



wwPDB EM Validation Summary Report ⓘ

Jan 12, 2023 – 07:21 pm GMT

PDB ID : 8B9Z
EMDB ID : EMD-15936
Title : Drosophila melanogaster complex I in the Active state (Dm1)
Authors : Agip, A.A.; Chung, I.; Sanchez-Martinez, A.; Whitworth, A.J.; Hirst, J.
Deposited on : 2022-10-10
Resolution : 3.28 Å (reported)
Based on initial model : 6ZR2

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

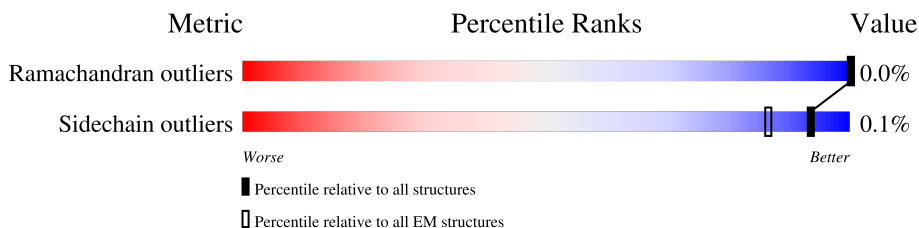
EMDB validation analysis : 0.0.1.dev43
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

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 3.28 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 ≥ 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	117	100%
2	B	182	99%
3	C	209	100%
4	D	430	100%
5	E	214	100%
6	F	441	100%
7	G	731	93% 7%
8	H	315	100%
9	I	186	100%

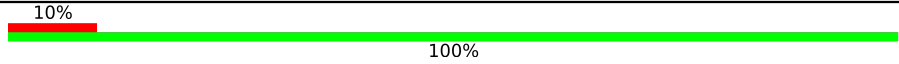
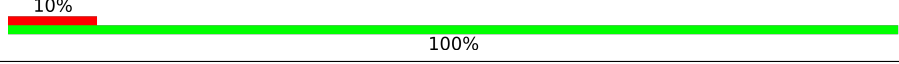
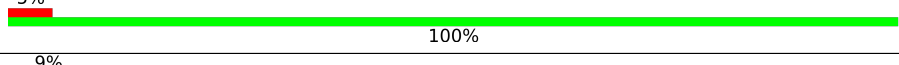
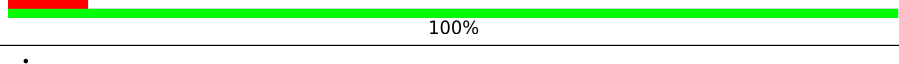
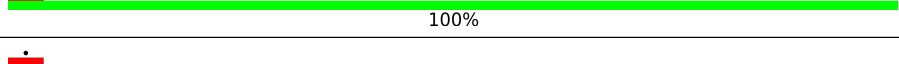
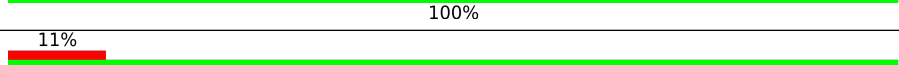
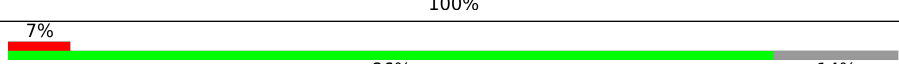
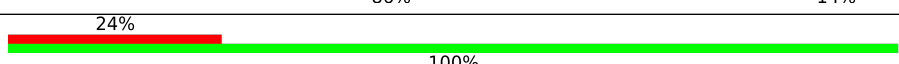

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Mol	Chain	Length	Quality of chain
10	J	173	5% 100%
11	K	96	5% 100%
12	L	577	0% 100%
13	M	446	0% 100%
14	N	341	0% 100%
15	O	368	5% 100%
16	P	377	0% 100%
17	Q	151	9% 99%
18	R	89	0% 100%
19	T	85	33% 91% 9%
19	U	85	12% 100%
20	V	118	0% 100%
21	W	114	0% 100%
22	X	174	7% 100%
23	Y	167	10% 100%
24	Z	146	0% 100%
25	a	73	12% 100%
26	b	66	6% 100%
27	d	115	0% 100%
28	e	100	5% 100%
29	f	55	16% 100%
30	g	108	12% 100%
31	h	145	0% 100%
32	i	161	6% 99%
33	j	66	8% 100%

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Mol	Chain	Length	Quality of chain
34	k	84	 10% 100%
35	l	146	 10% 100%
36	m	108	 5% 100%
37	n	134	 9% 100%
38	o	112	 . 100%
39	p	151	 . 100%
40	q	133	 11% 100%
41	r	103	 7% 86% 14%
42	s	62	 24% 100%

2 Entry composition

There are 54 unique types of molecules in this entry. The entry contains 66970 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	117	956	652	141	156	7	0	0

- Molecule 2 is a protein called LD31474p.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	182	1435	920	251	250	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	209	1726	1103	303	315	5	0	0

- Molecule 4 is a protein called Complex I-49kD.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	430	3434	2202	579	630	23	0	0

- Molecule 5 is a protein called NADH dehydrogenase (Ubiquinone) 24 kDa subunit, isoform A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	214	1679	1062	285	320	12	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	441	3381	2136	602	617	26	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	677	5146	3225	912	980	29	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	315	2571	1764	367	418	22	0	0

- Molecule 9 is a protein called NADH dehydrogenase (ubiquinone) 23 kDa subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	I	186	1485	935	251	287	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	173	1397	946	201	233	17	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	96	793	540	113	127	13	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	577	4606	3092	680	774	60	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	446	3617	2459	533	583	42	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	341	2796	1893	411	458	34	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	368	3007	1927	504	560	16	0	0

- Molecule 16 is a protein called NADH dehydrogenase (Ubiquinone) 39 kDa subunit, isoform A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	P	377	3032	1934	546	542	10	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	151	1214	756	227	227	4	0	0

- 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	R	89	716	453	130	129	4	0	0

- Molecule 19 is a protein called Acyl carrier protein, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	T	77	615	398	94	121	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	U	85	684	442	103	137	2	0	0

- Molecule 20 is a protein called NADH dehydrogenase (Ubiquinone) 13 kDa B subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	V	118	922	588	162	168	4	0	0

- Molecule 21 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	W	114	968	620	172	170	6	0	0

- Molecule 22 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	X	174	1383	867	240	266	10	0	0

- Molecule 23 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	Y	167	1277	829	212	230	6	0	0

- Molecule 24 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	Z	146	1201	787	203	209	2	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	a	73	601	386	101	108	6	0	0

- Molecule 26 is a protein called RH45008p.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	b	66	519	327	95	96	1	0	0

- Molecule 27 is a protein called NADH dehydrogenase [ubiquinone] 1 subunit C2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	d	115	907	590	159	157	1	0	0

- Molecule 28 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	e	100	828	523	145	149	11	0	0

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

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	f	55	429	278	76	73	2	0	0

- Molecule 30 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	g	108	883	567	142	173	1	0	0

- Molecule 31 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	h	145	1234	795	213	223	3	0	0

- Molecule 32 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	i	161	1302	829	242	226	5	0	0

- Molecule 33 is a protein called GEO11417p1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	j	66	541	352	96	92	1	0	0

- Molecule 34 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	k	84	671	437	117	116	1	0	0

- Molecule 35 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	l	146	1215	792	194	225	4	0	0

- Molecule 36 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	m	108	892	571	163	157	1	0	0

- Molecule 37 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	n	134	1152	735	218	196	3	0	0

- Molecule 38 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	o	112	Total	C	N	O	S	0	0
			937	596	163	169	9		

- Molecule 39 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
39	p	151	Total	C	N	O	S	0	0
			1266	795	233	228	10		

- Molecule 40 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	q	133	Total	C	N	O	S	0	0
			1118	727	187	199	5		

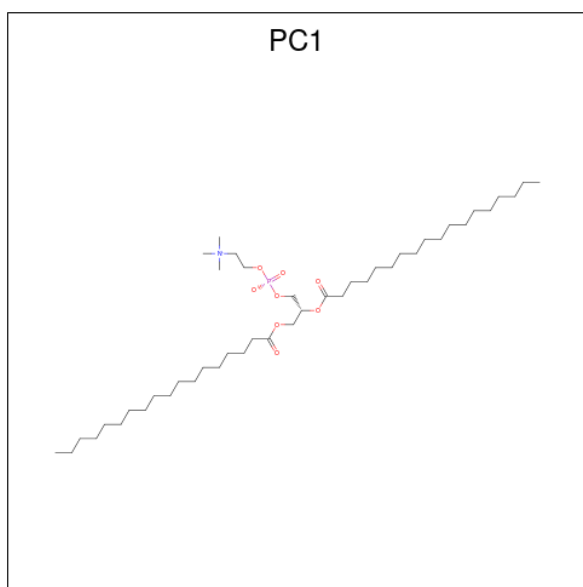
- Molecule 41 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
41	r	89	Total	C	N	O	S	0	0
			724	457	136	130	1		

- Molecule 42 is a protein called NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial.

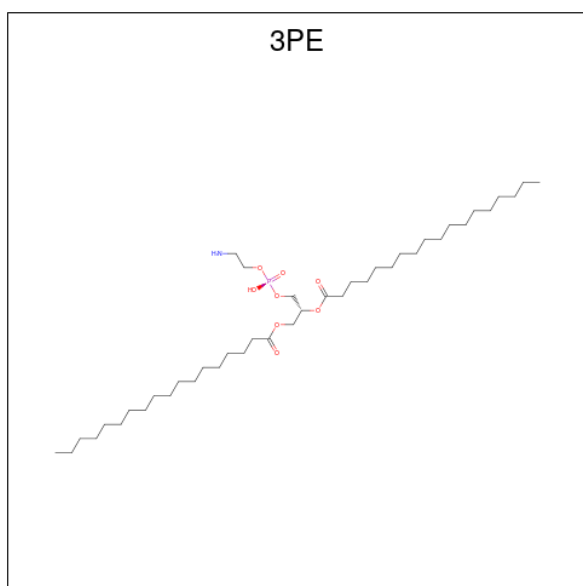
Mol	Chain	Residues	Atoms					AltConf	Trace
42	s	62	Total	C	N	O	S	0	0
			456	288	75	90	3		

- Molecule 43 is 1,2-DIACYL-SN-GLYCERO-3-PHOSPHOCHOLINE (three-letter code: PC1) (formula: C₄₄H₈₈NO₈P).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
43	A	1	39	29	1	8	1	0
43	J	1	44	34	1	8	1	0
43	i	1	34	24	1	8	1	0

- Molecule 44 is 1,2-Distearoyl-sn-glycerophosphoethanolamine (three-letter code: 3PE) (formula: $C_{41}H_{82}NO_8P$).



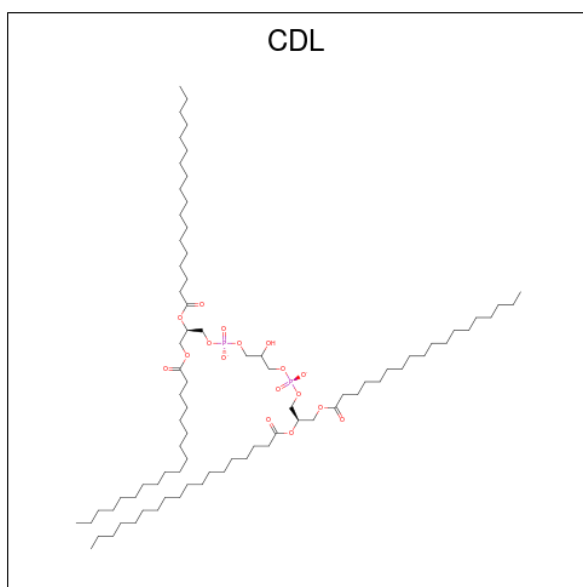
Mol	Chain	Residues	Atoms					AltConf
44	A	1	Total	C	N	O	P	0
			79	59	2	16	2	
44	A	1	Total	C	N	O	P	0
			79	59	2	16	2	
44	B	1	Total	C	N	O	P	0
			37	27	1	8	1	
44	H	1	Total	C	N	O	P	0
			47	37	1	8	1	
44	J	1	Total	C	N	O	P	0
			64	44	2	16	2	
44	J	1	Total	C	N	O	P	0
			64	44	2	16	2	
44	L	1	Total	C	N	O	P	0
			108	78	3	24	3	
44	L	1	Total	C	N	O	P	0
			108	78	3	24	3	
44	L	1	Total	C	N	O	P	0
			108	78	3	24	3	
44	M	1	Total	C	N	O	P	0
			35	25	1	8	1	
44	N	1	Total	C	N	O	P	0
			44	34	1	8	1	
44	X	1	Total	C	N	O	P	0
			30	20	1	8	1	
44	Y	1	Total	C	N	O	P	0
			107	77	3	24	3	
44	Y	1	Total	C	N	O	P	0
			107	77	3	24	3	
44	Y	1	Total	C	N	O	P	0
			107	77	3	24	3	
44	d	1	Total	C	N	O	P	0
			36	26	1	8	1	

- Molecule 45 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe₄S₄).



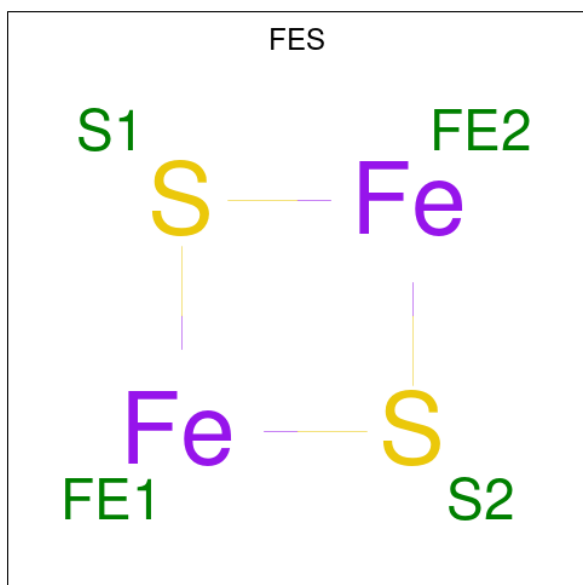
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
45	B	1	8	4	4	0
45	F	1	8	4	4	0
45	G	1	16	8	8	0
45	G	1	16	8	8	0
45	I	1	16	8	8	0
45	I	1	16	8	8	0

- Molecule 46 is CARDIOLIPIN (three-letter code: CDL) (formula: C₈₁H₁₅₆O₁₇P₂).



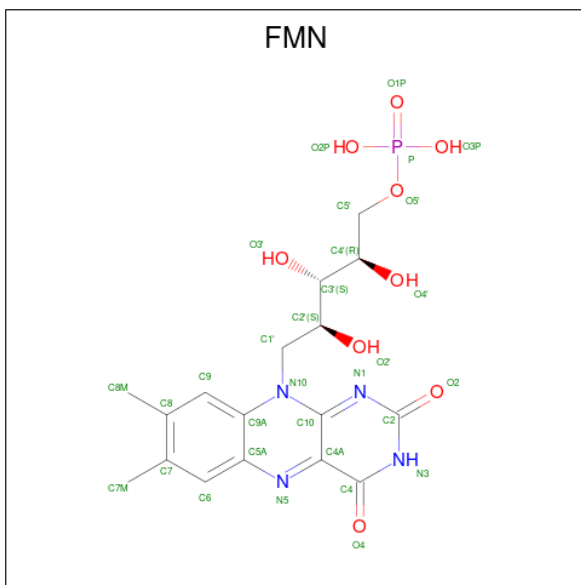
Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
46	B	1	67	48	17	2	0
46	P	1	54	35	17	2	0
46	h	1	129	91	34	4	0
46	h	1	129	91	34	4	0

- Molecule 47 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe₂S₂).



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

- Molecule 48 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).

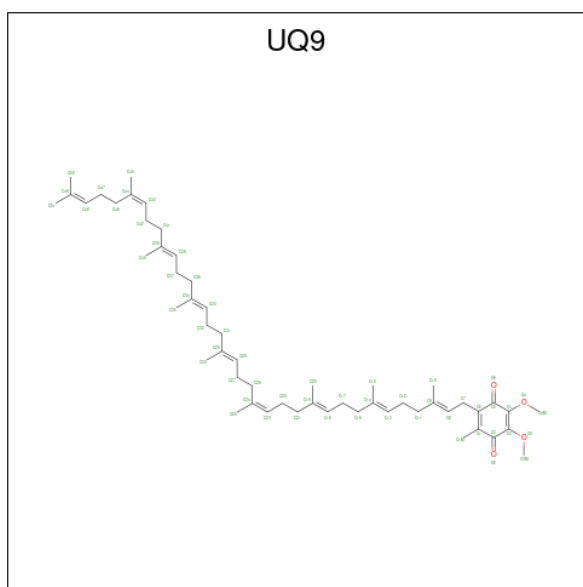


Mol	Chain	Residues	Atoms					AltConf
48	F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 49 is SODIUM ION (three-letter code: NA) (formula: Na).

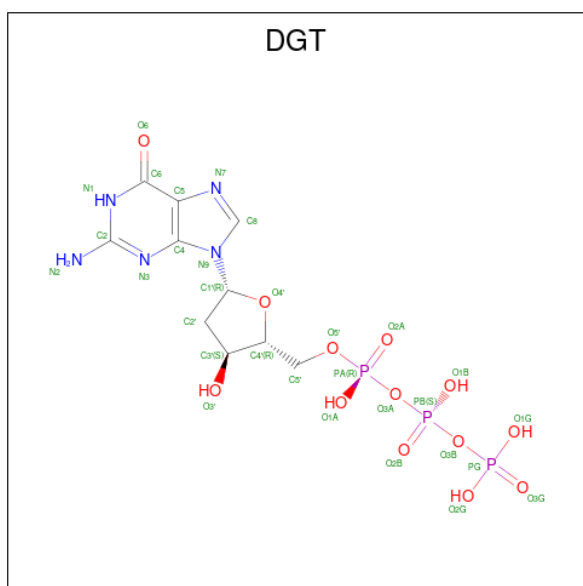
Mol	Chain	Residues	Atoms		AltConf
49	G	1	Total	Na	0
			1	1	

- Molecule 50 is Ubiquinone-9 (three-letter code: UQ9) (formula: C₅₄H₈₂O₄) (labeled as "Ligand of Interest" by depositor).



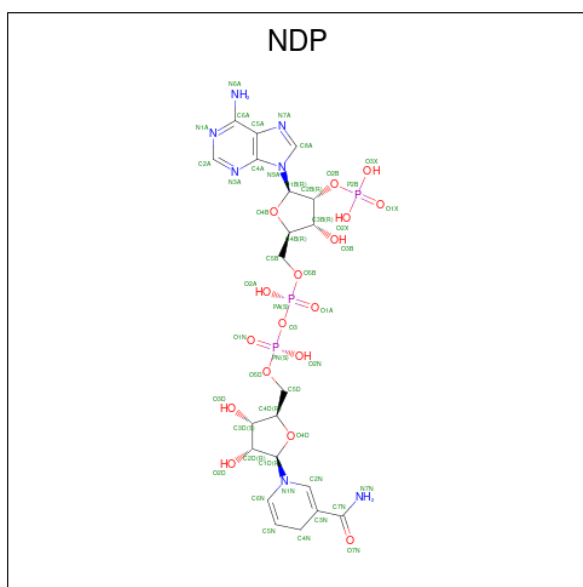
Mol	Chain	Residues	Atoms			AltConf
50	H	1	Total	C	O	0
			58	54	4	

- Molecule 51 is 2'-DEOXYGUANOSINE-5'-TRIPHOSPHATE (three-letter code: DGT) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms				AltConf	
51	O	1	Total	C	N	O	P	0
			31	10	5	13	3	

- Molecule 52 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).

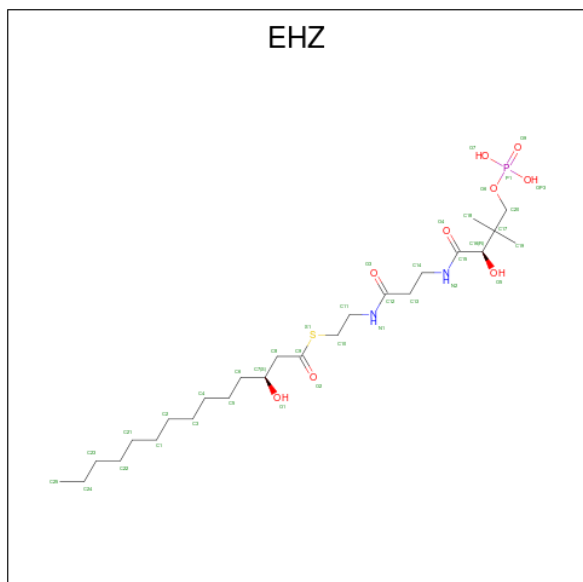


Mol	Chain	Residues	Atoms					AltConf
52	P	1	Total	C	N	O	P	0
			48	21	7	17	3	

- Molecule 53 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 54 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: C₂₅H₄₉N₂O₉PS).



