wwPDB EM Validation Summary Report

Jun 22, 2023 – 10:57 AM JST

PDB ID	:	7VYF
EMDB ID	:	EMD-32203
Title	:	Matrix arm of active state CI from Rotenone dataset
Authors	:	Gu, J.K.; Yang, M.J.
Deposited on	:	2021-11-14
Resolution	:	2.80 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:

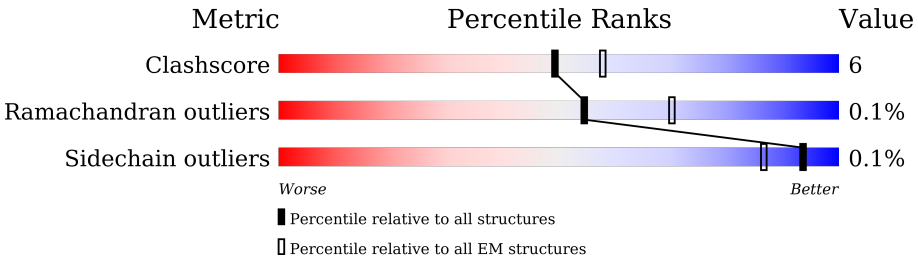
EMDB validation analysis	:	0.0.1.dev50
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 2.80 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=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 <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion < 40%). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	433	83% 17%
2	B	176	87% 13%
3	C	156	86% 14%
4	E	115	7% 91% 9%
5	F	86	10% 77% 23%
6	G	88	32% 78% 22%
7	H	112	83% 17%
8	I	112	6% 77% 10% 13%

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Mol	Chain	Length	Quality of chain
9	J	342	83% 17%
10	K	43	28% 84% 16%
11	L	125	6% 86% 14%
12	M	690	85% 15%
13	N	144	8% 80% 20%
14	O	217	6% 88% 12%
15	P	208	85% 15%
16	Q	386	79% 21%
17	T	96	17% 91% 9%
18	W	29	14% 86% 14%

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
19	SF4	A	501	-	-	X	-
19	SF4	C	301	-	-	X	-

2 Entry composition (i)

There are 29 unique types of molecules in this entry. The entry contains 28456 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

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

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

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

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

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

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

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

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

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

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

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

Mol	Chain	Residues	Atoms					AltConf	Trace
6	G	88	Total	C	N	O	S	0	0
			693	447	102	139	5		

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Mol	Chain	Residues	Atoms					AltConf	Trace
14	O	217	Total	C	N	O	S	0	0
			1667	1063	281	313	10		

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

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

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

Mol	Chain	Residues	Atoms					AltConf	Trace
16	Q	386	Total	C	N	O	S	0	0
			3096	1976	534	563	23		

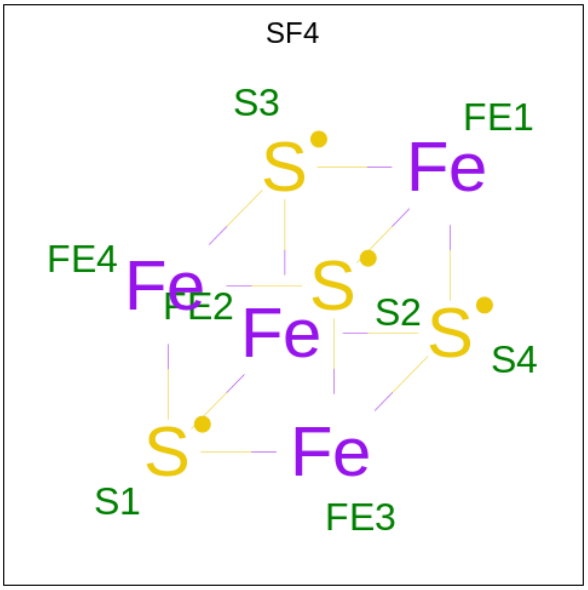
- Molecule 17 is a protein called NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial.

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

- Molecule 18 is a protein called NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13.

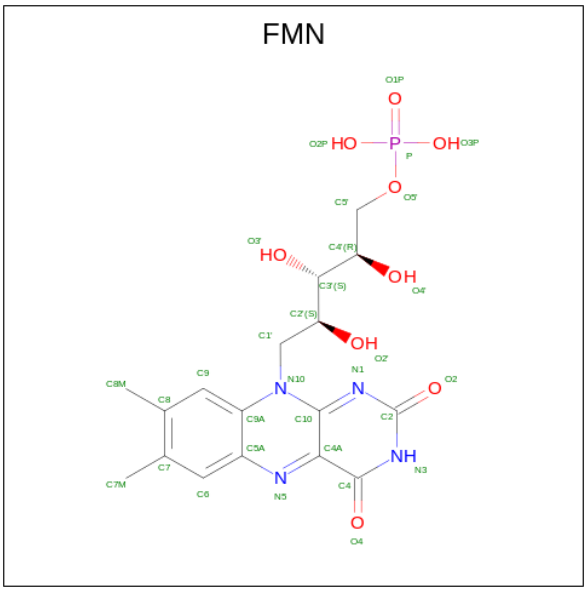
Mol	Chain	Residues	Atoms					AltConf	Trace
18	W	29	Total	C	N	O	S	0	0
			218	138	40	39	1		

- Molecule 19 is IRON/SULFUR CLUSTER (three-letter code: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).



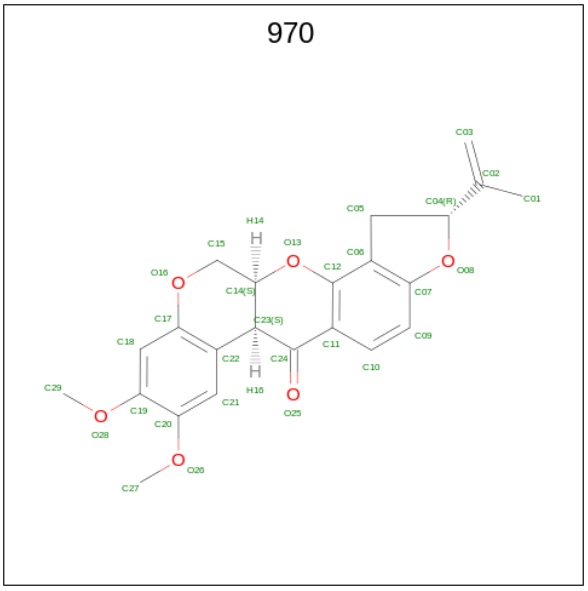
Mol	Chain	Residues	Atoms				AltConf
19	A	1	Total	Fe	S		0
			8	4	4		
19	B	1	Total	Fe	S		0
			8	4	4		
19	B	1	Total	Fe	S		0
			8	4	4		
19	C	1	Total	Fe	S		0
			8	4	4		
19	M	1	Total	Fe	S		0
			8	4	4		
19	M	1	Total	Fe	S		0
			8	4	4		

- Molecule 20 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



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

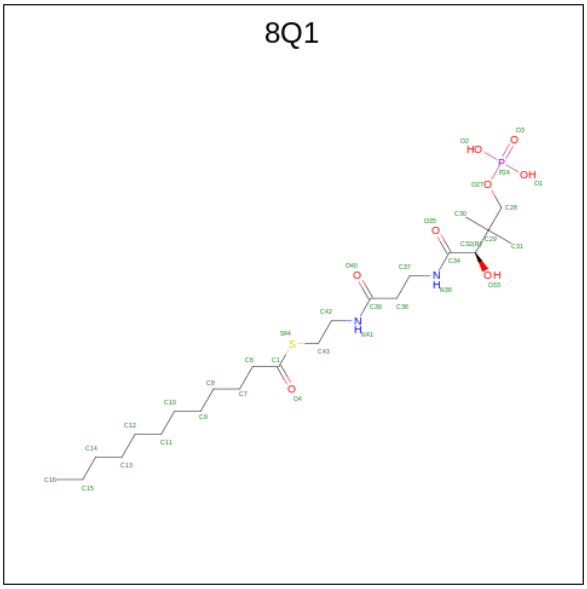
- Molecule 21 is (2R,6aS,12aS)-8,9-dimethoxy-2-(prop-1-en-2-yl)-1,2,12,12a-tetrahydrofuro[2',3':7,8][1]benzopyrano[2,3-c][1]benzopyran-6(6aH)-one (three-letter code: 970) (formula: $C_{23}H_{22}O_6$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
21	C	1	Total	C	O	0
			29	23	6	

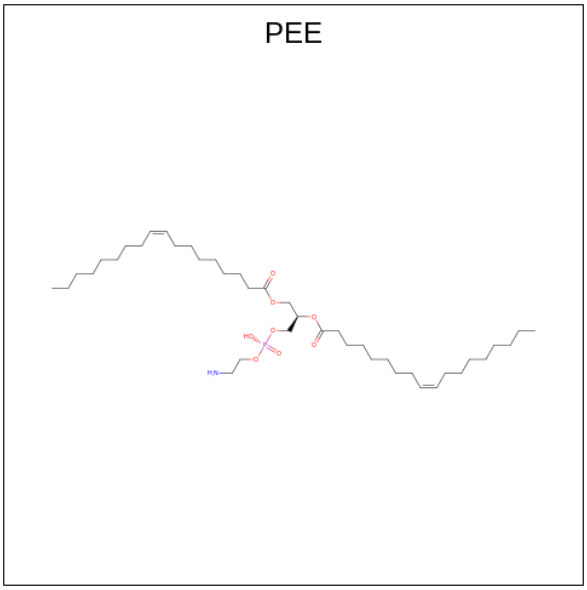
- Molecule 22 is S-[2-({N-[(2R)-2-hydroxy-3,3-dimethyl-4-(phosphonooxy)butanoyl]-beta

-alanyl}amino)ethyl] dodecanethioate (three-letter code: 8Q1) (formula: $C_{23}H_{45}N_2O_8PS$) (labeled as "Ligand of Interest" by depositor).



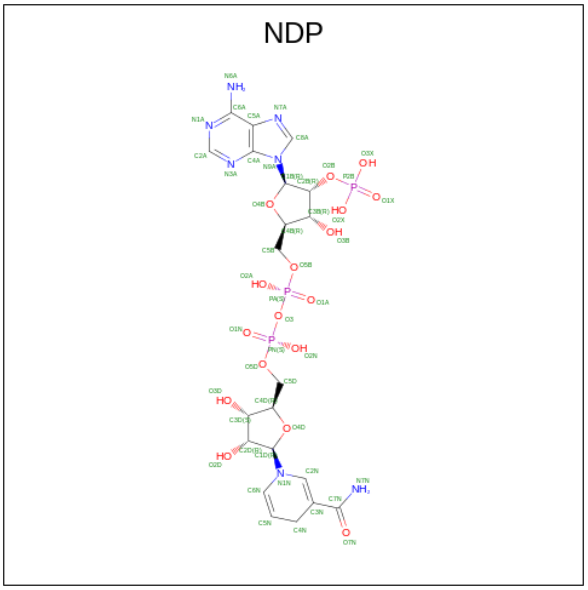
Mol	Chain	Residues	Atoms						AltConf
22	G	1	Total	C	N	O	P	S	0
			35	23	2	8	1	1	

- Molecule 23 is 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine (three-letter code: PEE) (formula: $C_{41}H_{78}NO_8P$) (labeled as "Ligand of Interest" by depositor).



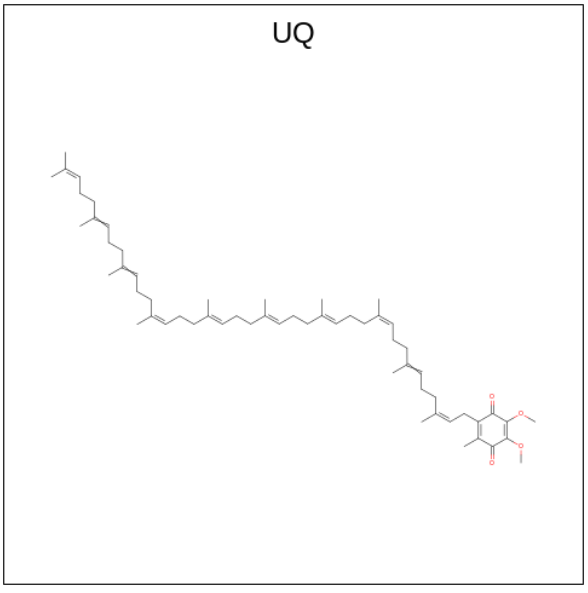
Mol	Chain	Residues	Atoms					AltConf
23	J	1	Total	C	N	O	P	0
			47	37	1	8	1	

- Molecule 24 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$) (labeled as "Ligand of Interest" by depositor).



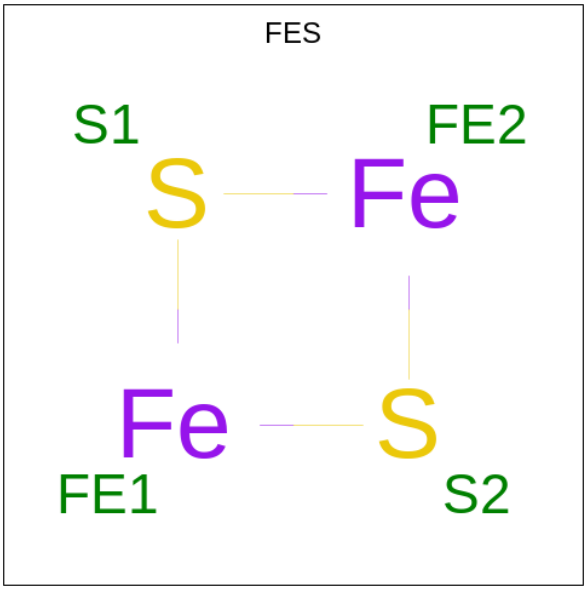
Mol	Chain	Residues	Atoms					AltConf
24	J	1	Total	C	N	O	P	0
			48	21	7	17	3	

- Molecule 25 is Coenzyme Q10, (2Z,6E,10Z,14E,18E,22E,26Z)-isomer (three-letter code: UQ) (formula: $C_{59}H_{90}O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
25	J	1	Total	C	O	0
			33	29	4	

- Molecule 26 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe_2S_2) (labeled as "Ligand of Interest" by depositor).

