



wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 09:25 PM UTC

PDB ID : 8UEZ / pdb_00008uez
EMDB ID : EMD-42176
Title : In-situ complex I, Active-Q10 (State-delta)
Authors : Zheng, W.; Zhu, J.; Zhang, K.
Deposited on : 2023-10-02
Resolution : 3.50 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

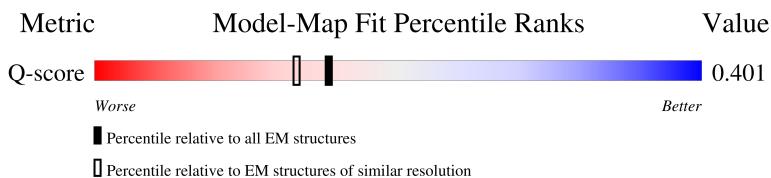
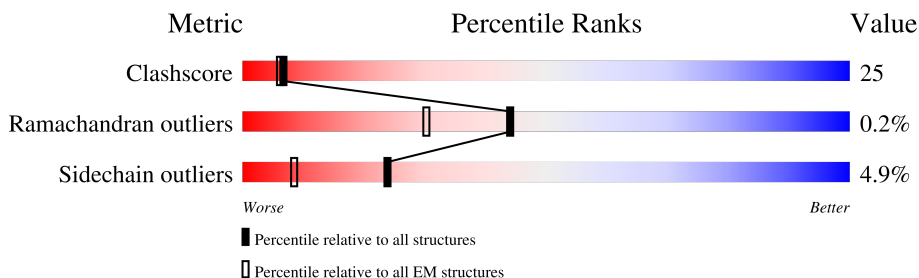
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data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

1 Overall quality at a glance

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

The reported resolution of this entry is 3.50 Å.

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



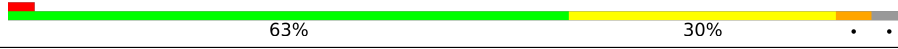
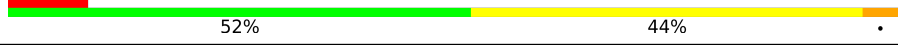
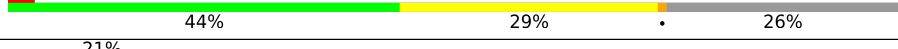
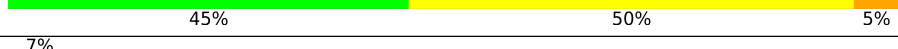
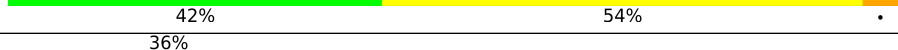
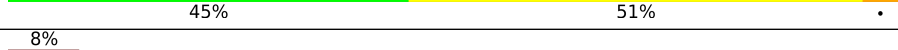
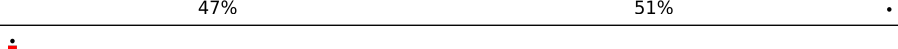
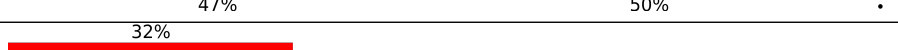
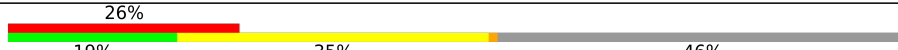
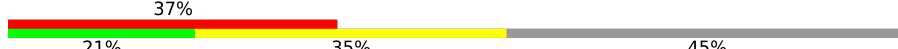
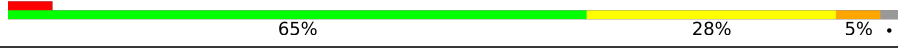
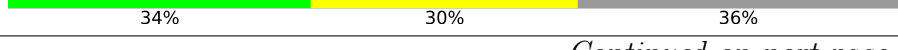
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	13950 (3.00 - 4.00)

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	1A	115	
2	1B	258	
3	1C	264	
4	1D	476	

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Mol	Chain	Length	Quality of chain
5	1E	249	
6	1F	464	
7	1G	727	
8	1H	318	
9	1I	239	
10	1J	175	
11	1K	98	
12	1L	606	
13	1M	459	
14	1N	347	
15	1O	357	
16	1P	377	
17	1Q	175	
18	1R	123	
19	1S	99	
20	1T	156	
20	1U	156	
21	1V	116	
22	1W	128	
23	1X	172	
24	1Y	141	
25	1Z	144	
26	1a	70	
27	1b	84	
28	1c	76	

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Mol	Chain	Length	Quality of chain
29	1d	123	
30	1e	106	
31	1f	135	
32	1g	154	
33	1h	189	
34	1i	128	
35	1j	105	
36	1k	98	
37	1l	186	
38	1m	129	
39	1n	179	
40	1o	137	
41	1p	176	
42	1q	145	
43	1r	114	
44	1s	471	

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
45	SF4	1F	502	-	-	X	-

2 Entry composition

There are 58 unique types of molecules in this entry. The entry contains 67334 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
1	1A	115	Total	C	N	O	S	0	0
			916	616	134	159	7		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
2	1B	155	Total	C	N	O	S	0	0
			1242	791	226	211	14		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
3	1C	209	Total	C	N	O	S	0	0
			1740	1125	297	316	2		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1C	104	GLN	ARG	conflict	UNP A0A286ZNN4
1C	154	GLY	ASP	conflict	UNP A0A286ZNN4

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

Mol	Chain	Residues	Atoms					AltConf	Trace
4	1D	429	Total	C	N	O	S	0	0
			3452	2207	593	628	24		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1D	0	GLY	GLU	conflict	UNP A0A8D0QM68

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

Mol	Chain	Residues	Atoms					AltConf	Trace
5	1E	214	Total	C	N	O	S	0	0
			1658	1058	278	312	10		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
6	1F	432	Total	C	N	O	S	0	0
			3325	2100	592	613	20		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
7	1G	699	Total	C	N	O	S	0	0
			5362	3360	933	1029	40		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
8	1H	318	Total	C	N	O	S	0	0
			2504	1673	385	425	21		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
9	1I	176	Total	C	N	O	S	0	0
			1412	887	243	269	13		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
10	1J	175	Total	C	N	O	S	0	0
			1339	898	190	238	13		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
11	1K	98	Total	C	N	O	S	0	0
			750	494	113	129	14		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
12	1L	606	Total	C	N	O	S	0	0
			4818	3195	746	826	51		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
13	1M	459	Total	C	N	O	S	0	0
			3632	2411	572	610	39		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
14	1N	347	Total	C	N	O	S	0	0
			2712	1783	420	463	46		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
15	1O	320	Total	C	N	O	S	0	0
			2590	1649	440	491	10		

- Molecule 16 is a protein called NADH:ubiquinone oxidoreductase subunit A9.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	1P	342	Total	C	N	O	S	0	0
			2751	1783	481	478	9		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
17	1Q	129	Total	C	N	O	S	0	0
			1047	659	186	199	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
18	1R	96	Total	C	N	O	S	0	0
			741	452	140	146	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
19	1S	87	Total	C	N	O	S	0	0
			700	440	131	127	2		

- Molecule 20 is a protein called NADH:ubiquinone oxidoreductase subunit AB1.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	1T	85	Total	C	N	O	S	0	0
			689	445	101	138	5		
20	1U	86	Total	C	N	O	S	0	0
			694	448	102	139	5		

- Molecule 21 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5 isoform X1.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	1V	115	Total	C	N	O	S	0	0
			927	599	157	168	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
22	1W	115	Total	C	N	O	S	0	0
			971	619	179	168	5		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
23	1X	171	Total	C	N	O	S	0	0
			1398	887	250	251	10		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
24	1Y	139	Total	C	N	O	S	0	0
			1016	648	173	189	6		

- Molecule 25 is a protein called NADH:ubiquinone oxidoreductase subunit A13.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	1Z	141	Total	C	N	O	S	0	0
			1168	752	202	205	9		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
26	1a	70	Total	C	N	O	S	0	0
			562	361	101	94	6		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
27	1b	83	Total	C	N	O	S	0	0
			643	417	110	115	1		

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

Mol	Chain	Residues	Atoms				AltConf	Trace
28	1c	49	Total	C	N	O	0	0
			417	276	71	70		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
29	1d	121	Total	C	N	O	S	0	0
			996	648	172	170	6		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1d	-2	ACE	-	acetylation	UNP A0A480JRW3

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

Mol	Chain	Residues	Atoms					AltConf	Trace
30	1e	99	Total	C	N	O	S	0	0
			816	519	151	140	6		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
31	1f	57	Total	C	N	O	S	0	0
			487	316	89	80	2		

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1f	-77	MET	-	initiating methionine	UNP A0A8D1IZ33
1f	-76	ALA	-	expression tag	UNP A0A8D1IZ33
1f	-75	ALA	-	expression tag	UNP A0A8D1IZ33
1f	-74	ALA	-	expression tag	UNP A0A8D1IZ33
1f	-73	ILE	-	expression tag	UNP A0A8D1IZ33
1f	-72	LEU	-	expression tag	UNP A0A8D1IZ33
1f	-71	LYS	-	expression tag	UNP A0A8D1IZ33
1f	-70	LEU	-	expression tag	UNP A0A8D1IZ33
1f	-69	GLU	-	expression tag	UNP A0A8D1IZ33
1f	-68	GLU	-	expression tag	UNP A0A8D1IZ33
1f	-67	THR	-	expression tag	UNP A0A8D1IZ33
1f	-66	ARG	-	expression tag	UNP A0A8D1IZ33
1f	-65	GLY	-	expression tag	UNP A0A8D1IZ33
1f	-64	GLY	-	expression tag	UNP A0A8D1IZ33
1f	-63	GLY	-	expression tag	UNP A0A8D1IZ33
1f	-62	GLU	-	expression tag	UNP A0A8D1IZ33
1f	-61	LYS	-	expression tag	UNP A0A8D1IZ33
1f	-60	CYS	-	expression tag	UNP A0A8D1IZ33
1f	-59	ASP	-	expression tag	UNP A0A8D1IZ33
1f	-58	LYS	-	expression tag	UNP A0A8D1IZ33
1f	-57	ASN	-	expression tag	UNP A0A8D1IZ33
1f	-56	GLN	-	expression tag	UNP A0A8D1IZ33
1f	-55	GLY	-	expression tag	UNP A0A8D1IZ33
1f	-54	VAL	-	expression tag	UNP A0A8D1IZ33
1f	-53	LYS	-	expression tag	UNP A0A8D1IZ33
1f	-52	GLY	-	expression tag	UNP A0A8D1IZ33
1f	-51	ARG	-	expression tag	UNP A0A8D1IZ33
1f	-50	ARG	-	expression tag	UNP A0A8D1IZ33
1f	-49	PHE	-	expression tag	UNP A0A8D1IZ33

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

Mol	Chain	Residues	Atoms					AltConf	Trace
32	1g	100	Total	C	N	O	S	0	0
			835	535	138	158	4		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
33	1h	138	Total	C	N	O	S	0	0
			1151	754	195	199	3		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
34	1i	127	Total	C	N	O	S	0	0
			1100	723	194	181	2		

- Molecule 35 is a protein called NADH:ubiquinone oxidoreductase subunit B2.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	1j	71	Total	C	N	O	S	0	0
			601	394	99	107	1		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
36	1k	81	Total	C	N	O	S	0	0
			649	422	110	116	1		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
37	1l	156	Total	C	N	O	S	0	0
			1310	847	213	242	8		

- Molecule 38 is a protein called NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4.

Mol	Chain	Residues	Atoms				AltConf	Trace
38	1m	128	Total	C	N	O	0	0
			1062	691	182	189		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
39	1n	172	Total	C	N	O	S	0	0
			1495	956	273	258	8		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
40	1o	122	Total	C	N	O	S	0	0
			1045	650	198	187	10		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
41	1p	173	Total	C	N	O	S	0	0
			1449	908	263	270	8		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
42	1q	145	Total	C	N	O	S	0	0
			1212	775	219	213	5		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
43	1r	96	Total	C	N	O	S	0	0
			767	483	144	137	3		

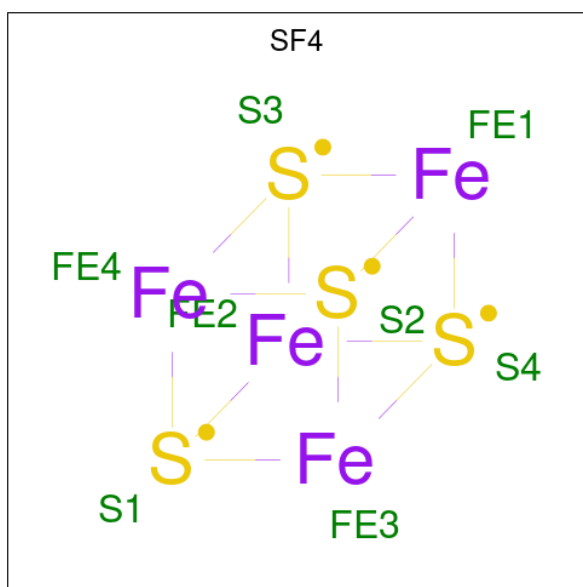
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1r	0	ACE	-	insertion	UNP A0A8W4F7N8

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

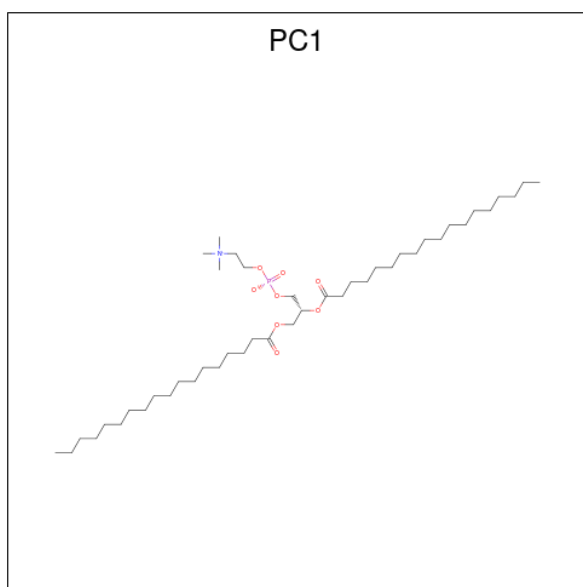
Mol	Chain	Residues	Atoms					AltConf	Trace
44	1s	45	Total	C	N	O	S	0	0
			382	238	70	73	1		

- Molecule 45 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe₄S₄).



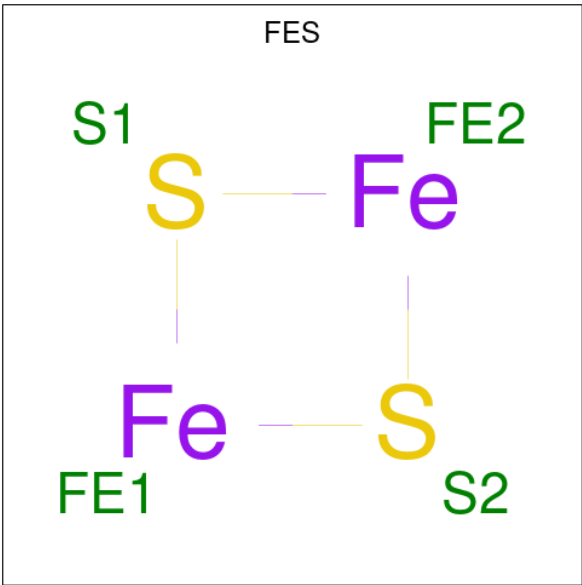
Mol	Chain	Residues	Atoms			AltConf
45	1B	1	Total	Fe	S	0
			8	4	4	
45	1F	1	Total	Fe	S	0
			8	4	4	
45	1G	1	Total	Fe	S	0
			8	4	4	
45	1G	1	Total	Fe	S	0
			8	4	4	
45	1I	1	Total	Fe	S	0
			8	4	4	
45	1I	1	Total	Fe	S	0
			8	4	4	

- Molecule 46 is 1,2-DIACYL-SN-GLYCERO-3-PHOSPHOCHOLINE (CCD ID: PC1) (formula: C₄₄H₈₈NO₈P).



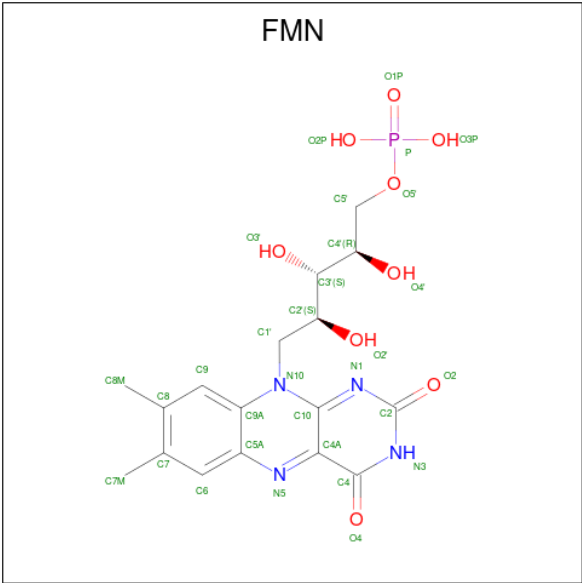
Mol	Chain	Residues	Atoms					AltConf
46	1B	1	Total	C	N	O	P	0
			34	24	1	8	1	
46	1L	1	Total	C	N	O	P	0
			46	36	1	8	1	
46	1M	1	Total	C	N	O	P	0
			35	25	1	8	1	
46	1d	1	Total	C	N	O	P	0
			39	29	1	8	1	
46	1f	1	Total	C	N	O	P	0
			25	15	1	8	1	
46	1q	1	Total	C	N	O	P	0
			48	38	1	8	1	

- Molecule 47 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe_2S_2).



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

- Molecule 48 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: C₁₇H₂₁N₄O₉P).

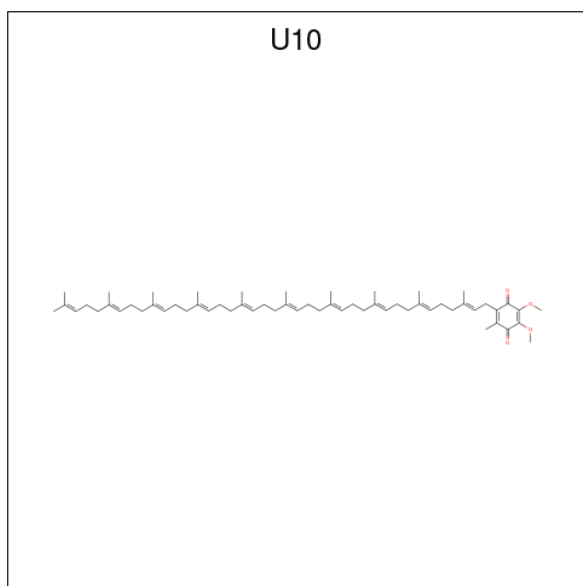


Mol	Chain	Residues	Atoms					AltConf
48	1F	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 49 is POTASSIUM ION (CCD ID: K) (formula: K).

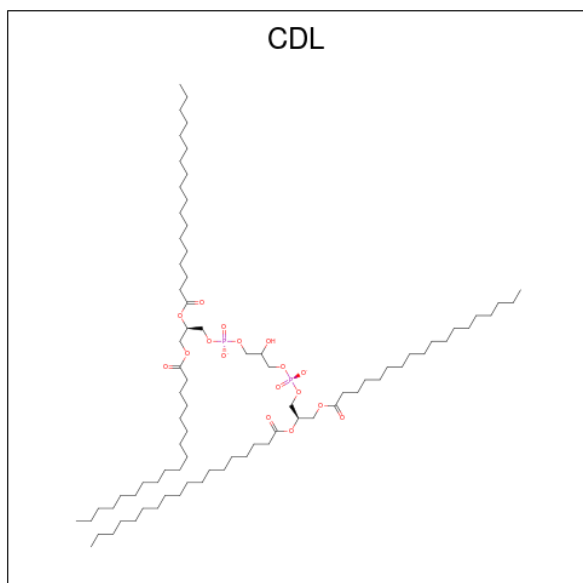
Mol	Chain	Residues	Atoms		AltConf
49	1G	1	Total	K	0
			1	1	

- Molecule 50 is UBIQUINONE-10 (CCD ID: U10) (formula: $C_{59}H_{90}O_4$) (labeled as "Ligand of Interest" by depositor).



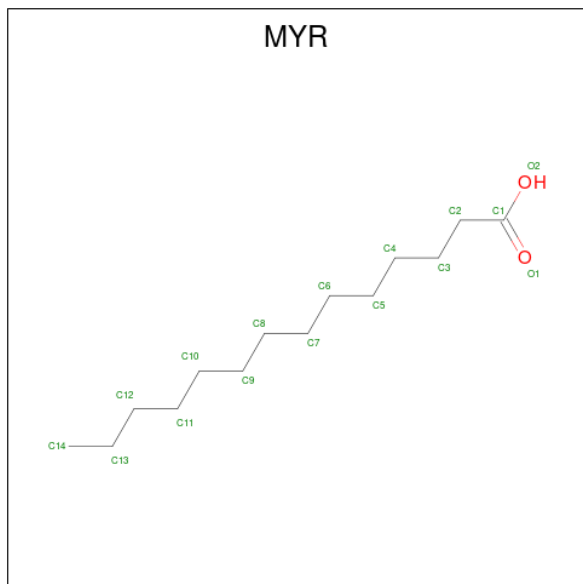
Mol	Chain	Residues	Atoms			AltConf
50	1H	1	Total	C	O	0
			63	59	4	

- Molecule 51 is CARDIOLIPIN (CCD ID: CDL) (formula: $C_{81}H_{156}O_{17}P_2$).