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

3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

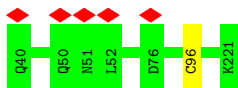
- Molecule 1: NADH-ubiquinone oxidoreductase chain 3

Chain A:  100%



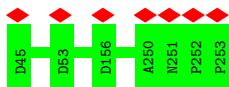
- Molecule 2: LD31474p

Chain B:  99%



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

Chain C:  100%



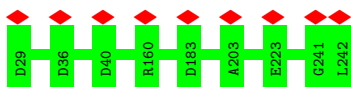
- Molecule 4: Complex I-49kD

Chain D:  100%

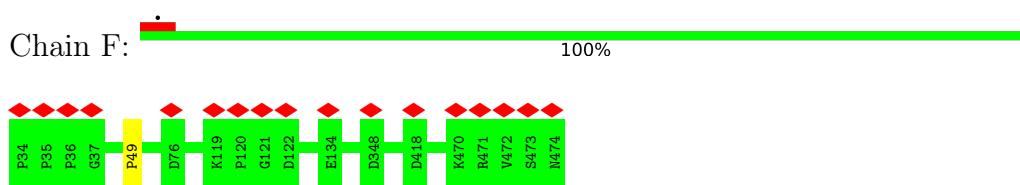


- Molecule 5: NADH dehydrogenase (Ubiquinone) 24 kDa subunit, isoform A

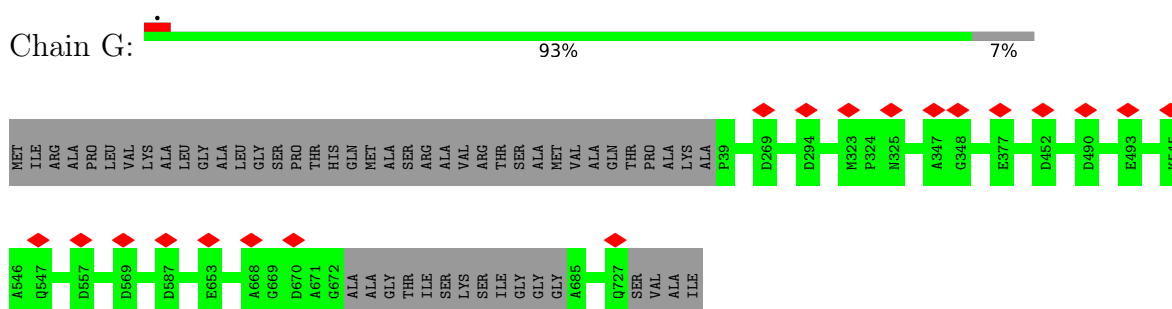
Chain E:  100%



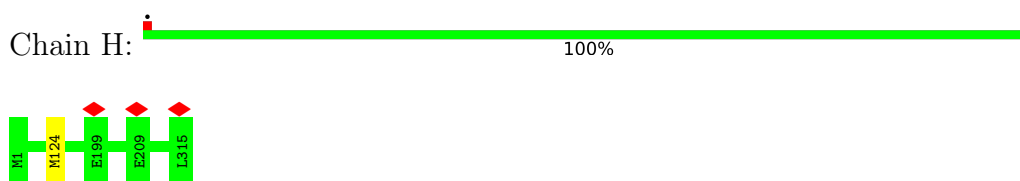
- Molecule 6: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial



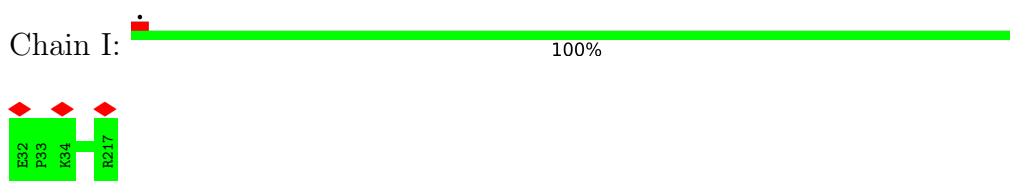
- Molecule 7: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial



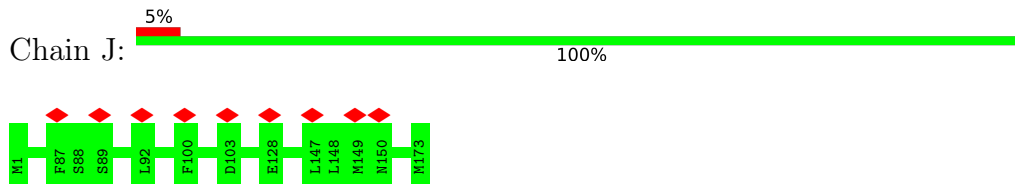
- Molecule 8: NADH-ubiquinone oxidoreductase chain 1



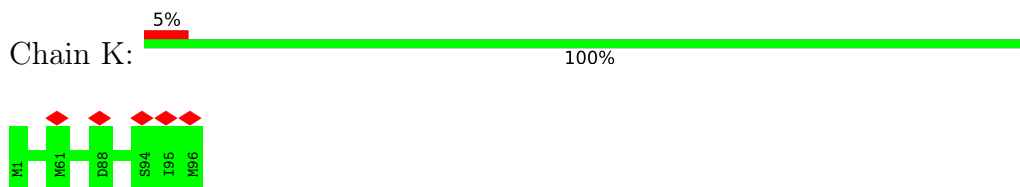
- Molecule 9: NADH dehydrogenase (ubiquinone) 23 kDa subunit



- Molecule 10: NADH-ubiquinone oxidoreductase chain 6

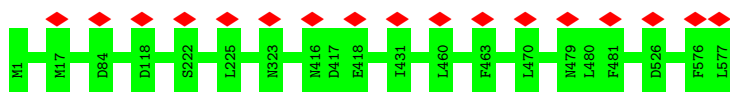


- Molecule 11: NADH-ubiquinone oxidoreductase chain 4L



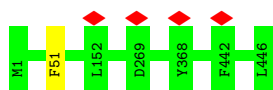
- Molecule 12: NADH-ubiquinone oxidoreductase chain 5

Chain L:  100%



- Molecule 13: NADH-ubiquinone oxidoreductase chain 4

Chain M:  100%



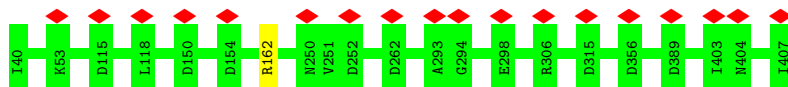
- Molecule 14: NADH-ubiquinone oxidoreductase chain 2

Chain N:  100%



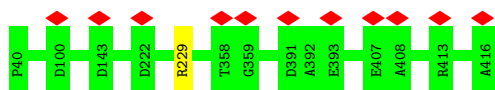
- Molecule 15: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial

Chain O:  5%  100%



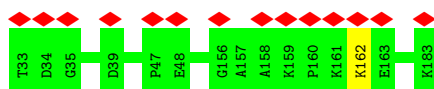
- Molecule 16: NADH dehydrogenase (Ubiquinone) 39 kDa subunit, isoform A

Chain P:  100%



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

Chain Q:  9%  99%

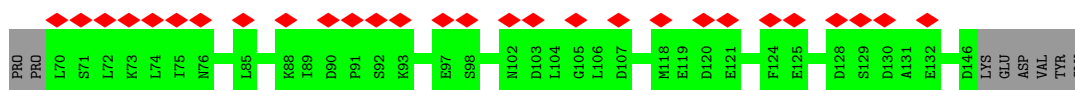
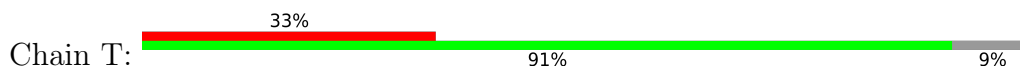


- Molecule 18: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial

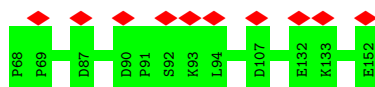
Chain R:  100%



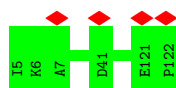
- Molecule 19: Acyl carrier protein, mitochondrial



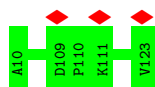
- Molecule 19: Acyl carrier protein, mitochondrial



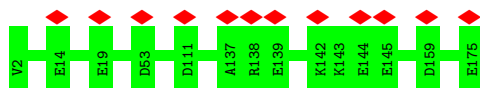
- Molecule 20: NADH dehydrogenase (Ubiquinone) 13 kDa B subunit



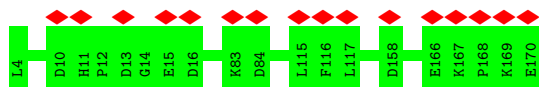
- Molecule 21: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6



- Molecule 22: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

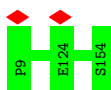


- Molecule 23: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11



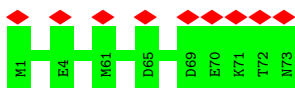
- Molecule 24: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13

Chain Z:  100%



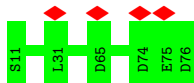
- Molecule 25: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 1

Chain a:  12% 100%



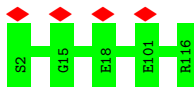
- Molecule 26: RH45008p

Chain b:  6% 100%



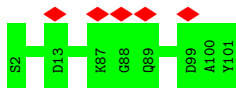
- Molecule 27: NADH dehydrogenase [ubiquinone] 1 subunit C2

Chain d:  100%



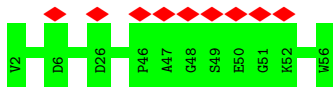
- Molecule 28: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5

Chain e:  5% 100%



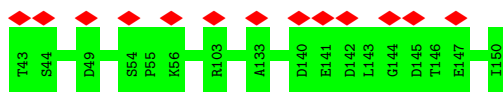
- Molecule 29: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 1

Chain f:  16% 100%

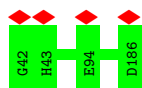


- Molecule 30: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

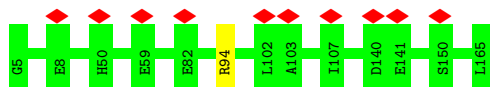
Chain g:  12% 100%



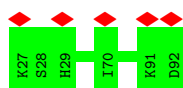
- Molecule 31: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial



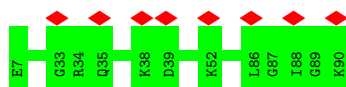
- Molecule 32: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6



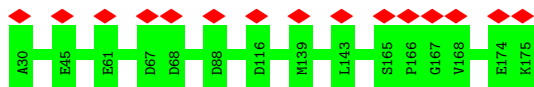
- Molecule 33: GEO11417p1



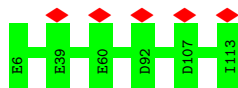
- Molecule 34: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3



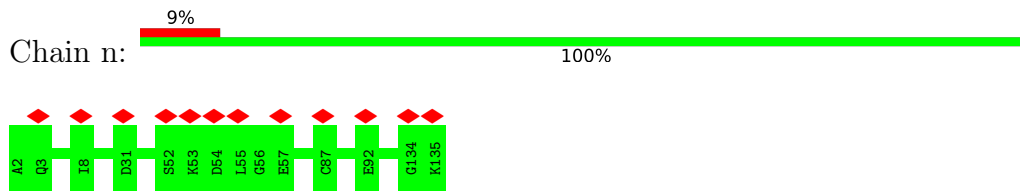
- Molecule 35: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial



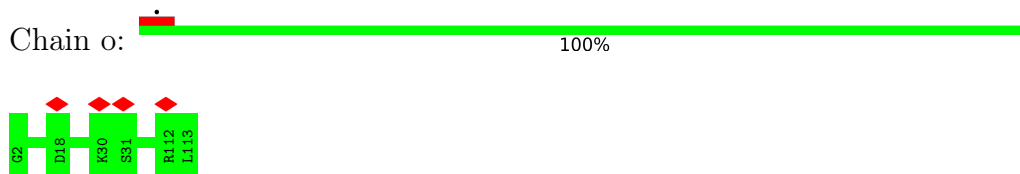
- Molecule 36: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4



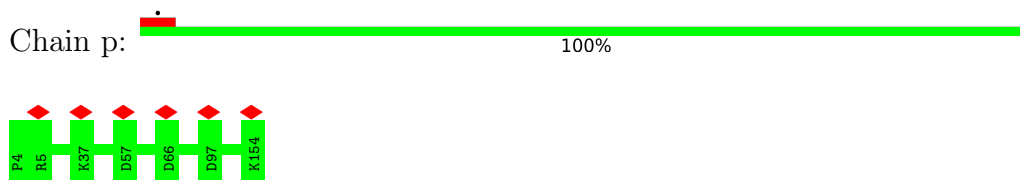
- Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9



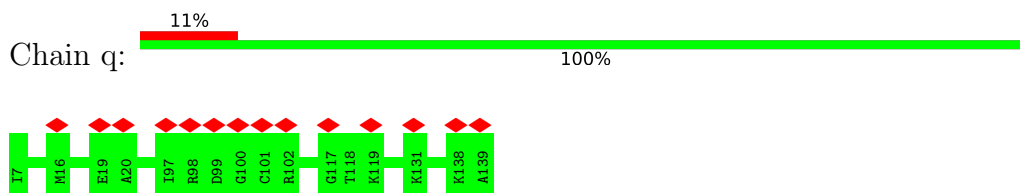
- Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7



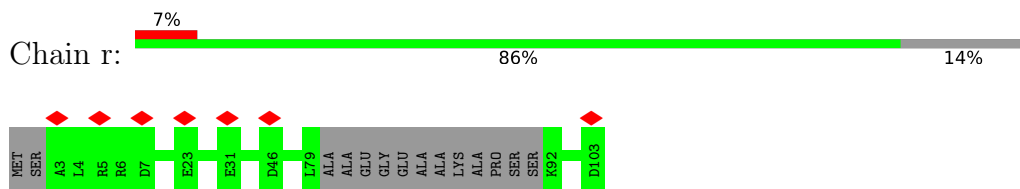
- Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10



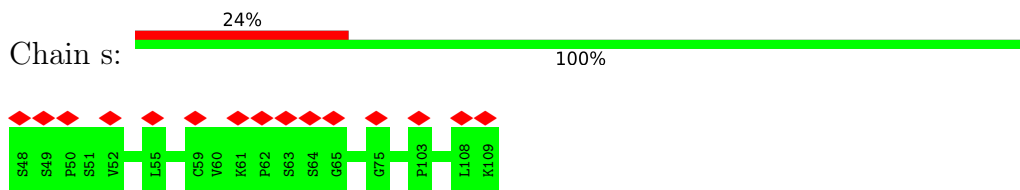
- Molecule 40: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12



- Molecule 41: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7



- Molecule 42: NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	37608	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 ($e^-/\text{\AA}^2$)	41.88	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	130000	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.103	Depositor
Minimum map value	-0.018	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.013	Depositor
Map size (Å)	471.59998, 471.59998, 471.59998	wwPDB
Map dimensions	450, 450, 450	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.048, 1.048, 1.048	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: 2MR, SF4, EHZ, CDL, DGT, ZN, PC1, NA, FMN, 3PE, FES, UQ9, 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	0/979	0.49	0/1325
2	B	0.43	0/1473	0.52	1/1997 (0.1%)
3	C	0.40	0/1774	0.48	0/2412
4	D	0.39	0/3505	0.48	0/4751
5	E	0.36	0/1718	0.49	0/2328
6	F	0.35	0/3461	0.47	0/4678
7	G	0.35	0/5229	0.48	0/7088
8	H	0.41	0/2651	0.51	1/3593 (0.0%)
9	I	0.44	0/1518	0.51	0/2050
10	J	0.34	0/1424	0.52	0/1925
11	K	0.38	0/814	0.48	0/1095
12	L	0.35	0/4726	0.44	0/6396
13	M	0.38	0/3723	0.45	0/5045
14	N	0.37	0/2875	0.46	0/3890
15	O	0.37	0/3082	0.46	1/4168 (0.0%)
16	P	0.36	0/3108	0.48	0/4205
17	Q	0.35	0/1245	0.48	0/1687
18	R	0.41	0/733	0.46	0/987
19	T	0.27	0/624	0.41	0/843
19	U	0.32	0/696	0.43	0/940
20	V	0.31	0/942	0.42	0/1278
21	W	0.40	0/988	0.50	0/1329
22	X	0.33	0/1416	0.44	0/1911
23	Y	0.30	0/1314	0.44	0/1784
24	Z	0.35	0/1239	0.44	0/1682
25	a	0.35	0/614	0.51	0/827
26	b	0.32	0/528	0.45	0/714
27	d	0.33	0/935	0.44	0/1271
28	e	0.39	0/846	0.53	0/1128
29	f	0.32	0/440	0.46	0/590
30	g	0.38	0/908	0.48	0/1240
31	h	0.39	0/1269	0.44	0/1714

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	i	0.34	0/1338	0.50	0/1808
33	j	0.31	0/566	0.41	0/776
34	k	0.31	0/690	0.48	0/936
35	l	0.41	0/1264	0.44	0/1719
36	m	0.36	0/913	0.44	0/1222
37	n	0.35	0/1185	0.43	0/1597
38	o	0.33	0/960	0.46	0/1290
39	p	0.39	0/1299	0.46	0/1752
40	q	0.42	0/1157	0.47	0/1569
41	r	0.32	0/740	0.48	0/1003
42	s	0.34	0/469	0.46	0/637
All	All	0.37	0/67378	0.47	3/91180 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	96	CYS	CA-CB-SG	7.20	126.95	114.00
15	O	162	ARG	NE-CZ-NH1	-6.60	117.00	120.30
8	H	124	MET	CB-CG-SD	-5.67	95.40	112.40

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	115/117 (98%)	112 (97%)	3 (3%)	0	100	100
2	B	180/182 (99%)	172 (96%)	8 (4%)	0	100	100
3	C	207/209 (99%)	194 (94%)	13 (6%)	0	100	100
4	D	427/430 (99%)	410 (96%)	17 (4%)	0	100	100
5	E	212/214 (99%)	198 (93%)	14 (7%)	0	100	100
6	F	439/441 (100%)	422 (96%)	16 (4%)	1 (0%)	47	77
7	G	673/731 (92%)	649 (96%)	24 (4%)	0	100	100
8	H	313/315 (99%)	301 (96%)	12 (4%)	0	100	100
9	I	184/186 (99%)	177 (96%)	7 (4%)	0	100	100
10	J	171/173 (99%)	164 (96%)	7 (4%)	0	100	100
11	K	94/96 (98%)	91 (97%)	3 (3%)	0	100	100
12	L	575/577 (100%)	553 (96%)	22 (4%)	0	100	100
13	M	444/446 (100%)	428 (96%)	15 (3%)	1 (0%)	47	77
14	N	339/341 (99%)	328 (97%)	11 (3%)	0	100	100
15	O	366/368 (100%)	358 (98%)	8 (2%)	0	100	100
16	P	375/377 (100%)	361 (96%)	14 (4%)	0	100	100
17	Q	149/151 (99%)	139 (93%)	10 (7%)	0	100	100
18	R	87/89 (98%)	84 (97%)	3 (3%)	0	100	100
19	T	75/85 (88%)	73 (97%)	2 (3%)	0	100	100
19	U	83/85 (98%)	80 (96%)	3 (4%)	0	100	100
20	V	116/118 (98%)	114 (98%)	2 (2%)	0	100	100
21	W	112/114 (98%)	110 (98%)	2 (2%)	0	100	100
22	X	172/174 (99%)	162 (94%)	10 (6%)	0	100	100
23	Y	165/167 (99%)	159 (96%)	6 (4%)	0	100	100
24	Z	144/146 (99%)	140 (97%)	4 (3%)	0	100	100
25	a	71/73 (97%)	68 (96%)	3 (4%)	0	100	100
26	b	64/66 (97%)	63 (98%)	1 (2%)	0	100	100
27	d	113/115 (98%)	112 (99%)	1 (1%)	0	100	100
28	e	98/100 (98%)	94 (96%)	4 (4%)	0	100	100
29	f	53/55 (96%)	48 (91%)	5 (9%)	0	100	100
30	g	106/108 (98%)	101 (95%)	5 (5%)	0	100	100
31	h	143/145 (99%)	133 (93%)	10 (7%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
32	i	159/161 (99%)	152 (96%)	7 (4%)	0	100	100
33	j	64/66 (97%)	64 (100%)	0	0	100	100
34	k	82/84 (98%)	80 (98%)	2 (2%)	0	100	100
35	l	144/146 (99%)	139 (96%)	5 (4%)	0	100	100
36	m	106/108 (98%)	102 (96%)	4 (4%)	0	100	100
37	n	132/134 (98%)	131 (99%)	1 (1%)	0	100	100
38	o	110/112 (98%)	105 (96%)	5 (4%)	0	100	100
39	p	149/151 (99%)	146 (98%)	3 (2%)	0	100	100
40	q	131/133 (98%)	125 (95%)	6 (5%)	0	100	100
41	r	85/103 (82%)	82 (96%)	3 (4%)	0	100	100
42	s	60/62 (97%)	54 (90%)	6 (10%)	0	100	100
All	All	8087/8254 (98%)	7778 (96%)	307 (4%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
13	M	51	PHE
6	F	49	PRO