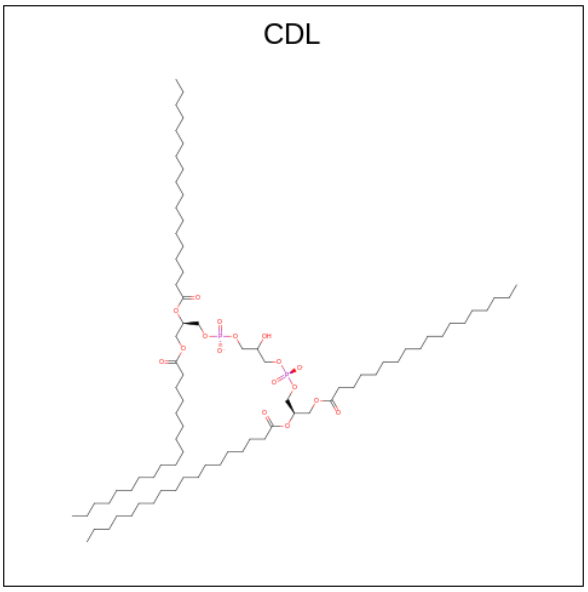


Mol	Chain	Residues	Atoms			AltConf
26	M	1	Total	Fe	S	0
			4	2	2	
26	O	1	Total	Fe	S	0
			4	2	2	

- Molecule 27 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 28 is CARDIOLIPIN (three-letter code: CDL) (formula: $C_{81}H_{156}O_{17}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf
28	N	1	Total	C	O	P	0
			51	32	17	2	

- Molecule 29 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

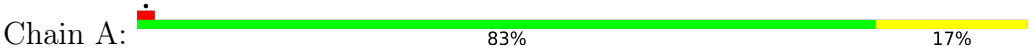
Mol	Chain	Residues	Atoms		AltConf
29	T	1	Total	Zn	0
			1	1	

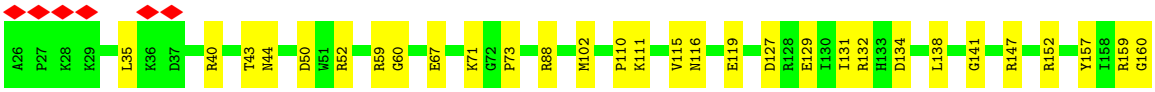
3 Residue-property plots (i)

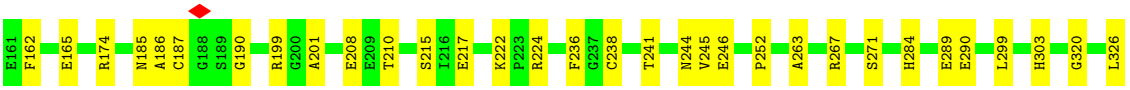
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

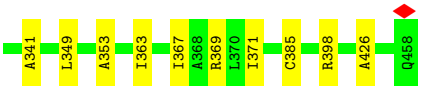
• Molecule 1: NADH dehydrogenase [ubiquinone] flavoprotein 1, mitochondrial

Chain A:



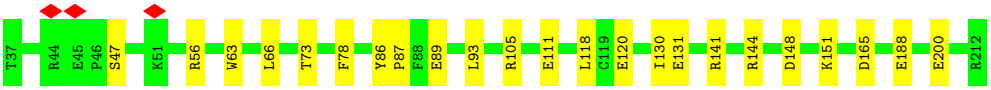






• Molecule 2: NADH dehydrogenase [ubiquinone] iron-sulfur protein 8, mitochondrial

Chain B:

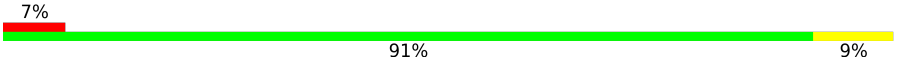


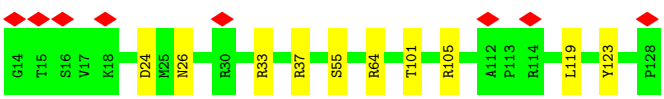
• Molecule 3: NADH dehydrogenase [ubiquinone] iron-sulfur protein 7, mitochondrial

Chain C:

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

Chain E:



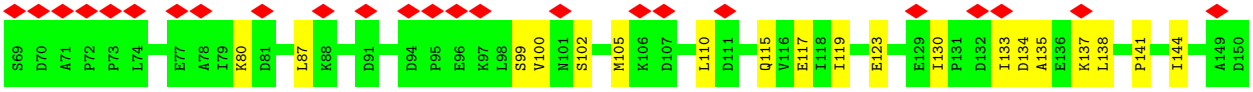


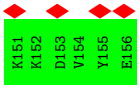
• Molecule 5: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 2

Chain F:

• Molecule 6: Acyl carrier protein, mitochondrial

Chain G:



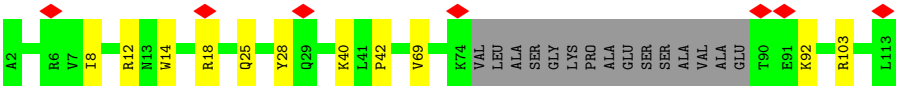


• Molecule 7: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 5

Chain H:

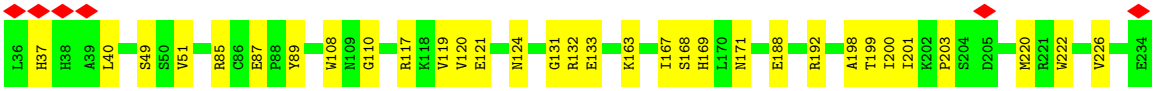
• Molecule 8: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 7

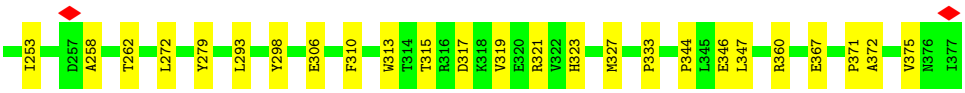
Chain I:



• Molecule 9: NADH dehydrogenase ubiquinone 1 alpha subcomplex subunit 9, mitochondrial

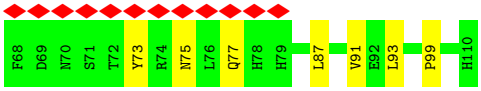
Chain J:



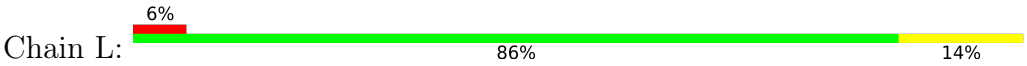


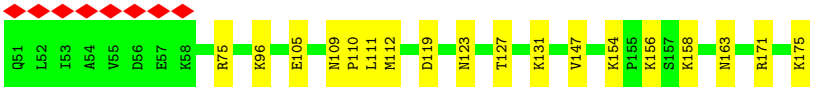
• Molecule 10: NADH dehydrogenase [ubiquinone] flavoprotein 3, mitochondrial

Chain K:

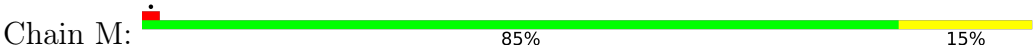


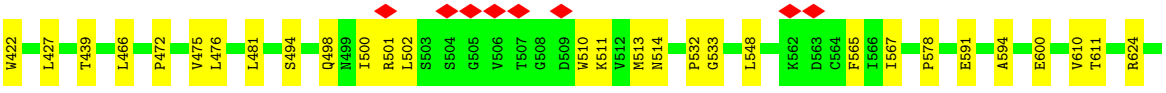
• Molecule 11: NADH dehydrogenase [ubiquinone] iron-sulfur protein 4, mitochondrial

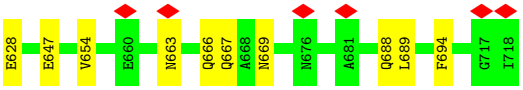




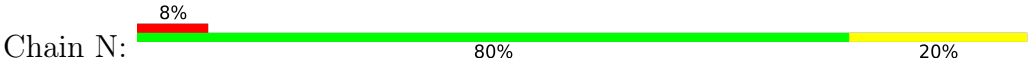
• Molecule 12: NADH-ubiquinone oxidoreductase 75 kDa subunit, mitochondrial

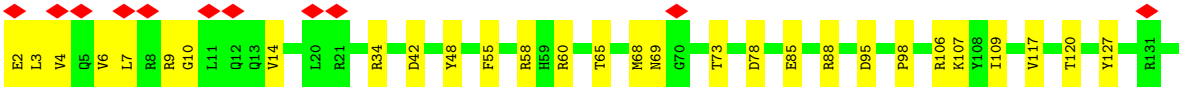




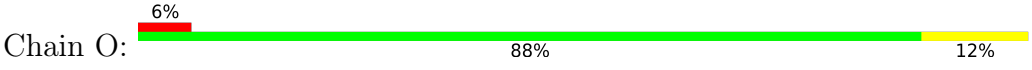


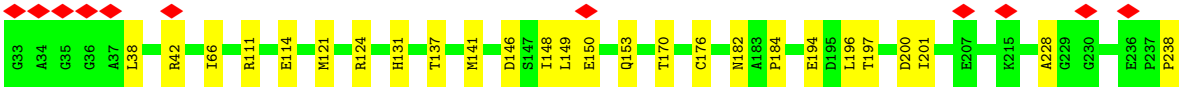
• Molecule 13: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 12

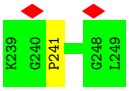




• Molecule 14: NADH dehydrogenase [ubiquinone] flavoprotein 2, mitochondrial





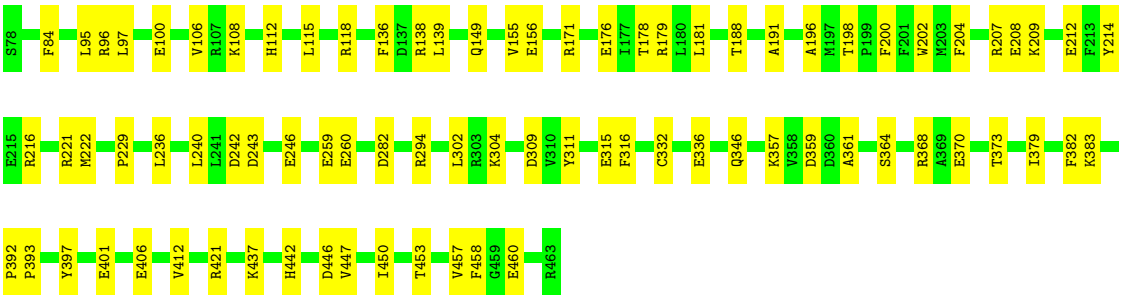


• Molecule 15: NADH dehydrogenase [ubiquinone] iron-sulfur protein 3, mitochondrial

Chain P:

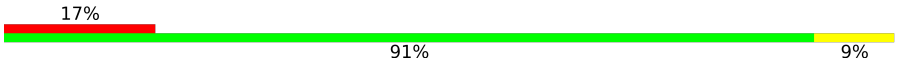
• Molecule 16: NADH dehydrogenase [ubiquinone] iron-sulfur protein 2, mitochondrial

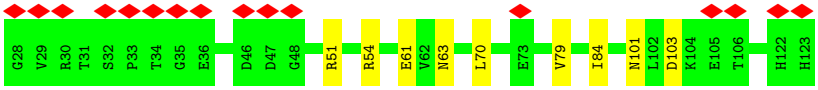
Chain Q:



• Molecule 17: NADH dehydrogenase [ubiquinone] iron-sulfur protein 6, mitochondrial

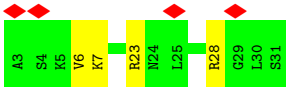
Chain T:





• Molecule 18: NADH dehydrogenase [ubiquinone] 1 alpha subcomplex subunit 13

Chain W:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	111024	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 ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.200	Depositor
Minimum map value	-0.112	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.0309	Depositor
Map size (Å)	333.002, 333.002, 333.002	wwPDB
Map dimensions	310, 310, 310	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.0742, 1.0742, 1.0742	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, 970, FMN, UQ, 8Q1, CDL, MG, NDP, SF4, 2MR, PEE, FES

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|>5$	RMSZ	#$\|Z\|>5$
1	A	0.27	0/3406	0.49	0/4603
2	B	0.28	0/1443	0.51	0/1952
3	C	0.30	0/1279	0.51	0/1730
4	E	0.26	0/995	0.54	0/1340
5	F	0.32	0/698	0.58	0/940
6	G	0.26	0/705	0.48	0/956
7	H	0.26	0/929	0.45	0/1258
8	I	0.26	0/798	0.50	0/1079
9	J	0.27	0/2828	0.49	0/3834
10	K	0.25	0/377	0.51	0/509
11	L	0.26	0/1039	0.49	0/1403
12	M	0.26	0/5384	0.51	0/7295
13	N	0.26	0/1245	0.52	0/1694
14	O	0.28	0/1707	0.49	0/2323
15	P	0.28	0/1789	0.52	0/2436
16	Q	0.28	0/3157	0.51	0/4268
17	T	0.25	0/755	0.51	0/1018
18	W	0.28	0/224	0.53	0/302
All	All	0.27	0/28758	0.50	0/38940

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3330	0	3292	53	0
2	B	1412	0	1363	16	0
3	C	1248	0	1254	18	0
4	E	971	0	975	8	0
5	F	687	0	700	15	0
6	G	693	0	671	13	0
7	H	910	0	950	14	0
8	I	780	0	808	11	0
9	J	2751	0	2773	41	0
10	K	366	0	338	6	0
11	L	1016	0	1016	15	0
12	M	5296	0	5326	66	0
13	N	1204	0	1162	20	0
14	O	1667	0	1669	19	0
15	P	1738	0	1693	20	0
16	Q	3096	0	3063	50	0
17	T	741	0	702	7	0
18	W	218	0	219	4	0
19	A	8	0	0	2	0
19	B	16	0	0	0	0
19	C	8	0	0	3	0
19	M	16	0	0	0	0
20	A	31	0	19	6	0
21	C	29	0	0	0	0
22	G	35	0	0	0	0
23	J	47	0	71	3	0
24	J	48	0	24	3	0
25	J	33	0	39	6	0
26	M	4	0	0	0	0
26	O	4	0	0	1	0
27	M	1	0	0	0	0
28	N	51	0	46	1	0
29	T	1	0	0	0	0
All	All	28456	0	28173	345	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 6.

