



## wwPDB EM Validation Summary Report ⓘ

Feb 27, 2023 – 05:18 pm GMT

PDB ID : 7QSD  
EMDB ID : EMD-14127  
Title : Bovine complex I in the active state at 3.1 Å  
Authors : Bridges, H.R.; Blaza, J.N.; Yin, Z.; Chung, I.; Hirst, J.  
Deposited on : 2022-01-13  
Resolution : 3.10 Å (reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

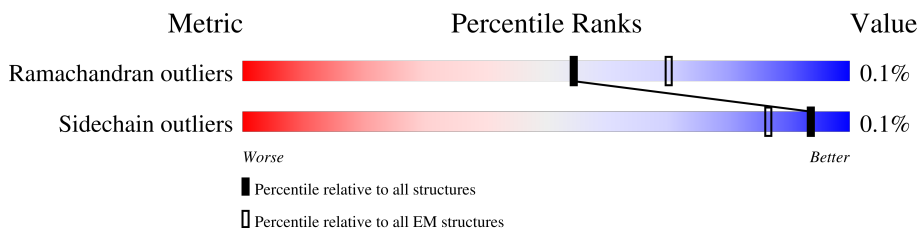
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.32.1

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.10 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
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	115	8% 99% .
2	B	216	71% 28%
3	C	266	. 78% 22%
4	D	463	. 93% 7%
5	E	249	6% 86% 14%
6	F	464	. 93% 7%
7	G	727	. 95% 5%
8	H	318	. 100%
9	I	212	. 83% 17%

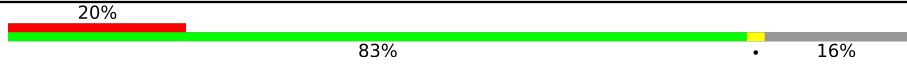

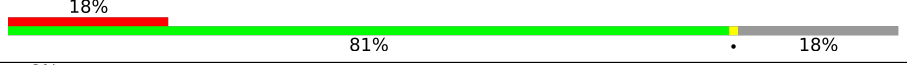

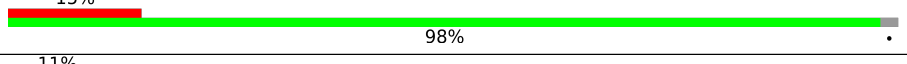
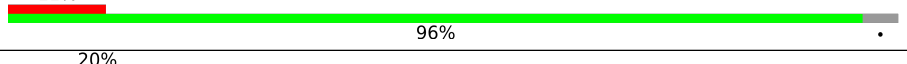
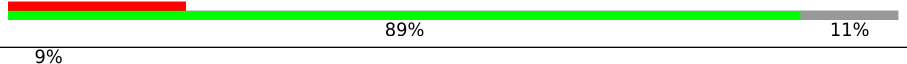
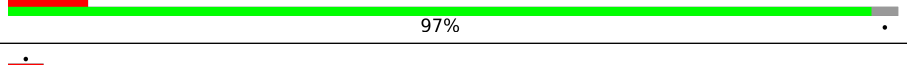
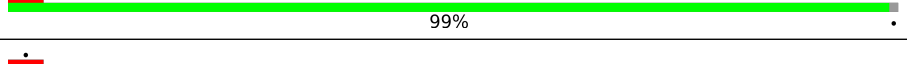

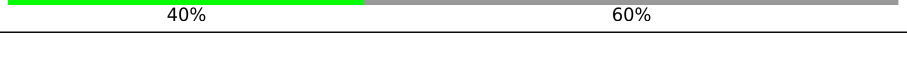
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Mol	Chain	Length	Quality of chain
10	J	175	9% 99%
11	K	98	100%
12	L	606	7% 99%
13	M	459	100%
14	N	347	100%
15	O	343	6% 93% 7%
16	P	380	90% 10%
17	Q	175	5% 71% 29%
18	R	124	6% 77% 23%
19	S	99	8% 85% 15%
20	T	156	18% 48% 51%
20	U	156	6% 54% 45%
21	V	116	9% 97%
22	W	128	9% 89% 11%
23	X	172	6% 99%
24	Y	141	11% 99%
25	Z	144	6% 98%
26	a	70	6% 99%
27	b	84	10% 99%
28	c	76	7% 63% 37%
29	d	120	12% 99%
30	e	106	5% 92% 8%
31	f	57	19% 88% 12%
32	g	154	7% 64% 36%
33	h	189	73% 27%

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Mol	Chain	Length	Quality of chain
34	i	127	
35	j	108	
36	k	98	
37	l	186	
38	m	129	
39	n	179	
40	o	137	
41	p	176	
42	q	145	
43	r	113	
44	s	109	

## 2 Entry composition [i](#)

There are 56 unique types of molecules in this entry. The entry contains 67258 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-ubiquinone oxidoreductase chain 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	115	921	622	133	159	7	0	0

- Molecule 2 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	155	1241	792	224	211	14	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	207	1721	1111	296	311	3	0	0

- Molecule 4 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	430	3459	2209	596	629	25	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	129	ARG	GLN	variant	UNP P17694

- Molecule 5 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	213	1655	1057	277	311	10	0	0

- Molecule 6 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	F	431	3319	2091	593	615	20	0	0

- Molecule 7 is a protein called NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	G	688	5279	3307	920	1013	39	0	0

- Molecule 8 is a protein called NADH-ubiquinone oxidoreductase chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	H	318	2509	1681	385	420	23	0	0

- Molecule 9 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	I	176	1414	889	243	270	12	0	0

- Molecule 10 is a protein called NADH-ubiquinone oxidoreductase chain 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	J	174	1337	902	189	234	12	0	0

- Molecule 11 is a protein called NADH-ubiquinone oxidoreductase chain 4L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	K	98	745	486	112	131	16	0	0

- Molecule 12 is a protein called NADH-ubiquinone oxidoreductase chain 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	L	606	4802	3195	737	827	43	0	0

- Molecule 13 is a protein called NADH-ubiquinone oxidoreductase chain 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	M	459	3654	2436	570	609	39	0	0

- Molecule 14 is a protein called NADH-ubiquinone oxidoreductase chain 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	N	347	2733	1817	416	457	43	0	0

- Molecule 15 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	O	320	2589	1662	429	488	10	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
O	255	LYS	ASN	variant	UNP P34942

- Molecule 16 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	P	341	2747	1777	486	479	5	0	0

- Molecule 17 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	Q	125	1016	641	181	191	3	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
18	R	95	Total	C	N	O	S	0	0
			730	448	137	142	3		

- Molecule 19 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	S	84	Total	C	N	O	S	0	0
			677	425	126	124	2		

- Molecule 20 is a protein called Acyl carrier protein, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	T	76	Total	C	N	O	S	0	0
			612	393	90	124	5		
20	U	86	Total	C	N	O	S	0	0
			692	447	102	138	5		

- Molecule 21 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	V	113	Total	C	N	O	S	0	0
			919	595	155	166	3		

- Molecule 22 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	W	114	Total	C	N	O	S	0	0
			971	622	180	165	4		

- Molecule 23 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	X	171	Total	C	N	O	S	0	0
			1402	887	253	252	10		

- Molecule 24 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11.



Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	Y	140	1030	657	176	191	6	0	0

- Molecule 25 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	Z	141	1152	740	201	202	9	0	0

- Molecule 26 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	a	70	569	365	104	95	5	0	0

- Molecule 27 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	b	83	651	425	109	115	2	0	0

- Molecule 28 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
28	c	48	405	268	69	68	0	0

- Molecule 29 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	d	120	993	647	169	172	5	0	0

- Molecule 30 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	e	97	819	518	156	139	6	0	0

- Molecule 31 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	f	50	437	286	77	73	1	0	0

- Molecule 32 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	g	98	824	529	137	154	4	0	0

- Molecule 33 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	h	138	1154	759	196	197	2	0	0

- Molecule 34 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	i	107	920	605	158	156	1	0	0

- Molecule 35 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	j	64	556	367	90	98	1	0	0

- Molecule 36 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	k	80	644	421	108	113	2	0	0

- Molecule 37 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	l	155	1304	844	213	239	8	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	S		
38	m	127	1061	681	187	193		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	n	172	1492	955	273	257	7	0	0

- Molecule 40 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
40	o	122	1048	653	201	185	9	0	0

- Molecule 41 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	p	171	1443	904	266	265	8	0	0

- Molecule 42 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
42	q	144	1201	773	215	209	4	0	0

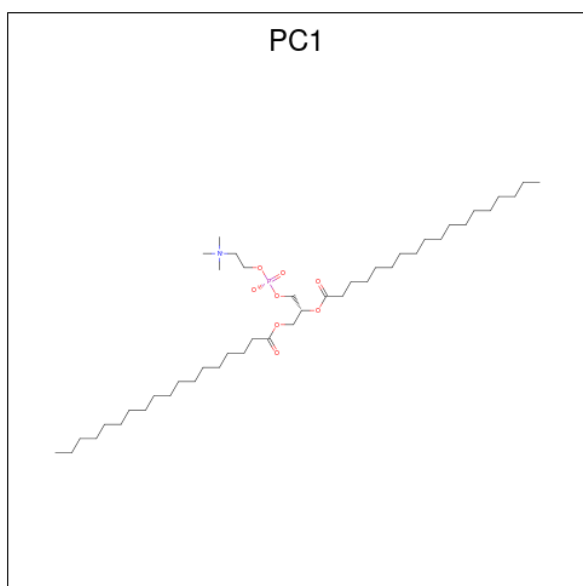
- Molecule 43 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
43	r	94	767	485	143	136	3	0	0

- Molecule 44 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial.

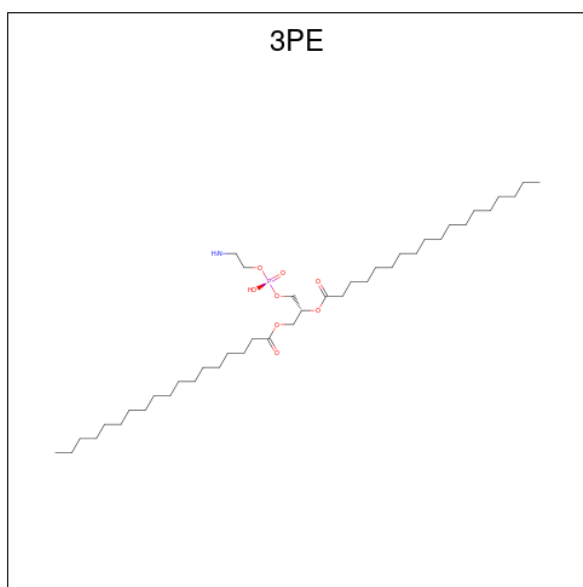
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
44	s	44	371	233	66	71	1	0	0

- Molecule 45 is 1,2-DIACYL-SN-GLYCERO-3-PHOSPHOCHOLINE (three-letter code: PC1) (formula:  $C_{44}H_{88}NO_8P$ ).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
45	A	1	21	11	1	8	1	0
45	B	1	43	33	1	8	1	0
45	B	1	35	25	1	8	1	0
45	d	1	26	16	1	8	1	0
45	g	1	49	39	1	8	1	0

- Molecule 46 is 1,2-Distearoyl-sn-glycerophosphoethanolamine (three-letter code: 3PE) (formula:  $C_{41}H_{82}NO_8P$ ).



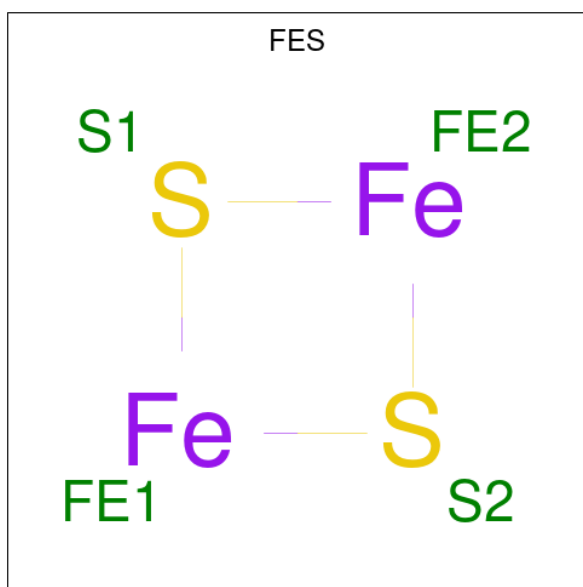
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
46	A	1	Total 39	C 29	N 1	O 8	P 1	0
46	I	1	Total 42	C 32	N 1	O 8	P 1	0
46	J	1	Total 28	C 18	N 1	O 8	P 1	0
46	K	1	Total 39	C 29	N 1	O 8	P 1	0
46	L	1	Total 38	C 28	N 1	O 8	P 1	0
46	L	1	Total 45	C 35	N 1	O 8	P 1	0
46	L	1	Total 35	C 25	N 1	O 8	P 1	0
46	M	1	Total 46	C 36	N 1	O 8	P 1	0
46	M	1	Total 40	C 30	N 1	O 8	P 1	0
46	N	1	Total 44	C 34	N 1	O 8	P 1	0
46	N	1	Total 41	C 31	N 1	O 8	P 1	0
46	X	1	Total 31	C 21	N 1	O 8	P 1	0
46	c	1	Total 38	C 28	N 1	O 8	P 1	0

- Molecule 47 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe<sub>4</sub>S<sub>4</sub>).



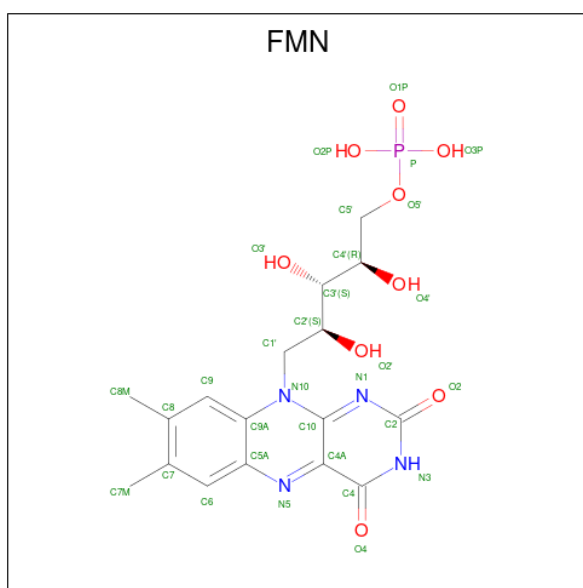
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
47	B	1	8	4	4	0
47	F	1	8	4	4	0
47	G	1	8	4	4	0
47	G	1	8	4	4	0
47	I	1	8	4	4	0
47	I	1	8	4	4	0

- Molecule 48 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).



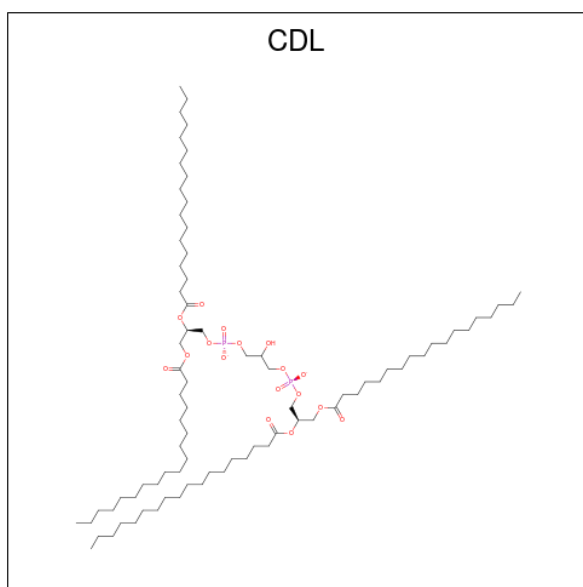
Mol	Chain	Residues	Atoms			AltConf
48	E	1	Total	Fe	S	0
			4	2	2	
48	G	1	Total	Fe	S	0
			4	2	2	

- Molecule 49 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).



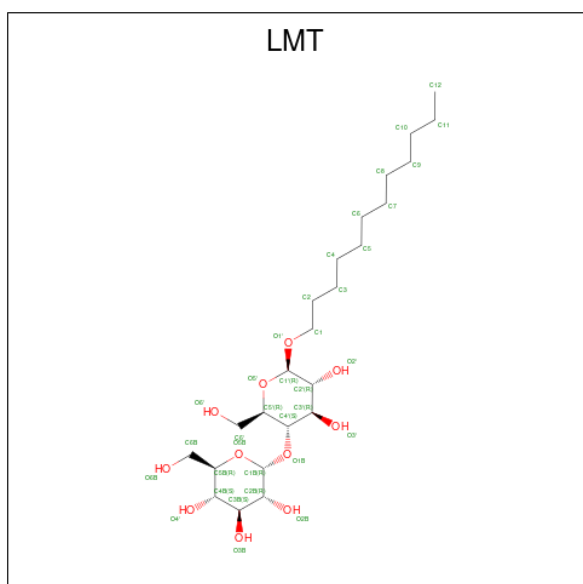
Mol	Chain	Residues	Atoms				AltConf	
49	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 50 is CARDIOLIPIN (three-letter code: CDL) (formula: C<sub>81</sub>H<sub>156</sub>O<sub>17</sub>P<sub>2</sub>).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
50	L	1	62	43	17	2	0
50	Y	1	50	31	17	2	0
50	h	1	64	45	17	2	0
50	q	1	69	50	17	2	0

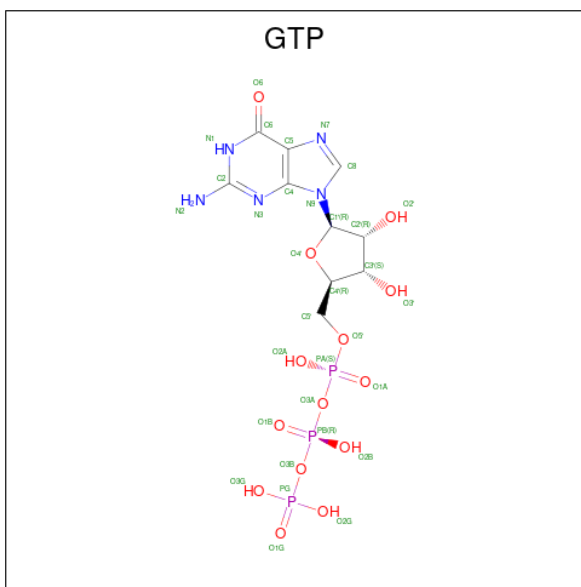
- Molecule 51 is DODECYL-BETA-D-MALTOSE (three-letter code: LMT) (formula:  $C_{24}H_{46}O_{11}$ ).





Mol	Chain	Residues	Atoms			AltConf
51	M	1	Total	C	O	0
			35	24	11	
51	N	1	Total	C	O	0
			35	24	11	
51	b	1	Total	C	O	0
			35	24	11	

- Molecule 52 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula:  $C_{10}H_{16}N_5O_{14}P_3$ ).

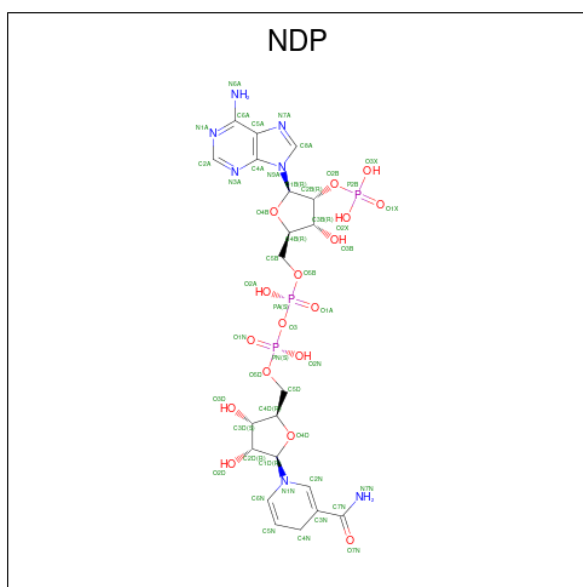


Mol	Chain	Residues	Atoms					AltConf
52	O	1	Total	C	N	O	P	0
			32	10	5	14	3	

- Molecule 53 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
53	O	1	Total	Mg	0
			1	1	

- Molecule 54 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula:  $C_{21}H_{30}N_7O_{17}P_3$ ).

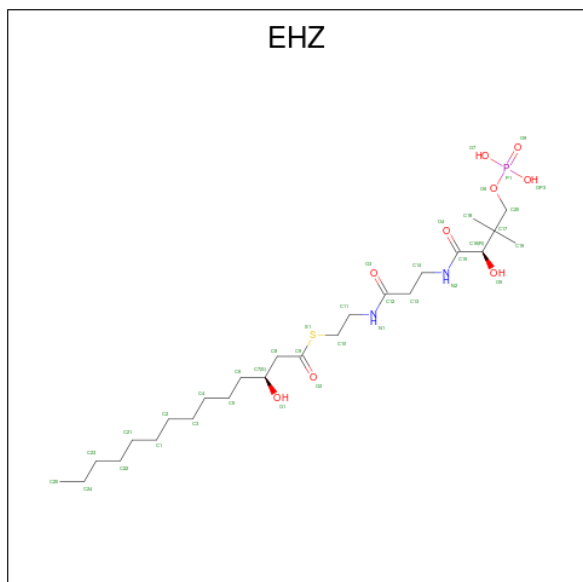


Mol	Chain	Residues	Atoms					AltConf
54	P	1	Total	C	N	O	P	0
			48	21	7	17	3	

- Molecule 55 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 56 is {S}-[2-[3-[(2 {R})-3,3-dimethyl-2-oxidanyl-4-phosphonoxy-butanoyl]amino]propanoylamino]ethyl] (3 {S})-3-oxidanyltetradecanethioate (three-letter code: EHZ) (formula: C<sub>25</sub>H<sub>49</sub>N<sub>2</sub>O<sub>9</sub>PS).

