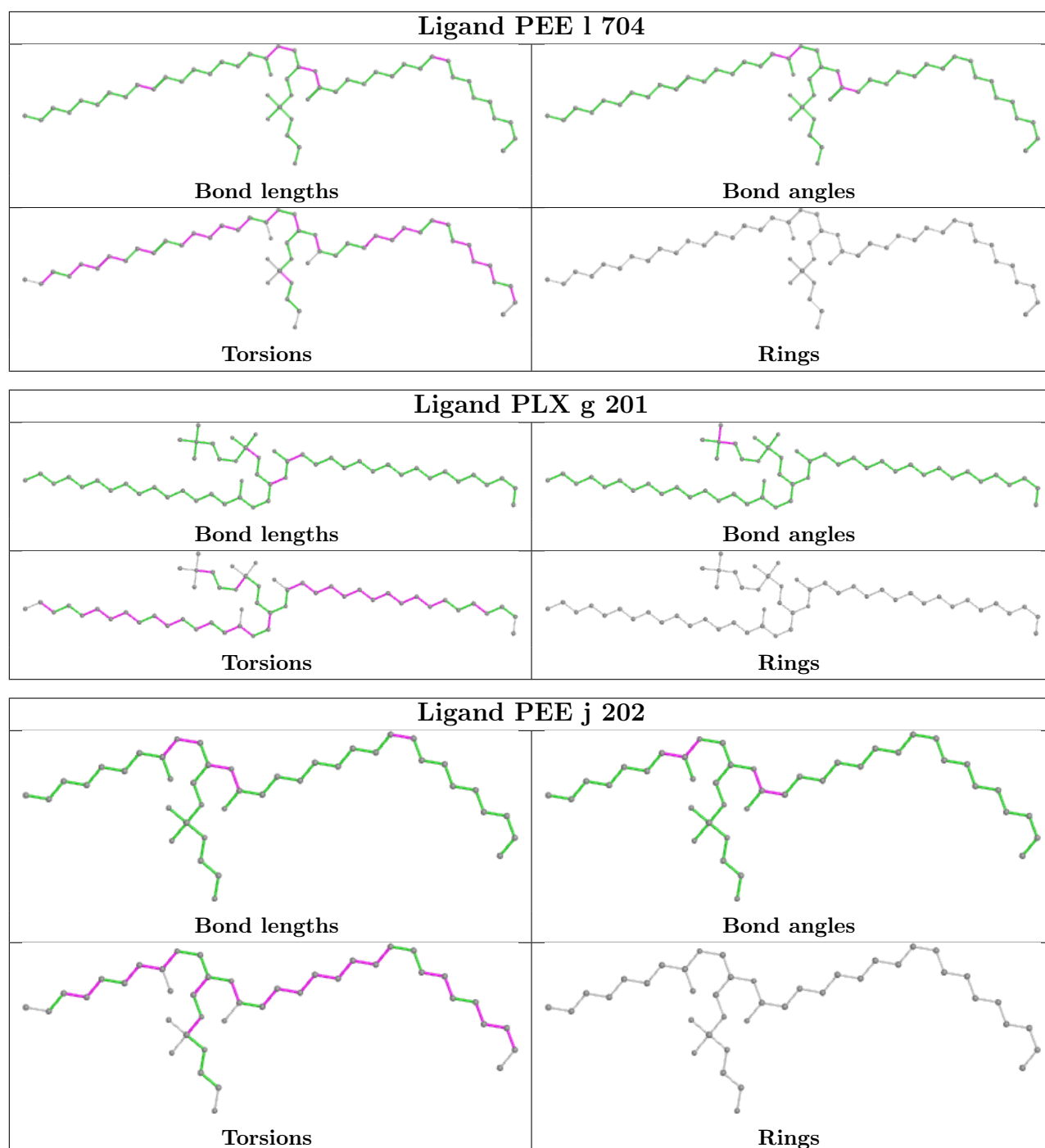












## 5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

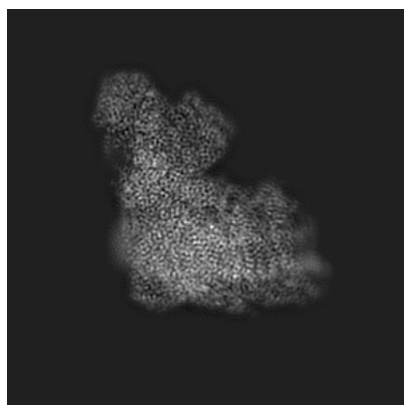
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-31640. These allow visual inspection of the internal detail of the map and identification of artifacts.