The worst 5 of 345 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)
24:J:402:NDP:C4D	24:J:402:NDP:O4D	1.68	1.20
20:A:502:FMN:N1	20:A:502:FMN:O3'	2.08	0.87
7:H:7:LYS:HG3	7:H:8:THR:HG23	1.64	0.79
1:A:152:ARG:NH2	10:K:99:PRO:O	2.21	0.74
9:J:346:GLU:HG2	9:J:371:PRO:HB3	1.71	0.73

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	431/433 (100%)	419 (97%)	11 (3%)	1 (0%)	47 78
2	B	174/176 (99%)	170 (98%)	4 (2%)	0	100 100
3	C	154/156 (99%)	148 (96%)	6 (4%)	0	100 100
4	E	113/115 (98%)	109 (96%)	4 (4%)	0	100 100
5	F	84/86 (98%)	79 (94%)	5 (6%)	0	100 100
6	G	86/88 (98%)	83 (96%)	3 (4%)	0	100 100
7	H	110/112 (98%)	102 (93%)	7 (6%)	1 (1%)	17 46
8	I	93/112 (83%)	80 (86%)	13 (14%)	0	100 100
9	J	340/342 (99%)	329 (97%)	11 (3%)	0	100 100
10	K	41/43 (95%)	40 (98%)	1 (2%)	0	100 100
11	L	123/125 (98%)	120 (98%)	3 (2%)	0	100 100
12	M	688/690 (100%)	660 (96%)	28 (4%)	0	100 100
13	N	142/144 (99%)	138 (97%)	4 (3%)	0	100 100
14	O	215/217 (99%)	201 (94%)	14 (6%)	0	100 100
15	P	206/208 (99%)	197 (96%)	9 (4%)	0	100 100
16	Q	383/386 (99%)	372 (97%)	11 (3%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
17	T	94/96 (98%)	93 (99%)	1 (1%)	0	100 100
18	W	27/29 (93%)	24 (89%)	3 (11%)	0	100 100
All	All	3504/3558 (98%)	3364 (96%)	138 (4%)	2 (0%)	54 81

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	186	ALA
7	H	77	ILE

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	346/346 (100%)	346 (100%)	0	100 100
2	B	151/151 (100%)	150 (99%)	1 (1%)	84 95
3	C	132/132 (100%)	132 (100%)	0	100 100
4	E	107/107 (100%)	107 (100%)	0	100 100
5	F	75/76 (99%)	75 (100%)	0	100 100
6	G	76/81 (94%)	76 (100%)	0	100 100
7	H	99/99 (100%)	99 (100%)	0	100 100
8	I	87/97 (90%)	87 (100%)	0	100 100
9	J	296/296 (100%)	295 (100%)	1 (0%)	92 98
10	K	42/42 (100%)	42 (100%)	0	100 100
11	L	113/113 (100%)	113 (100%)	0	100 100
12	M	580/580 (100%)	580 (100%)	0	100 100
13	N	130/130 (100%)	130 (100%)	0	100 100
14	O	182/183 (100%)	182 (100%)	0	100 100
15	P	190/190 (100%)	190 (100%)	0	100 100
16	Q	332/332 (100%)	332 (100%)	0	100 100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
17	T	79/79 (100%)	79 (100%)	0	100	100
18	W	23/24 (96%)	23 (100%)	0	100	100
All	All	3040/3058 (99%)	3038 (100%)	2 (0%)	93	98

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	73	THR
9	J	360	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
9	J	37	HIS
12	M	260	ASN
12	M	278	HIS
12	M	604	GLN
14	O	41	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
16	2MR	Q	118	16	10,12,13	2.01	1 (10%)	5,13,15	6.06	3 (60%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral

centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
16	2MR	Q	118	16	-	2/10/13/15	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
16	Q	118	2MR	CZ-NE	5.67	1.46	1.34

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
16	Q	118	2MR	NE-CZ-NH2	12.42	130.87	119.48
16	Q	118	2MR	CD-NE-CZ	4.20	131.27	123.41
16	Q	118	2MR	CQ2-NH2-CZ	3.02	130.53	123.86

There are no chirality outliers.

All (2) torsion outliers are listed below:

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

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 17 ligands modelled in this entry, 2 are monoatomic - leaving 15 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	$\#\|Z\| > 2$
19	SF4	C	301	3	0,12,12	-	-	-		
25	UQ	J	403	-	33,33,63	3.46	10 (30%)	40,43,79	2.81	14 (35%)
26	FES	O	301	14	0,4,4	-	-	-		
19	SF4	B	302	2	0,12,12	-	-	-		
19	SF4	M	801	12	0,12,12	-	-	-		
19	SF4	A	501	1	0,12,12	-	-	-		
19	SF4	M	802	12	0,12,12	-	-	-		
26	FES	M	803	12	0,4,4	-	-	-		
28	CDL	N	201	-	50,50,99	1.40	9 (18%)	56,62,111	1.18	4 (7%)
22	8Q1	G	201	-	31,34,34	1.68	6 (19%)	40,43,43	1.65	5 (12%)
24	NDP	J	402	-	45,52,52	4.55	20 (44%)	53,80,80	1.99	7 (13%)
20	FMN	A	502	-	33,33,33	1.41	6 (18%)	48,50,50	1.25	7 (14%)
23	PEE	J	401	-	46,46,50	1.21	6 (13%)	49,51,55	0.99	2 (4%)
21	970	C	302	-	33,33,33	4.79	15 (45%)	48,50,50	2.87	22 (45%)
19	SF4	B	301	2	0,12,12	-	-	-		

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
19	SF4	C	301	3	-	-	0/6/5/5
25	UQ	J	403	-	-	12/27/51/87	0/1/1/1
26	FES	O	301	14	-	-	0/1/1/1
19	SF4	B	302	2	-	-	0/6/5/5
28	CDL	N	201	-	-	34/61/61/110	-
19	SF4	A	501	1	-	-	0/6/5/5
19	SF4	M	801	12	-	-	0/6/5/5
19	SF4	M	802	12	-	-	0/6/5/5
26	FES	M	803	12	-	-	0/1/1/1
22	8Q1	G	201	-	-	17/41/41/41	-
24	NDP	J	402	-	-	10/30/77/77	0/4/5/5
20	FMN	A	502	-	-	9/18/18/18	0/3/3/3
23	PEE	J	401	-	-	24/50/50/54	-
21	970	C	302	-	-	4/8/41/41	0/5/5/5
19	SF4	B	301	2	-	-	0/6/5/5

The worst 5 of 72 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
21	C	302	970	O16-C17	17.88	1.57	1.37
24	J	402	NDP	C3B-C2B	-12.90	1.24	1.52
24	J	402	NDP	C6N-C5N	12.31	1.55	1.33
21	C	302	970	O25-C24	10.74	1.37	1.22
24	J	402	NDP	O4D-C4D	10.69	1.68	1.45

The worst 5 of 61 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
21	C	302	970	O25-C24-C23	-8.61	108.62	121.00
21	C	302	970	O25-C24-C11	-8.20	108.83	121.98
25	J	403	UQ	C7-C8-C9	-8.15	113.23	126.79
24	J	402	NDP	C3N-C2N-N1N	-7.99	111.70	123.10
24	J	402	NDP	C1D-N1N-C2N	-7.21	109.11	121.11

There are no chirality outliers.

5 of 110 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
20	A	502	FMN	N10-C1'-C2'-O2'
20	A	502	FMN	N10-C1'-C2'-C3'
20	A	502	FMN	C3'-C4'-C5'-O5'
20	A	502	FMN	O4'-C4'-C5'-O5'
20	A	502	FMN	C5'-O5'-P-O1P

There are no ring outliers.

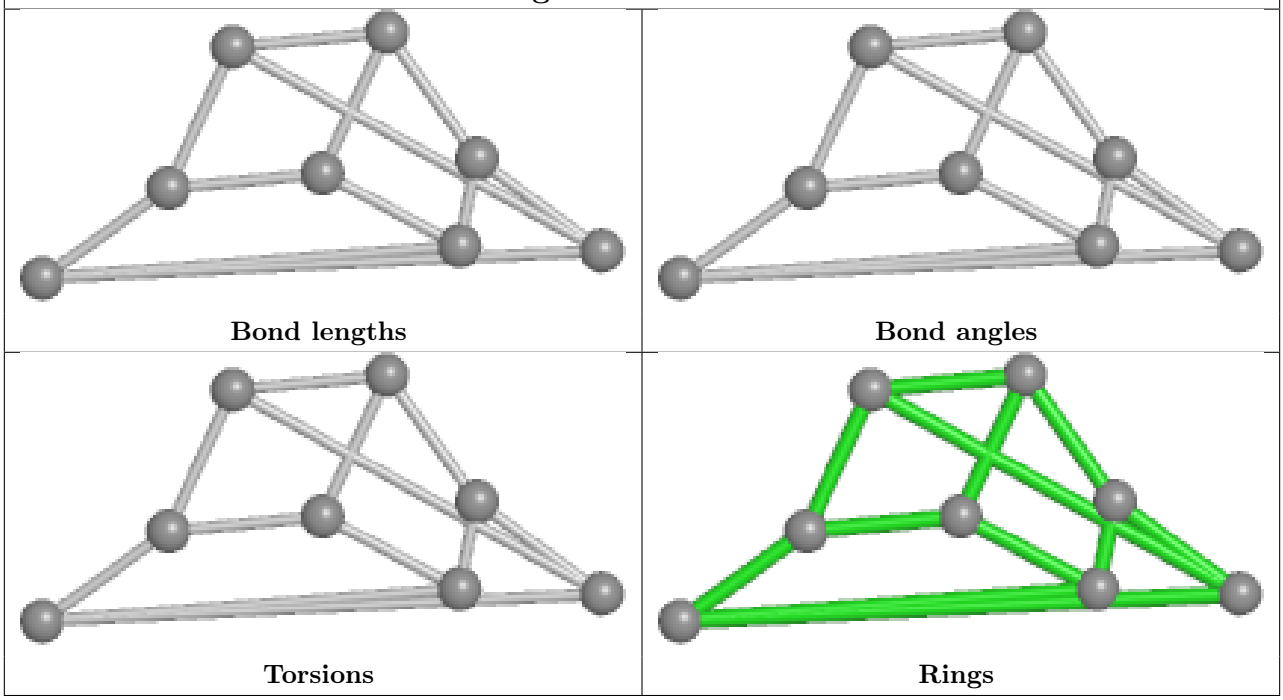
8 monomers are involved in 25 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
19	C	301	SF4	3	0
25	J	403	UQ	6	0
26	O	301	FES	1	0
19	A	501	SF4	2	0
28	N	201	CDL	1	0
24	J	402	NDP	3	0
20	A	502	FMN	6	0
23	J	401	PEE	3	0

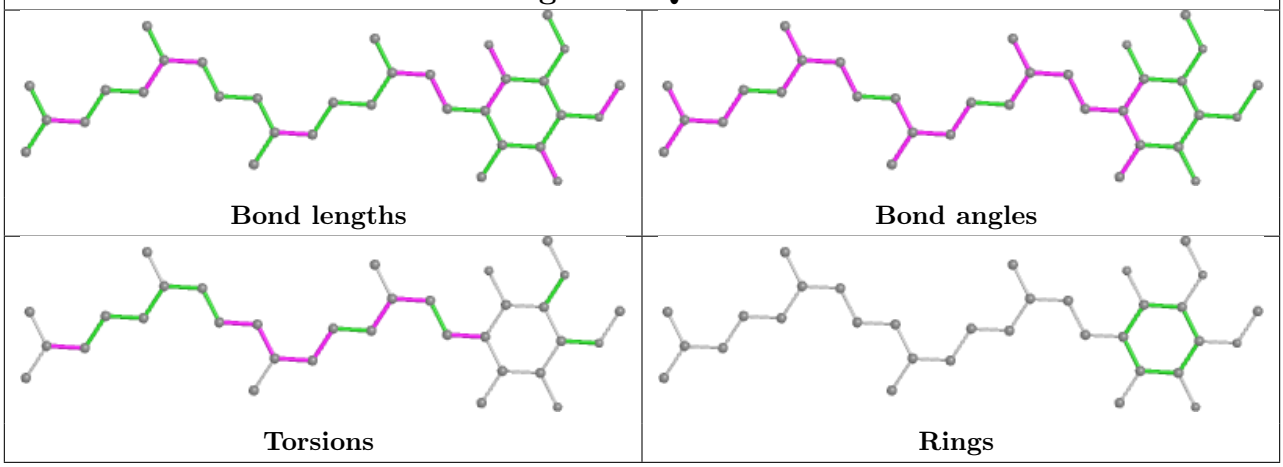
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

also be included. For torsion angles, if less then 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.