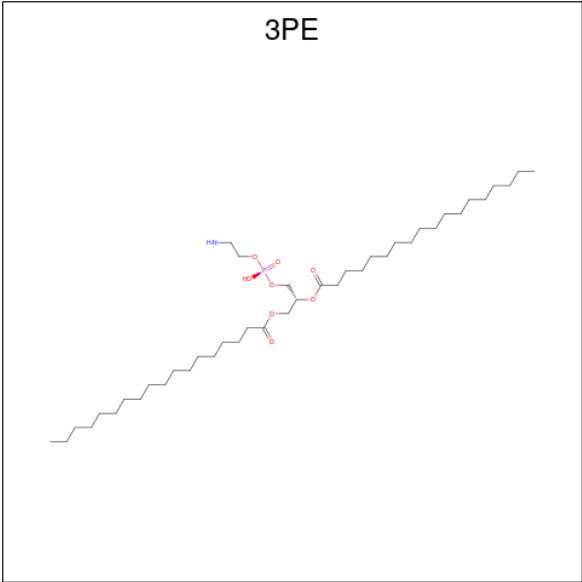
Mol	Chain	Residues	Atoms				AltConf
51	1H	1	Total	C	O	P	0
			51	32	17	2	
51	1O	1	Total	C	O	P	0
			67	48	17	2	
51	1a	1	Total	C	O	P	0
			61	42	17	2	

- Molecule 52 is MYRISTIC ACID (CCD ID: MYR) (formula: $C_{14}H_{28}O_2$).



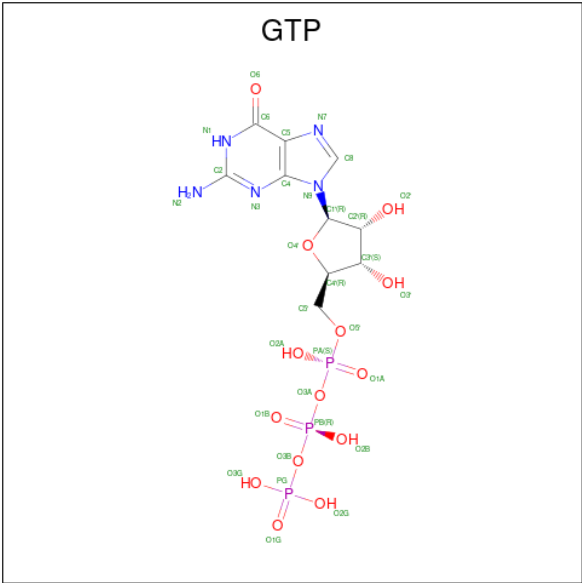
Mol	Chain	Residues	Atoms			AltConf
52	1L	1	Total	C	O	0
			15	14	1	

- Molecule 53 is 1,2-Distearoyl-sn-glycerophosphoethanolamine (CCD ID: 3PE) (formula: $C_{41}H_{82}NO_8P$).



Mol	Chain	Residues	Atoms					AltConf
53	1M	1	Total	C	N	O	P	0
			38	28	1	8	1	
53	1Y	1	Total	C	N	O	P	0
			35	25	1	8	1	

- Molecule 54 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: C₁₀H₁₆N₅O₁₄P₃).

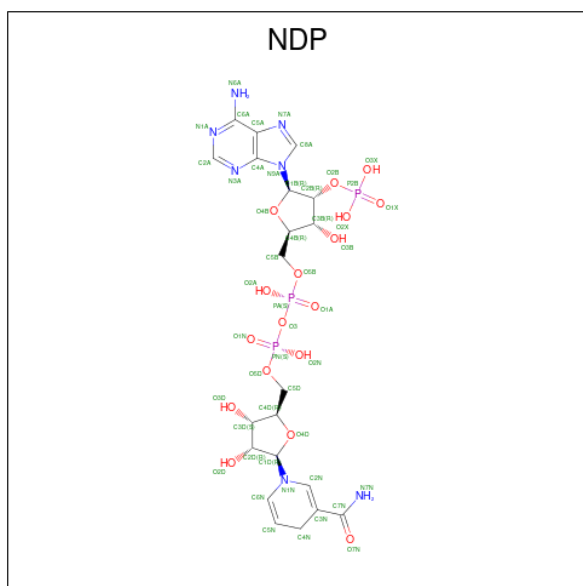


Mol	Chain	Residues	Atoms					AltConf
54	1O	1	Total	C	N	O	P	0
			32	10	5	14	3	

- Molecule 55 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
55	1O	1	Total	Mg	0
			1	1	

- Molecule 56 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).

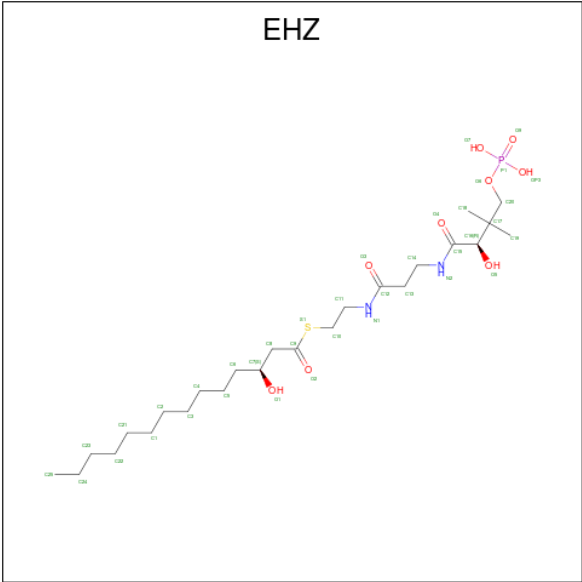


Mol	Chain	Residues	Atoms					AltConf
56	1P	1	Total	C	N	O	P	0
			48	21	7	17	3	

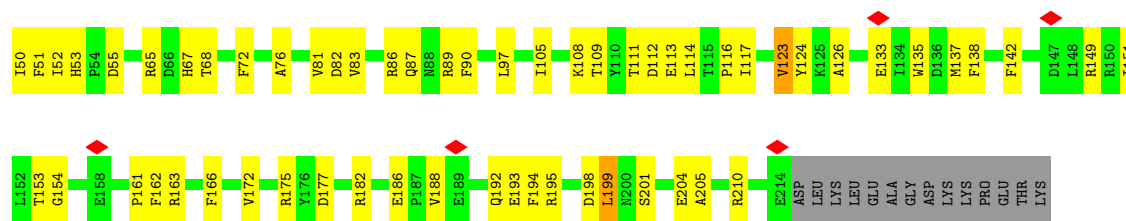
- Molecule 57 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
57	1R	1	Total	Zn	0
			1	1	

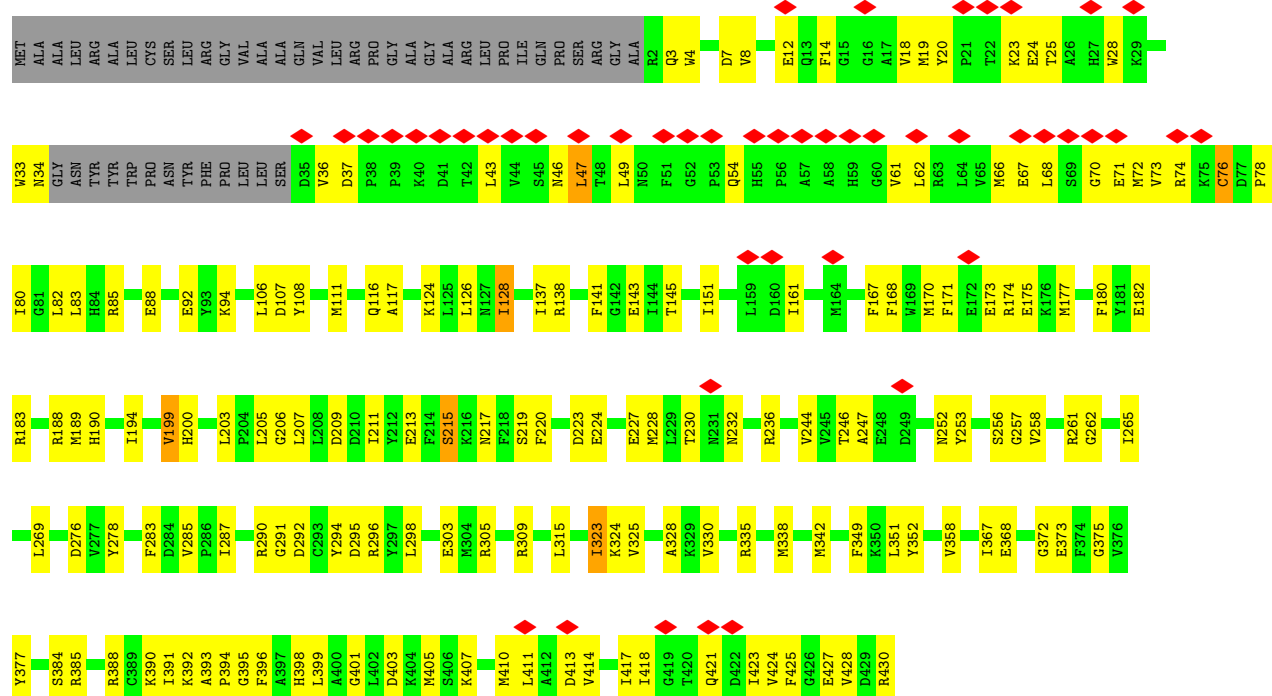
- Molecule 58 is {S}-[2-[3-[(2 {R})-3,3-dimethyl-2-oxidanyl-4-phosphonooxy-butanoyl]amino]propanoylamino]ethyl] (3 {S})-3-oxidanyltetradecanethioate (CCD ID: EHZ) (formula: $C_{25}H_{49}N_2O_9PS$).



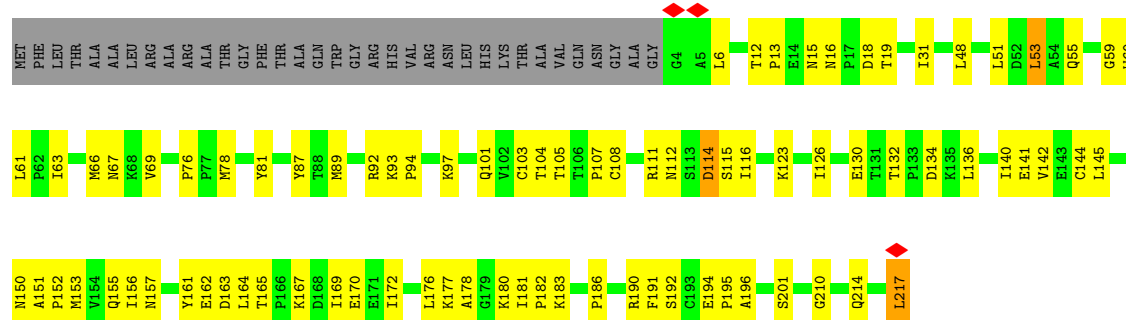
Mol	Chain	Residues	Atoms						AltConf
58	1W	1	Total	C	N	O	P	S	0
			37	25	2	8	1	1	
58	1n	1	Total	C	N	O	P	S	0
			37	25	2	8	1	1	



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



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

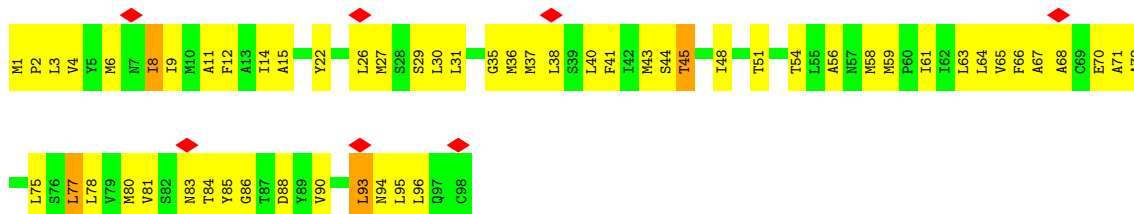
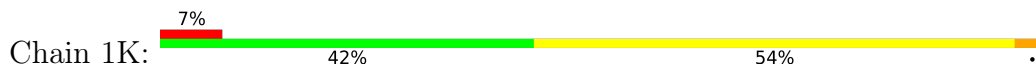