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	110/110 (100%)	110 (100%)	0	100	100
2	B	152/152 (100%)	152 (100%)	0	100	100
3	C	187/187 (100%)	187 (100%)	0	100	100
4	D	367/367 (100%)	366 (100%)	1 (0%)	92	96
5	E	185/185 (100%)	185 (100%)	0	100	100
6	F	353/353 (100%)	353 (100%)	0	100	100
7	G	546/582 (94%)	546 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
8	H	282/282 (100%)	282 (100%)	0	100	100
9	I	159/159 (100%)	159 (100%)	0	100	100
10	J	166/166 (100%)	166 (100%)	0	100	100
11	K	91/91 (100%)	91 (100%)	0	100	100
12	L	518/518 (100%)	518 (100%)	0	100	100
13	M	404/404 (100%)	404 (100%)	0	100	100
14	N	317/317 (100%)	316 (100%)	1 (0%)	92	96
15	O	324/324 (100%)	324 (100%)	0	100	100
16	P	319/319 (100%)	318 (100%)	1 (0%)	92	96
17	Q	131/131 (100%)	130 (99%)	1 (1%)	81	89
18	R	77/77 (100%)	77 (100%)	0	100	100
19	T	71/79 (90%)	71 (100%)	0	100	100
19	U	79/79 (100%)	79 (100%)	0	100	100
20	V	97/97 (100%)	97 (100%)	0	100	100
21	W	107/107 (100%)	107 (100%)	0	100	100
22	X	150/150 (100%)	150 (100%)	0	100	100
23	Y	128/128 (100%)	128 (100%)	0	100	100
24	Z	128/128 (100%)	128 (100%)	0	100	100
25	a	65/65 (100%)	65 (100%)	0	100	100
26	b	52/52 (100%)	52 (100%)	0	100	100
27	d	93/93 (100%)	93 (100%)	0	100	100
28	e	88/88 (100%)	88 (100%)	0	100	100
29	f	42/42 (100%)	42 (100%)	0	100	100
30	g	97/97 (100%)	97 (100%)	0	100	100
31	h	130/130 (100%)	130 (100%)	0	100	100
32	i	133/133 (100%)	132 (99%)	1 (1%)	81	89
33	j	57/57 (100%)	57 (100%)	0	100	100
34	k	69/69 (100%)	69 (100%)	0	100	100
35	l	122/122 (100%)	122 (100%)	0	100	100
36	m	89/89 (100%)	89 (100%)	0	100	100
37	n	117/117 (100%)	117 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
38	o	101/101 (100%)	101 (100%)	0	100	100
39	p	135/135 (100%)	135 (100%)	0	100	100
40	q	115/115 (100%)	115 (100%)	0	100	100
41	r	78/86 (91%)	78 (100%)	0	100	100
42	s	50/50 (100%)	50 (100%)	0	100	100
All	All	7081/7133 (99%)	7076 (100%)	5 (0%)	93	97

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	448	MET
14	N	181	ASN
16	P	229	ARG
17	Q	162	LYS
32	i	94	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
28	e	20	ASN
41	r	59	GLN
42	s	104	GLN
7	G	436	ASN
12	L	132	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	$\# Z > 2$
4	2MR	D	123	4	10,12,13	2.52	3 (30%)	5,13,15	3.08	1 (20%)

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
4	2MR	D	123	4	-	1/10/13/15	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	123	2MR	CZ-NE	5.43	1.45	1.34
4	D	123	2MR	CZ-NH2	5.36	1.45	1.33
4	D	123	2MR	O-C	2.02	1.28	1.19

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	123	2MR	NE-CZ-NH2	-6.55	113.48	119.48

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	123	2MR	O-C-CA-CB

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 39 ligands modelled in this entry, 2 are monoatomic - leaving 37 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
50	UQ9	H	501	-	58,58,58	2.26	19 (32%)	70,73,73	1.55	11 (15%)
47	FES	E	301	5	0,4,4	-	-	-	-	-
45	SF4	B	301	2	0,12,12	-	-	-	-	-
45	SF4	G	801	7	0,12,12	-	-	-	-	-
46	CDL	h	202	-	59,59,99	1.13	7 (11%)	65,71,111	1.22	5 (7%)
44	3PE	H	502	-	46,46,50	0.88	4 (8%)	49,51,55	1.14	2 (4%)
54	EHZ	U	201	19	29,36,37	1.70	6 (20%)	35,44,47	1.73	7 (20%)
45	SF4	I	302	9	0,12,12	-	-	-	-	-
44	3PE	L	602	-	43,43,50	0.92	4 (9%)	46,48,55	1.07	2 (4%)
44	3PE	Y	302	-	29,29,50	1.10	4 (13%)	32,34,55	1.21	2 (6%)
43	PC1	J	201	-	43,43,53	1.38	6 (13%)	49,51,61	1.05	2 (4%)
46	CDL	B	303	-	66,66,99	1.10	6 (9%)	72,78,111	1.03	3 (4%)
45	SF4	F	502	6	0,12,12	-	-	-	-	-
45	SF4	I	301	9	0,12,12	-	-	-	-	-
47	FES	G	803	7	0,4,4	-	-	-	-	-
44	3PE	Y	303	-	32,32,50	1.06	4 (12%)	35,37,55	1.03	2 (5%)
44	3PE	B	302	-	36,36,50	1.02	3 (8%)	39,41,55	1.14	3 (7%)
43	PC1	i	201	-	33,33,53	1.53	6 (18%)	39,41,61	1.07	2 (5%)
44	3PE	M	501	-	34,34,50	1.03	4 (11%)	37,39,55	1.10	2 (5%)
44	3PE	d	201	-	35,35,50	1.01	4 (11%)	38,40,55	1.05	2 (5%)
44	3PE	X	201	-	29,29,50	1.14	4 (13%)	32,34,55	1.23	3 (9%)
46	CDL	h	201	-	68,68,99	1.07	7 (10%)	74,80,111	1.11	4 (5%)
54	EHZ	T	201	19	29,36,37	1.68	6 (20%)	35,44,47	1.63	5 (14%)
45	SF4	G	802	7	0,12,12	-	-	-	-	-
52	NDP	P	501	-	45,52,52	4.21	21 (46%)	53,80,80	2.12	6 (11%)
44	3PE	N	401	-	43,43,50	0.93	2 (4%)	46,48,55	1.00	2 (4%)
44	3PE	Y	301	-	43,43,50	0.92	4 (9%)	46,48,55	1.30	3 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
43	PC1	A	201	-	38,38,53	1.47	6 (15%)	44,46,61	1.04	2 (4%)
44	3PE	A	202	-	34,34,50	1.02	4 (11%)	37,39,55	1.28	2 (5%)
44	3PE	A	203	-	43,43,50	0.91	4 (9%)	46,48,55	1.17	3 (6%)
44	3PE	L	603	-	24,24,50	1.18	4 (16%)	27,29,55	1.38	2 (7%)
44	3PE	L	601	-	38,38,50	0.97	4 (10%)	41,43,55	1.04	2 (4%)
46	CDL	P	502	-	53,53,99	1.21	7 (13%)	59,65,111	1.24	4 (6%)
51	DGT	O	501	-	26,33,33	3.27	12 (46%)	32,52,52	1.49	6 (18%)
48	FMN	F	501	-	33,33,33	2.63	10 (30%)	48,50,50	1.74	15 (31%)
44	3PE	J	203	-	23,23,50	1.19	4 (17%)	26,28,55	1.23	2 (7%)
44	3PE	J	202	-	39,39,50	0.96	4 (10%)	42,44,55	1.17	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
50	UQ9	H	501	-	-	14/57/81/81	0/1/1/1
47	FES	E	301	5	-	-	0/1/1/1
45	SF4	B	301	2	-	-	0/6/5/5
45	SF4	G	801	7	-	-	0/6/5/5
46	CDL	h	202	-	-	34/70/70/110	-
44	3PE	H	502	-	-	16/50/50/54	-
54	EHZ	U	201	19	-	12/42/44/45	-
45	SF4	I	302	9	-	-	0/6/5/5
44	3PE	L	602	-	-	19/47/47/54	-
44	3PE	Y	302	-	-	12/33/33/54	-
43	PC1	J	201	-	-	14/47/47/57	-
46	CDL	B	303	-	-	44/77/77/110	-
45	SF4	F	502	6	-	-	0/6/5/5
45	SF4	I	301	9	-	-	0/6/5/5
47	FES	G	803	7	-	-	0/1/1/1
44	3PE	Y	303	-	-	14/36/36/54	-
44	3PE	B	302	-	-	17/40/40/54	-
43	PC1	i	201	-	-	17/37/37/57	-
44	3PE	M	501	-	-	20/38/38/54	-
44	3PE	d	201	-	-	19/39/39/54	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
44	3PE	X	201	-	-	21/33/33/54	-
46	CDL	h	201	-	-	40/79/79/110	-
54	EHZ	T	201	19	-	13/42/44/45	-
45	SF4	G	802	7	-	-	0/6/5/5
52	NDP	P	501	-	-	4/30/77/77	0/5/5/5
44	3PE	N	401	-	-	19/47/47/54	-
44	3PE	Y	301	-	-	13/47/47/54	-
43	PC1	A	201	-	-	15/42/42/57	-
44	3PE	A	202	-	-	16/38/38/54	-
44	3PE	A	203	-	-	15/47/47/54	-
44	3PE	L	603	-	-	8/27/27/54	-
44	3PE	L	601	-	-	23/42/42/54	-
46	CDL	P	502	-	-	33/64/64/110	-
51	DGT	O	501	-	-	4/18/34/34	0/3/3/3
48	FMN	F	501	-	-	8/18/18/18	0/3/3/3
44	3PE	J	203	-	-	13/27/27/54	-
44	3PE	J	202	-	-	19/43/43/54	-

The worst 5 of 180 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
52	P	501	NDP	O4B-C1B	14.32	1.61	1.41
52	P	501	NDP	C6N-C5N	12.12	1.55	1.33
50	H	501	UQ9	C6-C1	10.61	1.54	1.35
52	P	501	NDP	C7N-N7N	8.24	1.55	1.33
51	O	501	DGT	C3'-C4'	-8.15	1.30	1.53

The worst 5 of 108 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
52	P	501	NDP	C5A-C6A-N6A	8.55	133.34	120.35
52	P	501	NDP	C1B-N9A-C4A	-6.92	114.49	126.64
52	P	501	NDP	N6A-C6A-N1A	-6.06	106.00	118.57
50	H	501	UQ9	C7-C6-C5	-5.30	112.09	118.48
52	P	501	NDP	N3A-C2A-N1A	-5.30	120.39	128.68

There are no chirality outliers.

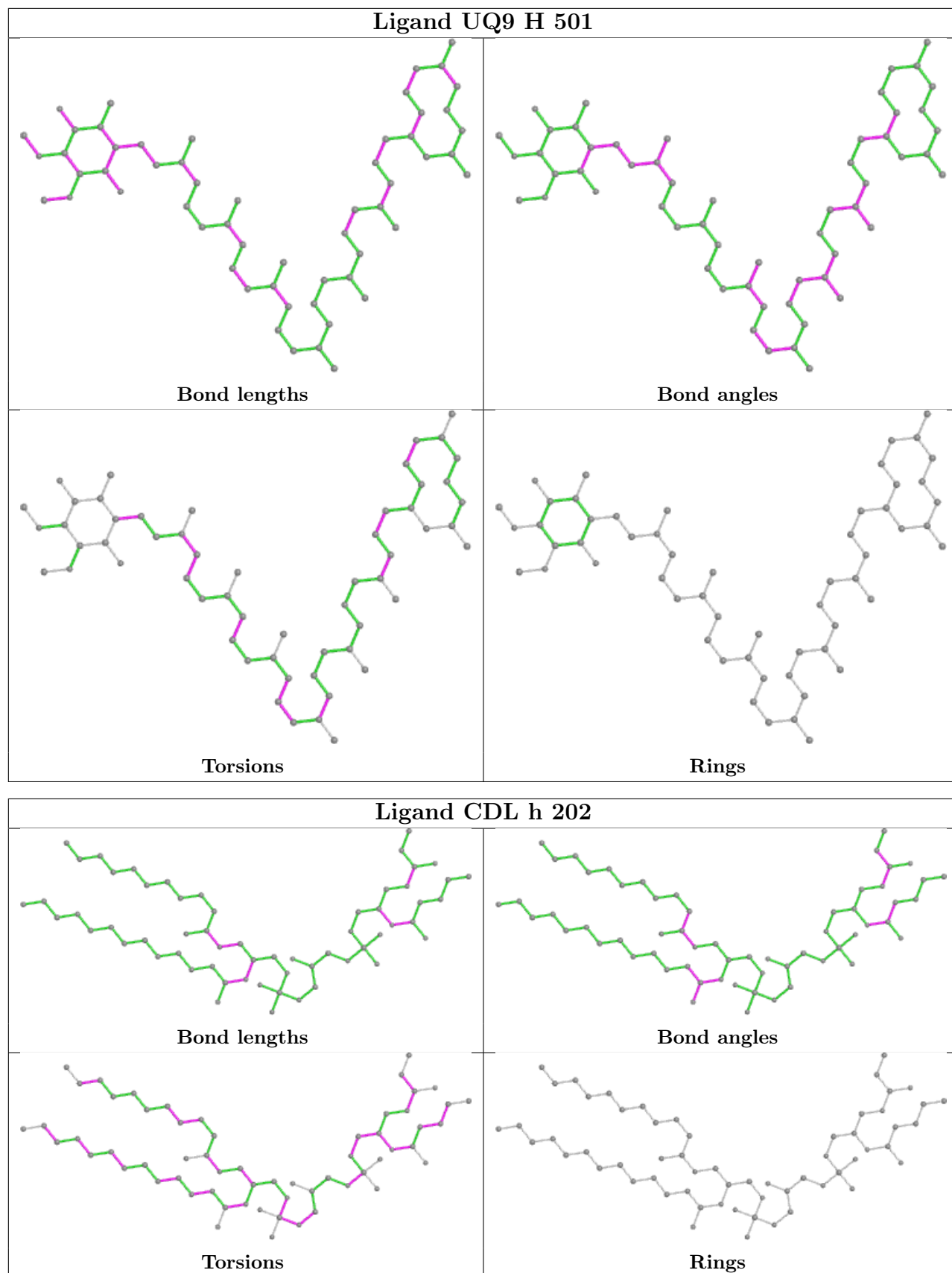
5 of 516 torsion outliers are listed below:

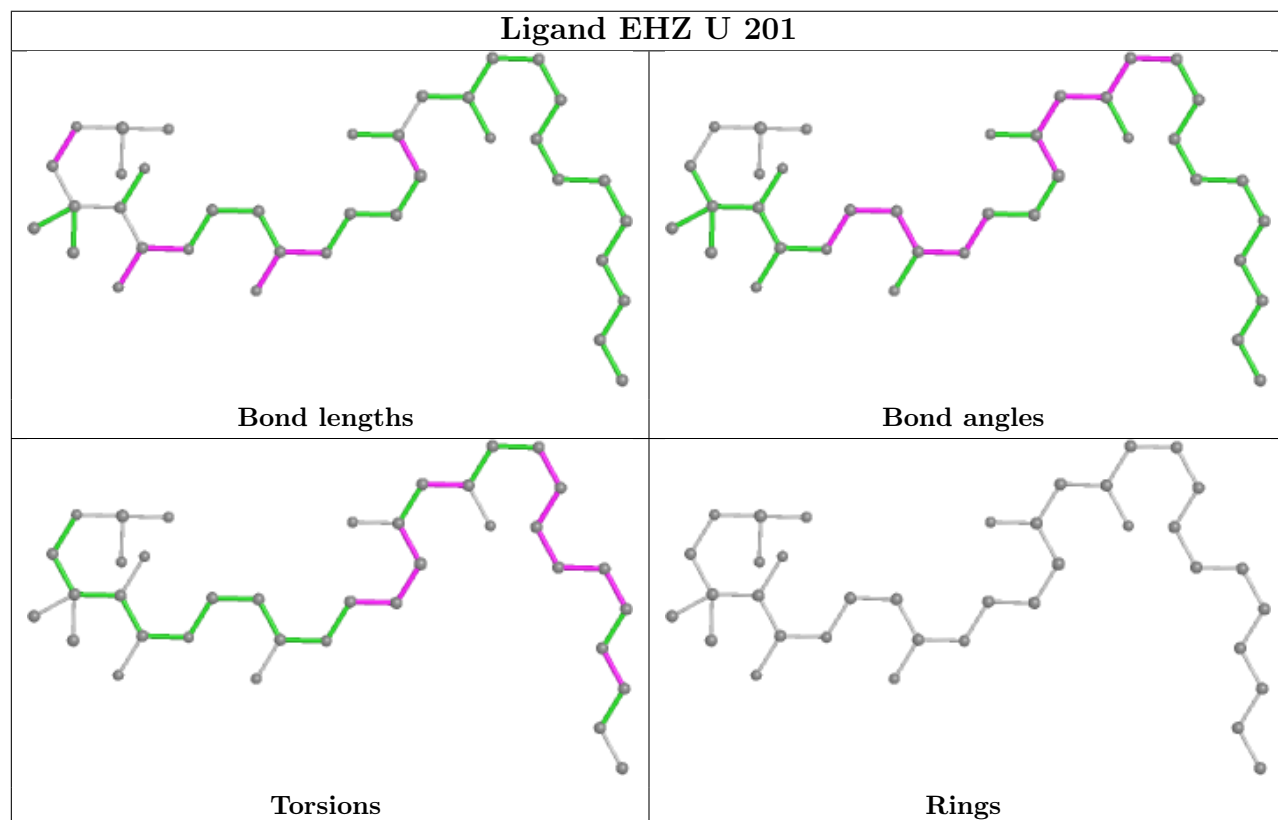
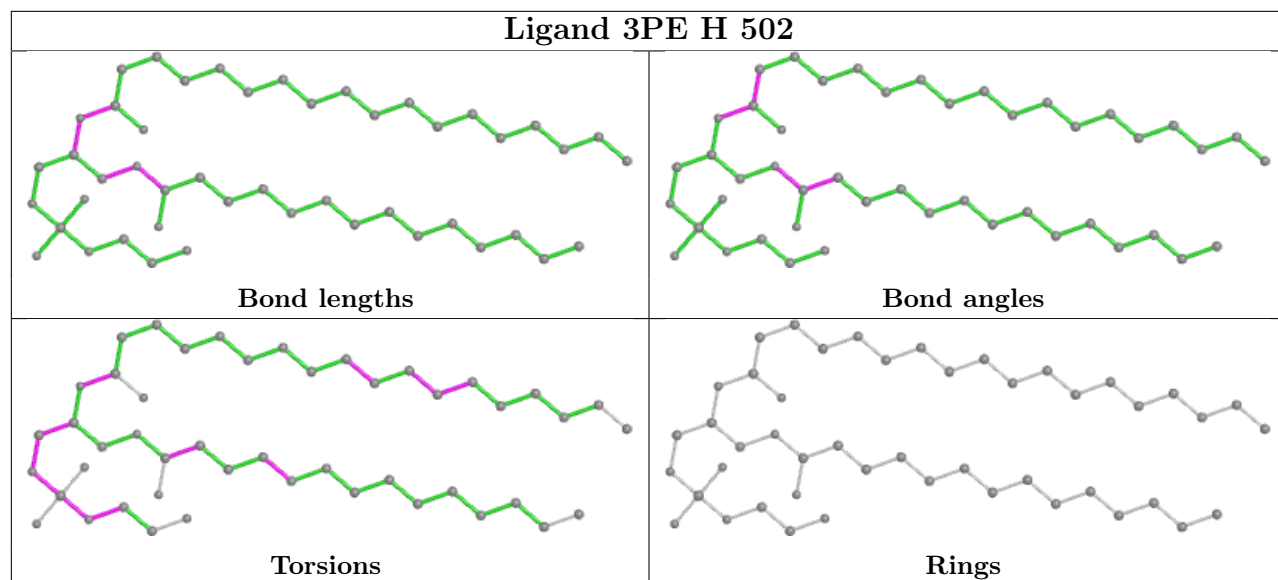
Mol	Chain	Res	Type	Atoms
43	A	201	PC1	C1-O11-P-O12
43	A	201	PC1	C1-O11-P-O14
43	J	201	PC1	O22-C21-O21-C2
43	i	201	PC1	C11-O13-P-O12
43	i	201	PC1	C11-O13-P-O14