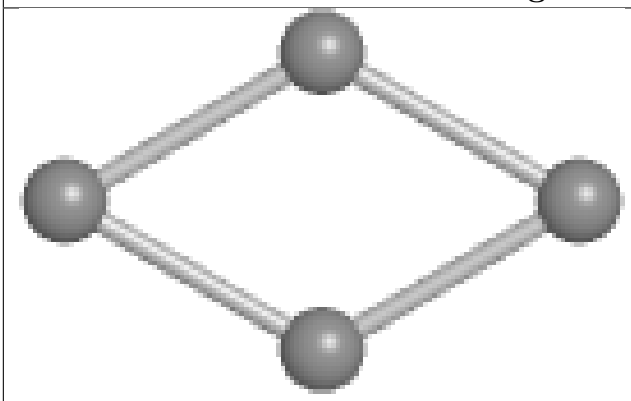
Ligand SF4 C 301



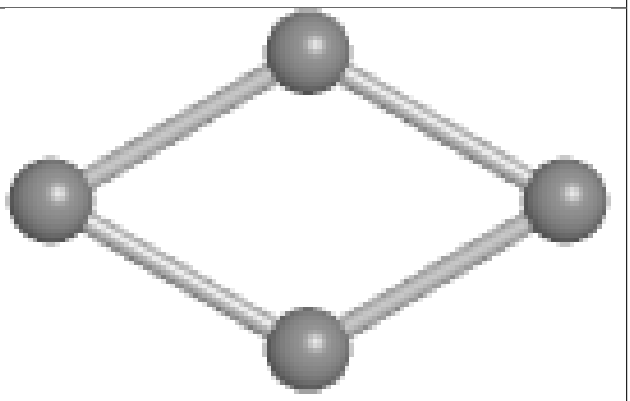
Ligand UQ J 403



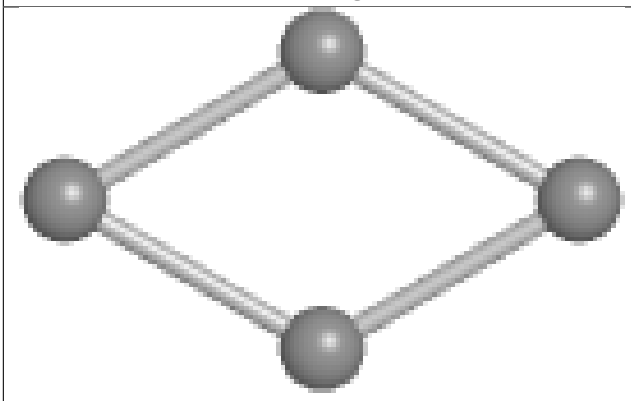
Ligand FES O 301



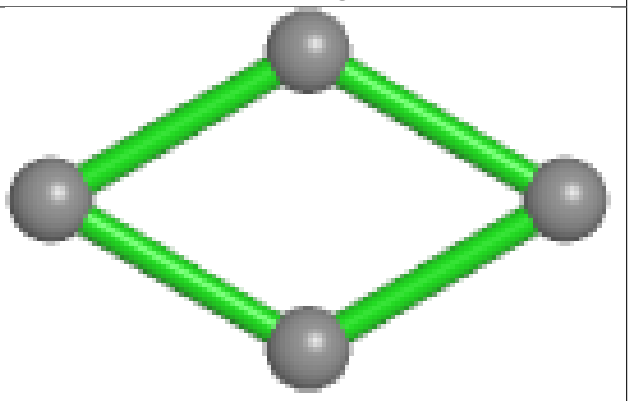
Bond lengths



Bond angles

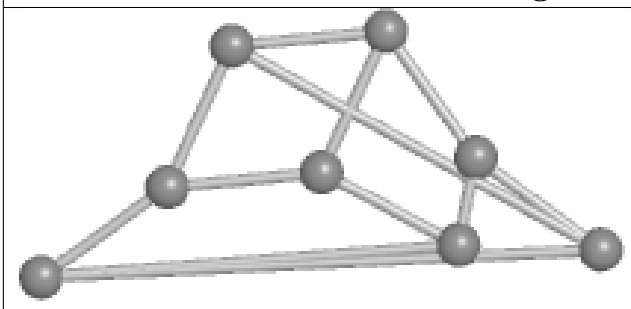


Torsions

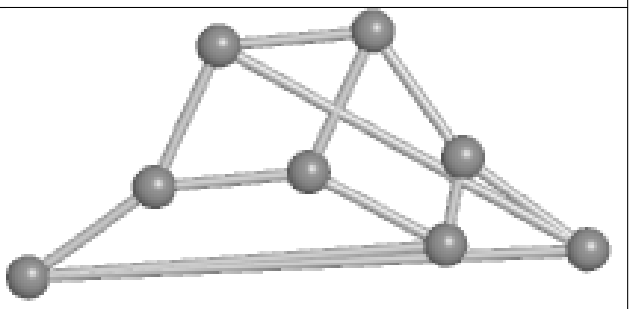


Rings

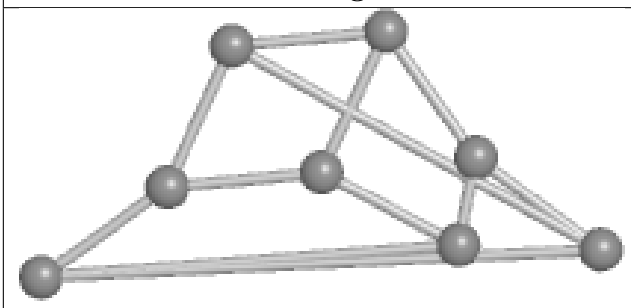
Ligand SF4 B 302



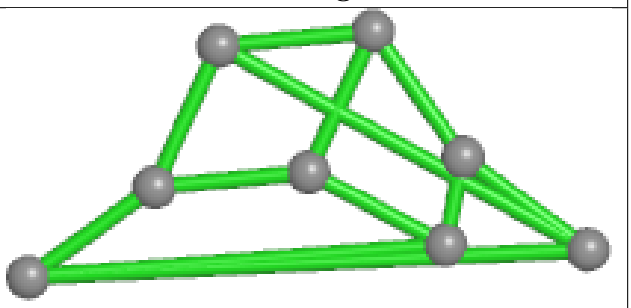
Bond lengths



Bond angles

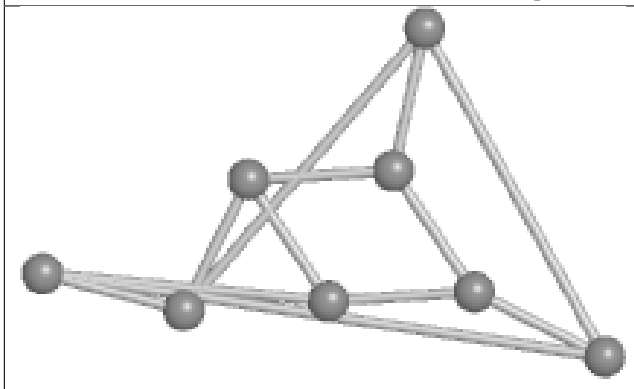


Torsions

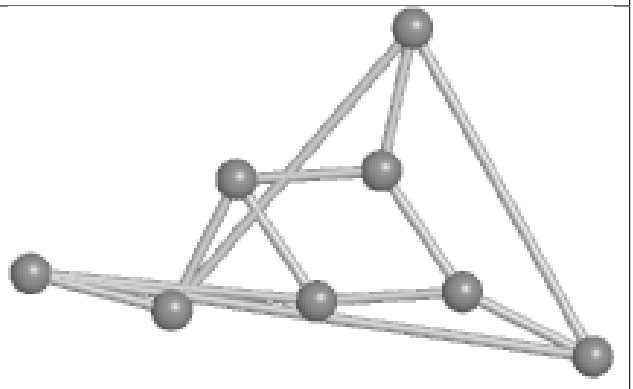


Rings

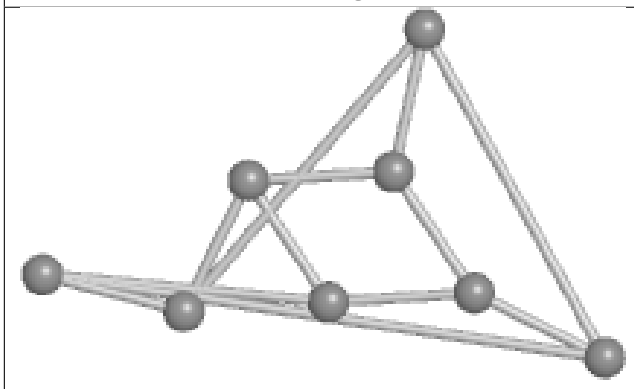
Ligand SF4 M 801



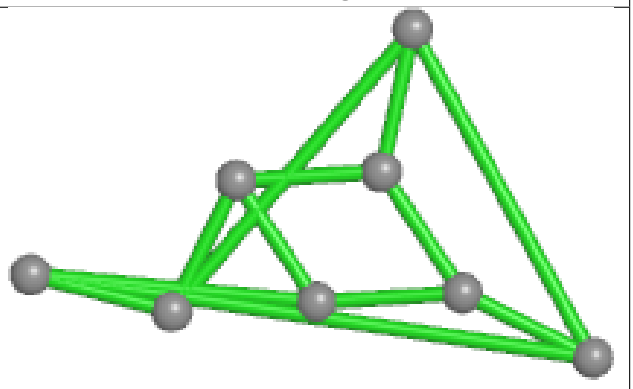
Bond lengths



Bond angles

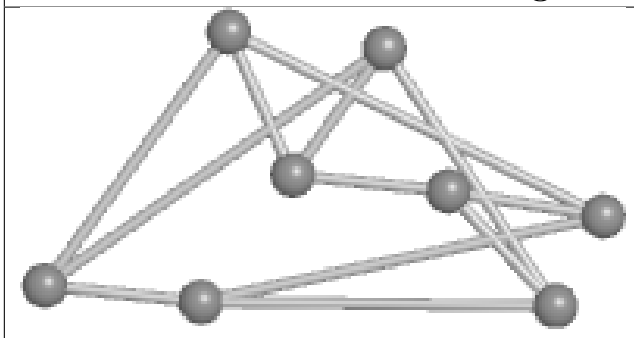


Torsions

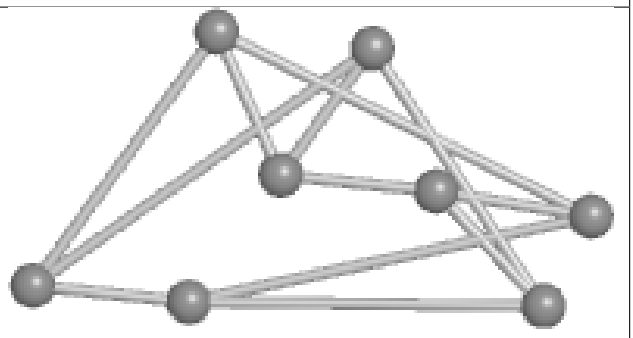


