



wwPDB EM Validation Summary Report ⓘ

Dec 18, 2022 – 03:47 am GMT

PDB ID : 7A23
EMDB ID : EMD-11614
Title : Plant mitochondrial respiratory complex I
Authors : Soufari, H.; Waltz, F.; Hashem, Y.
Deposited on : 2020-08-15
Resolution : 3.70 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:

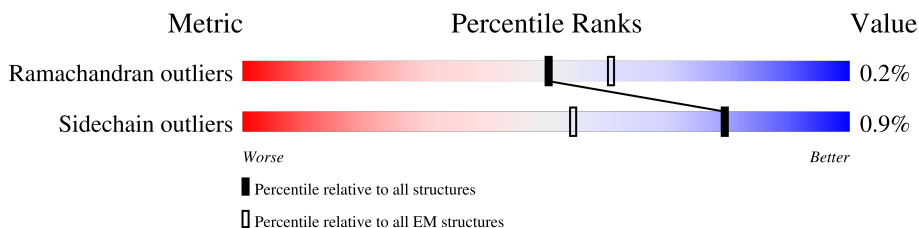
EMDB validation analysis : 0.0.1.dev43
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : 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 3.70 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.







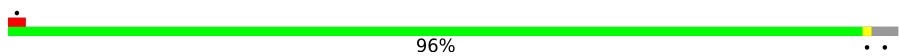
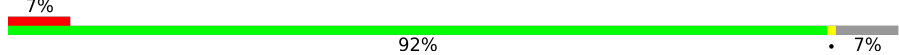

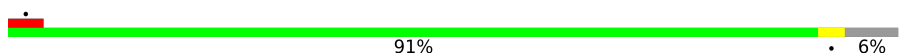




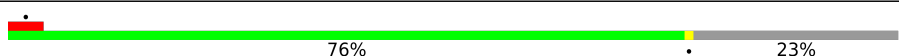
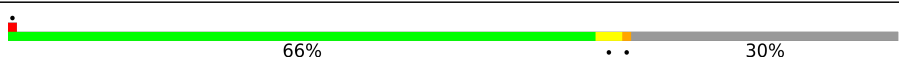
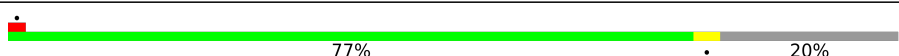

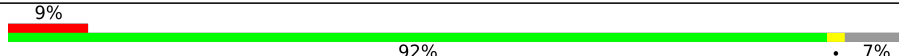
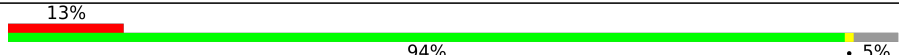

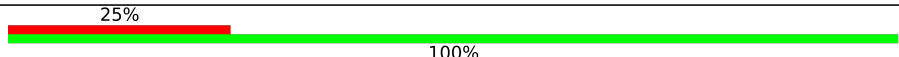




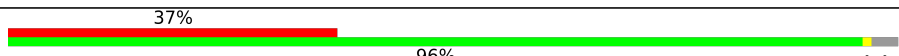
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	486	5% (red), 88% (green), 12% (grey)
2	I	499	14% (red), 95% (green), 1% (yellow), 1% (grey)
3	J	119	32% (red), 81% (green), 19% (grey)
4	N	205	20% (red), 72% (green), 27% (grey)
5	H	325	16% (red), 96% (green), 1% (yellow), 1% (grey)
6	K	100	12% (red), 84% (green), 1% (yellow), 15% (grey)
7	Y	106	10% (red), 92% (green), 1% (yellow), 8% (grey)
8	Z	143	13% (red), 98% (green), 1% (grey)
9	V	65	14% (red), 88% (green), 12% (grey)



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Mol	Chain	Length	Quality of chain
10	W	65	
11	S	131	
12	i	81	
13	j	83	
14	G	394	
15	C	748	
16	T	402	
17	F	190	
18	B	255	
19	O	154	
20	P	110	
21	R	169	
22	U	159	
23	E	218	
24	D	222	
25	X	133	
26	c	106	
27	Q	97	
28	k	122	
29	r	24	
30	n	113	
31	o	252	
32	p	275	
32	q	275	
33	M	495	

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Mol	Chain	Length	Quality of chain
34	f	107	
35	g	114	
36	d	117	
37	a	669	
38	b	103	
39	h	69	
40	e	126	
41	l	71	
42	s	20	
43	m	98	
44	t	73	

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
47	T7X	I	501	X	-	-	-

2 Entry composition [i](#)

There are 54 unique types of molecules in this entry. The entry contains 57959 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 51kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	429	3328	2100	593	610	25	0	0

- Molecule 2 is a protein called Nad2m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	I	481	3754	2525	569	633	27	0	0

- Molecule 3 is a protein called Nad3m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	J	96	800	559	112	126	3	0	0

- Molecule 4 is a protein called Nad6m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	N	149	1201	810	194	189	8	0	0

- Molecule 5 is a protein called Nad1m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	H	318	2493	1691	378	409	15	0	0

- Molecule 6 is a protein called Nad4Lm.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	K	85	667	450	101	110	6	0	0

- Molecule 7 is a protein called PGIV.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	Y	98	774	484	133	145	12	0	0

- Molecule 8 is a protein called B16.6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	Z	140	1103	701	195	199	8	0	0

- Molecule 9 is a protein called MWFE.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	V	57	461	296	82	78	5	0	0

- Molecule 10 is a protein called B9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	W	37	273	179	45	46	3	0	0

- Molecule 11 is a protein called B14.5a.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	S	101	821	513	143	161	4	0	0

- Molecule 12 is a protein called B14.5b.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	i	66	514	331	91	87	5	0	0

- Molecule 13 is a protein called 15kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	j	68	582	359	113	103	7	0	0

- Molecule 14 is a protein called Nad7m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	G	382	3049	1939	535	551	24	0	0

- Molecule 15 is a protein called 75kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	C	693	5288	3315	926	1008	39	0	0

- Molecule 16 is a protein called 39kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	T	328	2535	1628	433	459	15	0	0

- Molecule 17 is a protein called Nad9m.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	F	178	1518	979	262	272	5	0	0

- Molecule 18 is a protein called 24kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	B	219	1702	1081	286	323	12	0	0

- Molecule 19 is a protein called 18kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	O	111	874	561	150	162	1	0	0

- Molecule 20 is a protein called 13kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	P	71	554	348	97	103	6	0	0

- Molecule 21 is a protein called B13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	R	129	1039	656	174	204	5	0	0

- Molecule 22 is a protein called B17.2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	U	122	1011	643	184	183	1	0	0

- Molecule 23 is a protein called PSST.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
23	E	153	1215	779	212	210	14	0	0

- Molecule 24 is a protein called TYKY.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
24	D	177	1438	901	239	287	11	0	0

- Molecule 25 is a protein called B14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
25	X	103	843	537	151	152	3	0	0

- Molecule 26 is a protein called 20.9kDa.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
26	c	99	744	479	121	140	4	0	0

- Molecule 27 is a protein called B8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
27	Q	92	722	456	128	132	6	0	0

- Molecule 28 is a protein called ACPM1.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	k	78	Total	C	N	O	S	0	0
			614	390	94	127	3		

- Molecule 29 is a protein called Unk1.

Mol	Chain	Residues	Atoms				AltConf	Trace
29	r	24	Total	C	N	O	0	0
			120	72	24	24		

- Molecule 30 is a protein called P2.

Mol	Chain	Residues	Atoms				AltConf	Trace
30	n	27	Total	C	N	O	0	0
			205	133	35	37		

- Molecule 31 is a protein called CAL1.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	o	202	Total	C	N	O	S	0	0
			1568	1006	270	287	5		

- Molecule 32 is a protein called CA1.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	q	228	Total	C	N	O	S	0	0
			1736	1088	318	324	6		
32	p	224	Total	C	N	O	S	0	0
			1705	1068	311	320	6		

- Molecule 33 is a protein called Nad4m.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	M	482	Total	C	N	O	S	0	0
			3825	2579	593	630	23		

- Molecule 34 is a protein called PDSW.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	f	76	Total	C	N	O	S	0	0
			640	407	116	113	4		

- Molecule 35 is a protein called ESSS.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	g	47	Total	C	N	O	S	0	0
			386	253	60	71	2		

- Molecule 36 is a protein called B22.

Mol	Chain	Residues	Atoms				AltConf	Trace
36	d	66	Total	C	N	O	0	0
			329	197	66	66		

- Molecule 37 is a protein called Nad5m.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	a	600	Total	C	N	O	S	0	0
			4677	3106	725	813	33		

- Molecule 38 is a protein called B18.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	b	63	Total	C	N	O	S	0	0
			519	327	89	94	9		

- Molecule 39 is a protein called AGGG.

Mol	Chain	Residues	Atoms					AltConf	Trace
39	h	28	Total	C	N	O	S	0	0
			232	155	40	35	2		

- Molecule 40 is a protein called ACPM2.

Mol	Chain	Residues	Atoms				AltConf	Trace
40	e	84	Total	C	N	O	0	0
			417	249	84	84		

- Molecule 41 is a protein called B15.

Mol	Chain	Residues	Atoms				AltConf	Trace
41	l	23	Total	C	N	O	0	0
			112	66	23	23		

- Molecule 42 is a protein called Unk2.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
42	s	20	100	60	20	20	0	0

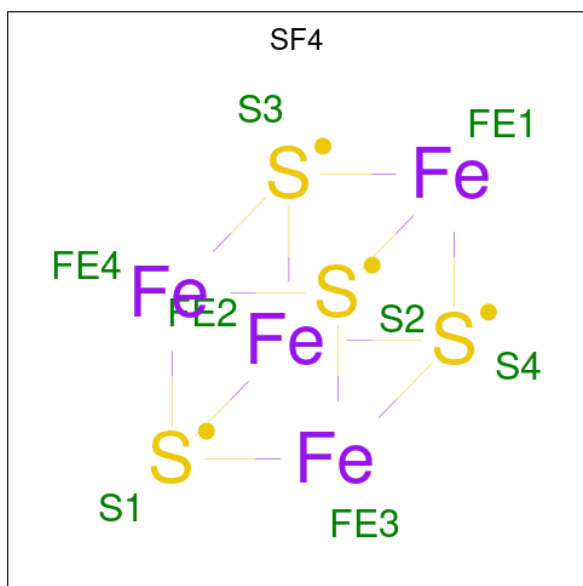
- Molecule 43 is a protein called P1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
43	m	69	605	385	112	103	5	0	0

- Molecule 44 is a protein called B12-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
44	t	31	232	149	42	38	3	0	0

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



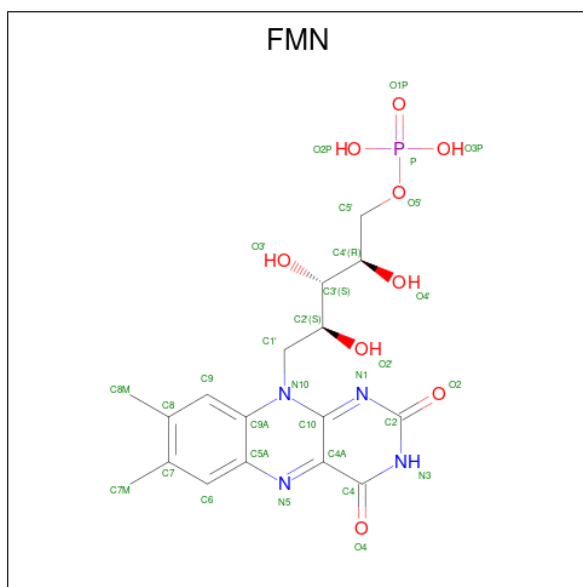
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
45	A	1	8	4	4	0
45	C	1	16	8	8	0
45	C	1	16	8	8	0
45	E	1	8	4	4	0

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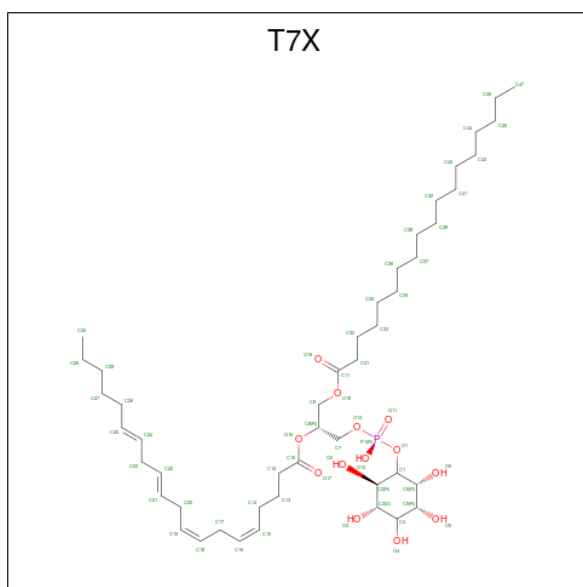
Mol	Chain	Residues	Atoms			AltConf
45	D	1	Total	Fe	S	0
			16	8	8	
45	D	1	Total	Fe	S	0
			16	8	8	

- Molecule 46 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).



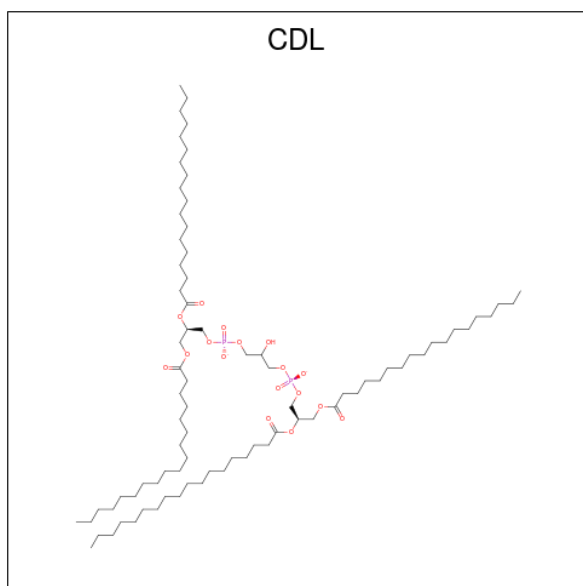
Mol	Chain	Residues	Atoms					AltConf
46	A	1	Total	C	N	O	P	0
			31	17	4	9	1	

- Molecule 47 is Phosphatidylinositol (three-letter code: T7X) (formula: C₄₇H₈₃O₁₃P).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
47	I	1	54	40	13	1	0
47	p	1	61	47	13	1	0

- Molecule 48 is CARDIOLIPIN (three-letter code: CDL) (formula: $C_{81}H_{156}O_{17}P_2$).