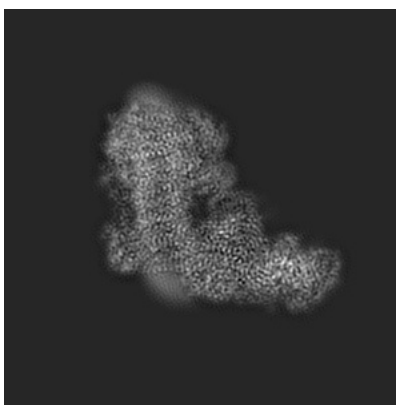
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

### 6.1 Orthogonal projections [i](#)

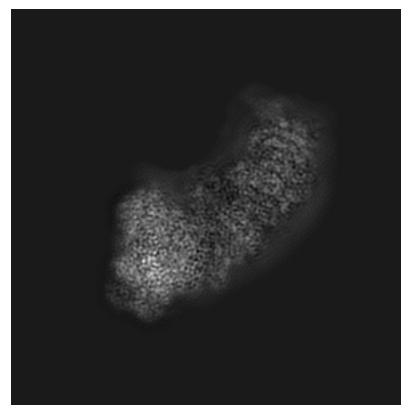
#### 6.1.1 Primary map



X



Y

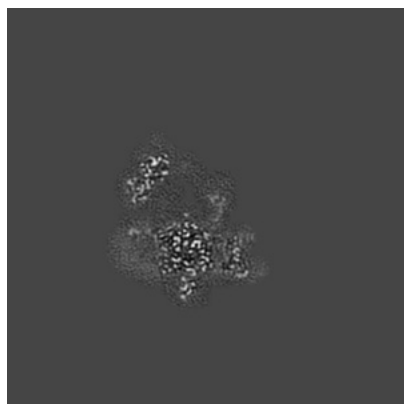


Z

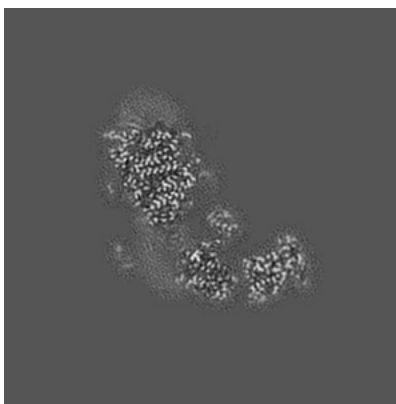
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

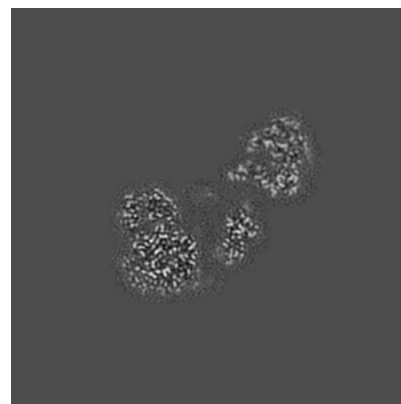
#### 6.2.1 Primary map



X Index: 165



Y Index: 165

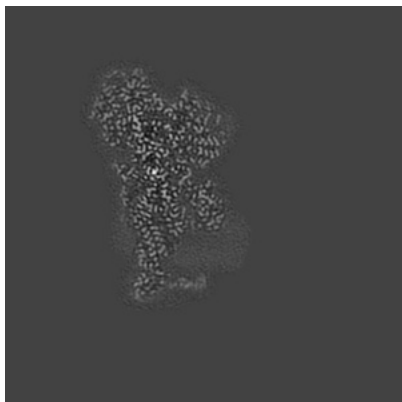


Z Index: 165

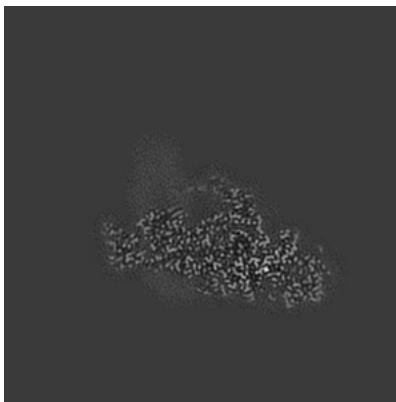
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

