



Full wwPDB EM Validation Report ⓘ

Oct 1, 2026 – 04:27 PM EDT

PDB ID : 9ZC5 / pdb_00009zc5
EMDB ID : EMD-74031
Title : Cryo-EM structure of Leishmania tarentolae respiratory complex V (ATP synthase) Fo monomer membrane region
Authors : Liao, Y.T.; Chao, L.
Deposited on : 2025-11-22
Resolution : 3.62 Å(reported)
Based on initial model : .

This is a Full wwPDB EM Validation 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:

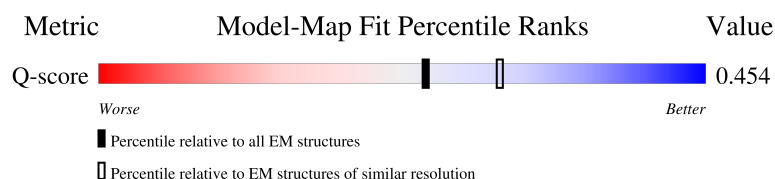
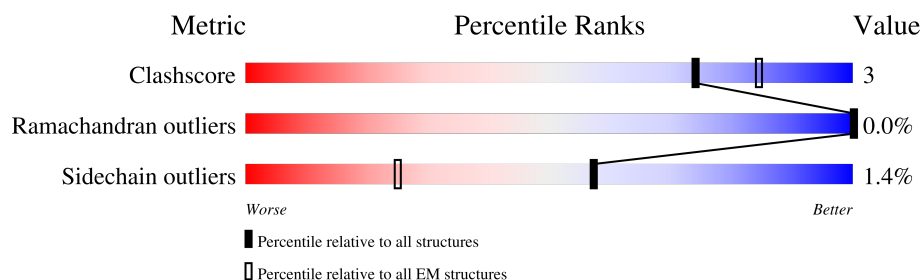
EMDB validation analysis : 0.0.1.dev133
MolProbity : 4-5-2 with Phenix2.2
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDb archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.51

1 Overall quality at a glance

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

The reported resolution of this entry is 3.62 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	11773 (3.12 - 4.12)

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	99	30% 99%
2	B	102	22% 94% 6%
3	C	76	87% 84% 16%
3	P	76	89% 91% 9%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	Q	76	84% 87% 13%
3	R	76	89% 89% 11%
3	S	76	89% 89% 11%
3	T	76	86% 82% 18%
3	U	76	80% 84% 14%
3	V	76	83% 87% 13%
3	W	76	74% 88% 12%
3	X	76	86% 95% 5%
4	D	384	22% 93% 6%
5	E	123	15% 96% •
6	F	136	17% 94% 6%
7	G	104	39% 92% 8%
8	H	163	24% 90% 10%
9	I	127	47% 93% 7%
10	J	66	20% 92% 8%
11	K	75	23% 96% •
12	L	231	27% 91% 9%
13	M	59	37% 92% 8%
14	N	78	18% 100%
15	O	55	11% 91% 9%

2 Entry composition [i](#)

There are 15 unique types of molecules in this entry. The entry contains 20618 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 Mitochondrial ATP synthase subunit ATPTB12.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	99	Total	C	N	O	S	0	0
			804	500	149	150	5		

- Molecule 2 is a protein called Mitochondrial ATP synthase subunit i/j.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	102	Total	C	N	O	S	0	0
			865	557	152	151	5		

- Molecule 3 is a protein called Mitochondrial ATP synthase subunit c-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	P	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	Q	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	R	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	S	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	T	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	U	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	V	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	W	76	Total	C	N	O	S	0	0
			550	367	86	91	6		
3	X	76	Total	C	N	O	S	0	0
			550	367	86	91	6		

- Molecule 4 is a protein called Mitochondrial ATP synthase subunit ATPTB1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	384	Total	C	N	O	S	0	0
			3196	2047	551	578	20		

- Molecule 5 is a protein called Mitochondrial ATP synthase subunit f.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	123	Total	C	N	O	S	0	0
			1012	660	176	171	5		

- Molecule 6 is a protein called Mitochondrial ATP synthase subunit ATPTB11.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	136	Total	C	N	O	S	0	0
			1108	715	178	209	6		

- Molecule 7 is a protein called Mitochondrial ATP synthase subunit k.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	104	Total	C	N	O	S	0	0
			848	558	139	145	6		

- Molecule 8 is a protein called Mitochondrial ATP synthase subunit ATPTB6.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	163	Total	C	N	O	S	0	0
			1349	860	247	235	7		

- Molecule 9 is a protein called Mitochondrial ATP synthase subunit g.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	127	Total	C	N	O	S	0	0
			1030	658	184	179	9		

- Molecule 10 is a protein called Mitochondrial ATP synthase subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	66	Total	C	N	O	S	0	0
			590	402	91	94	3		

- Molecule 11 is a protein called Mitochondrial ATP synthase subunit b.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	75	Total	C	N	O	S	0	0
			642	423	100	118	1		

- Molecule 12 is a protein called ATPase 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	231	Total	C	N	O	S	0	0
			1983	1401	257	288	37		

- Molecule 13 is a protein called Mitochondrial ATP synthase subunit e.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	59	Total	C	N	O	S	0	0
			490	307	96	85	2		

- Molecule 14 is a protein called Mitochondrial ATP synthase subunit ATPEG3.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	78	Total	C	N	O	S	0	0
			720	471	130	116	3		

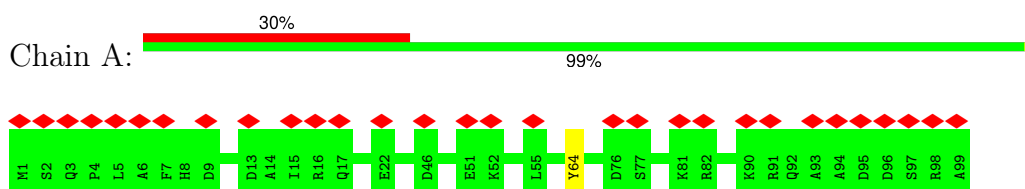
- Molecule 15 is a protein called LtATPEG4, LtaP27:632926-633111.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	55	Total	C	N	O	S	0	0
			481	322	83	74	2		

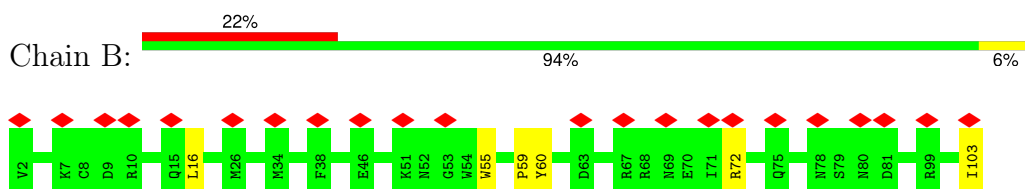
3 Residue-property plots [i](#)

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.

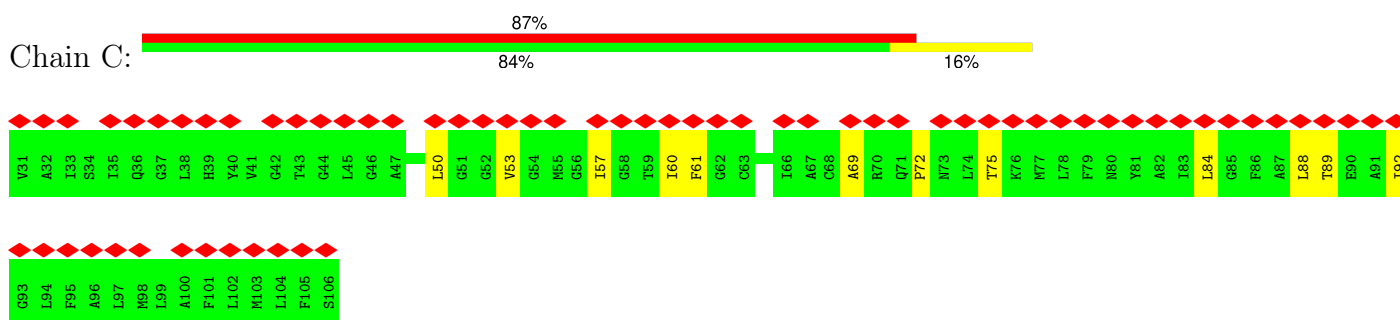
- Molecule 1: Mitochondrial ATP synthase subunit ATPTB12



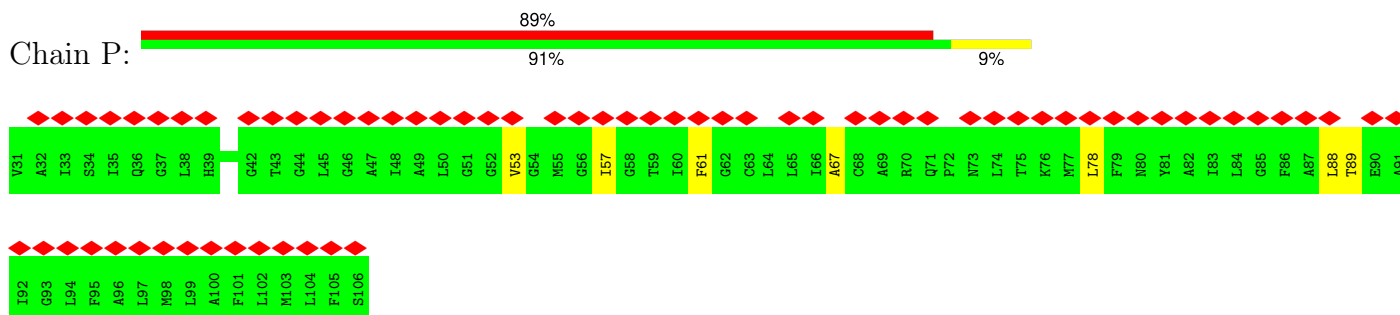
- Molecule 2: Mitochondrial ATP synthase subunit i/j