- Molecule 6: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial

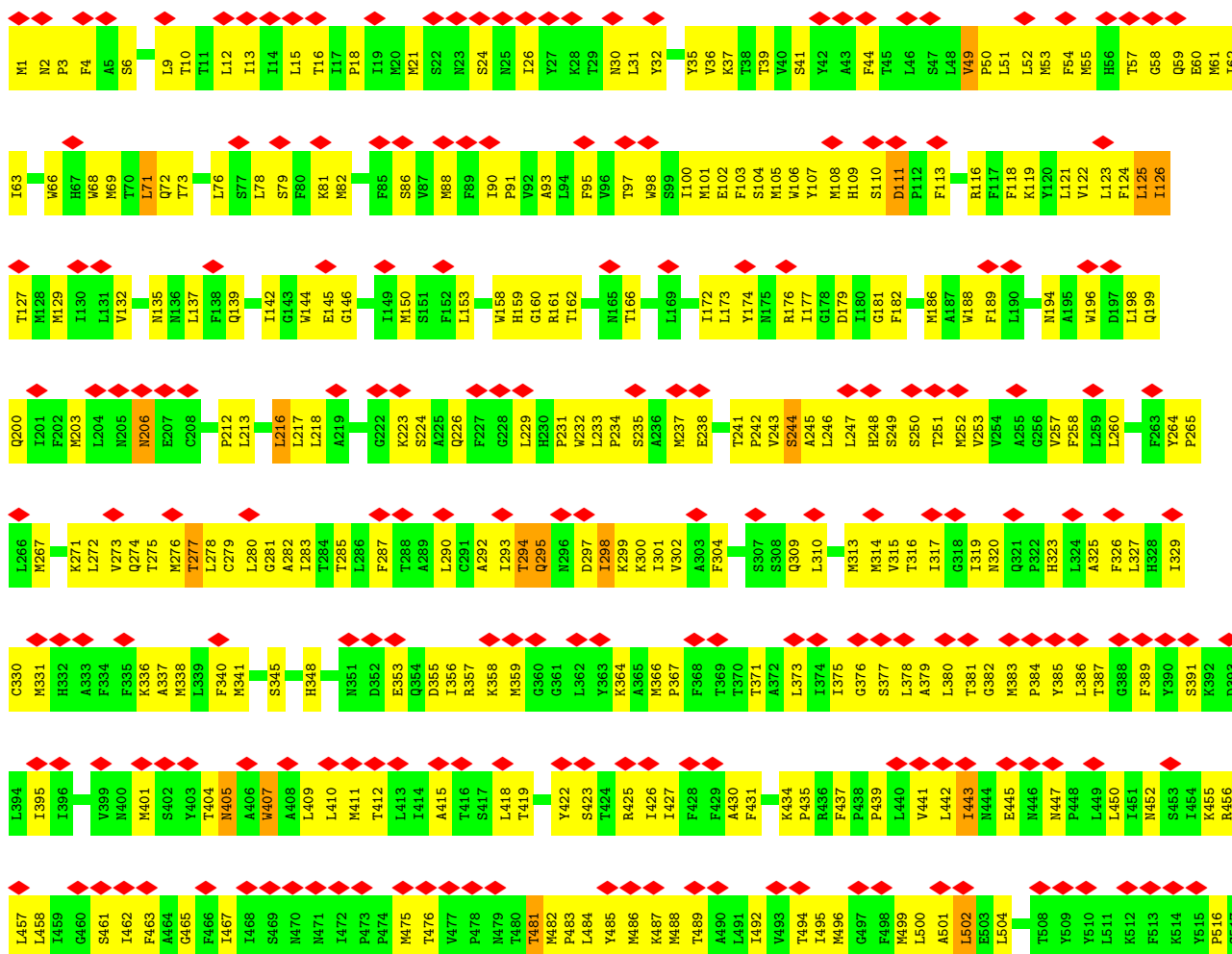


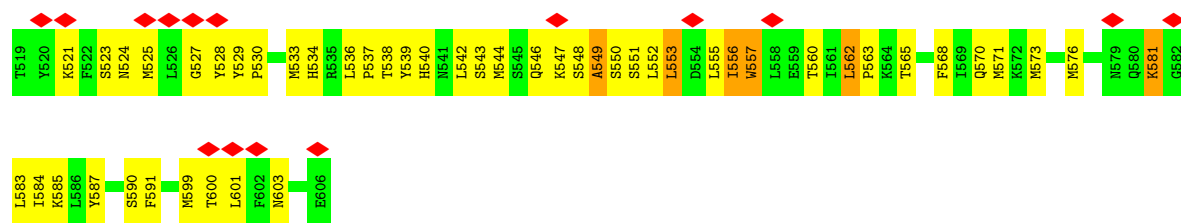


- Molecule 11: NADH-ubiquinone oxidoreductase chain 4L

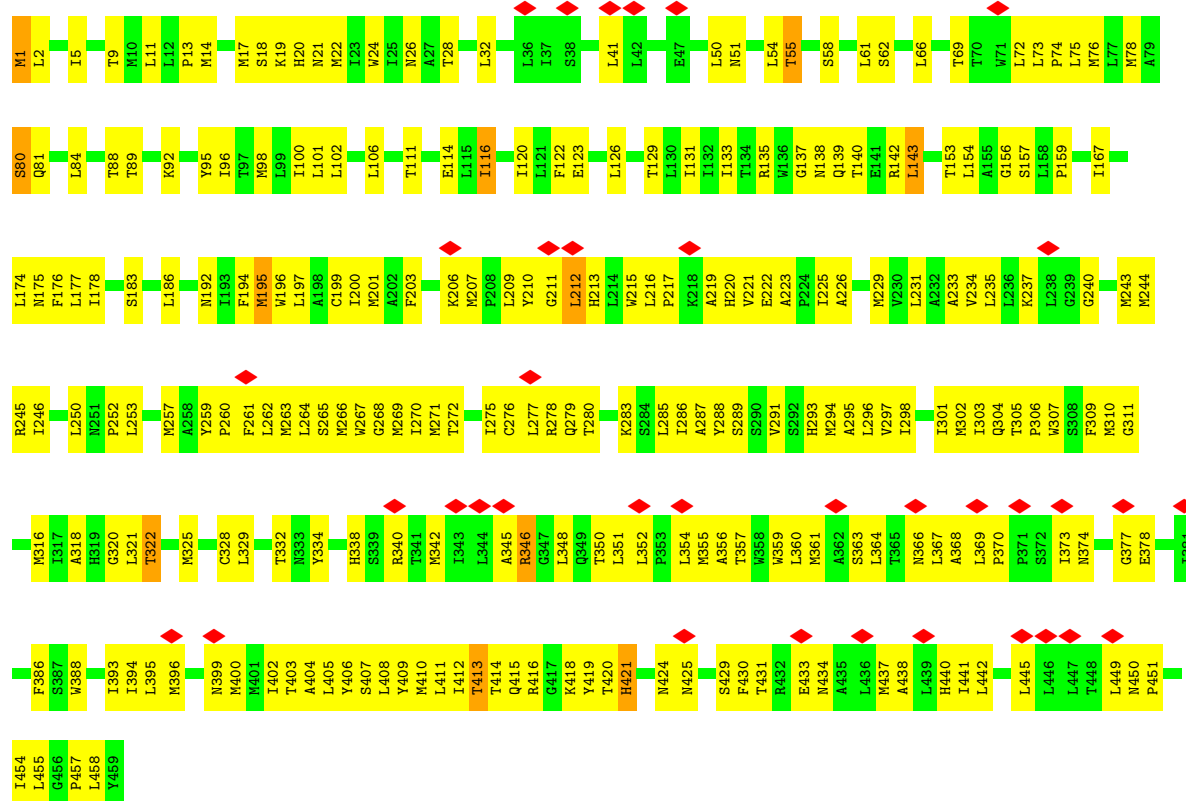


- Molecule 12: NADH-ubiquinone oxidoreductase chain 5

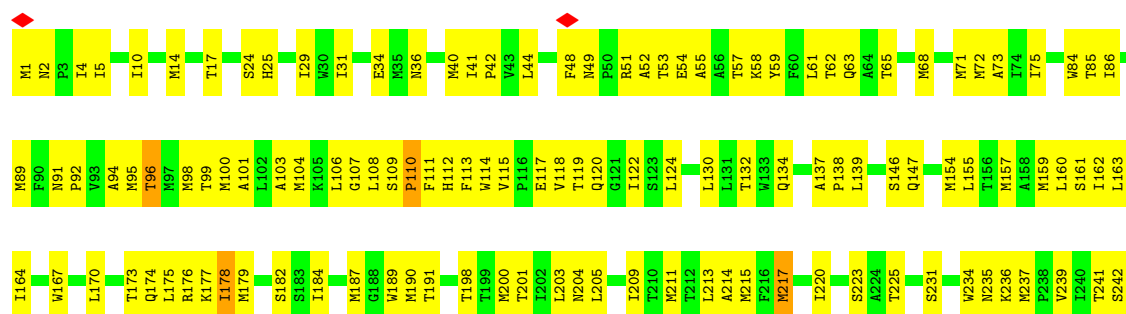


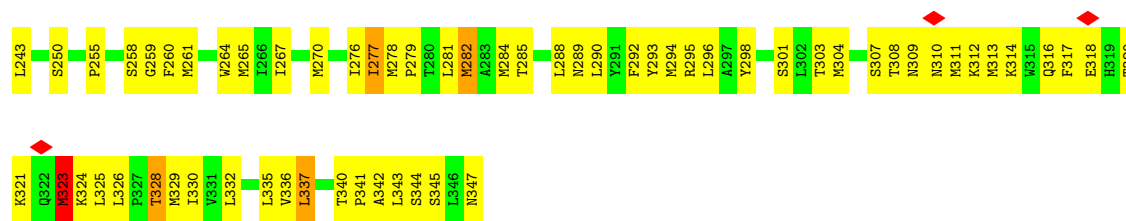


• Molecule 13: NADH-ubiquinone oxidoreductase chain 4

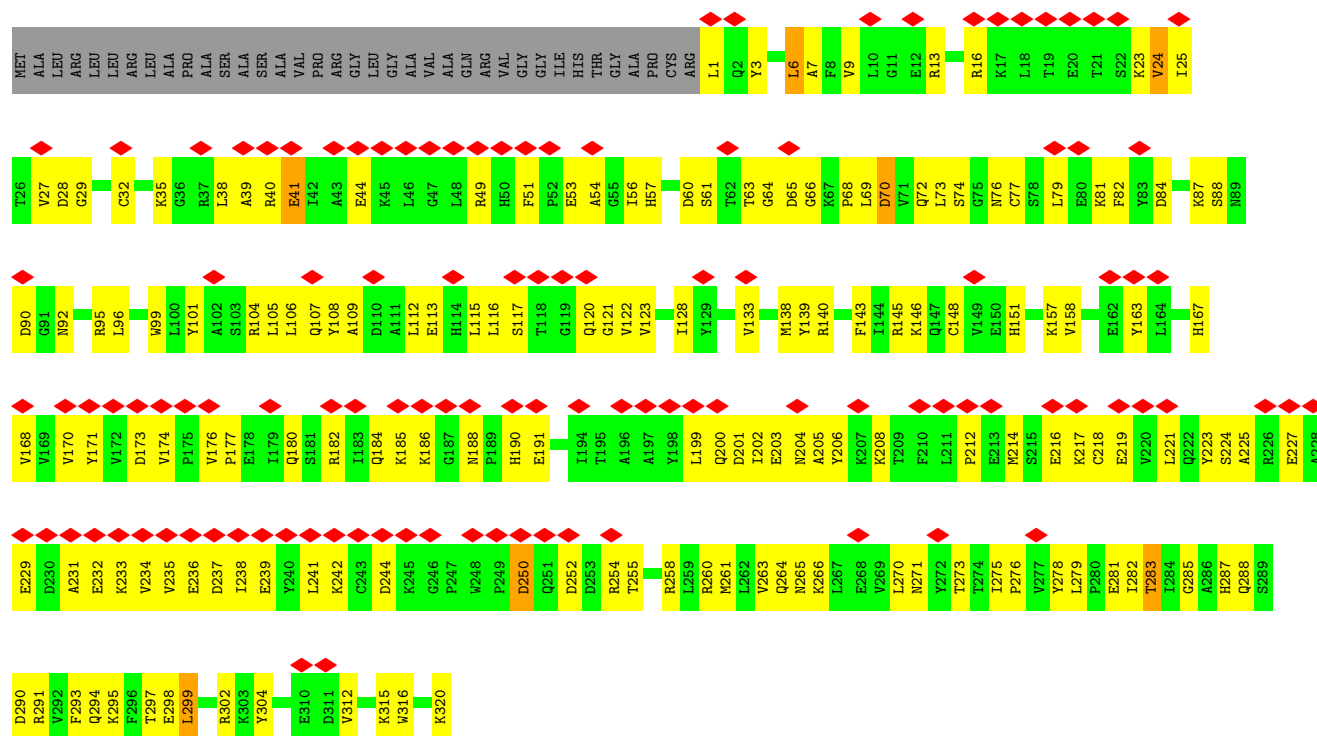


• Molecule 14: NADH-ubiquinone oxidoreductase chain 2

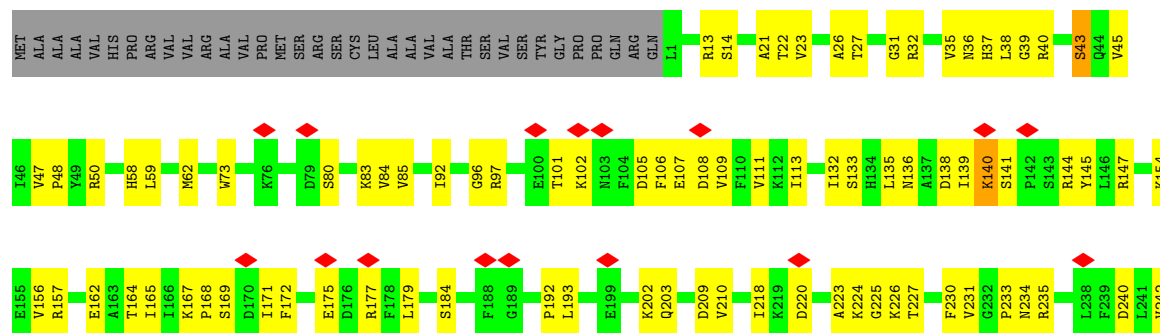


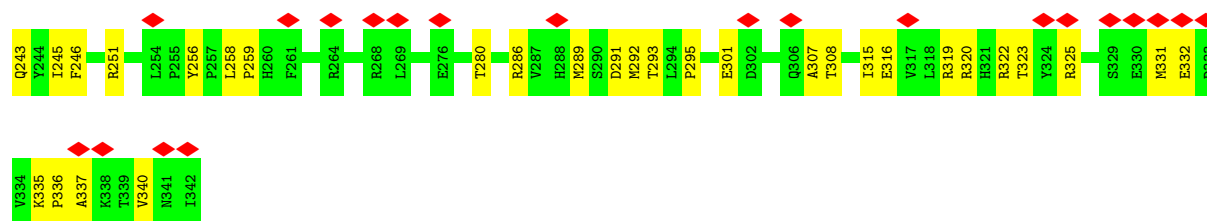


- Molecule 15: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 10, mitochondrial

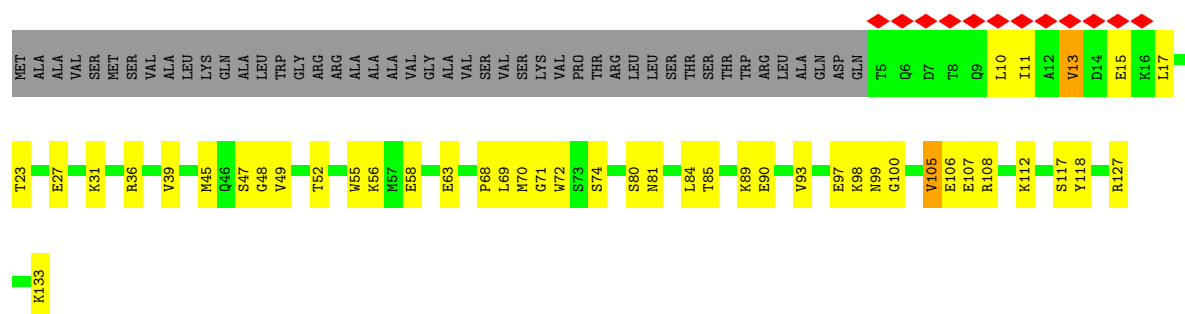


- Molecule 16: NADH:ubiquinone oxidoreductase subunit A9

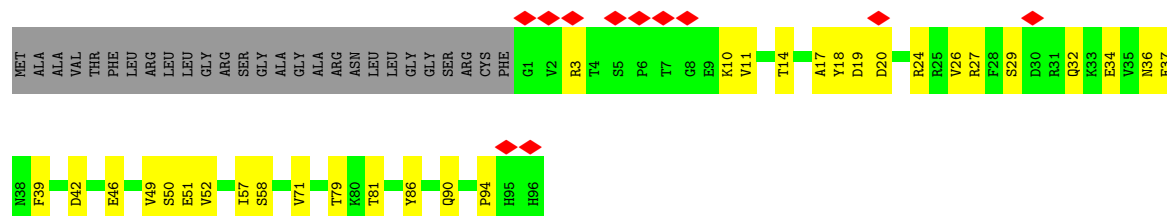




- Molecule 17: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial



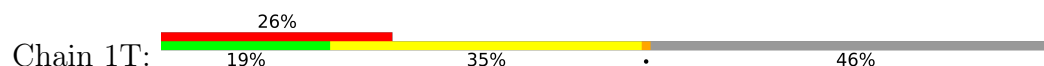
- Molecule 18: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial

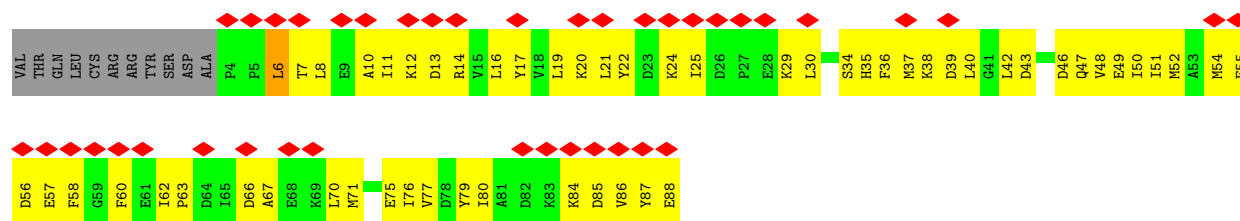


- Molecule 19: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2

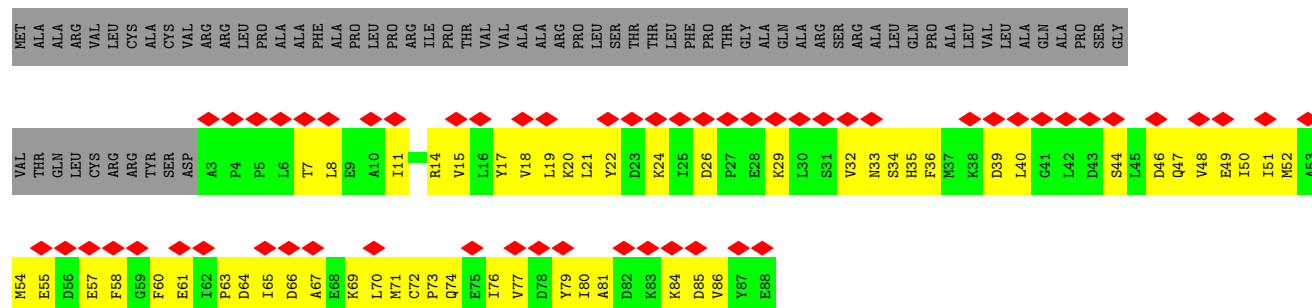
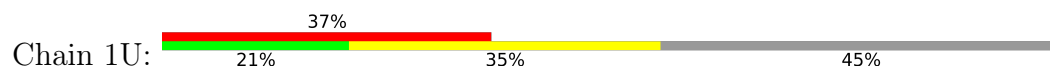


- Molecule 20: NADH:ubiquinone oxidoreductase subunit AB1





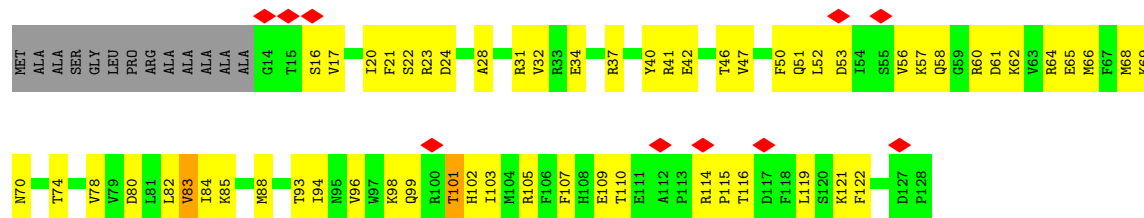
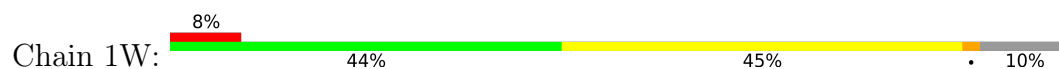
• Molecule 20: NADH:ubiquinone oxidoreductase subunit AB1



• Molecule 21: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5 isoform X1

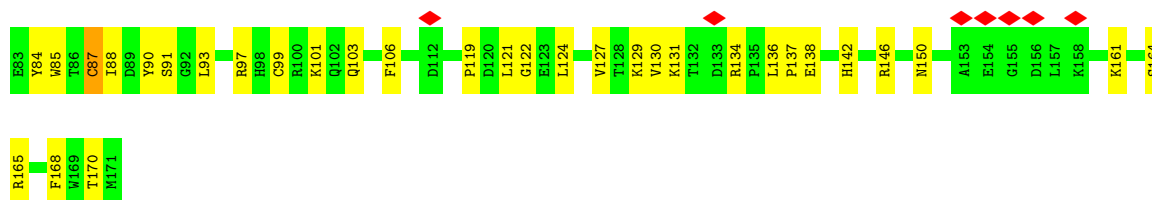


• Molecule 22: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 6

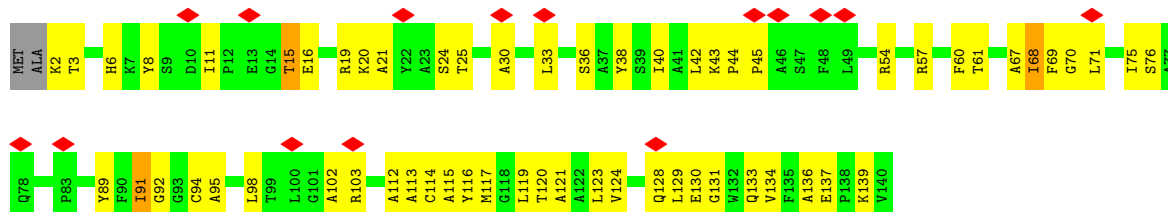


• Molecule 23: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 8

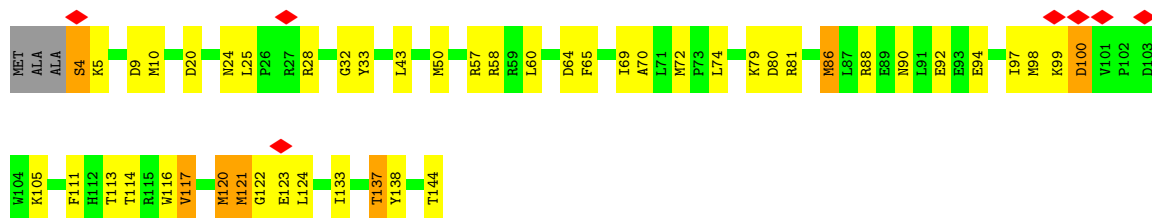




- Molecule 24: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 11



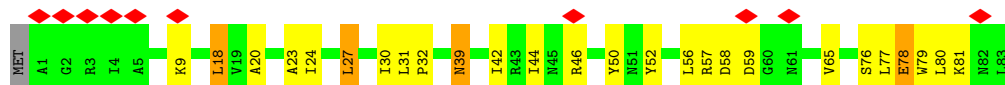
- Molecule 25: NADH:ubiquinone oxidoreductase subunit A13



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



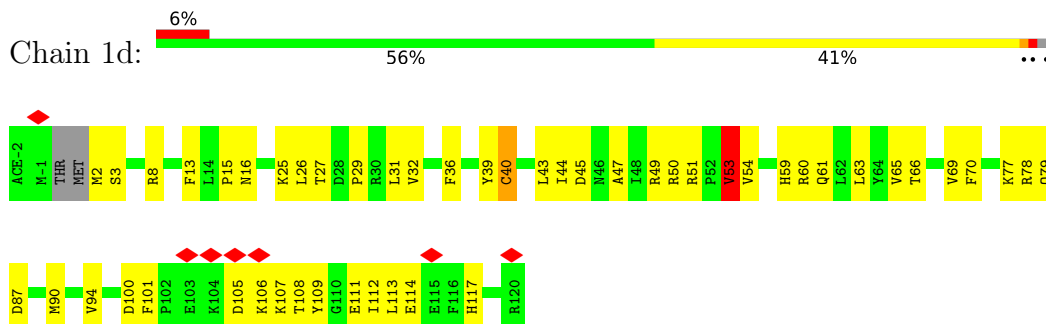
- Molecule 27: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 3



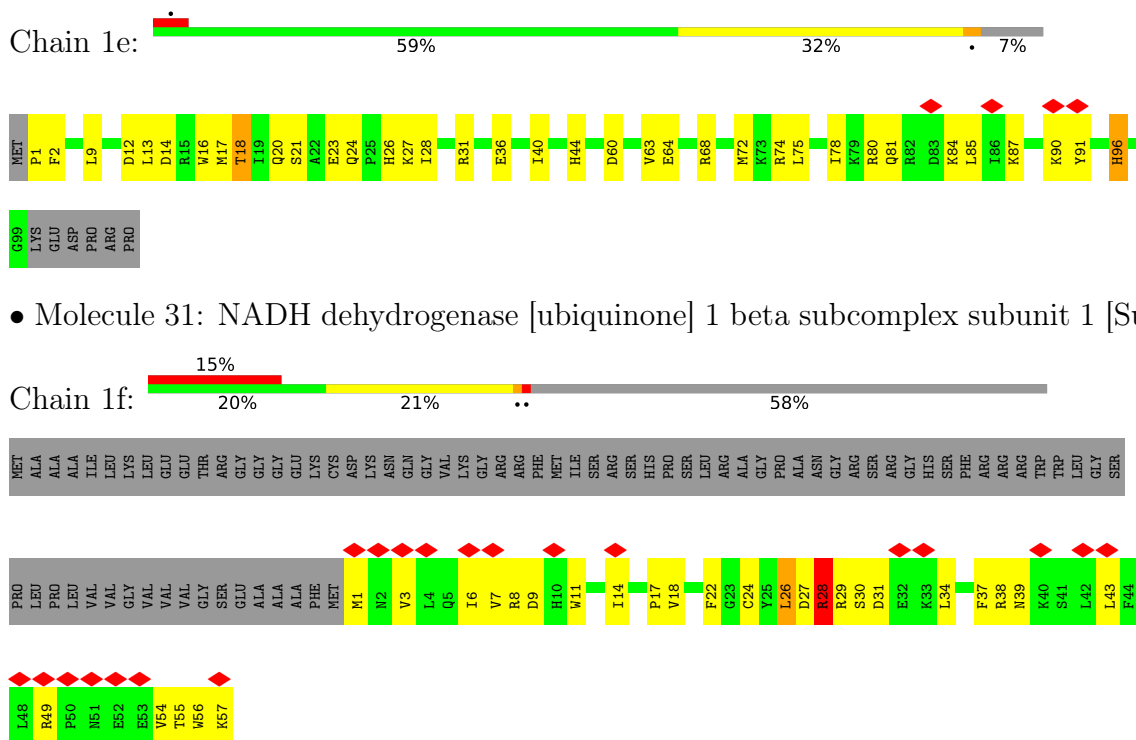
- Molecule 28: NADH dehydrogenase [ubiquinone] 1 subunit C1, mitochondrial



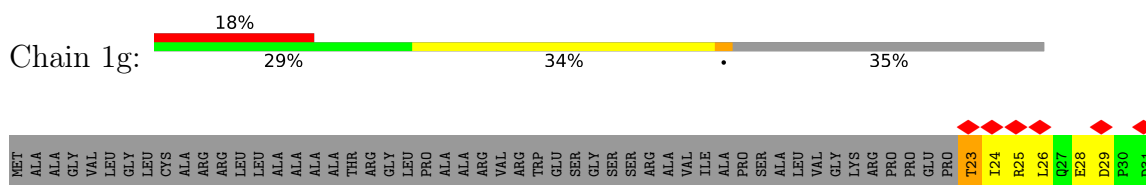
- Molecule 29: NADH dehydrogenase [ubiquinone] 1 subunit C2

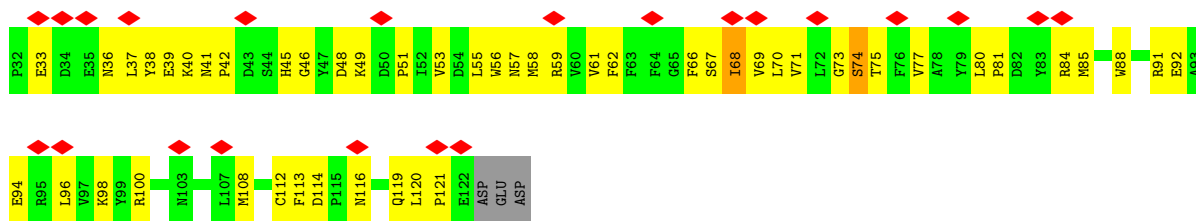


- Molecule 30: NADH dehydrogenase [ubiquinone] iron-sulfur protein 5

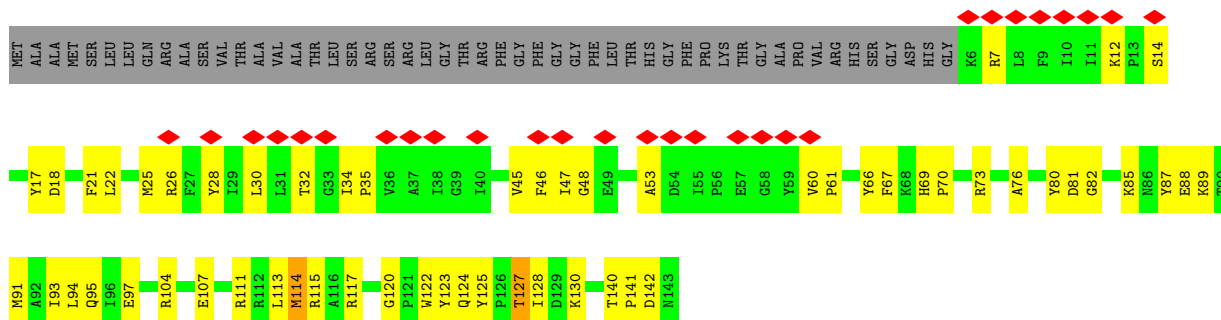
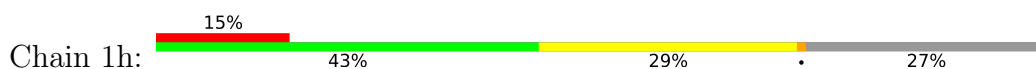


- Molecule 32: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 11, mitochondrial