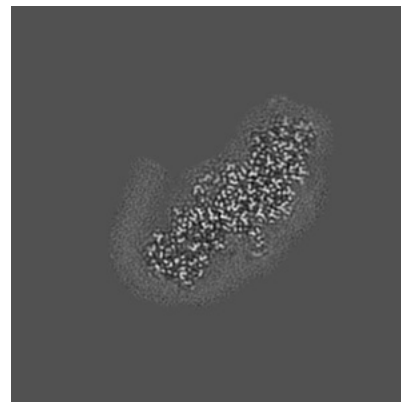
### 6.3.1 Primary map



X Index: 116



Y Index: 118



Z Index: 136

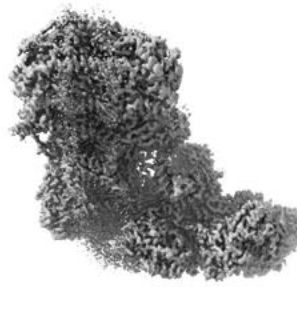
The images above show the largest variance slices of the map in three orthogonal directions.

## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.018. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

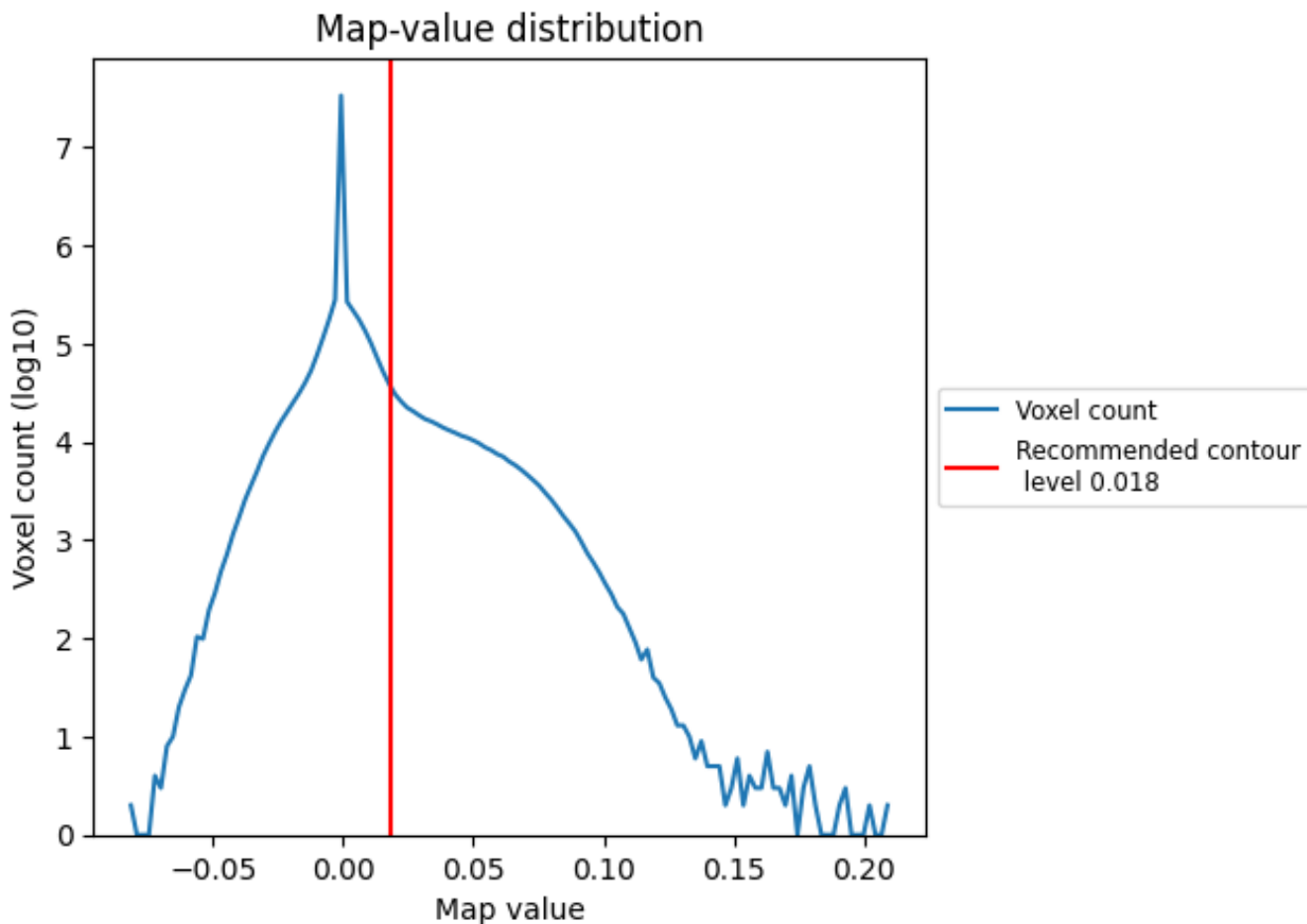
## 6.5 Mask visualisation

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.

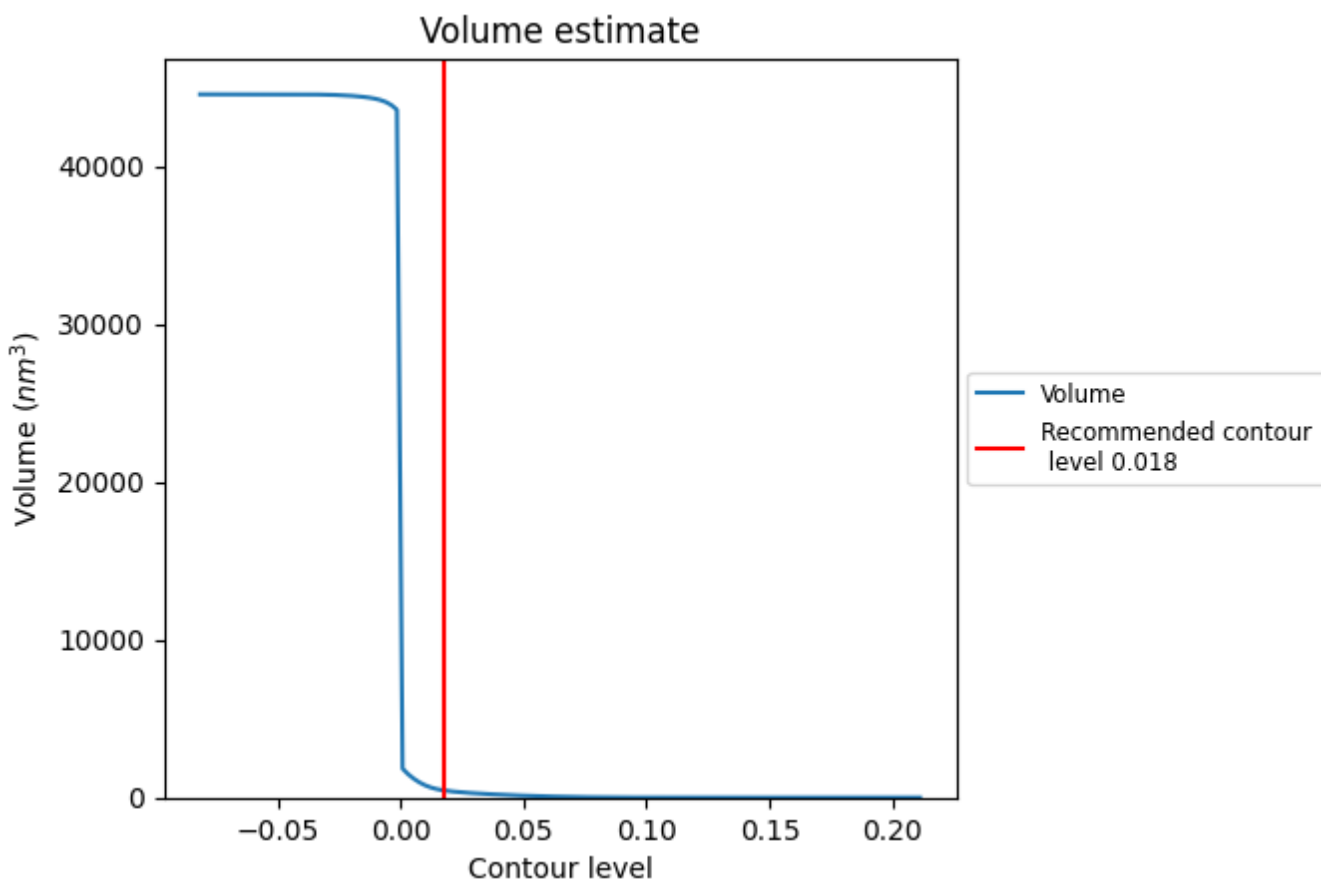
### 7.1 Map-value distribution [i](#)