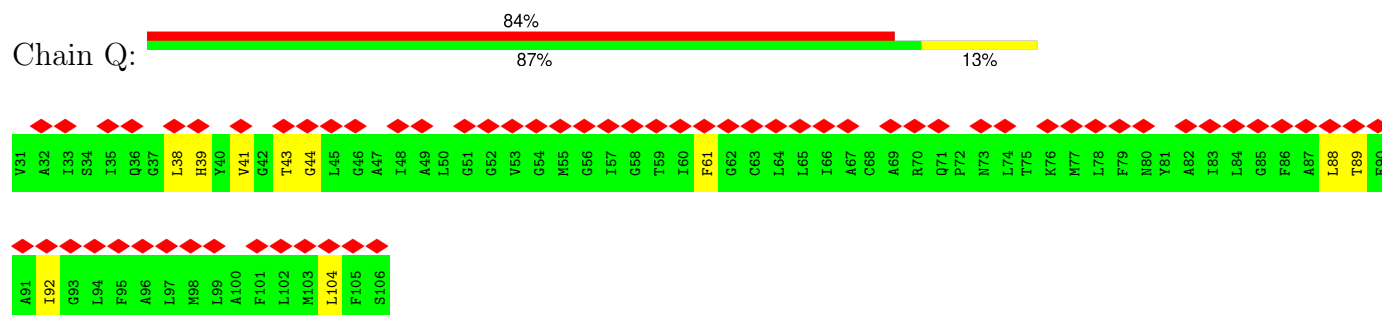
- Molecule 3: Mitochondrial ATP synthase subunit c-1



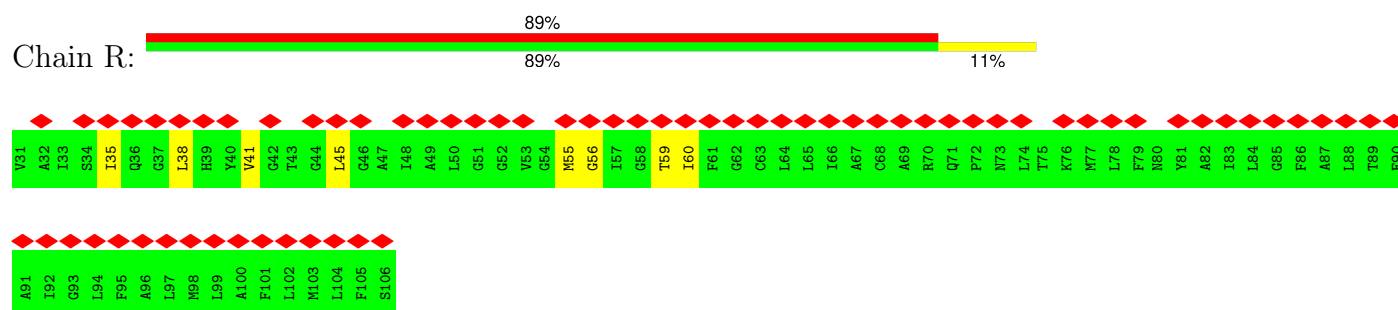
- Molecule 3: Mitochondrial ATP synthase subunit c-1



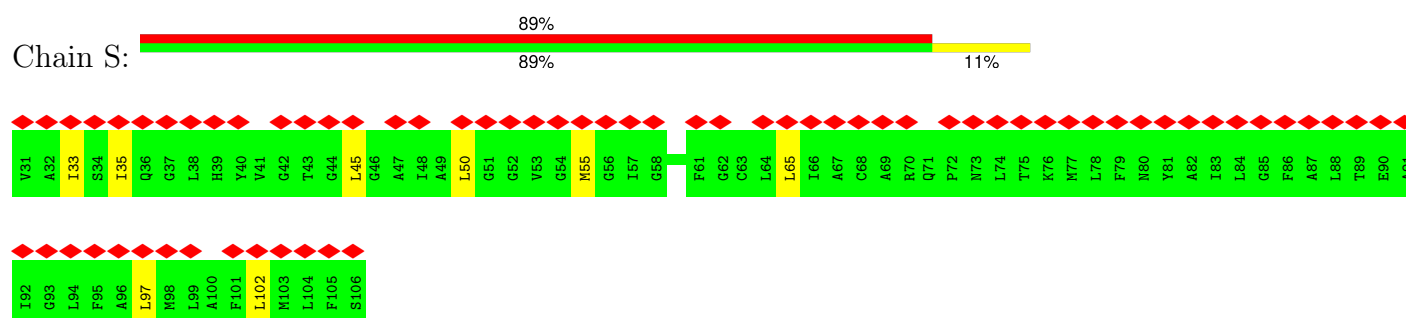
• Molecule 3: Mitochondrial ATP synthase subunit c-1



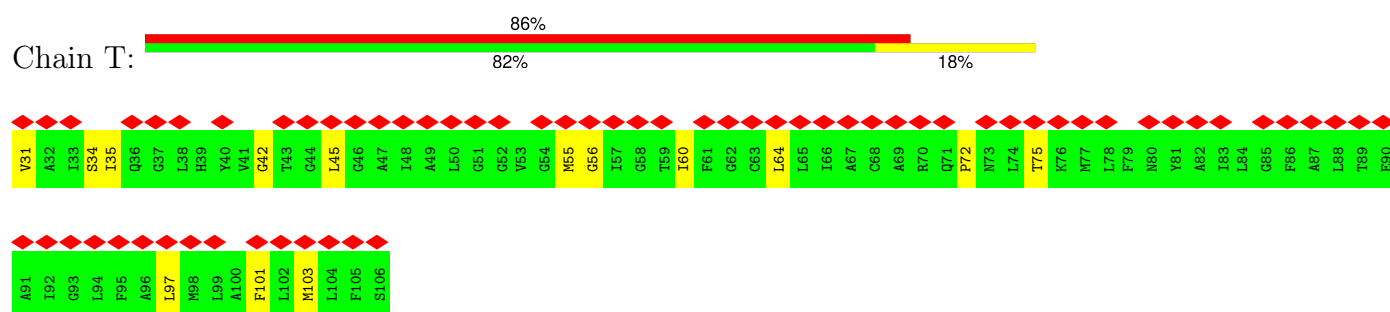
• Molecule 3: Mitochondrial ATP synthase subunit c-1



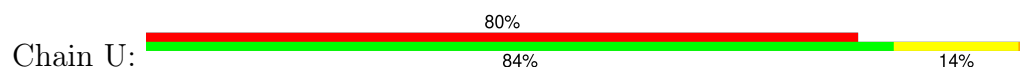
• Molecule 3: Mitochondrial ATP synthase subunit c-1

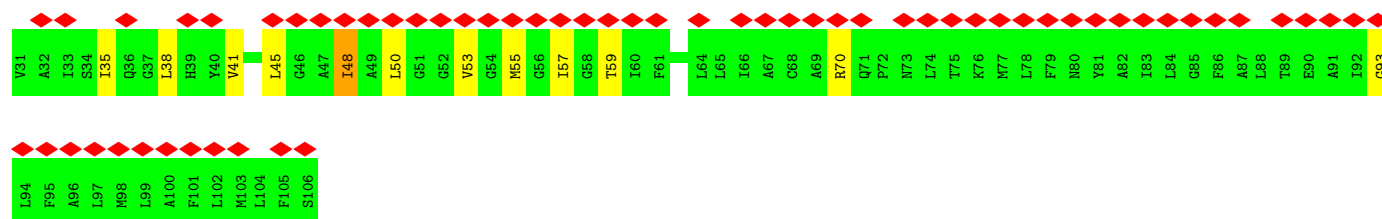


• Molecule 3: Mitochondrial ATP synthase subunit c-1

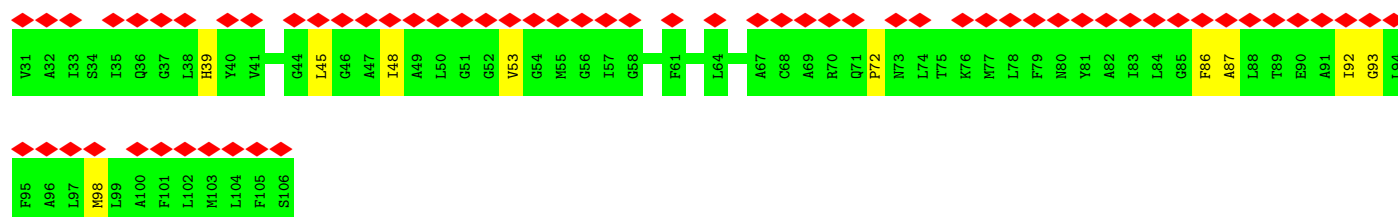
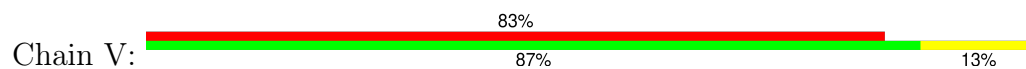