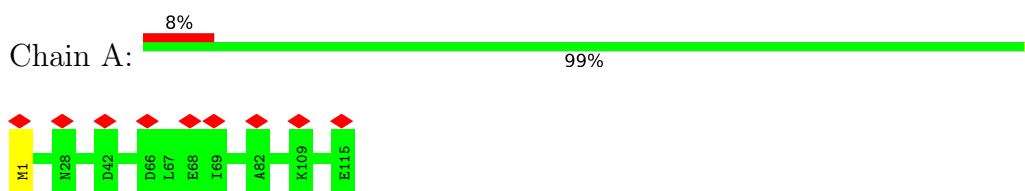


Mol	Chain	Residues	Atoms					AltConf	
			Total	C	N	O	P		S
56	T	1	37	25	2	8	1	1	0
56	U	1	37	25	2	8	1	1	0

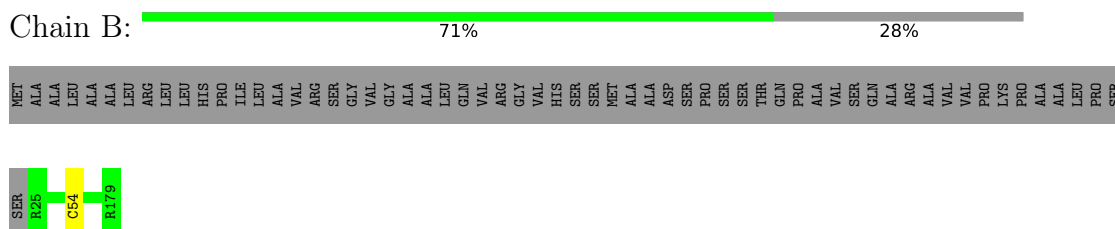
### 3 Residue-property plots [i](#)

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.

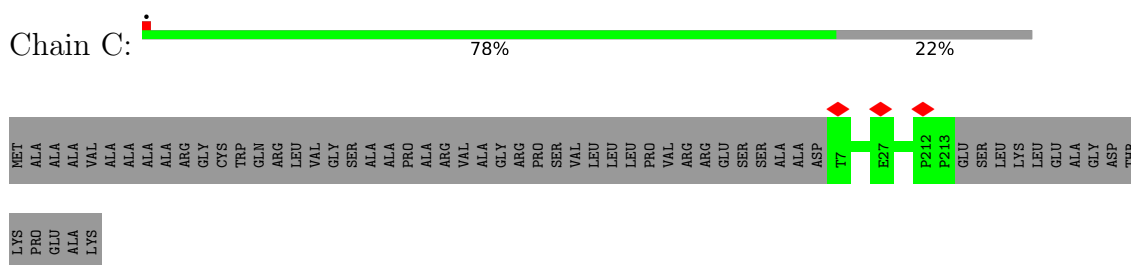
- Molecule 1: NADH-ubiquinone oxidoreductase chain 3



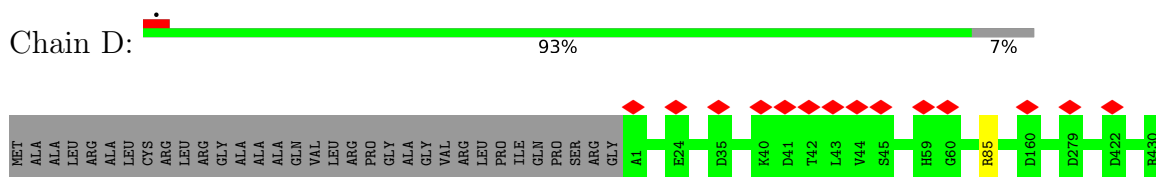
- Molecule 2: NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial



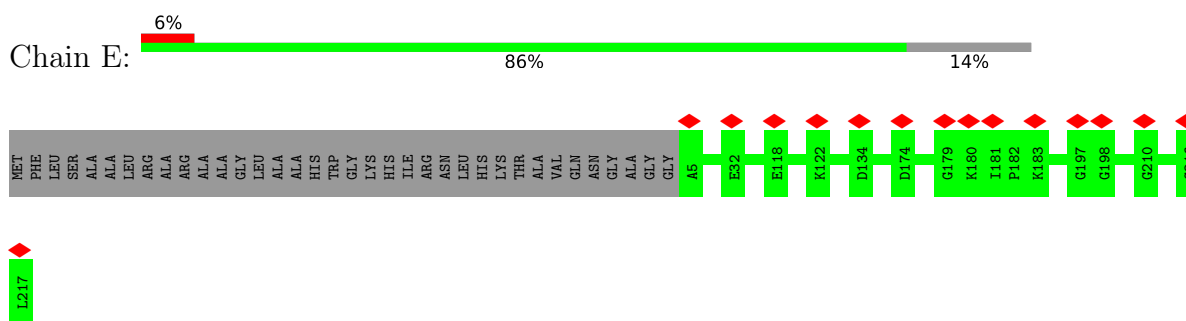
- Molecule 3: NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial



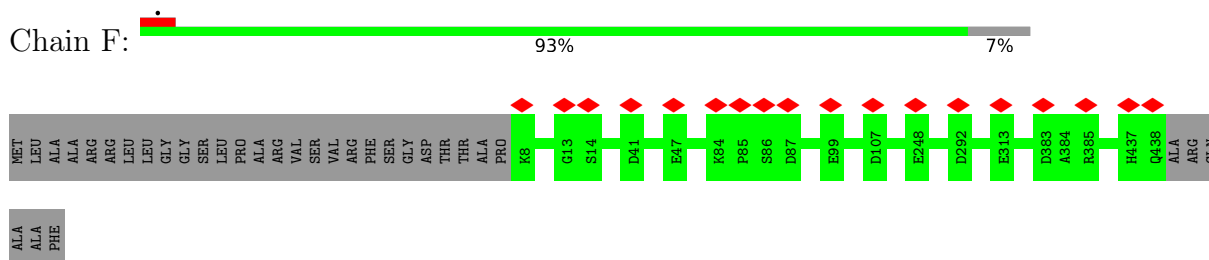
- Molecule 4: NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial



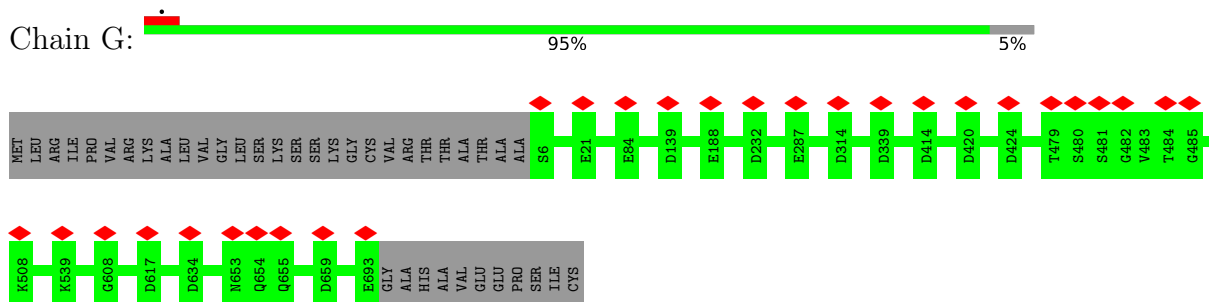
- Molecule 5: NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial



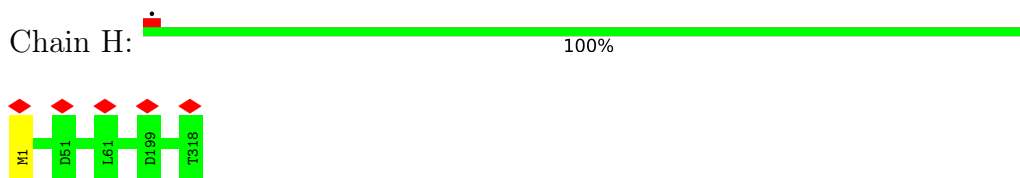
- Molecule 6: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial



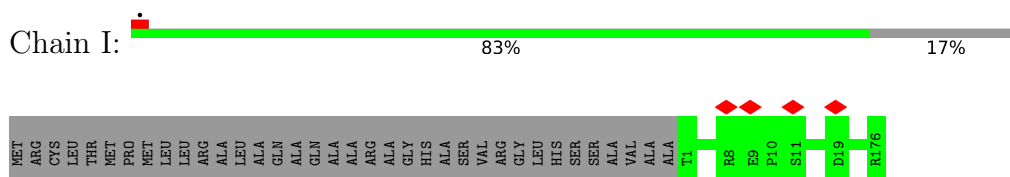
- Molecule 7: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial



- Molecule 8: NADH-ubiquinone oxidoreductase chain 1

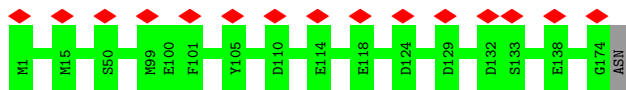


- Molecule 9: NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial



- Molecule 10: NADH-ubiquinone oxidoreductase chain 6





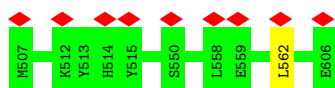
- Molecule 11: NADH-ubiquinone oxidoreductase chain 4L

Chain K: 100%



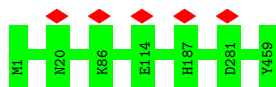
- Molecule 12: NADH-ubiquinone oxidoreductase chain 5

Chain L: 99%



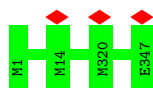
- Molecule 13: NADH-ubiquinone oxidoreductase chain 4

Chain M: 100%



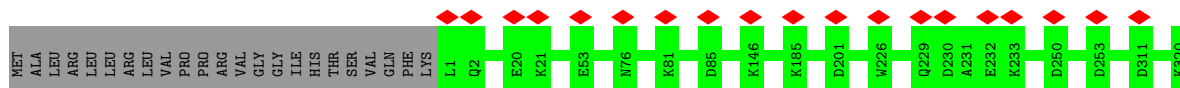
- Molecule 14: NADH-ubiquinone oxidoreductase chain 2

Chain N: 100%



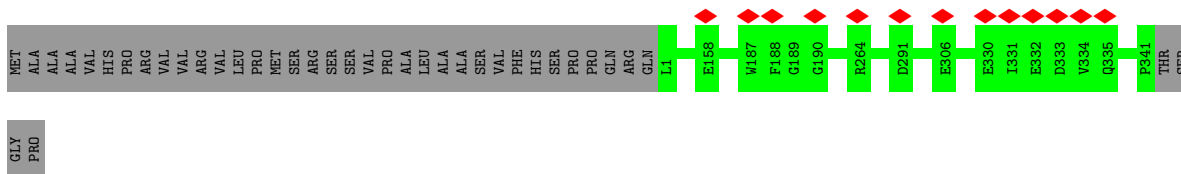
- Molecule 15: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial

Chain O: 93%

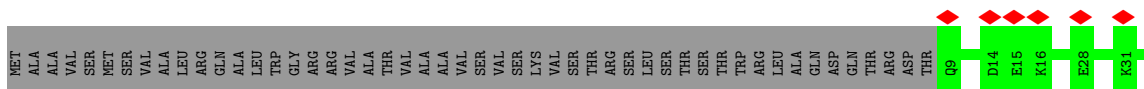


- Molecule 16: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 9, mitochondrial

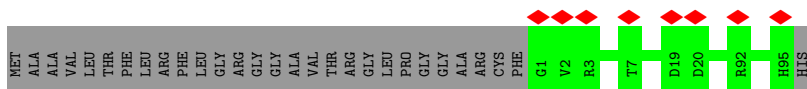
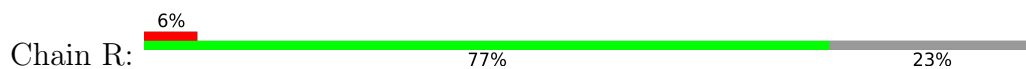
Chain P: 90%



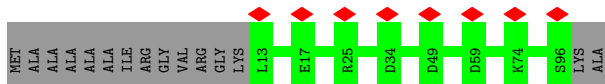
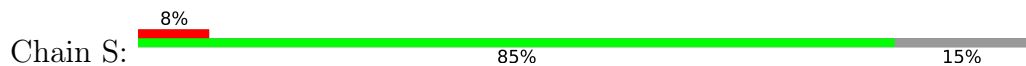
- Molecule 17: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial



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



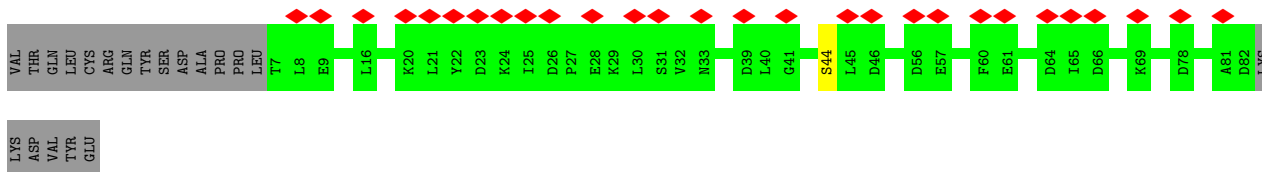
- Molecule 19: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2



- Molecule 20: Acyl carrier protein, mitochondrial



- Molecule 20: Acyl carrier protein, mitochondrial



MET ALA VAL ARG LEU CYS ALA CYS VAL ARG ARG LEU PRO THR ALA PHE ALA PRO LEU PRO ARG LEU PRO THR LEU ALA ALA ARG PRO LEU SER THR THR PHE ALA ALA GLU THR ARG THR ARG PRO GLY ALA PRO LEU PRO ALA VAL LEU ALA GLN VAL PRO GLY ARG

VAL THR GLN LEU CYS ARG GLN TYR SER ASP A3 K29 D39 D43 S44 D56 G59 D64 D78 E88

- Molecule 21: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5

Chain V: 9% 97%

MET ALA GLY L3 L4 R5 R6 E17 E21 D32 E51 R65 R66 E78 I115

- Molecule 22: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6

Chain W: 9% 89% 11%

MET ALA ALA SER GLY LEU ARG GLN ALA VAL ALA SER T15 S16 D24 M25 N26 D53 K57 T74 E111 R114 D117 P128

- Molecule 23: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

Chain X: 6% 99%

MET PI E10 R75 E79 C99 D133 E152 V153 E154 G155 D156 M171

- Molecule 24: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11

Chain Y: 11% 99%

MET ALI K2 Q7 D10 E13 T46 L49 E50 E81 D84 G83 R103 T104 R105 A111 A112 Y116 L119 V140

- Molecule 25: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13

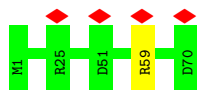
Chain Z: 6% 98%

MET ALA ALA S4 G14 L25 L30 D64 D100 G103 T144

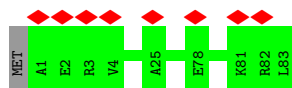
- Molecule 26: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1

Chain a: 6% 99%

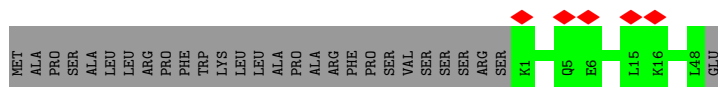




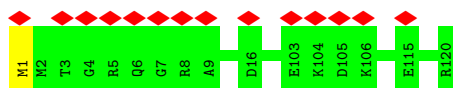
- Molecule 27: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3



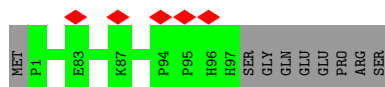
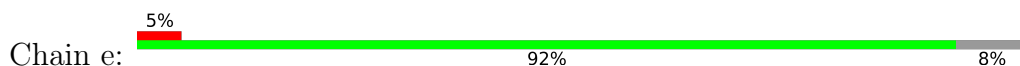
- Molecule 28: NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial



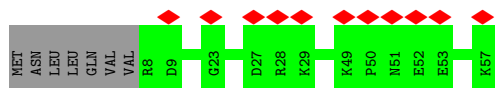
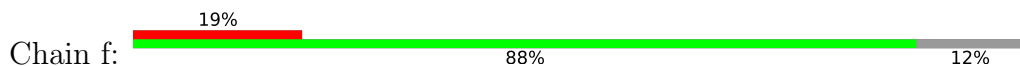
- Molecule 29: NADH dehydrogenase [ubiquinone] 1 subunit C2



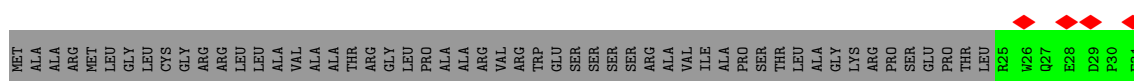
- Molecule 30: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5

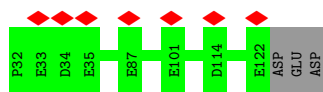


- Molecule 31: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1

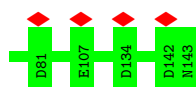
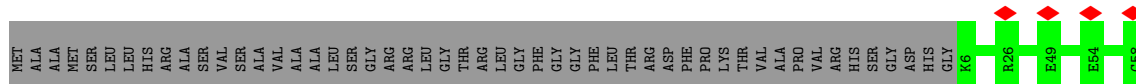


- Molecule 32: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

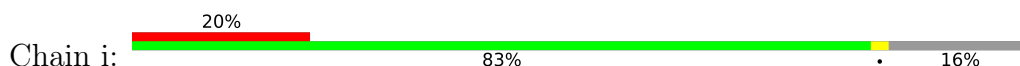




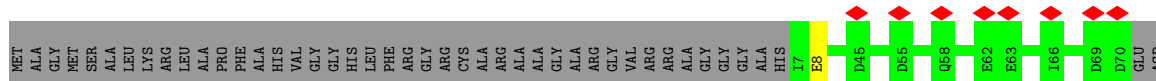
- Molecule 33: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial



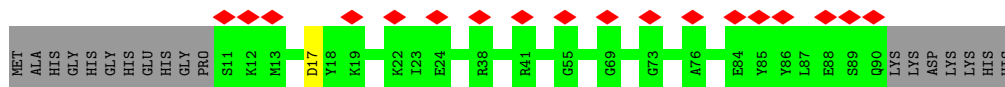
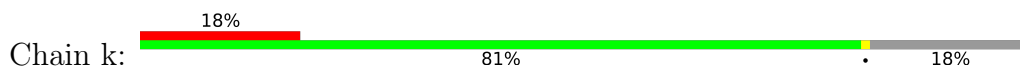
- Molecule 34: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6



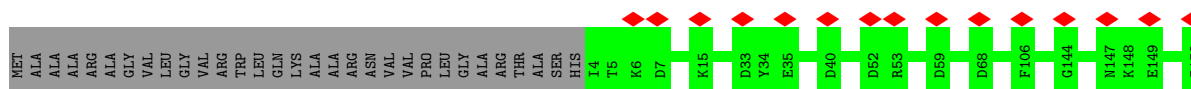
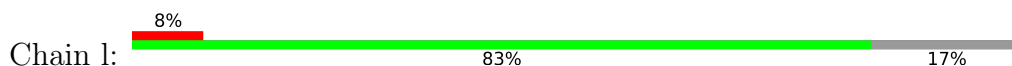
- Molecule 35: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 2, mitochondrial



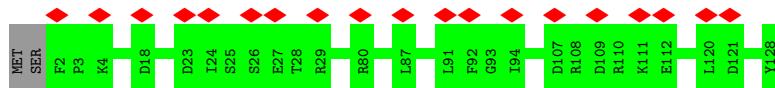
- Molecule 36: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3



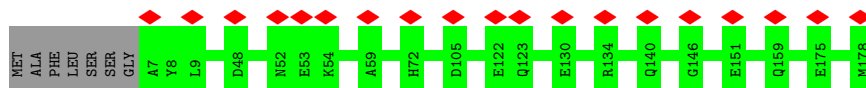
- Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial



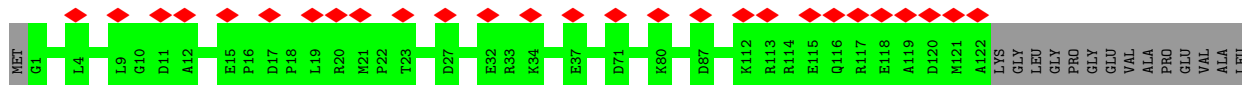
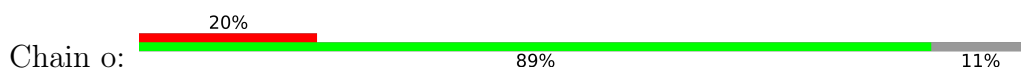
- Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4



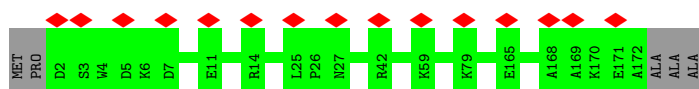
- Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9



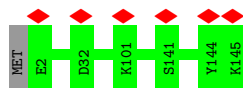
- Molecule 40: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7



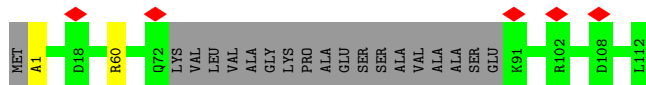
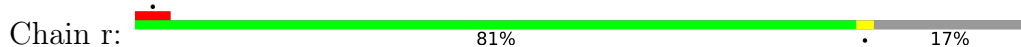
- Molecule 41: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10



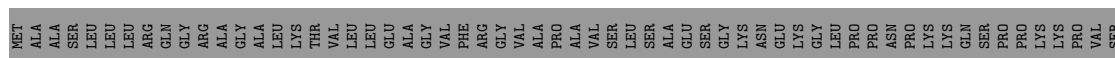
- Molecule 42: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12

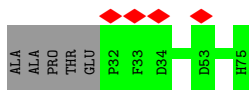


- Molecule 43: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7



- Molecule 44: NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	18231	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)	1500	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	27.341	Depositor
Minimum map value	-13.287	Depositor
Average map value	-0.003	Depositor
Map value standard deviation	0.973	Depositor
Recommended contour level	5.08	Depositor
Map size (Å)	475.2, 475.2, 475.2	wwPDB
Map dimensions	450, 450, 450	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.056, 1.056, 1.056	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, CDL, 3PE, GTP, FMN, PC1, FME, SAC, MG, AME, AYA, ZN, EHZ, 2MR, SF4, LMT, NDP

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	0.34	0/936	0.43	0/1281
2	B	0.45	1/1272 (0.1%)	0.48	0/1720
3	C	0.43	0/1772	0.46	0/2413
4	D	0.41	0/3537	0.44	0/4794
5	E	0.37	0/1695	0.44	0/2307
6	F	0.36	0/3393	0.47	0/4584
7	G	0.37	0/5367	0.46	0/7274
8	H	0.38	0/2571	0.44	0/3513
9	I	0.44	0/1445	0.47	0/1956
10	J	0.39	0/1362	0.43	0/1848
11	K	0.36	0/745	0.43	0/1008
12	L	0.34	0/4920	0.43	0/6694
13	M	0.36	0/3738	0.44	0/5097
14	N	0.35	0/2792	0.44	0/3800
15	O	0.37	0/2651	0.42	0/3587
16	P	0.37	0/2824	0.45	0/3831
17	Q	0.37	0/1039	0.45	0/1404
18	R	0.41	0/742	0.46	0/999
19	S	0.33	0/688	0.45	0/927
20	T	0.30	0/621	0.40	0/837
20	U	0.35	0/704	0.42	0/950
21	V	0.33	0/939	0.40	0/1272
22	W	0.37	0/995	0.42	0/1337
23	X	0.37	0/1439	0.44	0/1942
24	Y	0.31	0/1042	0.43	0/1414
25	Z	0.37	0/1181	0.42	0/1592
26	a	0.36	0/584	0.42	0/786
27	b	0.34	0/672	0.42	0/923
28	c	0.34	0/418	0.37	0/567
29	d	0.42	0/1012	0.42	0/1368
30	e	0.34	0/840	0.41	0/1123

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
31	f	0.34	0/450	0.42	0/606
32	g	0.37	0/850	0.42	0/1154
33	h	0.36	0/1188	0.41	0/1607
34	i	0.34	0/941	0.41	0/1279
35	j	0.36	0/582	0.38	0/799
36	k	0.31	0/663	0.40	0/895
37	l	0.38	0/1358	0.42	0/1858
38	m	0.36	0/1088	0.42	0/1472
39	n	0.36	0/1545	0.39	0/2092
40	o	0.32	0/1073	0.39	0/1437
41	p	0.37	0/1476	0.41	0/1990
42	q	0.40	0/1242	0.45	0/1688
43	r	0.37	0/780	0.42	0/1056
44	s	0.34	0/383	0.43	0/518
All	All	0.37	1/67555 (0.0%)	0.44	0/91599

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	54	CYS	CB-SG	-5.31	1.73	1.81

There are no bond angle outliers.