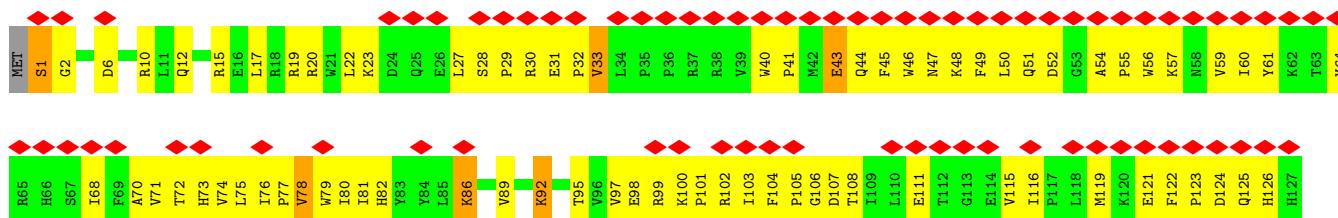
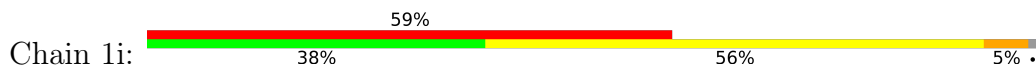




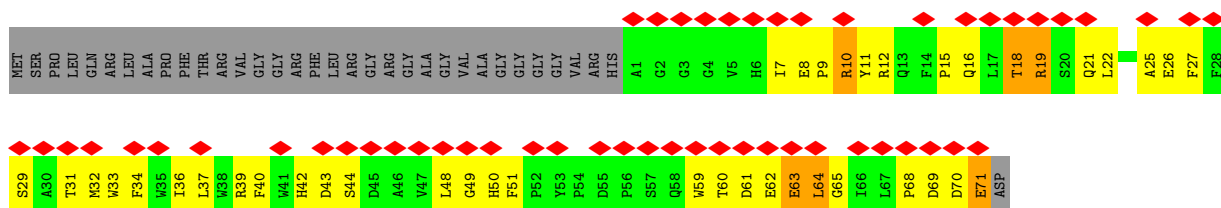
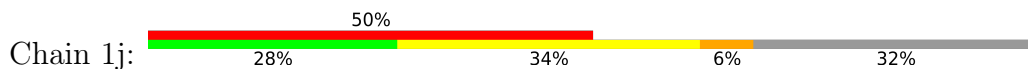
- Molecule 33: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 5, mitochondrial



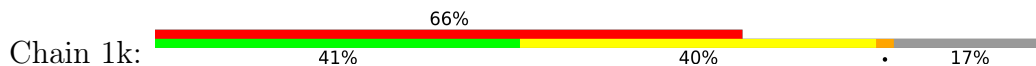
- Molecule 34: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 6

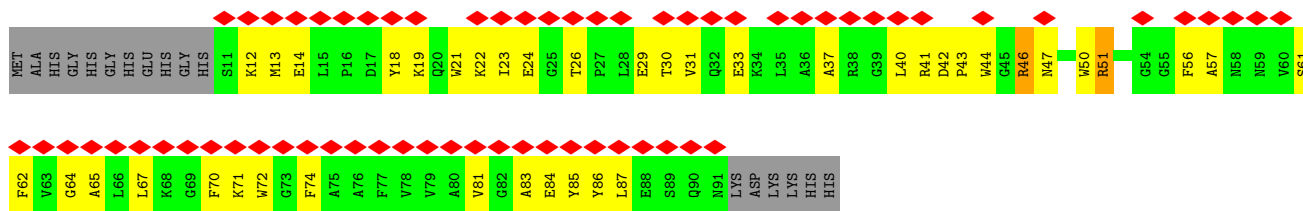


- Molecule 35: NADH:ubiquinone oxidoreductase subunit B2

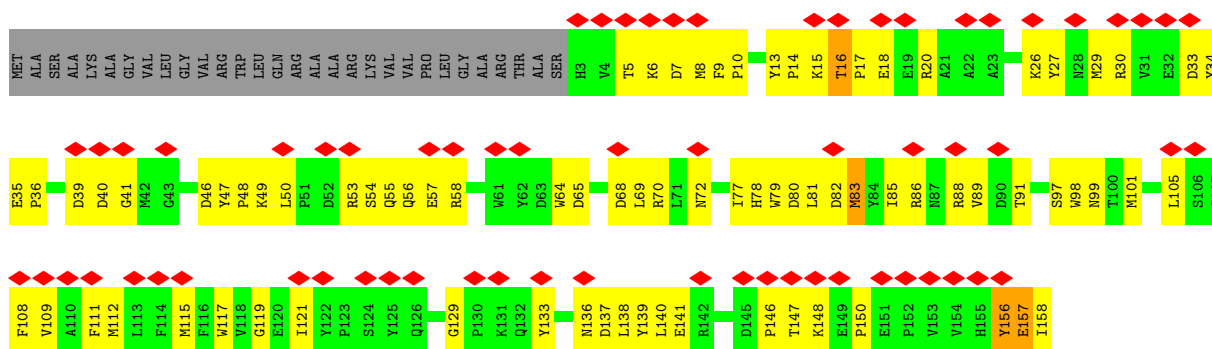
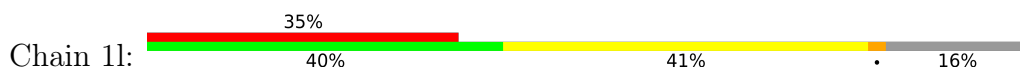


- Molecule 36: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 3

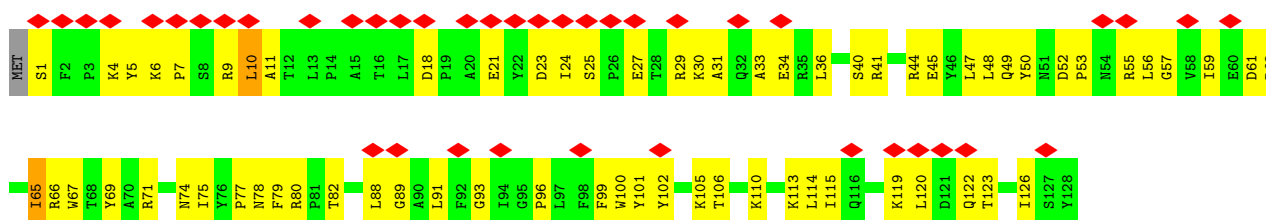




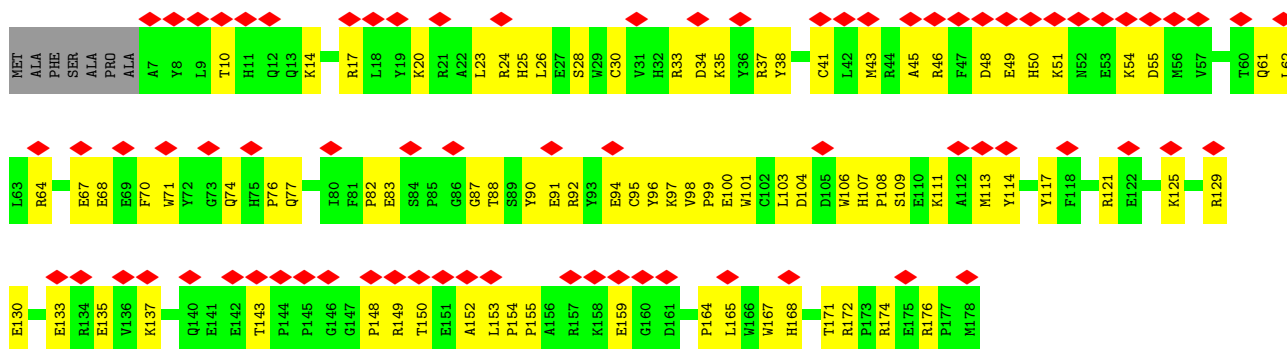
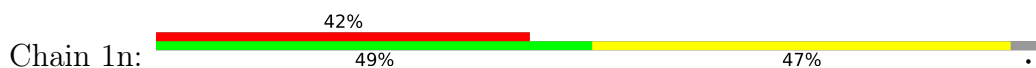
- Molecule 37: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 8, mitochondrial



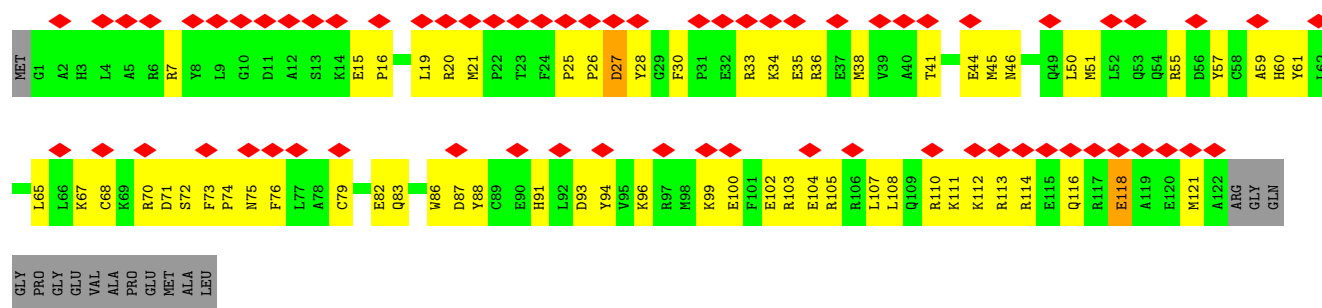
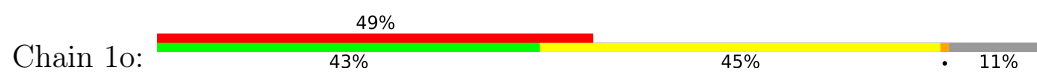
- Molecule 38: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 4



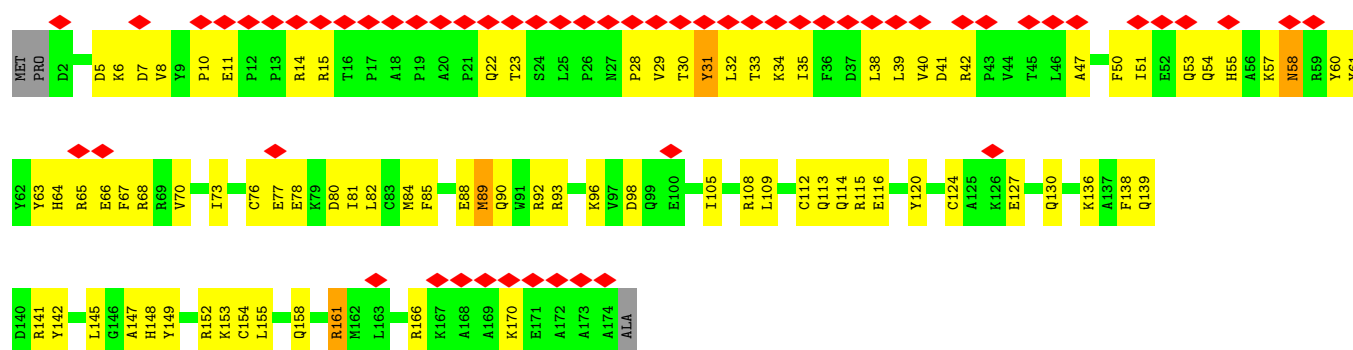
- Molecule 39: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 9



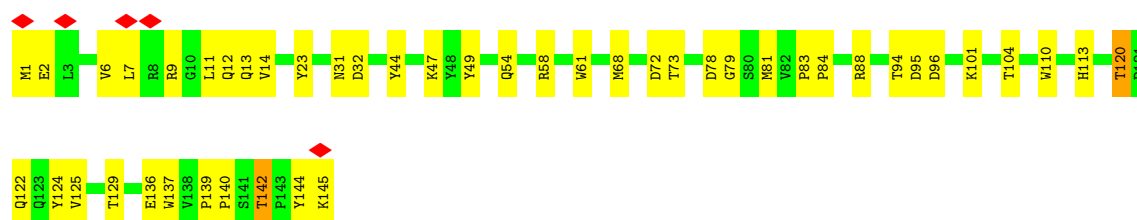
- Molecule 40: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 7



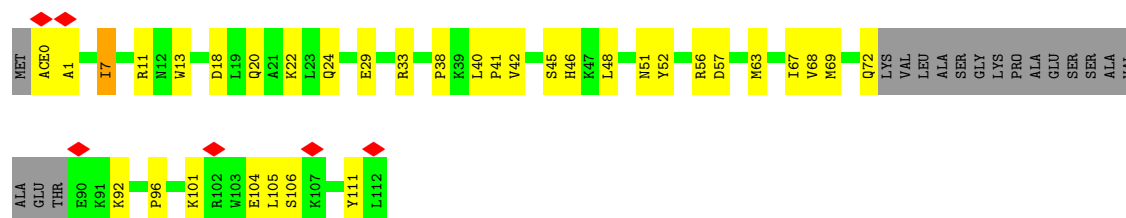
- Molecule 41: NADH dehydrogenase [ubiquinone] 1 beta subcomplex subunit 10



- 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

[illegible]

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	46000	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.011	Depositor
Minimum map value	-0.198	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.019	Depositor
Recommended contour level	0.12	Depositor
Map size (Å)	556.0, 556.0, 556.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.39, 1.39, 1.39	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: CDL, NDP, FES, SF4, ACE, 3PE, EHZ, FME, U10, MYR, MG, SAC, FMN, PC1, K, GTP, ZN

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	1A	0.28	0/930	0.46	0/1271
2	1B	0.21	0/1273	0.39	0/1722
3	1C	0.16	0/1791	0.29	0/2439
4	1D	0.20	0/3545	0.35	0/4806
5	1E	0.15	0/1698	0.34	0/2311
6	1F	0.62	7/3401 (0.2%)	0.83	10/4595 (0.2%)
7	1G	0.21	1/5451 (0.0%)	0.31	1/7387 (0.0%)
8	1H	0.25	0/2566	0.42	0/3509
9	1I	0.25	0/1443	0.33	0/1952
10	1J	0.24	0/1364	0.46	0/1850
11	1K	0.35	1/751 (0.1%)	0.50	0/1018
12	1L	0.28	1/4939 (0.0%)	0.46	0/6718
13	1M	0.22	1/3713 (0.0%)	0.41	0/5063
14	1N	0.38	1/2765 (0.0%)	0.45	2/3758 (0.1%)
15	1O	0.18	0/2650	0.40	0/3588
16	1P	0.17	0/2828	0.31	0/3834
17	1Q	0.20	0/1070	0.36	0/1446
18	1R	0.17	0/755	0.31	0/1018
19	1S	0.13	0/711	0.29	0/956
20	1T	0.29	0/701	0.50	0/946
20	1U	0.19	0/706	0.42	0/954
21	1V	0.27	0/946	0.47	0/1281
22	1W	0.19	0/995	0.40	0/1340
23	1X	0.27	1/1436 (0.1%)	0.31	0/1938
24	1Y	0.27	0/1037	0.44	0/1404
25	1Z	0.25	1/1199 (0.1%)	0.31	0/1617
26	1a	0.18	0/577	0.31	0/777
27	1b	0.27	0/664	0.38	0/912
28	1c	0.21	0/430	0.50	0/581
29	1d	0.20	0/1024	0.46	0/1383
30	1e	0.15	0/836	0.33	0/1118
31	1f	0.19	0/499	0.58	1/673 (0.1%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	1g	0.16	0/858	0.44	0/1165
33	1h	0.15	0/1184	0.33	0/1603
34	1i	0.21	0/1131	0.46	0/1541
35	1j	0.44	1/627 (0.2%)	0.47	0/858
36	1k	0.23	0/668	0.44	0/903
37	1l	0.17	0/1365	0.39	0/1867
38	1m	0.22	0/1092	0.39	0/1481
39	1n	0.14	0/1549	0.34	0/2098
40	1o	0.14	0/1069	0.36	0/1430
41	1p	0.13	0/1481	0.30	0/1997
42	1q	0.37	1/1253 (0.1%)	0.46	1/1704 (0.1%)
43	1r	0.21	0/782	0.37	0/1057
44	1s	0.95	5/394 (1.3%)	1.21	7/533 (1.3%)
All	All	0.27	21/68147 (0.0%)	0.43	22/92402 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
2	1B	0	2
6	1F	0	2
8	1H	0	1
21	1V	0	1
31	1f	0	1
All	All	0	7

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	1F	207	PRO	CG-CD	-23.91	0.69	1.50
14	1N	323	MET	SD-CE	-14.93	1.42	1.79
12	1L	90	ILE	CA-CB	13.37	1.61	1.54
6	1F	206	LYS	C-N	13.09	1.48	1.33
44	1s	32	PRO	CG-CD	-11.18	1.12	1.50

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	1F	207	PRO	CB-CG-CD	-33.15	0.04	106.10
6	1F	207	PRO	CA-N-CD	-29.18	71.15	112.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
44	1s	32	PRO	CA-N-CD	-19.83	84.24	112.00
6	1F	207	PRO	N-CA-CB	-17.24	86.35	103.08
6	1F	207	PRO	CA-CB-CG	-12.52	80.72	104.50

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	1B	108	PRO	Peptide
2	1B	109	GLU	Peptide
6	1F	206	LYS	Peptide
6	1F	207	PRO	Mainchain
8	1H	196	ALA	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	1A	916	0	950	78	0
2	1B	1242	0	1248	64	0
3	1C	1740	0	1691	58	0
4	1D	3452	0	3389	158	0
5	1E	1658	0	1662	70	0
6	1F	3325	0	3288	138	0
7	1G	5362	0	5388	198	0
8	1H	2504	0	2602	182	0
9	1I	1412	0	1366	72	0
10	1J	1339	0	1337	125	0
11	1K	750	0	798	74	0
12	1L	4818	0	4954	360	0
13	1M	3632	0	3836	261	0
14	1N	2712	0	2873	208	0
15	1O	2590	0	2556	168	0
16	1P	2751	0	2776	100	0
17	1Q	1047	0	1042	42	0
18	1R	741	0	704	19	0
19	1S	700	0	719	29	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
20	1T	689	0	687	79	0
20	1U	694	0	691	69	0
21	1V	927	0	972	72	0
22	1W	971	0	975	66	0
23	1X	1398	0	1378	54	0
24	1Y	1016	0	1020	56	0
25	1Z	1168	0	1161	65	0
26	1a	562	0	557	25	0
27	1b	643	0	645	41	0
28	1c	417	0	425	27	0
29	1d	996	0	990	55	0
30	1e	816	0	823	37	0
31	1f	487	0	496	35	0
32	1g	835	0	795	58	0
33	1h	1151	0	1164	66	0
34	1i	1100	0	1106	93	0
35	1j	601	0	546	51	0
36	1k	649	0	626	64	0
37	1l	1310	0	1204	104	0
38	1m	1062	0	1075	89	0
39	1n	1495	0	1434	86	0
40	1o	1045	0	1018	69	0
41	1p	1449	0	1416	84	0
42	1q	1212	0	1172	39	0
43	1r	767	0	791	33	0
44	1s	382	0	351	20	0
45	1B	8	0	0	0	0
45	1F	8	0	0	3	0
45	1G	16	0	0	0	0
45	1I	16	0	0	1	0
46	1B	34	0	42	2	0
46	1L	46	0	66	5	0
46	1M	35	0	44	1	0
46	1d	39	0	49	4	0
46	1f	25	0	21	3	0
46	1q	48	0	68	1	0
47	1E	4	0	0	0	0
47	1G	4	0	0	1	0
48	1F	31	0	19	1	0
49	1G	1	0	0	0	0
50	1H	63	0	90	8	0
51	1H	51	0	46	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
51	1O	67	0	78	3	0
51	1a	61	0	65	4	0
52	1L	15	0	27	2	0
53	1M	38	0	48	4	0
53	1Y	35	0	42	7	0
54	1O	32	0	12	1	0
55	1O	1	0	0	0	0
56	1P	48	0	26	8	0
57	1R	1	0	0	0	0
58	1W	37	0	0	2	0
58	1n	37	0	0	4	0
All	All	67334	0	67440	3326	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 25.