• Molecule 3: Mitochondrial ATP synthase subunit c-1

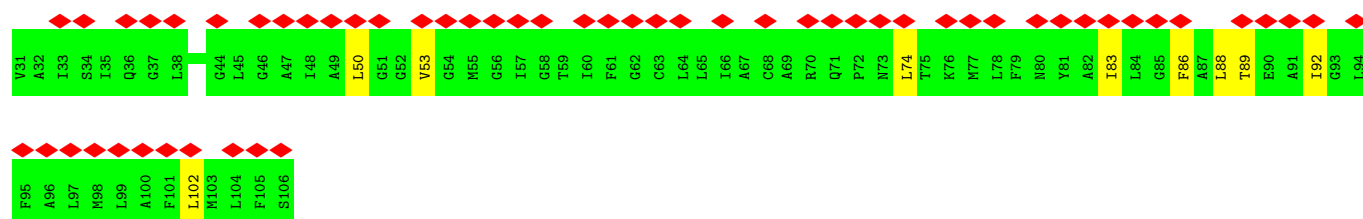
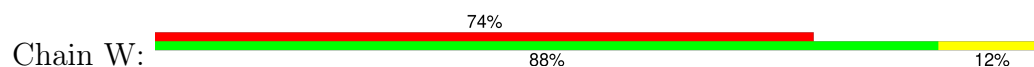




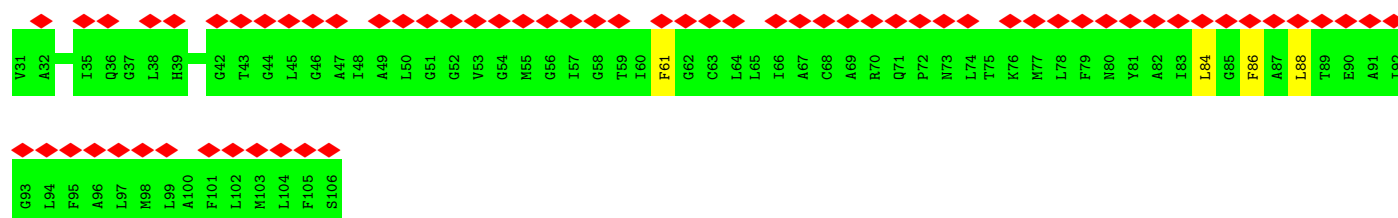
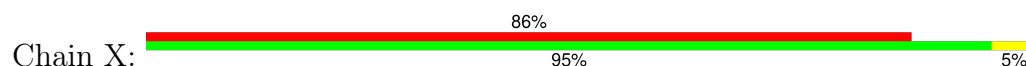
- Molecule 3: Mitochondrial ATP synthase subunit c-1



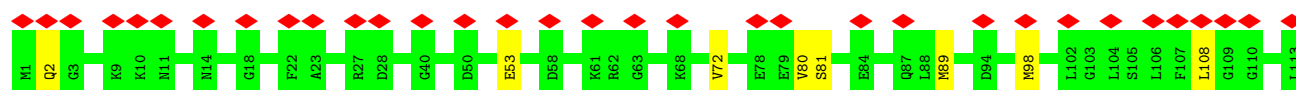
- Molecule 3: Mitochondrial ATP synthase subunit c-1

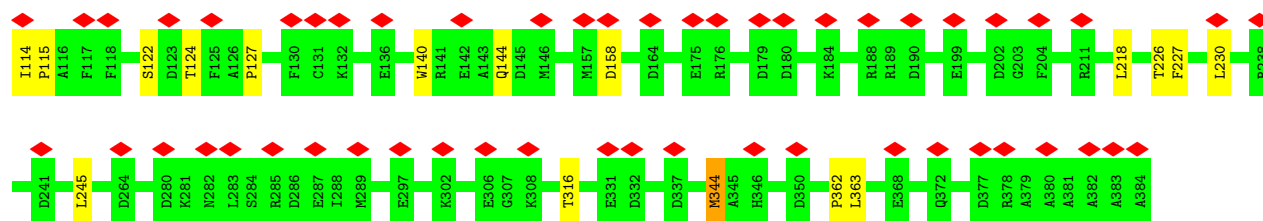


- Molecule 3: Mitochondrial ATP synthase subunit c-1



- Molecule 4: Mitochondrial ATP synthase subunit ATPTB1

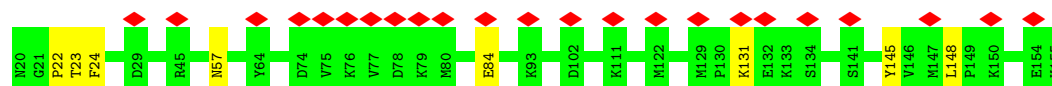




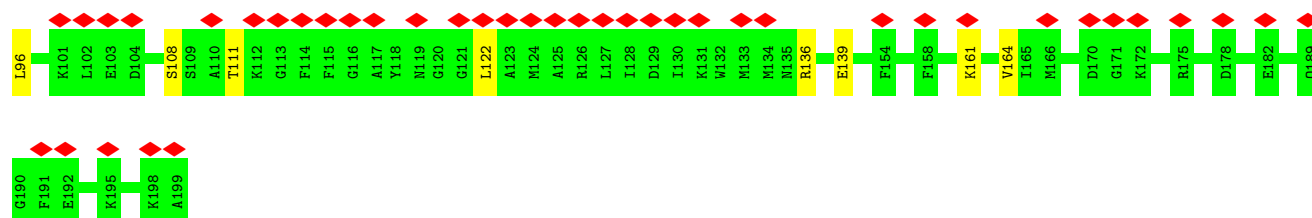
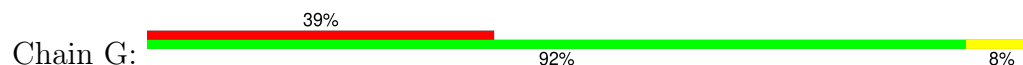
- Molecule 5: Mitochondrial ATP synthase subunit f



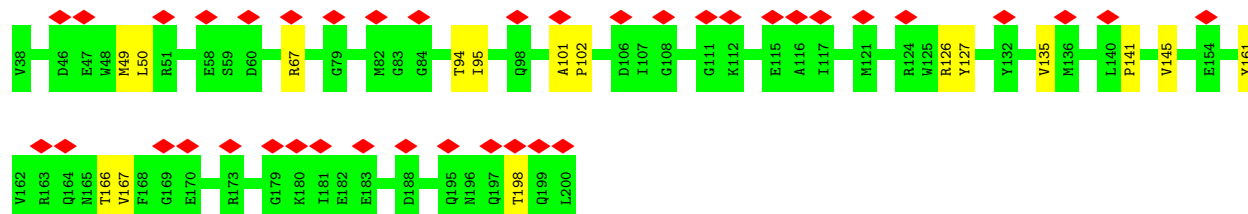
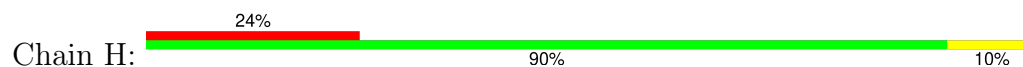
- Molecule 6: Mitochondrial ATP synthase subunit ATPTB11



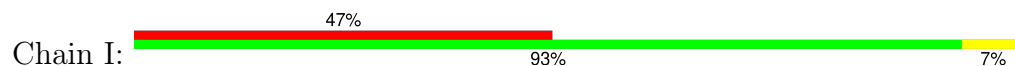
- Molecule 7: Mitochondrial ATP synthase subunit k

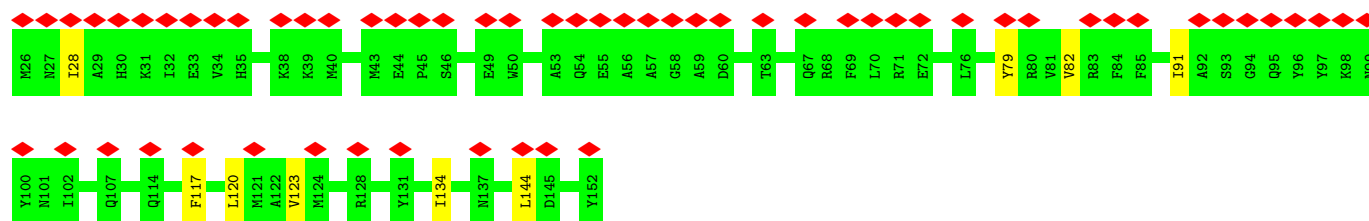


- Molecule 8: Mitochondrial ATP synthase subunit ATPTB6

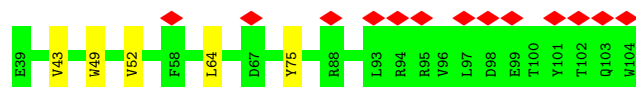
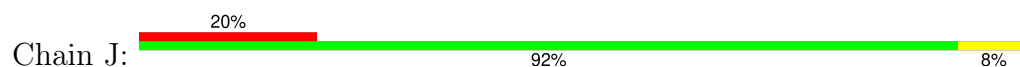