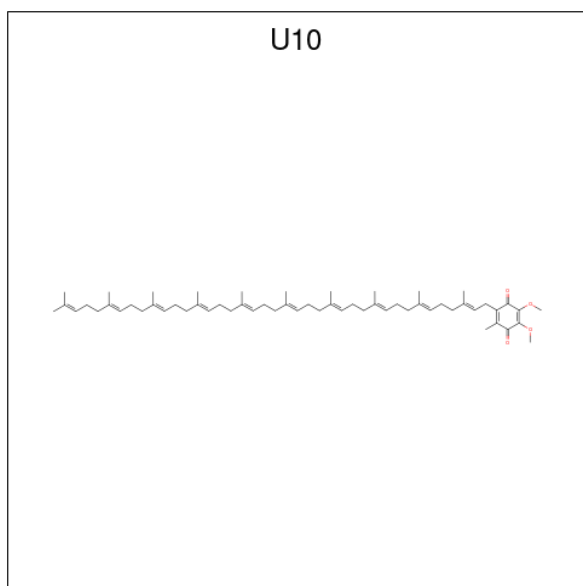
Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
48	I	1	198	160	34	4	0
48	I	1	198	160	34	4	0

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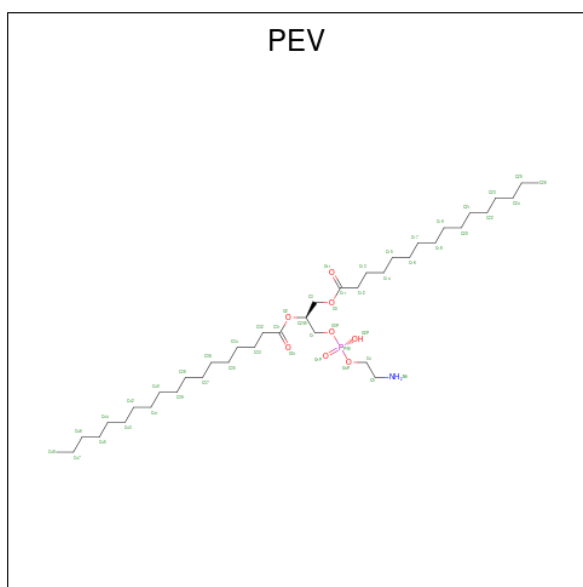
Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
48	J	1	87	68	17	2	0

- Molecule 49 is UBIQUINONE-10 (three-letter code: U10) (formula: $C_{59}H_{90}O_4$).



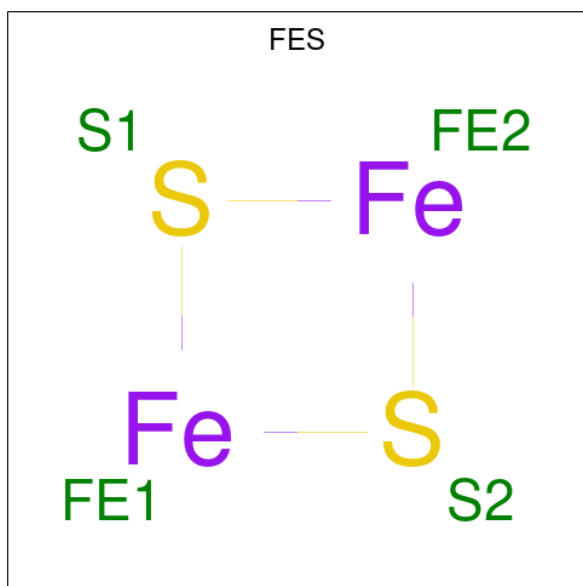
Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
49	H	1	44	40	4	0

- Molecule 50 is (1S)-2-[[[(2-AMINOETHOXY)(HYDROXY)PHOSPHORYL]OXY]-1-[(PALMITOYLOXY)METHYL]ETHYL STEARATE (three-letter code: PEV) (formula: $C_{39}H_{78}NO_8P$).



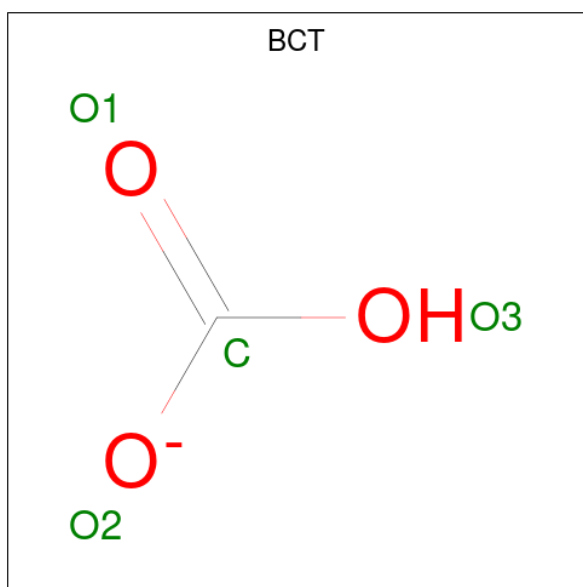
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
50	H	1	49	39	1	8	1	0

- Molecule 51 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2).



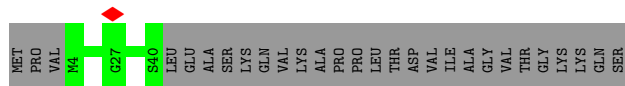
Mol	Chain	Residues	Atoms			AltConf
			Total	Fe	S	
51	C	1	4	2	2	0
51	B	1	4	2	2	0

- Molecule 52 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE

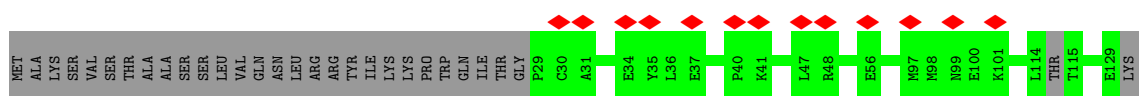
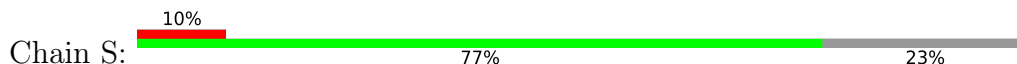


Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
54	q	1	4	1	3	0

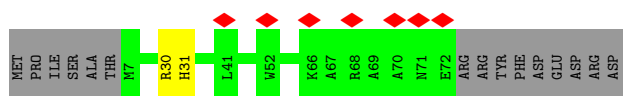
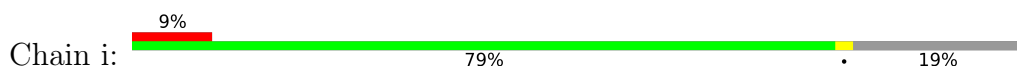
• Molecule 10: B9



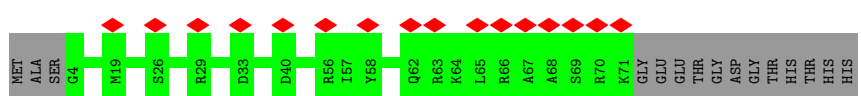
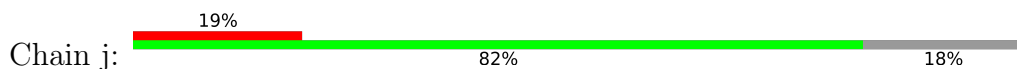
• Molecule 11: B14.5a



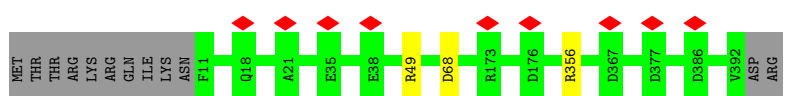
• Molecule 12: B14.5b



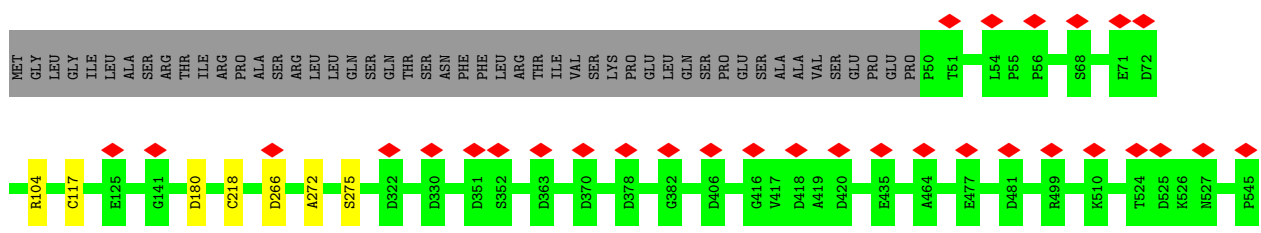
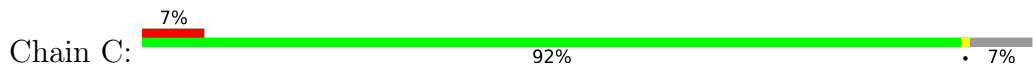
• Molecule 13: 15kDa

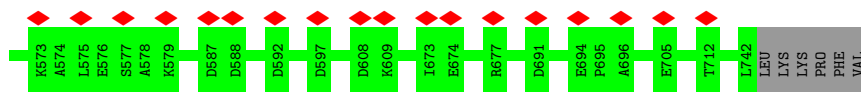


• Molecule 14: Nad7m

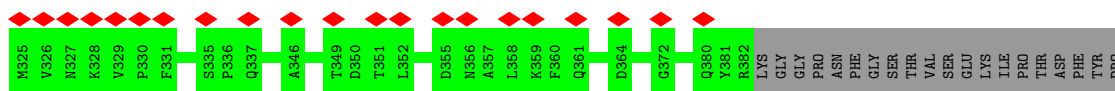
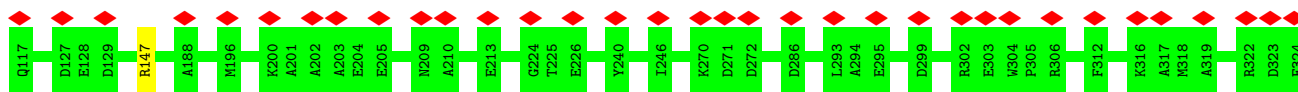
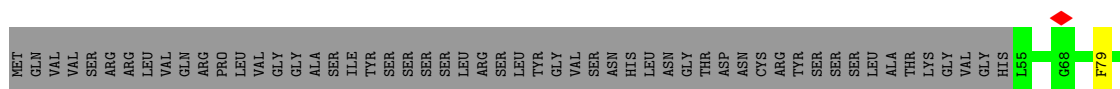
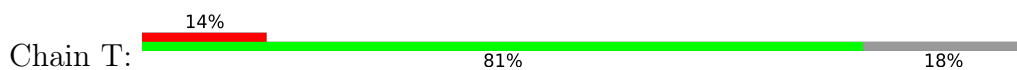


• Molecule 15: 75kDa

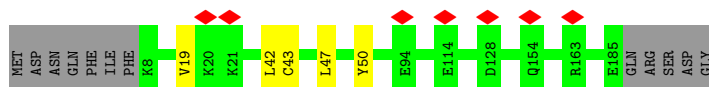
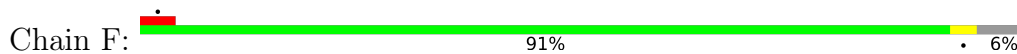




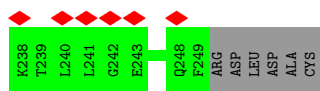
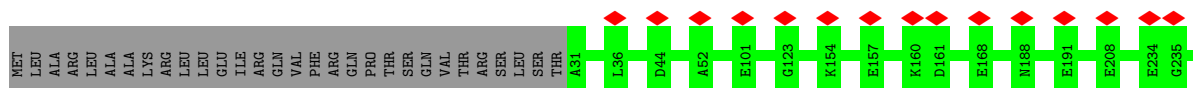
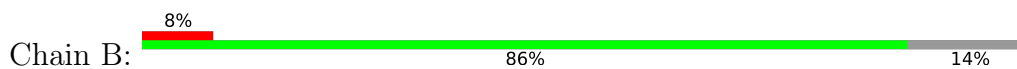
• Molecule 16: 39kDa



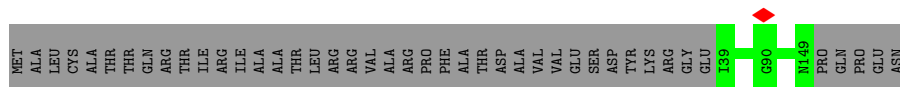
• Molecule 17: Nad9m



• Molecule 18: 24kDa

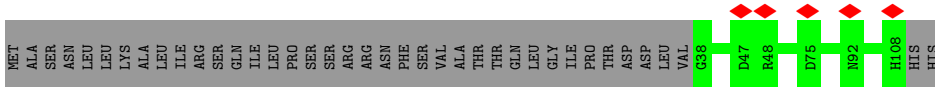


• Molecule 19: 18kDa

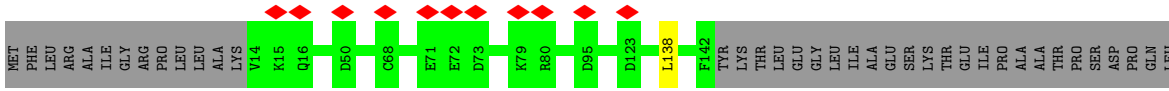
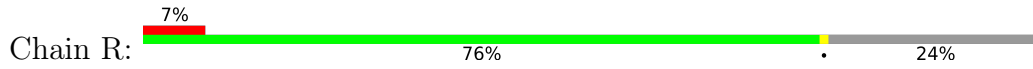