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](#)

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	113/115 (98%)	107 (95%)	6 (5%)	0	100	100
2	B	153/216 (71%)	145 (95%)	8 (5%)	0	100	100
3	C	205/266 (77%)	199 (97%)	6 (3%)	0	100	100
4	D	427/463 (92%)	397 (93%)	30 (7%)	0	100	100
5	E	211/249 (85%)	192 (91%)	19 (9%)	0	100	100
6	F	429/464 (92%)	410 (96%)	19 (4%)	0	100	100
7	G	686/727 (94%)	642 (94%)	44 (6%)	0	100	100
8	H	316/318 (99%)	293 (93%)	23 (7%)	0	100	100
9	I	174/212 (82%)	165 (95%)	9 (5%)	0	100	100
10	J	172/175 (98%)	160 (93%)	12 (7%)	0	100	100
11	K	96/98 (98%)	93 (97%)	3 (3%)	0	100	100
12	L	604/606 (100%)	557 (92%)	44 (7%)	3 (0%)	29	64
13	M	457/459 (100%)	443 (97%)	14 (3%)	0	100	100
14	N	345/347 (99%)	333 (96%)	12 (4%)	0	100	100
15	O	318/343 (93%)	300 (94%)	18 (6%)	0	100	100
16	P	339/380 (89%)	318 (94%)	21 (6%)	0	100	100
17	Q	123/175 (70%)	117 (95%)	6 (5%)	0	100	100
18	R	93/124 (75%)	88 (95%)	5 (5%)	0	100	100
19	S	82/99 (83%)	76 (93%)	6 (7%)	0	100	100
20	T	74/156 (47%)	71 (96%)	3 (4%)	0	100	100
20	U	84/156 (54%)	82 (98%)	1 (1%)	1 (1%)	13	44
21	V	111/116 (96%)	108 (97%)	3 (3%)	0	100	100
22	W	112/128 (88%)	106 (95%)	6 (5%)	0	100	100
23	X	169/172 (98%)	154 (91%)	14 (8%)	1 (1%)	25	59
24	Y	138/141 (98%)	133 (96%)	5 (4%)	0	100	100
25	Z	139/144 (96%)	129 (93%)	10 (7%)	0	100	100
26	a	68/70 (97%)	67 (98%)	1 (2%)	0	100	100
27	b	81/84 (96%)	73 (90%)	8 (10%)	0	100	100
28	c	46/76 (60%)	45 (98%)	1 (2%)	0	100	100
29	d	118/120 (98%)	111 (94%)	7 (6%)	0	100	100
30	e	95/106 (90%)	92 (97%)	3 (3%)	0	100	100
31	f	48/57 (84%)	44 (92%)	4 (8%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
32	g	96/154 (62%)	89 (93%)	7 (7%)	0	100	100
33	h	136/189 (72%)	131 (96%)	5 (4%)	0	100	100
34	i	103/127 (81%)	92 (89%)	10 (10%)	1 (1%)	15	49
35	j	62/108 (57%)	59 (95%)	2 (3%)	1 (2%)	9	37
36	k	78/98 (80%)	72 (92%)	5 (6%)	1 (1%)	12	42
37	l	153/186 (82%)	142 (93%)	11 (7%)	0	100	100
38	m	125/129 (97%)	115 (92%)	10 (8%)	0	100	100
39	n	170/179 (95%)	157 (92%)	13 (8%)	0	100	100
40	o	120/137 (88%)	107 (89%)	13 (11%)	0	100	100
41	p	169/176 (96%)	165 (98%)	4 (2%)	0	100	100
42	q	142/145 (98%)	141 (99%)	1 (1%)	0	100	100
43	r	90/113 (80%)	82 (91%)	8 (9%)	0	100	100
44	s	42/109 (38%)	38 (90%)	4 (10%)	0	100	100
All	All	8112/9212 (88%)	7640 (94%)	464 (6%)	8 (0%)	54	83

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
23	X	99	CYS
12	L	562	LEU
20	U	43	ASP
35	j	8	GLU
12	L	25	ASN

### 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	100/100 (100%)	100 (100%)	0	100	100
2	B	131/175 (75%)	131 (100%)	0	100	100
3	C	188/228 (82%)	188 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	D	370/392 (94%)	370 (100%)	0	100	100
5	E	183/205 (89%)	183 (100%)	0	100	100
6	F	345/368 (94%)	345 (100%)	0	100	100
7	G	578/608 (95%)	578 (100%)	0	100	100
8	H	274/274 (100%)	274 (100%)	0	100	100
9	I	151/175 (86%)	151 (100%)	0	100	100
10	J	140/141 (99%)	140 (100%)	0	100	100
11	K	85/85 (100%)	85 (100%)	0	100	100
12	L	533/533 (100%)	533 (100%)	0	100	100
13	M	412/412 (100%)	412 (100%)	0	100	100
14	N	315/315 (100%)	315 (100%)	0	100	100
15	O	283/303 (93%)	283 (100%)	0	100	100
16	P	295/327 (90%)	295 (100%)	0	100	100
17	Q	112/153 (73%)	112 (100%)	0	100	100
18	R	78/97 (80%)	78 (100%)	0	100	100
19	S	75/82 (92%)	75 (100%)	0	100	100
20	T	70/135 (52%)	69 (99%)	1 (1%)	67	86
20	U	79/135 (58%)	78 (99%)	1 (1%)	69	87
21	V	101/102 (99%)	101 (100%)	0	100	100
22	W	107/114 (94%)	107 (100%)	0	100	100
23	X	154/155 (99%)	154 (100%)	0	100	100
24	Y	101/102 (99%)	101 (100%)	0	100	100
25	Z	120/121 (99%)	120 (100%)	0	100	100
26	a	59/59 (100%)	58 (98%)	1 (2%)	60	83
27	b	71/72 (99%)	71 (100%)	0	100	100
28	c	44/68 (65%)	44 (100%)	0	100	100
29	d	104/105 (99%)	104 (100%)	0	100	100
30	e	88/96 (92%)	88 (100%)	0	100	100
31	f	47/54 (87%)	47 (100%)	0	100	100
32	g	89/131 (68%)	89 (100%)	0	100	100
33	h	121/158 (77%)	121 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
34	i	102/120 (85%)	102 (100%)	0	100	100
35	j	59/84 (70%)	59 (100%)	0	100	100
36	k	62/76 (82%)	62 (100%)	0	100	100
37	l	139/159 (87%)	139 (100%)	0	100	100
38	m	113/115 (98%)	113 (100%)	0	100	100
39	n	156/161 (97%)	156 (100%)	0	100	100
40	o	110/120 (92%)	110 (100%)	0	100	100
41	p	155/157 (99%)	155 (100%)	0	100	100
42	q	130/131 (99%)	130 (100%)	0	100	100
43	r	84/97 (87%)	83 (99%)	1 (1%)	71	88
44	s	43/92 (47%)	43 (100%)	0	100	100
All	All	7156/7892 (91%)	7152 (100%)	4 (0%)	93	98

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
20	T	44	SER
20	U	44	SER
26	a	59	ARG
43	r	60	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
22	W	48	HIS
22	W	108	HIS
44	s	43	HIS
12	L	248	HIS
7	G	401	HIS

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

12 non-standard protein/DNA/RNA residues 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
8	FME	H	1	8	8,9,10	0.90	0	7,9,11	1.08	1 (14%)
24	AYA	Y	1	24	6,7,8	1.29	1 (16%)	5,8,10	1.54	1 (20%)
12	FME	L	1	12	8,9,10	1.00	1 (12%)	7,9,11	0.75	0
13	FME	M	1	13	8,9,10	0.94	0	7,9,11	0.96	0
14	FME	N	1	14	8,9,10	0.96	0	7,9,11	0.94	0
29	AME	d	1	29	9,10,11	1.48	1 (11%)	9,11,13	1.54	2 (22%)
4	2MR	D	85	4	10,12,13	2.40	2 (20%)	5,13,15	1.30	0
10	FME	J	1	10	8,9,10	0.91	0	7,9,11	0.89	0
1	FME	A	1	1	8,9,10	1.03	1 (12%)	7,9,11	0.61	0
11	FME	K	1	11	8,9,10	0.97	0	7,9,11	0.72	0
43	AYA	r	1	43	6,7,8	1.41	1 (16%)	5,8,10	0.98	0
34	SAC	i	1	34	7,8,9	0.91	0	8,9,11	1.02	1 (12%)

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. <sup>1,2</sup> means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	FME	H	1	8	-	3/7/9/11	-
24	AYA	Y	1	24	-	0/4/6/8	-
12	FME	L	1	12	-	2/7/9/11	-
13	FME	M	1	13	-	0/7/9/11	-
14	FME	N	1	14	-	3/7/9/11	-
29	AME	d	1	29	-	6/9/10/12	-
4	2MR	D	85	4	-	1/10/13/15	-
10	FME	J	1	10	-	3/7/9/11	-
1	FME	A	1	1	-	0/7/9/11	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
11	FME	K	1	11	-	2/7/9/11	-
43	AYA	r	1	43	-	0/4/6/8	-
34	SAC	i	1	34	-	2/7/8/10	-

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	85	2MR	CZ-NH2	5.30	1.45	1.33
4	D	85	2MR	CZ-NE	4.89	1.44	1.34
29	d	1	AME	CT1-N	3.38	1.46	1.34
43	r	1	AYA	CA-N	-2.99	1.43	1.46
24	Y	1	AYA	CA-N	-2.67	1.43	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
24	Y	1	AYA	CB-CA-N	3.29	113.27	109.61
29	d	1	AME	CE-SD-CG	2.60	109.32	100.40
29	d	1	AME	CT2-CT1-N	2.36	120.10	116.10
34	i	1	SAC	OG-CB-CA	-2.23	105.27	110.97
8	H	1	FME	C-CA-N	2.08	113.48	109.73

There are no chirality outliers.

5 of 22 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	85	2MR	O-C-CA-CB
8	H	1	FME	O-C-CA-CB
10	J	1	FME	O1-CN-N-CA
12	L	1	FME	O1-CN-N-CA
12	L	1	FME	CA-CB-CG-SD

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

Of 40 ligands modelled in this entry, 2 are monoatomic - leaving 38 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
51	LMT	N	901	-	36,36,36	1.13	2 (5%)	47,47,47	1.17	3 (6%)
46	3PE	L	703	-	44,44,50	0.90	4 (9%)	47,49,55	1.14	3 (6%)
46	3PE	L	704	-	34,34,50	1.03	4 (11%)	37,39,55	1.16	2 (5%)
52	GTP	O	401	53	26,34,34	2.92	10 (38%)	32,54,54	1.74	11 (34%)
45	PC1	g	1501	-	48,48,53	1.00	3 (6%)	54,56,61	1.08	2 (3%)
56	EHZ	T	101	20	29,36,37	1.69	5 (17%)	35,44,47	1.73	7 (20%)
45	PC1	d	501	-	25,25,53	1.37	4 (16%)	31,33,61	1.03	2 (6%)
51	LMT	b	301	-	36,36,36	1.19	3 (8%)	47,47,47	1.34	5 (10%)
47	SF4	I	203	9	0,12,12	-	-	-	-	-
46	3PE	X	401	-	30,30,50	1.09	3 (10%)	33,35,55	1.24	2 (6%)
50	CDL	q	201	-	68,68,99	1.03	8 (11%)	74,80,111	1.11	4 (5%)
46	3PE	M	601	-	45,45,50	0.91	4 (8%)	48,50,55	1.22	2 (4%)
50	CDL	L	702	-	61,61,99	1.12	8 (13%)	67,73,111	1.14	4 (5%)
46	3PE	c	301	-	37,37,50	0.99	3 (8%)	40,42,55	0.99	2 (5%)
51	LMT	M	602	-	36,36,36	1.15	2 (5%)	47,47,47	1.02	1 (2%)
47	SF4	B	201	2	0,12,12	-	-	-	-	-
48	FES	G	803	7	0,4,4	-	-	-	-	-
47	SF4	I	202	9	0,12,12	-	-	-	-	-
47	SF4	G	802	7	0,12,12	-	-	-	-	-
47	SF4	G	801	7	0,12,12	-	-	-	-	-
45	PC1	B	203	-	34,34,53	1.19	4 (11%)	40,42,61	1.09	2 (5%)
50	CDL	Y	701	-	49,49,99	1.21	8 (16%)	55,61,111	1.31	4 (7%)
46	3PE	I	201	-	41,41,50	0.93	3 (7%)	44,46,55	1.18	2 (4%)
46	3PE	M	603	-	39,39,50	0.96	4 (10%)	42,44,55	1.07	2 (4%)
49	FMN	F	501	-	33,33,33	1.10	2 (6%)	48,50,50	1.32	7 (14%)
46	3PE	N	903	-	40,40,50	0.95	4 (10%)	43,45,55	1.20	2 (4%)
56	EHZ	U	101	20	29,36,37	1.64	5 (17%)	35,44,47	1.35	3 (8%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
45	PC1	A	701	-	20,20,53	1.89	3 (15%)	24,27,61	1.13	1 (4%)
50	CDL	h	1001	-	63,63,99	1.10	8 (12%)	69,75,111	1.22	5 (7%)
54	NDP	P	501	-	45,52,52	2.09	8 (17%)	53,80,80	1.75	10 (18%)
46	3PE	A	702	-	38,38,50	0.98	4 (10%)	41,43,55	1.11	2 (4%)
47	SF4	F	502	6	0,12,12	-	-	-	-	-
46	3PE	L	701	-	37,37,50	1.01	4 (10%)	40,42,55	1.13	2 (5%)
48	FES	E	301	5	0,4,4	-	-	-	-	-
45	PC1	B	202	-	42,42,53	1.05	4 (9%)	48,50,61	1.04	2 (4%)
46	3PE	K	101	-	38,38,50	1.00	4 (10%)	41,43,55	1.11	2 (4%)
46	3PE	J	401	-	27,27,50	1.08	3 (11%)	30,32,55	1.10	1 (3%)
46	3PE	N	902	-	43,43,50	0.92	3 (6%)	46,48,55	1.04	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
51	LMT	N	901	-	-	5/21/61/61	0/2/2/2
46	3PE	L	703	-	-	23/48/48/54	-
46	3PE	L	704	-	-	20/38/38/54	-
52	GTP	O	401	53	-	0/18/38/38	0/3/3/3
45	PC1	g	1501	-	-	23/52/52/57	-
56	EHZ	T	101	20	-	11/42/44/45	-
45	PC1	d	501	-	-	11/29/29/57	-
51	LMT	b	301	-	-	8/21/61/61	0/2/2/2
47	SF4	I	203	9	-	-	0/6/5/5
46	3PE	X	401	-	-	16/34/34/54	-
50	CDL	q	201	-	-	35/79/79/110	-
46	3PE	M	601	-	-	20/49/49/54	-
50	CDL	L	702	-	-	34/72/72/110	-
46	3PE	c	301	-	-	22/41/41/54	-
51	LMT	M	602	-	-	6/21/61/61	0/2/2/2
47	SF4	B	201	2	-	-	0/6/5/5
48	FES	G	803	7	-	-	0/1/1/1
47	SF4	I	202	9	-	-	0/6/5/5
47	SF4	G	802	7	-	-	0/6/5/5

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
47	SF4	G	801	7	-	-	0/6/5/5
45	PC1	B	203	-	-	12/38/38/57	-
50	CDL	Y	701	-	-	23/59/59/110	-
46	3PE	I	201	-	-	18/45/45/54	-
46	3PE	M	603	-	-	20/43/43/54	-
49	FMN	F	501	-	-	3/18/18/18	0/3/3/3
46	3PE	N	903	-	-	19/44/44/54	-
56	EHZ	U	101	20	-	7/42/44/45	-
45	PC1	A	701	-	-	13/22/22/57	-
50	CDL	h	1001	-	-	28/74/74/110	-
54	NDP	P	501	-	-	9/30/77/77	0/5/5/5
46	3PE	A	702	-	-	16/42/42/54	-
47	SF4	F	502	6	-	-	0/6/5/5
46	3PE	L	701	-	-	19/41/41/54	-
48	FES	E	301	5	-	-	0/1/1/1
45	PC1	B	202	-	-	22/46/46/57	-
46	3PE	K	101	-	-	19/42/42/54	-
46	3PE	J	401	-	-	12/30/30/54	-
46	3PE	N	902	-	-	24/47/47/54	-

The worst 5 of 134 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
54	P	501	NDP	P2B-O2B	10.95	1.80	1.59
52	O	401	GTP	O6-C6	8.25	1.40	1.23
45	A	701	PC1	O21-C2	-5.79	1.40	1.46
56	T	101	EHZ	C12-N1	5.29	1.45	1.33
52	O	401	GTP	O4'-C1'	5.28	1.48	1.41

The worst 5 of 99 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
54	P	501	NDP	PN-O3-PA	-7.29	107.80	132.83
56	T	101	EHZ	C8-C9-S1	6.21	121.31	113.63
50	Y	701	CDL	OB6-CB5-C51	5.54	121.29	111.09
56	U	101	EHZ	C8-C9-S1	5.06	119.89	113.63
50	h	1001	CDL	OB6-CB5-C51	5.01	122.30	111.50



There are no chirality outliers.