- Molecule 9: Mitochondrial ATP synthase subunit g

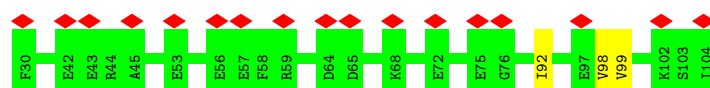




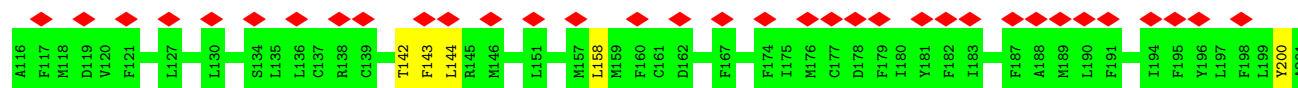
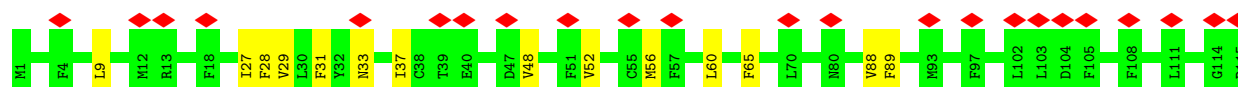
- Molecule 10: Mitochondrial ATP synthase subunit 8



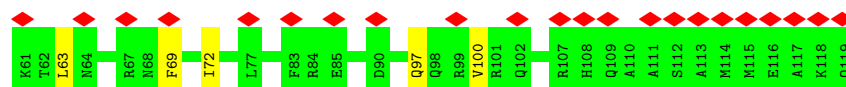
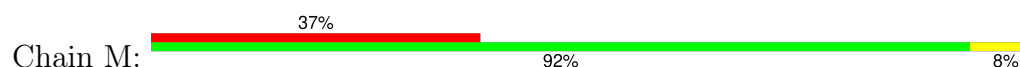
- Molecule 11: Mitochondrial ATP synthase subunit b



- Molecule 12: ATPase 6

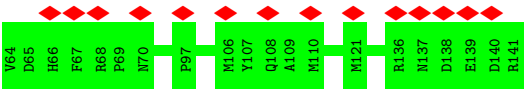


- Molecule 13: Mitochondrial ATP synthase subunit e

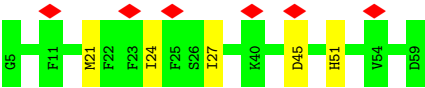
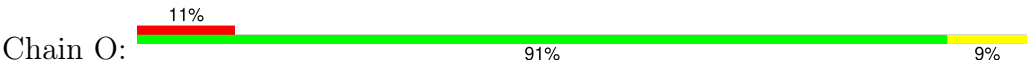


- Molecule 14: Mitochondrial ATP synthase subunit ATPEG3





• Molecule 15: LtATPEG4, LtaP27:632926-633111



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	8358	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	52	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	165000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.173	Depositor
Minimum map value	-0.086	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.010	Depositor
Recommended contour level	0.0673	Depositor
Map size (Å)	353.28, 353.28, 353.28	wwPDB
Map dimensions	480, 480, 480	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.736, 0.736, 0.736	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.15	0/823	0.35	0/1110
2	B	0.14	0/888	0.33	0/1202
3	C	0.15	0/559	0.30	0/753
3	P	0.14	0/559	0.33	0/753
3	Q	0.14	0/559	0.30	0/753
3	R	0.15	0/559	0.30	0/753
3	S	0.14	0/559	0.30	0/753
3	T	0.14	0/559	0.28	0/753
3	U	0.14	0/559	0.31	0/753
3	V	0.13	0/559	0.29	0/753
3	W	0.13	0/559	0.30	0/753
3	X	0.14	0/559	0.25	0/753
4	D	0.13	0/3292	0.32	0/4453
5	E	0.15	0/1046	0.37	0/1419
6	F	0.16	0/1145	0.34	0/1556
7	G	0.14	0/878	0.35	0/1190
8	H	0.13	0/1380	0.31	0/1863
9	I	0.14	0/1054	0.30	0/1421
10	J	0.15	0/617	0.37	0/846
11	K	0.15	0/666	0.31	0/907
12	L	0.15	0/2052	0.34	0/2775
13	M	0.14	0/500	0.27	0/670
14	N	0.14	0/750	0.33	0/1023
15	O	0.17	0/503	0.31	0/685
All	All	0.14	0/21184	0.32	0/28650

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	804	0	779	0	0
2	B	865	0	859	4	0
3	C	550	0	584	11	0
3	P	550	0	584	9	0
3	Q	550	0	584	7	0
3	R	550	0	584	8	0
3	S	550	0	584	9	0
3	T	550	0	584	11	0
3	U	550	0	584	10	0
3	V	550	0	584	11	0
3	W	550	0	584	10	0
3	X	550	0	584	7	0
4	D	3196	0	3050	14	0
5	E	1012	0	991	4	0
6	F	1108	0	1061	7	0
7	G	848	0	828	6	0
8	H	1349	0	1341	9	0
9	I	1030	0	1029	8	0
10	J	590	0	566	3	0
11	K	642	0	604	6	0
12	L	1983	0	1997	12	0
13	M	490	0	475	3	0
14	N	720	0	681	0	0
15	O	481	0	449	2	0
All	All	20618	0	20550	131	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 3.

All (131) 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)
3:W:86:PHE:CE1	3:X:88:LEU:HD21	2.26	0.71
3:C:61:PHE:CZ	3:P:88:LEU:HD21	2.25	0.71
6:F:23:THR:HG22	6:F:24:PHE:H	1.57	0.69