• Molecule 20: 13kDa

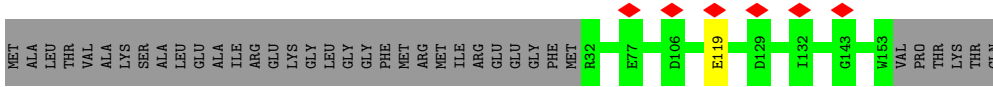
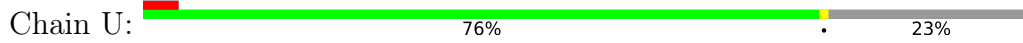




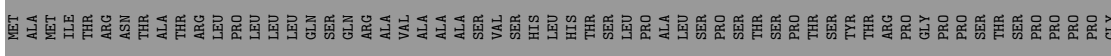
• Molecule 21: B13



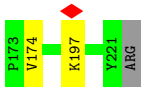
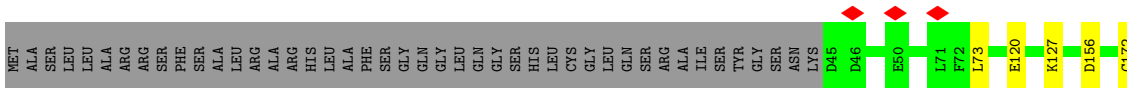
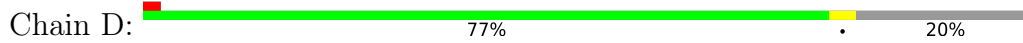
• Molecule 22: B17.2



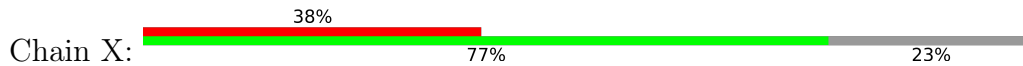
• Molecule 23: PSST

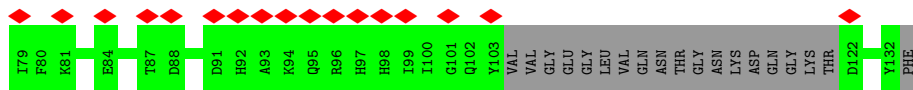


• Molecule 24: TYKY

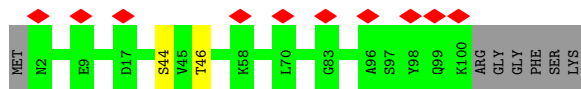
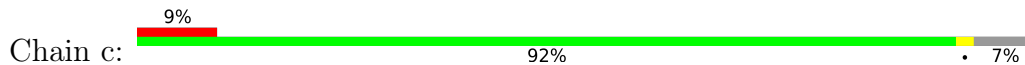


• Molecule 25: B14

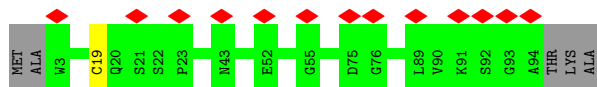




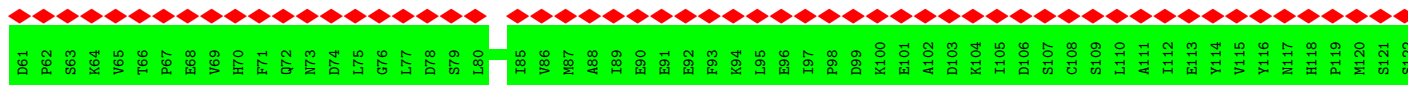
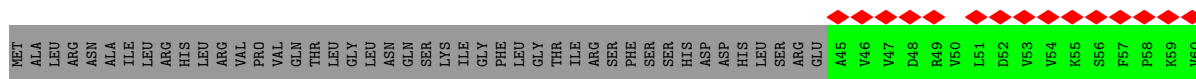
• Molecule 26: 20.9kDa



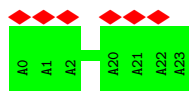
• Molecule 27: B8



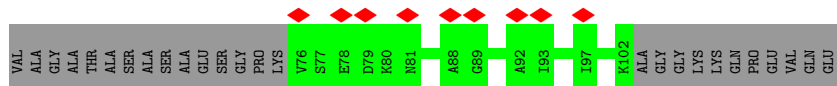
• Molecule 28: ACPM1



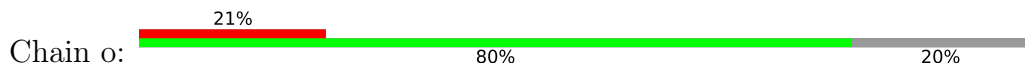
• Molecule 29: Unk1

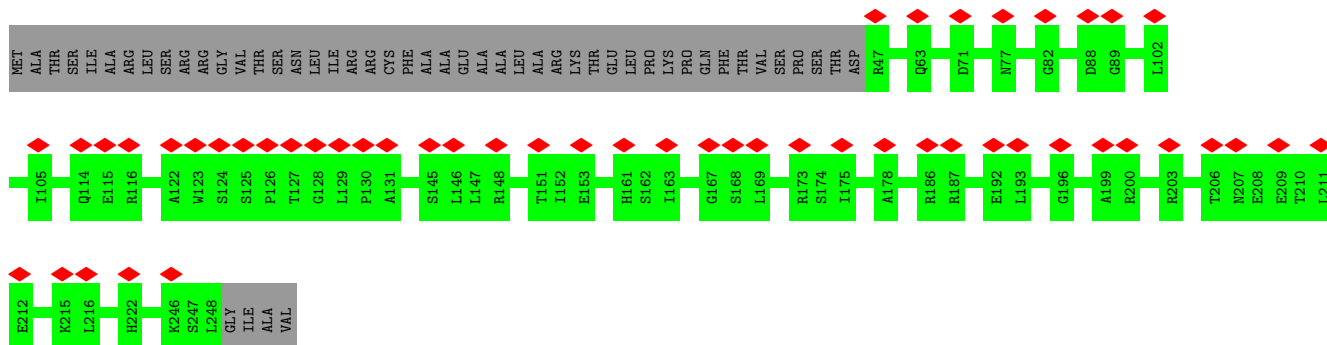


• Molecule 30: P2

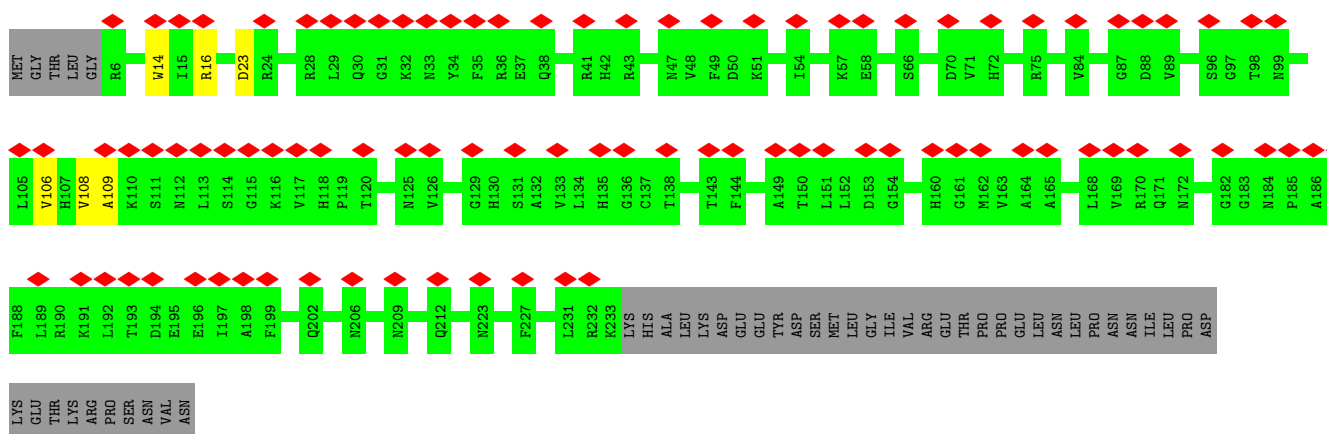
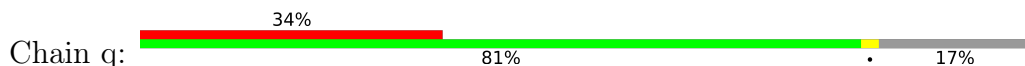


• Molecule 31: CAL1

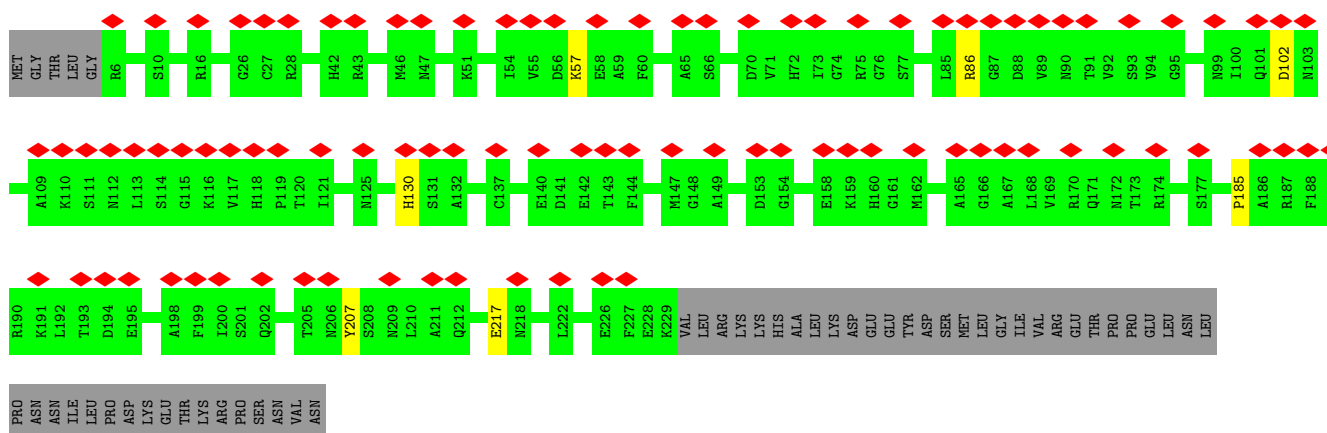
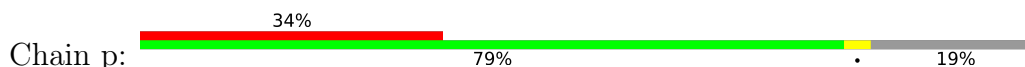