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.



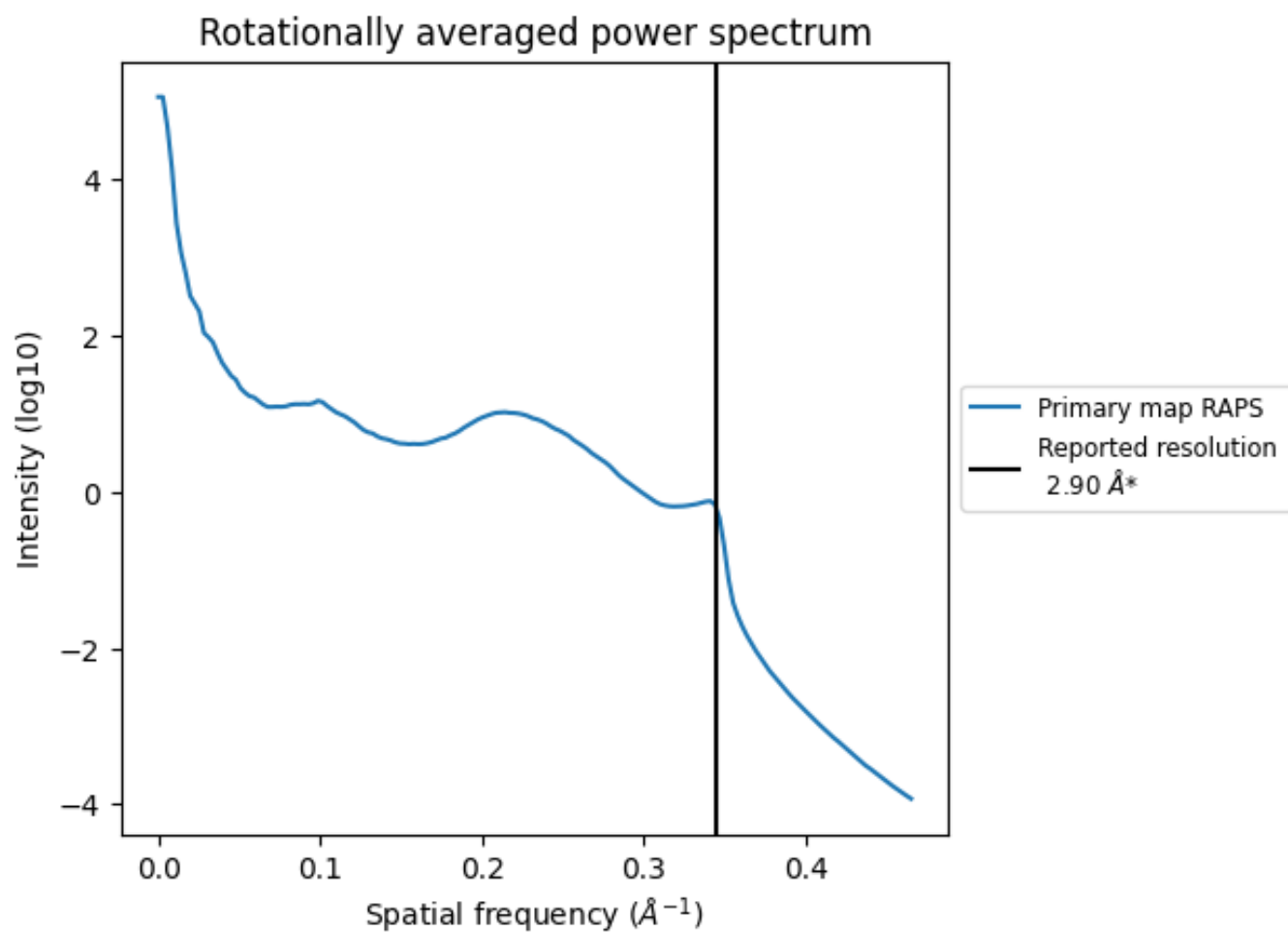
## 7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 447  $\text{nm}^3$ ; this corresponds to an approximate mass of 404 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 [i](#)