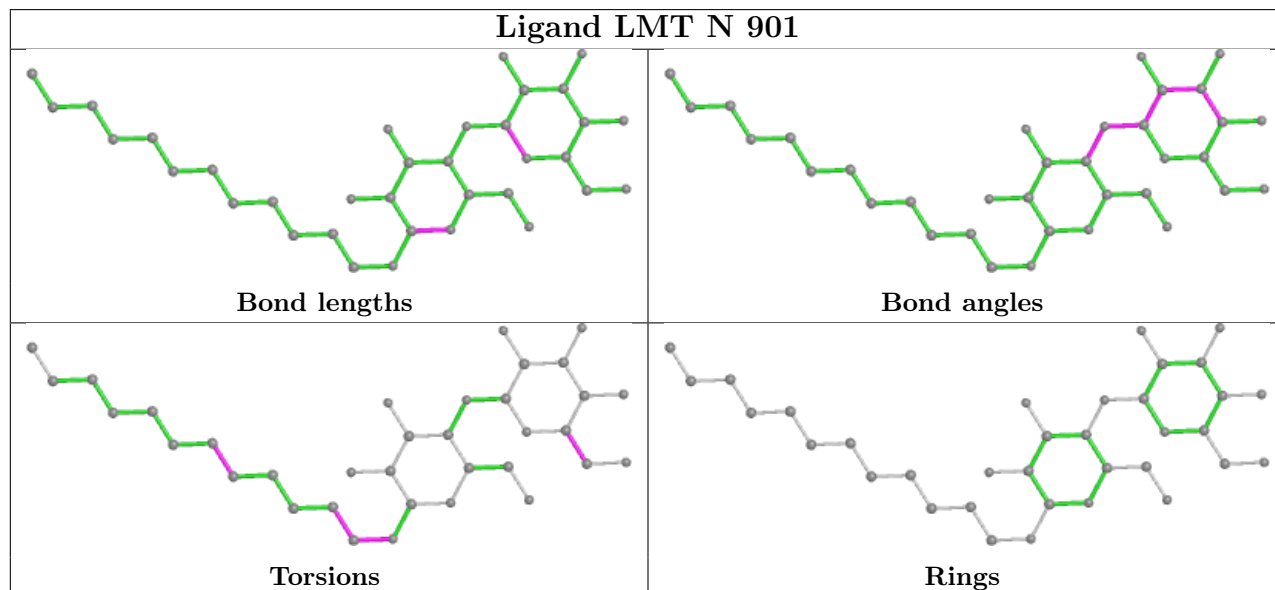
5 of 498 torsion outliers are listed below:

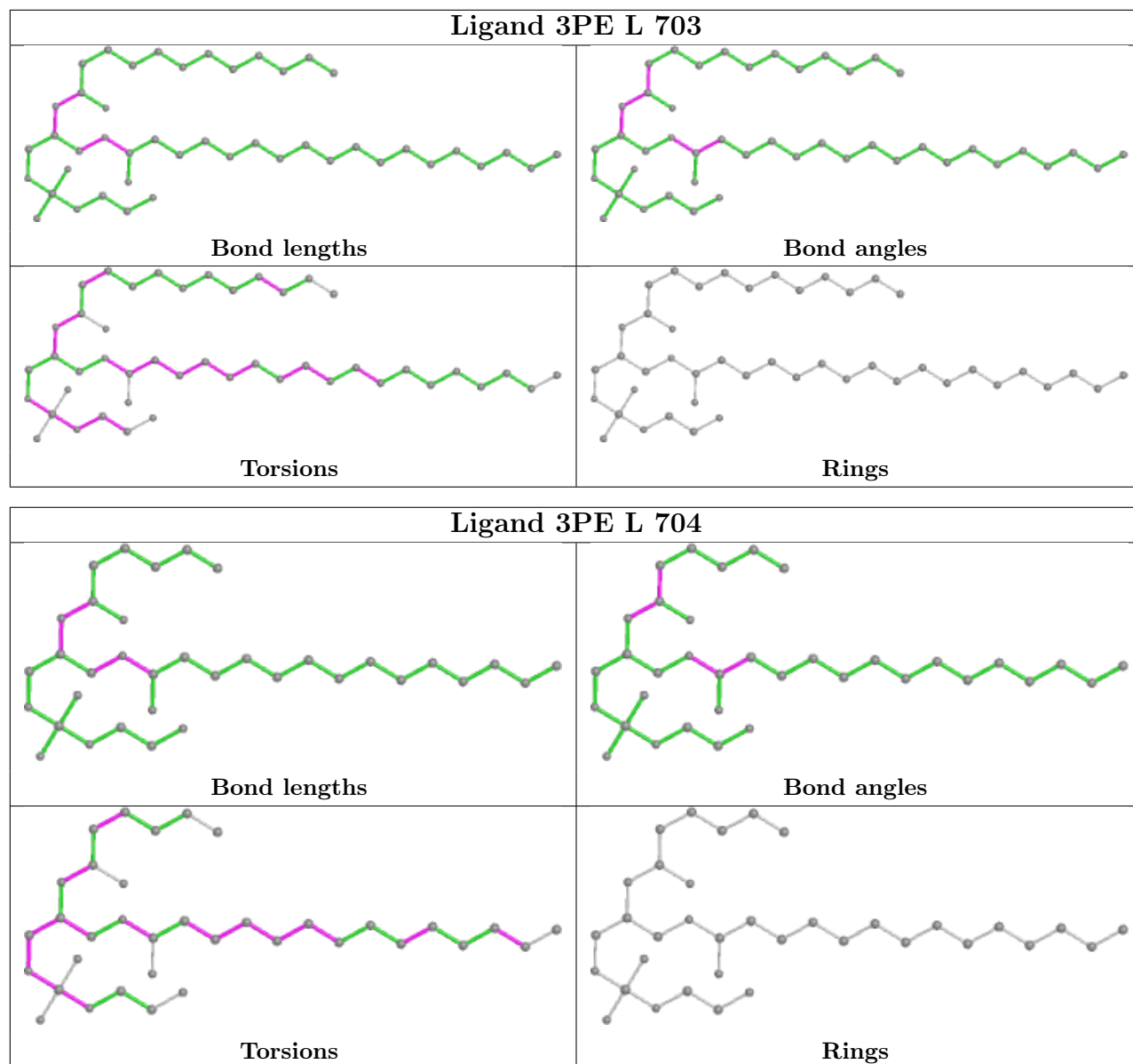
Mol	Chain	Res	Type	Atoms
45	A	701	PC1	C1-O11-P-O14
45	A	701	PC1	O13-C11-C12-N
45	A	701	PC1	C1-C2-O21-C21
45	A	701	PC1	O22-C21-O21-C2
45	B	202	PC1	C11-O13-P-O14

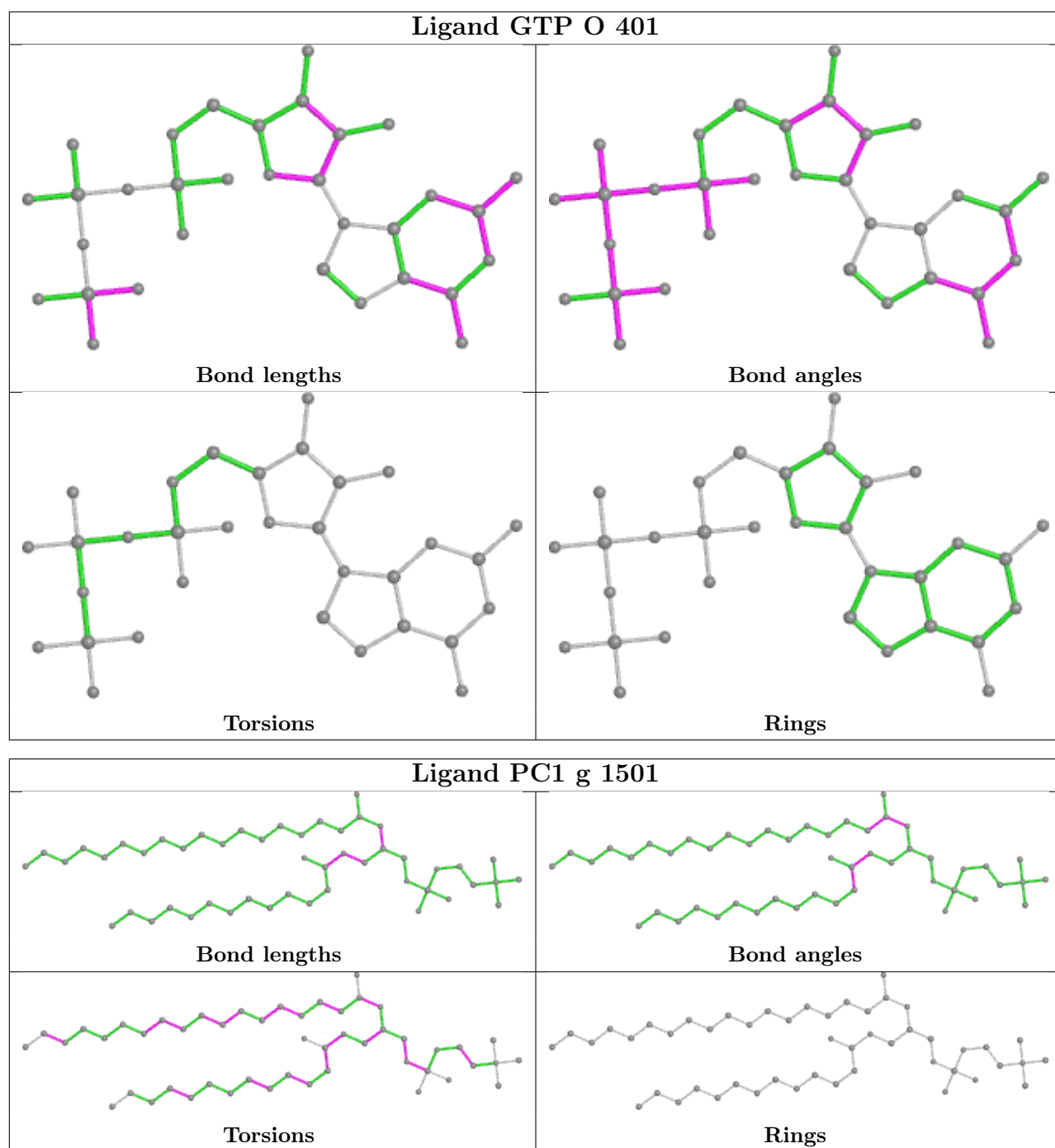
There are no ring outliers.

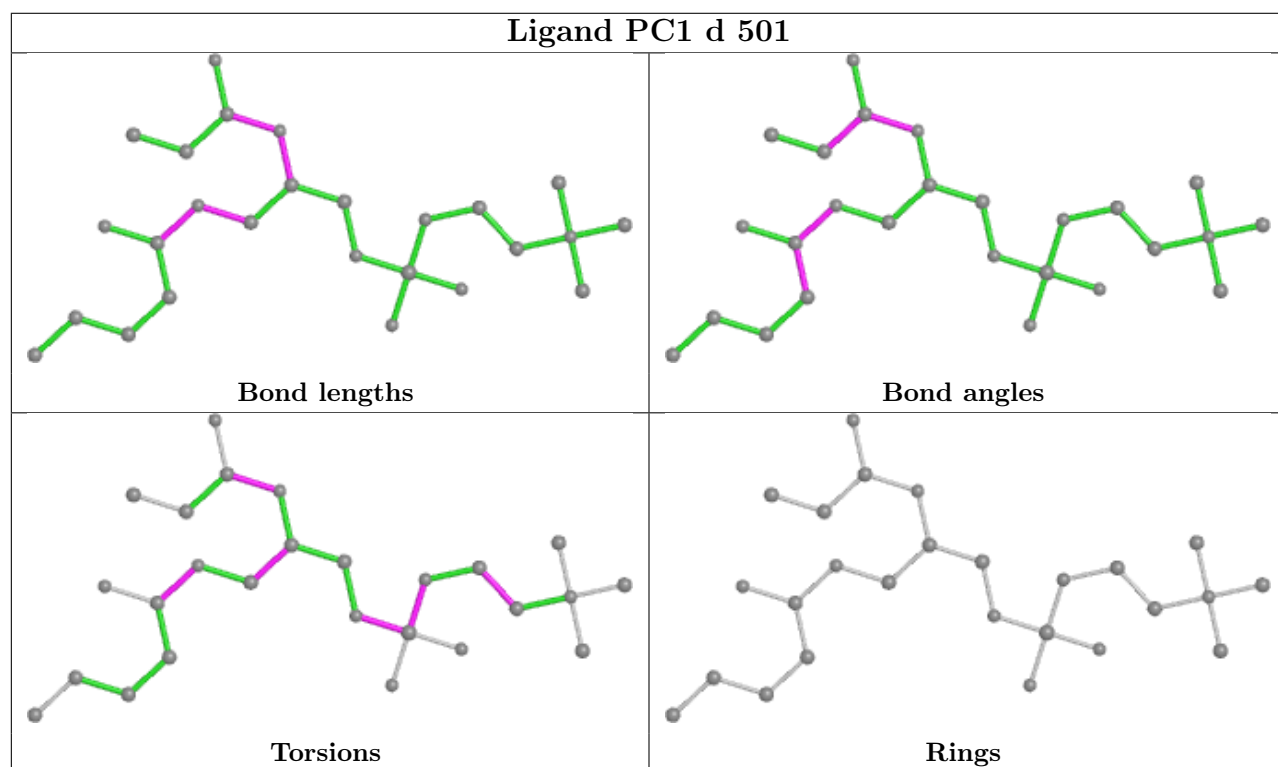
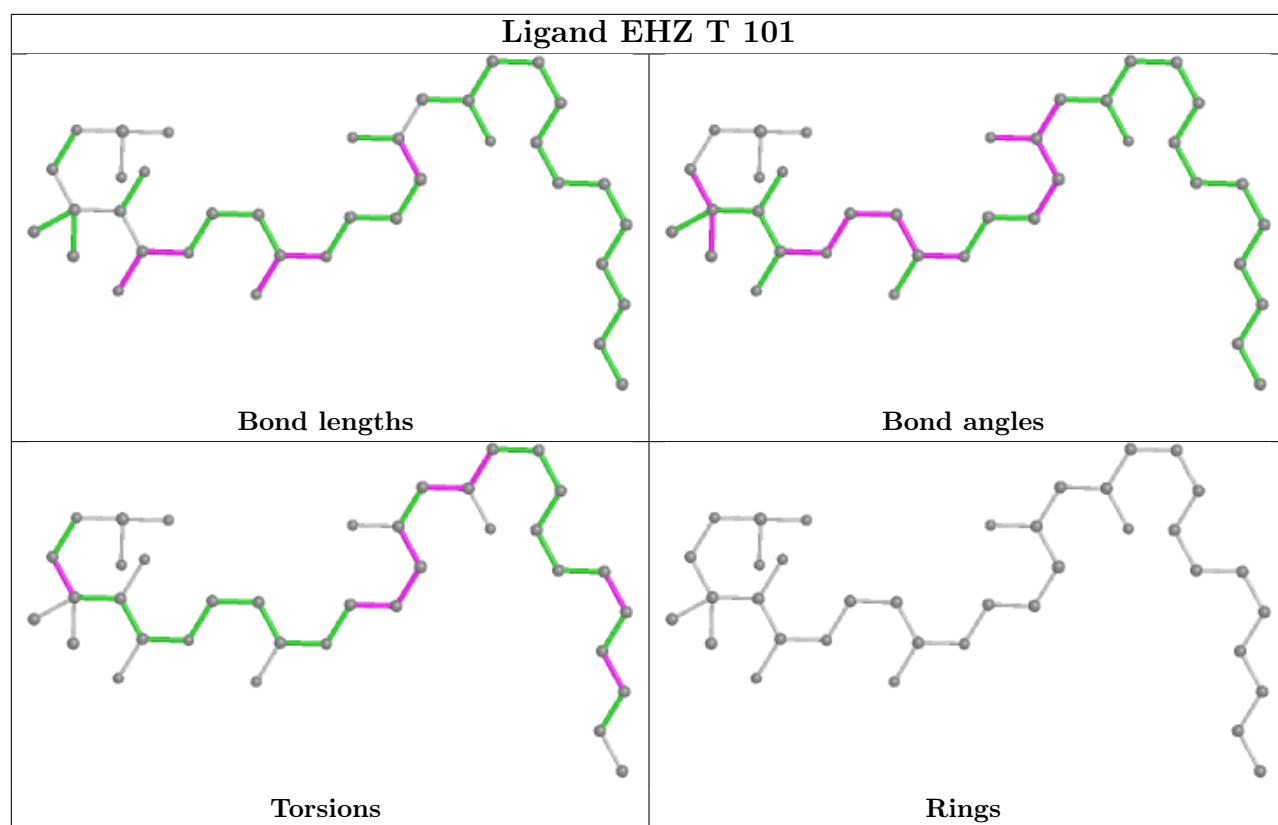
No monomer is involved in short contacts.

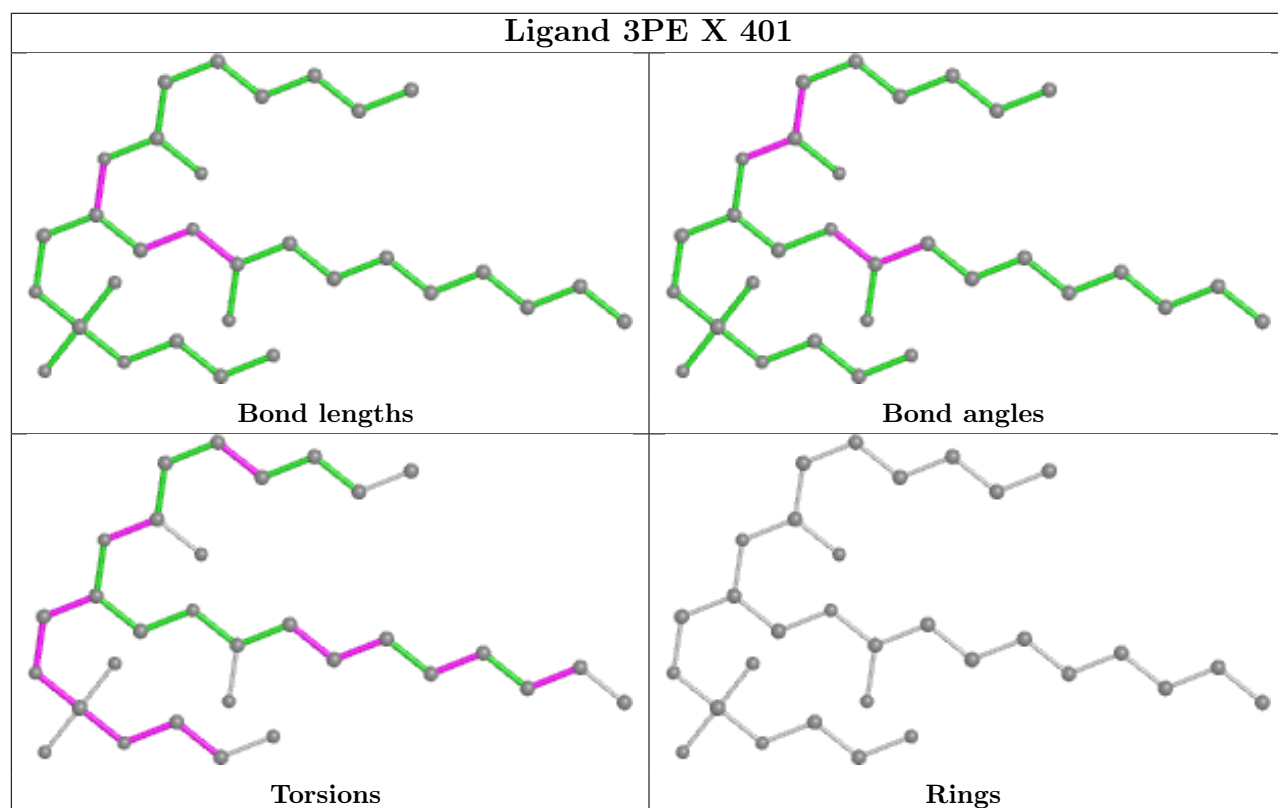
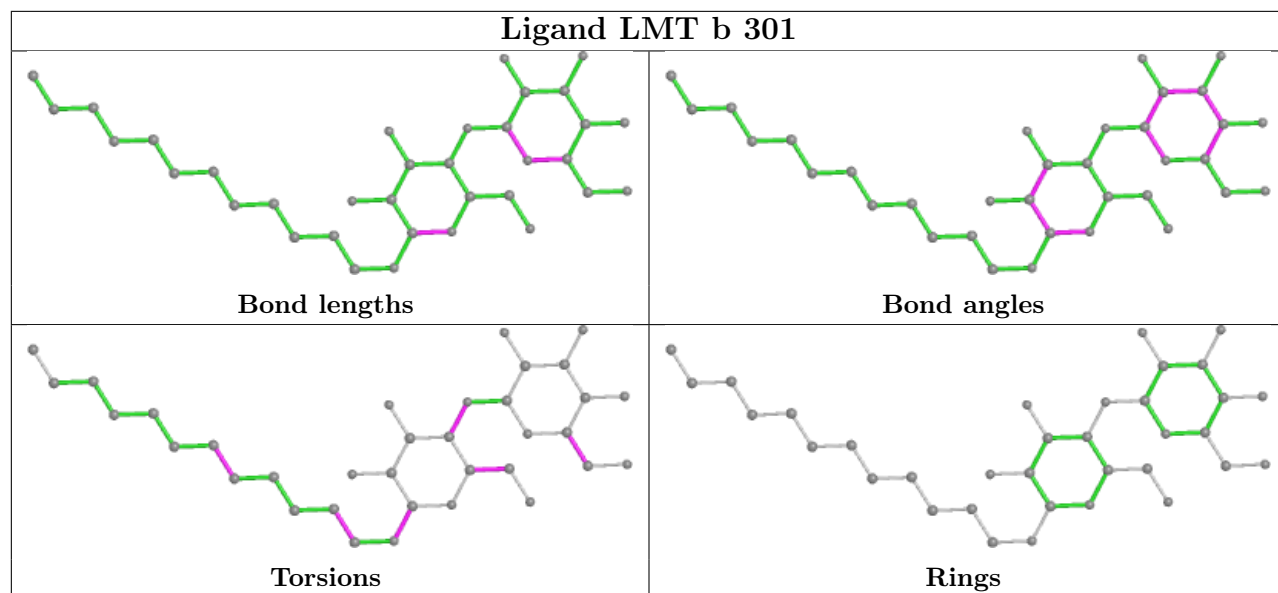
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