The worst 5 of 3326 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
44:1s:32:PRO:CG	44:1s:32:PRO:CB	1.76	1.33
27:1b:78:GLU:HA	27:1b:81:LYS:NZ	1.57	1.17
21:1V:97:LYS:HA	21:1V:97:LYS:HE3	1.25	1.14
16:1P:162:GLU:HB2	16:1P:224:LYS:HG3	1.26	1.12
13:1M:408:LEU:HA	13:1M:411:LEU:HD12	1.14	1.12

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	1A	113/115 (98%)	103 (91%)	9 (8%)	1 (1%)	14 47

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	1B	153/258 (59%)	138 (90%)	15 (10%)	0	100	100
3	1C	207/264 (78%)	199 (96%)	8 (4%)	0	100	100
4	1D	427/476 (90%)	402 (94%)	25 (6%)	0	100	100
5	1E	212/249 (85%)	195 (92%)	16 (8%)	1 (0%)	24	57
6	1F	430/464 (93%)	414 (96%)	16 (4%)	0	100	100
7	1G	697/727 (96%)	655 (94%)	41 (6%)	1 (0%)	48	79
8	1H	316/318 (99%)	292 (92%)	21 (7%)	3 (1%)	14	47
9	1I	174/239 (73%)	168 (97%)	6 (3%)	0	100	100
10	1J	173/175 (99%)	160 (92%)	10 (6%)	3 (2%)	7	35
11	1K	96/98 (98%)	88 (92%)	8 (8%)	0	100	100
12	1L	604/606 (100%)	552 (91%)	47 (8%)	5 (1%)	16	49
13	1M	457/459 (100%)	438 (96%)	19 (4%)	0	100	100
14	1N	345/347 (99%)	322 (93%)	22 (6%)	1 (0%)	36	67
15	1O	318/357 (89%)	298 (94%)	20 (6%)	0	100	100
16	1P	340/377 (90%)	324 (95%)	16 (5%)	0	100	100
17	1Q	127/175 (73%)	117 (92%)	10 (8%)	0	100	100
18	1R	94/123 (76%)	89 (95%)	5 (5%)	0	100	100
19	1S	85/99 (86%)	79 (93%)	6 (7%)	0	100	100
20	1T	83/156 (53%)	76 (92%)	7 (8%)	0	100	100
20	1U	84/156 (54%)	77 (92%)	7 (8%)	0	100	100
21	1V	113/116 (97%)	106 (94%)	7 (6%)	0	100	100
22	1W	113/128 (88%)	107 (95%)	6 (5%)	0	100	100
23	1X	169/172 (98%)	164 (97%)	4 (2%)	1 (1%)	21	54
24	1Y	137/141 (97%)	132 (96%)	5 (4%)	0	100	100
25	1Z	139/144 (96%)	130 (94%)	9 (6%)	0	100	100
26	1a	68/70 (97%)	66 (97%)	2 (3%)	0	100	100
27	1b	81/84 (96%)	77 (95%)	4 (5%)	0	100	100
28	1c	47/76 (62%)	43 (92%)	4 (8%)	0	100	100
29	1d	117/123 (95%)	104 (89%)	12 (10%)	1 (1%)	14	47
30	1e	97/106 (92%)	88 (91%)	9 (9%)	0	100	100
31	1f	55/135 (41%)	49 (89%)	6 (11%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
32	1g	98/154 (64%)	83 (85%)	14 (14%)	1 (1%)	12	44
33	1h	136/189 (72%)	126 (93%)	10 (7%)	0	100	100
34	1i	124/128 (97%)	115 (93%)	9 (7%)	0	100	100
35	1j	69/105 (66%)	66 (96%)	3 (4%)	0	100	100
36	1k	79/98 (81%)	74 (94%)	5 (6%)	0	100	100
37	1l	154/186 (83%)	142 (92%)	12 (8%)	0	100	100
38	1m	126/129 (98%)	114 (90%)	12 (10%)	0	100	100
39	1n	170/179 (95%)	157 (92%)	13 (8%)	0	100	100
40	1o	120/137 (88%)	110 (92%)	10 (8%)	0	100	100
41	1p	171/176 (97%)	162 (95%)	9 (5%)	0	100	100
42	1q	143/145 (99%)	131 (92%)	12 (8%)	0	100	100
43	1r	90/114 (79%)	86 (96%)	4 (4%)	0	100	100
44	1s	43/471 (9%)	38 (88%)	4 (9%)	1 (2%)	5	30
All	All	8194/9744 (84%)	7656 (93%)	519 (6%)	19 (0%)	44	74

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1A	109	LYS
7	1G	652	VAL
8	1H	68	ILE
8	1H	92	PRO
10	1J	2	THR

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	1A	99/99 (100%)	92 (93%)	7 (7%)	13	38
2	1B	131/212 (62%)	127 (97%)	4 (3%)	35	59
3	1C	190/227 (84%)	181 (95%)	9 (5%)	23	49

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	1D	371/405 (92%)	352 (95%)	19 (5%)	21	48
5	1E	183/207 (88%)	178 (97%)	5 (3%)	39	62
6	1F	346/368 (94%)	333 (96%)	13 (4%)	29	55
7	1G	588/610 (96%)	548 (93%)	40 (7%)	14	40
8	1H	274/274 (100%)	261 (95%)	13 (5%)	23	49
9	1I	151/201 (75%)	145 (96%)	6 (4%)	28	54
10	1J	140/140 (100%)	131 (94%)	9 (6%)	16	42
11	1K	84/84 (100%)	78 (93%)	6 (7%)	13	38
12	1L	539/539 (100%)	504 (94%)	35 (6%)	15	42
13	1M	408/408 (100%)	386 (95%)	22 (5%)	20	46
14	1N	310/310 (100%)	293 (94%)	17 (6%)	19	46
15	1O	283/307 (92%)	273 (96%)	10 (4%)	32	57
16	1P	296/323 (92%)	282 (95%)	14 (5%)	23	49
17	1Q	117/152 (77%)	108 (92%)	9 (8%)	12	37
18	1R	79/97 (81%)	73 (92%)	6 (8%)	12	37
19	1S	77/82 (94%)	73 (95%)	4 (5%)	21	47
20	1T	79/133 (59%)	77 (98%)	2 (2%)	42	63
20	1U	79/133 (59%)	79 (100%)	0	100	100
21	1V	100/101 (99%)	96 (96%)	4 (4%)	28	54
22	1W	107/112 (96%)	103 (96%)	4 (4%)	30	56
23	1X	153/154 (99%)	145 (95%)	8 (5%)	21	47
24	1Y	101/102 (99%)	96 (95%)	5 (5%)	22	48
25	1Z	123/124 (99%)	115 (94%)	8 (6%)	15	42
26	1a	58/58 (100%)	56 (97%)	2 (3%)	32	57
27	1b	69/70 (99%)	64 (93%)	5 (7%)	13	38
28	1c	45/66 (68%)	45 (100%)	0	100	100
29	1d	107/109 (98%)	102 (95%)	5 (5%)	23	49
30	1e	87/94 (93%)	84 (97%)	3 (3%)	32	57
31	1f	54/113 (48%)	51 (94%)	3 (6%)	19	46
32	1g	92/129 (71%)	86 (94%)	6 (6%)	15	42
33	1h	121/158 (77%)	116 (96%)	5 (4%)	27	53

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
34	1i	119/120 (99%)	112 (94%)	7 (6%)	18	44
35	1j	62/84 (74%)	56 (90%)	6 (10%)	8	30
36	1k	63/76 (83%)	60 (95%)	3 (5%)	23	49
37	1l	141/161 (88%)	135 (96%)	6 (4%)	26	51
38	1m	113/114 (99%)	111 (98%)	2 (2%)	51	69
39	1n	156/160 (98%)	153 (98%)	3 (2%)	50	68
40	1o	110/120 (92%)	107 (97%)	3 (3%)	39	62
41	1p	154/156 (99%)	149 (97%)	5 (3%)	34	59
42	1q	131/131 (100%)	125 (95%)	6 (5%)	24	50
43	1r	85/98 (87%)	82 (96%)	3 (4%)	32	57
44	1s	44/351 (12%)	41 (93%)	3 (7%)	14	40
All	All	7219/8272 (87%)	6864 (95%)	355 (5%)	24	48

5 of 355 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
17	1Q	49	VAL
29	1d	3	SER
18	1R	14	THR
23	1X	91	SER
32	1g	91	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 71 such sidechains are listed below:

Mol	Chain	Res	Type
36	1k	90	GLN
38	1m	78	ASN
41	1p	133	GLN
13	1M	213	HIS
13	1M	192	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

8 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	$\# Z > 2$
34	SAC	1i	1	-	7,8,9	0.53	0	7,9,11	1.54	1 (14%)
1	FME	1A	1	1	8,9,10	0.53	0	8,9,11	1.03	1 (12%)
12	FME	1L	1	12	8,9,10	0.54	0	8,9,11	0.97	1 (12%)
10	FME	1J	1	10	8,9,10	0.54	0	8,9,11	1.13	1 (12%)
13	FME	1M	1	13	8,9,10	0.55	0	8,9,11	0.98	1 (12%)
11	FME	1K	1	11	8,9,10	0.55	0	8,9,11	0.97	1 (12%)
14	FME	1N	1	14	8,9,10	0.54	0	8,9,11	0.95	1 (12%)
8	FME	1H	1	8	8,9,10	0.54	0	8,9,11	0.97	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
34	SAC	1i	1	-	-	5/7/8/10	-
1	FME	1A	1	1	-	0/7/9/11	-
12	FME	1L	1	12	-	0/7/9/11	-
10	FME	1J	1	10	-	1/7/9/11	-
13	FME	1M	1	13	-	0/7/9/11	-
11	FME	1K	1	11	-	1/7/9/11	-
14	FME	1N	1	14	-	0/7/9/11	-
8	FME	1H	1	8	-	0/7/9/11	-

There are no bond length outliers.

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
34	1i	1	SAC	O-C-CA	-2.97	117.14	124.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	1A	1	FME	O-C-CA	-2.61	118.05	124.77
11	1K	1	FME	O-C-CA	-2.55	118.21	124.77
12	1L	1	FME	O-C-CA	-2.53	118.25	124.77
10	1J	1	FME	O-C-CA	-2.53	118.26	124.77

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
10	1J	1	FME	CB-CA-N-CN
34	1i	1	SAC	C-CA-CB-OG
34	1i	1	SAC	C2A-C1A-N-CA
34	1i	1	SAC	OAC-C1A-N-CA
34	1i	1	SAC	N-CA-CB-OG

There are no ring outliers.

5 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
34	1i	1	SAC	1	0
1	1A	1	FME	1	0
10	1J	1	FME	4	0
13	1M	1	FME	1	0
8	1H	1	FME	2	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 29 ligands modelled in this entry, 3 are monoatomic - leaving 26 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
45	SF4	1B	201	2	0,12,12	-	-	-		
58	EHZ	1n	201	-	31,36,37	0.26	0	36,44,47	0.97	1 (2%)
46	PC1	1q	201	-	47,47,53	0.29	0	53,55,61	0.32	0
46	PC1	1M	501	-	34,34,53	0.32	0	40,42,61	0.38	0
46	PC1	1d	201	-	38,38,53	0.32	0	44,46,61	0.48	0
51	CDL	1a	101	-	60,60,99	0.33	0	66,72,111	0.44	0
52	MYR	1L	701	-	13,14,15	0.28	0	12,13,15	0.29	0
46	PC1	1B	202	-	33,33,53	0.33	0	39,41,61	0.34	0
45	SF4	1F	502	6	0,12,12	-	-	-		
53	3PE	1Y	201	-	34,34,50	0.47	0	37,39,55	0.89	2 (5%)
46	PC1	1f	101	-	24,24,53	0.36	0	30,32,61	0.65	0
58	EHZ	1W	201	-	31,36,37	0.20	0	36,44,47	1.05	1 (2%)
47	FES	1E	301	5	0,4,4	-	-	-		
45	SF4	1G	801	7	0,12,12	-	-	-		
45	SF4	1I	201	9	0,12,12	-	-	-		
45	SF4	1I	202	9	0,12,12	-	-	-		
48	FMN	1F	501	-	33,33,33	0.63	0	48,50,50	0.66	1 (2%)
45	SF4	1G	802	7	0,12,12	-	-	-		
56	NDP	1P	501	-	51,52,52	0.52	0	71,80,80	0.78	2 (2%)
53	3PE	1M	502	-	37,37,50	0.31	0	40,42,55	0.41	0
46	PC1	1L	702	-	45,45,53	0.29	0	51,53,61	0.34	0
51	CDL	1O	403	-	66,66,99	0.98	3 (4%)	72,78,111	1.40	5 (6%)
51	CDL	1H	702	-	50,50,99	0.36	0	56,62,111	0.60	1 (1%)
50	U10	1H	701	-	63,63,63	0.60	2 (3%)	78,79,79	0.76	4 (5%)
47	FES	1G	804	7	0,4,4	-	-	-		
54	GTP	1O	401	55	33,34,34	0.60	0	50,54,54	0.64	0

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
45	SF4	1B	201	2	-	-	0/6/5/5
58	EHZ	1n	201	-	-	10/42/44/45	-
46	PC1	1q	201	-	-	9/51/51/57	-
46	PC1	1M	501	-	-	3/38/38/57	-
46	PC1	1d	201	-	-	11/42/42/57	-
51	CDL	1a	101	-	-	2/71/71/110	-

Continued on next page...

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
52	MYR	1L	701	-	-	3/12/12/13	-
46	PC1	1B	202	-	-	12/37/37/57	-
45	SF4	1F	502	6	-	-	0/6/5/5
53	3PE	1Y	201	-	-	11/38/38/54	-
46	PC1	1f	101	-	-	4/27/27/57	-
58	EHZ	1W	201	-	-	4/42/44/45	-
45	SF4	1G	801	7	-	-	0/6/5/5
47	FES	1E	301	5	-	-	0/1/1/1
45	SF4	1I	201	9	-	-	0/6/5/5
45	SF4	1I	202	9	-	-	0/6/5/5
48	FMN	1F	501	-	-	3/18/18/18	0/3/3/3
45	SF4	1G	802	7	-	-	0/6/5/5
56	NDP	1P	501	-	-	4/34/77/77	0/5/5/5
53	3PE	1M	502	-	-	4/41/41/54	-
46	PC1	1L	702	-	-	7/49/49/57	-
51	CDL	1O	403	-	-	13/76/76/110	-
51	CDL	1H	702	-	-	8/61/61/110	-
50	U10	1H	701	-	-	22/63/87/87	0/1/1/1
47	FES	1G	804	7	-	-	0/1/1/1
54	GTP	1O	401	55	-	0/22/38/38	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
51	1O	403	CDL	C71-CB7	5.28	1.66	1.50
51	1O	403	CDL	OB9-CB7	4.74	1.36	1.22
50	1H	701	U10	C4-C5	-2.58	1.41	1.48
50	1H	701	U10	C4-C3	2.07	1.43	1.36
51	1O	403	CDL	OB8-CB7	2.05	1.39	1.33

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
51	1O	403	CDL	OB8-CB7-C71	-7.24	89.76	111.83
58	1W	201	EHZ	C10-S1-C9	5.85	119.14	101.84
51	1O	403	CDL	OB8-CB7-OB9	5.58	137.58	123.63
58	1n	201	EHZ	C10-S1-C9	5.38	117.73	101.84
51	1O	403	CDL	OB8-CB6-CB4	5.17	123.31	108.40

There are no chirality outliers.

5 of 130 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
46	1B	202	PC1	C11-O13-P-O14
46	1B	202	PC1	C1-O11-P-O13
46	1B	202	PC1	C2-C1-O11-P
46	1B	202	PC1	O32-C31-O31-C3
46	1B	202	PC1	C32-C31-O31-C3

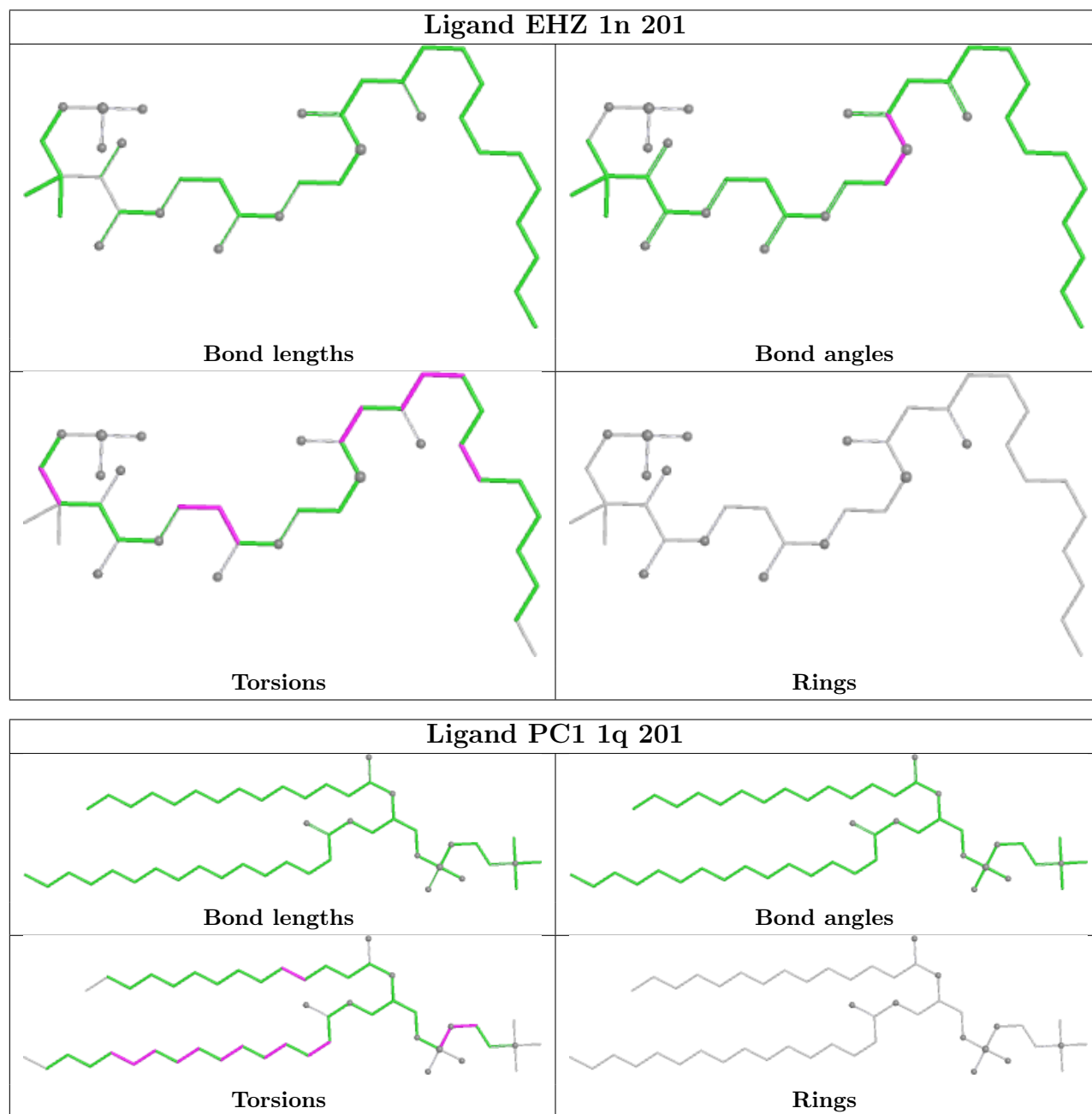
There are no ring outliers.

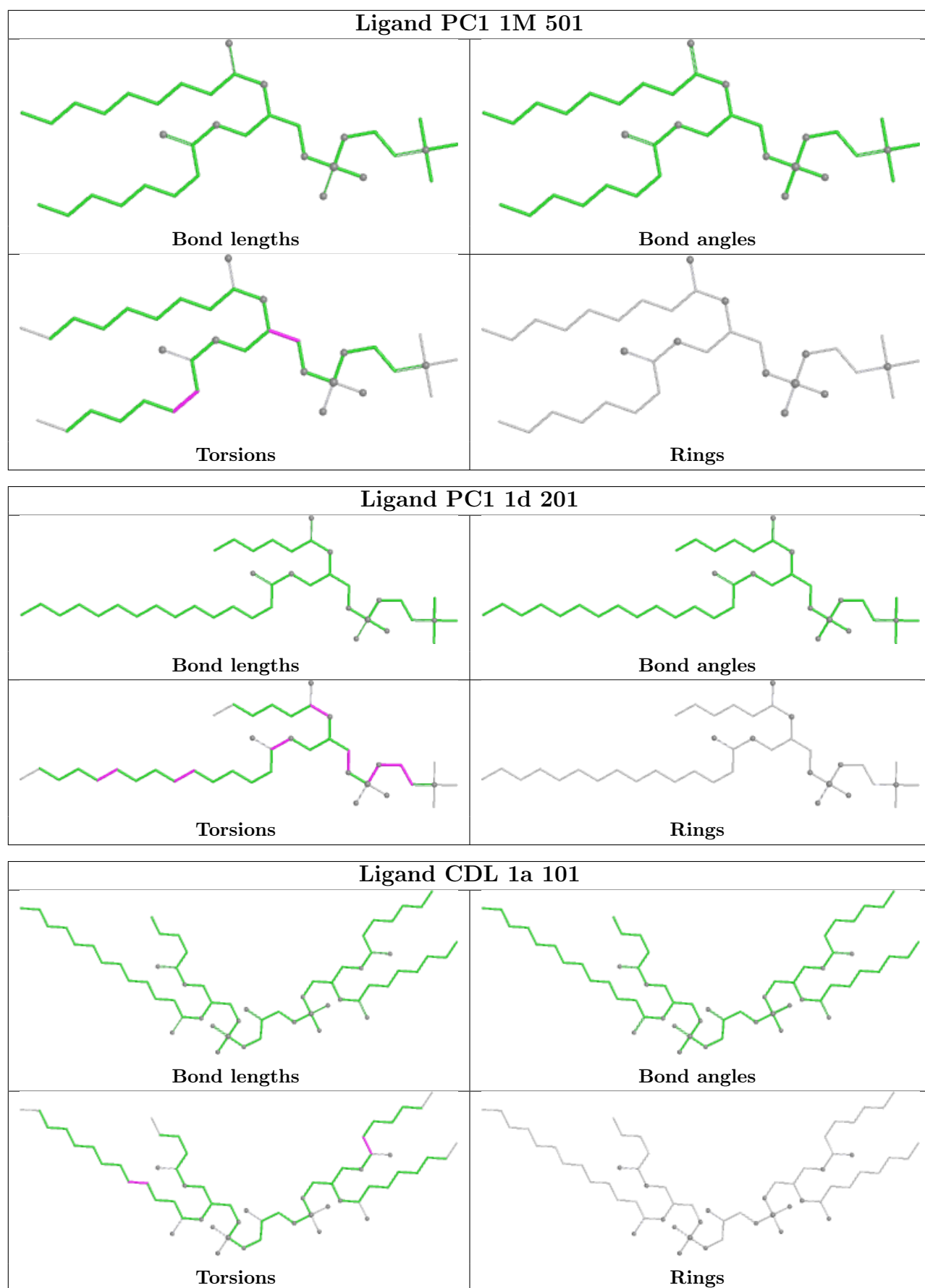
21 monomers are involved in 67 short contacts:

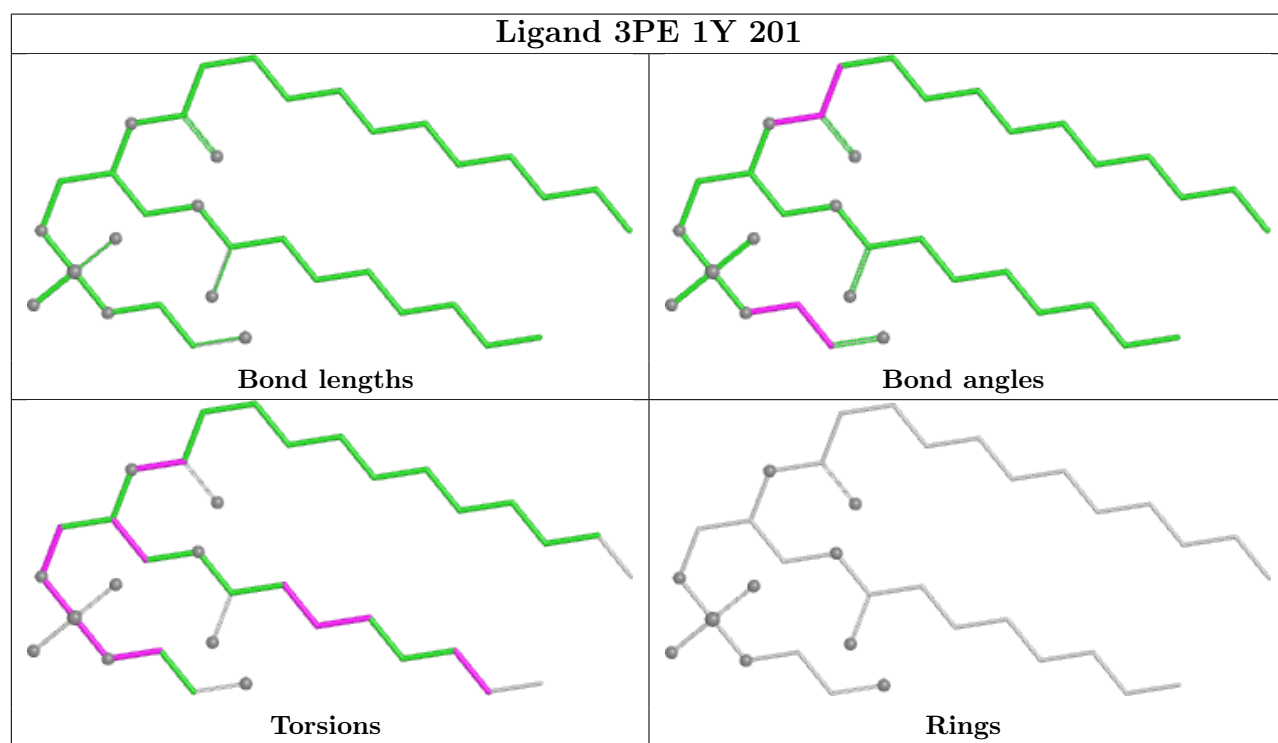
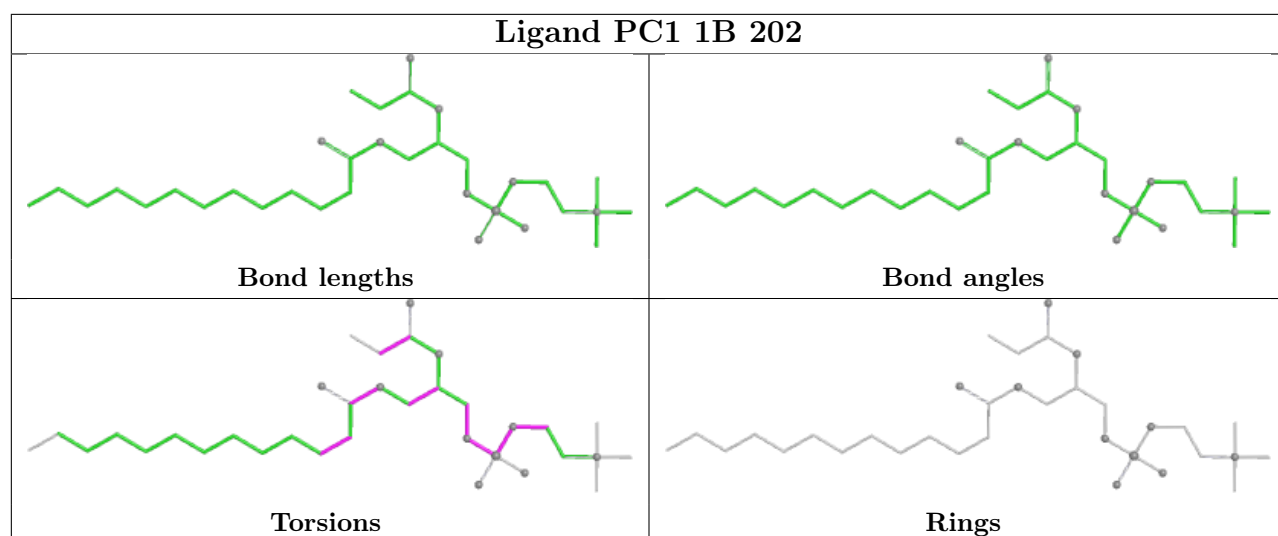
Mol	Chain	Res	Type	Clashes	Symm-Clashes
58	1n	201	EHZ	4	0
46	1q	201	PC1	1	0
46	1M	501	PC1	1	0
46	1d	201	PC1	4	0
51	1a	101	CDL	4	0
52	1L	701	MYR	2	0
46	1B	202	PC1	2	0
45	1F	502	SF4	3	0
53	1Y	201	3PE	7	0
46	1f	101	PC1	3	0
58	1W	201	EHZ	2	0
45	1I	201	SF4	1	0
48	1F	501	FMN	1	0
56	1P	501	NDP	8	0
53	1M	502	3PE	4	0
46	1L	702	PC1	5	0
51	1O	403	CDL	3	0
51	1H	702	CDL	2	0
50	1H	701	U10	8	0
47	1G	804	FES	1	0
54	1O	401	GTP	1	0

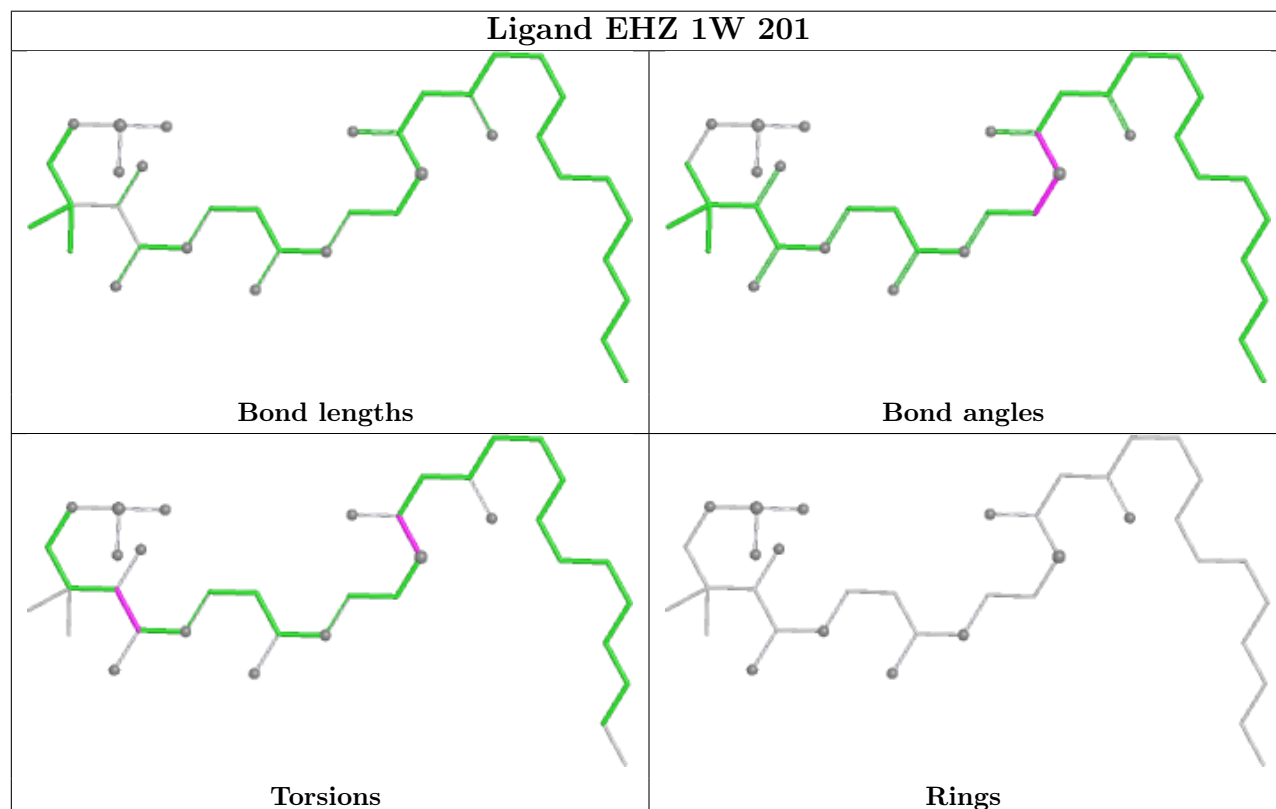
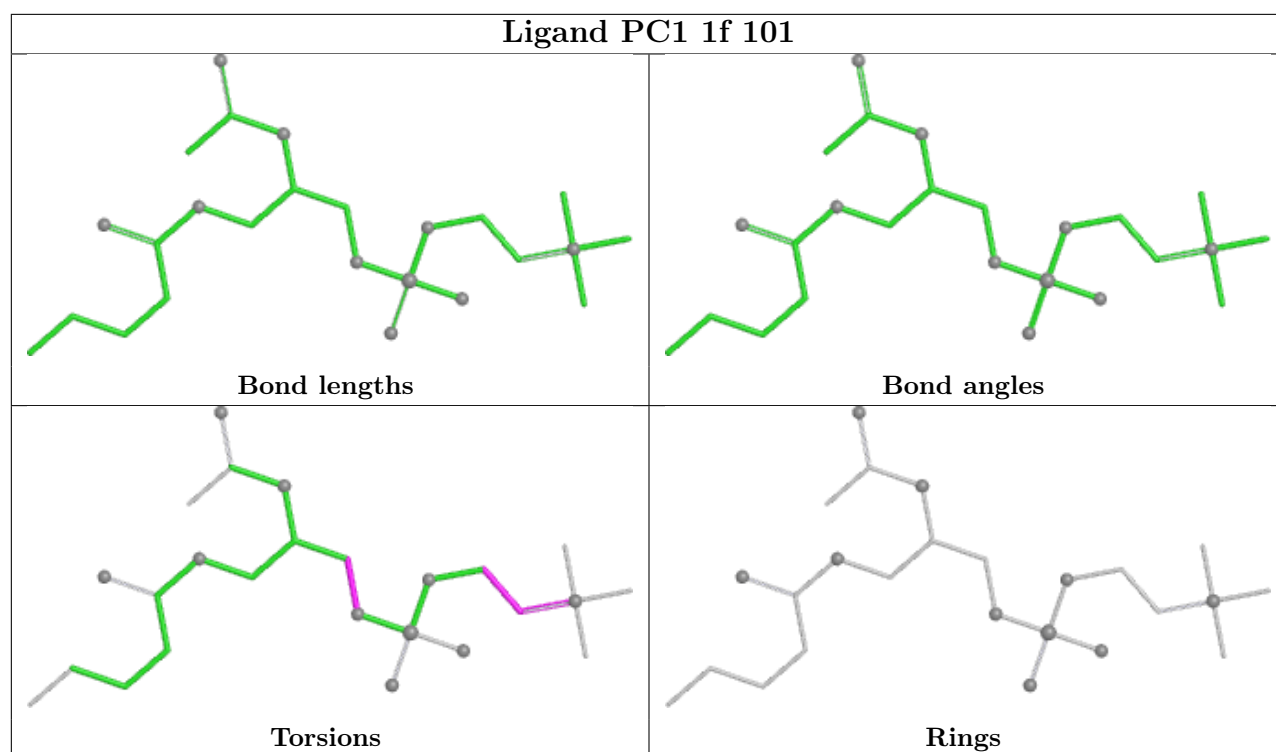
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the