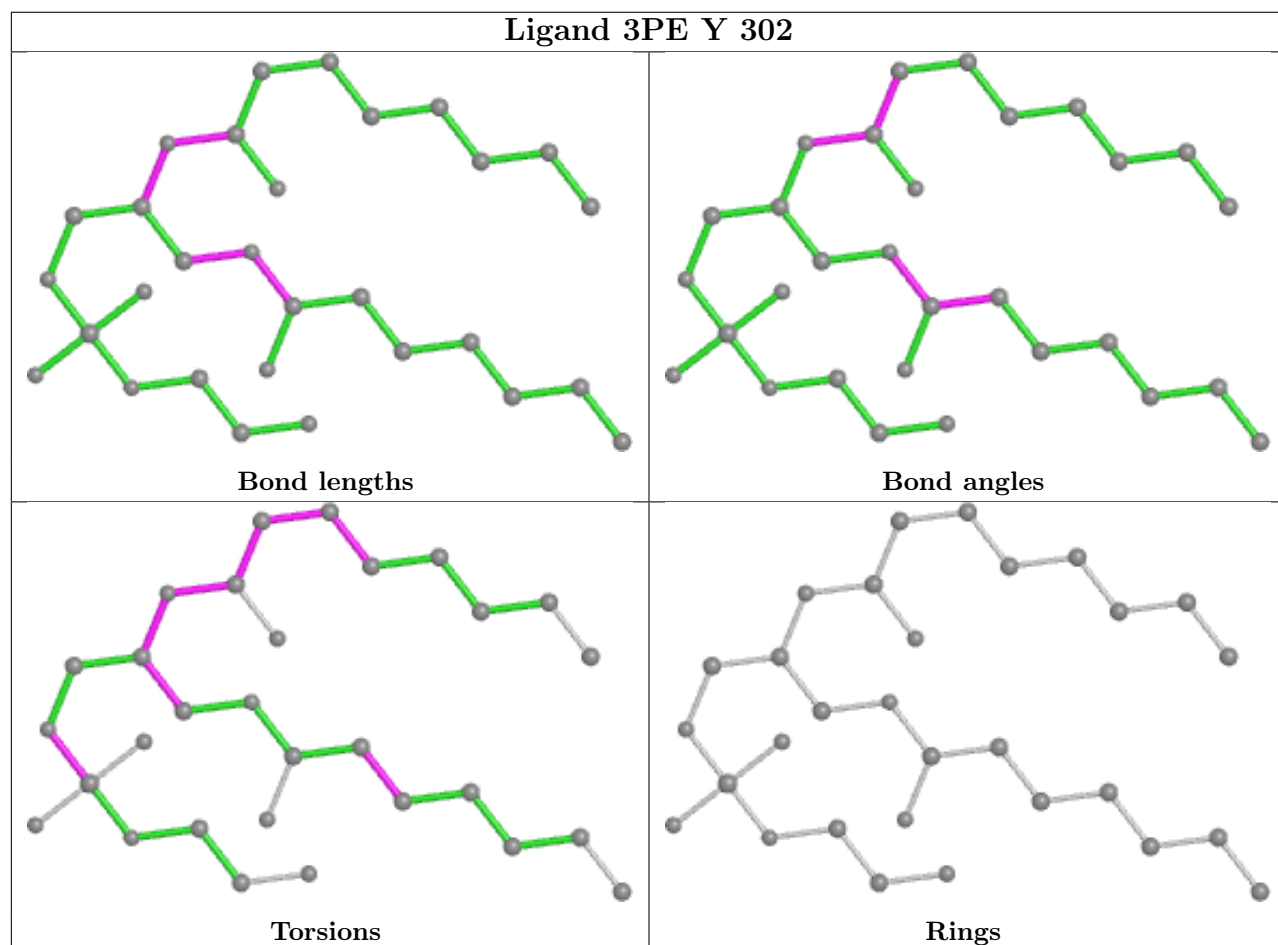
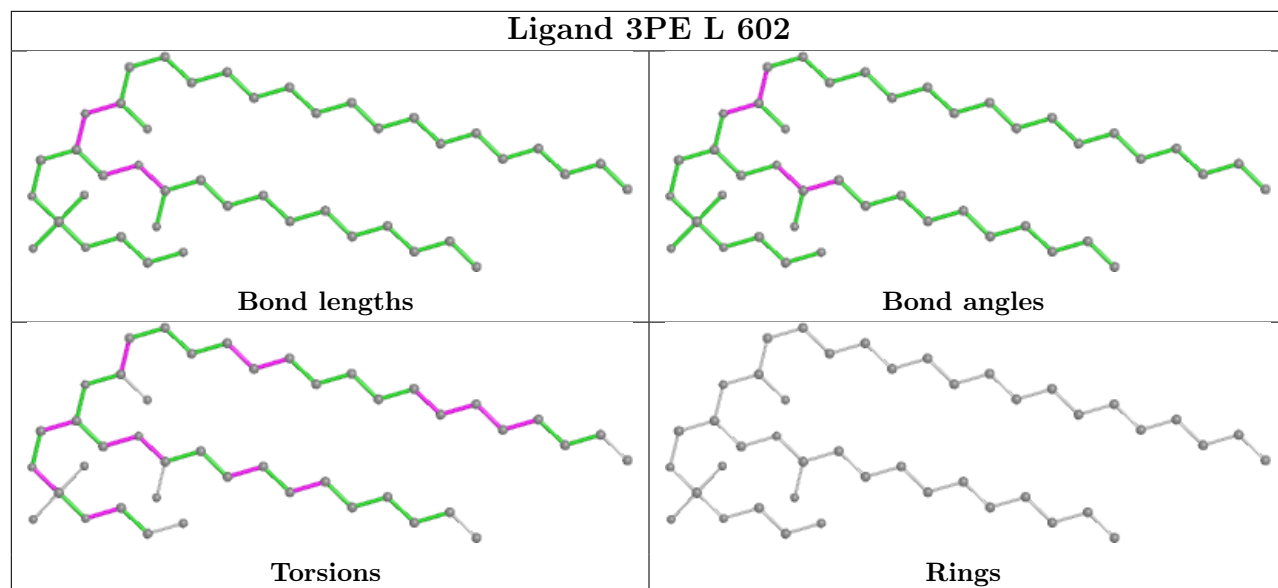
There are no ring outliers.

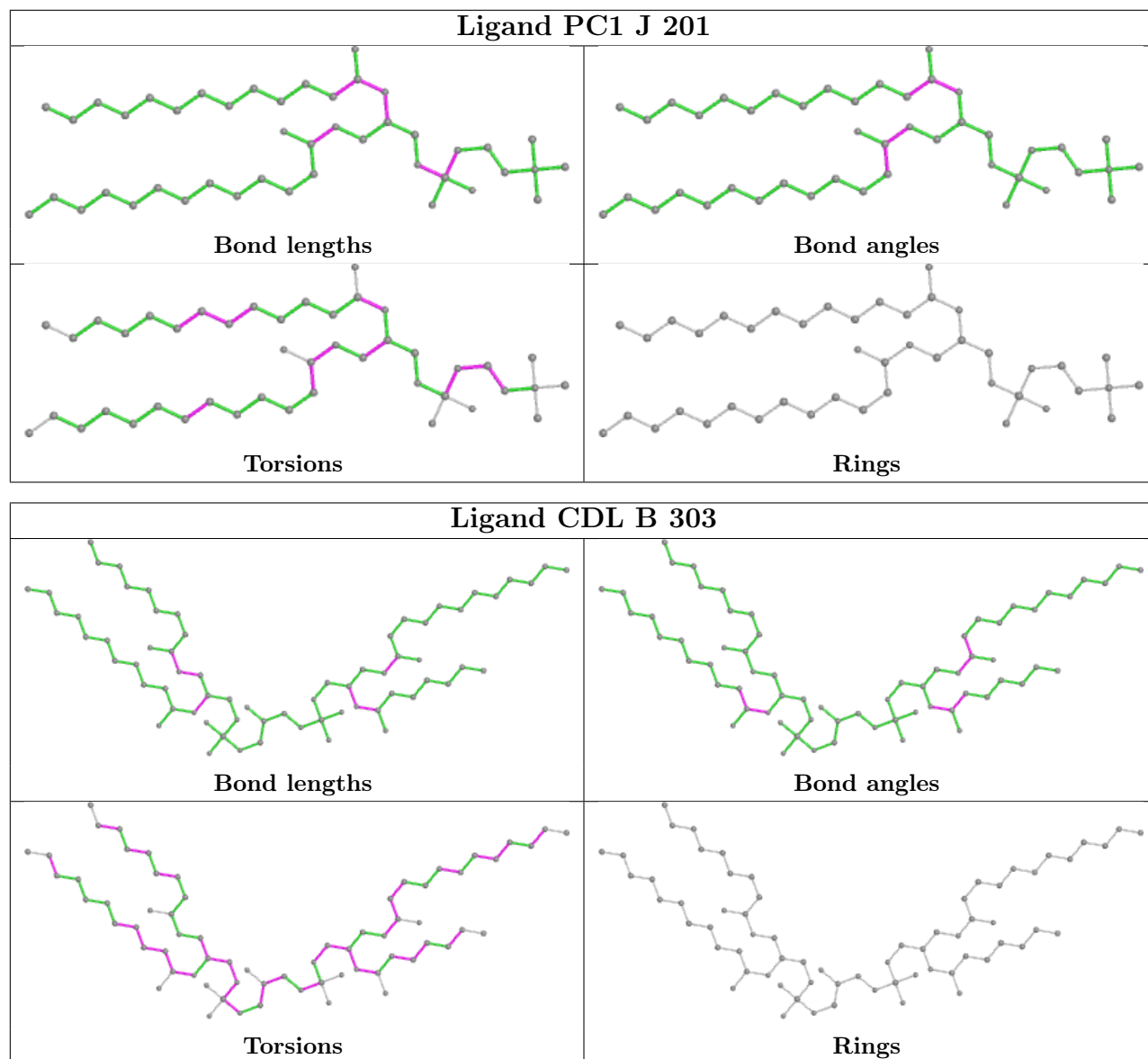
No monomer is involved in short contacts.

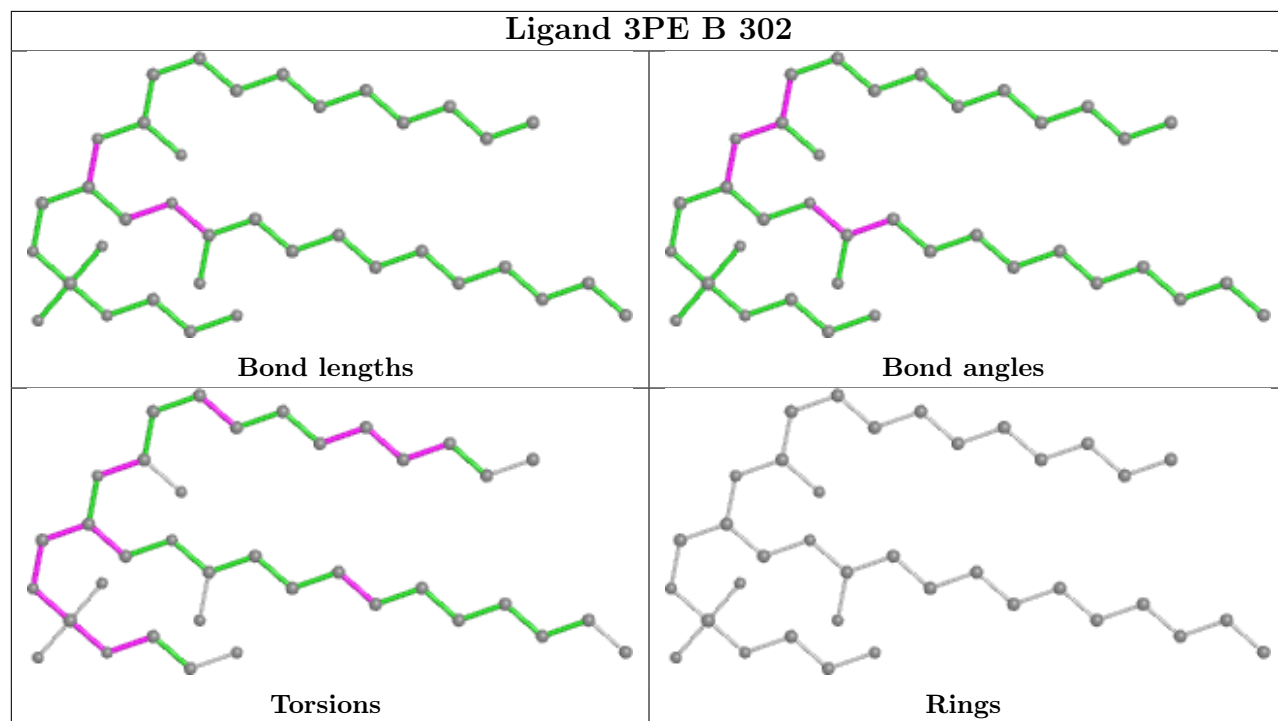
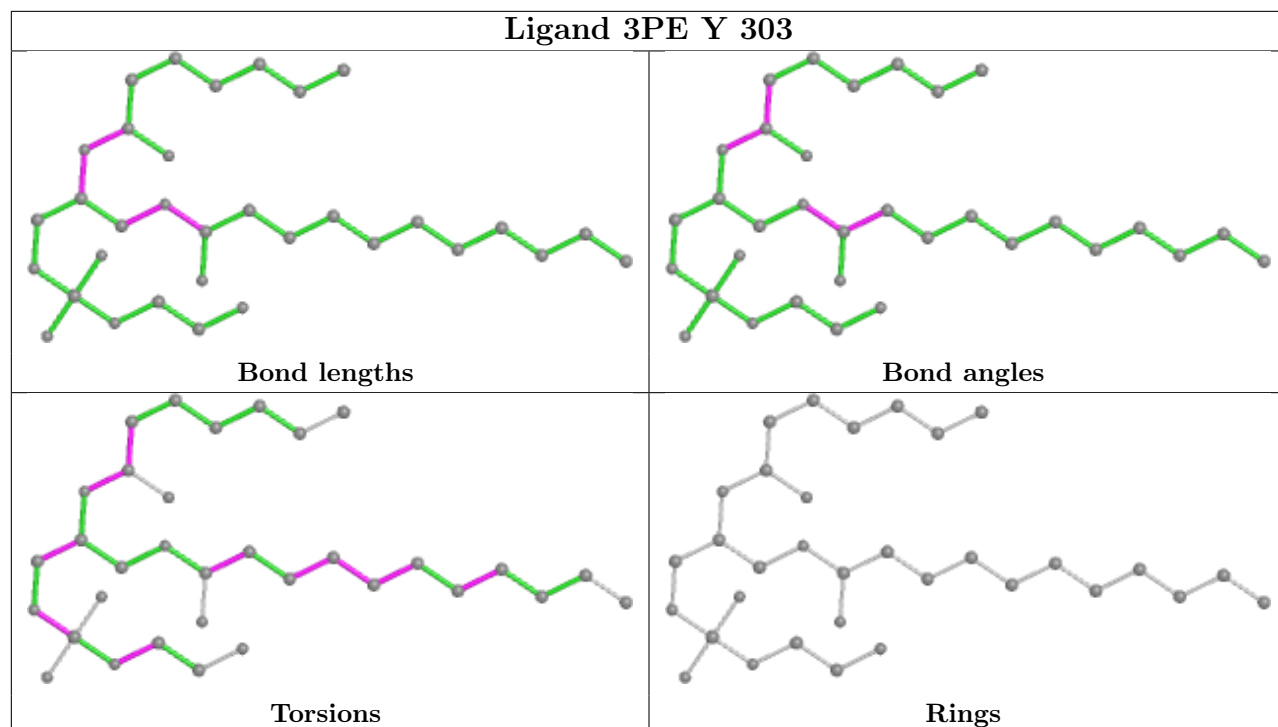
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

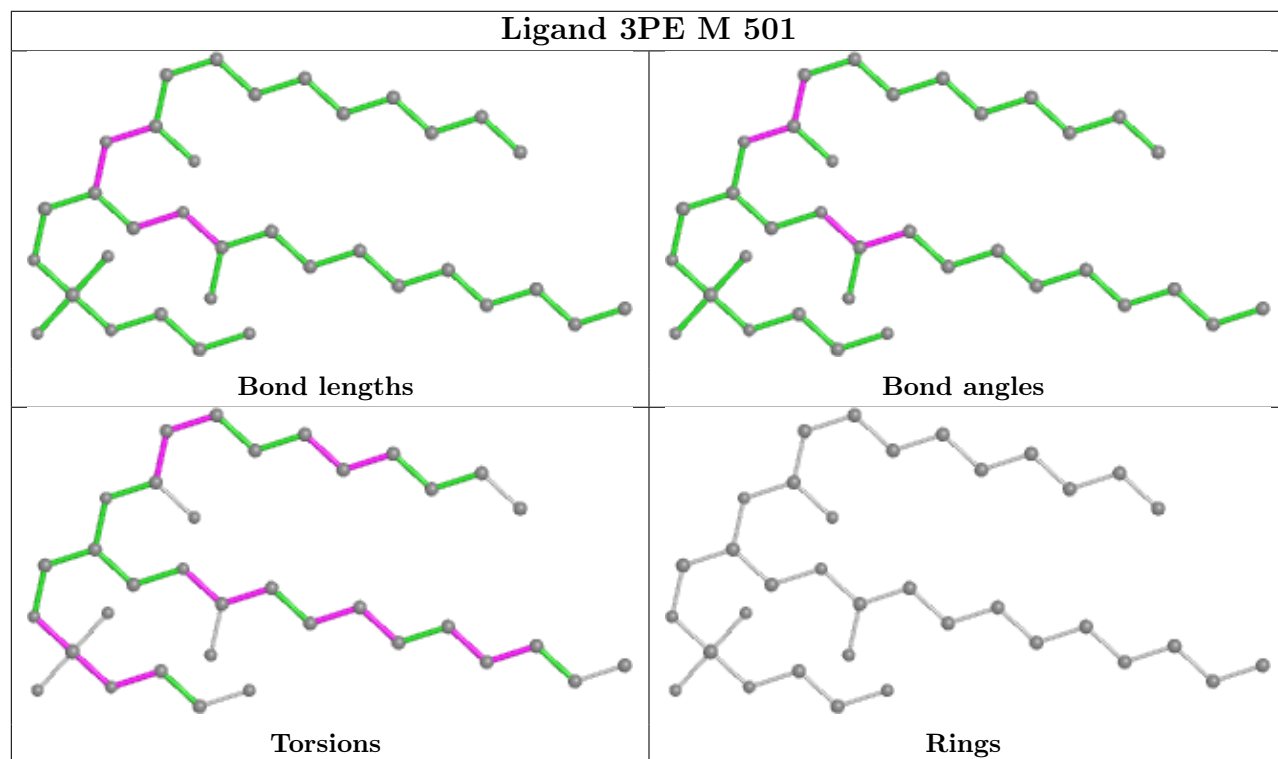
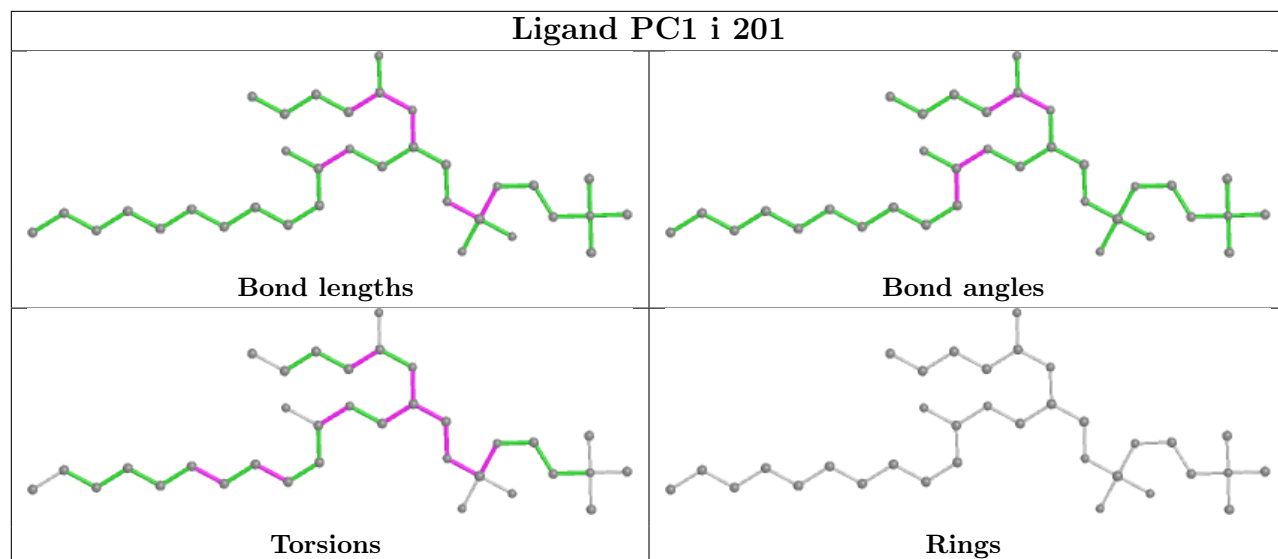