Rings

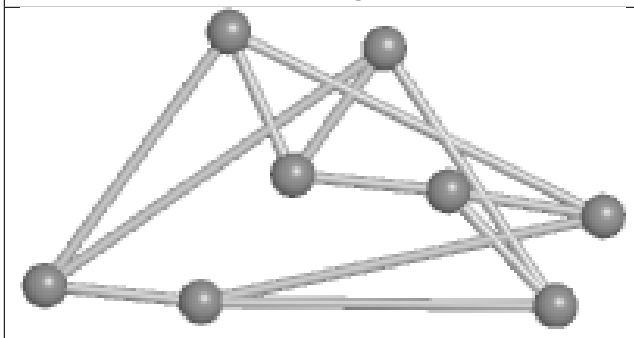
Ligand SF4 A 501



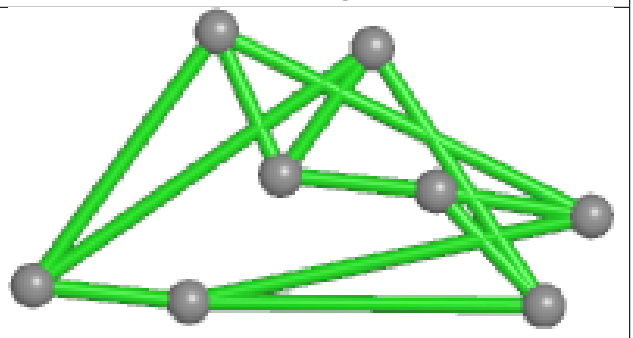
Bond lengths



Bond angles

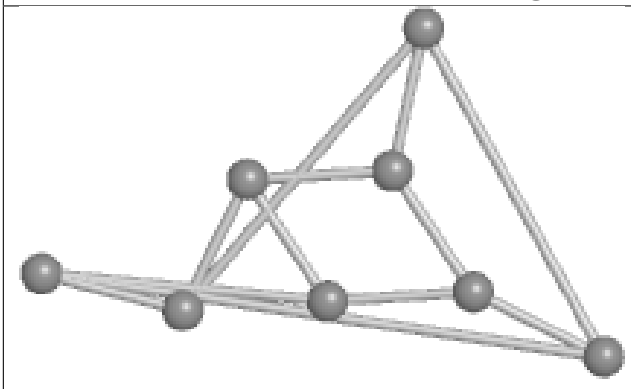


Torsions

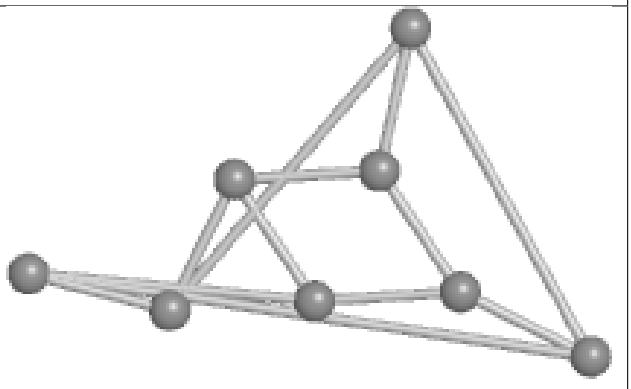


Rings

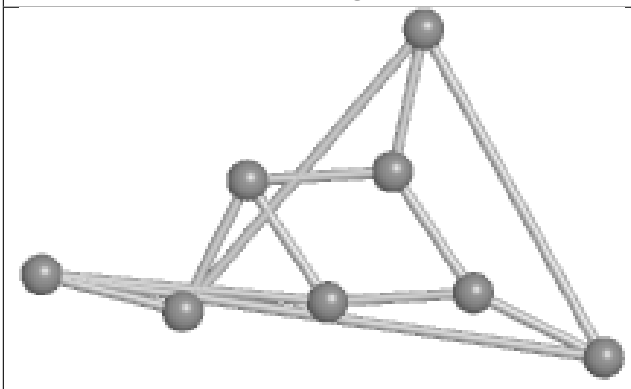
Ligand SF4 M 802



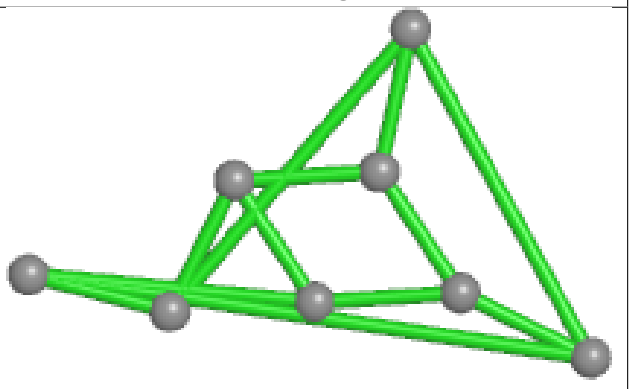
Bond lengths



Bond angles

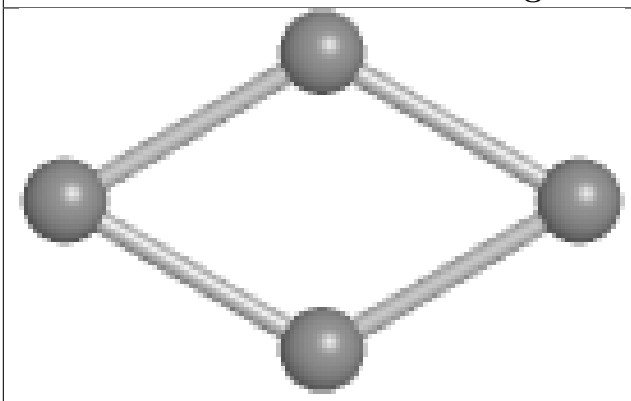


Torsions

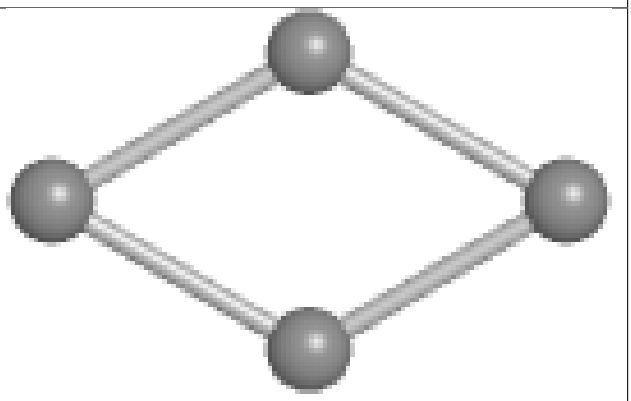


Rings

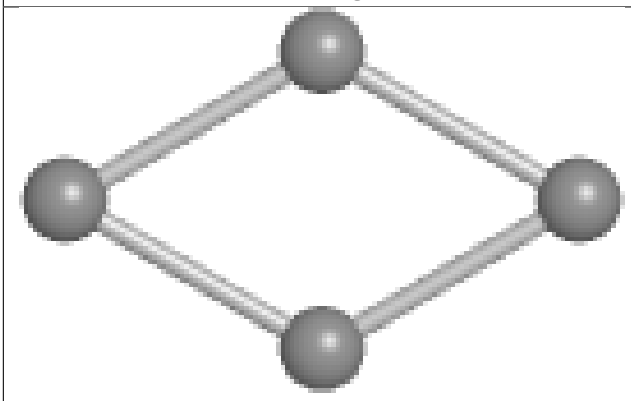
Ligand FES M 803



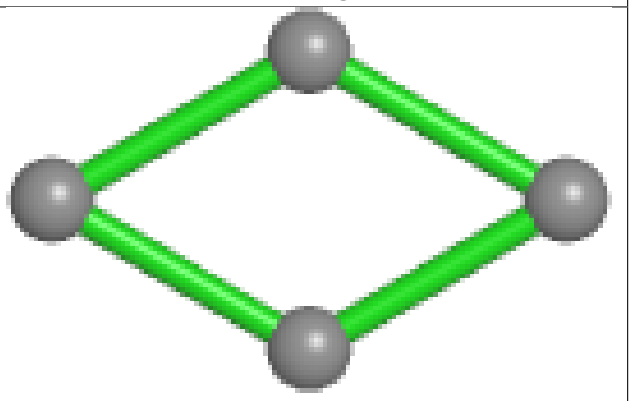
Bond lengths



Bond angles

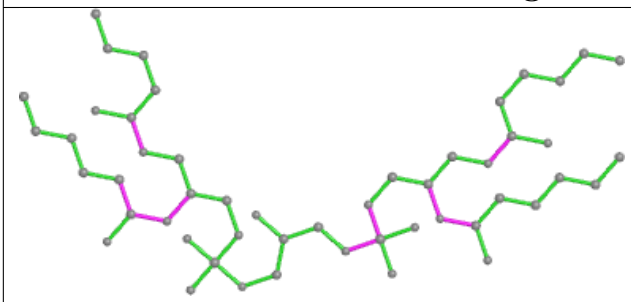


Torsions

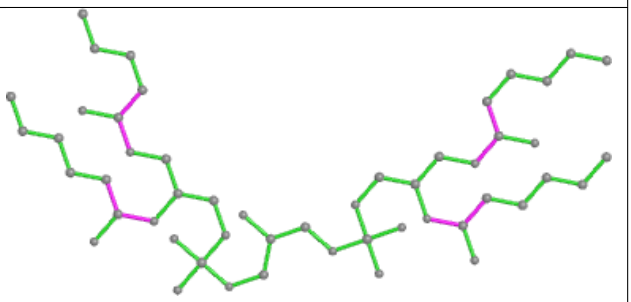


Rings

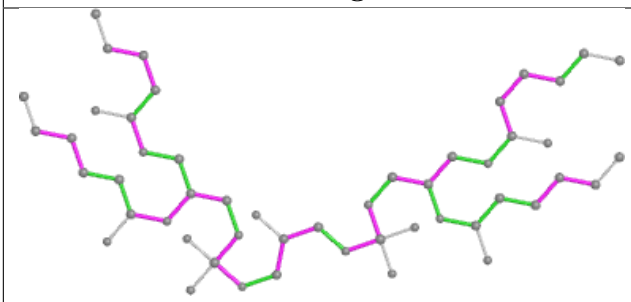
Ligand CDL N 201



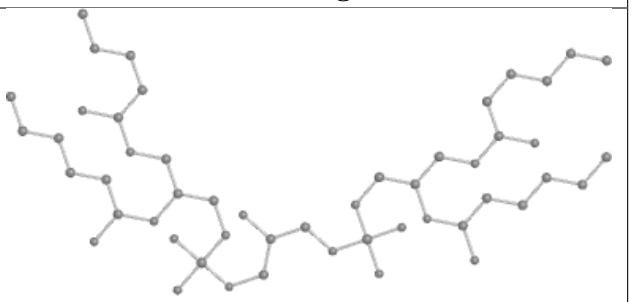