\*Reported resolution corresponds to spatial frequency of 0.345 Å<sup>-1</sup>

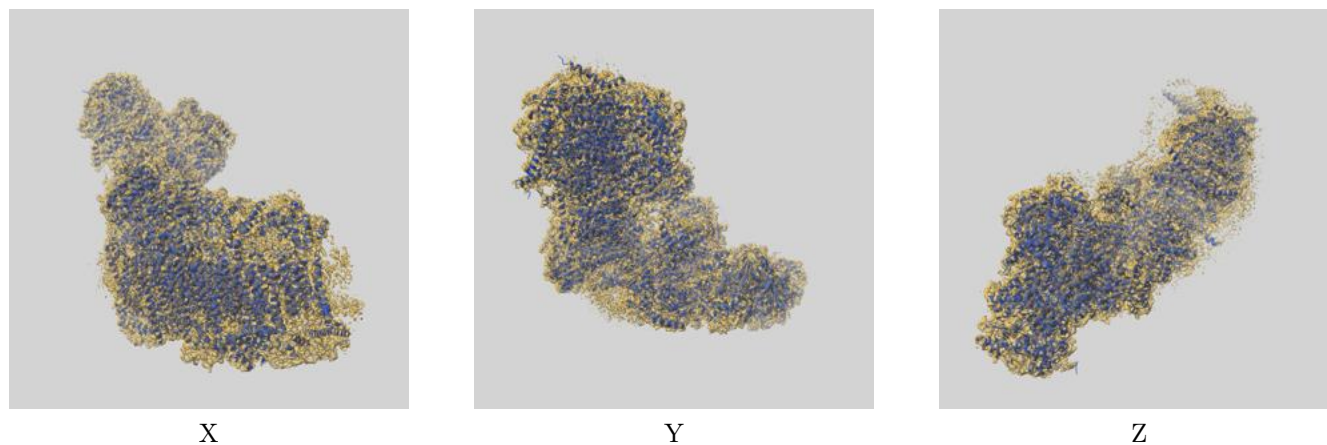
## 8 Fourier-Shell correlation

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

## 9 Map-model fit [i](#)

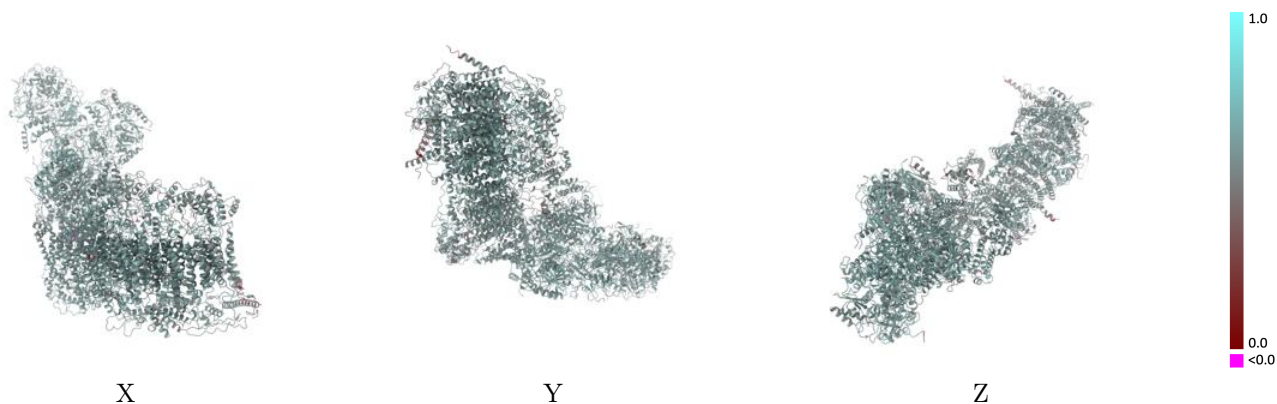
This section contains information regarding the fit between EMDB map EMD-31640 and PDB model 7V2C. Per-residue inclusion information can be found in section 3 on page 20.