• Molecule 32: CA1



• Molecule 32: CA1

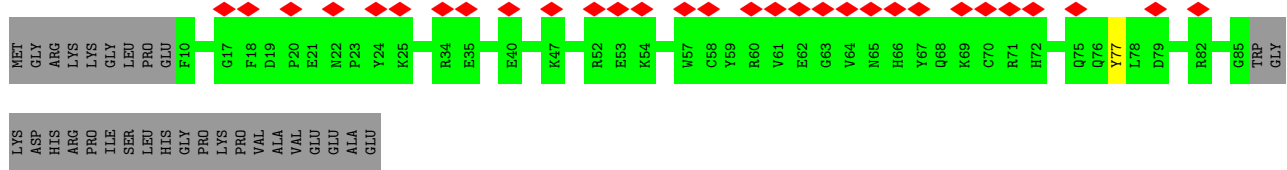


• Molecule 33: Nad4m

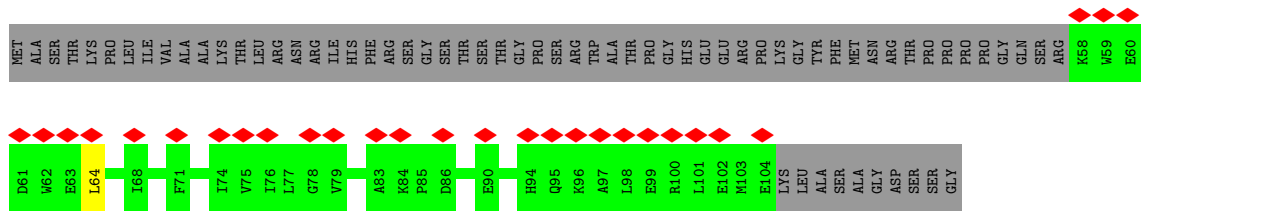




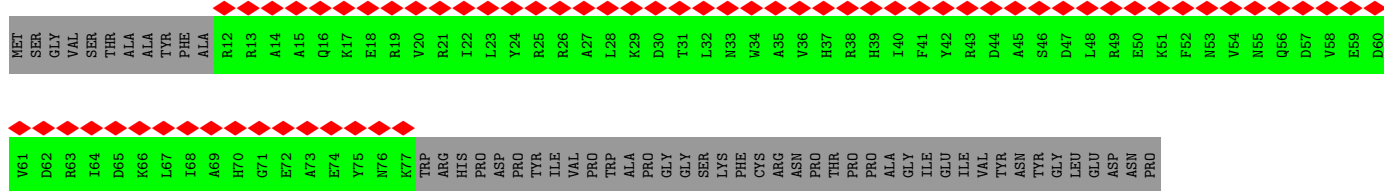
• Molecule 34: PDSW



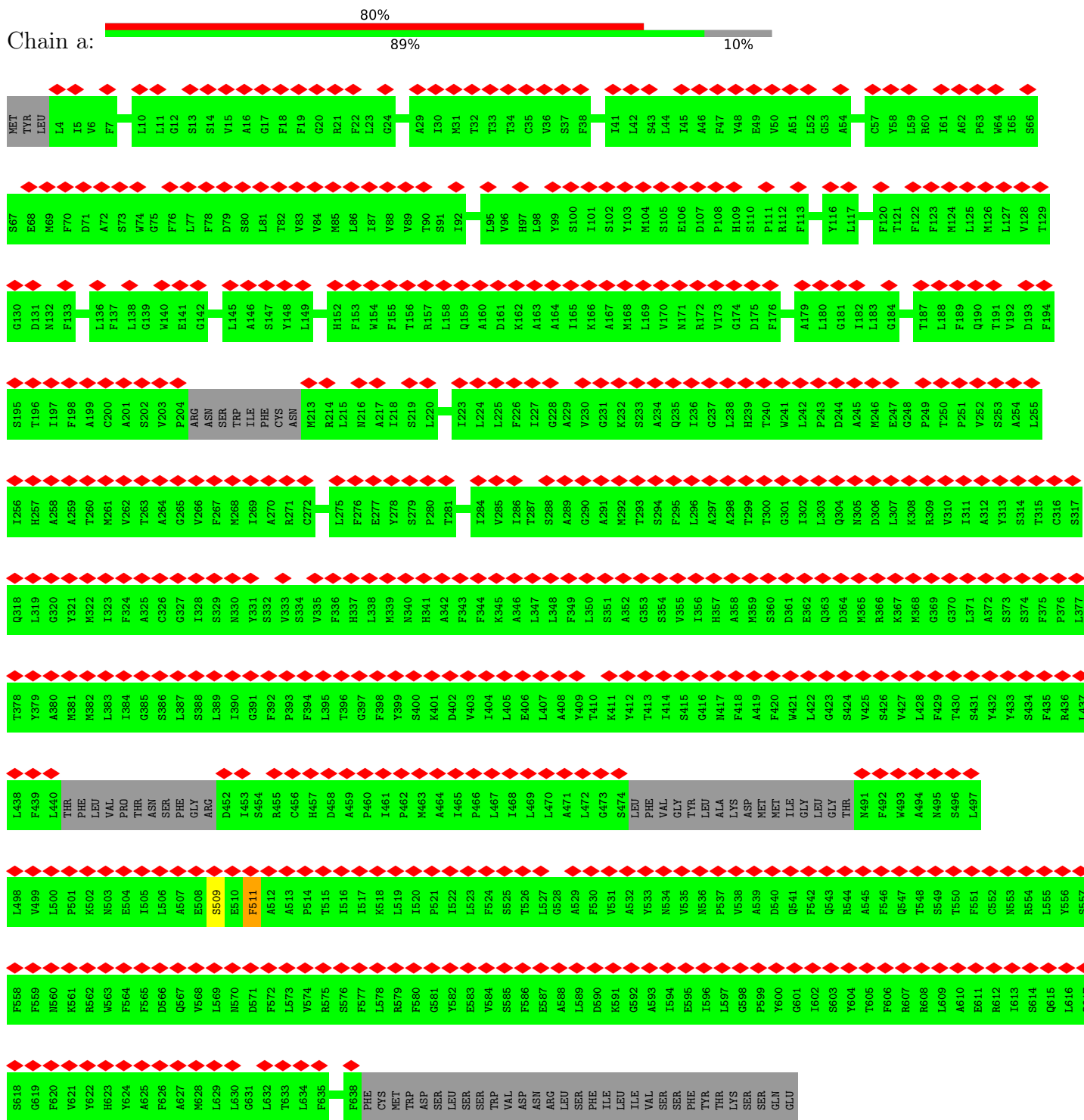
• Molecule 35: ESSS



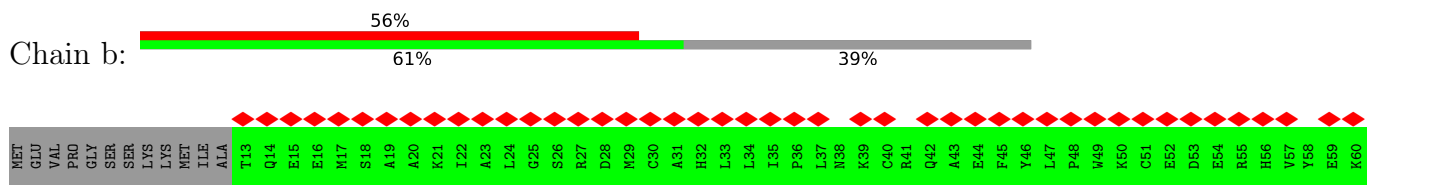
• Molecule 36: B22

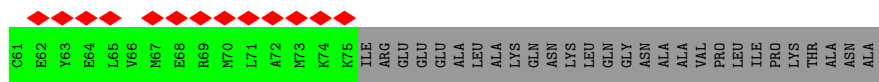


• Molecule 37: Nad5m

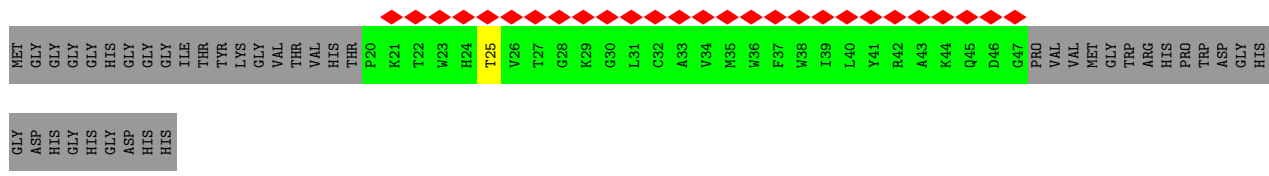


• Molecule 38: B18

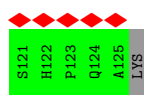
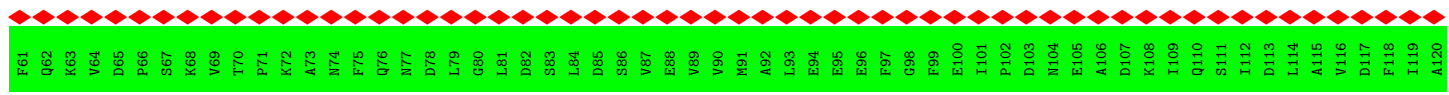
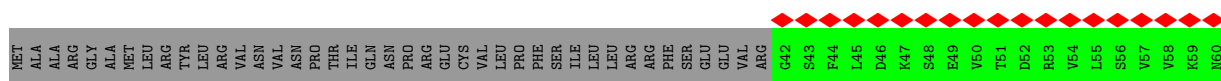




• Molecule 39: AGGG



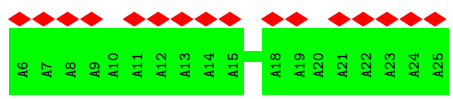
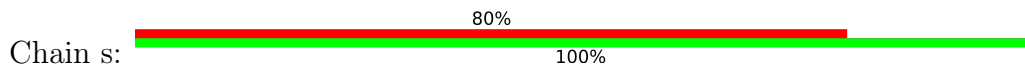
• Molecule 40: ACPM2



• Molecule 41: B15



• Molecule 42: Unk2



SER
SER
SER
ASP

• Molecule 44: B12-1



MET	ALA	LYS	PRO	LEU	GLY	THR	THR	GLY	PHE	PHE	ARG	ARG	ARG	ASP	GLU	TRP	ARG	K20	H21	P22	M23	L24	S25	N26	Q27	M28	R29	H30	A31	L32	P33	G34	L35	G36	I37	G38	V39	A40	A41	F42	C43	V44	Y45	L46	V47	G48	E49	Q50	I51	T52	A53	N54	L55	A56	L57	A58	PRO	SER	LYS
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SER
SER
HIS
HIS
HIS
GLN
GLU
GLN
THR
ALA
PRO
SER
HIS

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	65018	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	45	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.257	Depositor
Minimum map value	-0.079	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.0235	Depositor
Map size (\AA)	399.6, 399.6, 399.6	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.11, 1.11, 1.11	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: CDL, FES, SF4, FMN, NDP, ZN, BCT, PEV, U10, T7X

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	0.40	0/3401	0.51	0/4588
2	I	0.41	0/3855	0.56	0/5234
3	J	0.42	0/826	0.49	0/1120
4	N	0.39	0/1227	0.50	0/1664
5	H	0.49	0/2565	0.64	5/3492 (0.1%)
6	K	0.37	0/677	0.47	0/916
7	Y	0.40	0/788	0.49	0/1059
8	Z	0.35	0/1132	0.52	0/1530
9	V	0.33	0/473	0.43	0/636
10	W	0.50	0/277	0.63	0/375
11	S	0.36	0/840	0.49	0/1141
12	i	0.44	0/524	0.70	0/706
13	j	0.34	0/595	0.49	0/791
14	G	0.51	0/3120	0.56	0/4221
15	C	0.43	0/5386	0.54	1/7299 (0.0%)
16	T	0.40	0/2591	0.52	0/3509
17	F	0.47	0/1564	0.57	1/2120 (0.0%)
18	B	0.38	0/1743	0.49	0/2364
19	O	0.45	0/899	0.48	0/1215
20	P	0.41	0/567	0.52	0/768
21	R	0.44	0/1061	0.64	0/1441
22	U	0.42	0/1044	0.50	0/1413
23	E	0.50	0/1250	0.67	3/1697 (0.2%)
24	D	0.53	0/1467	0.62	0/1981
25	X	0.29	0/861	0.40	0/1166
26	c	0.46	1/760 (0.1%)	0.51	0/1028
27	Q	0.32	0/734	0.46	0/989
28	k	0.25	0/625	0.43	0/848
29	r	0.25	0/119	0.46	0/165
30	n	0.40	0/208	0.59	0/282
31	o	0.32	0/1606	0.48	0/2192
32	p	0.38	0/1737	0.63	2/2353 (0.1%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	q	0.33	0/1768	0.56	0/2395
33	M	0.37	0/3930	0.57	0/5344
34	f	0.28	0/657	0.46	0/885
35	g	0.32	0/396	0.59	1/539 (0.2%)
36	d	0.24	0/328	0.39	0/457
37	a	0.29	0/4802	0.51	0/6520
38	b	0.25	0/528	0.50	0/705
39	h	0.60	0/241	0.60	0/326
40	e	0.24	0/416	0.42	0/579
41	l	0.25	0/111	0.37	0/152
42	s	0.25	0/99	0.31	0/137
43	m	0.30	0/621	0.60	2/834 (0.2%)
44	t	0.63	0/237	0.64	0/319
All	All	0.40	1/58656 (0.0%)	0.54	15/79495 (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
32	q	0	1
33	M	0	1
All	All	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
26	c	44	SER	CA-CB	-5.43	1.44	1.52

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	H	229	PHE	CB-CA-C	7.53	125.45	110.40
23	E	94	CYS	CB-CA-C	6.69	123.78	110.40
35	g	64	LEU	CA-CB-CG	5.69	128.40	115.30
43	m	47	PRO	N-CA-CB	5.68	110.12	103.30
23	E	189	PRO	N-CA-C	-5.50	97.81	112.10

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
33	M	478	LEU	Peptide
32	q	109	ALA	Peptide

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	427/486 (88%)	381 (89%)	46 (11%)	0	100	100
2	I	479/499 (96%)	440 (92%)	39 (8%)	0	100	100
3	J	92/119 (77%)	86 (94%)	6 (6%)	0	100	100
4	N	145/205 (71%)	125 (86%)	20 (14%)	0	100	100
5	H	316/325 (97%)	283 (90%)	33 (10%)	0	100	100
6	K	83/100 (83%)	81 (98%)	2 (2%)	0	100	100
7	Y	96/106 (91%)	87 (91%)	8 (8%)	1 (1%)	15	51
8	Z	138/143 (96%)	112 (81%)	26 (19%)	0	100	100
9	V	55/65 (85%)	52 (94%)	3 (6%)	0	100	100
10	W	35/65 (54%)	31 (89%)	4 (11%)	0	100	100
11	S	99/131 (76%)	86 (87%)	13 (13%)	0	100	100
12	i	64/81 (79%)	59 (92%)	4 (6%)	1 (2%)	9	43
13	j	66/83 (80%)	63 (96%)	3 (4%)	0	100	100
14	G	380/394 (96%)	348 (92%)	32 (8%)	0	100	100
15	C	691/748 (92%)	618 (89%)	72 (10%)	1 (0%)	51	83
16	T	326/402 (81%)	281 (86%)	45 (14%)	0	100	100
17	F	176/190 (93%)	151 (86%)	25 (14%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
18	B	217/255 (85%)	184 (85%)	33 (15%)	0	100	100
19	O	109/154 (71%)	102 (94%)	7 (6%)	0	100	100
20	P	69/110 (63%)	64 (93%)	5 (7%)	0	100	100
21	R	127/169 (75%)	119 (94%)	8 (6%)	0	100	100
22	U	120/159 (76%)	98 (82%)	22 (18%)	0	100	100
23	E	151/218 (69%)	134 (89%)	16 (11%)	1 (1%)	22	59
24	D	175/222 (79%)	160 (91%)	14 (8%)	1 (1%)	25	62
25	X	99/133 (74%)	92 (93%)	7 (7%)	0	100	100
26	c	97/106 (92%)	91 (94%)	6 (6%)	0	100	100
27	Q	90/97 (93%)	81 (90%)	9 (10%)	0	100	100
28	k	76/122 (62%)	74 (97%)	2 (3%)	0	100	100
29	r	22/24 (92%)	18 (82%)	4 (18%)	0	100	100
30	n	25/113 (22%)	22 (88%)	3 (12%)	0	100	100
31	o	200/252 (79%)	172 (86%)	28 (14%)	0	100	100
32	p	222/275 (81%)	190 (86%)	30 (14%)	2 (1%)	17	54
32	q	226/275 (82%)	195 (86%)	28 (12%)	3 (1%)	12	47
33	M	480/495 (97%)	433 (90%)	47 (10%)	0	100	100
34	f	74/107 (69%)	67 (90%)	7 (10%)	0	100	100
35	g	45/114 (40%)	39 (87%)	6 (13%)	0	100	100
36	d	64/117 (55%)	60 (94%)	4 (6%)	0	100	100
37	a	592/669 (88%)	524 (88%)	66 (11%)	2 (0%)	41	74
38	b	61/103 (59%)	50 (82%)	11 (18%)	0	100	100
39	h	26/69 (38%)	26 (100%)	0	0	100	100
40	e	82/126 (65%)	80 (98%)	2 (2%)	0	100	100
41	l	21/71 (30%)	21 (100%)	0	0	100	100
42	s	18/20 (90%)	18 (100%)	0	0	100	100
43	m	67/98 (68%)	48 (72%)	17 (25%)	2 (3%)	4	32
44	t	29/73 (40%)	28 (97%)	1 (3%)	0	100	100
All	All	7252/8888 (82%)	6474 (89%)	764 (10%)	14 (0%)	50	78