Bond lengths



Bond angles

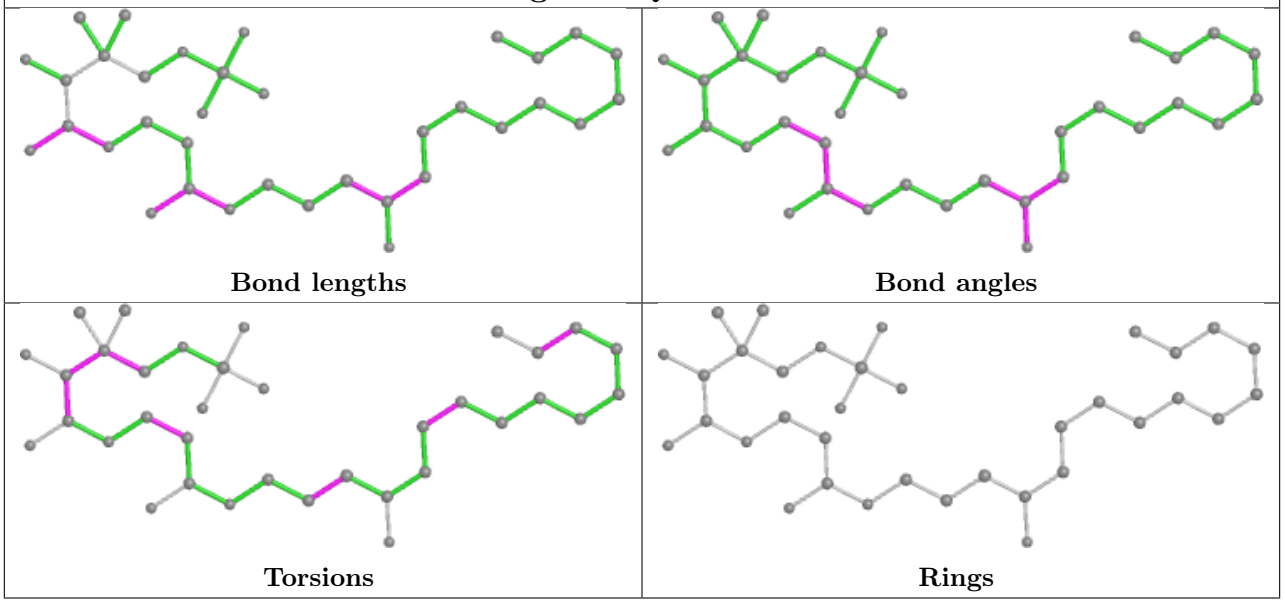


Torsions

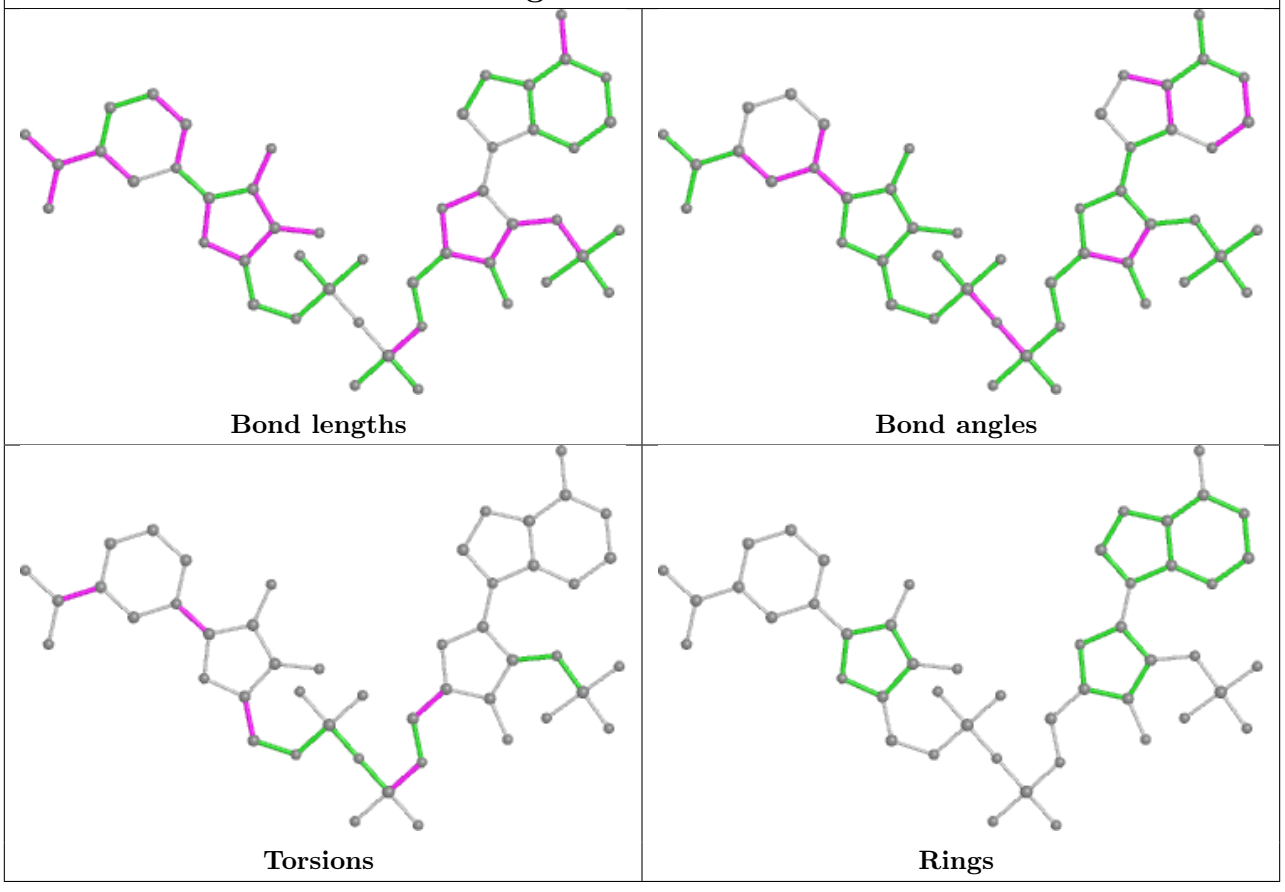


Rings

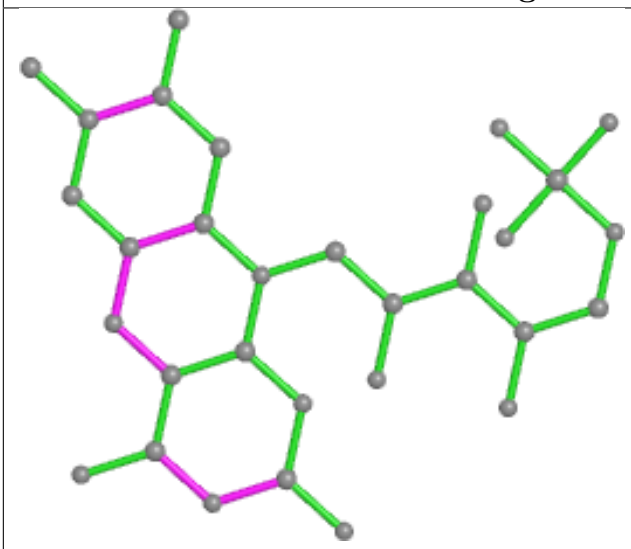
Ligand 8Q1 G 201



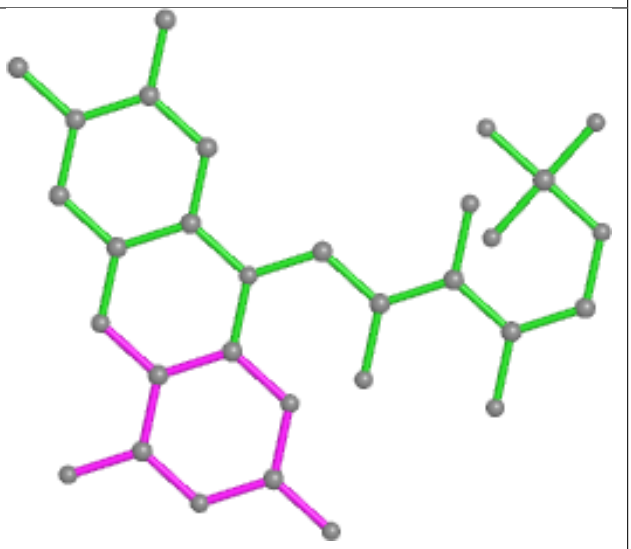
Ligand NDP J 402



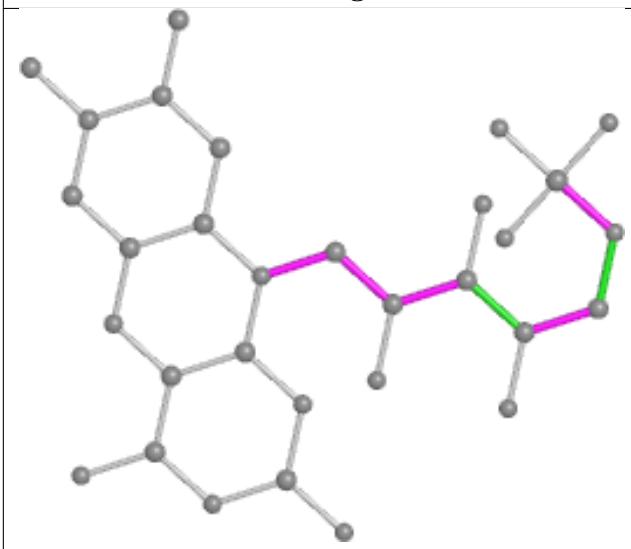
Ligand FMN A 502



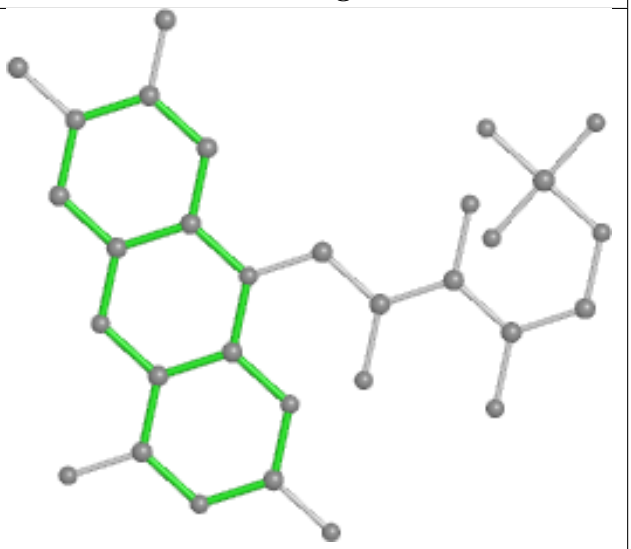
Bond lengths



Bond angles

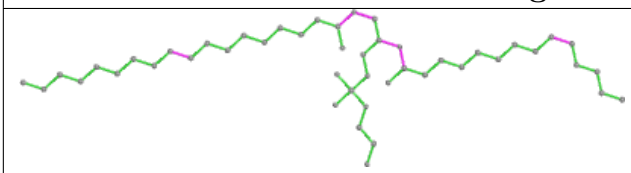


Torsions

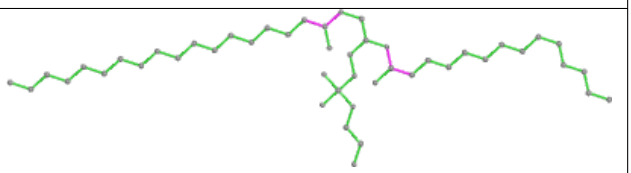


Rings

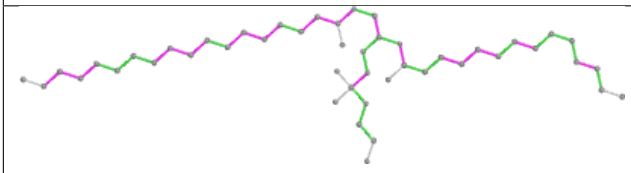
Ligand PEE J 401



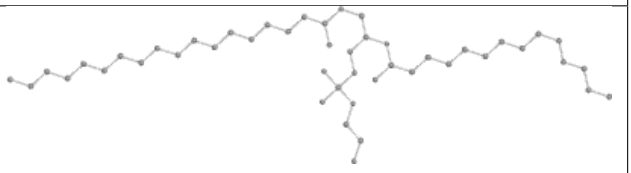
Bond lengths



Bond angles

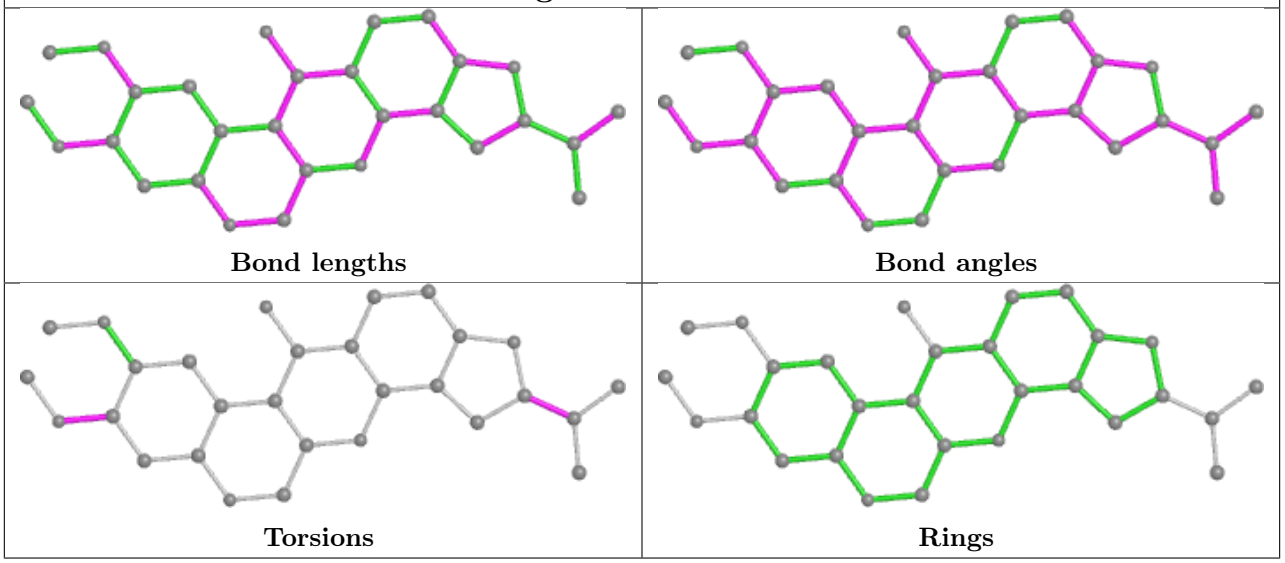


Torsions

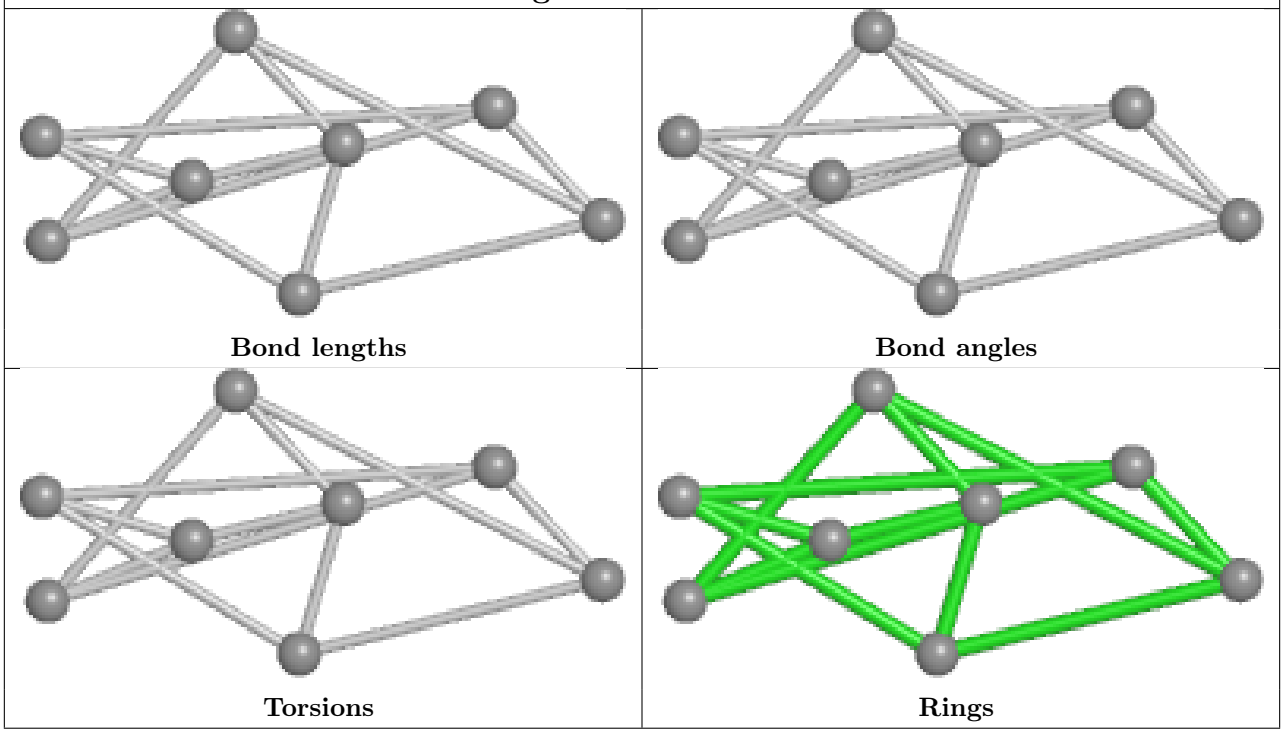


Rings

Ligand 970 C 302



Ligand SF4 B 301



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.