average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

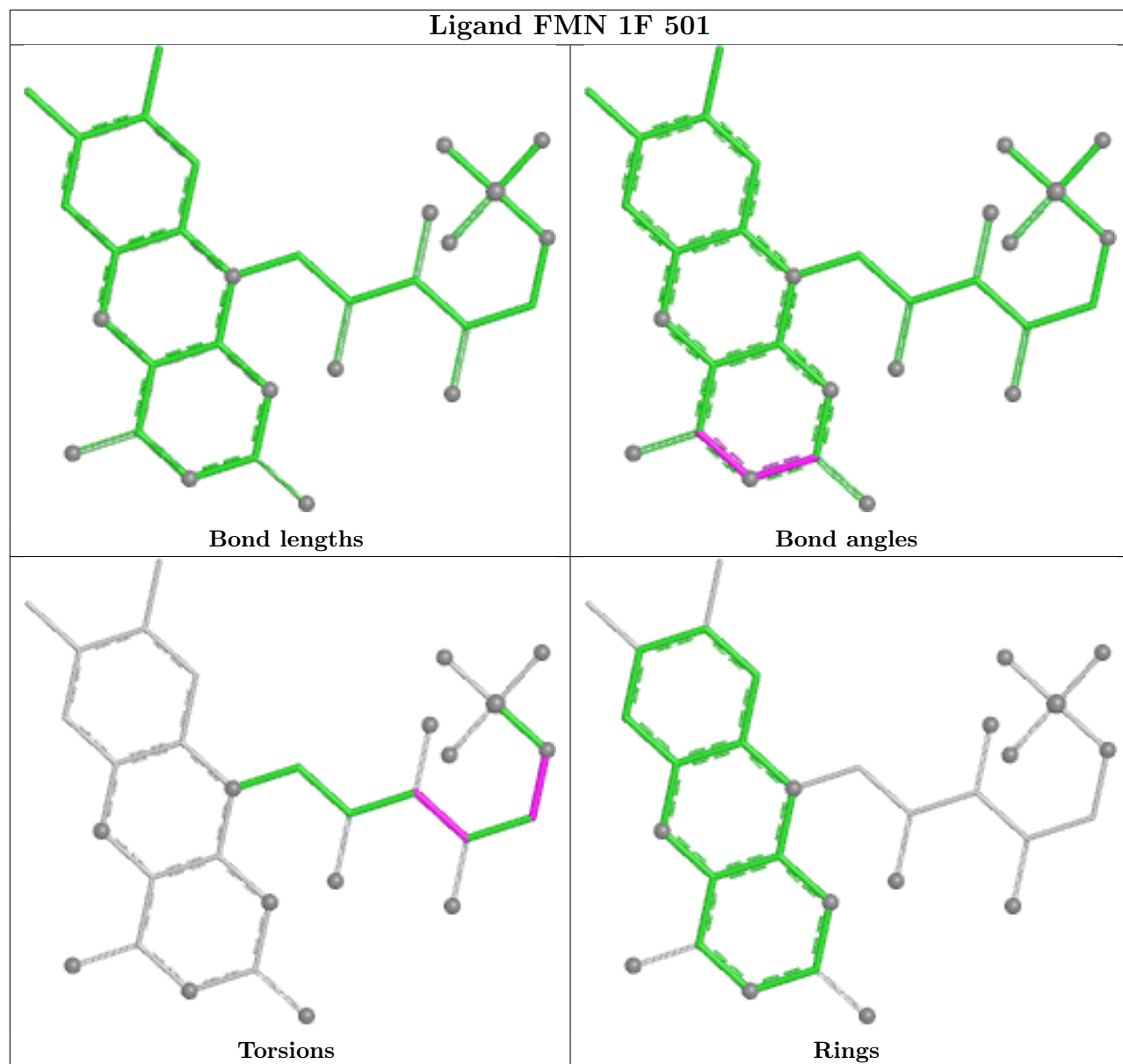


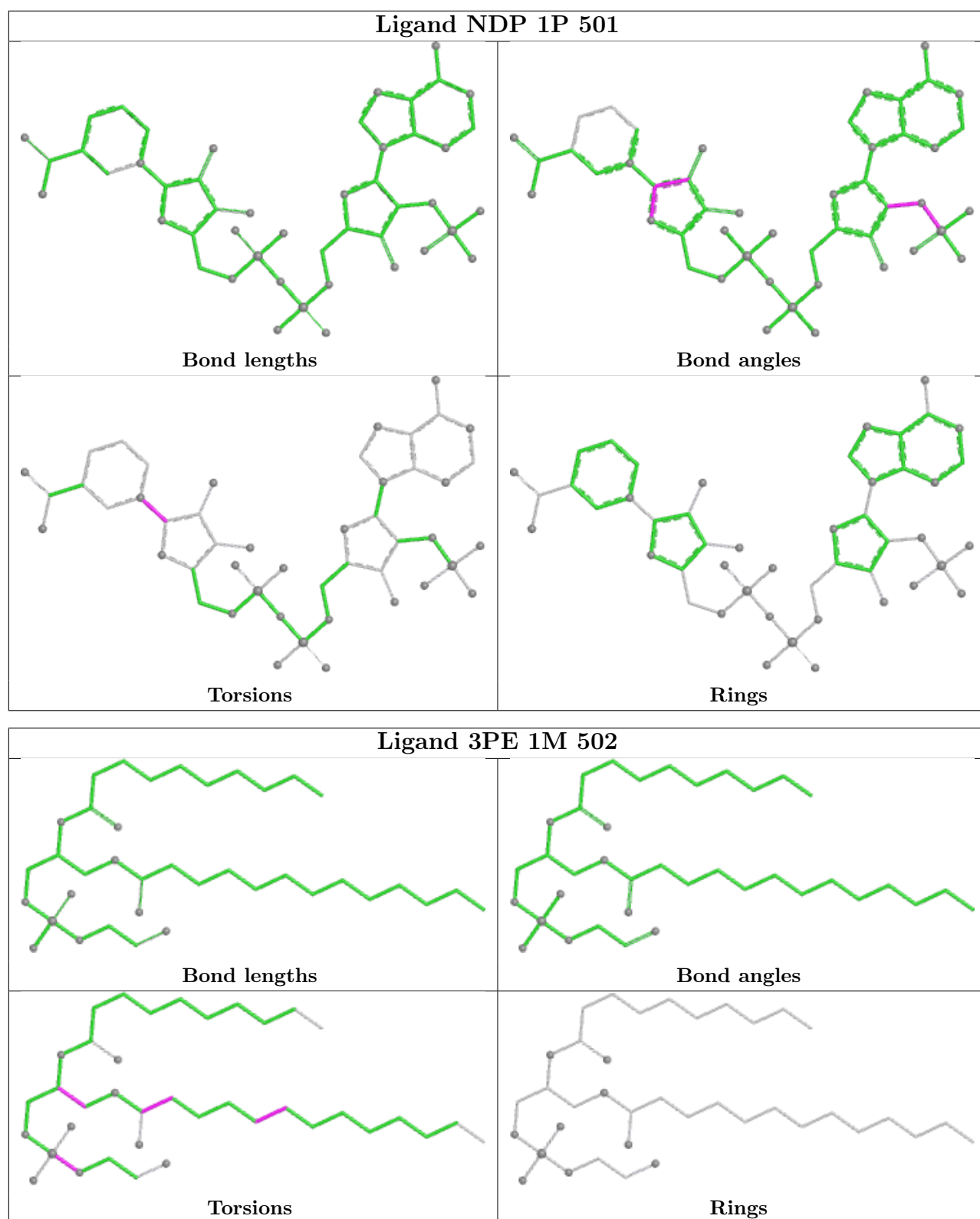


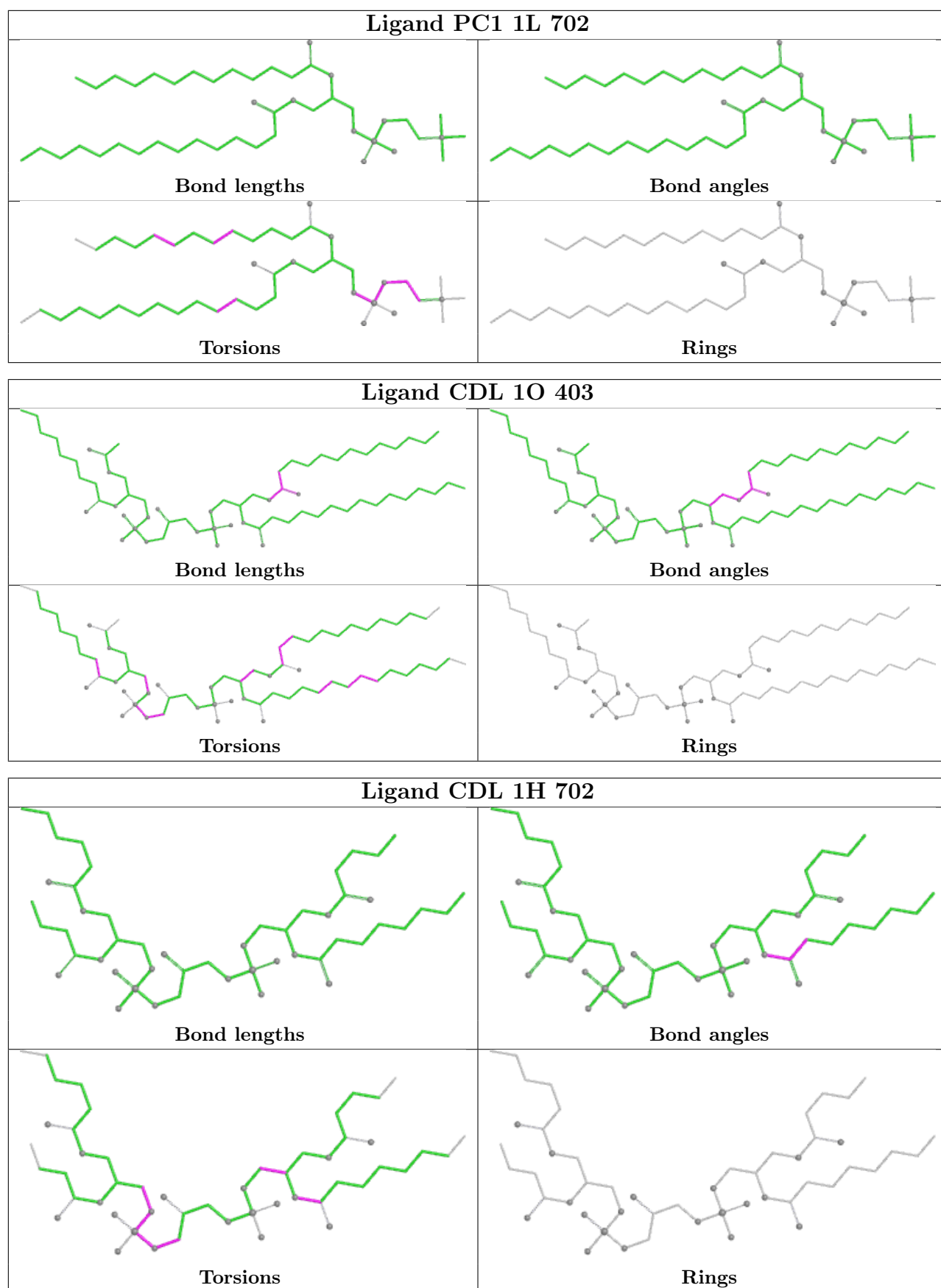


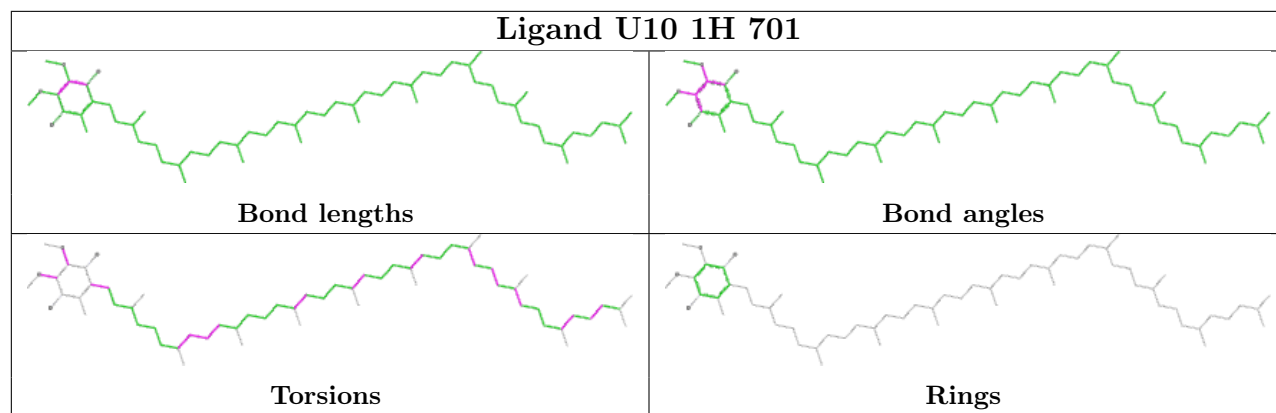


Ligand FMN 1F 501









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
43	1r	1
34	1i	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	1r	1:ALA	C	2:SER	N	6.44
1	1i	1:SAC	C	2:GLY	N	3.63

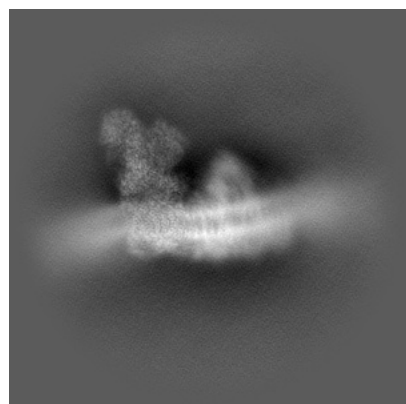
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-42176. These allow visual inspection of the internal detail of the map and identification of artifacts.

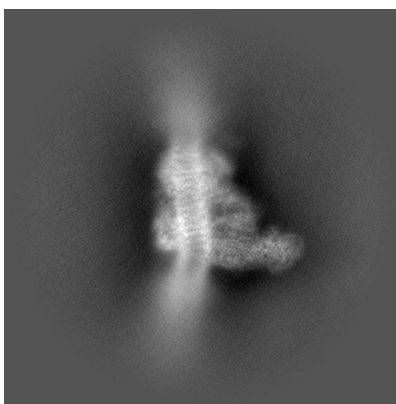
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

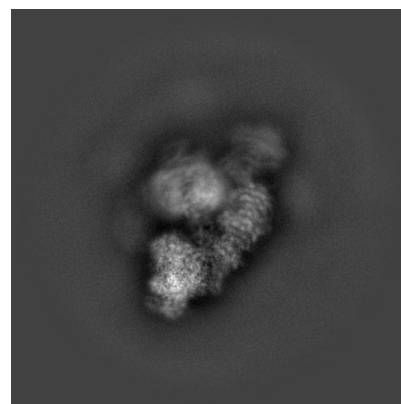
6.1.1 Primary map



X

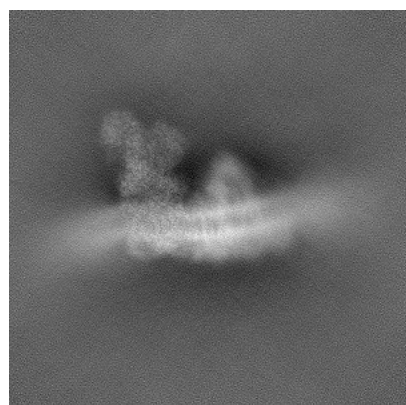


Y

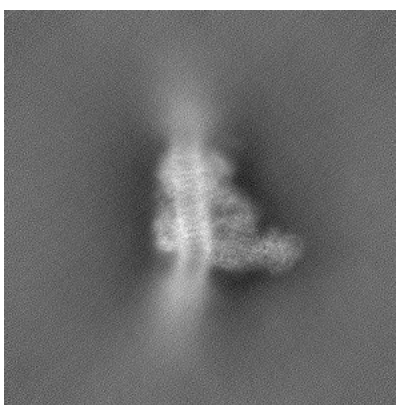


Z

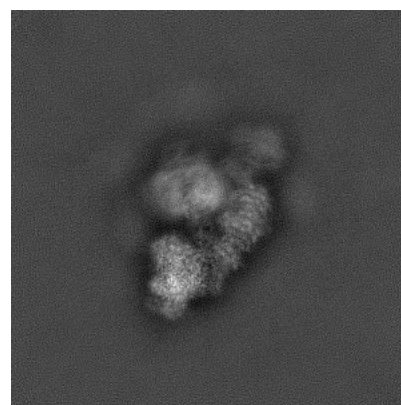
6.1.2 Raw map



X



Y

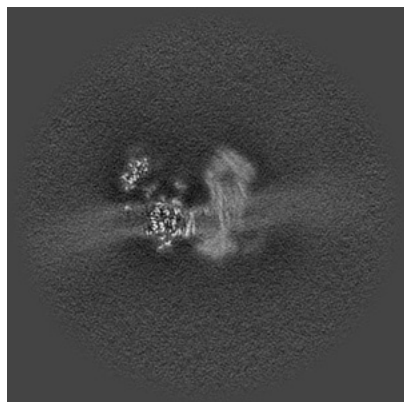


Z

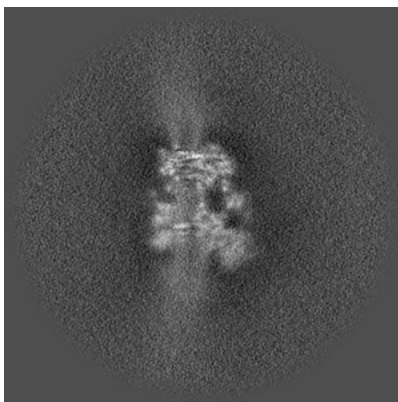
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

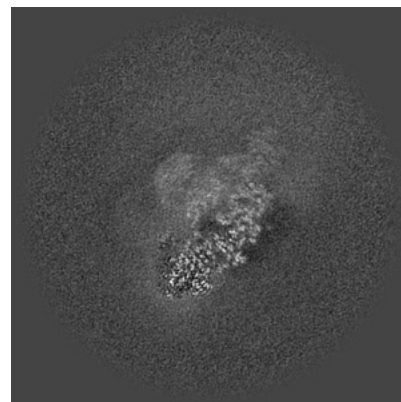
6.2.1 Primary map



X Index: 200

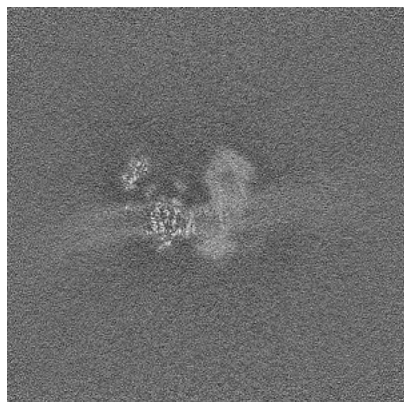


Y Index: 200

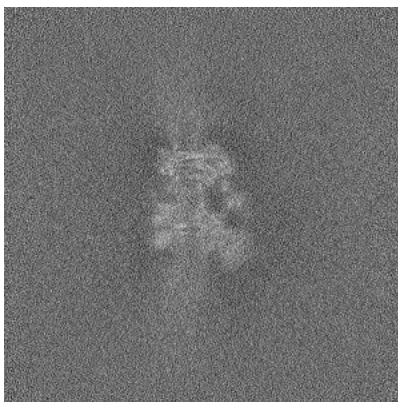


Z Index: 200

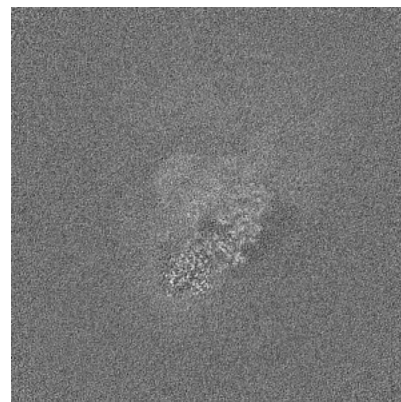
6.2.2 Raw map



X Index: 200



Y Index: 200

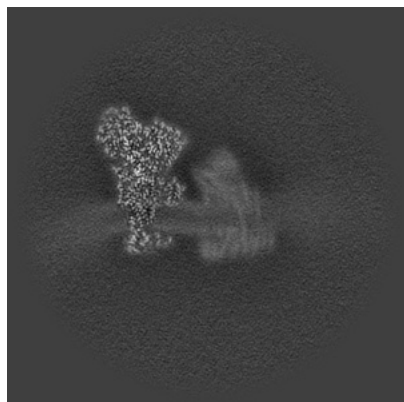


Z Index: 200

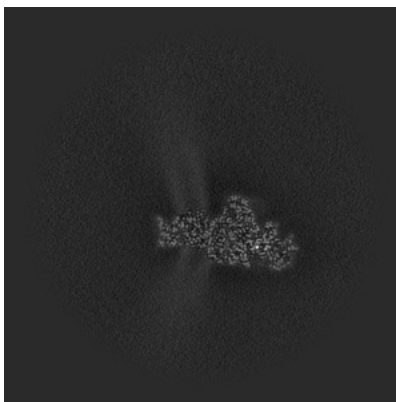
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

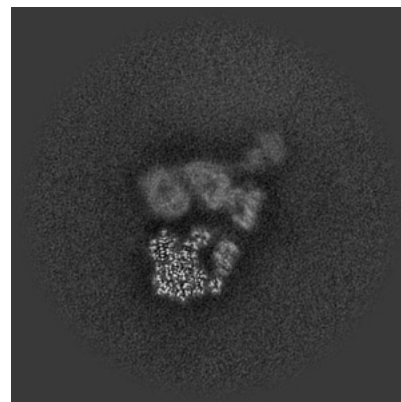
6.3.1 Primary map



X Index: 163

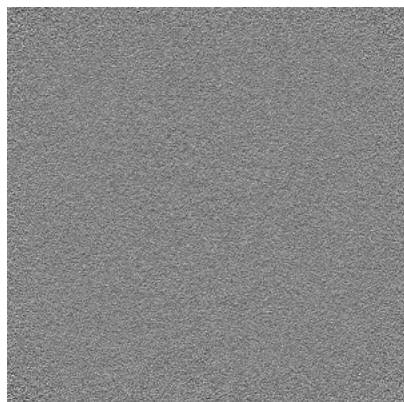


Y Index: 127

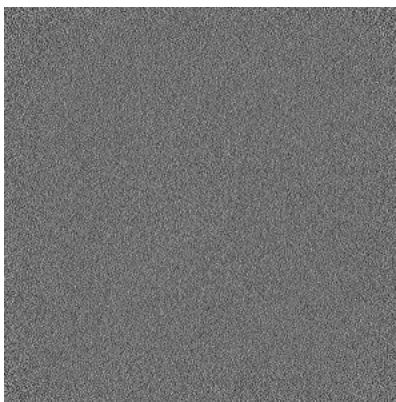


Z Index: 225

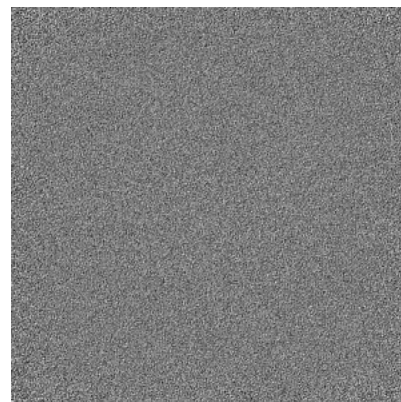
6.3.2 Raw map



X Index: 0



Y Index: 0

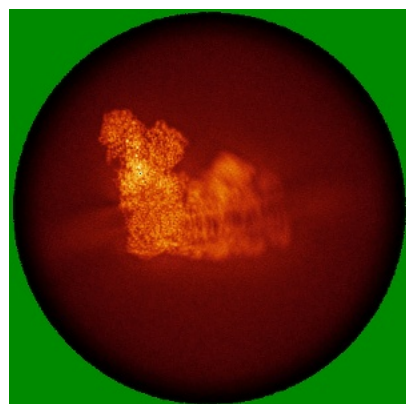


Z Index: 0

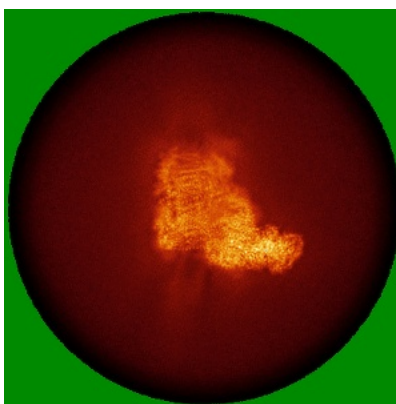
The images above show the largest variance slices of the map in three orthogonal directions.

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

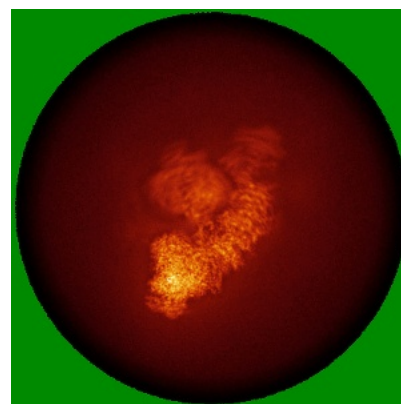
6.4.1 Primary map



X

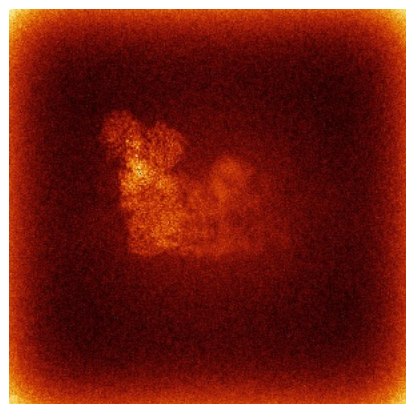


Y

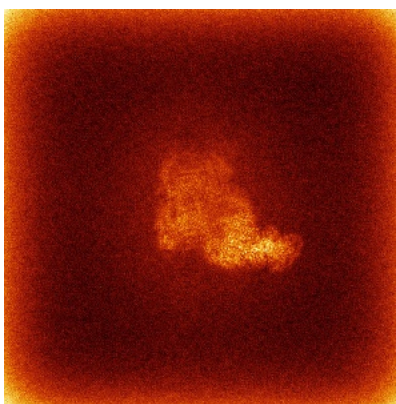


Z

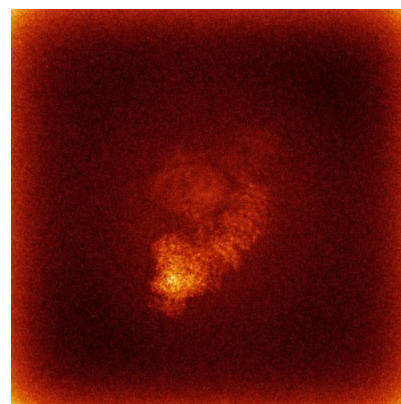
6.4.2 Raw map



X



Y



Z

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

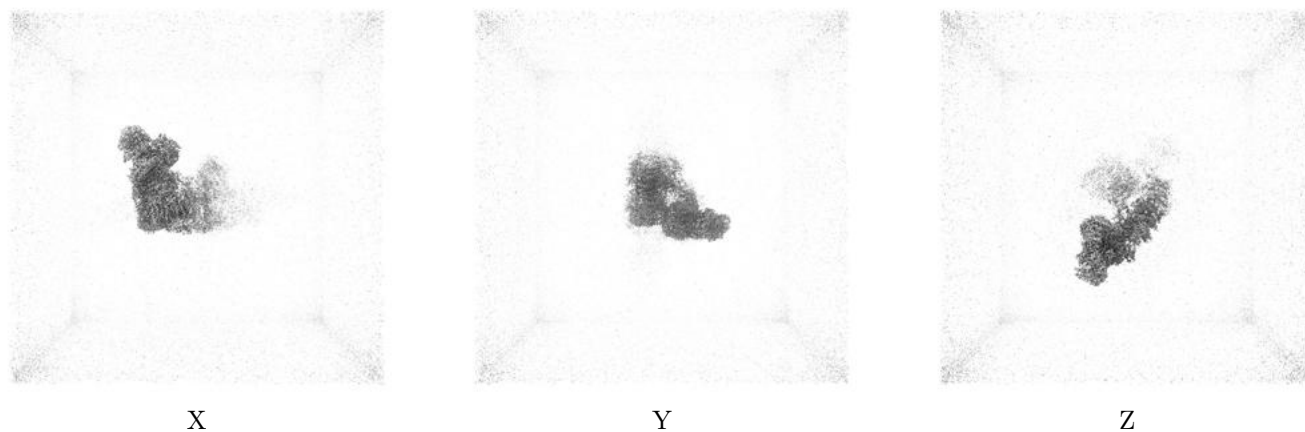
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.12. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 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.