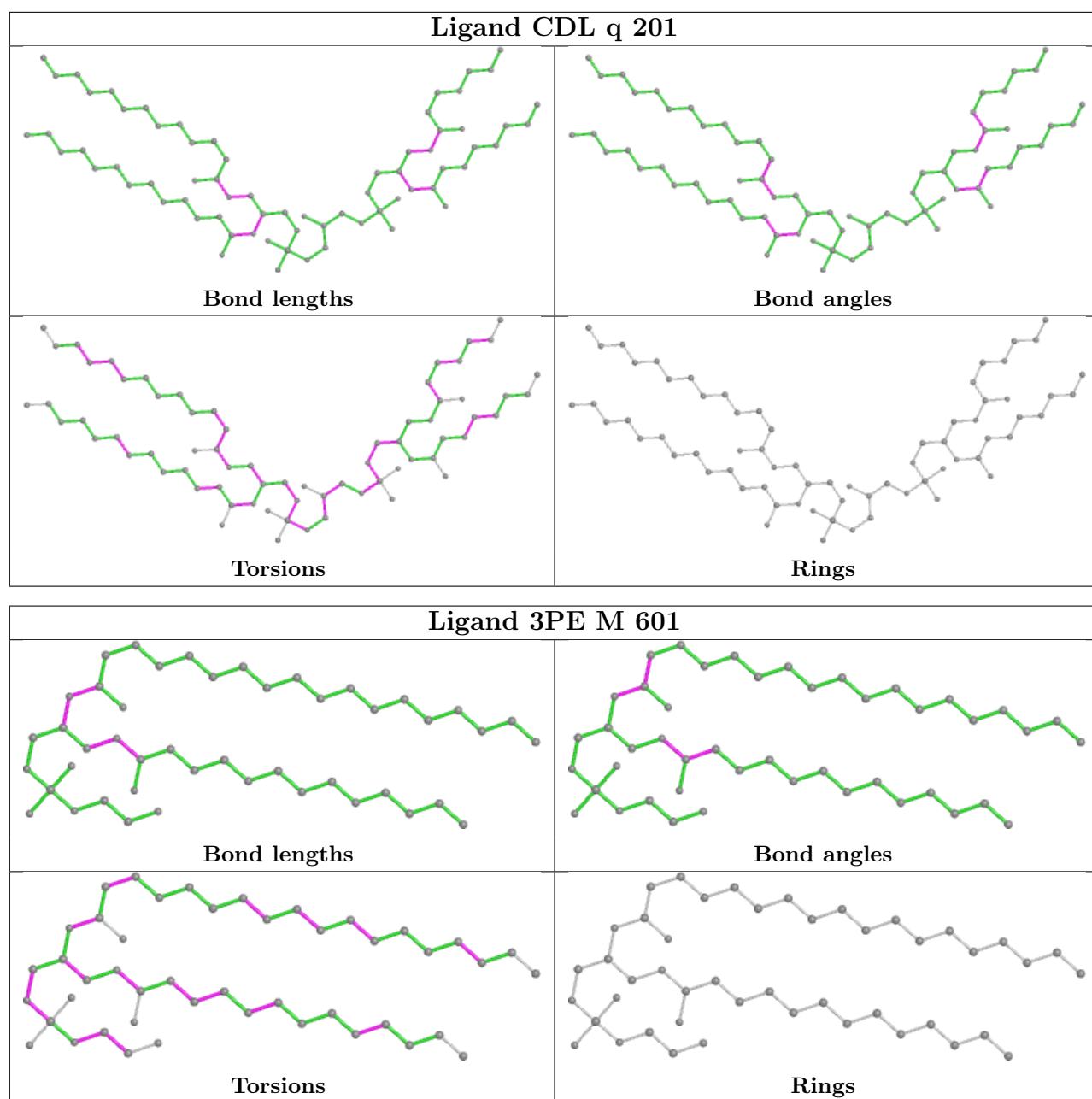


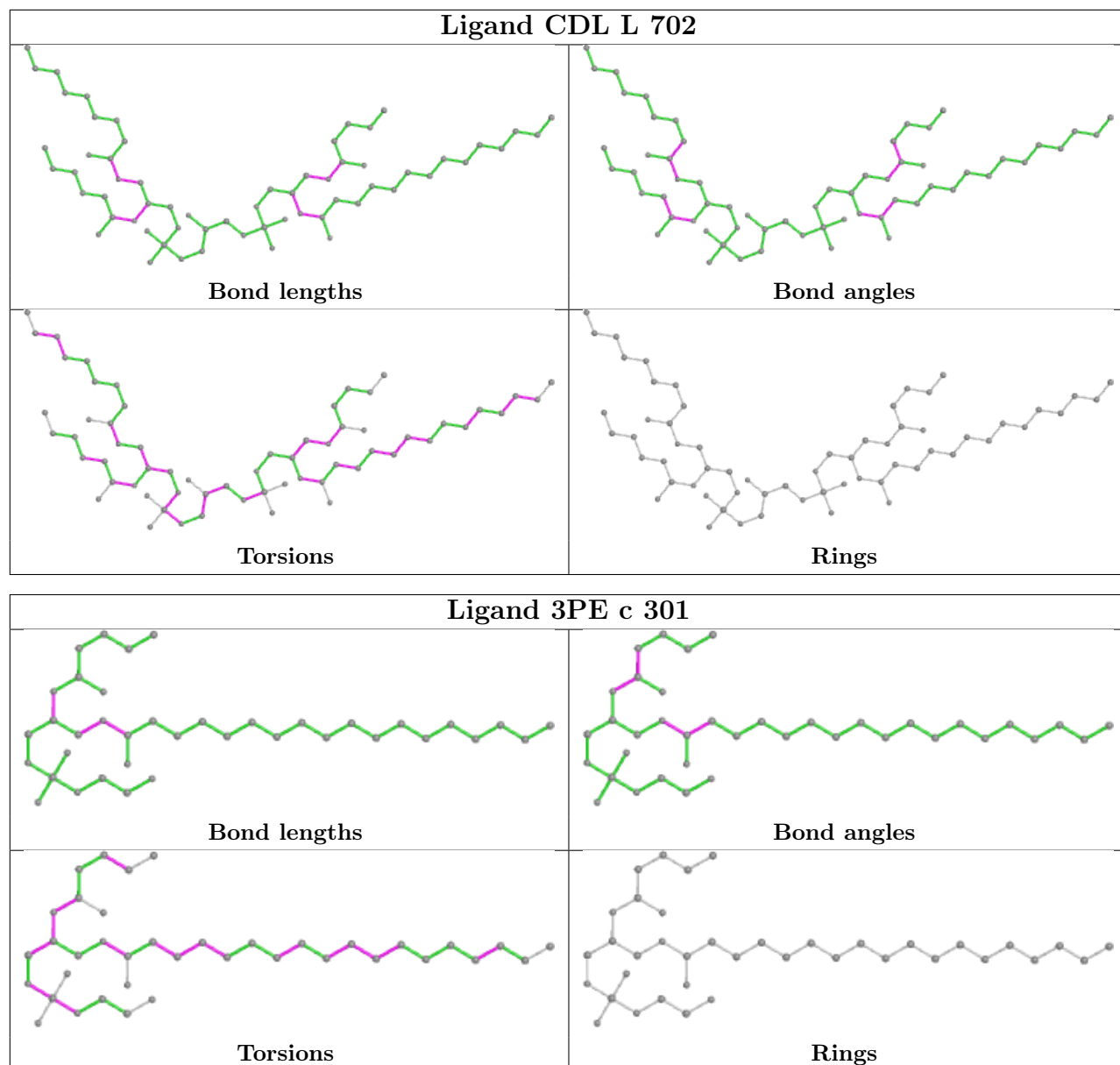


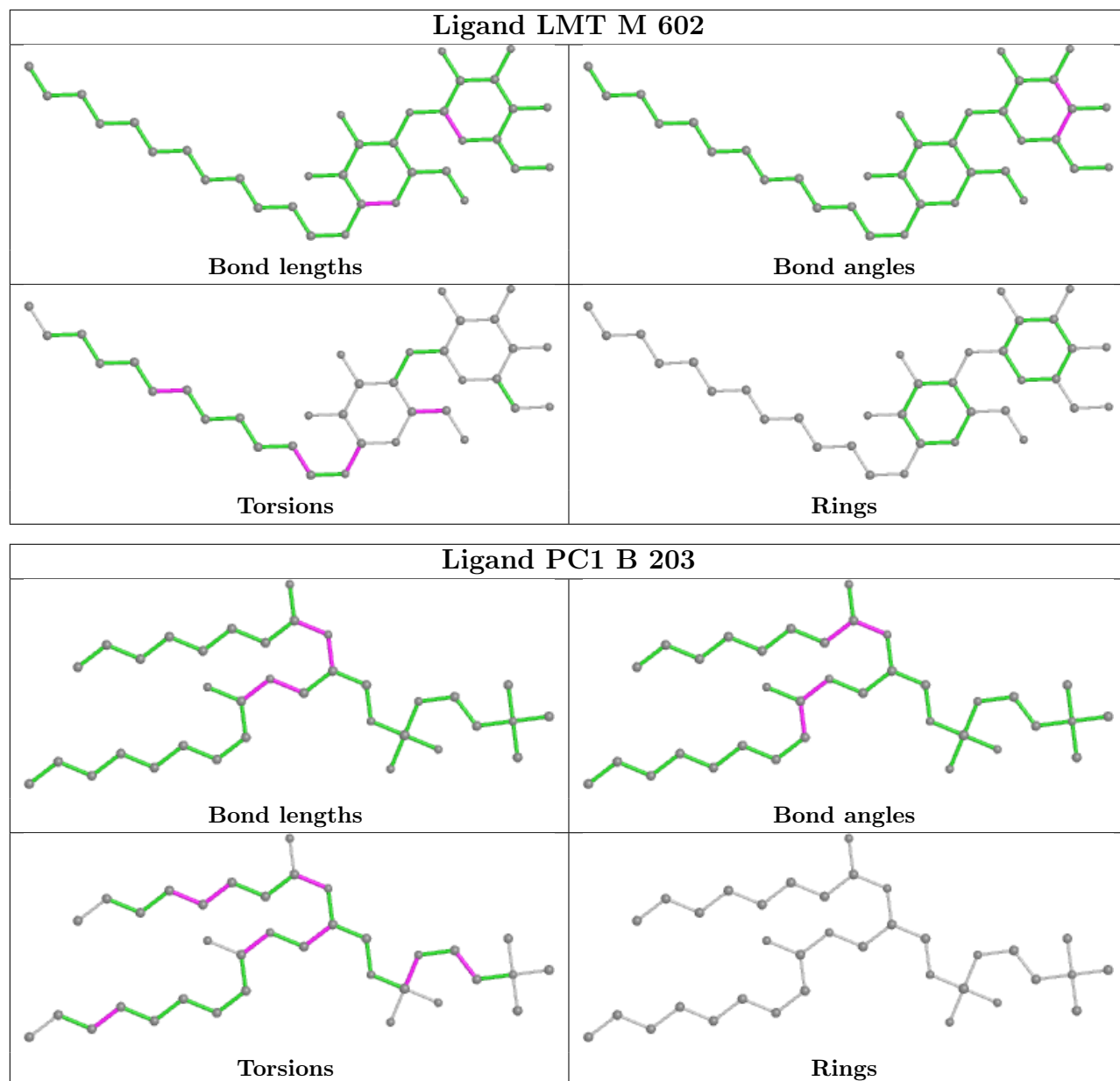




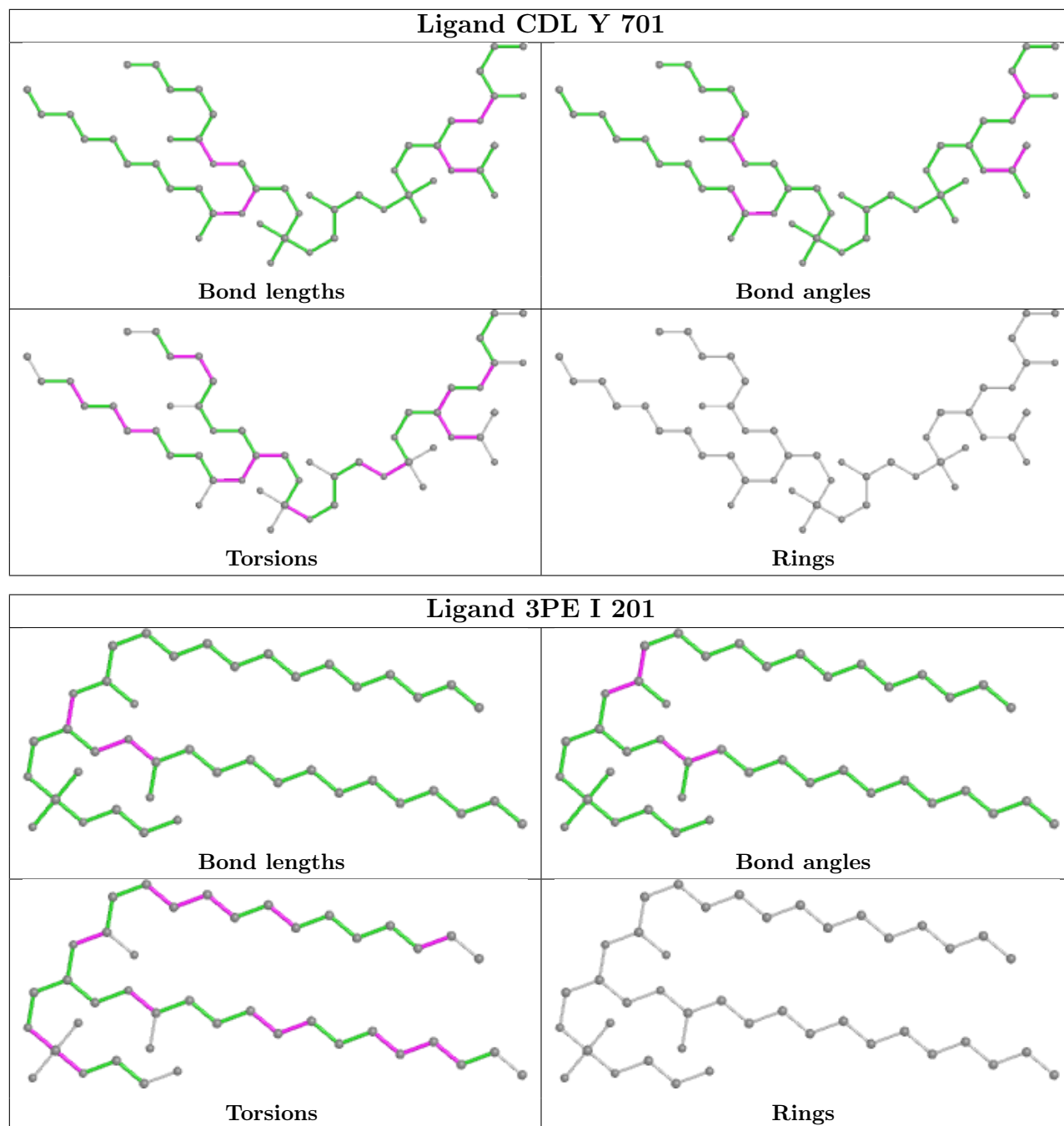


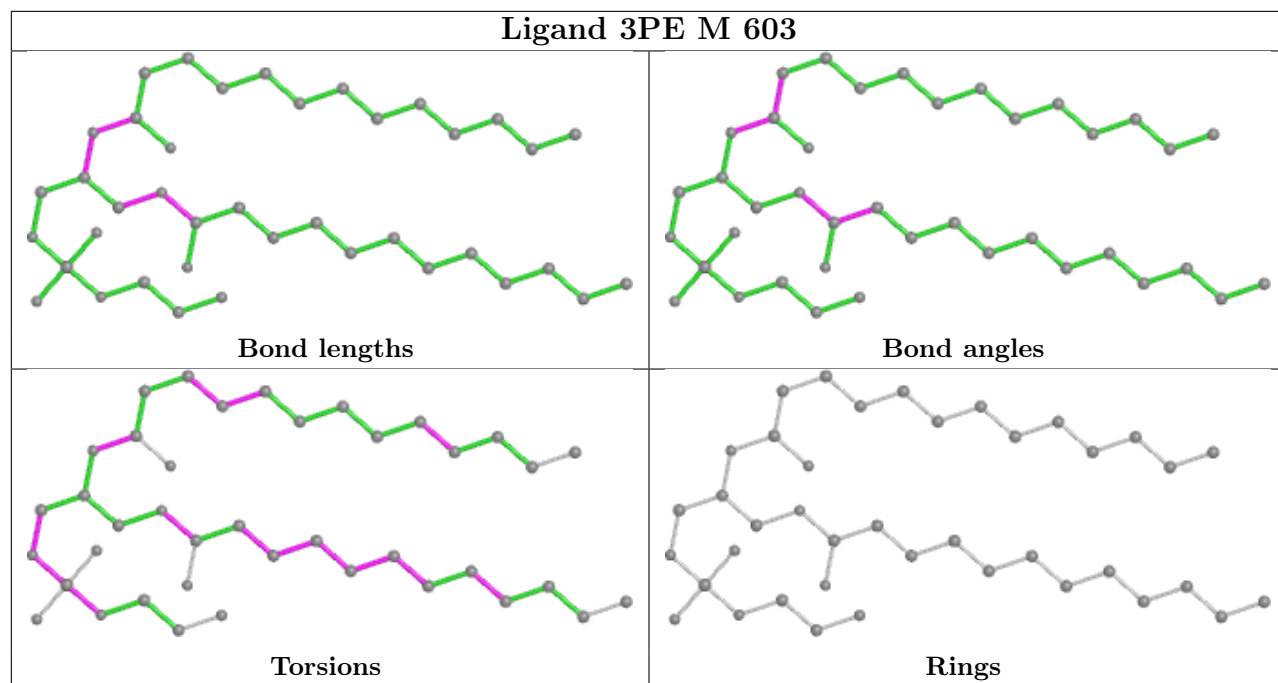


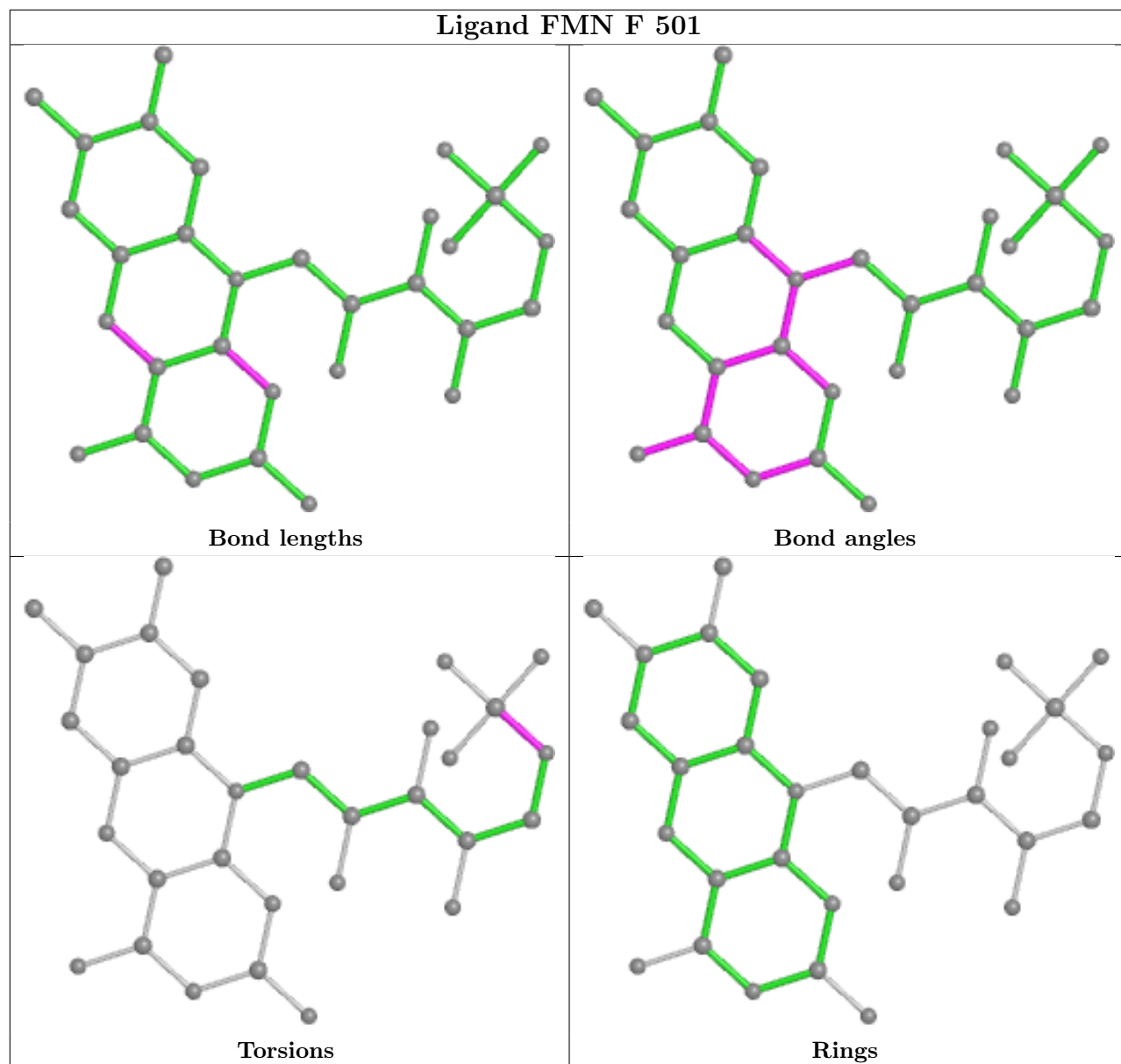


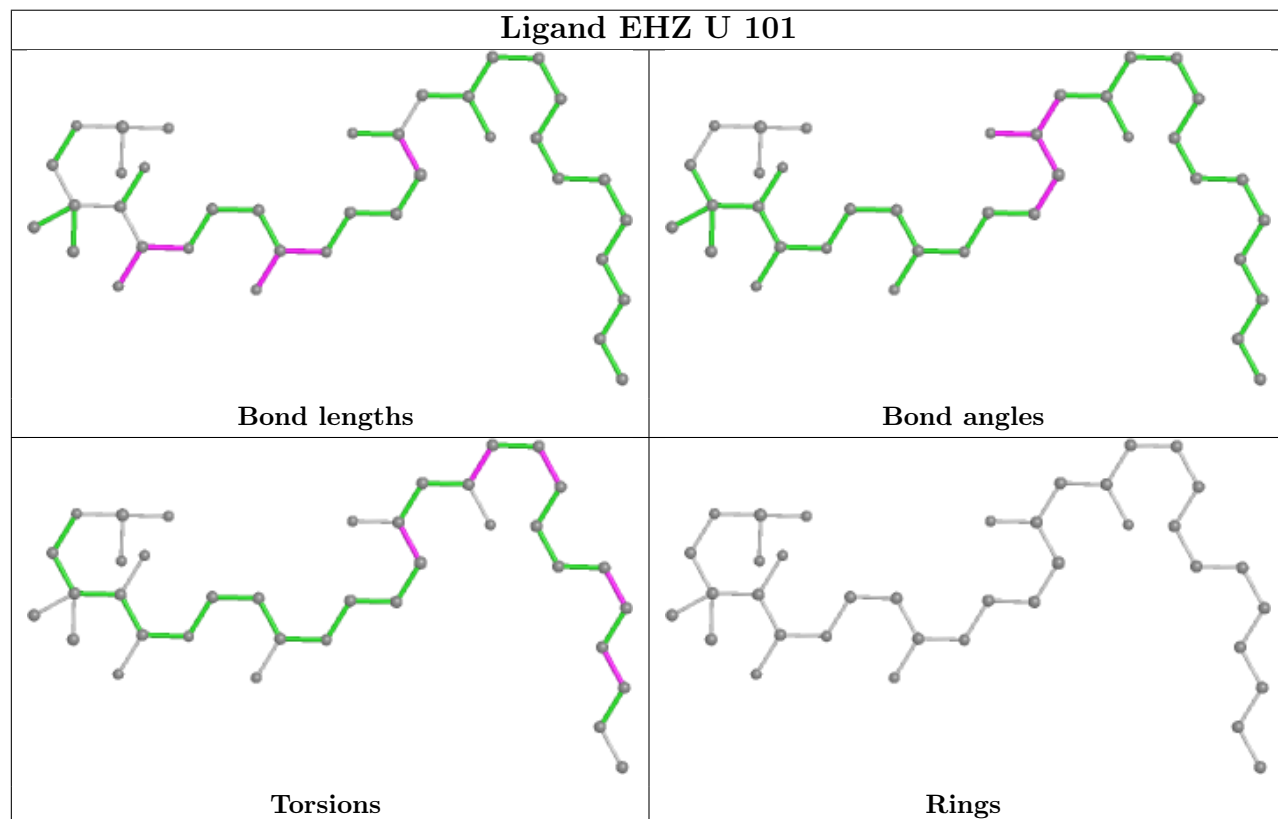
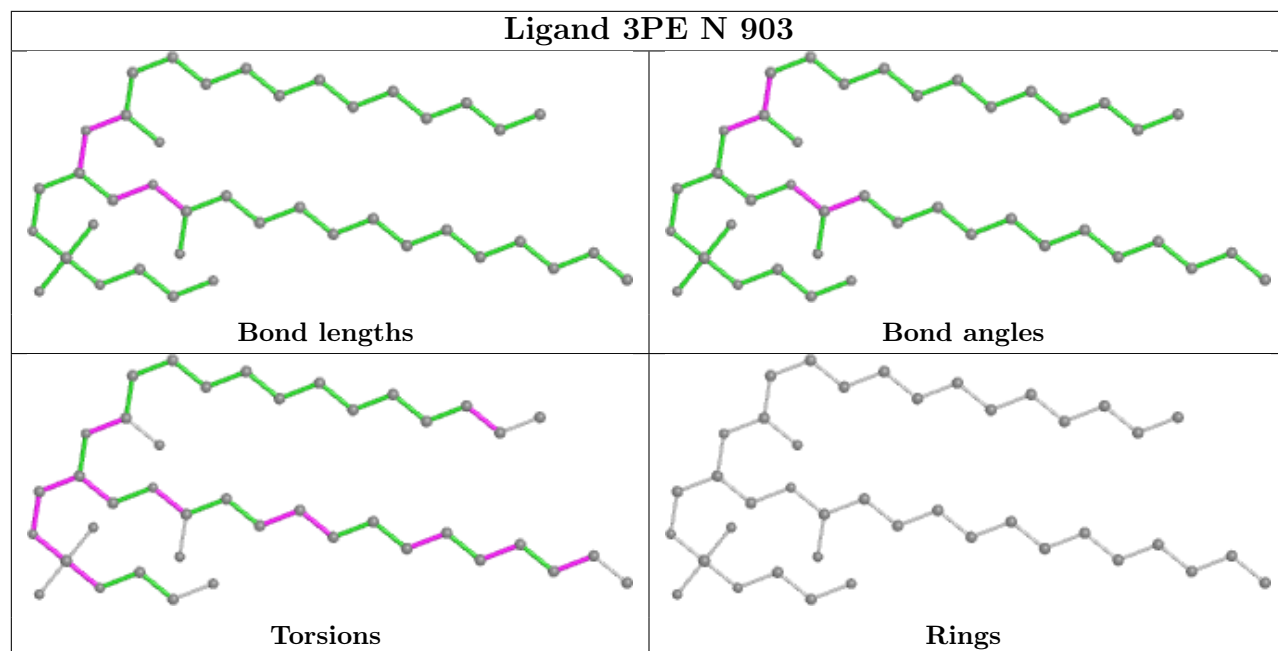


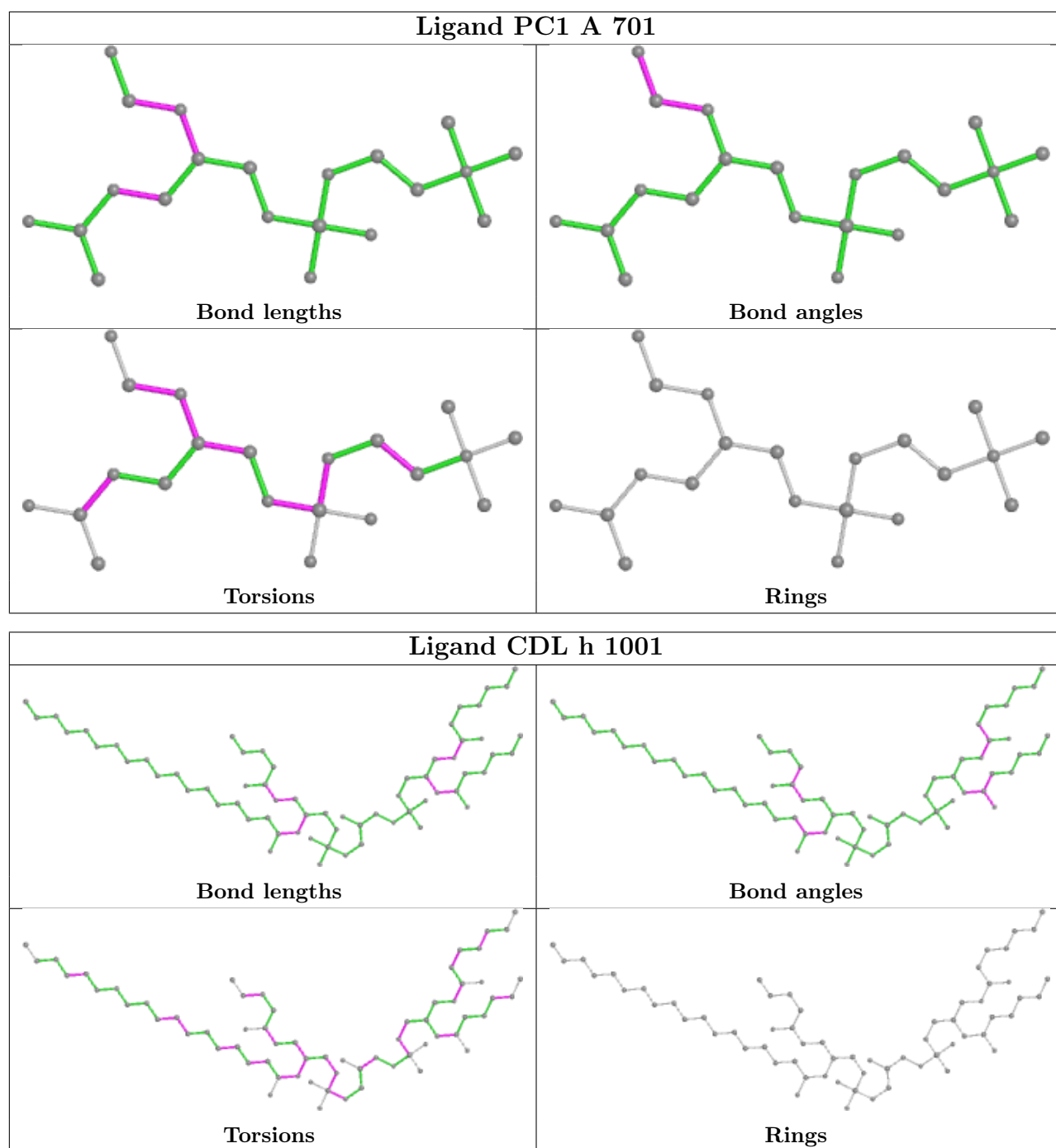


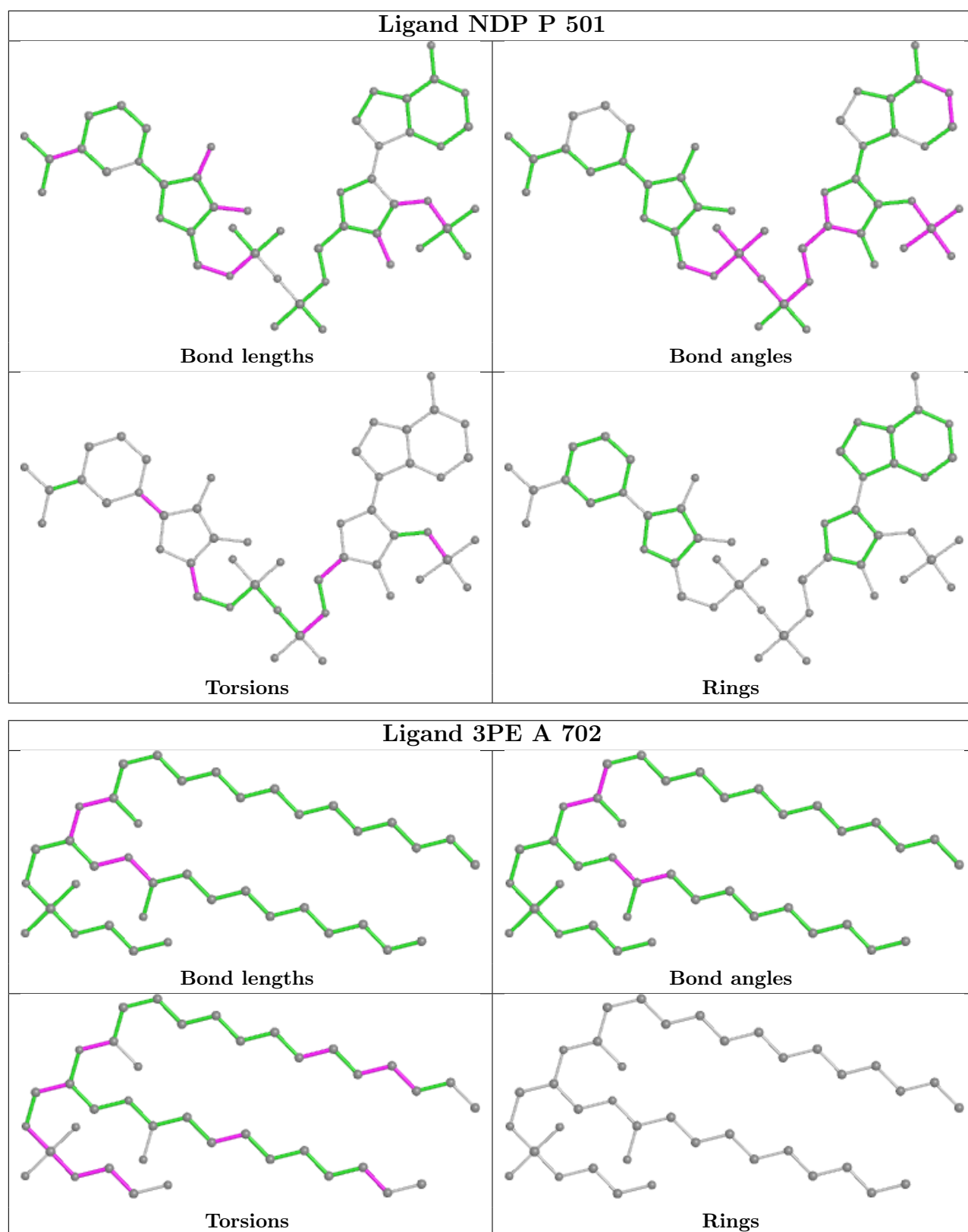