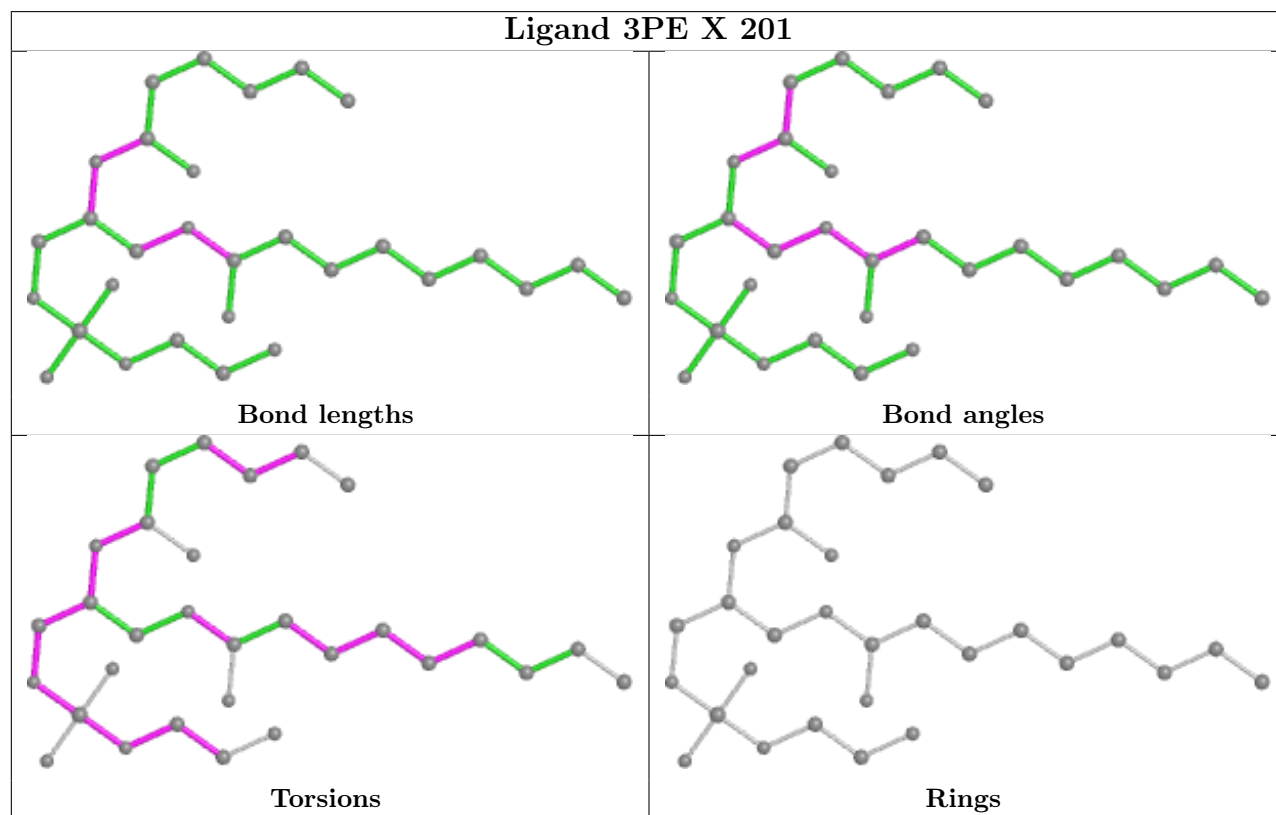
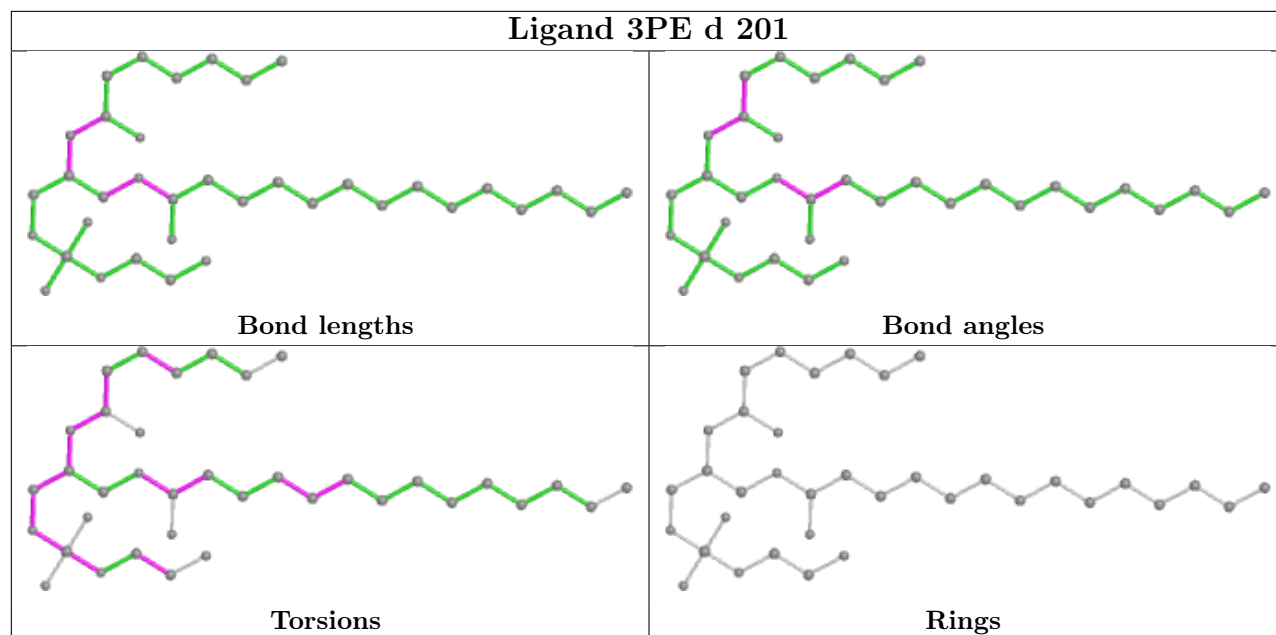


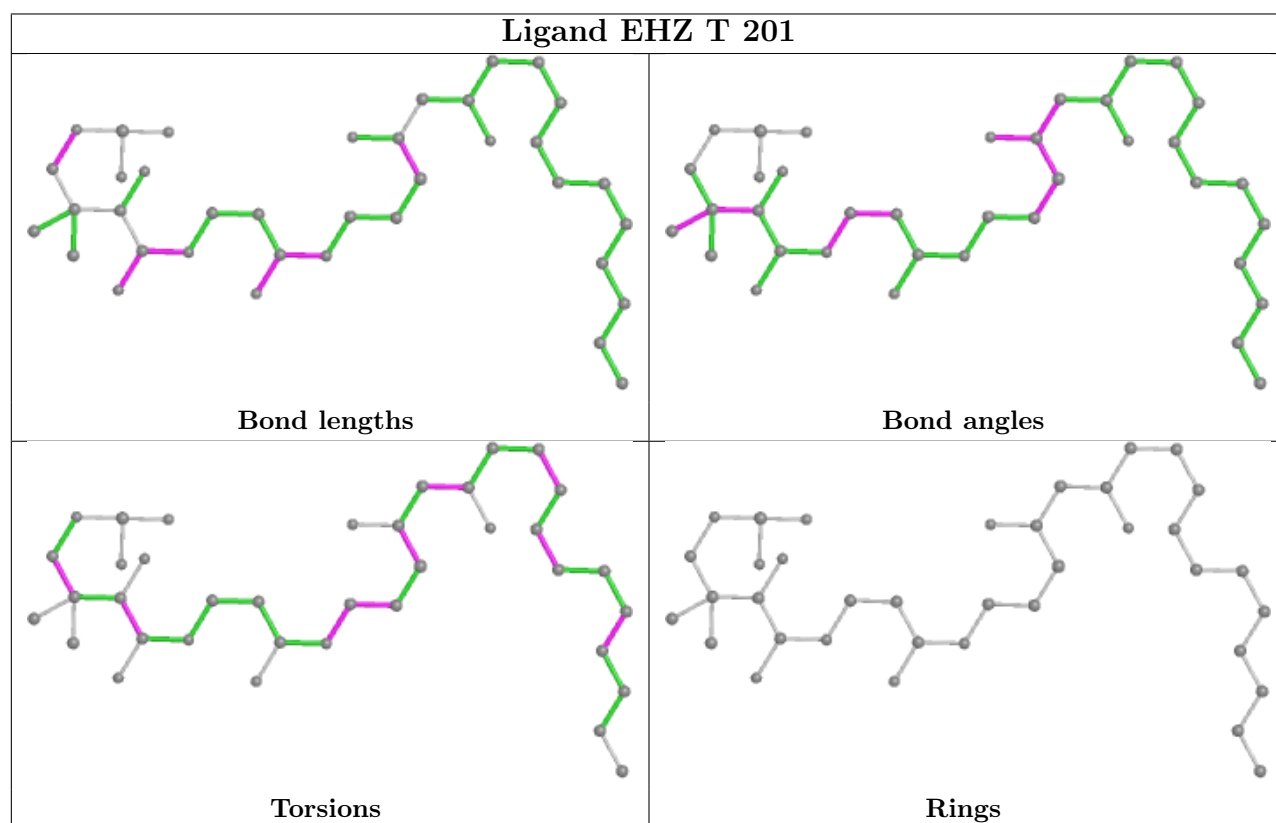
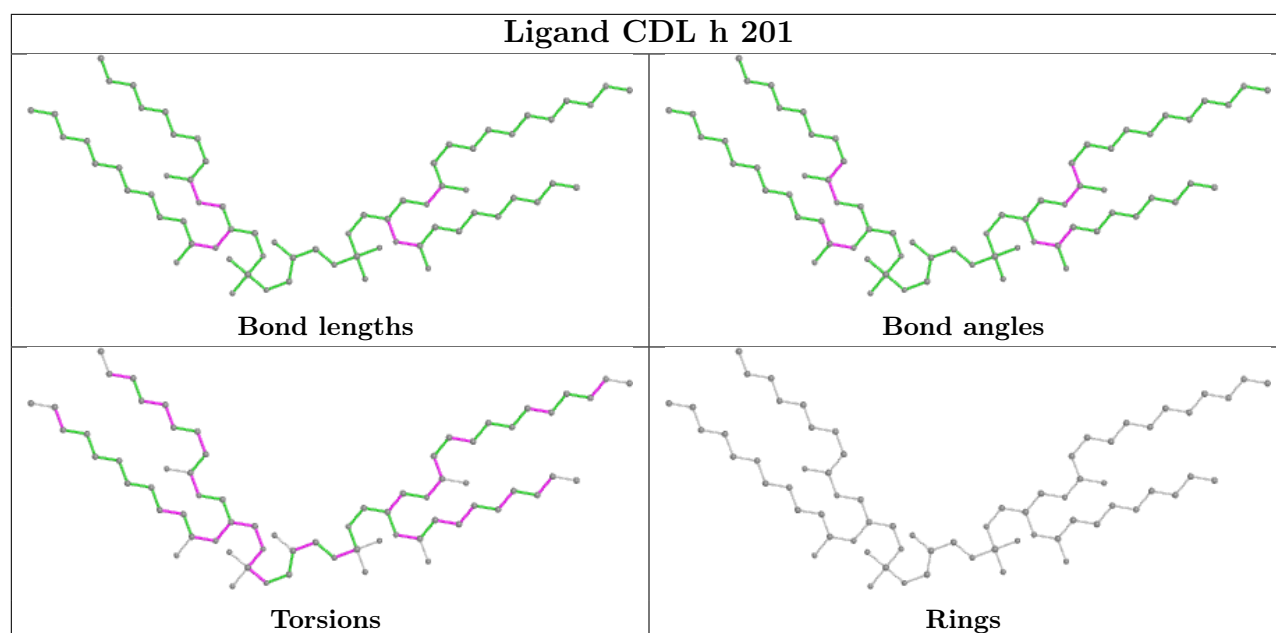