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:I:91:ILE:HD11	13:M:63:LEU:HD11	1.75	0.68
3:U:55:MET:O	3:U:59:THR:HG23	1.93	0.68
12:L:29:VAL:HG13	12:L:56:MET:HE1	1.77	0.65
8:H:49:MET:HE1	8:H:161:TYR:CZ	2.31	0.65
3:R:55:MET:O	3:R:59:THR:HG23	1.96	0.63
9:I:120:LEU:HD12	11:K:92:ILE:HD13	1.82	0.61
4:D:344:MET:HE3	6:F:22:PRO:HD3	1.83	0.60
3:V:53:VAL:HG21	3:V:93:GLY:CA	2.32	0.59
3:C:72:PRO:O	3:C:75:THR:HG23	2.03	0.58
3:P:61:PHE:CZ	3:Q:88:LEU:HD21	2.40	0.56
3:T:35:ILE:HG23	3:U:35:ILE:HD13	1.87	0.56
8:H:198:THR:HG22	8:H:198:THR:O	2.05	0.55
3:C:61:PHE:CE2	3:P:88:LEU:HD11	2.42	0.55
3:W:86:PHE:CD1	3:X:88:LEU:HD21	2.40	0.55
5:E:13:VAL:HG23	5:E:14:ALA:N	2.23	0.54
3:Q:38:LEU:O	3:Q:41:VAL:HG12	2.08	0.54
4:D:218:LEU:HD13	4:D:316:THR:HG21	1.89	0.54
3:P:53:VAL:HG23	3:P:89:THR:HG22	1.90	0.54
3:S:33:ILE:HG22	3:T:31:VAL:CG1	2.38	0.54
3:T:34:SER:C	3:T:35:ILE:HD12	2.33	0.53
12:L:29:VAL:HG12	12:L:31:PHE:H	1.73	0.53
3:V:86:PHE:CZ	3:W:88:LEU:HD12	2.43	0.53
12:L:144:LEU:CD1	3:V:98:MET:HE1	2.39	0.53
9:I:28:ILE:HD12	9:I:28:ILE:H	1.75	0.52
2:B:55:TRP:CG	6:F:131:LYS:HZ1	2.27	0.52
4:D:114:ILE:HB	4:D:115:PRO:HD3	1.91	0.52
3:S:45:LEU:HG	3:T:45:LEU:HD13	1.92	0.52
3:S:50:LEU:HD11	3:S:97:LEU:HD21	1.92	0.51
3:T:42:GLY:C	3:T:103:MET:HE3	2.36	0.51
12:L:9:LEU:HD13	12:L:65:PHE:CZ	2.46	0.51
4:D:344:MET:HE3	6:F:22:PRO:CD	2.40	0.50
3:U:50:LEU:HA	3:U:53:VAL:HG22	1.93	0.50
8:H:166:THR:HG22	8:H:167:VAL:N	2.27	0.50
3:C:69:ALA:HB2	3:P:67:ALA:HB1	1.94	0.49
10:J:49:TRP:O	10:J:52:VAL:HG12	2.11	0.49
5:E:72:GLU:N	5:E:73:PRO:HD2	2.28	0.49
3:U:48:ILE:HD11	3:V:48:ILE:HB	1.95	0.49
3:R:35:ILE:HD11	3:S:35:ILE:CG2	2.43	0.48
9:I:134:ILE:HD12	9:I:144:LEU:HD11	1.95	0.47
8:H:166:THR:HG22	8:H:167:VAL:H	1.79	0.47
3:R:45:LEU:HD22	3:S:45:LEU:HD13	1.95	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:I:117:PHE:CA	11:K:92:ILE:HD11	2.44	0.47
3:W:102:LEU:C	3:W:102:LEU:HD23	2.39	0.47
3:Q:104:LEU:C	3:Q:104:LEU:HD13	2.40	0.47
3:U:53:VAL:HG11	3:U:93:GLY:HA2	1.97	0.47
3:W:89:THR:O	3:W:92:ILE:HG22	2.15	0.47
3:C:89:THR:O	3:C:92:ILE:HG22	2.15	0.47
3:C:57:ILE:HA	3:C:60:ILE:HG22	1.96	0.46
3:C:61:PHE:HZ	3:P:88:LEU:HD21	1.76	0.46
3:C:57:ILE:O	3:C:60:ILE:HG22	2.15	0.46
3:Q:88:LEU:HD12	3:Q:89:THR:N	2.30	0.46
12:L:88:VAL:HG21	12:L:143:PHE:HB3	1.98	0.46
3:V:72:PRO:HG3	3:W:74:LEU:HD11	1.97	0.46
5:E:72:GLU:N	5:E:73:PRO:CD	2.80	0.45
5:E:73:PRO:HA	5:E:76:VAL:HG12	1.97	0.45
3:T:72:PRO:O	3:T:75:THR:HG23	2.16	0.45
15:O:21:MET:O	15:O:24:ILE:HG22	2.17	0.45
3:X:88:LEU:C	3:X:88:LEU:HD23	2.41	0.45
4:D:98:MET:HE2	4:D:127:PRO:HG2	1.98	0.45
12:L:144:LEU:HD12	3:V:98:MET:HE1	1.99	0.45
6:F:23:THR:HG22	6:F:24:PHE:N	2.27	0.45
9:I:79:TYR:HA	9:I:82:VAL:HG12	1.99	0.45
3:P:67:ALA:HB3	3:P:78:LEU:HD21	1.99	0.45
4:D:53:GLU:OE2	8:H:94:THR:HG22	2.17	0.45
3:U:38:LEU:O	3:U:41:VAL:HG12	2.17	0.44
4:D:140:TRP:O	4:D:144:GLN:HG2	2.17	0.44
9:I:117:PHE:HA	11:K:92:ILE:HD11	1.98	0.44
4:D:89:MET:SD	4:D:245:LEU:HD11	2.58	0.44
12:L:27:ILE:HD11	12:L:28:PHE:CE2	2.52	0.44
4:D:80:VAL:HG12	4:D:81:SER:N	2.33	0.44
15:O:24:ILE:HA	15:O:27:ILE:HG22	2.00	0.44
3:P:53:VAL:HG23	3:P:89:THR:CG2	2.47	0.44
2:B:103:ILE:H	2:B:103:ILE:HD12	1.83	0.44
3:S:65:LEU:HD13	3:T:64:LEU:HA	1.99	0.44
3:T:45:LEU:HG	3:U:45:LEU:HD13	1.99	0.44
7:G:108:SER:O	7:G:111:THR:HG22	2.18	0.43
4:D:122:SER:OG	4:D:124:THR:HG22	2.18	0.43
11:K:98:VAL:O	11:K:98:VAL:HG12	2.18	0.43
3:W:102:LEU:HD23	3:W:102:LEU:O	2.19	0.43
3:U:48:ILE:HD11	3:V:45:LEU:O	2.18	0.43
3:V:45:LEU:HD12	3:V:48:ILE:HD12	1.99	0.43
8:H:49:MET:HE1	8:H:161:TYR:CE1	2.53	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:U:53:VAL:HG11	3:U:93:GLY:CA	2.48	0.43
3:V:86:PHE:CE1	3:W:88:LEU:HD12	2.54	0.43
12:L:209:LEU:HD21	3:V:87:ALA:HB2	1.99	0.43
3:P:57:ILE:HD13	3:Q:92:ILE:HD12	2.01	0.43
12:L:52:VAL:O	12:L:56:MET:HG2	2.18	0.43
7:G:122:LEU:HD12	7:G:122:LEU:H	1.84	0.43
3:S:50:LEU:HD11	3:S:97:LEU:CD2	2.48	0.43
13:M:97:GLN:HA	13:M:100:VAL:HG12	2.01	0.42
3:R:55:MET:HE3	3:S:55:MET:CG	2.48	0.42
3:R:56:GLY:O	3:R:60:ILE:HG12	2.19	0.42
8:H:101:ALA:HB1	8:H:102:PRO:HD2	2.00	0.42
3:T:97:LEU:O	3:T:97:LEU:HD13	2.19	0.42
3:W:50:LEU:HA	3:W:53:VAL:HG12	2.00	0.42
2:B:16:LEU:C	2:B:16:LEU:HD13	2.44	0.42
3:C:60:ILE:HD13	3:X:61:PHE:CB	2.49	0.42
9:I:123:VAL:HG11	11:K:99:VAL:HG13	2.01	0.42
3:T:97:LEU:HD13	3:T:97:LEU:C	2.44	0.42
3:U:57:ILE:HD12	3:V:92:ILE:HG13	2.01	0.42
7:G:136:ARG:HA	7:G:139:GLU:HG2	2.02	0.42
10:J:64:LEU:HD23	12:L:60:LEU:HD23	2.02	0.42
13:M:69:PHE:O	13:M:72:ILE:HG22	2.19	0.42
11:K:99:VAL:HG12	11:K:99:VAL:O	2.19	0.42
3:S:102:LEU:HD12	3:S:102:LEU:C	2.44	0.42
6:F:148:LEU:H	6:F:148:LEU:HD22	1.84	0.41
12:L:158:LEU:C	12:L:158:LEU:HD23	2.45	0.41
3:W:86:PHE:CE2	3:X:88:LEU:HD11	2.55	0.41
3:C:88:LEU:HD23	3:X:86:PHE:CE1	2.55	0.41
3:R:38:LEU:O	3:R:41:VAL:HG12	2.20	0.41
8:H:141:PRO:O	8:H:145:VAL:HG23	2.21	0.41
3:Q:43:THR:HG23	3:Q:44:GLY:N	2.36	0.41
3:R:35:ILE:O	3:R:35:ILE:HG23	2.20	0.41
7:G:96:LEU:HD22	7:G:96:LEU:N	2.35	0.41
3:T:56:GLY:O	3:T:60:ILE:HG12	2.21	0.41
6:F:145:TYR:HB3	6:F:148:LEU:HD21	2.03	0.41
7:G:122:LEU:HD12	7:G:122:LEU:N	2.35	0.41
3:Q:61:PHE:HB2	3:R:60:ILE:CD1	2.50	0.41
7:G:161:LYS:HA	7:G:164:VAL:HG12	2.02	0.41
10:J:43:VAL:HG22	10:J:43:VAL:O	2.21	0.41
4:D:230:LEU:CD1	8:H:135:VAL:HG11	2.51	0.40
4:D:362:PRO:O	4:D:363:LEU:HG	2.21	0.40
3:C:50:LEU:HA	3:C:53:VAL:HG12	2.03	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:X:84:LEU:HD23	3:X:84:LEU:C	2.46	0.40
2:B:59:PRO:O	2:B:60:TYR:HB2	2.20	0.40
4:D:226:THR:O	4:D:226:THR:HG23	2.21	0.40
4:D:363:LEU:HD12	4:D:363:LEU:C	2.47	0.40
12:L:37:ILE:CD1	12:L:48:VAL:HG21	2.52	0.40

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	97/99 (98%)	95 (98%)	2 (2%)	0	100	100
2	B	100/102 (98%)	98 (98%)	2 (2%)	0	100	100
3	C	74/76 (97%)	74 (100%)	0	0	100	100
3	P	74/76 (97%)	73 (99%)	1 (1%)	0	100	100
3	Q	74/76 (97%)	73 (99%)	1 (1%)	0	100	100
3	R	74/76 (97%)	74 (100%)	0	0	100	100
3	S	74/76 (97%)	74 (100%)	0	0	100	100
3	T	74/76 (97%)	72 (97%)	2 (3%)	0	100	100
3	U	74/76 (97%)	73 (99%)	1 (1%)	0	100	100
3	V	74/76 (97%)	73 (99%)	1 (1%)	0	100	100
3	W	74/76 (97%)	73 (99%)	1 (1%)	0	100	100
3	X	74/76 (97%)	72 (97%)	2 (3%)	0	100	100
4	D	382/384 (100%)	369 (97%)	12 (3%)	1 (0%)	36	64
5	E	121/123 (98%)	112 (93%)	9 (7%)	0	100	100
6	F	134/136 (98%)	128 (96%)	6 (4%)	0	100	100
7	G	102/104 (98%)	100 (98%)	2 (2%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
8	H	161/163 (99%)	156 (97%)	5 (3%)	0	100	100
9	I	125/127 (98%)	122 (98%)	3 (2%)	0	100	100
10	J	64/66 (97%)	61 (95%)	3 (5%)	0	100	100
11	K	73/75 (97%)	73 (100%)	0	0	100	100
12	L	229/231 (99%)	220 (96%)	9 (4%)	0	100	100
13	M	57/59 (97%)	53 (93%)	4 (7%)	0	100	100
14	N	76/78 (97%)	73 (96%)	3 (4%)	0	100	100
15	O	53/55 (96%)	53 (100%)	0	0	100	100
All	All	2514/2562 (98%)	2444 (97%)	69 (3%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	D	227	PHE

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	83/83 (100%)	82 (99%)	1 (1%)	63	70
2	B	93/93 (100%)	92 (99%)	1 (1%)	65	71
3	C	54/54 (100%)	53 (98%)	1 (2%)	50	64
3	P	54/54 (100%)	54 (100%)	0	100	100
3	Q	54/54 (100%)	53 (98%)	1 (2%)	50	64
3	R	54/54 (100%)	54 (100%)	0	100	100
3	S	54/54 (100%)	54 (100%)	0	100	100
3	T	54/54 (100%)	52 (96%)	2 (4%)	30	52
3	U	54/54 (100%)	52 (96%)	2 (4%)	30	52
3	V	54/54 (100%)	53 (98%)	1 (2%)	50	64