5 of 14 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
12	i	30	ARG
32	q	108	VAL
15	C	272	ALA
24	D	120	GLU
32	q	23	ASP

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	349/396 (88%)	348 (100%)	1 (0%)	92	96
2	I	399/416 (96%)	394 (99%)	5 (1%)	69	83
3	J	87/106 (82%)	87 (100%)	0	100	100
4	N	133/186 (72%)	132 (99%)	1 (1%)	81	89
5	H	266/272 (98%)	264 (99%)	2 (1%)	81	89
6	K	74/86 (86%)	73 (99%)	1 (1%)	67	82
7	Y	88/94 (94%)	88 (100%)	0	100	100
8	Z	112/115 (97%)	112 (100%)	0	100	100
9	V	48/53 (91%)	48 (100%)	0	100	100
10	W	30/53 (57%)	30 (100%)	0	100	100
11	S	92/118 (78%)	92 (100%)	0	100	100
12	i	52/66 (79%)	51 (98%)	1 (2%)	57	76
13	j	62/73 (85%)	62 (100%)	0	100	100
14	G	328/340 (96%)	325 (99%)	3 (1%)	78	88
15	C	576/625 (92%)	571 (99%)	5 (1%)	78	88
16	T	271/334 (81%)	269 (99%)	2 (1%)	84	91
17	F	168/179 (94%)	164 (98%)	4 (2%)	49	71
18	B	188/220 (86%)	188 (100%)	0	100	100
19	O	93/128 (73%)	93 (100%)	0	100	100
20	P	62/97 (64%)	62 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
21	R	115/148 (78%)	114 (99%)	1 (1%)	78	88
22	U	104/133 (78%)	103 (99%)	1 (1%)	76	86
23	E	129/184 (70%)	122 (95%)	7 (5%)	22	54
24	D	157/191 (82%)	151 (96%)	6 (4%)	33	61
25	X	92/114 (81%)	92 (100%)	0	100	100
26	c	79/84 (94%)	78 (99%)	1 (1%)	69	83
27	Q	82/85 (96%)	81 (99%)	1 (1%)	71	84
28	k	73/112 (65%)	73 (100%)	0	100	100
30	n	21/84 (25%)	21 (100%)	0	100	100
31	o	171/211 (81%)	171 (100%)	0	100	100
32	p	181/228 (79%)	178 (98%)	3 (2%)	60	79
32	q	184/228 (81%)	182 (99%)	2 (1%)	73	85
33	M	421/434 (97%)	417 (99%)	4 (1%)	76	86
34	f	68/93 (73%)	67 (98%)	1 (2%)	65	81
35	g	42/96 (44%)	42 (100%)	0	100	100
37	a	504/568 (89%)	503 (100%)	1 (0%)	93	97
38	b	56/87 (64%)	56 (100%)	0	100	100
39	h	23/51 (45%)	22 (96%)	1 (4%)	29	58
43	m	63/90 (70%)	63 (100%)	0	100	100
44	t	24/60 (40%)	23 (96%)	1 (4%)	30	59
All	All	6067/7238 (84%)	6012 (99%)	55 (1%)	79	88

5 of 55 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
23	E	93	CYS
24	D	127	LYS
44	t	37	ILE
33	M	193	PHE
23	E	130	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 104 such sidechains are listed below:

Mol	Chain	Res	Type
22	U	46	ASN
30	n	83	ASN
37	a	171	ASN
22	U	134	HIS
25	X	15	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 20 ligands modelled in this entry, 2 are monoatomic - leaving 18 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	C	802	15	0,12,12	-	-	-		
52	NDP	T	501	-	45,52,52	0.62	0	53,80,80	0.83	2 (3%)
46	FMN	A	502	-	33,33,33	0.62	0	48,50,50	0.72	1 (2%)
51	FES	C	803	15	0,4,4	-	-	-		
45	SF4	C	801	15	0,12,12	-	-	-		
45	SF4	E	301	23	0,12,12	-	-	-		
45	SF4	A	501	1	0,12,12	-	-	-		
47	T7X	I	501	-	54,54,61	0.28	0	64,66,73	0.77	3 (4%)
48	CDL	J	401	-	86,86,99	0.31	0	92,98,111	0.52	1 (1%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
50	PEV	H	502	-	48,48,48	0.38	0	51,53,53	0.39	0
54	BCT	q	802	53	2,3,3	0.60	0	2,3,3	0.26	0
45	SF4	D	301	24	0,12,12	-	-	-		
51	FES	B	301	-	0,4,4	-	-	-		
49	U10	H	501	-	44,44,63	0.72	2 (4%)	53,56,79	0.57	0
45	SF4	D	302	24	0,12,12	-	-	-		
48	CDL	I	502	-	99,99,99	0.27	0	105,111,111	0.43	0
48	CDL	I	503	-	97,97,99	0.27	0	103,109,111	0.34	0
47	T7X	p	301	-	61,61,61	0.26	0	71,73,73	0.39	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	C	802	15	-	-	0/6/5/5
52	NDP	T	501	-	-	6/30/77/77	0/5/5/5
46	FMN	A	502	-	-	6/18/18/18	0/3/3/3
51	FES	C	803	15	-	-	0/1/1/1
47	T7X	I	501	-	1/1/10/18	16/49/73/80	0/1/1/1
45	SF4	C	801	15	-	-	0/6/5/5
45	SF4	A	501	1	-	-	0/6/5/5
45	SF4	E	301	23	-	-	0/6/5/5
48	CDL	J	401	-	-	33/97/97/110	-
50	PEV	H	502	-	-	25/52/52/52	-
45	SF4	D	301	24	-	-	0/6/5/5
51	FES	B	301	-	-	-	0/1/1/1
49	U10	H	501	-	-	18/41/65/87	0/1/1/1
45	SF4	D	302	24	-	-	0/6/5/5
48	CDL	I	502	-	-	33/110/110/110	-
48	CDL	I	503	-	-	32/108/108/110	-
47	T7X	p	301	-	-	16/56/80/80	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
49	H	501	U10	C4-C5	-2.41	1.41	1.48
49	H	501	U10	C3-C2	-2.38	1.42	1.48

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
47	I	501	T7X	C4-C3-C2	3.29	116.58	110.82
48	J	401	CDL	OA6-CA4-CA6	2.84	118.69	108.40
47	I	501	T7X	O3-C3-C4	2.55	116.24	110.35
47	I	501	T7X	O3-C3-C2	2.41	115.92	110.35
52	T	501	NDP	O4D-C1D-C2D	-2.39	101.42	106.64

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
47	I	501	T7X	C3

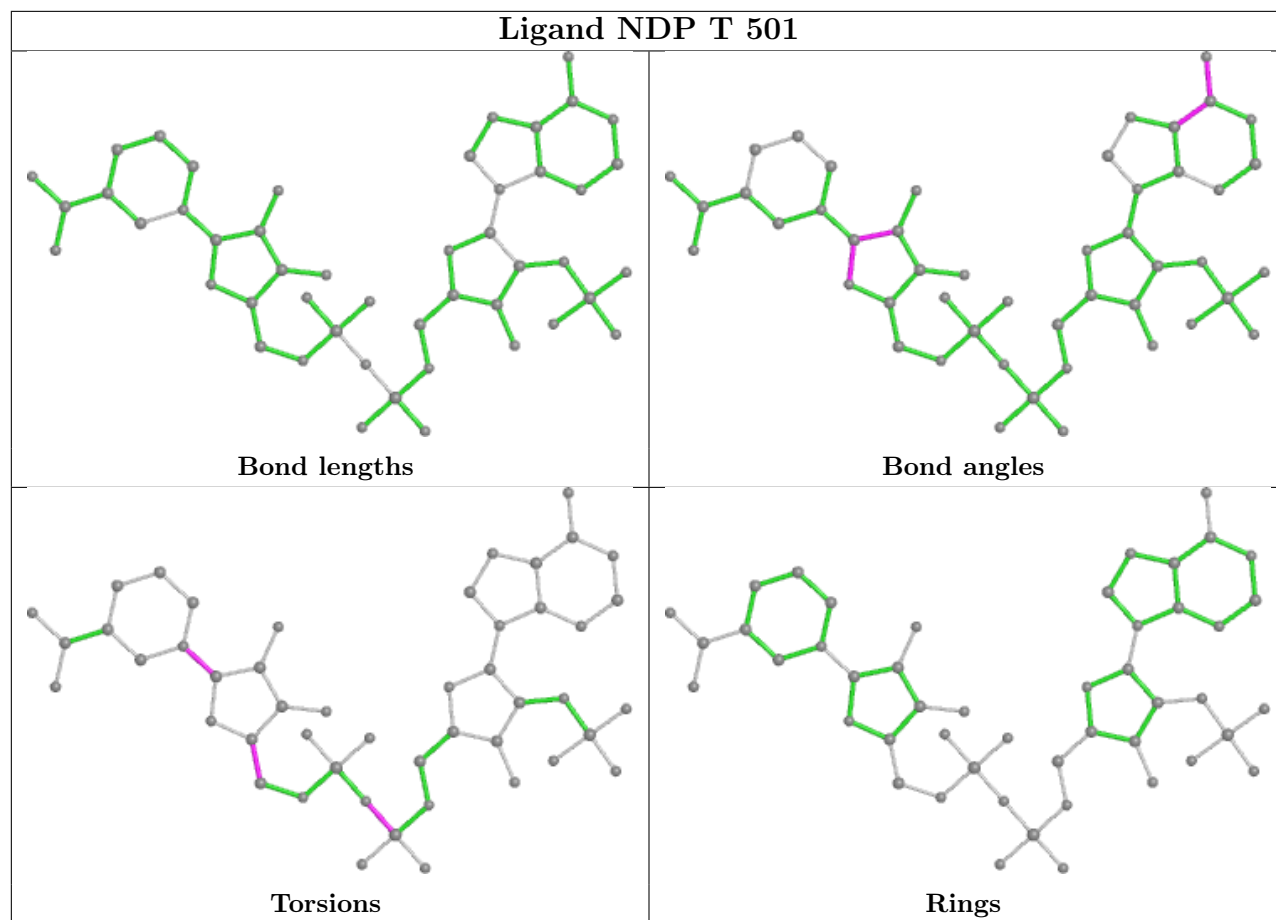
5 of 185 torsion outliers are listed below:

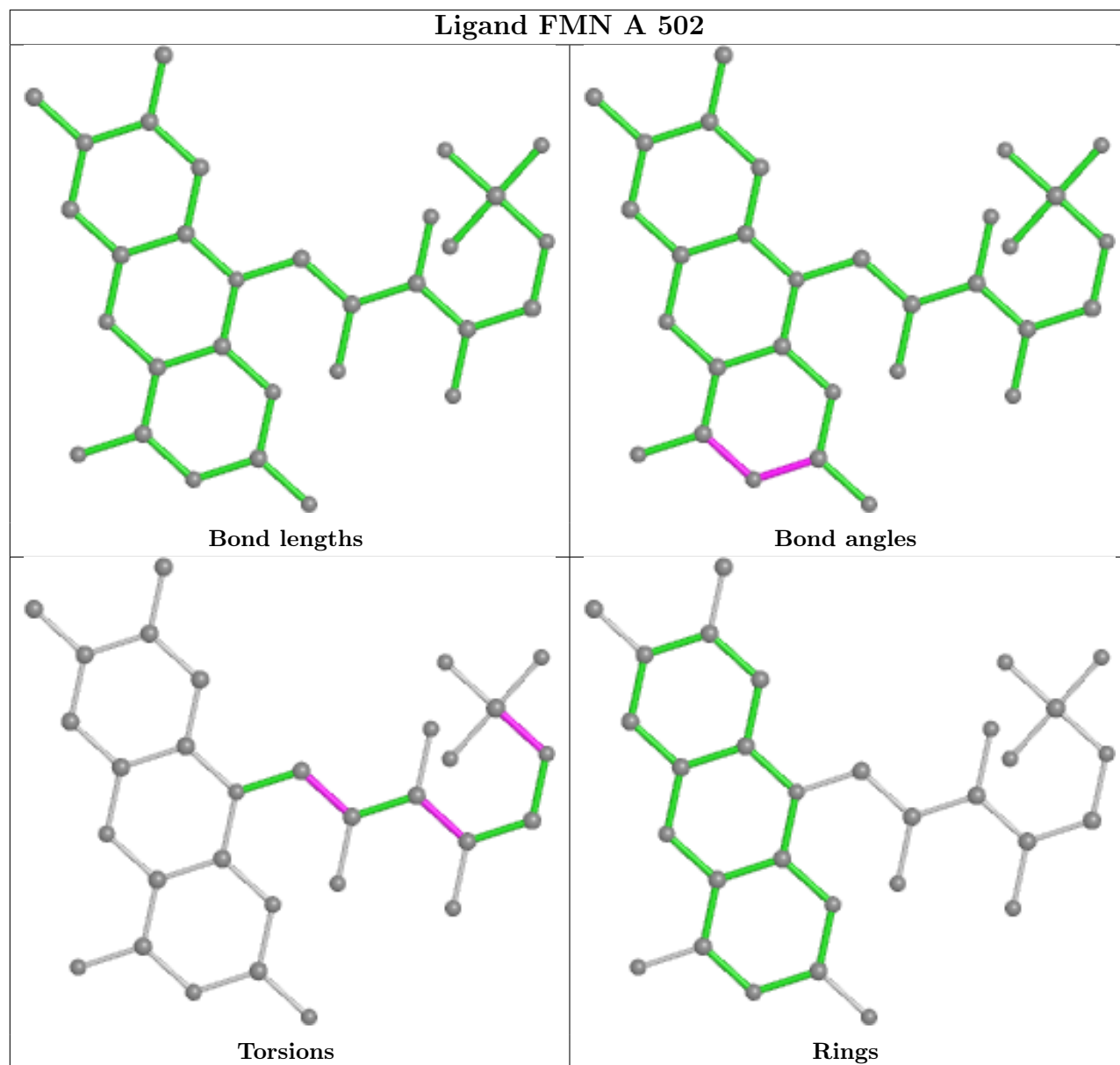
Mol	Chain	Res	Type	Atoms
46	A	502	FMN	N10-C1'-C2'-C3'
46	A	502	FMN	O3'-C3'-C4'-C5'
47	I	501	T7X	C2-C1-O1-P1
47	I	501	T7X	C6-C1-O1-P1
47	I	501	T7X	C8-C7-O13-P1