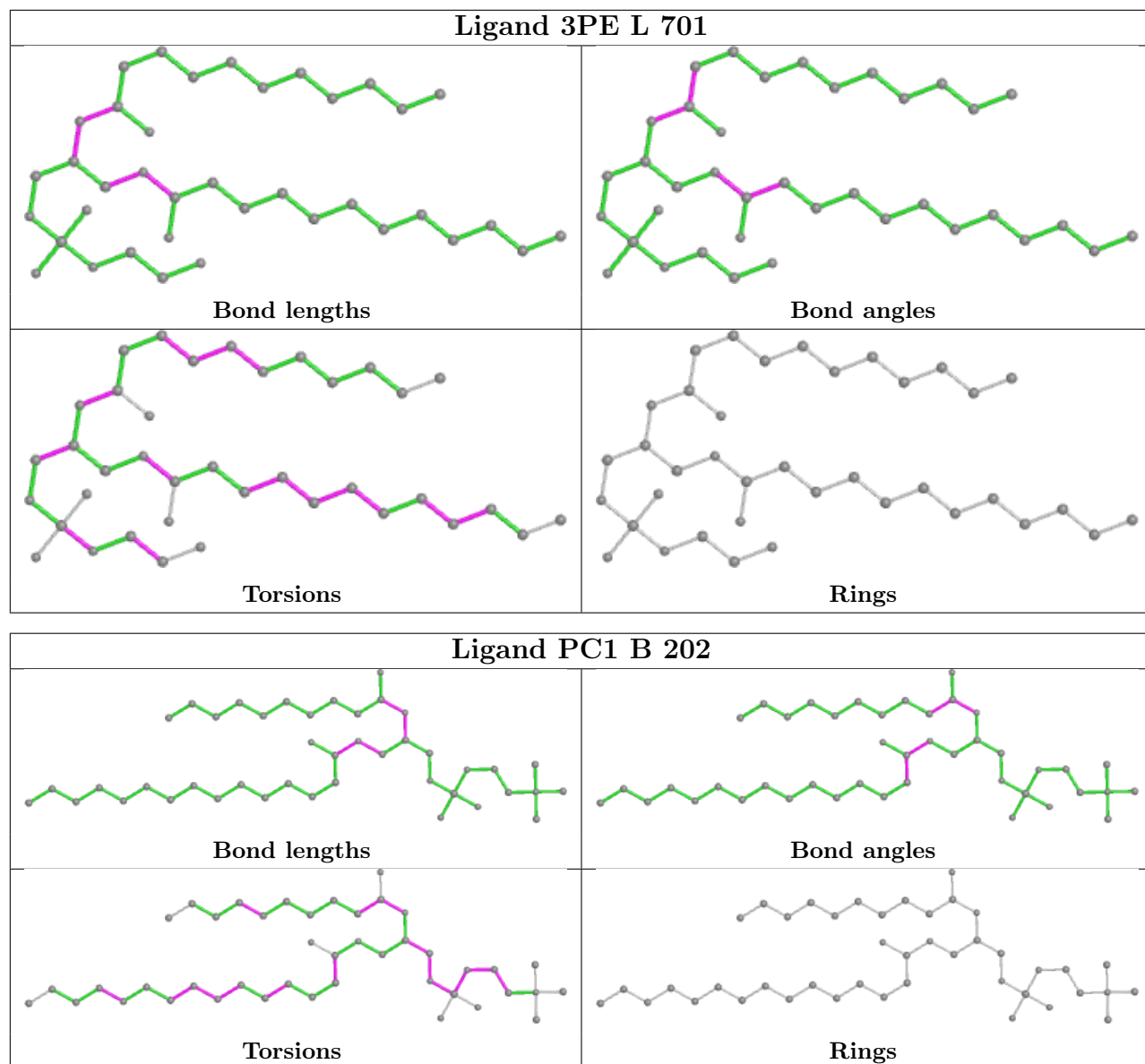


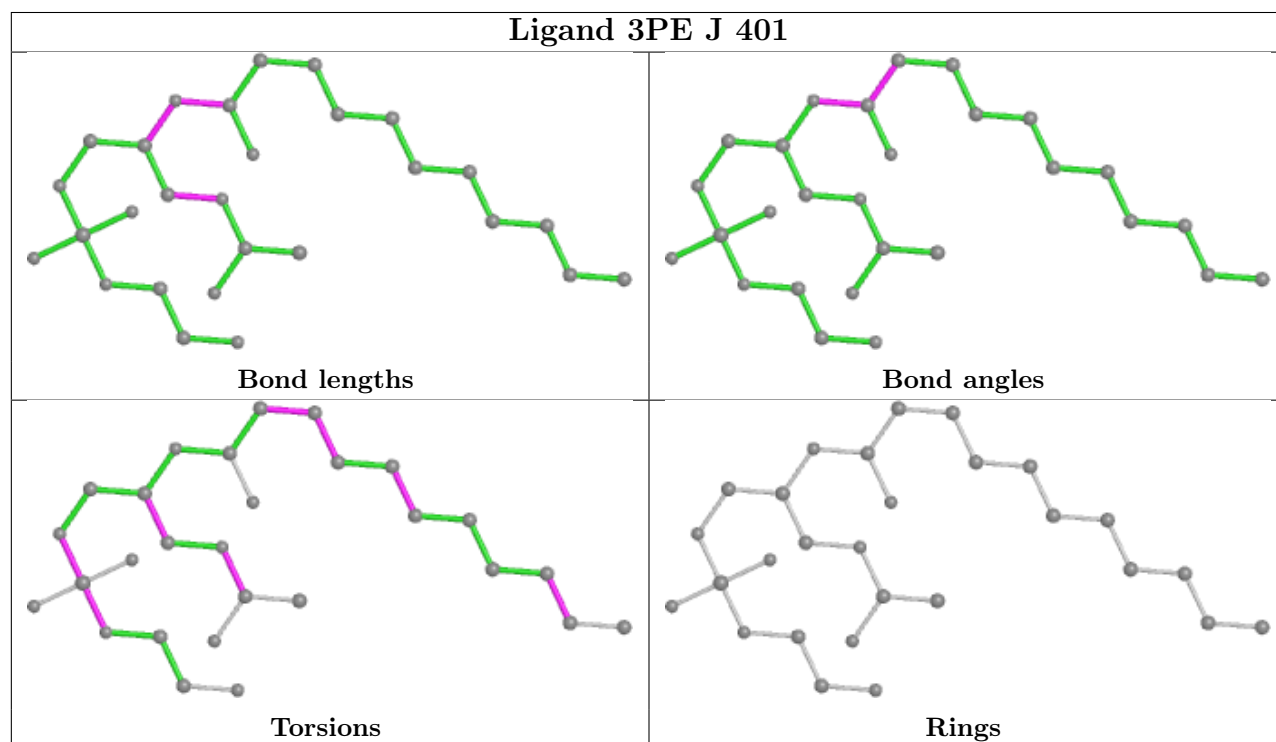
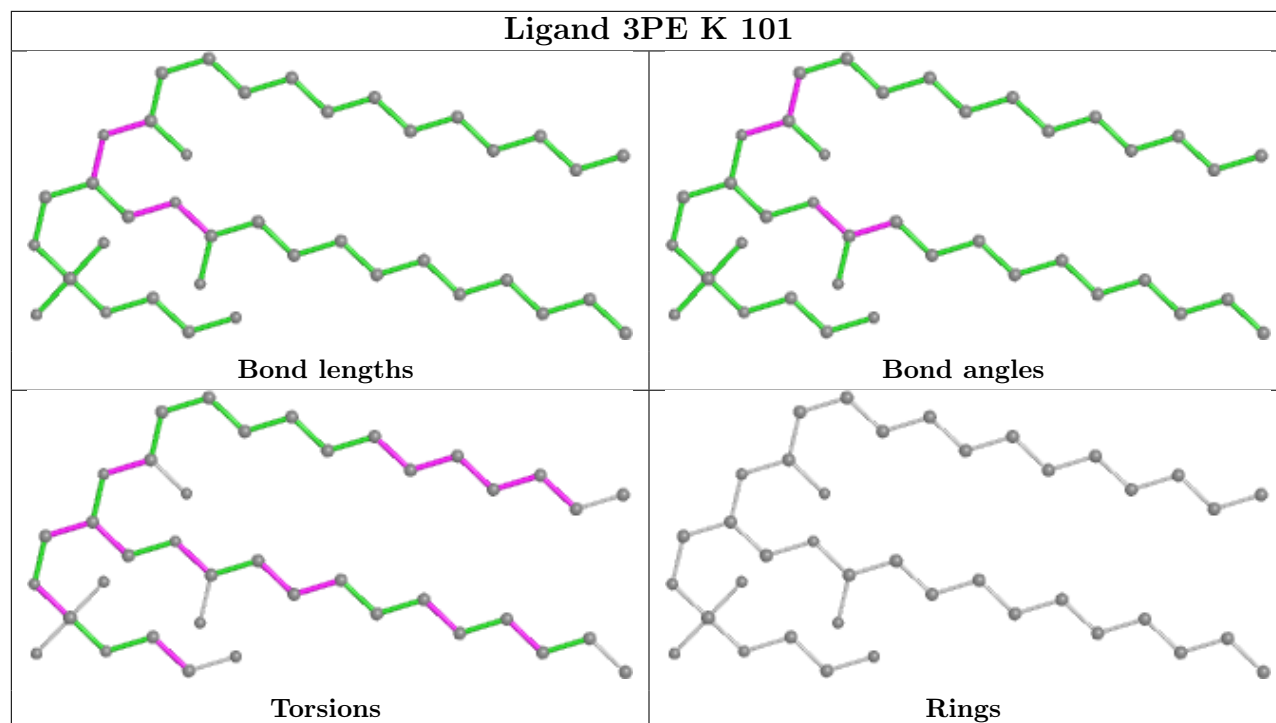




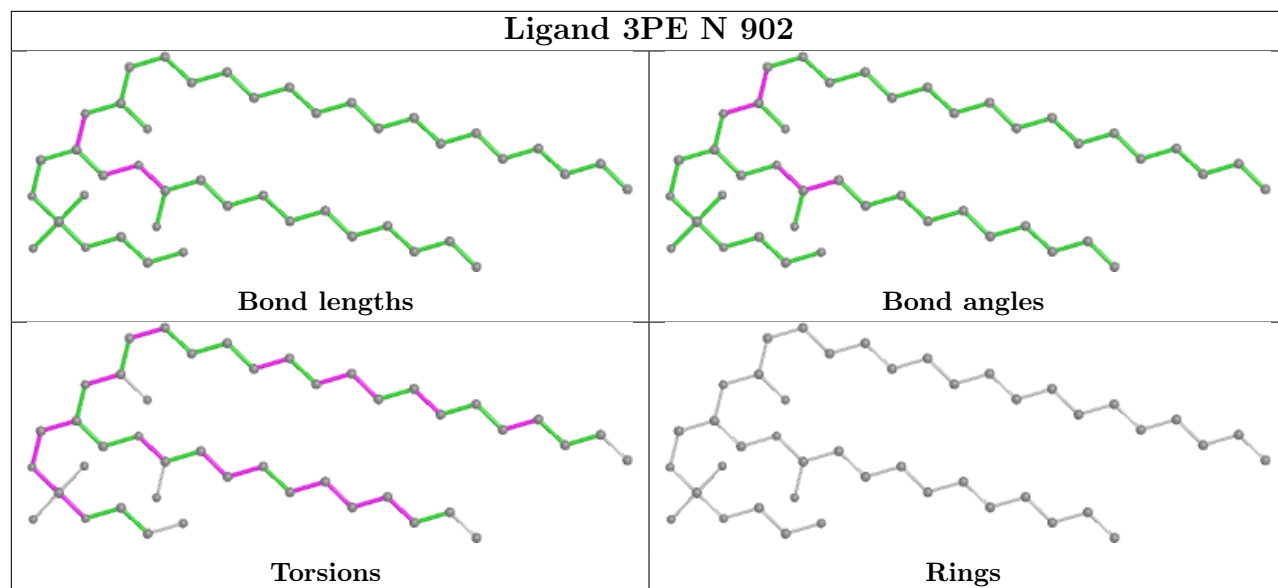












## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

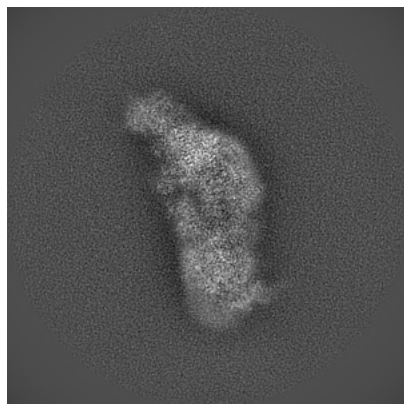
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-14127. These allow visual inspection of the internal detail of the map and identification of artifacts.