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	W	54/54 (100%)	53 (98%)	1 (2%)	50	64
3	X	54/54 (100%)	54 (100%)	0	100	100
4	D	331/331 (100%)	326 (98%)	5 (2%)	57	66
5	E	106/106 (100%)	106 (100%)	0	100	100
6	F	123/123 (100%)	121 (98%)	2 (2%)	55	66
7	G	87/87 (100%)	87 (100%)	0	100	100
8	H	139/139 (100%)	134 (96%)	5 (4%)	31	53
9	I	108/108 (100%)	108 (100%)	0	100	100
10	J	64/64 (100%)	63 (98%)	1 (2%)	55	66
11	K	70/70 (100%)	70 (100%)	0	100	100
12	L	222/222 (100%)	218 (98%)	4 (2%)	51	65
13	M	48/48 (100%)	48 (100%)	0	100	100
14	N	77/77 (100%)	77 (100%)	0	100	100
15	O	48/48 (100%)	46 (96%)	2 (4%)	26	49
All	All	2139/2139 (100%)	2110 (99%)	29 (1%)	57	68

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	64	TYR
2	B	72	ARG
3	C	84	LEU
4	D	2	GLN
4	D	72	VAL
4	D	108	LEU
4	D	158	ASP
4	D	344	MET
6	F	57	ASN
6	F	84	GLU
8	H	50	LEU
8	H	67	ARG
8	H	95	ILE
8	H	126	ARG
8	H	127	TYR
10	J	75	TYR
12	L	33	ASN
12	L	89	PHE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
12	L	142	THR
12	L	200	TYR
15	O	45	ASP
15	O	51	HIS
3	Q	39	HIS
3	T	55	MET
3	T	101	PHE
3	U	48	ILE
3	U	70	ARG
3	V	39	HIS
3	W	83	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3	GLN
4	D	2	GLN
4	D	244	ASN
4	D	268	HIS
4	D	372	GLN
5	E	66	HIS
5	E	67	ASN
7	G	98	HIS
8	H	164	GLN
3	P	73	ASN
3	P	80	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 oligosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

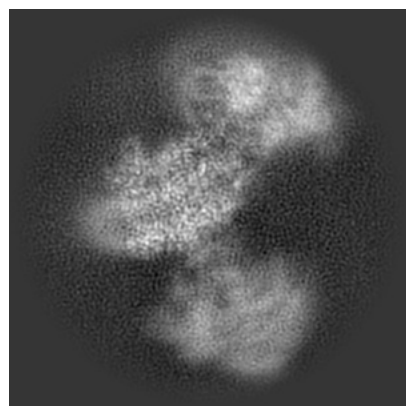
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-74031. These allow visual inspection of the internal detail of the map and identification of artifacts.

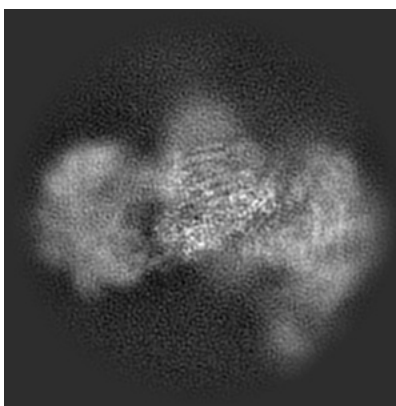
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

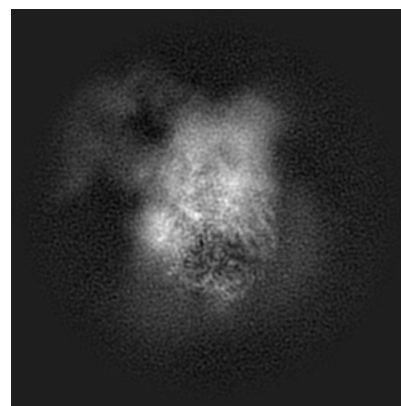
6.1.1 Primary map



X

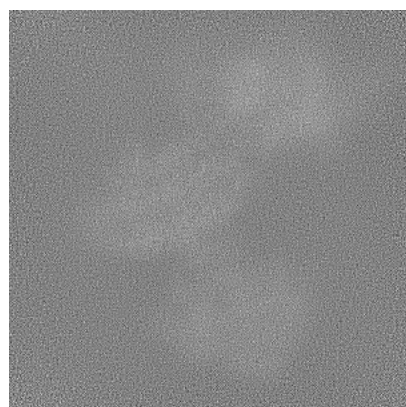


Y

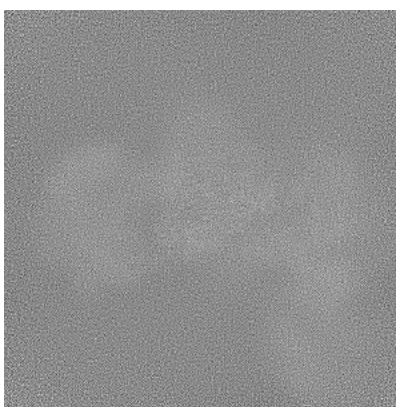


Z

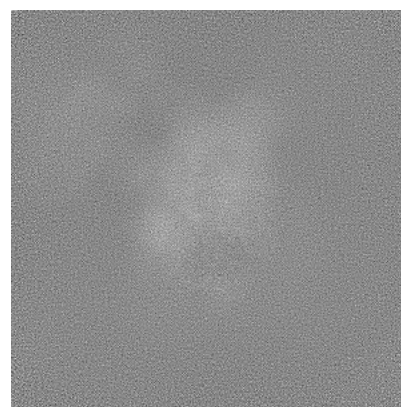
6.1.2 Raw map



X



Y

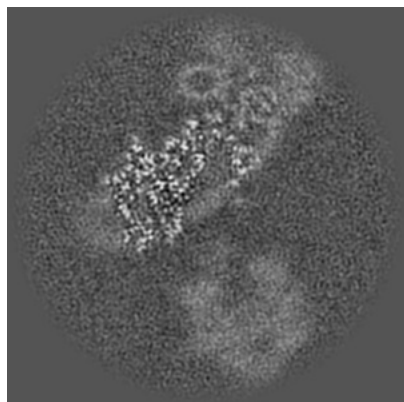


Z

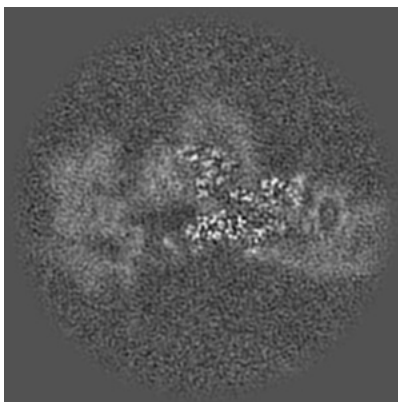
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

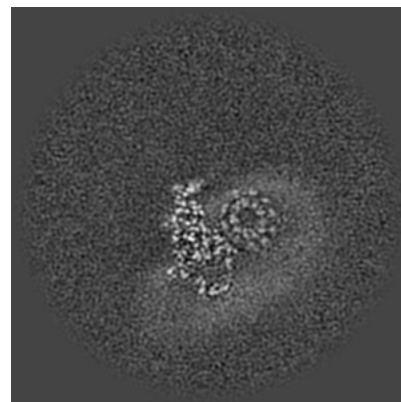
6.2.1 Primary map



X Index: 240

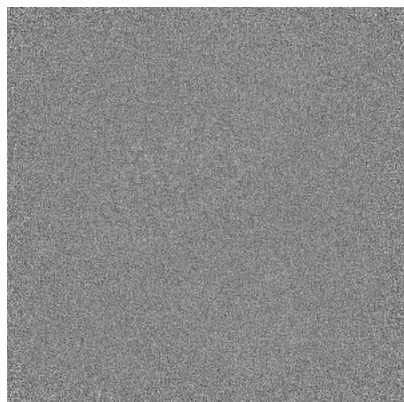


Y Index: 240

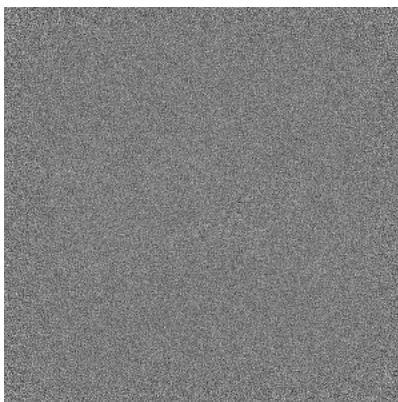


Z Index: 240

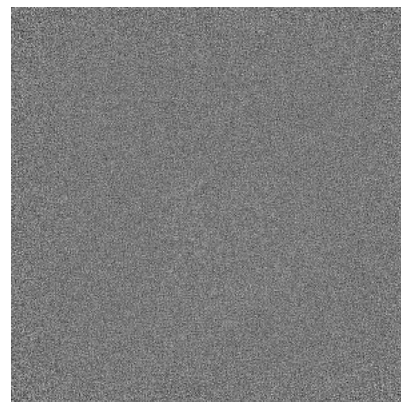
6.2.2 Raw map



X Index: 240



Y Index: 240

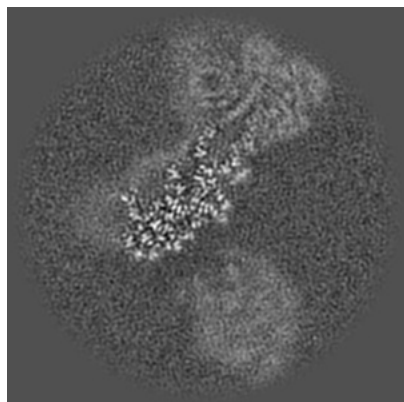


Z Index: 240

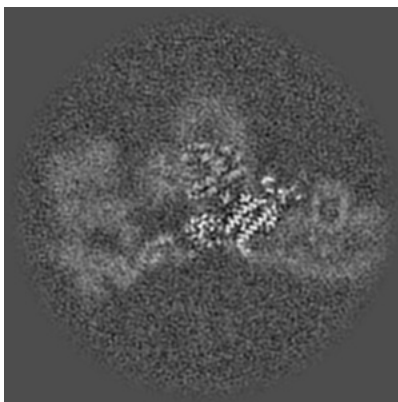
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