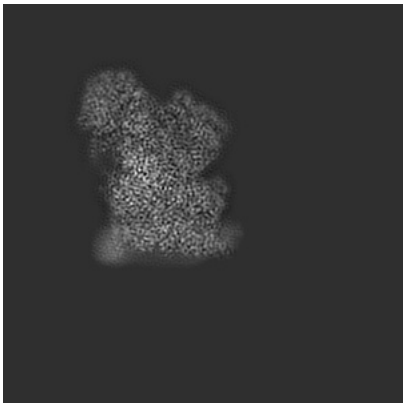
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-32203. These allow visual inspection of the internal detail of the map and identification of artifacts.

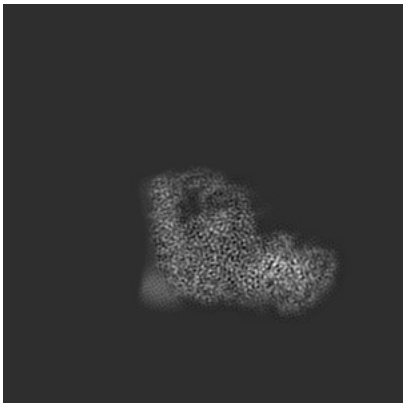
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

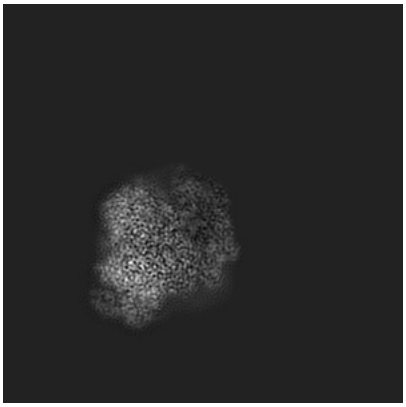
6.1.1 Primary map



X



Y

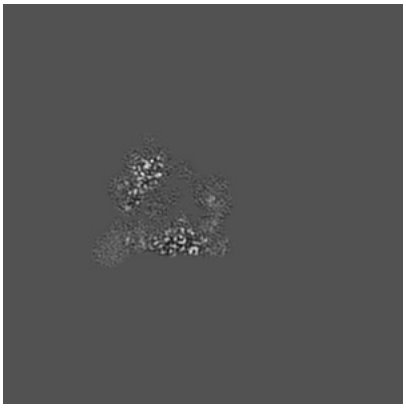


Z

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

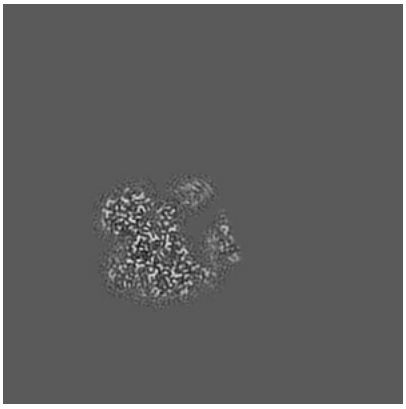
6.2 Central slices

6.2.1 Primary map



X Index: 155

Y Index: 155

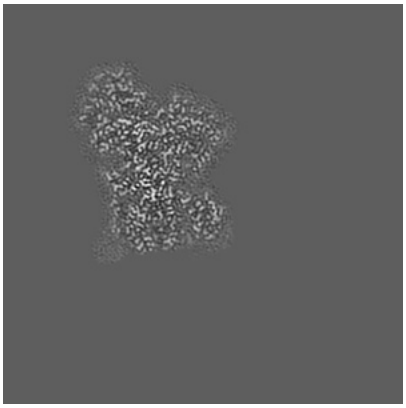


Z Index: 155

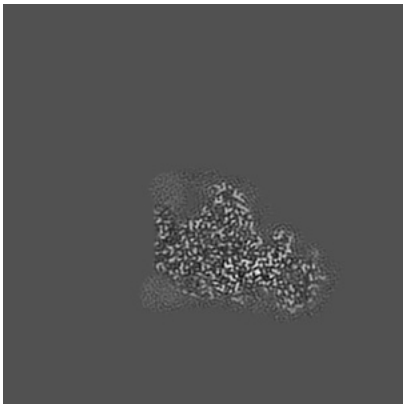
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

6.3.1 Primary map



X Index: 108



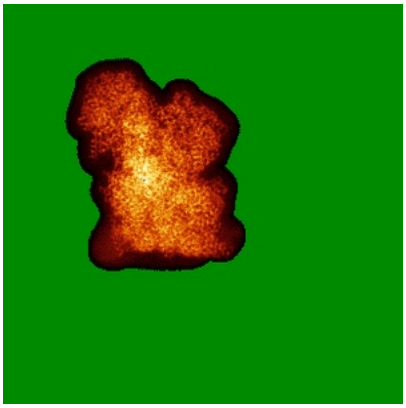
Y Index: 106

Z Index: 164

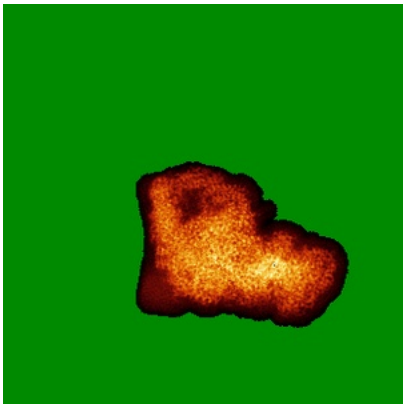
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

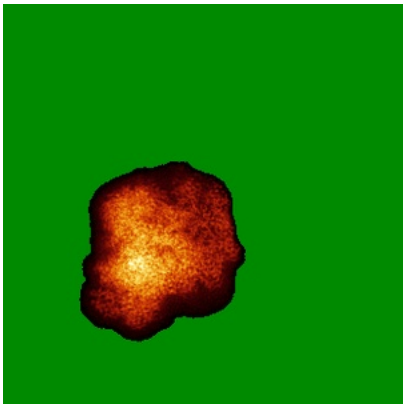
6.4.1 Primary map



X



Y



Z

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

X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.0309. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

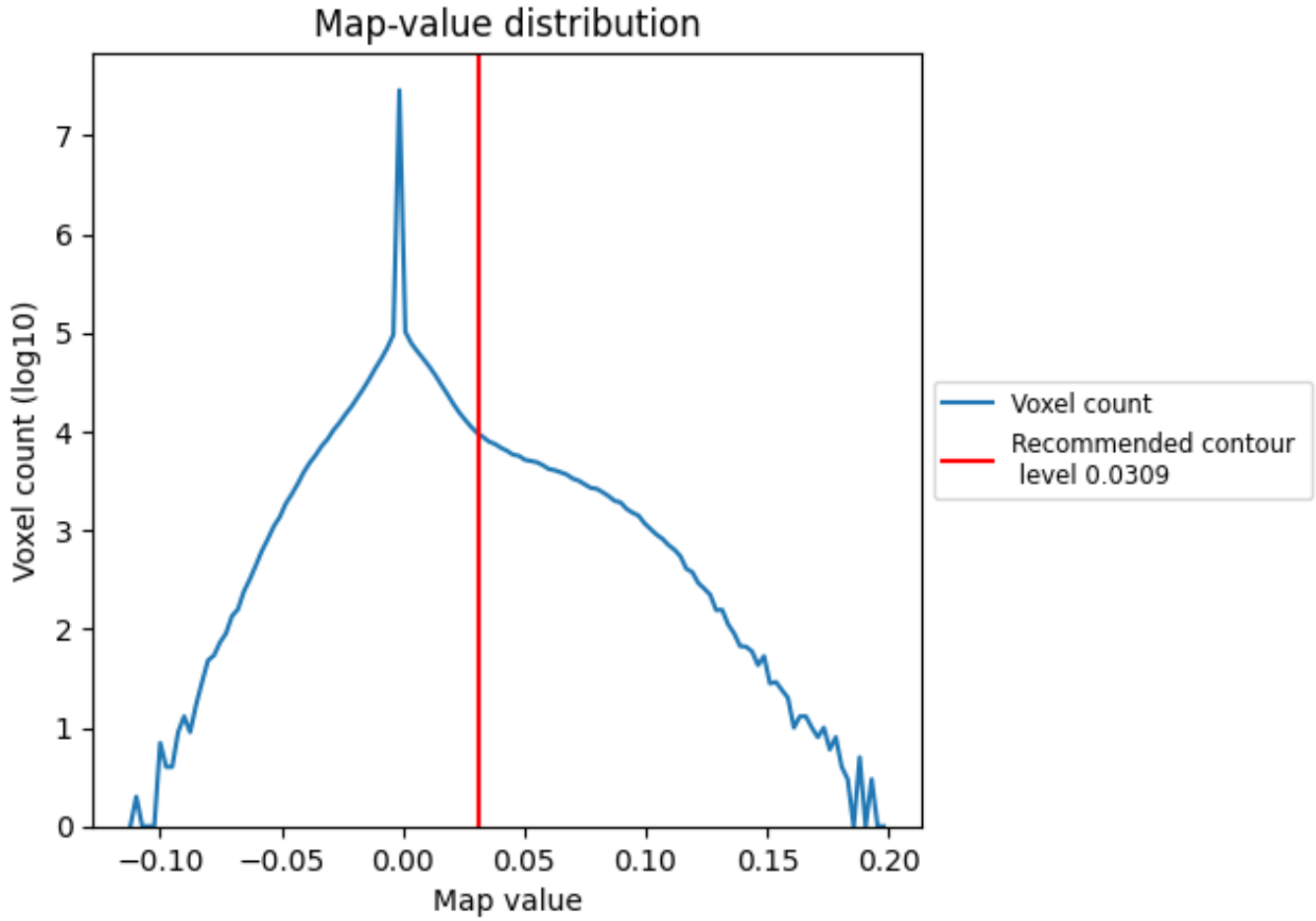
6.6 Mask visualisation (i)

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

7 Map analysis

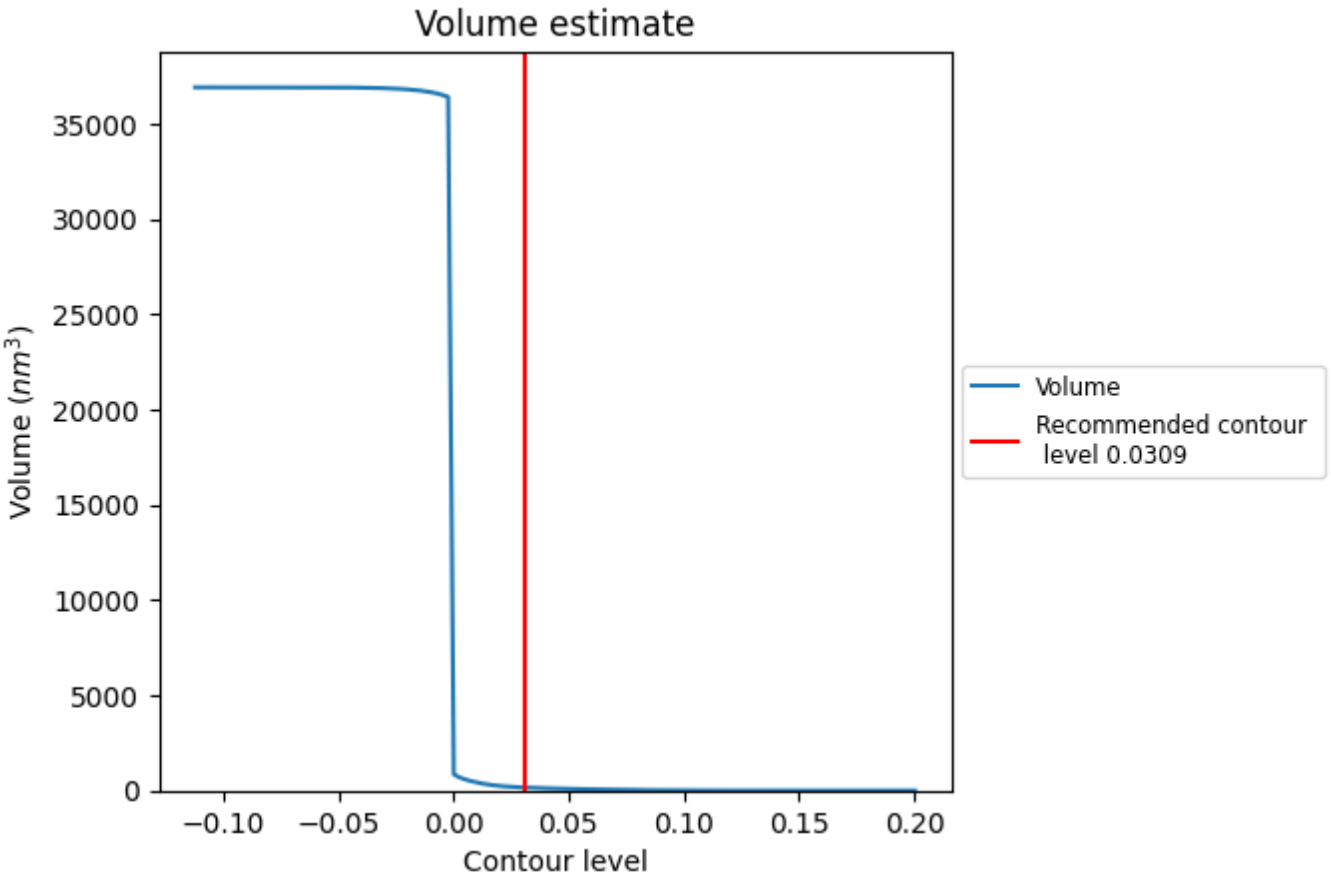
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