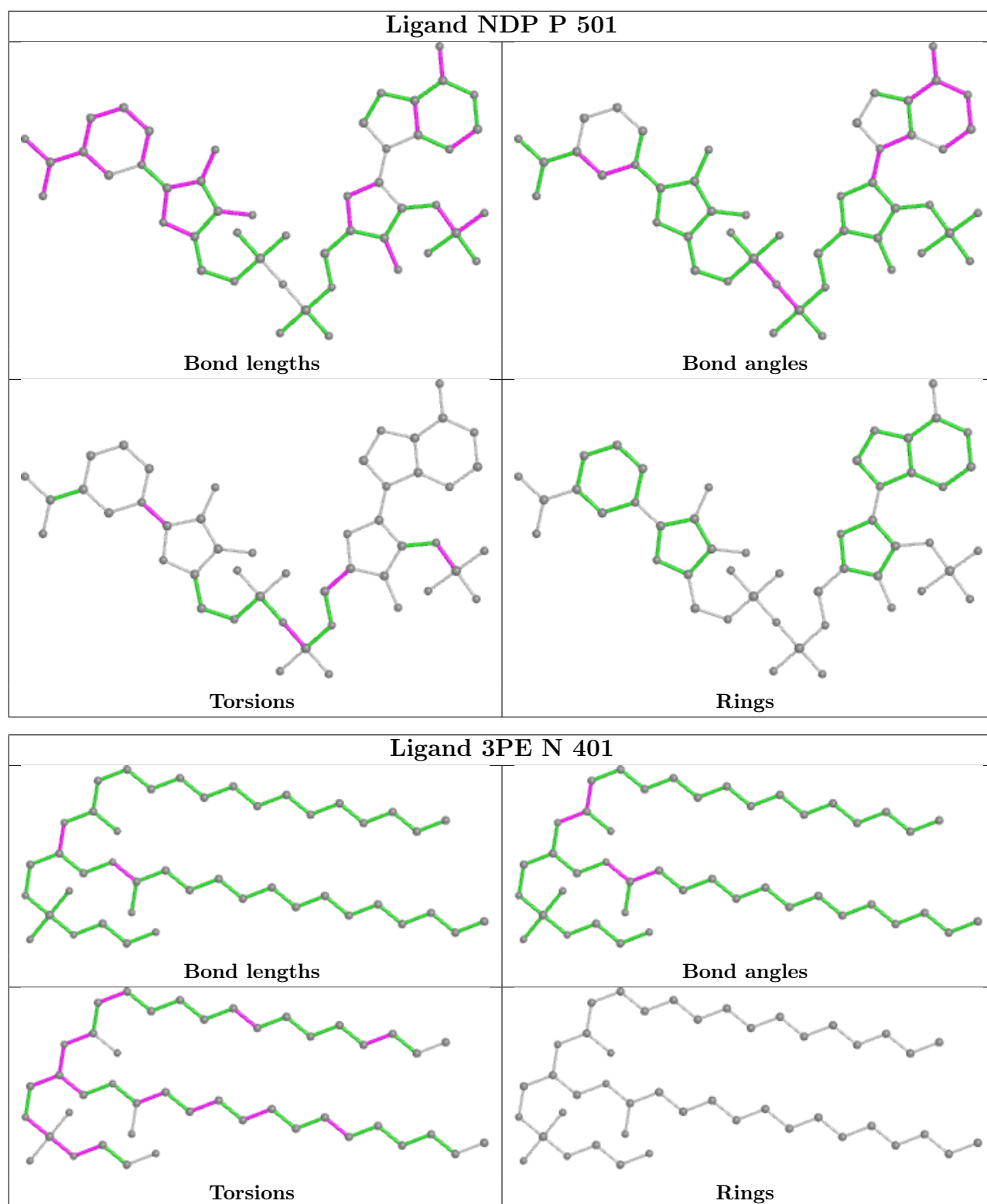


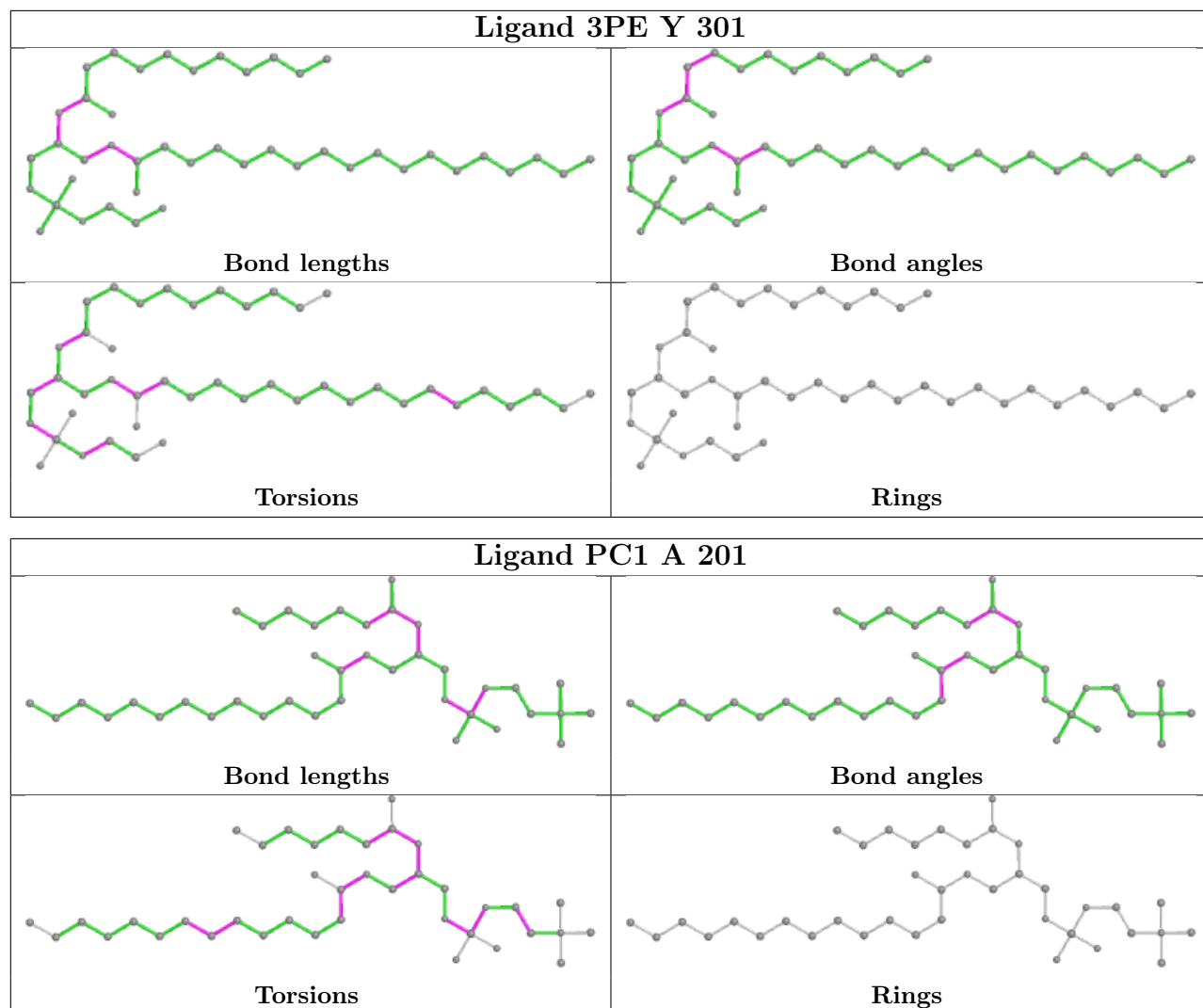


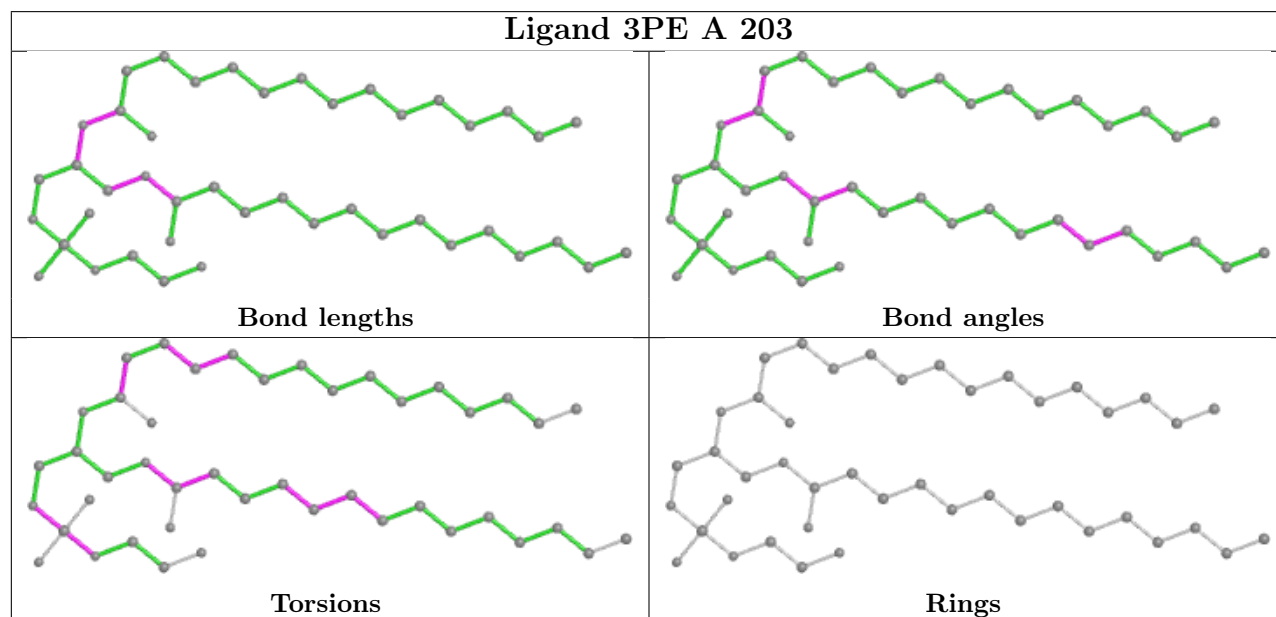
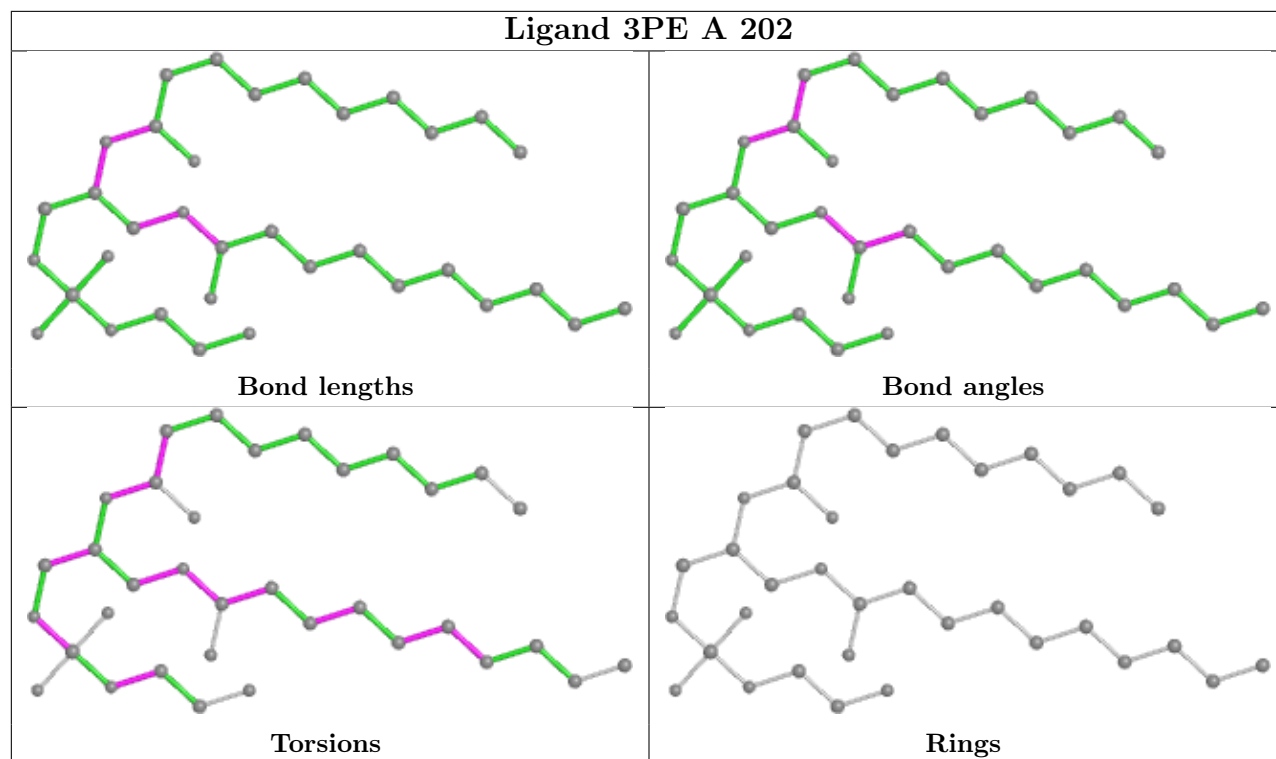


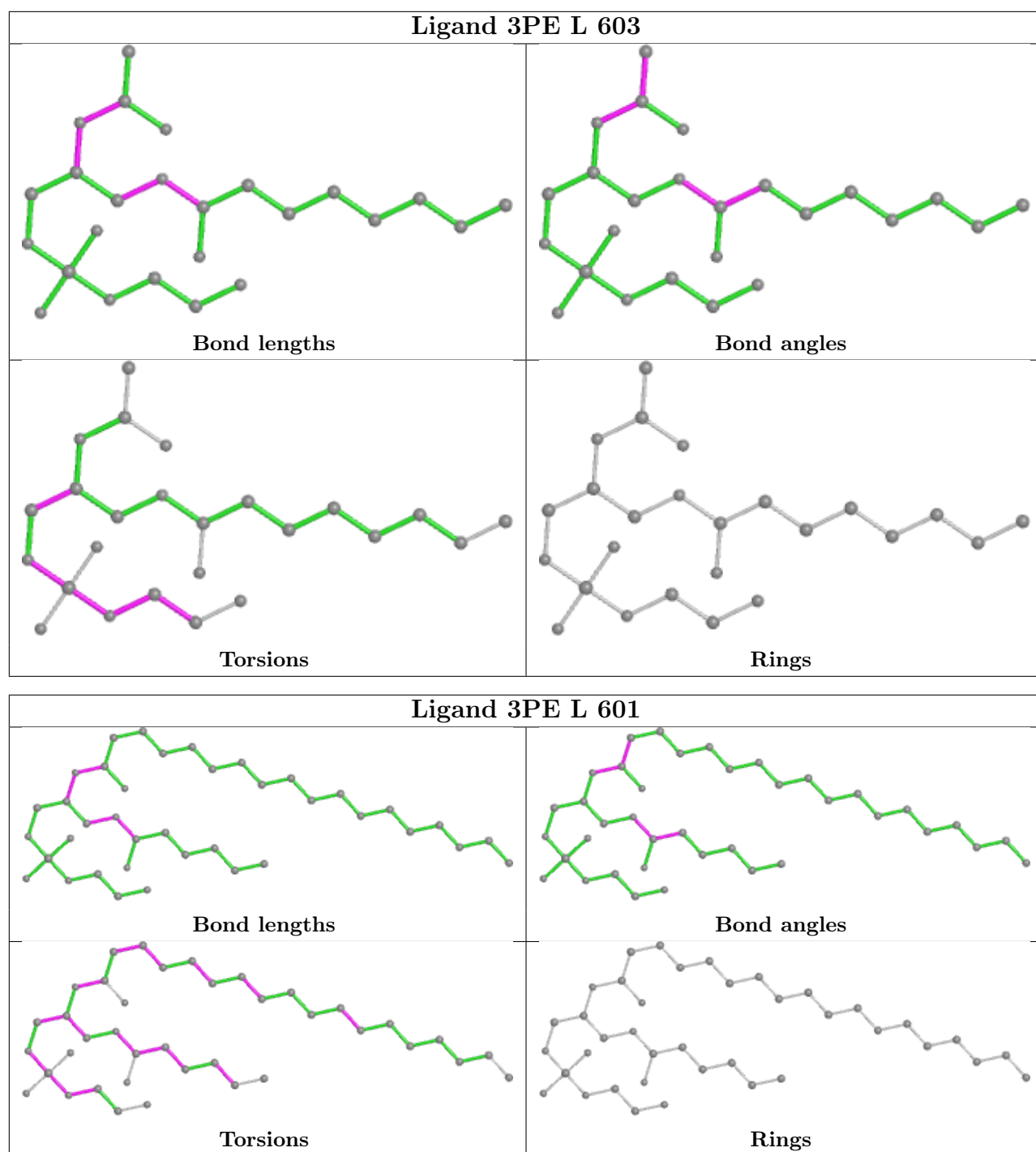


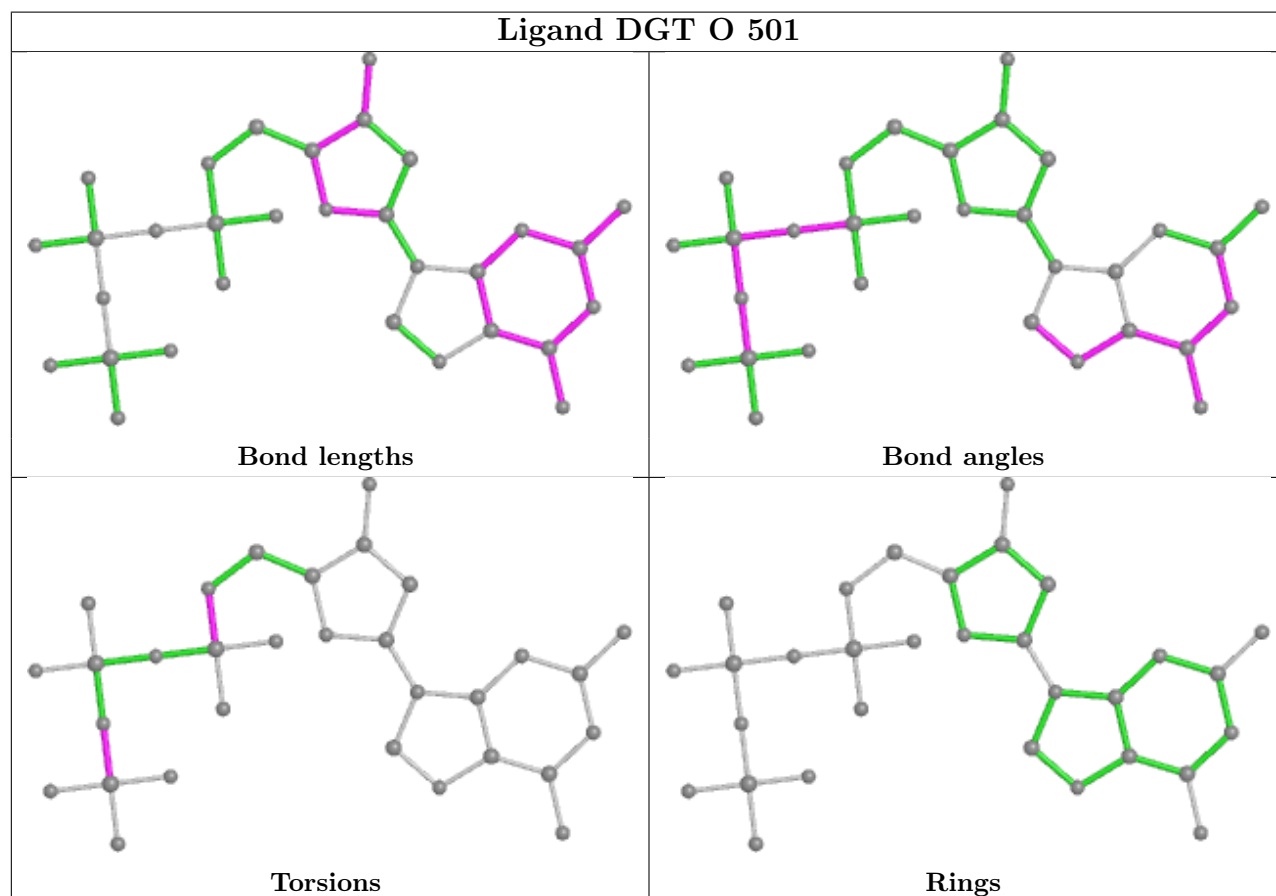
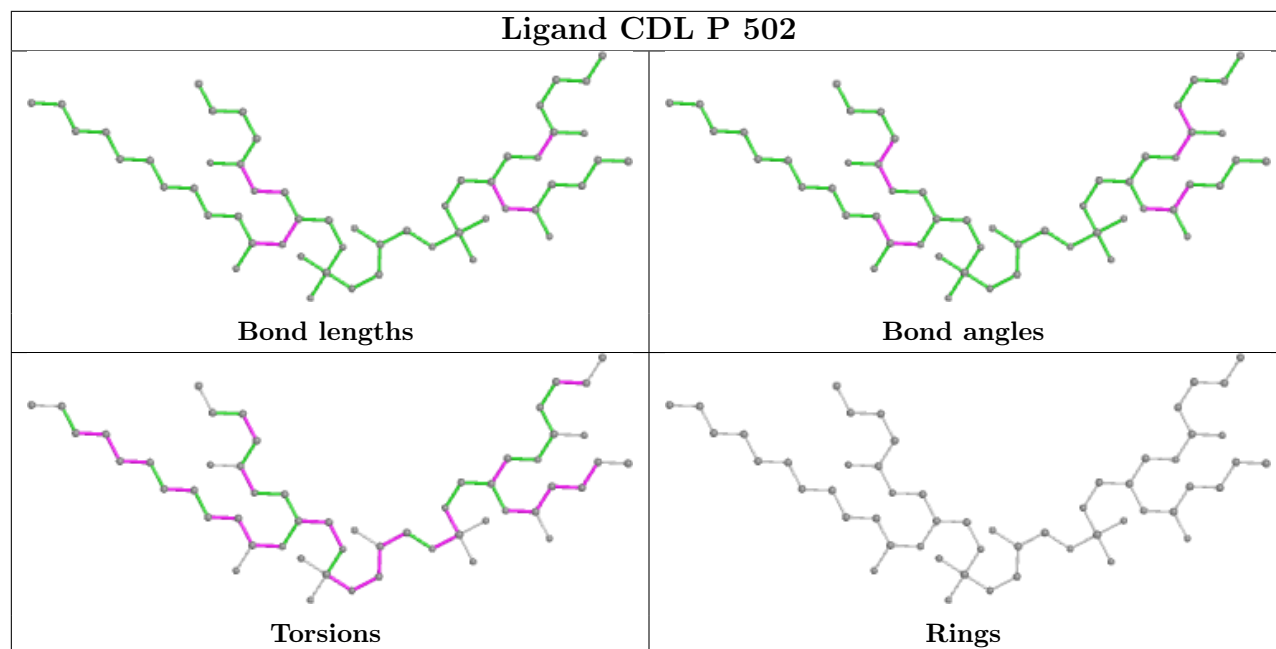


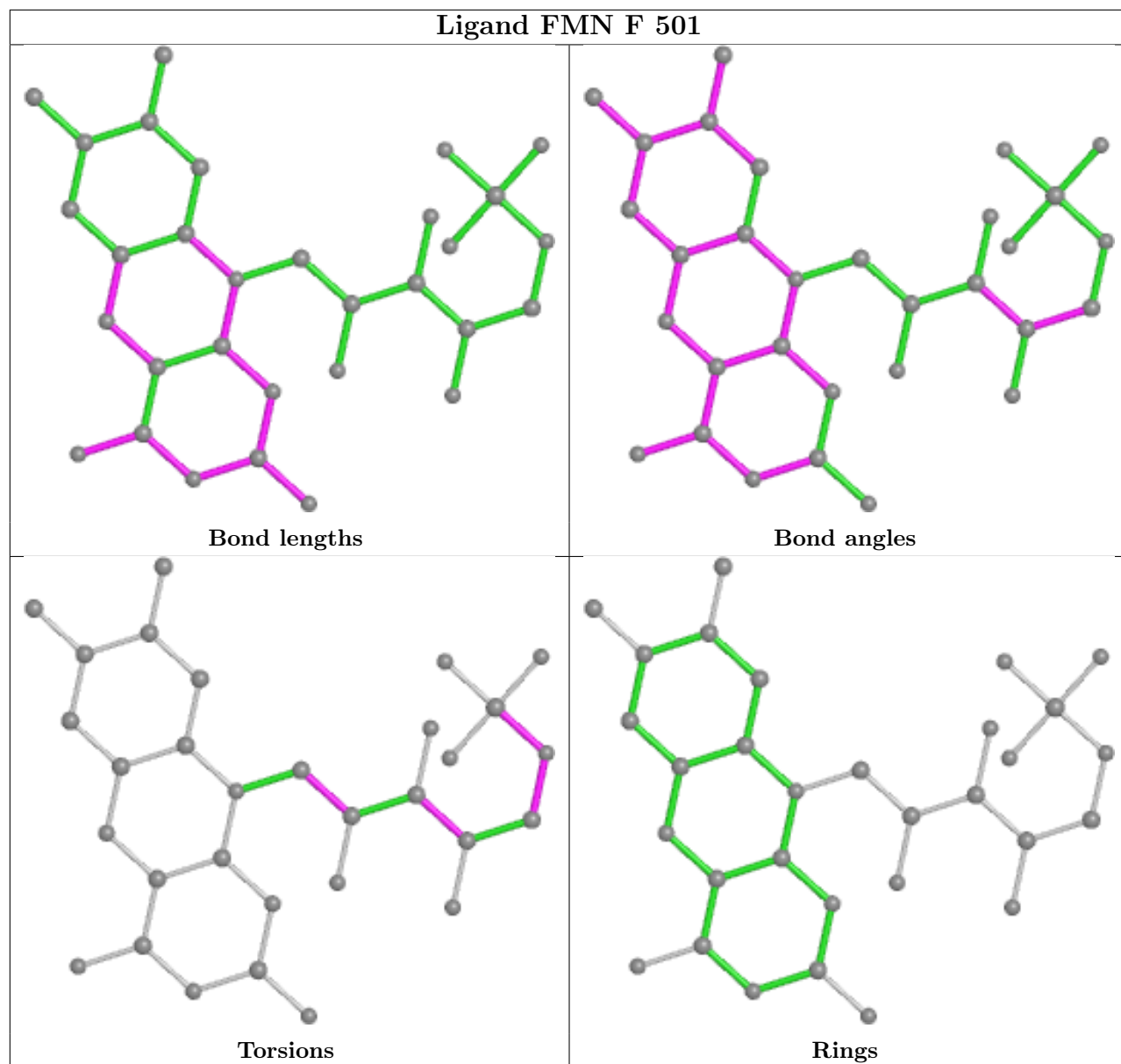


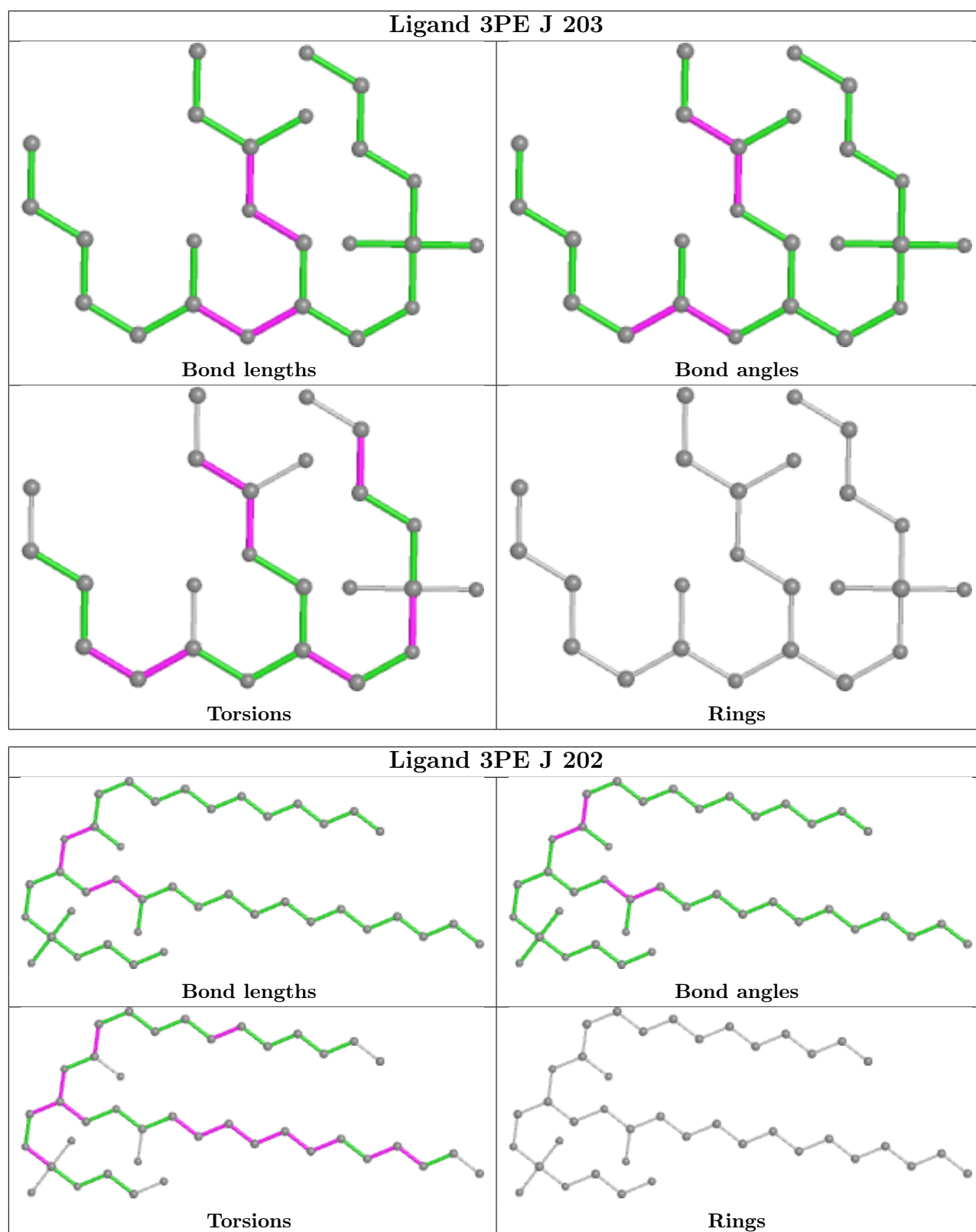












5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

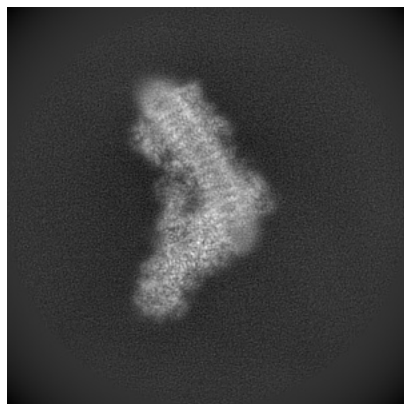
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-15936. These allow visual inspection of the internal detail of the map and identification of artifacts.