### 9.1 Map-model overlay [i](#)



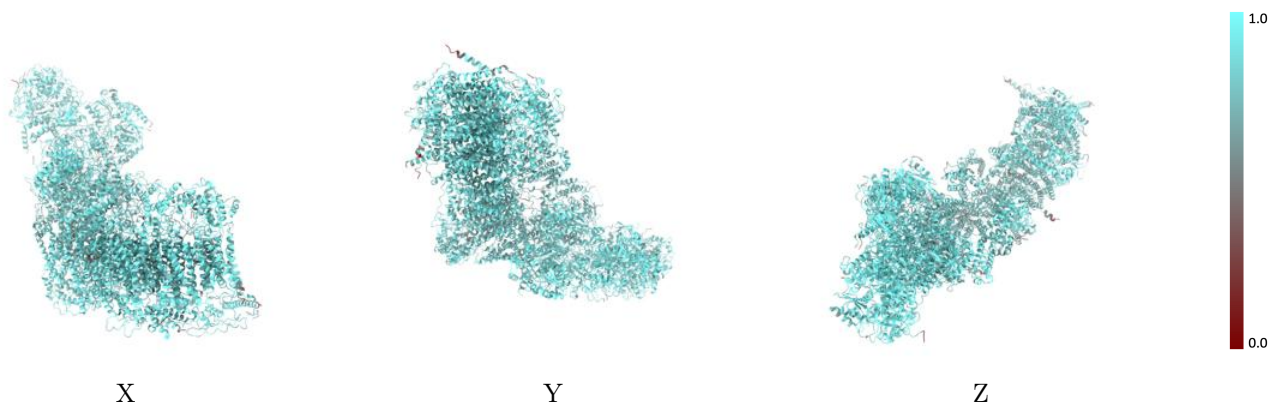
The images above show the 3D surface view of the map at the recommended contour level 0.018 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