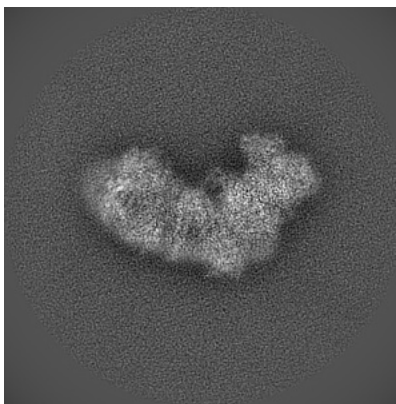
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

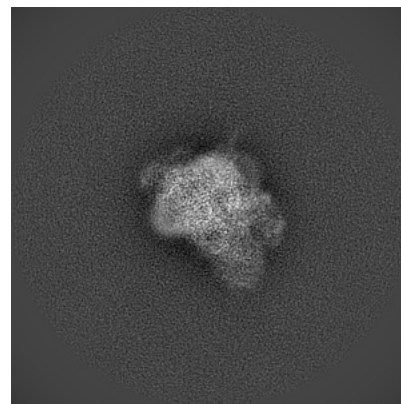
#### 6.1.1 Primary map



X

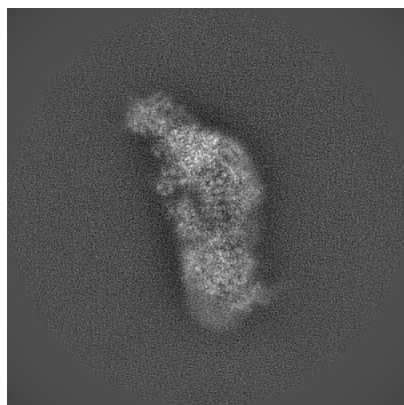


Y

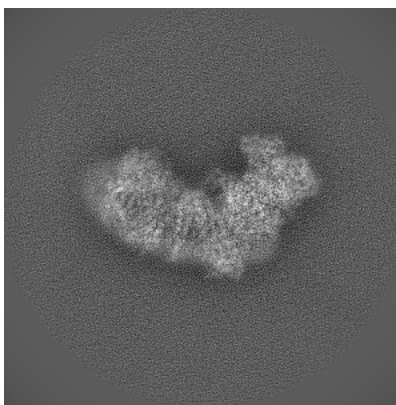


Z

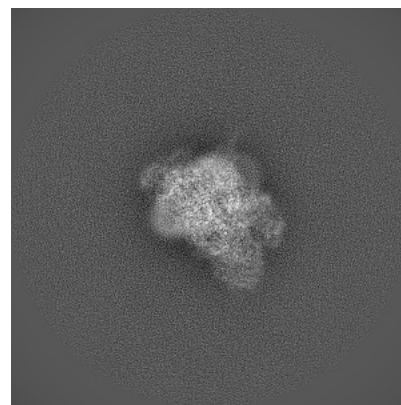
#### 6.1.2 Raw map



X



Y

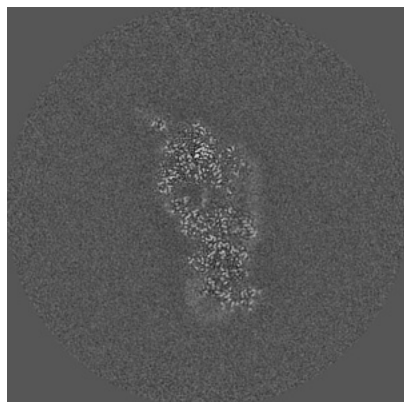


Z

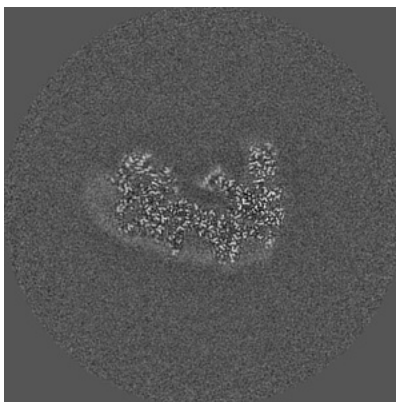
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

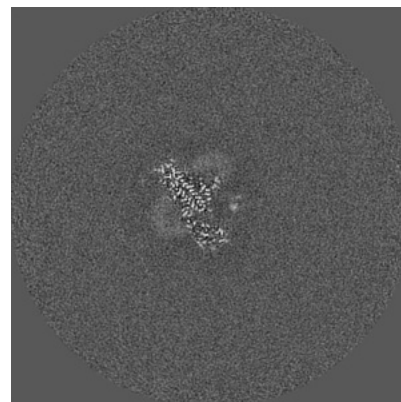
### 6.2.1 Primary map



X Index: 225

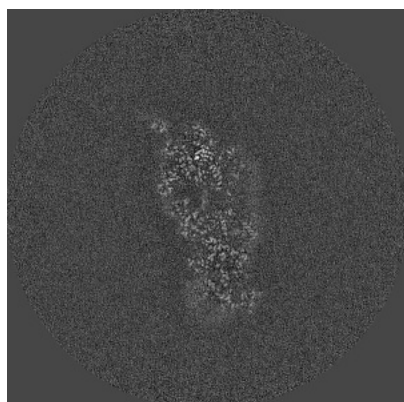


Y Index: 225

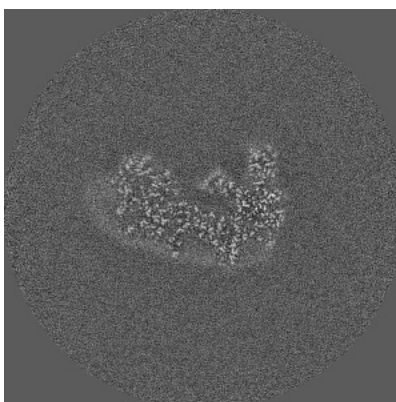


Z Index: 225

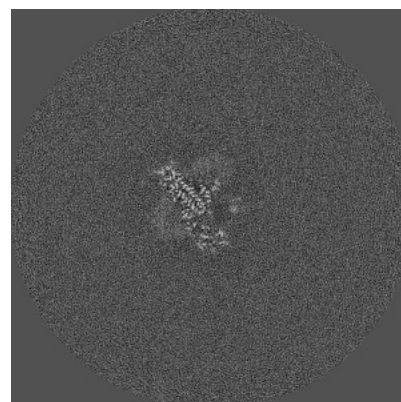
### 6.2.2 Raw map



X Index: 225



Y Index: 225

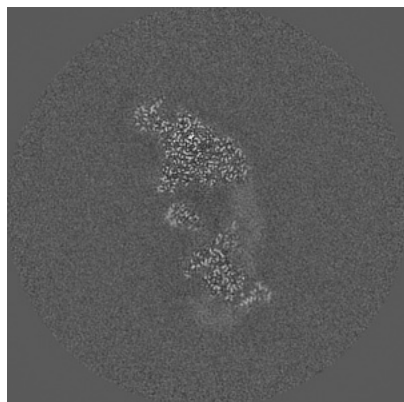


Z Index: 225

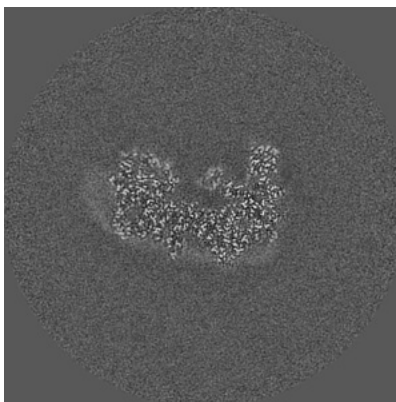
The images above show central slices of the map in three orthogonal directions.

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

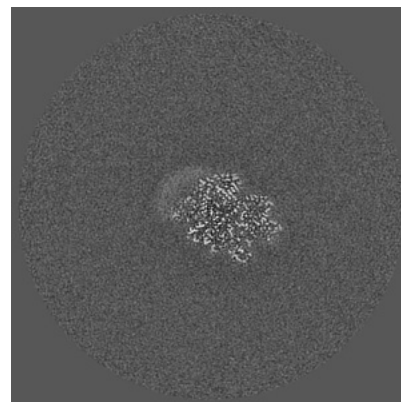
### 6.3.1 Primary map



X Index: 238

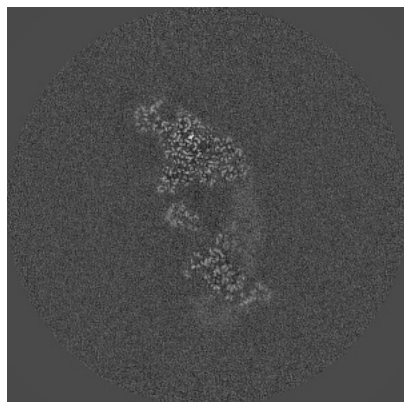


Y Index: 229

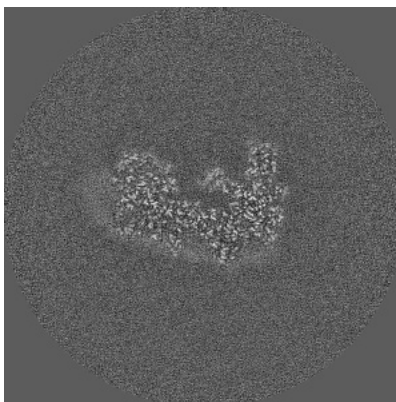


Z Index: 290

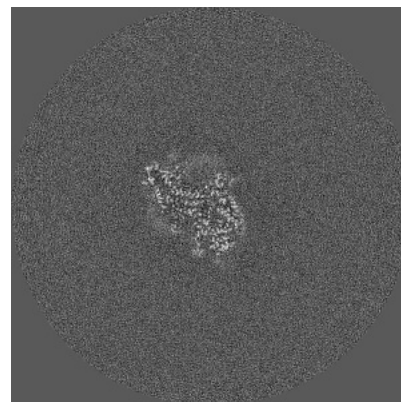
### 6.3.2 Raw map



X Index: 238



Y Index: 227



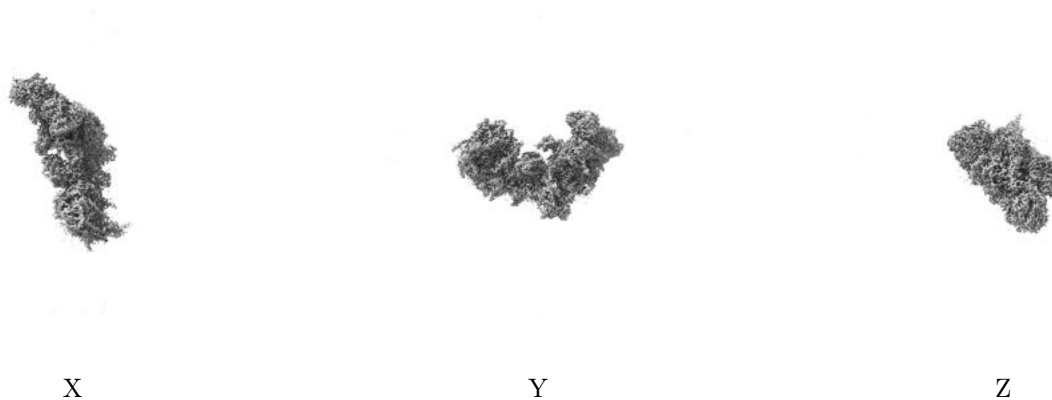
Z Index: 254

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



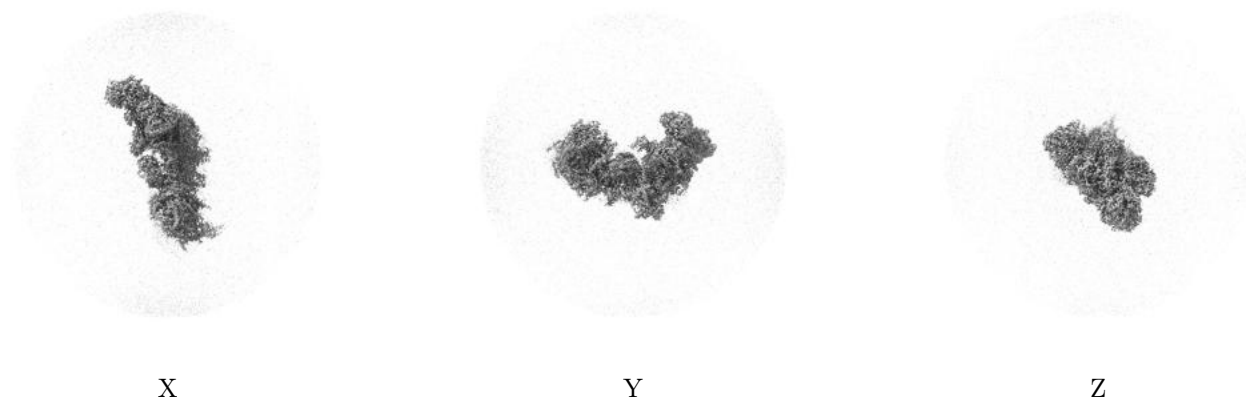
## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 5.08. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.4.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

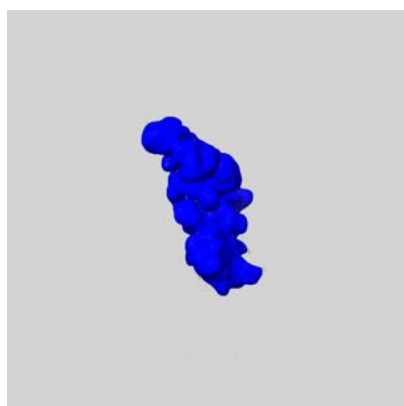
## 6.5 Mask visualisation [i](#)

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

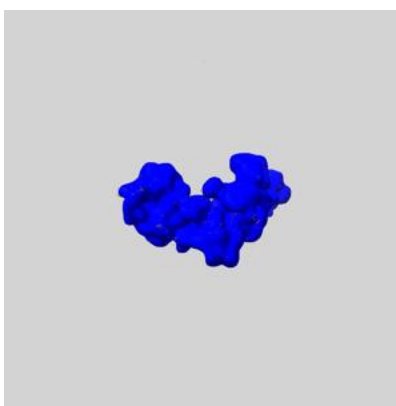
A mask typically either:

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

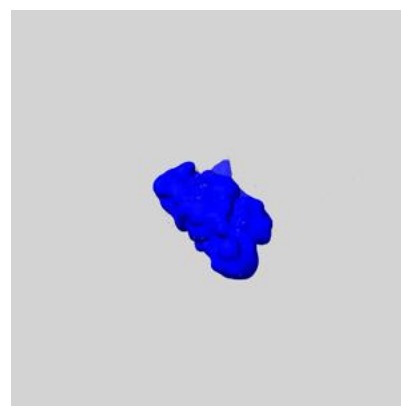
### 6.5.1 emd\_14127\_msk\_1.map [i](#)



X



Y

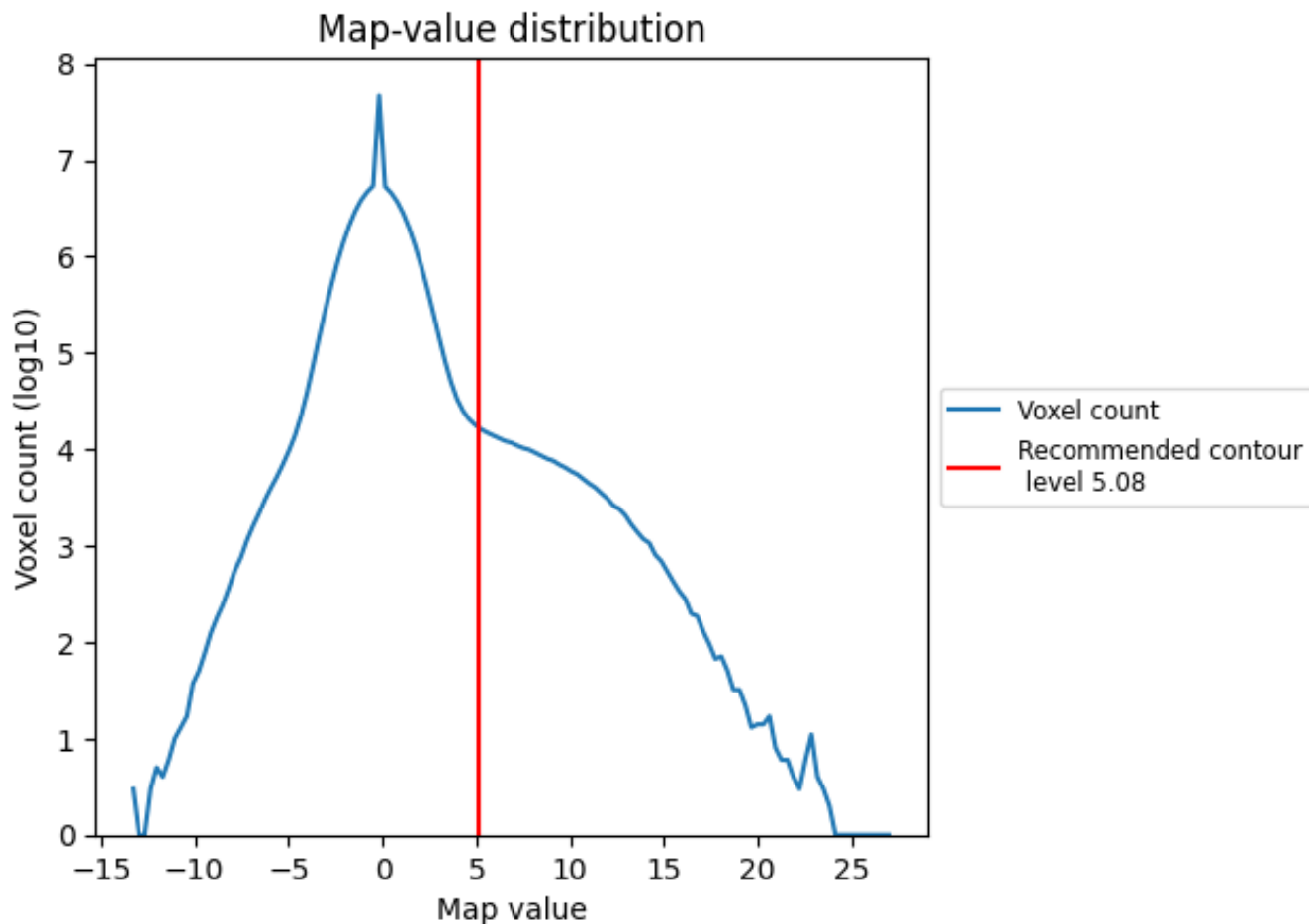


Z

## 7 Map analysis [i](#)

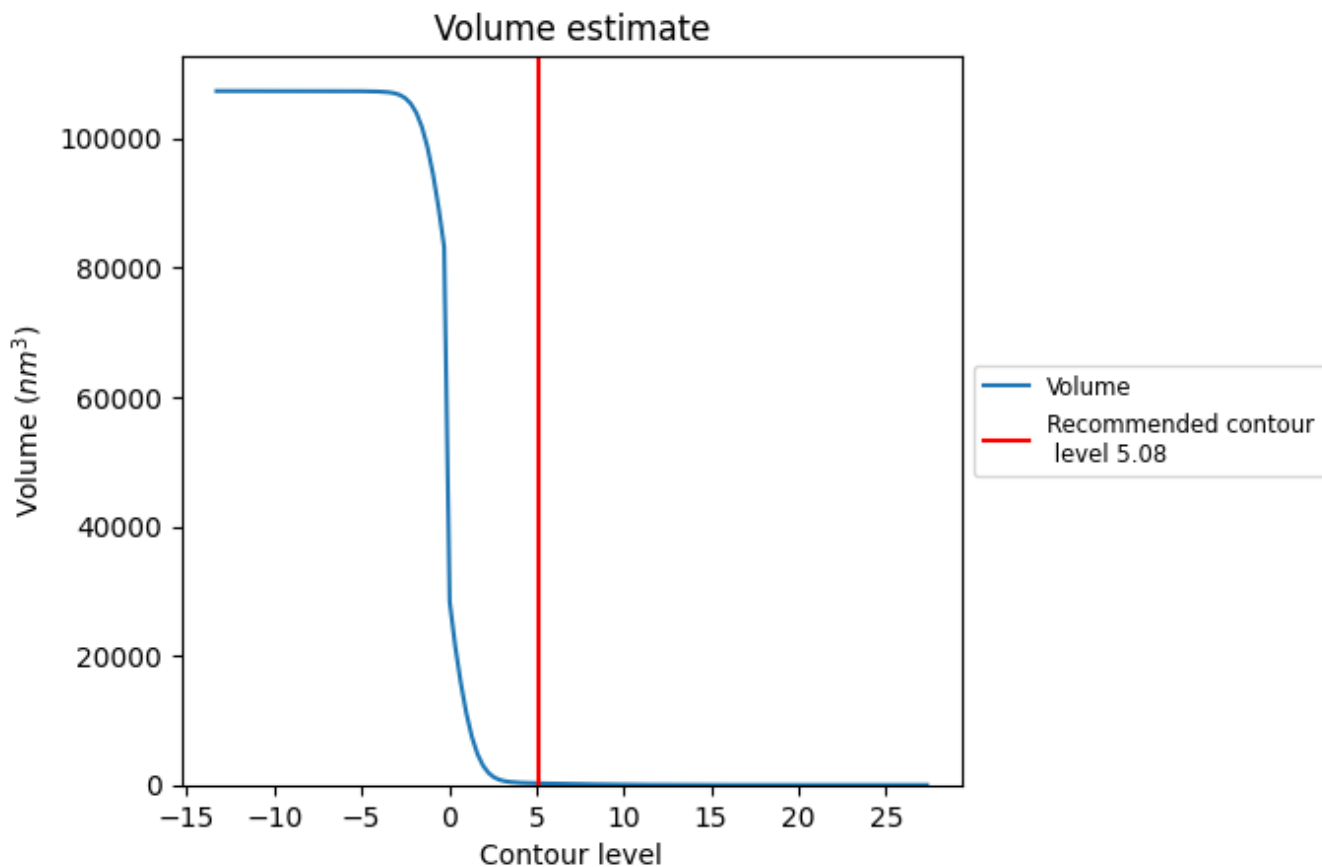
This section contains the results of statistical analysis of the map.