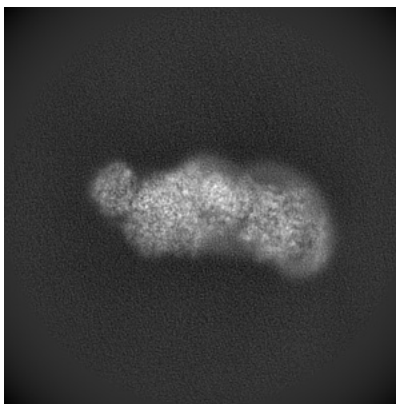
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

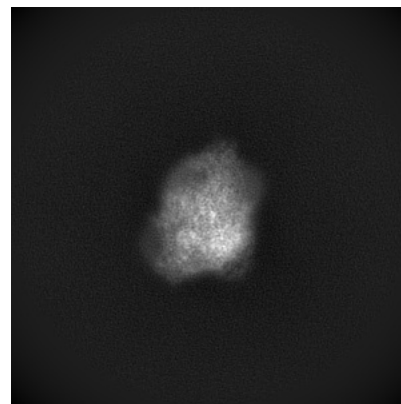
6.1.1 Primary map



X

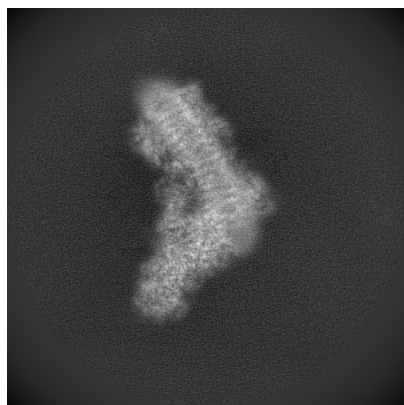


Y

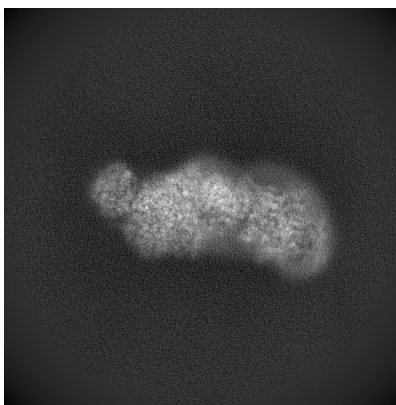


Z

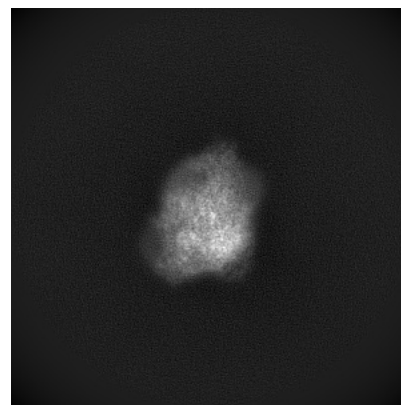
6.1.2 Raw map



X



Y

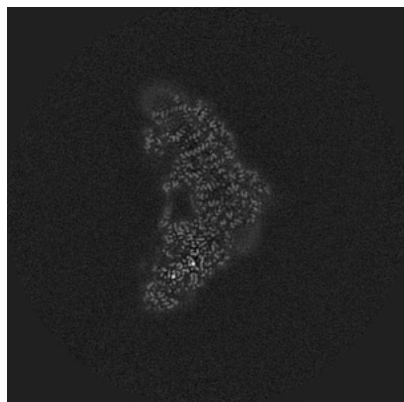


Z

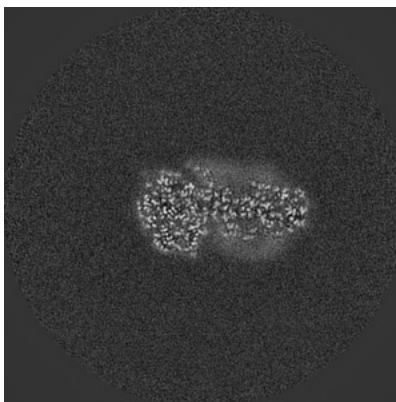
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

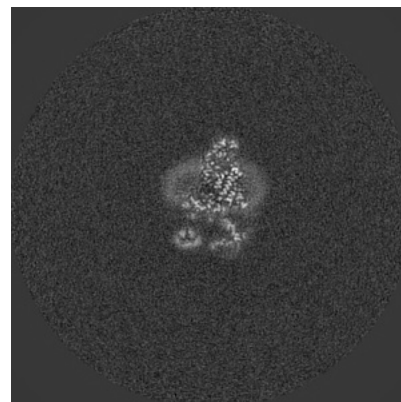
6.2.1 Primary map



X Index: 225

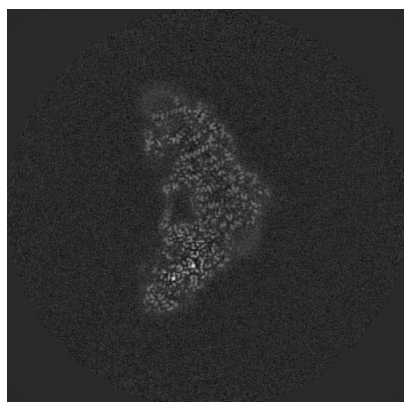


Y Index: 225

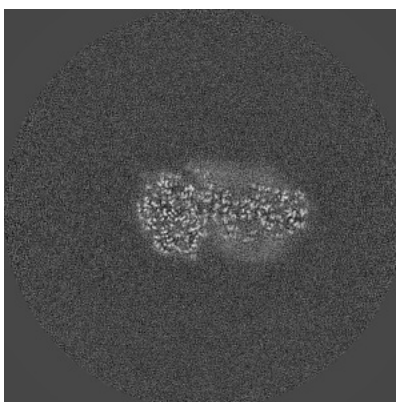


Z Index: 225

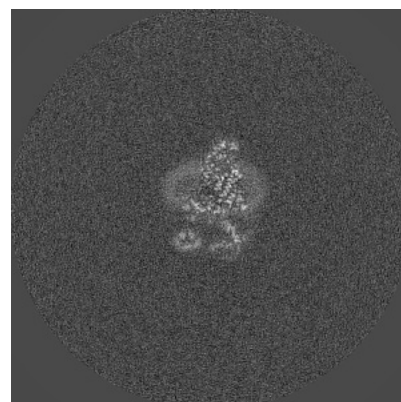
6.2.2 Raw map



X Index: 225



Y Index: 225

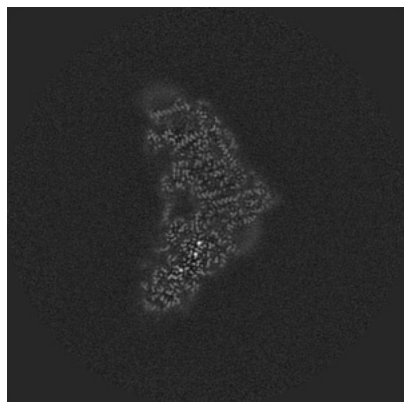


Z Index: 225

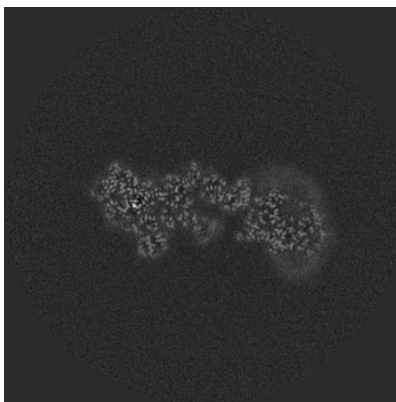
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

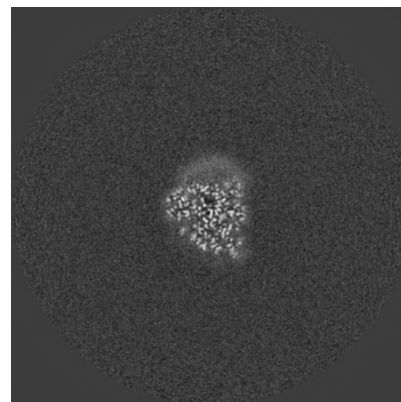
6.3.1 Primary map



X Index: 228

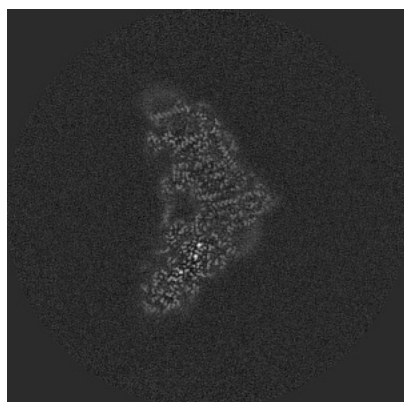


Y Index: 188

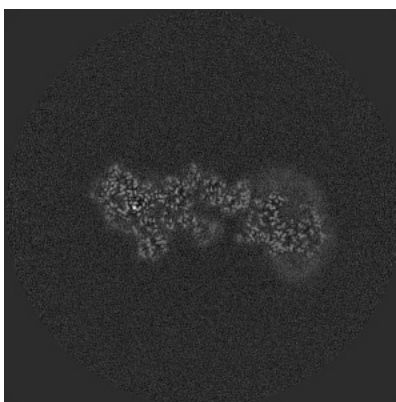


Z Index: 188

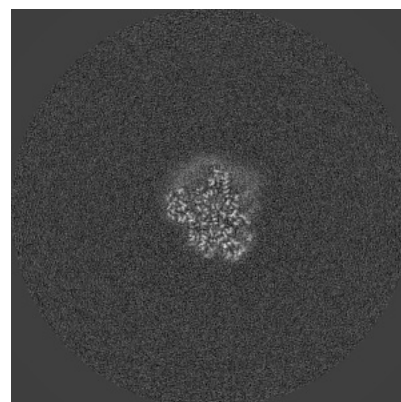
6.3.2 Raw map



X Index: 228



Y Index: 188



Z Index: 206

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

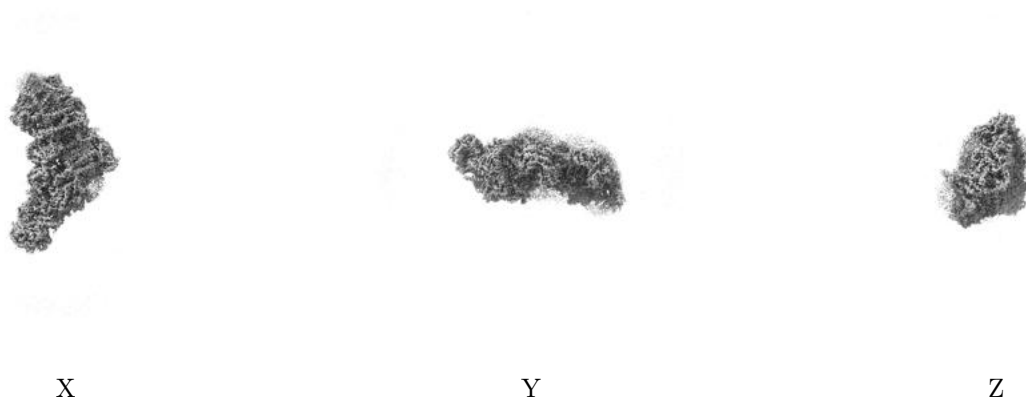
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.013. 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.

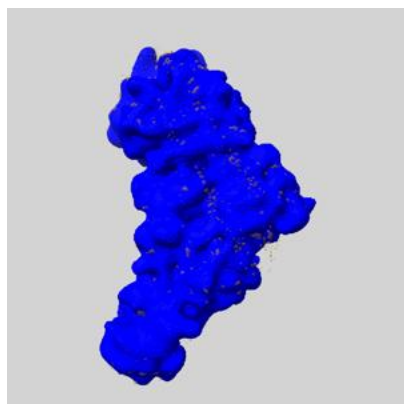
6.5 Mask visualisation [i](#)

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

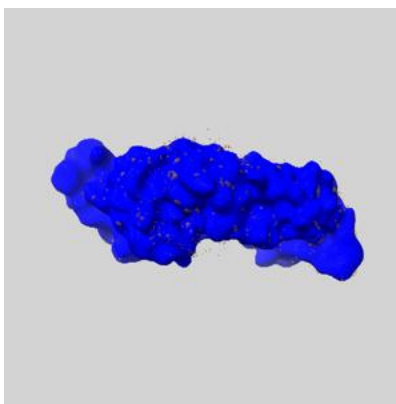
A mask typically either:

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

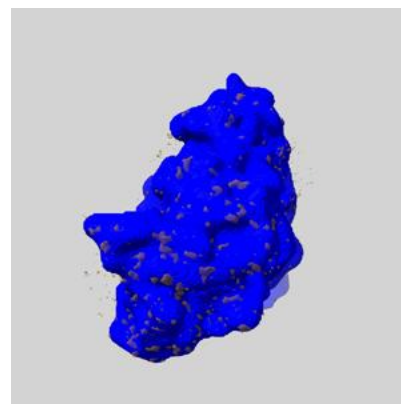
6.5.1 emd_15936_msk_1.map [i](#)



X



Y

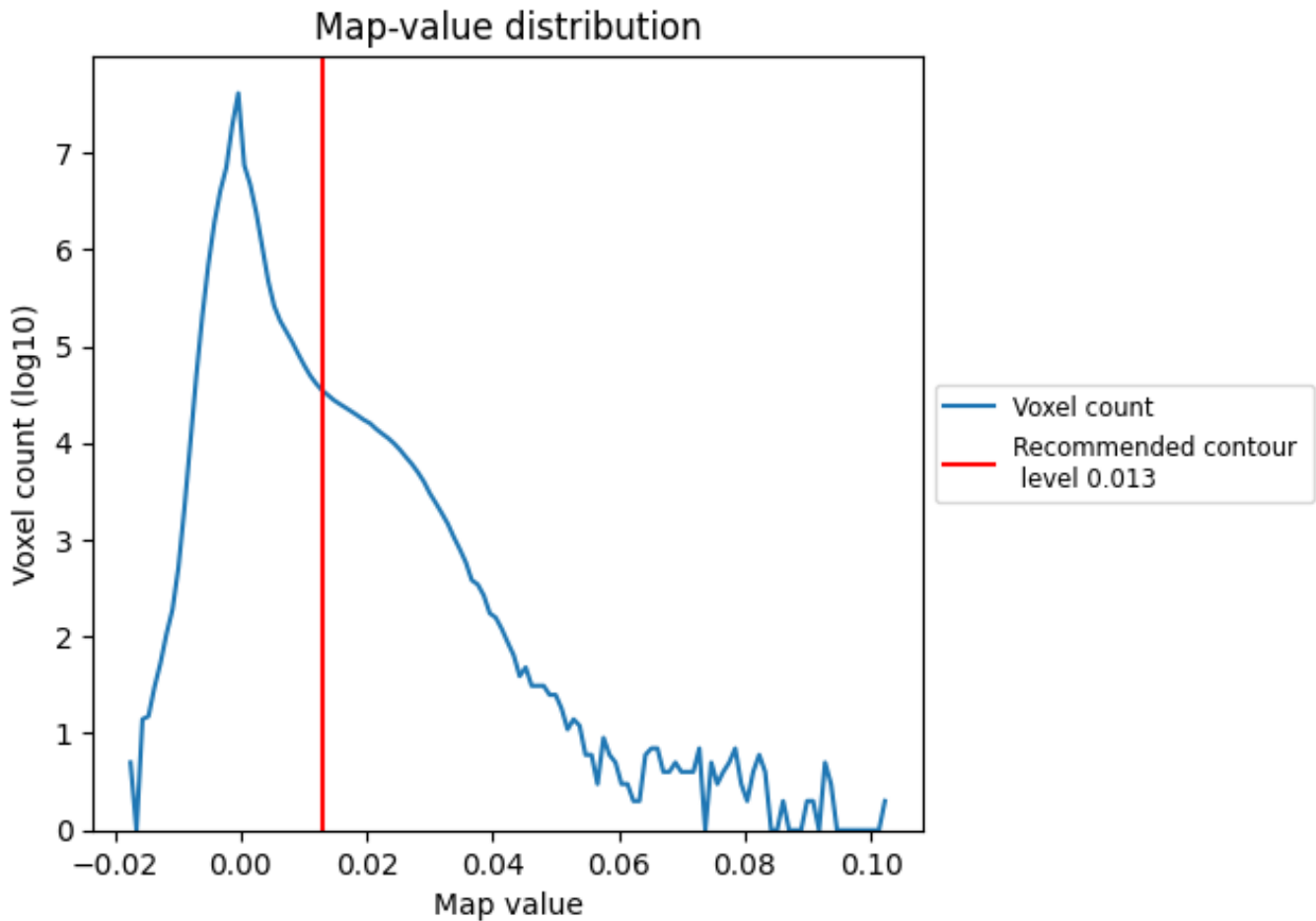


Z

7 Map analysis [i](#)

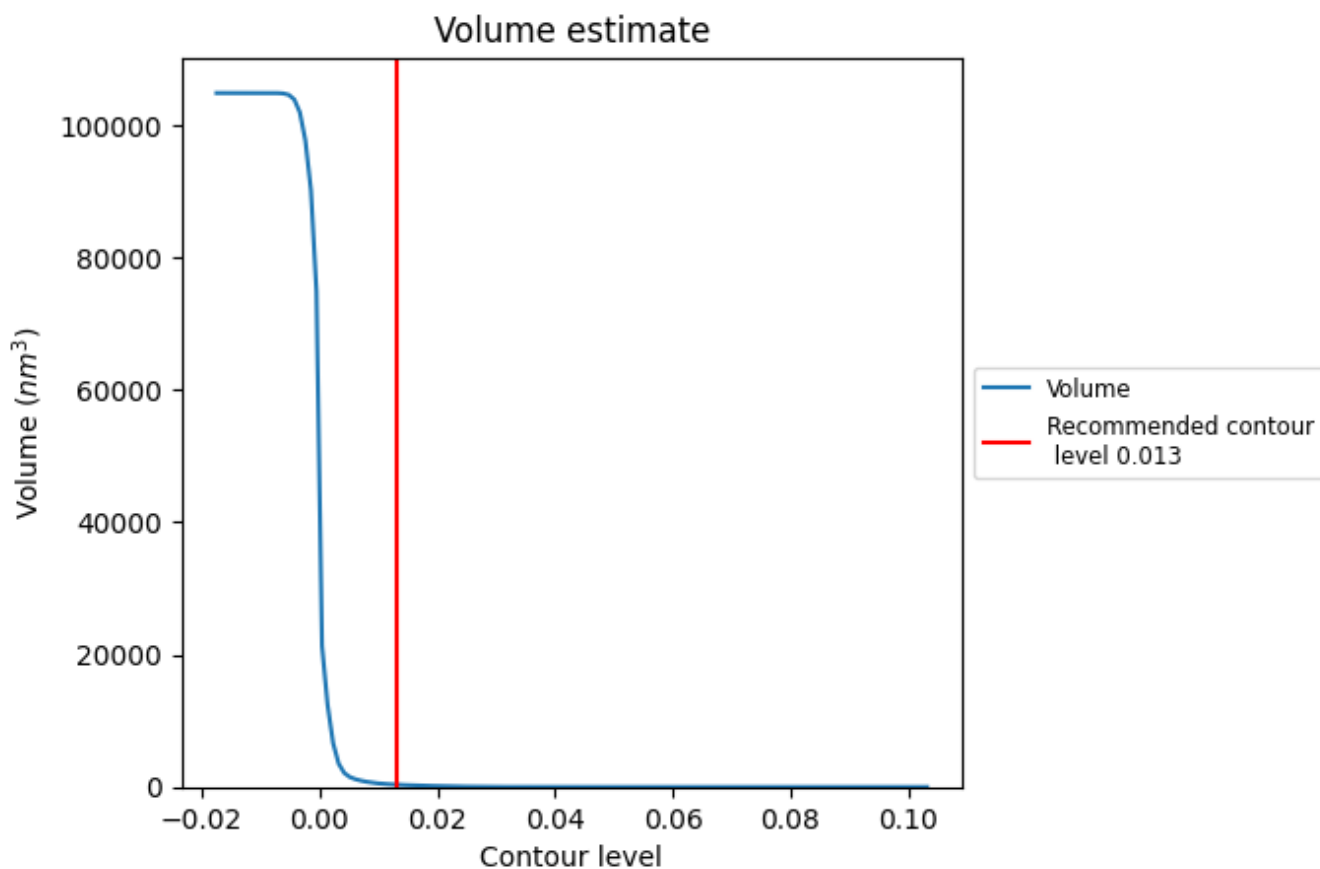
This section contains the results of statistical analysis of the map.