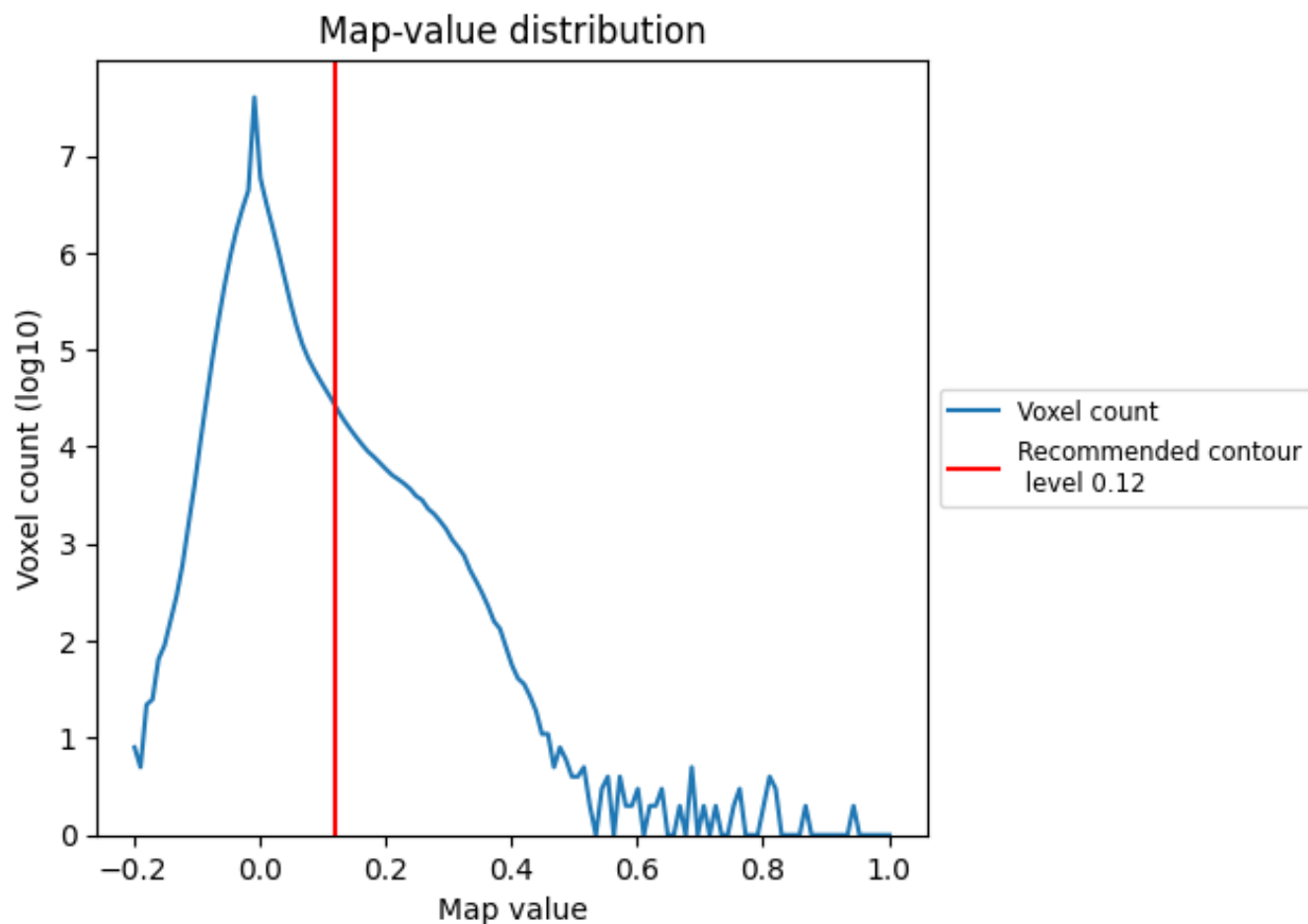
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

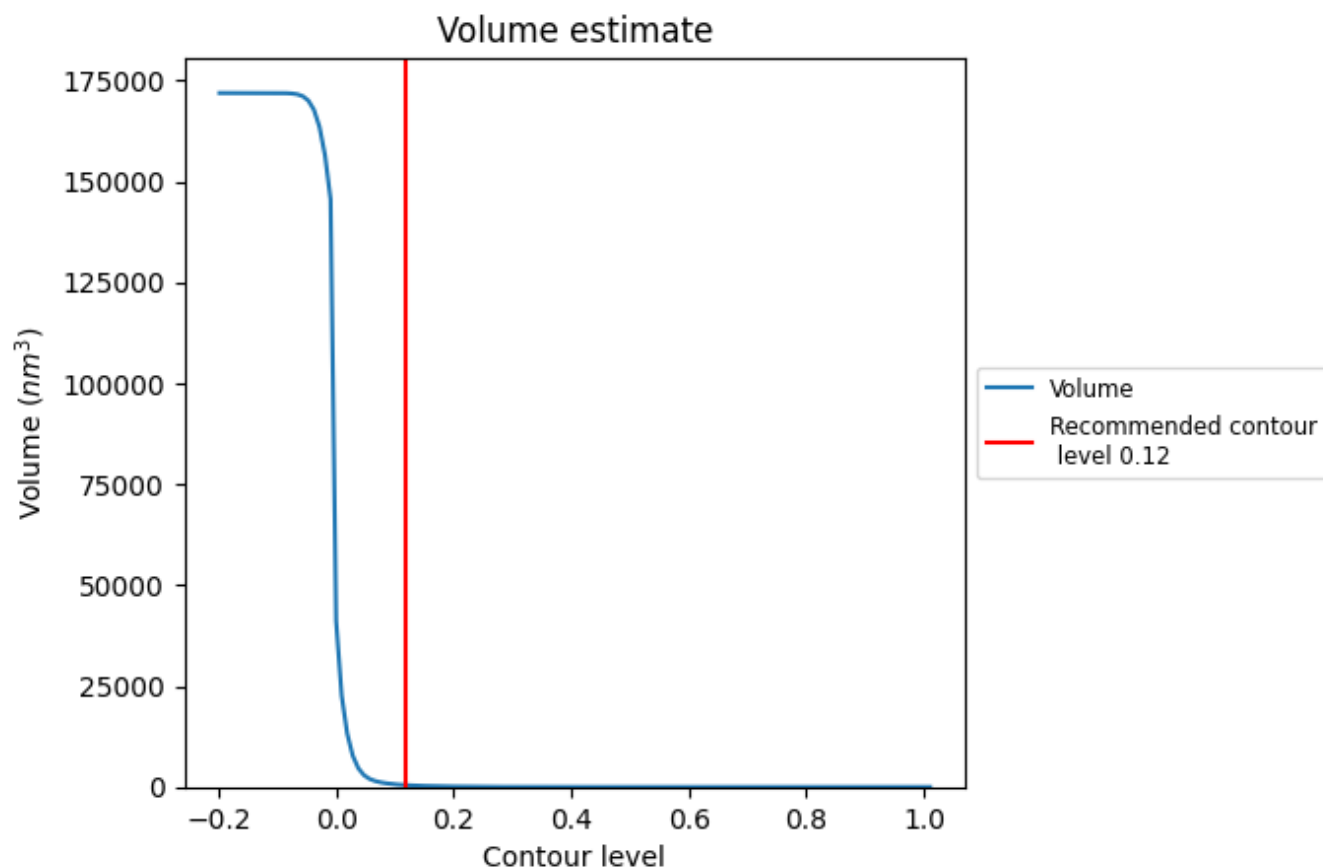
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

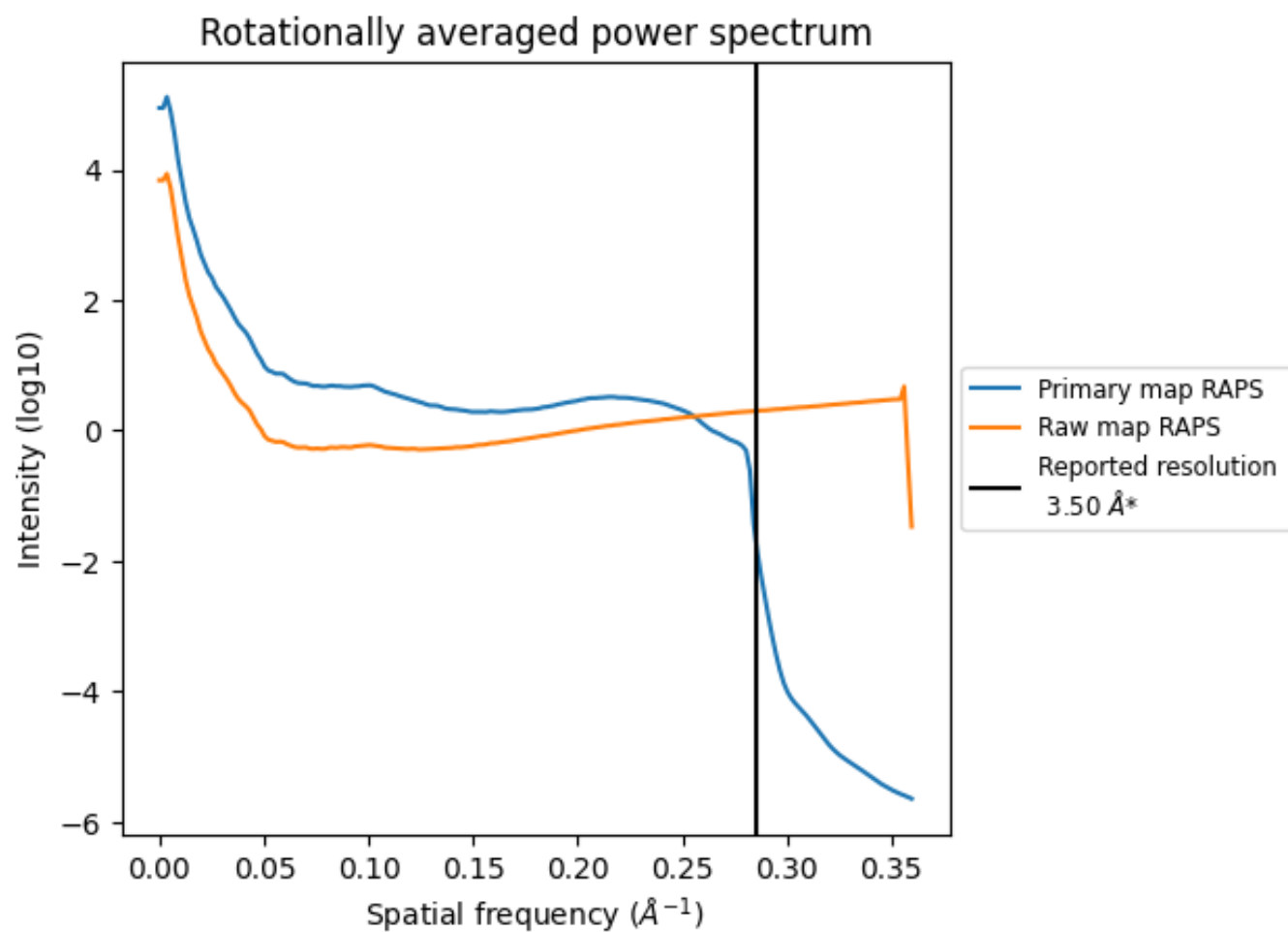
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 437 nm³; this corresponds to an approximate mass of 394 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ

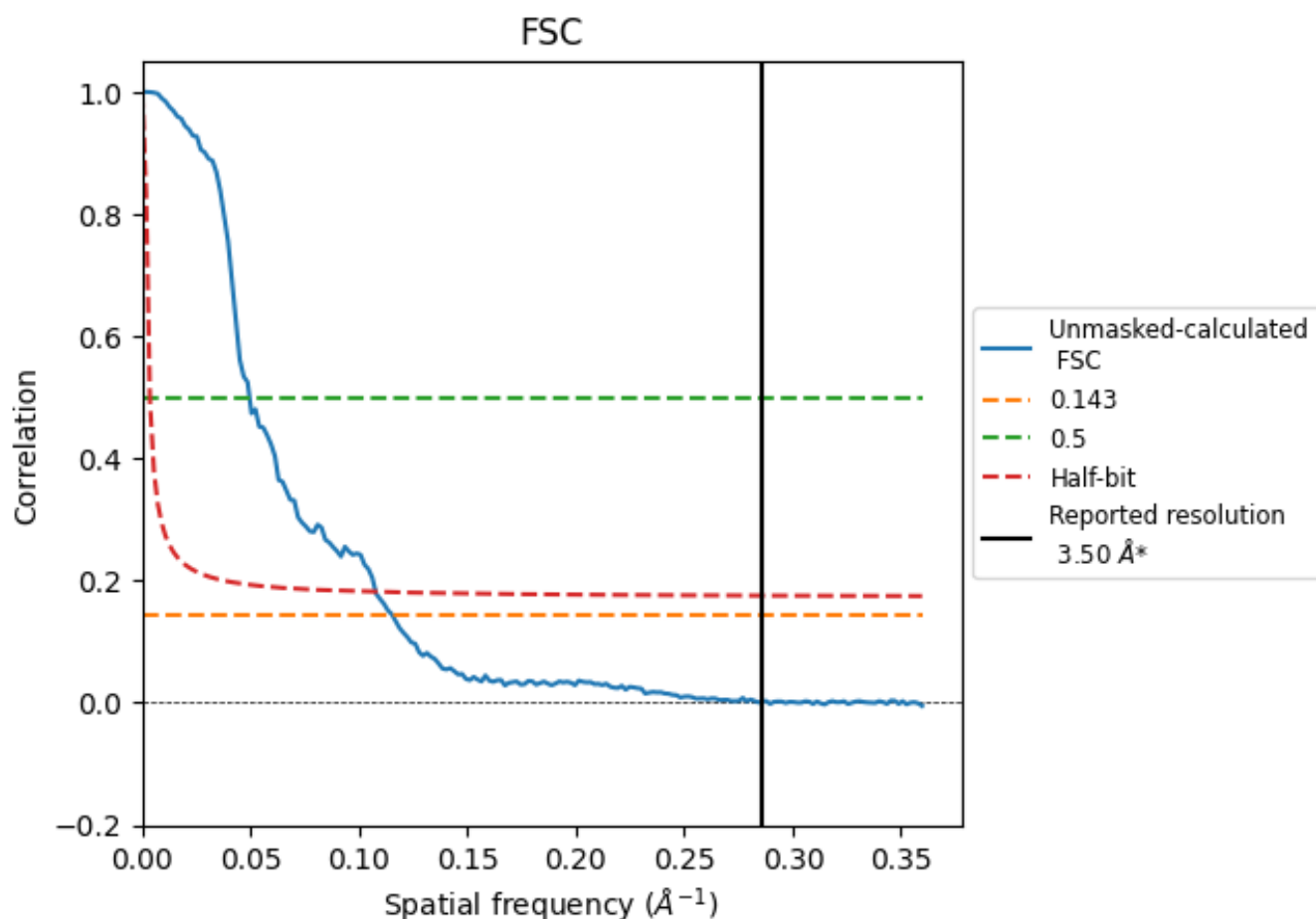


*Reported resolution corresponds to spatial frequency of 0.286 $\text{\AA}^{-1}$

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 0.286 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.50	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	8.67	20.24	9.29

*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 8.67 differs from the reported value 3.5 by more than 10 %

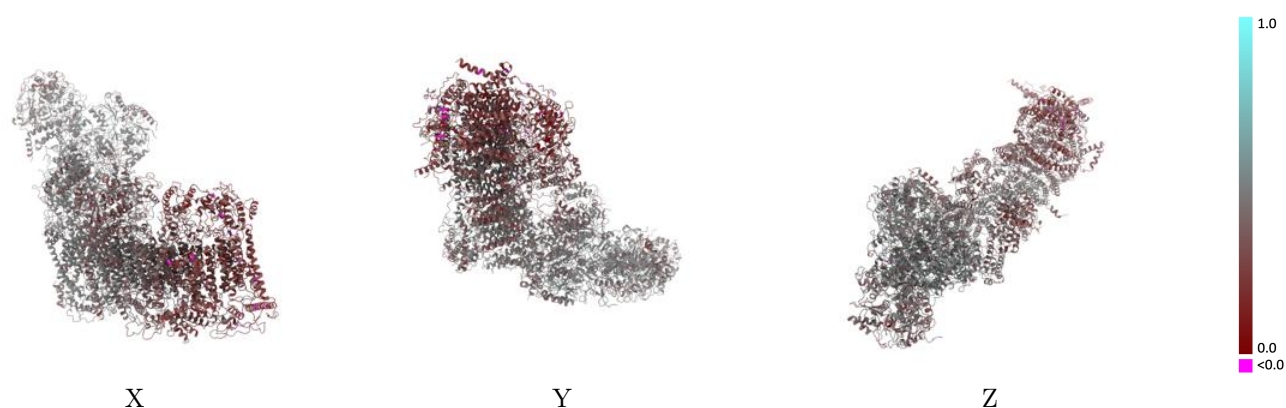
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-42176 and PDB model 8UEZ. Per-residue inclusion information can be found in section 3 on page 21.

9.1 Map-model overlay [i](#)

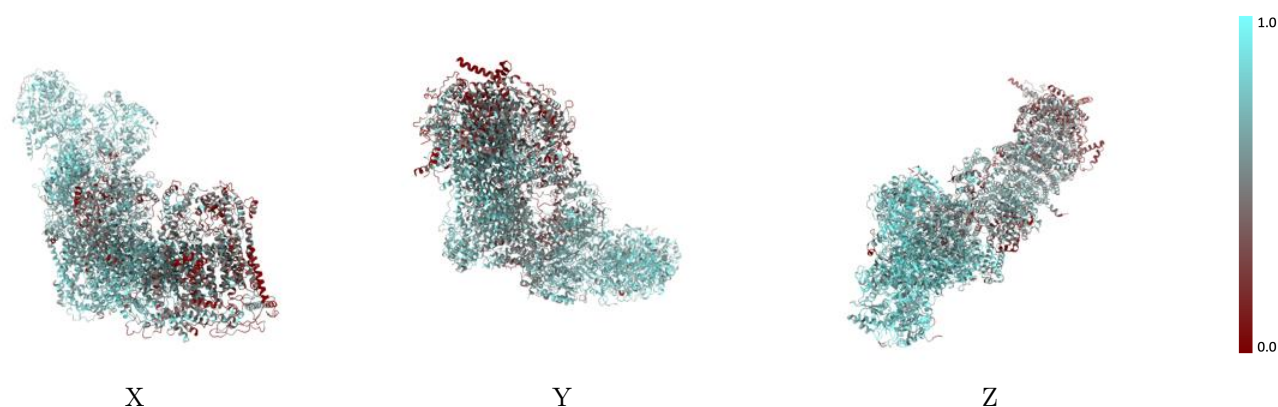
This section was not generated.

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



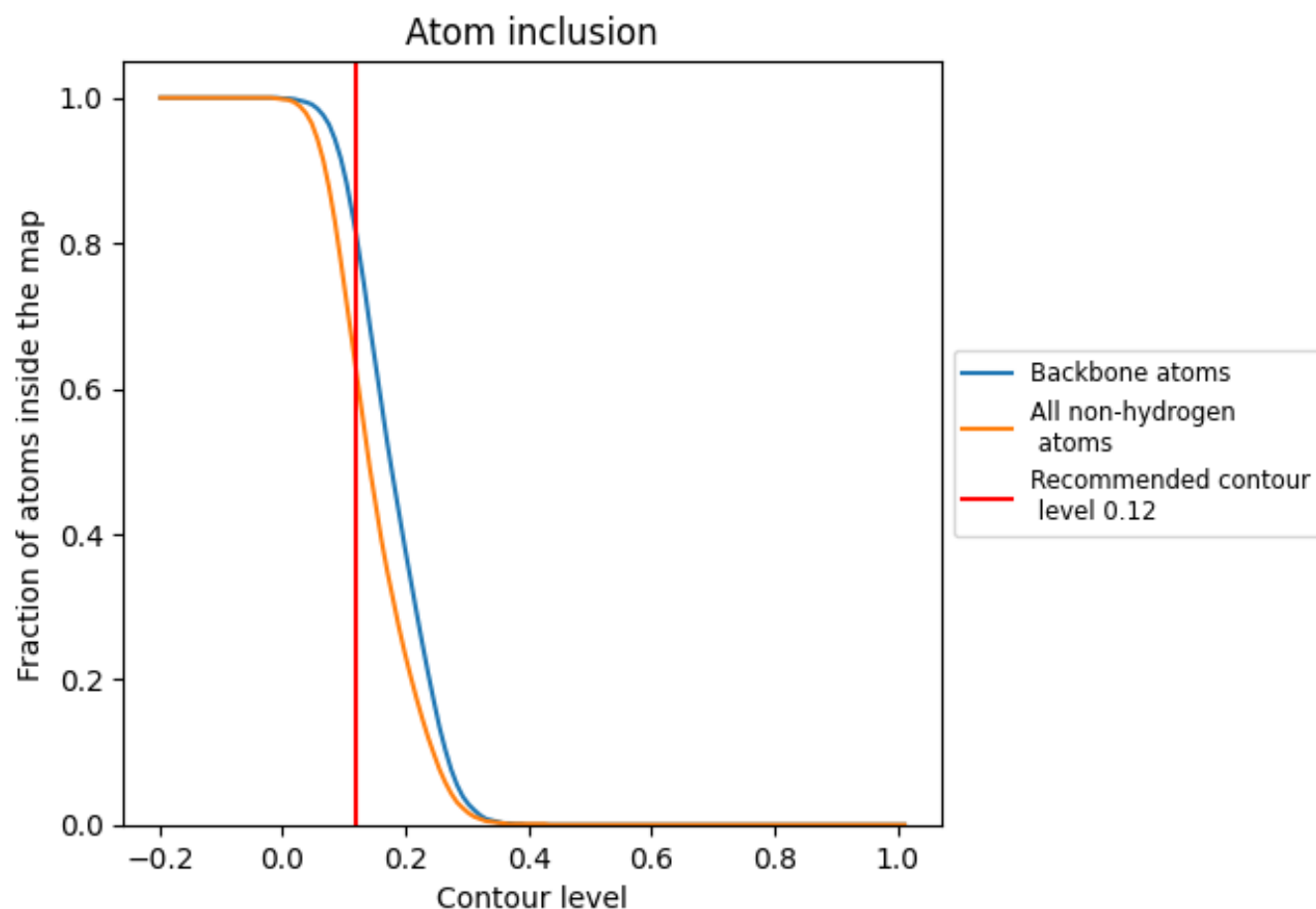
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.12).

9.4 Atom inclusion [i](#)



At the recommended contour level, 81% of all backbone atoms, 62% 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 (0.12) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6230	 0.4010
1A	 0.5080	 0.4400
1B	 0.6810	 0.4650
1C	 0.7470	 0.4810
1D	 0.6960	 0.4630
1E	 0.7530	 0.4310
1F	 0.7600	 0.4330
1G	 0.7680	 0.4620
1H	 0.6370	 0.4520
1I	 0.7930	 0.4780
1J	 0.5660	 0.4110
1K	 0.6560	 0.4220
1L	 0.4650	 0.2850
1M	 0.6410	 0.3930
1N	 0.7170	 0.4480
1O	 0.4580	 0.3360
1P	 0.6340	 0.4620
1Q	 0.6640	 0.4610
1R	 0.7260	 0.4720
1S	 0.7300	 0.4200
1T	 0.4410	 0.3560
1U	 0.3490	 0.2370
1V	 0.6490	 0.4250
1W	 0.6380	 0.4360
1X	 0.7470	 0.4320
1Y	 0.6080	 0.3420
1Z	 0.7450	 0.4470
1a	 0.7460	 0.4700
1b	 0.6920	 0.4520
1c	 0.4900	 0.3690
1d	 0.6970	 0.4220
1e	 0.7200	 0.4420
1f	 0.4750	 0.3600
1g	 0.5180	 0.3530
1h	 0.6120	 0.3860



Continued on next page...

Continued from previous page...

Chain	Atom inclusion	Q-score
1i	 0.2920	 0.2750
1j	 0.2660	 0.2590
1k	 0.2150	 0.2400
1l	 0.4720	 0.2970
1m	 0.4870	 0.2980
1n	 0.4540	 0.2740
1o	 0.4030	 0.2470
1p	 0.5130	 0.3290
1q	 0.7440	 0.4730
1r	 0.7510	 0.4730
1s	 0.7090	 0.4110