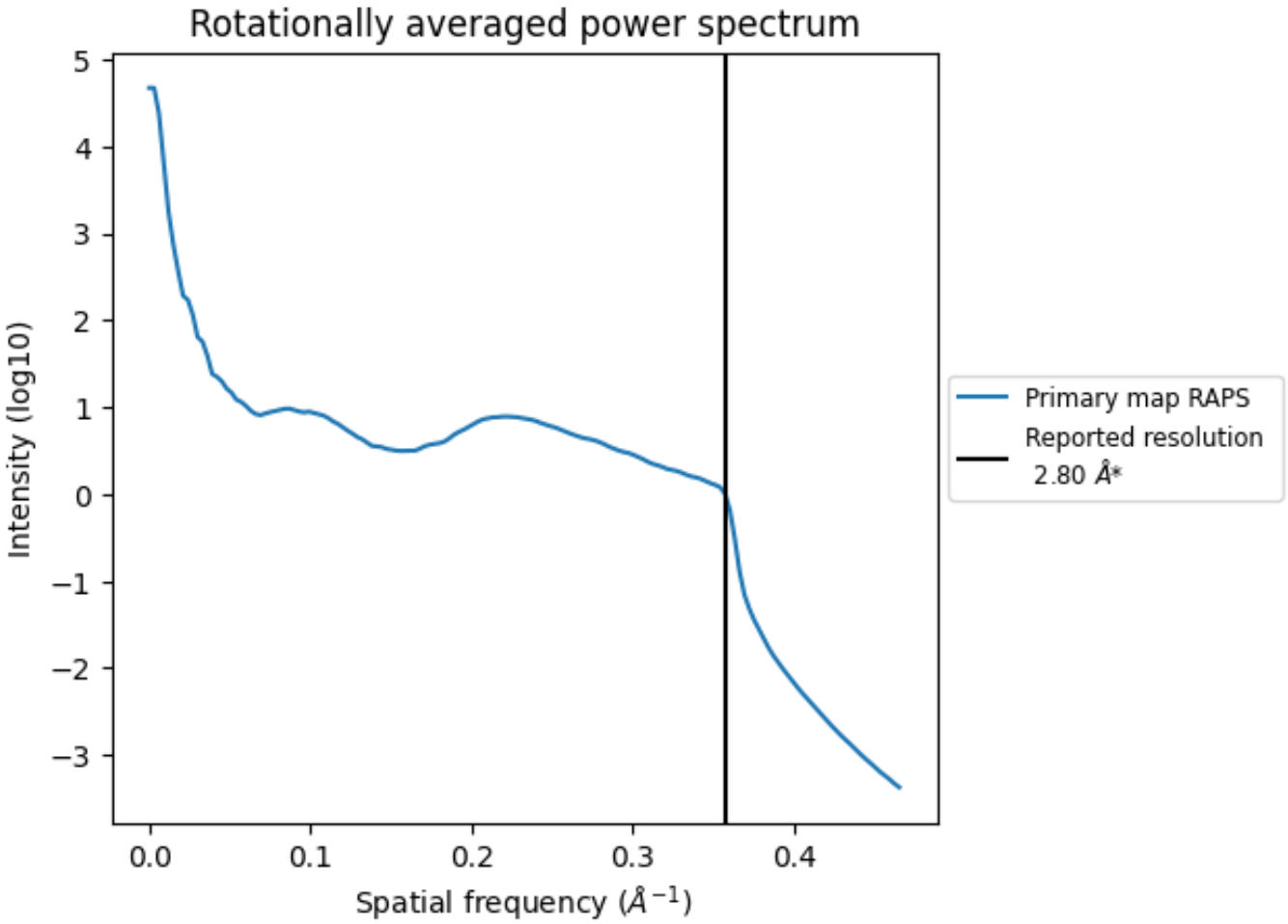
7.2 Volume estimate (i)



The volume at the recommended contour level is 160 nm^3; this corresponds to an approximate mass of 144 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 0.357 Å^{-1}

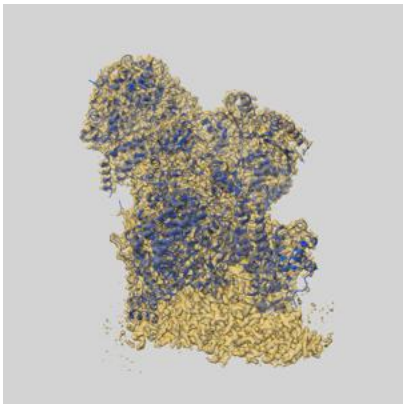
8 Fourier-Shell correlation (i)

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

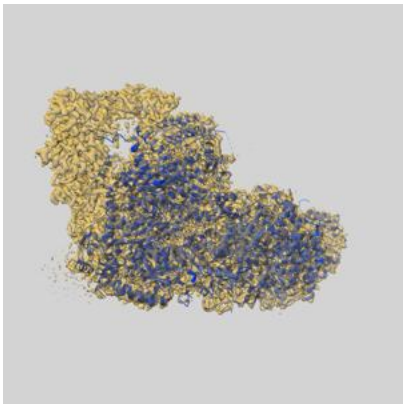
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-32203 and PDB model 7VYF. Per-residue inclusion information can be found in section 3 on page 13.

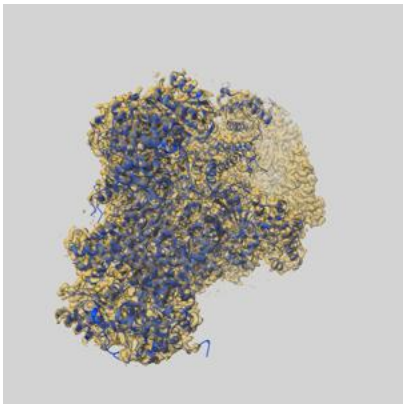
9.1 Map-model overlay



X



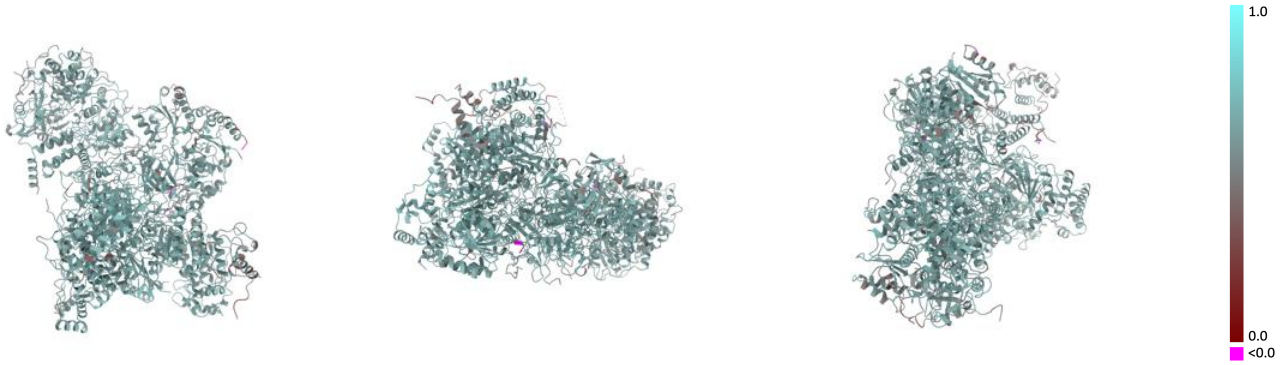
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0309 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.

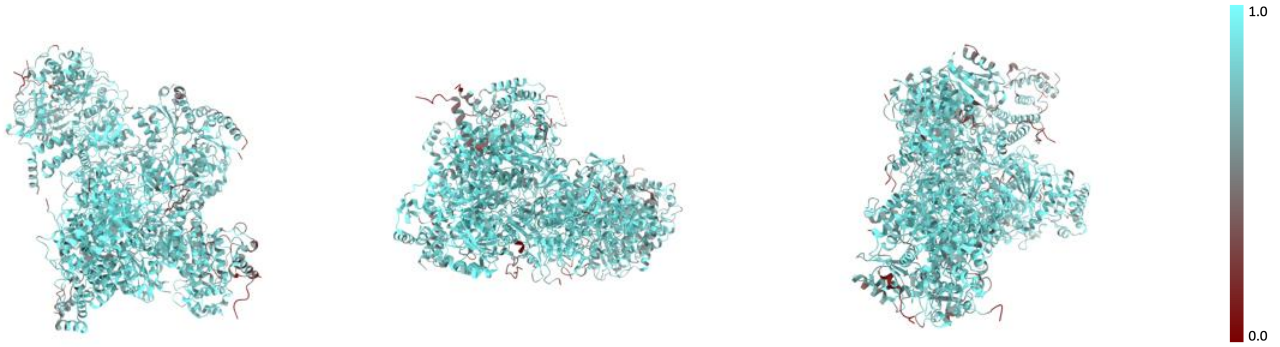
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

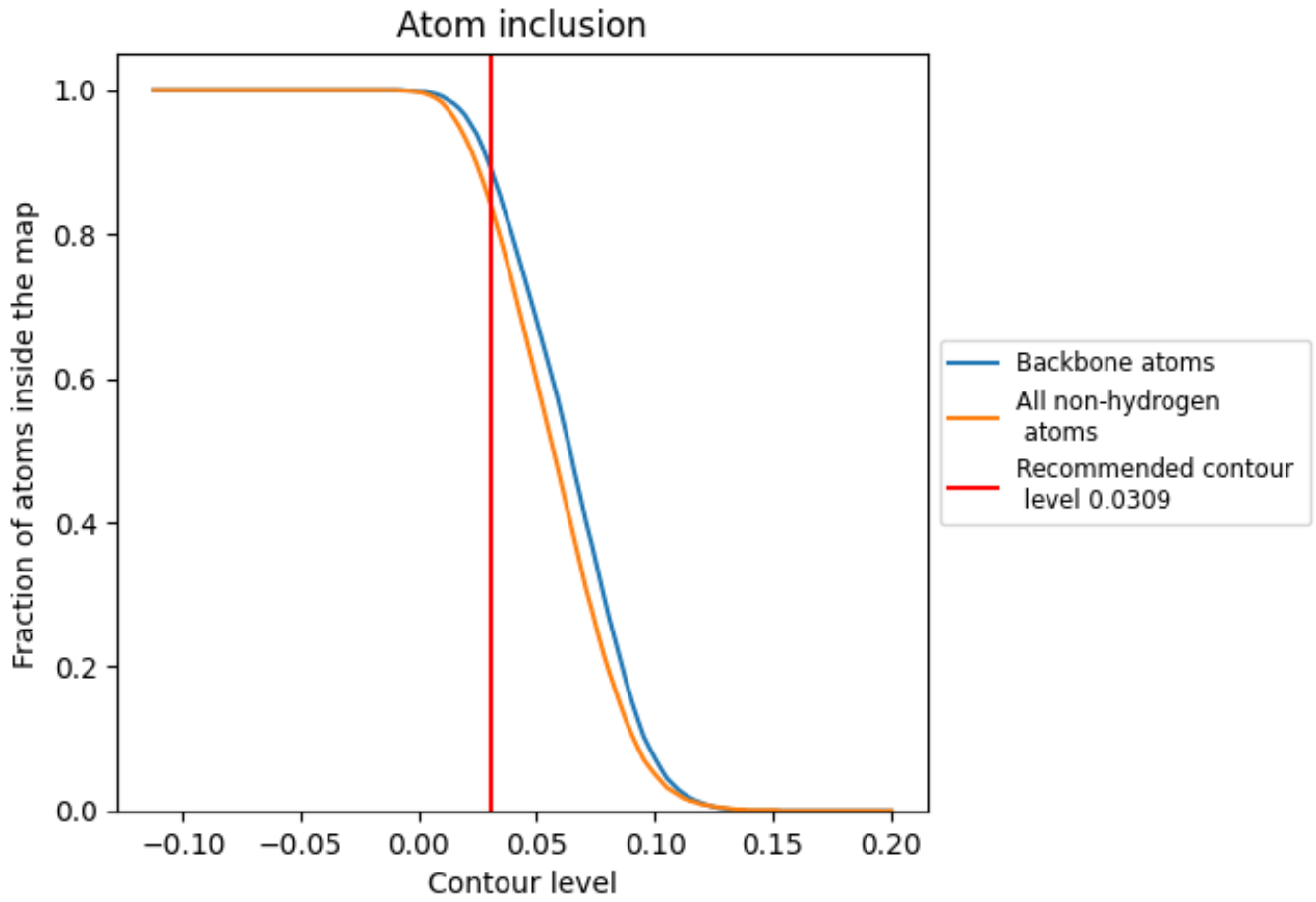
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.0309).

9.4 Atom inclusion (i)



At the recommended contour level, 89% of all backbone atoms, 84% 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 (0.0309) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8370	0.6180
A	0.8290	0.6110
B	0.9160	0.6470
C	0.9350	0.6470
E	0.8050	0.6080
F	0.7320	0.5650
G	0.5730	0.5100
H	0.8070	0.6000
I	0.7540	0.5940
J	0.8480	0.6210
K	0.5970	0.5420
L	0.8410	0.6250
M	0.8640	0.6250
N	0.7360	0.6050
O	0.7730	0.5920
P	0.9270	0.6480
Q	0.9230	0.6500
T	0.7090	0.5960
W	0.7500	0.5770