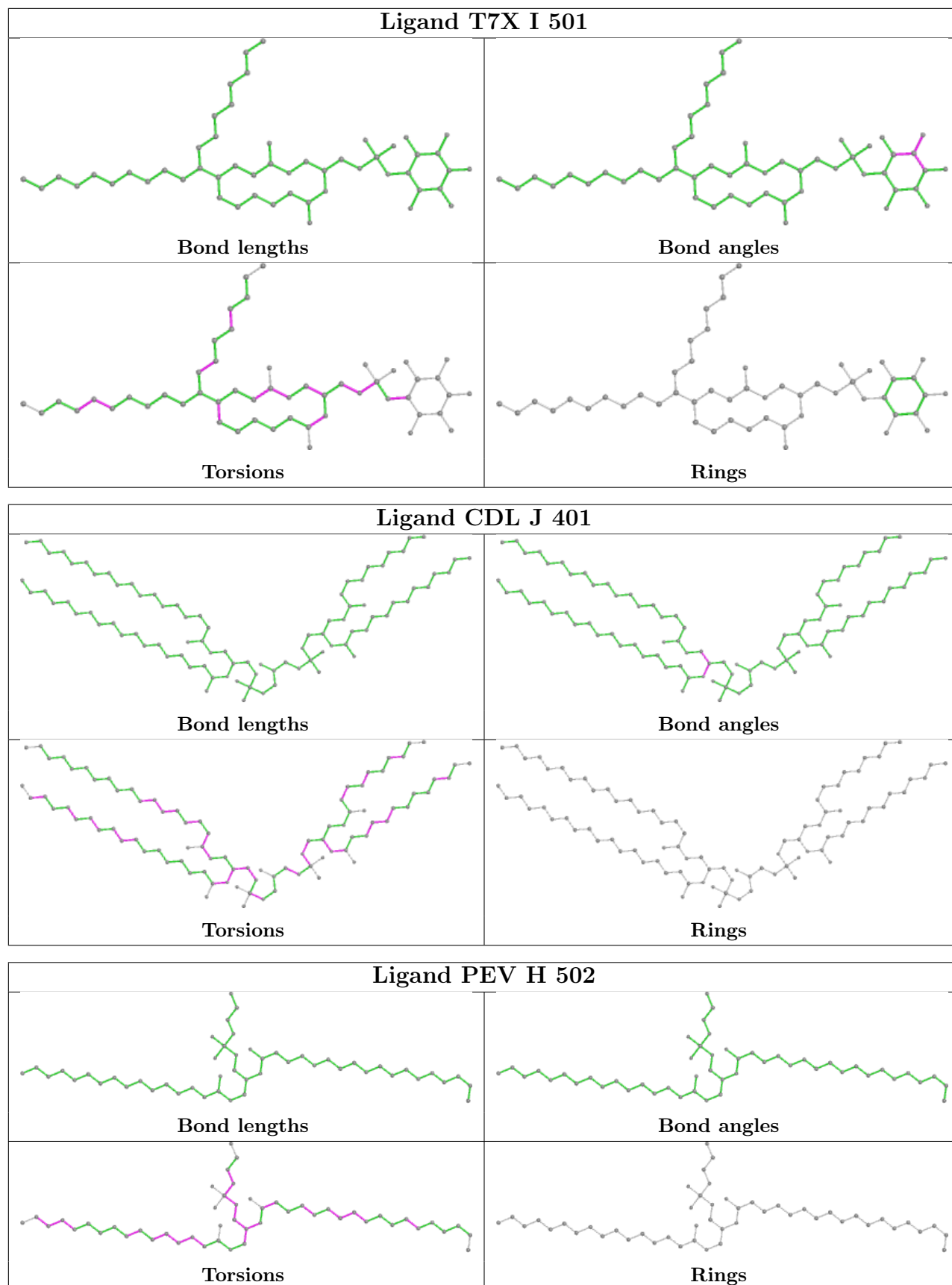
There are no ring outliers.

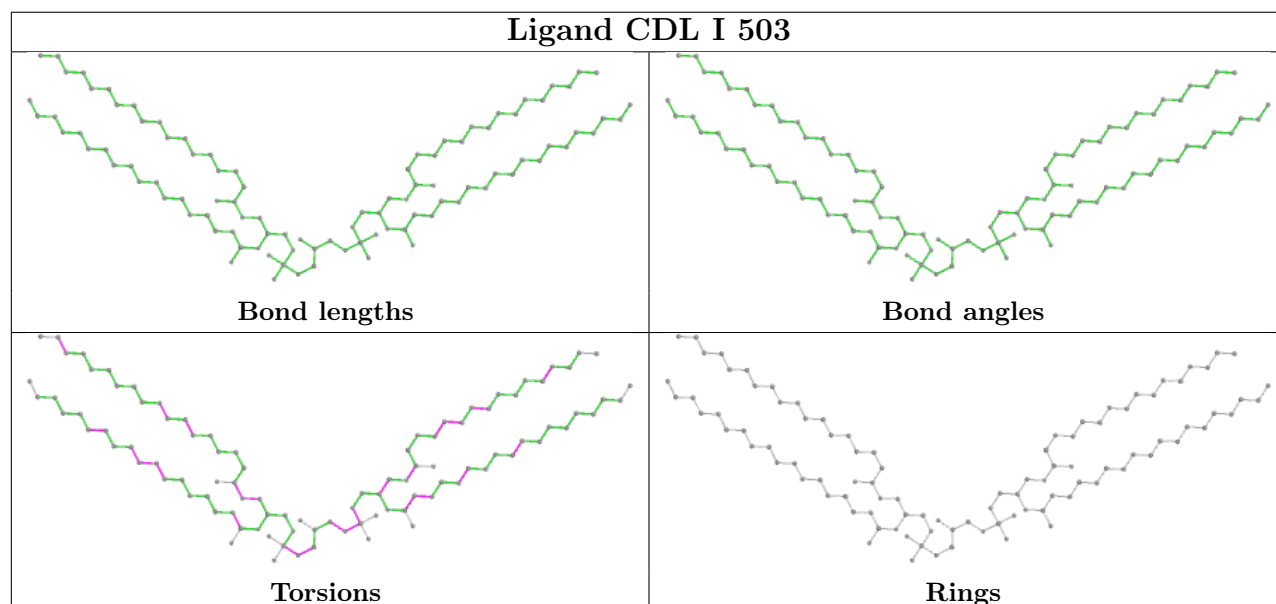
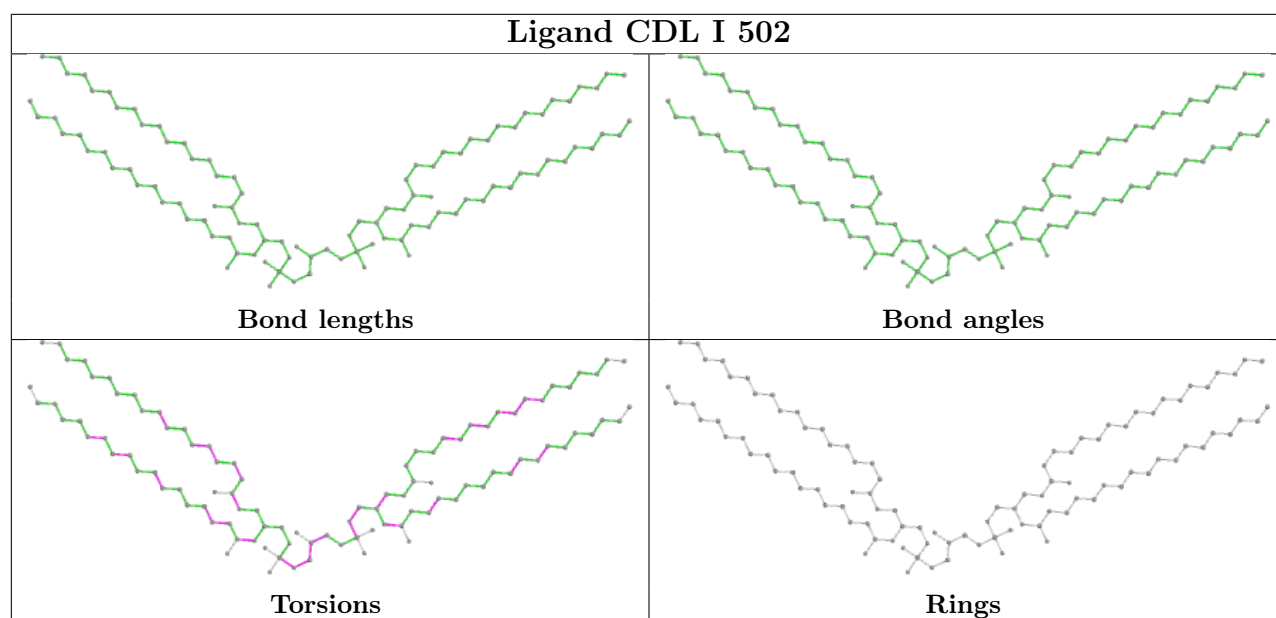
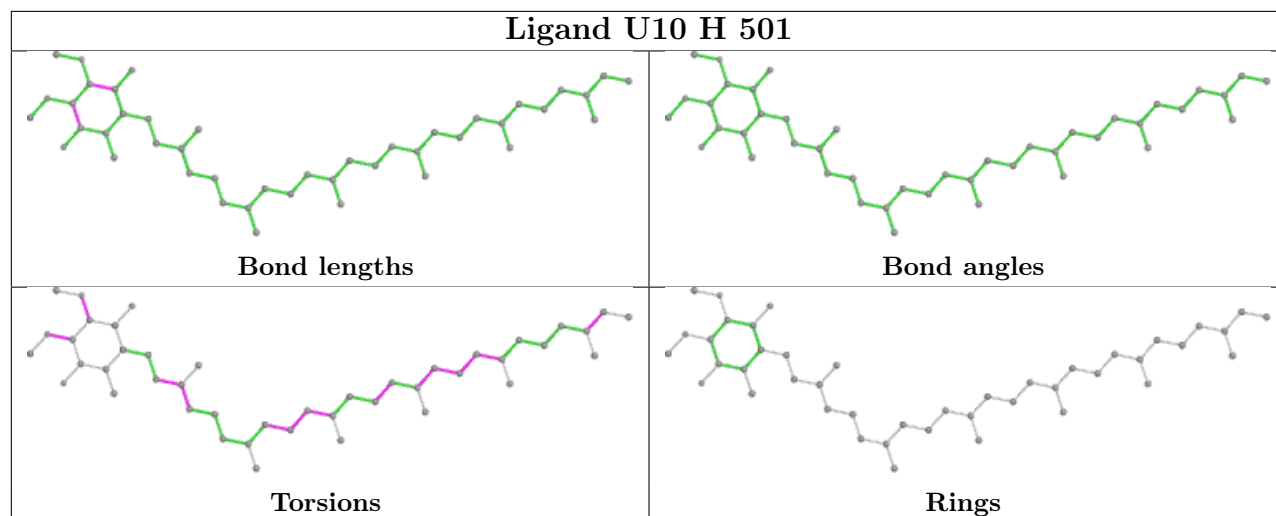
No monomer is involved in short contacts.

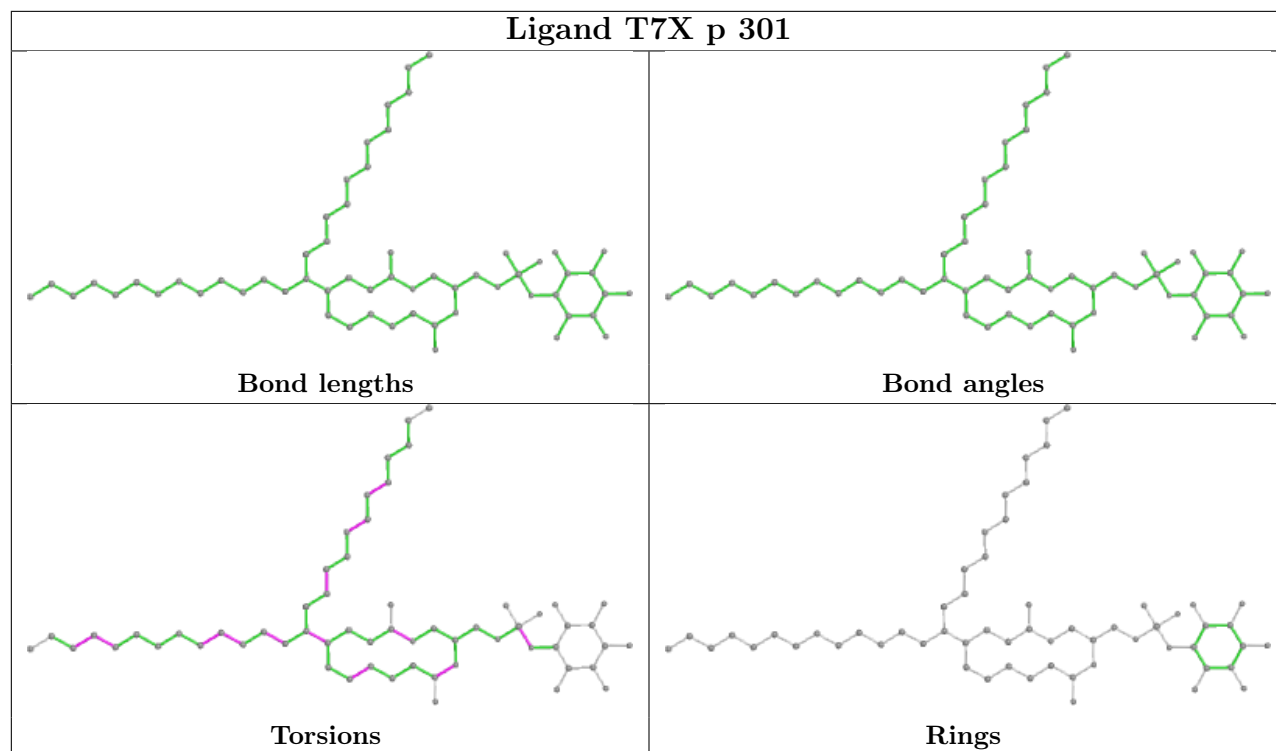
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

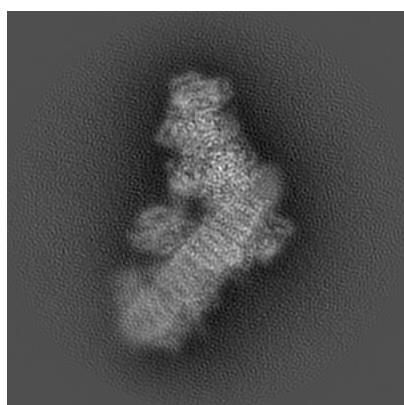
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-11614. These allow visual inspection of the internal detail of the map and identification of artifacts.