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



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

## 7.2 Volume estimate [i](#)

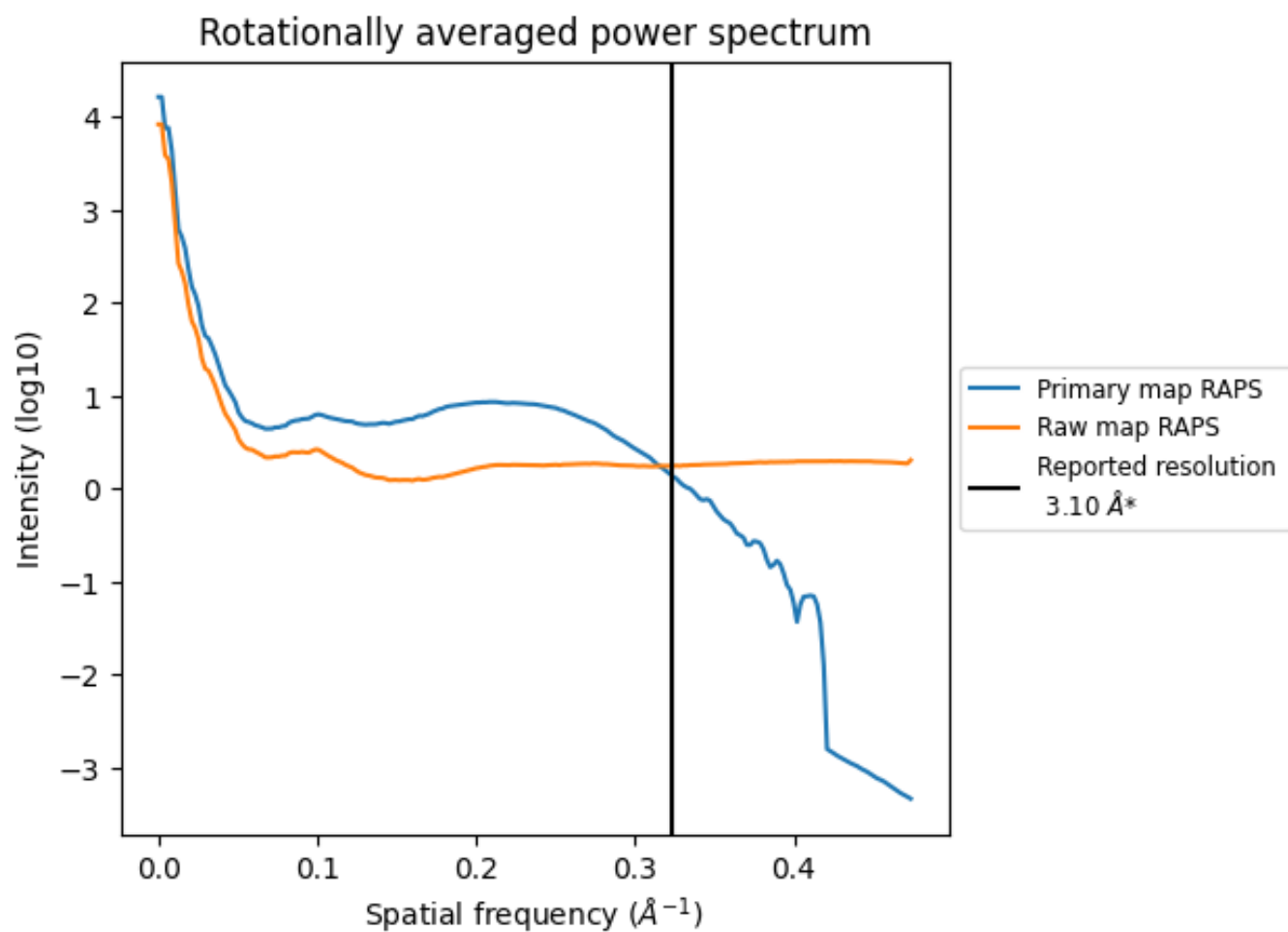


The volume at the recommended contour level is 257 nm<sup>3</sup>; this corresponds to an approximate mass of 232 kDa.

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

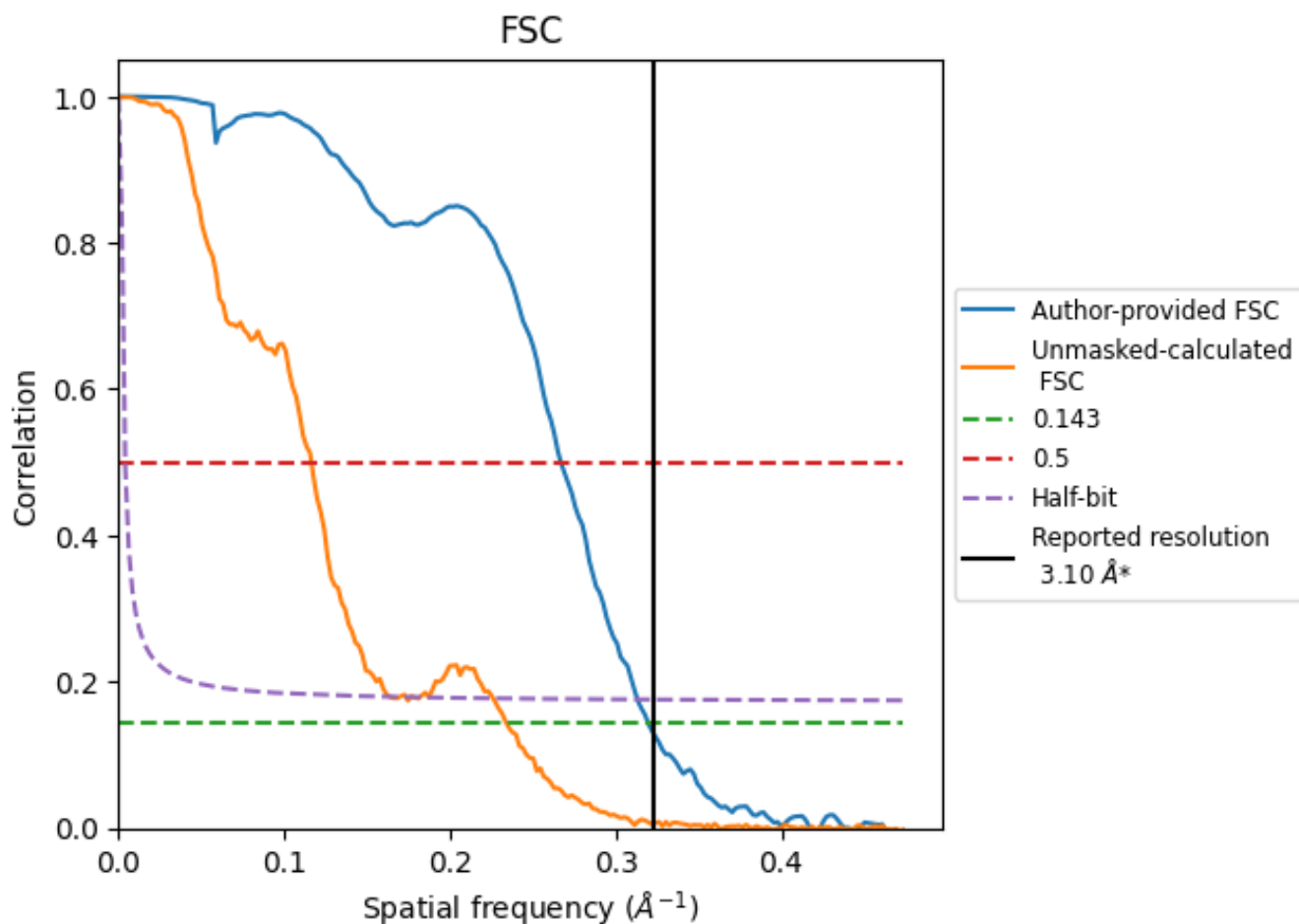


\*Reported resolution corresponds to spatial frequency of  $0.323 \text{ \AA}^{-1}$

## 8 Fourier-Shell correlation [i](#)

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

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of 0.323 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

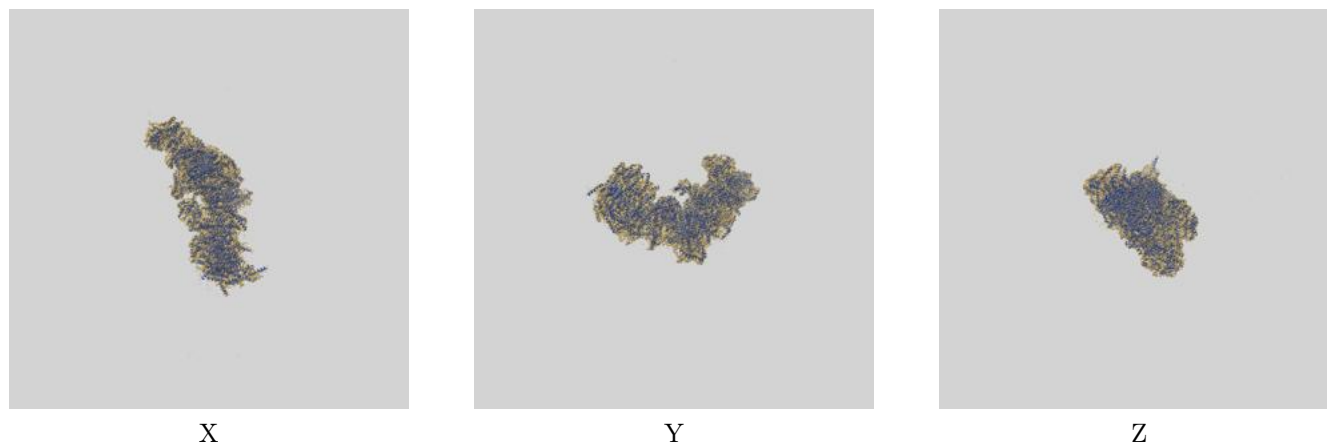
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.10	-	-
Author-provided FSC curve	3.13	3.75	3.19
Unmasked-calculated*	4.27	8.58	6.11

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.27 differs from the reported value 3.1 by more than 10 %

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

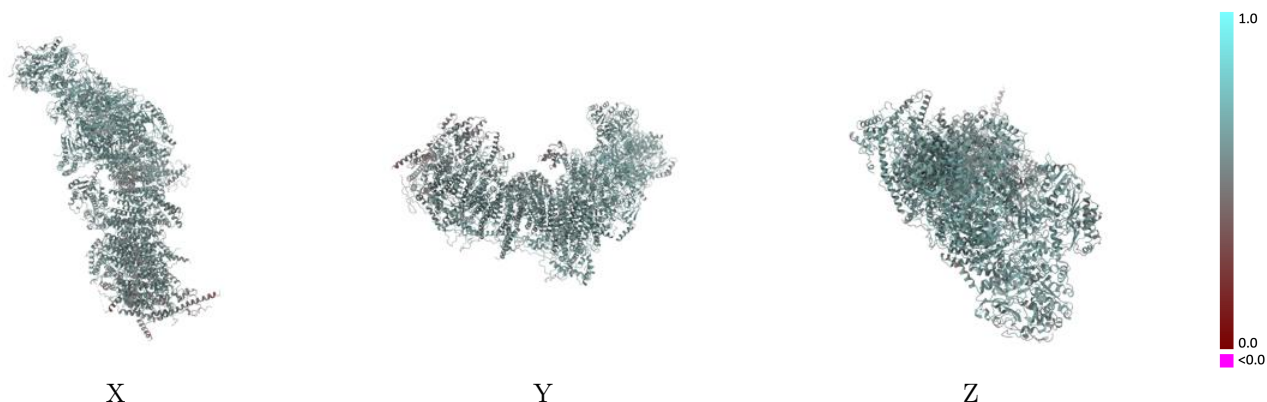
This section contains information regarding the fit between EMDB map EMD-14127 and PDB model 7QSD. Per-residue inclusion information can be found in section 3 on page 20.

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



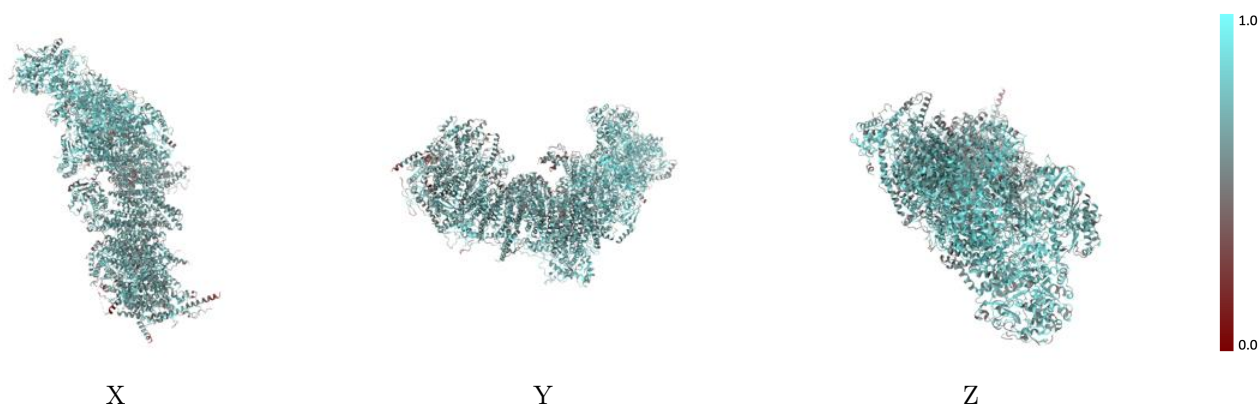
The images above show the 3D surface view of the map at the recommended contour level 5.08 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



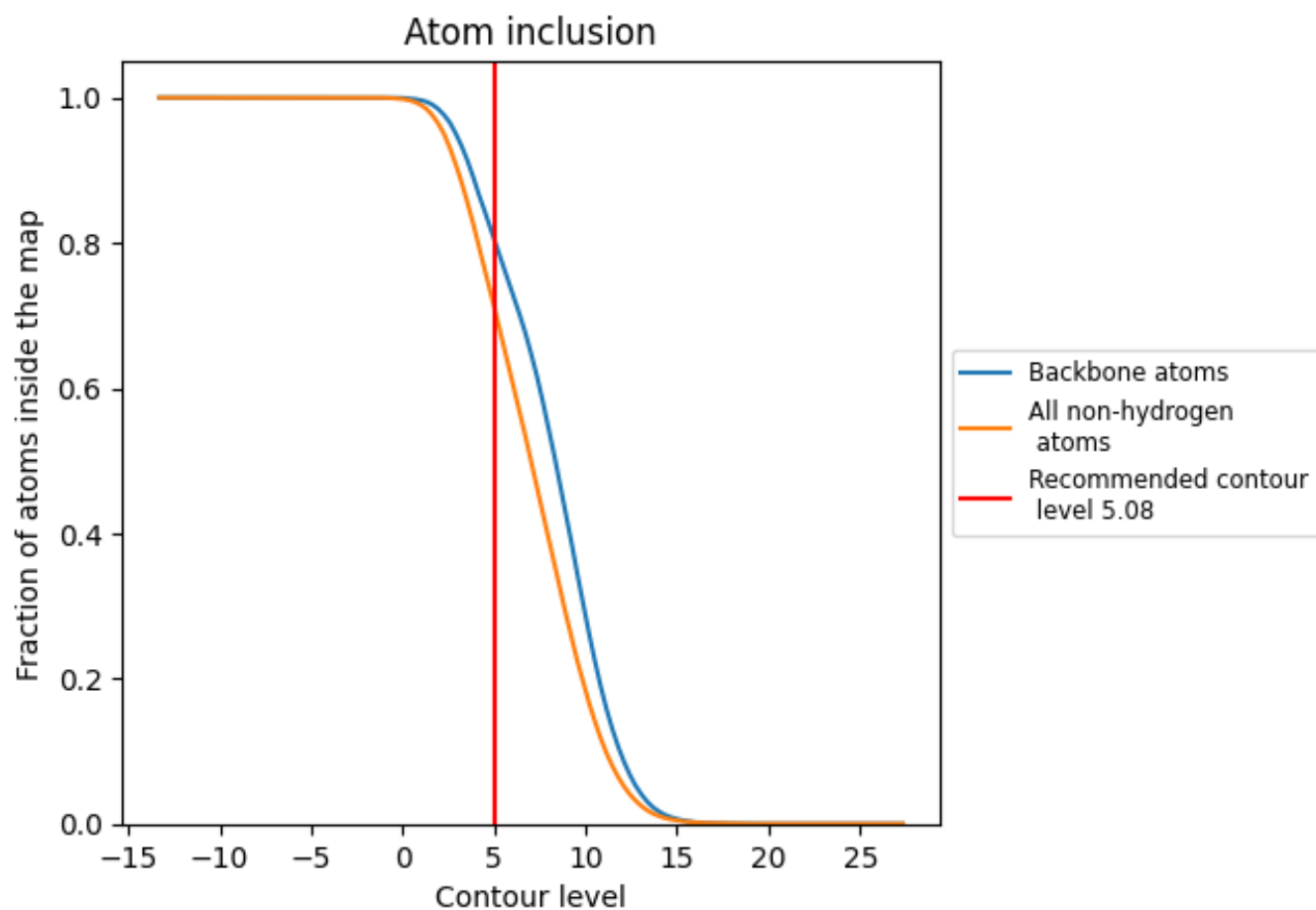
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (5.08).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 80% of all backbone atoms, 70% 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 (5.08) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7046	 0.5850
A	 0.6564	 0.6000
B	 0.8025	 0.6320
C	 0.8130	 0.6290
D	 0.7956	 0.6240
E	 0.7062	 0.5780
F	 0.7347	 0.5800
G	 0.7547	 0.6010
H	 0.7602	 0.6190
I	 0.8282	 0.6280
J	 0.6709	 0.5910
K	 0.7288	 0.6090
L	 0.6545	 0.5670
M	 0.7199	 0.6070
N	 0.7337	 0.6140
O	 0.6702	 0.5660
P	 0.7398	 0.5960
Q	 0.7261	 0.6120
R	 0.7293	 0.6020
S	 0.6778	 0.5550
T	 0.5031	 0.4900
U	 0.5768	 0.5180
V	 0.6659	 0.5880
W	 0.6815	 0.5940
X	 0.6943	 0.5780
Y	 0.5818	 0.5510
Z	 0.7110	 0.5910
a	 0.7322	 0.5980
b	 0.6577	 0.5660
c	 0.5589	 0.5550
d	 0.6751	 0.5830
e	 0.6897	 0.5810
f	 0.5896	 0.5460
g	 0.6541	 0.5720
h	 0.7051	 0.5920



*Continued on next page...*

*Continued from previous page...*

Chain	Atom inclusion	Q-score
i	 0.5531	 0.5260
j	 0.6451	 0.4950
k	 0.5796	 0.4990
l	 0.6751	 0.5440
m	 0.6386	 0.5500
n	 0.6752	 0.5500
o	 0.5889	 0.4930
p	 0.6779	 0.5610
q	 0.7314	 0.6020
r	 0.7318	 0.6020
s	 0.6547	 0.5530