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.

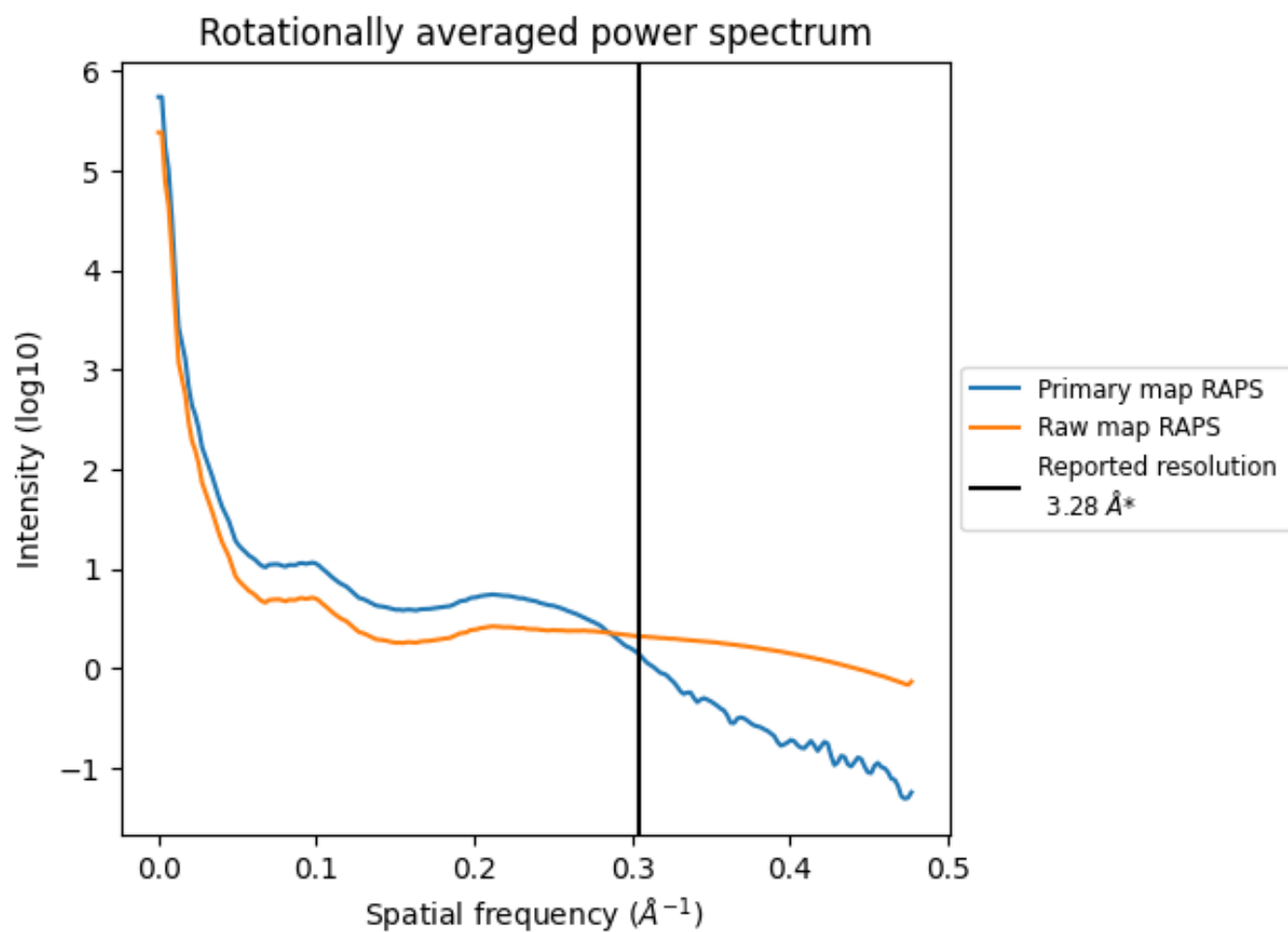
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 349 nm^3 ; this corresponds to an approximate mass of 315 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

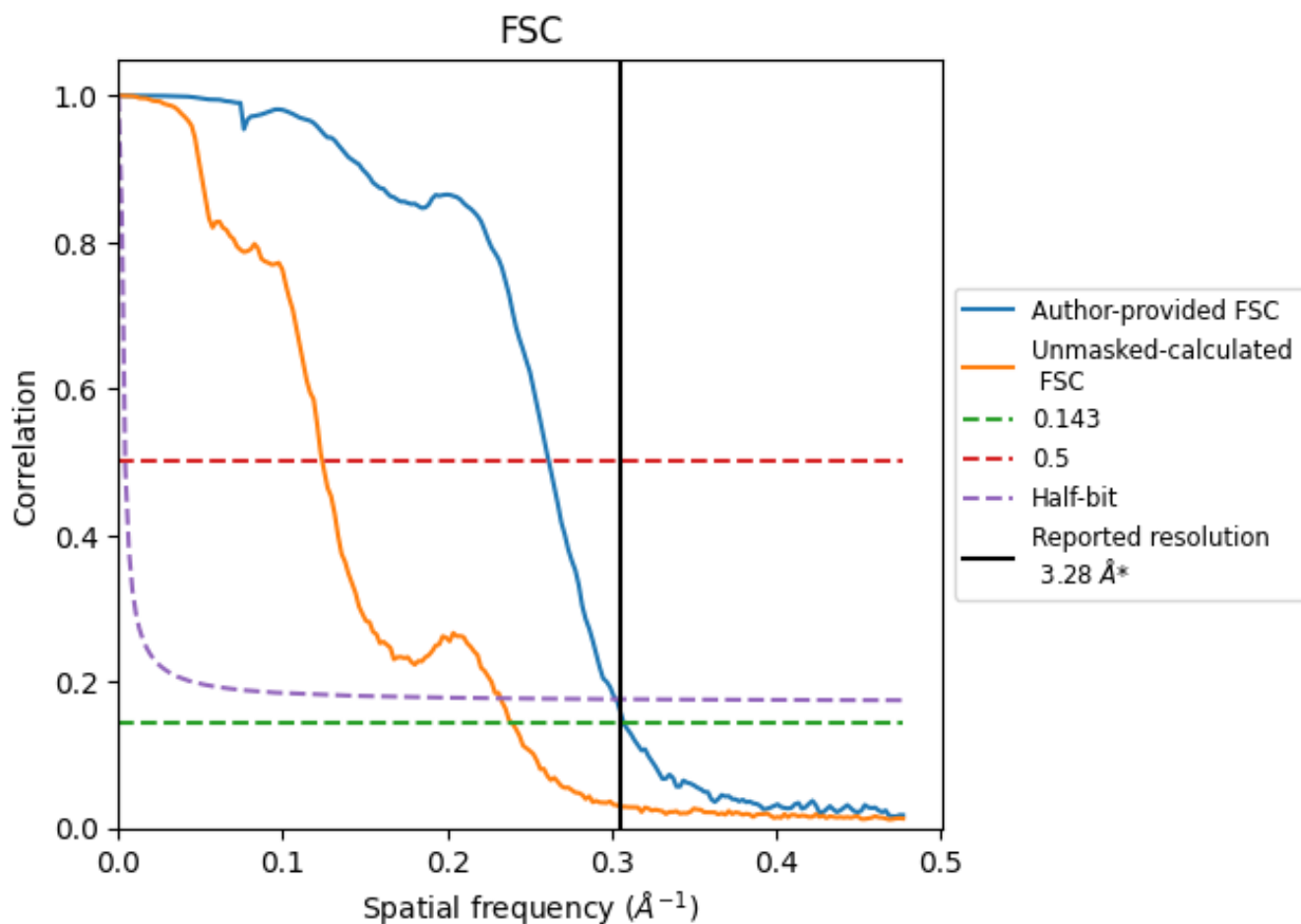


*Reported resolution corresponds to spatial frequency of 0.305 Å⁻¹

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 0.305 Å⁻¹

8.2 Resolution estimates [i](#)

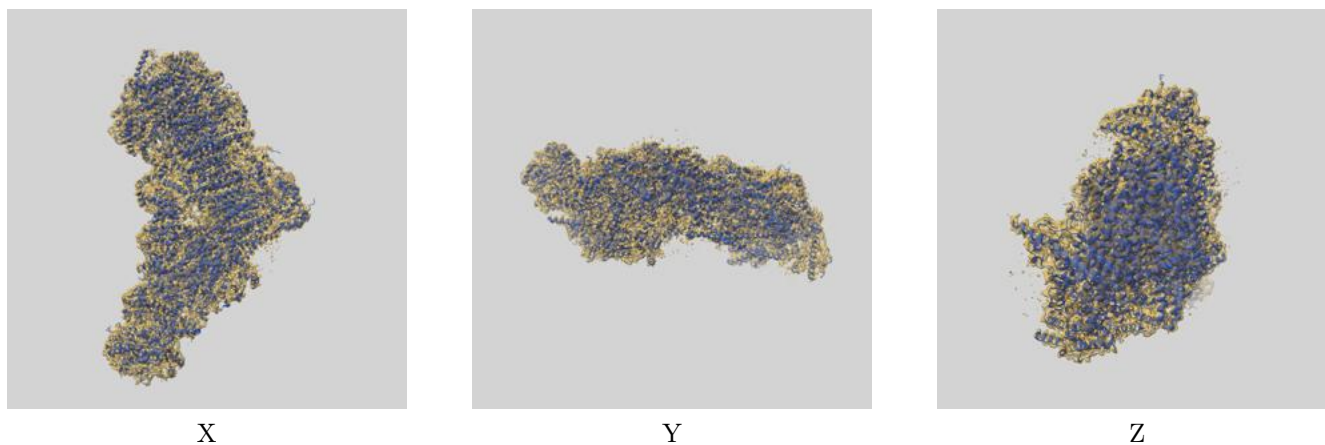
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.28	-	-
Author-provided FSC curve	3.26	3.82	3.31
Unmasked-calculated*	4.18	8.06	4.30

*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 4.18 differs from the reported value 3.28 by more than 10 %

9 Map-model fit [i](#)

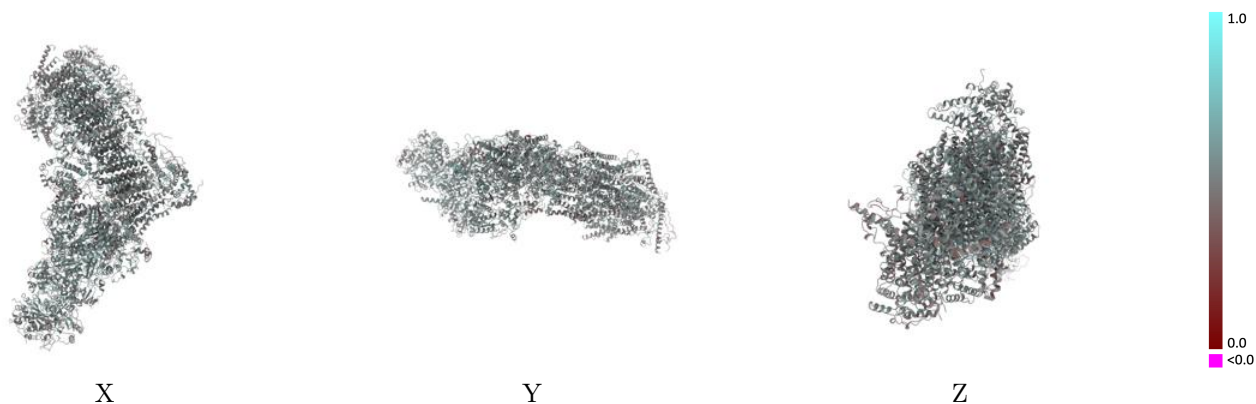
This section contains information regarding the fit between EMDB map EMD-15936 and PDB model 8B9Z. Per-residue inclusion information can be found in section 3 on page 20.

9.1 Map-model overlay [i](#)



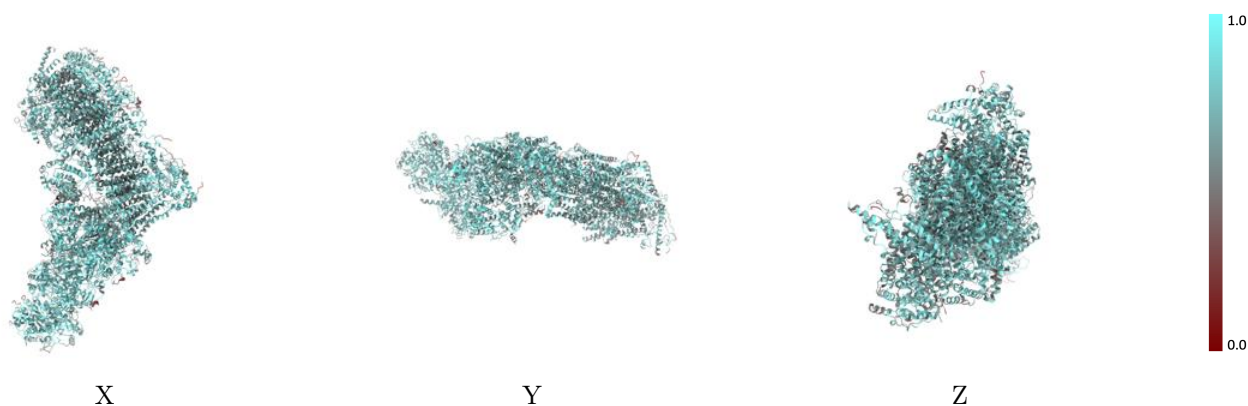
The images above show the 3D surface view of the map at the recommended contour level 0.013 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



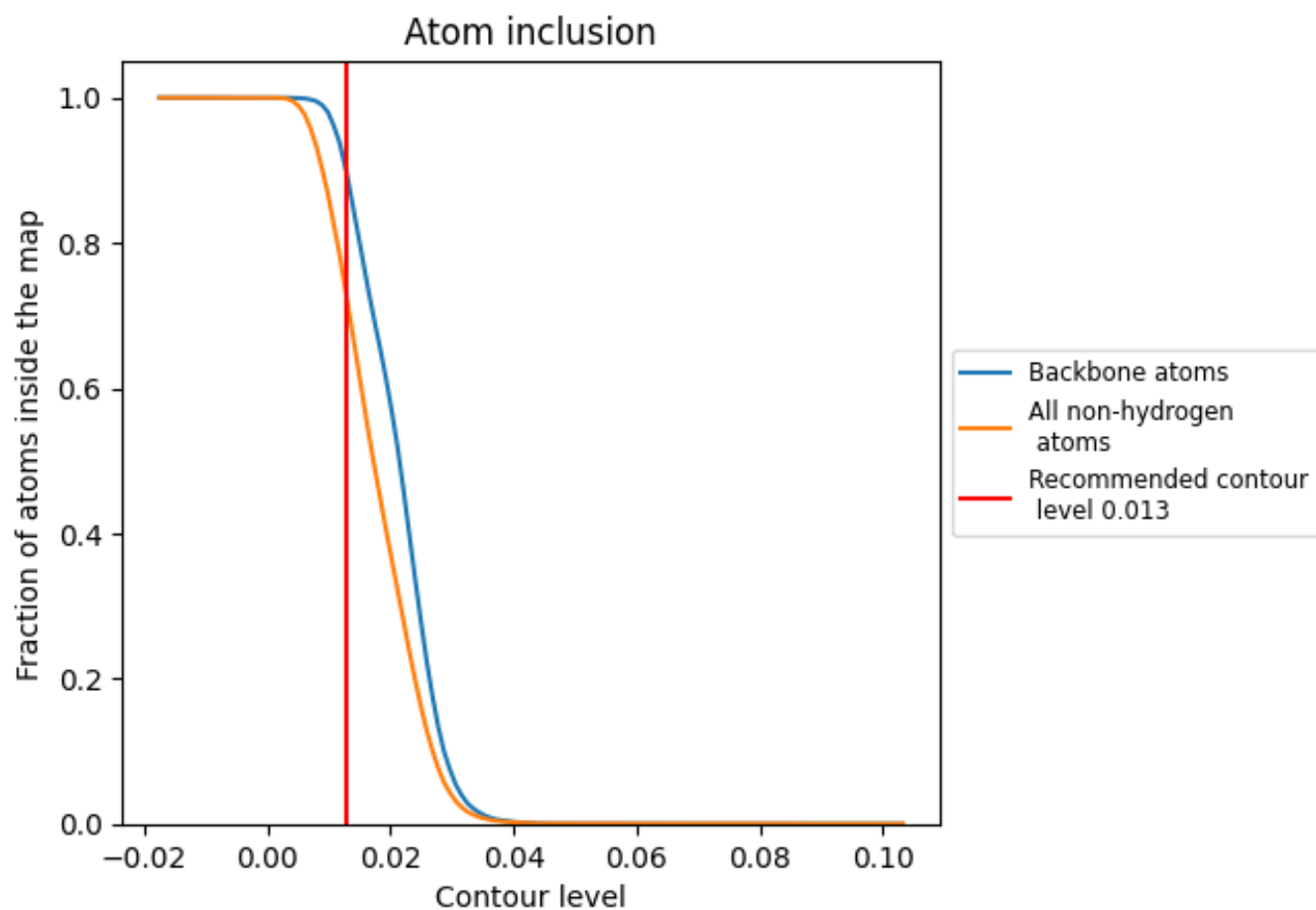
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.013).







































































9.4 Atom inclusion [i](#)



At the recommended contour level, 89% of all backbone atoms, 72% 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 (0.013) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7208	 0.5150
A	 0.6369	 0.5070
B	 0.7585	 0.5360
C	 0.7909	 0.5430
D	 0.7585	 0.5340
E	 0.7406	 0.5090
F	 0.7752	 0.5210
G	 0.7621	 0.5290
H	 0.6987	 0.5190
I	 0.8065	 0.5410
J	 0.6321	 0.5060
K	 0.6501	 0.5100
L	 0.6773	 0.5060
M	 0.7082	 0.5290
N	 0.6923	 0.5220
O	 0.7461	 0.5180
P	 0.7658	 0.5250
Q	 0.7356	 0.5250
R	 0.8057	 0.5420
T	 0.4815	 0.4040
U	 0.5992	 0.4740
V	 0.7166	 0.5110
W	 0.7362	 0.5150
X	 0.7159	 0.5070
Y	 0.6029	 0.4900
Z	 0.7699	 0.5180
a	 0.7055	 0.5020
b	 0.7206	 0.4920
d	 0.7067	 0.5110
e	 0.7373	 0.5140
f	 0.6244	 0.4940
g	 0.6810	 0.5110
h	 0.7139	 0.5220
i	 0.7057	 0.4950
j	 0.6635	 0.4720



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Chain	Atom inclusion	Q-score
k	 0.6539	 0.4750
l	 0.7288	 0.5140
m	 0.7390	 0.5050
n	 0.7267	 0.5010
o	 0.6989	 0.4750
p	 0.7616	 0.5100
q	 0.7576	 0.5210
r	 0.7171	 0.5220
s	 0.6085	 0.4830