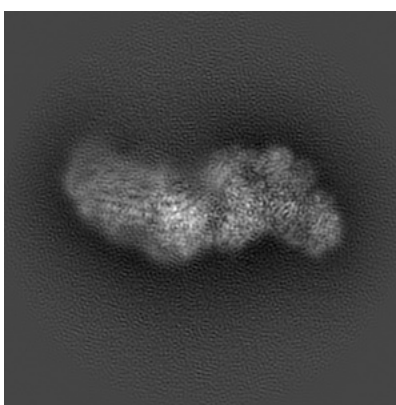
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

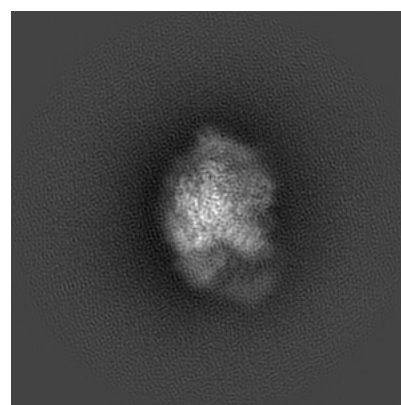
6.1.1 Primary map



X



Y

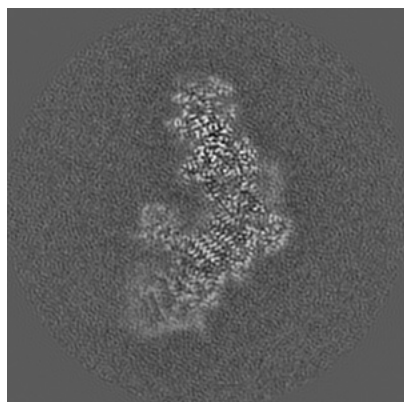


Z

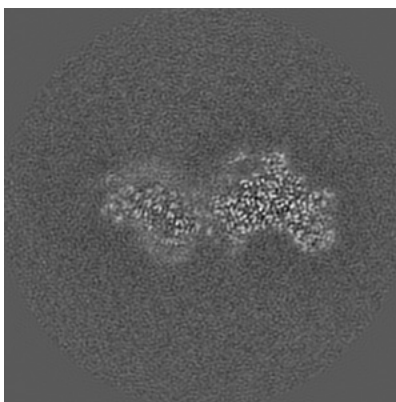
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

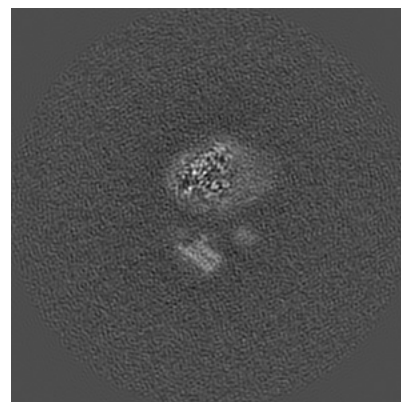
6.2.1 Primary map



X Index: 180



Y Index: 180

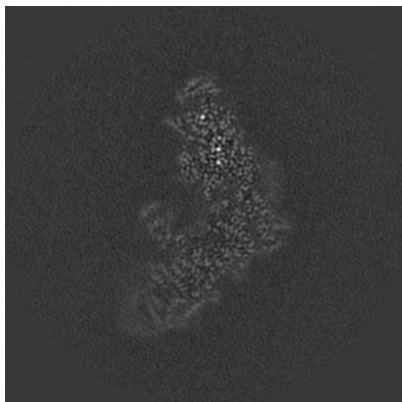


Z Index: 180

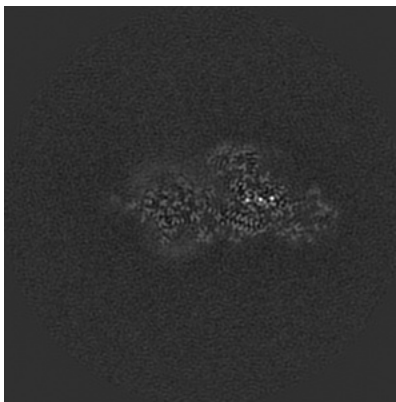
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

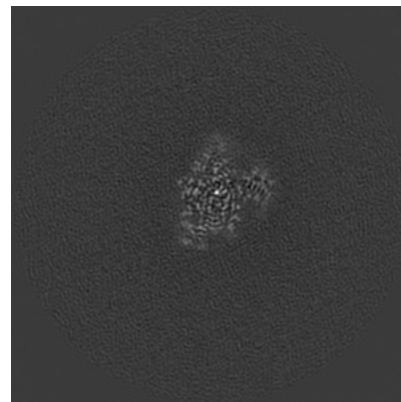
6.3.1 Primary map



X Index: 185



Y Index: 192



Z Index: 218

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

6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0235. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

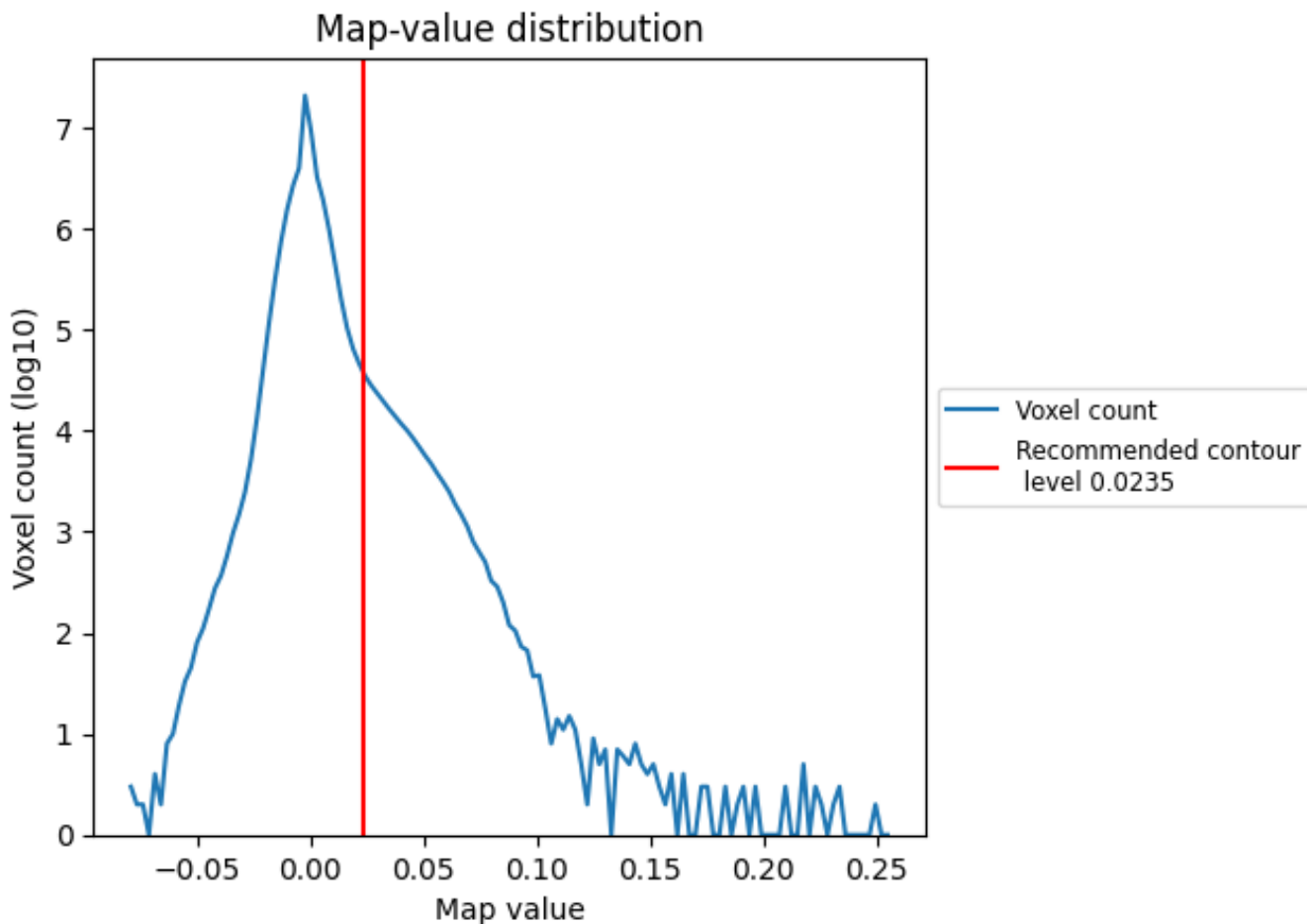
6.5 Mask visualisation

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

7 Map analysis [i](#)

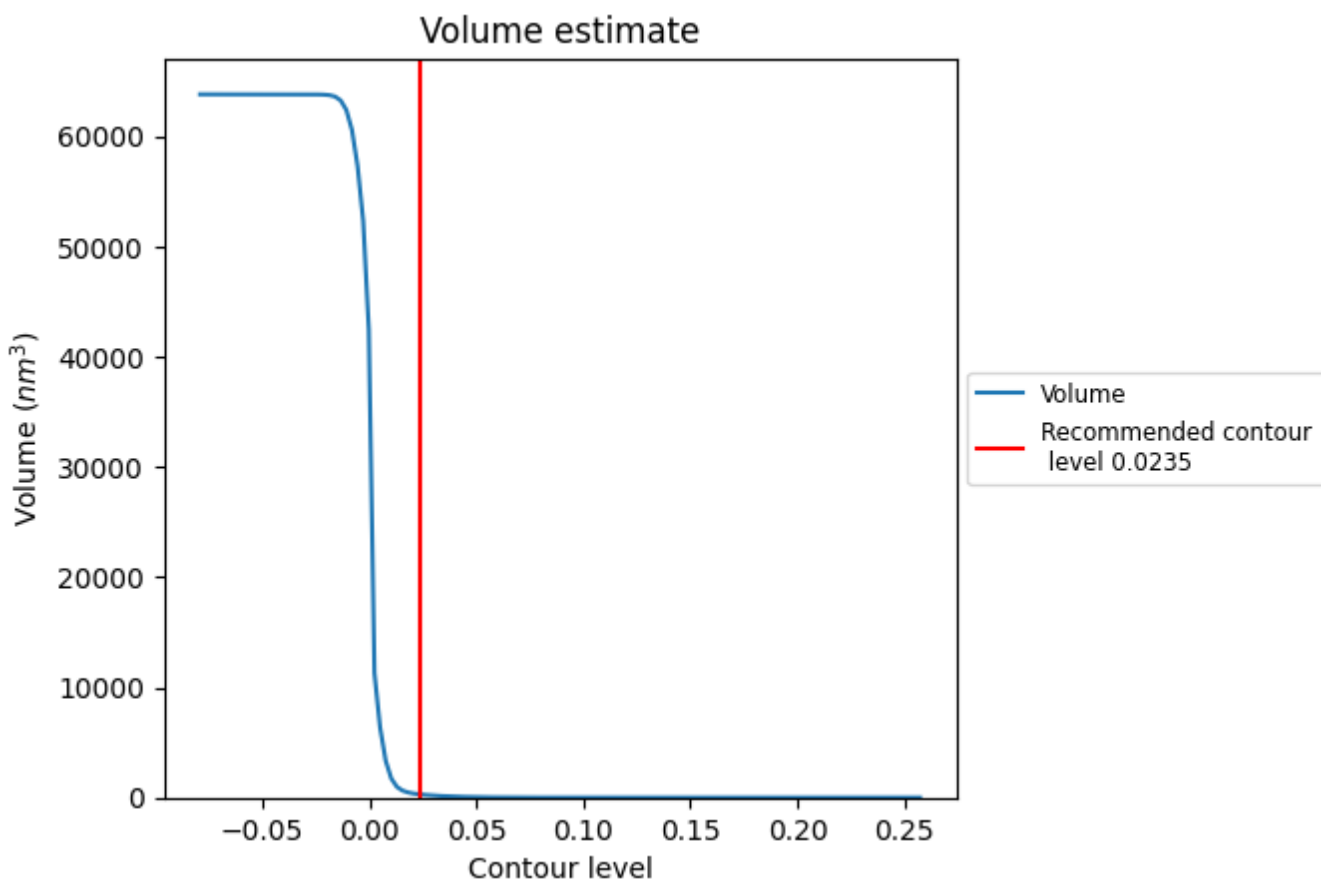
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