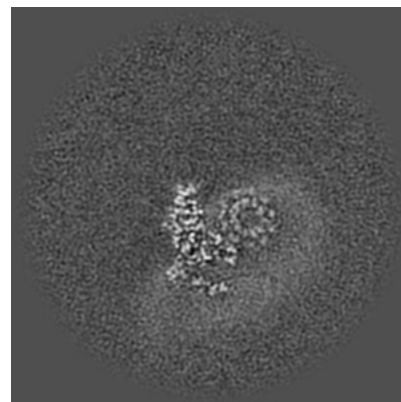
6.3.1 Primary map



X Index: 218

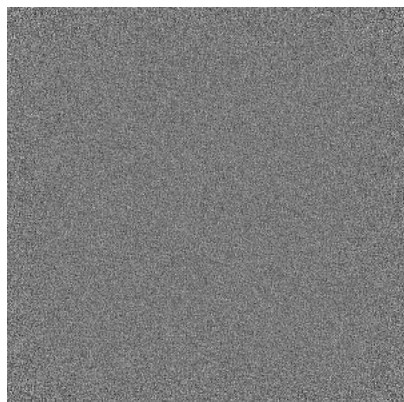


Y Index: 232

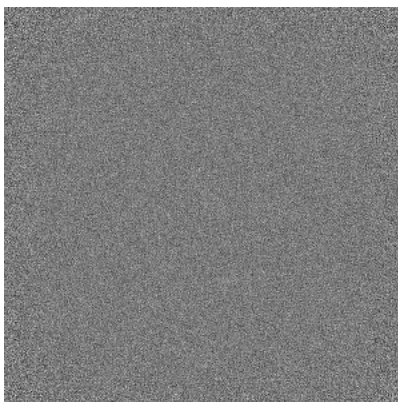


Z Index: 238

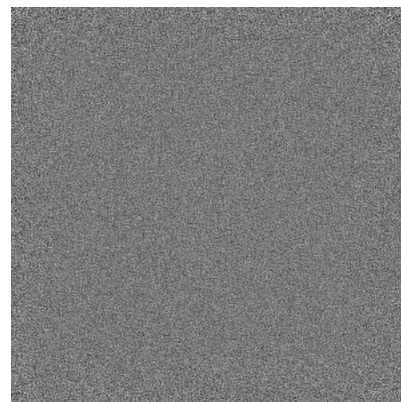
6.3.2 Raw map



X Index: 0



Y Index: 0

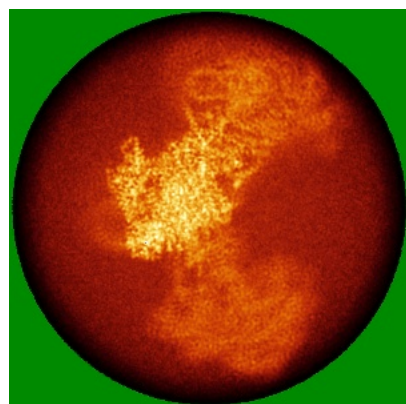


Z Index: 0

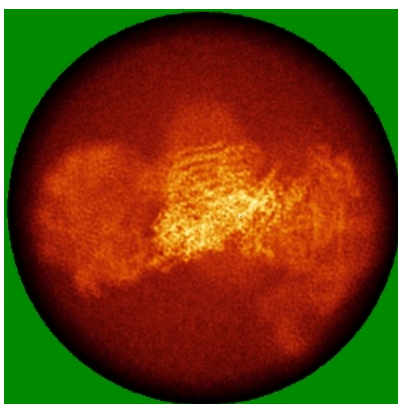
The images above show the largest variance slices of the map in three orthogonal directions.

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

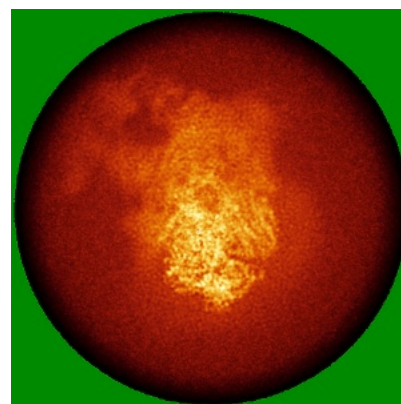
6.4.1 Primary map



X

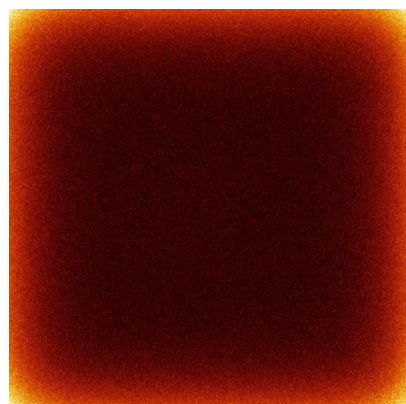


Y

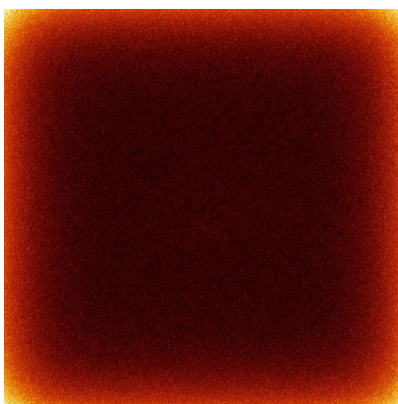


Z

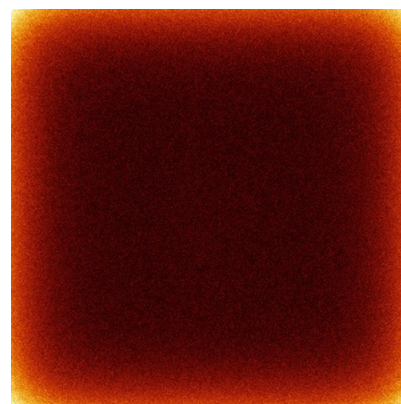
6.4.2 Raw map



X



Y

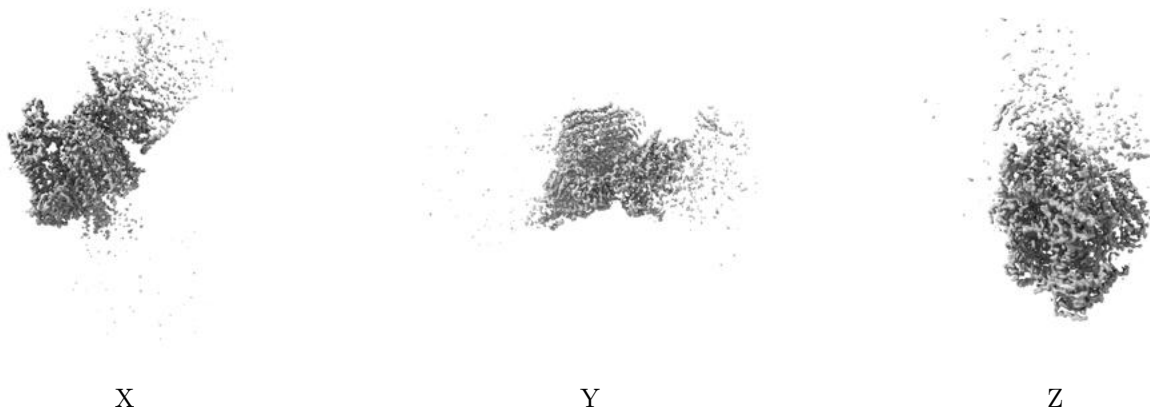


Z

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

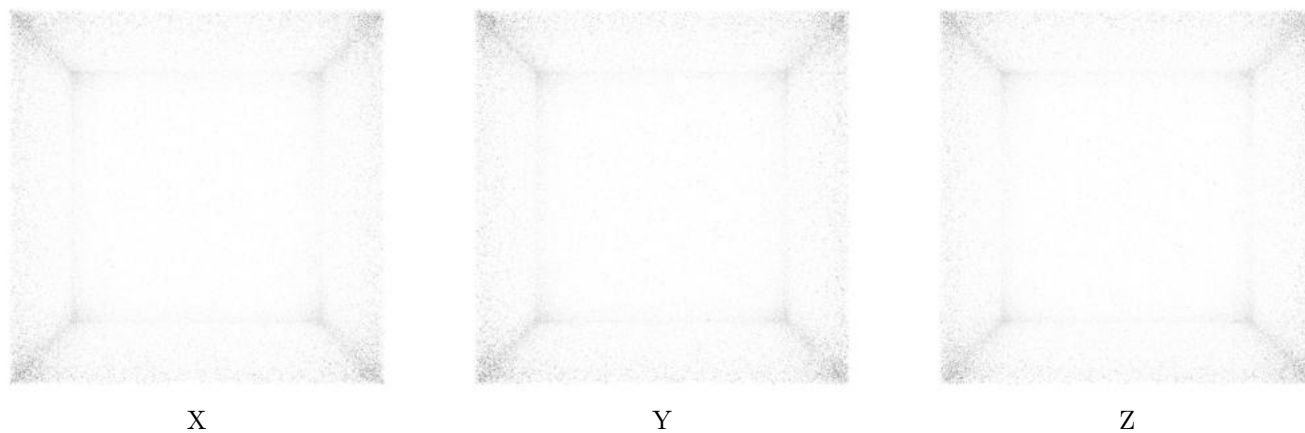
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0673. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