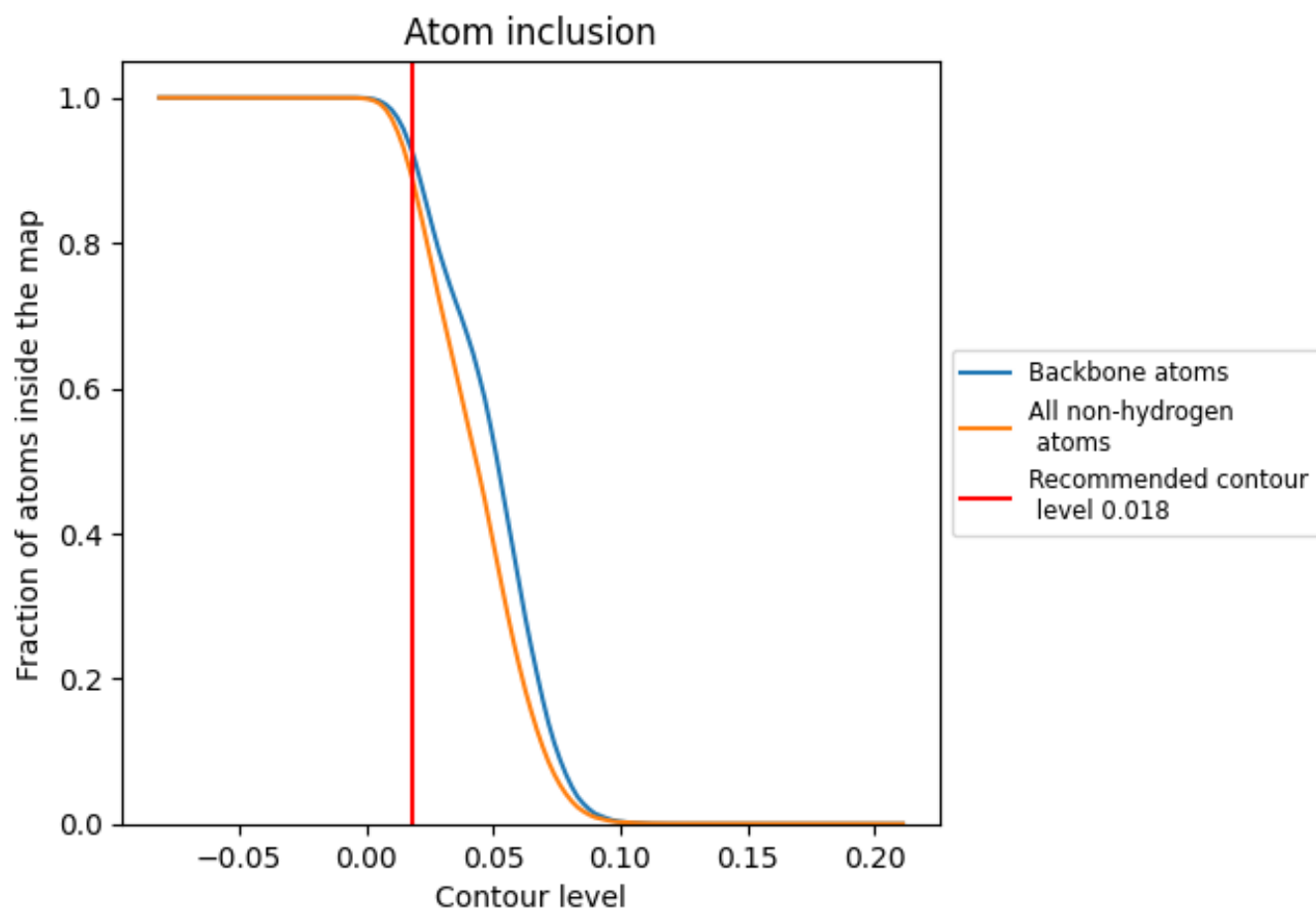
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.018).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 89% 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 (0.018) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8903	 0.5780
A	 0.9132	 0.5780
B	 0.9528	 0.6110
C	 0.9441	 0.6120
E	 0.8936	 0.5840
F	 0.8578	 0.5310
G	 0.7427	 0.4670
H	 0.8983	 0.5710
I	 0.8294	 0.5600
J	 0.9065	 0.5930
K	 0.8873	 0.5600
L	 0.9034	 0.5970
M	 0.9220	 0.5900
N	 0.8241	 0.5740
O	 0.8945	 0.5680
P	 0.9450	 0.6160
Q	 0.9387	 0.6080
S	 0.9312	 0.5880
T	 0.8947	 0.5910
U	 0.8998	 0.5730
V	 0.8050	 0.5580
W	 0.8964	 0.5690
X	 0.8382	 0.5260
Y	 0.8401	 0.5310
Z	 0.7792	 0.5190
a	 0.8875	 0.5860
b	 0.8476	 0.5440
c	 0.8726	 0.5660
d	 0.8481	 0.5480
e	 0.8322	 0.5510
f	 0.7838	 0.5260
g	 0.8952	 0.5820
h	 0.8759	 0.5600
i	 0.9212	 0.5940
j	 0.8770	 0.5950



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Chain	Atom inclusion	Q-score
k	 0.9164	 0.5940
l	 0.8797	 0.5790
m	 0.8401	 0.5590
n	 0.7868	 0.5380
o	 0.8678	 0.5650
p	 0.8835	 0.5660
r	 0.9049	 0.5940
s	 0.9187	 0.5960
u	 0.9015	 0.5790
v	 0.8338	 0.5210
w	 0.8766	 0.5640