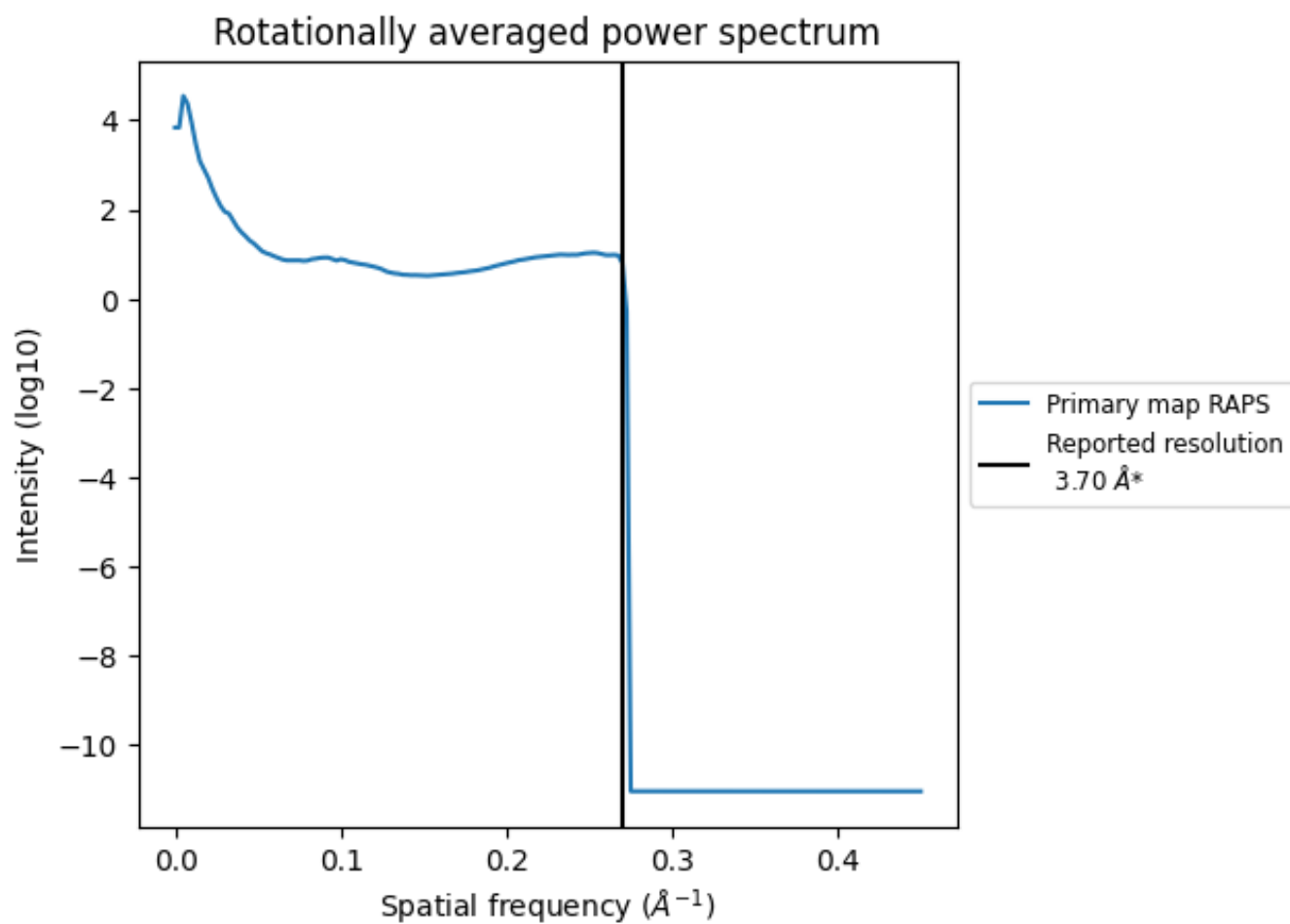
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 289 nm³; this corresponds to an approximate mass of 261 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 0.270 Å⁻¹

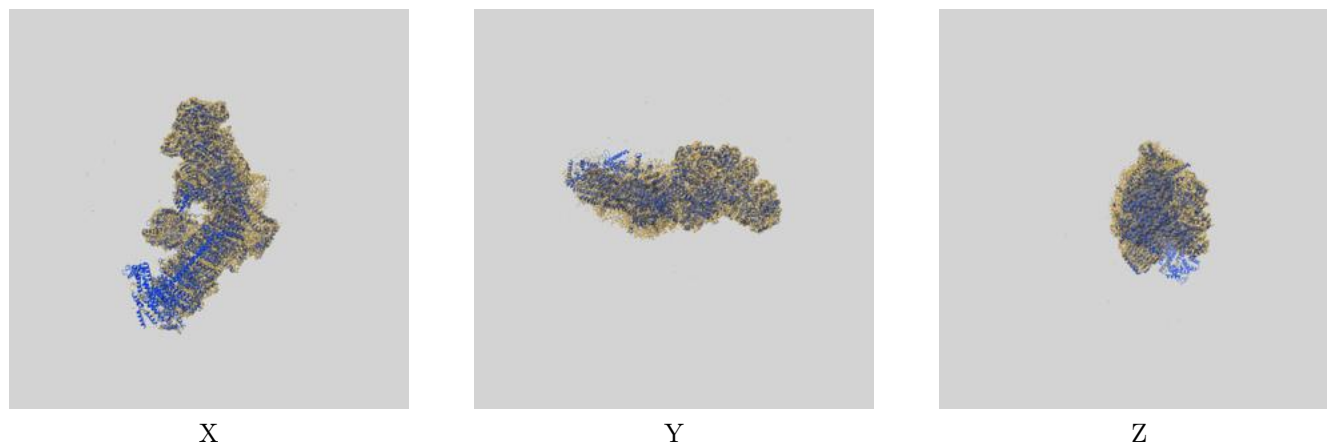
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

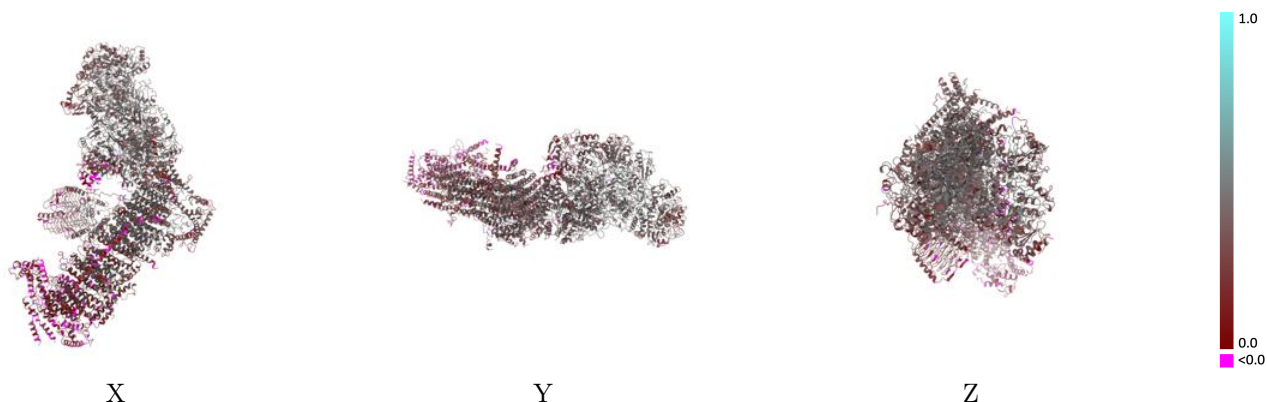
This section contains information regarding the fit between EMDB map EMD-11614 and PDB model 7A23. Per-residue inclusion information can be found in section 3 on page 18.

9.1 Map-model overlay [i](#)



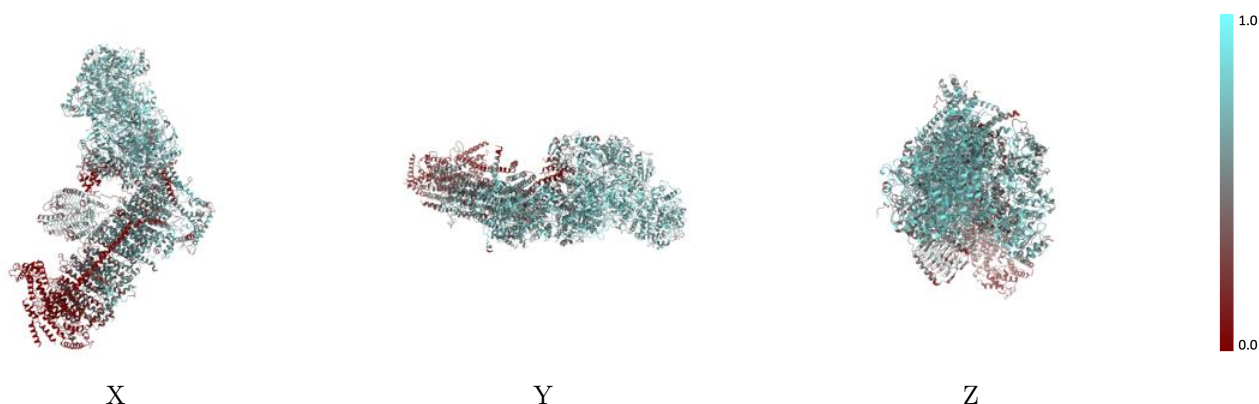
The images above show the 3D surface view of the map at the recommended contour level 0.0235 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



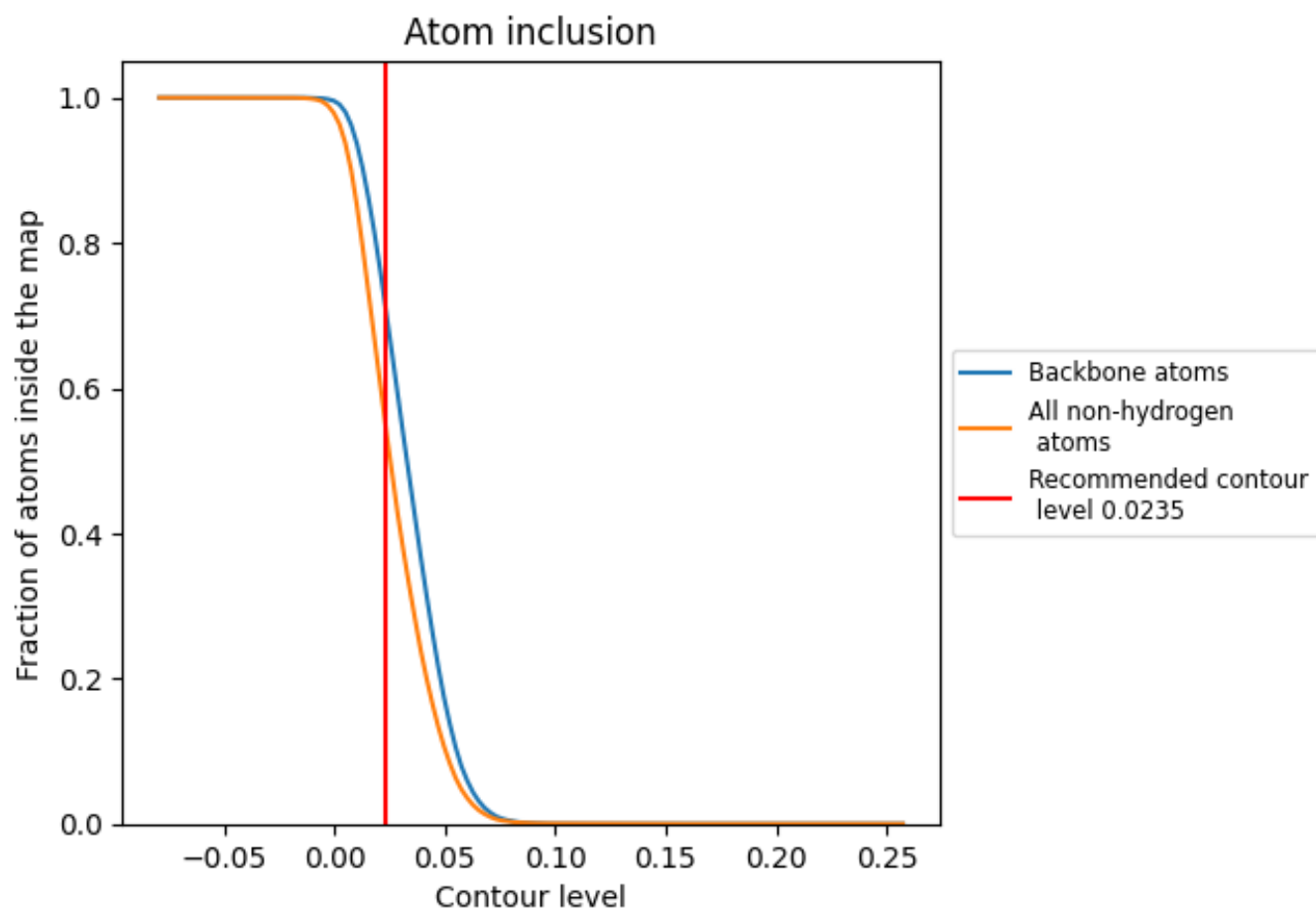
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0235).






































































9.4 Atom inclusion [i](#)



At the recommended contour level, 70% of all backbone atoms, 54% 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 (0.0235) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.5398	 0.3380
A	 0.6631	 0.3770
B	 0.6474	 0.3780
C	 0.6698	 0.4080
D	 0.7188	 0.4150
E	 0.7256	 0.4370
F	 0.7078	 0.4270
G	 0.7299	 0.4520
H	 0.5852	 0.3950
I	 0.5694	 0.3810
J	 0.4366	 0.3530
K	 0.5781	 0.3770
M	 0.4619	 0.3120
N	 0.4911	 0.3570
O	 0.7183	 0.4410
P	 0.7015	 0.4350
Q	 0.6091	 0.3270
R	 0.6310	 0.3710
S	 0.6055	 0.3930
T	 0.6050	 0.3630
U	 0.6832	 0.4150
V	 0.6489	 0.3530
W	 0.6543	 0.4230
X	 0.4209	 0.2880
Y	 0.5932	 0.3280
Z	 0.6218	 0.3560
a	 0.1389	 0.1650
b	 0.1361	 0.1310
c	 0.6503	 0.4030
d	 0.0091	 0.0930
e	 0.0024	 0.1210
f	 0.4357	 0.2460
g	 0.3579	 0.2190
h	 0.0664	 0.1130
i	 0.6290	 0.3360



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Chain	Atom inclusion	Q-score
j	 0.5939	 0.3200
k	 0.1082	 0.1120
l	 0.5982	 0.2820
m	 0.6045	 0.2770
n	 0.5100	 0.3030
o	 0.5265	 0.3010
p	 0.4403	 0.2200
q	 0.4601	 0.2210
r	 0.6500	 0.4050
s	 0.3200	 0.2040
t	 0.0087	 0.0990