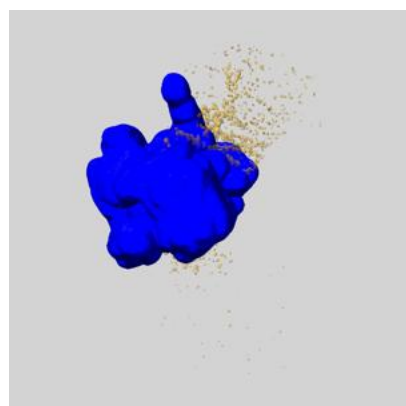
6.6 Mask visualisation [i](#)

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

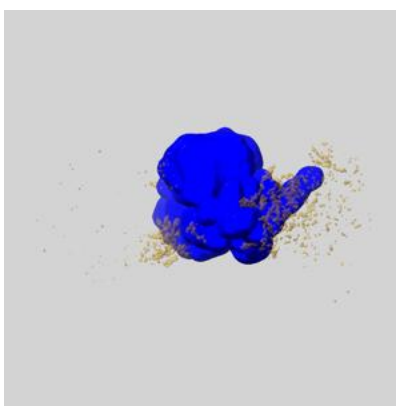
A mask typically either:

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

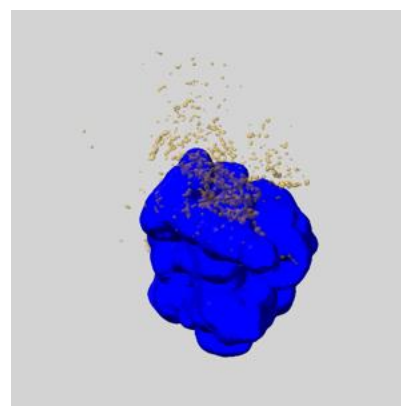
6.6.1 emd_74031_msk_1.map [i](#)



X



Y

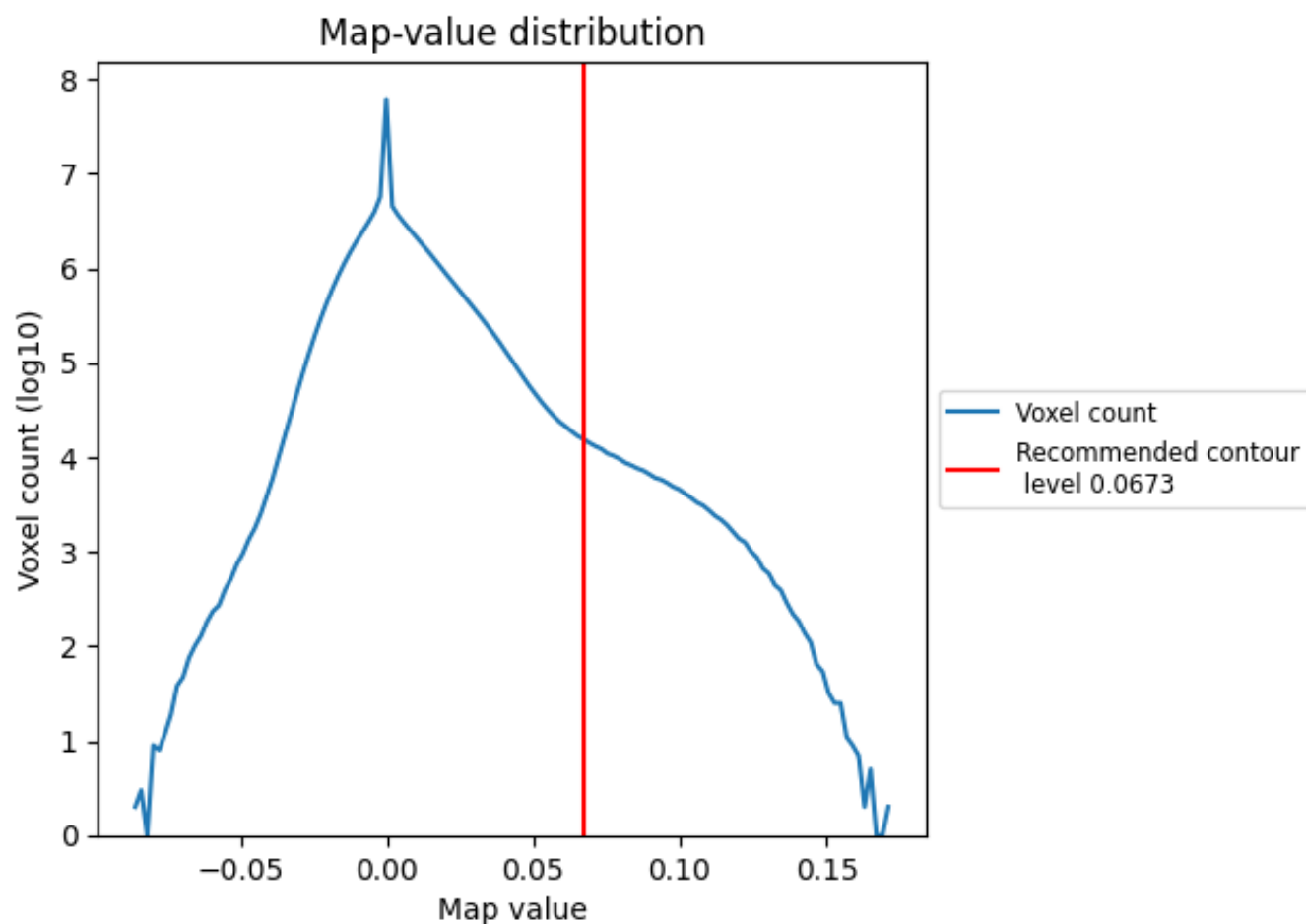


Z

7 Map analysis [i](#)

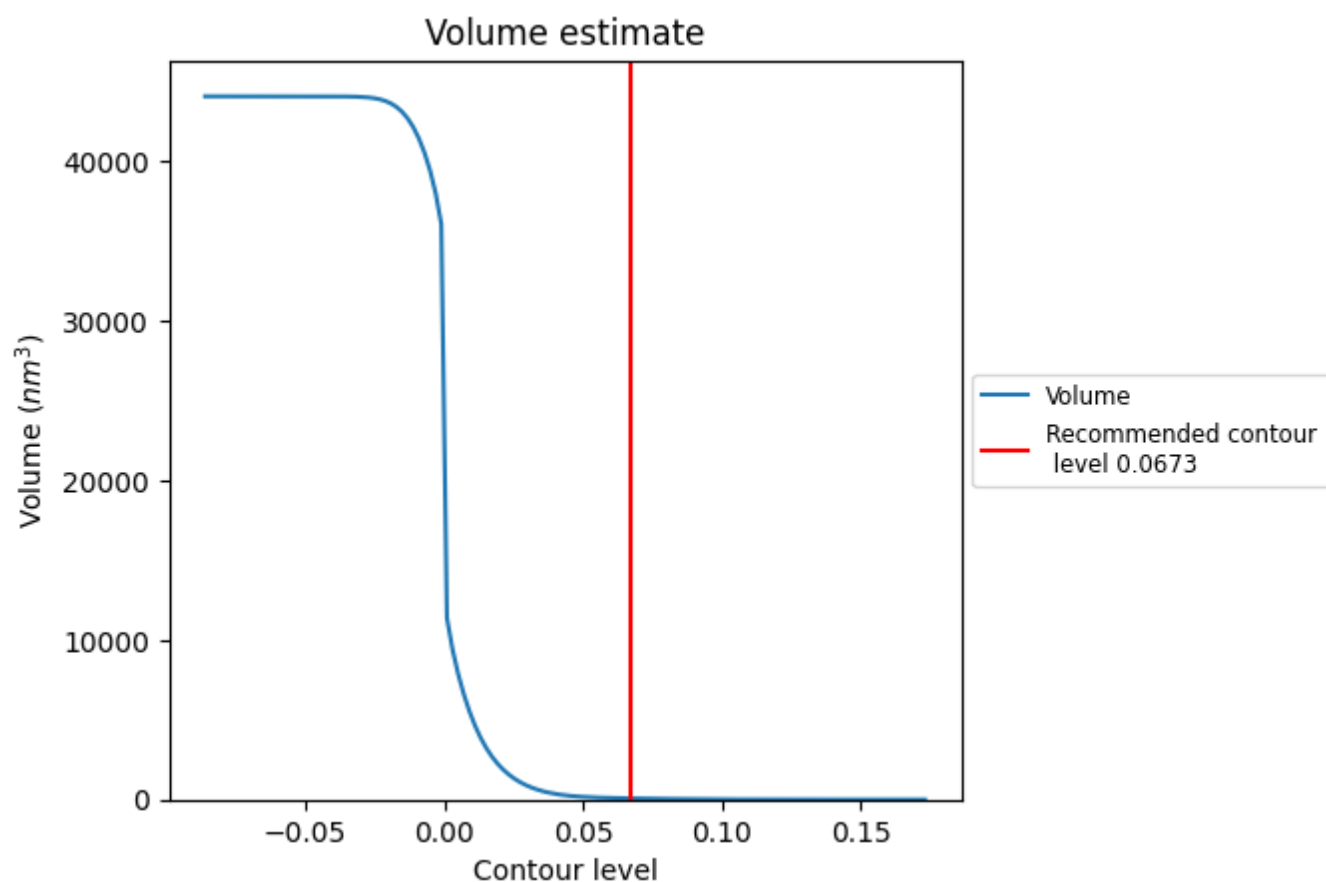
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

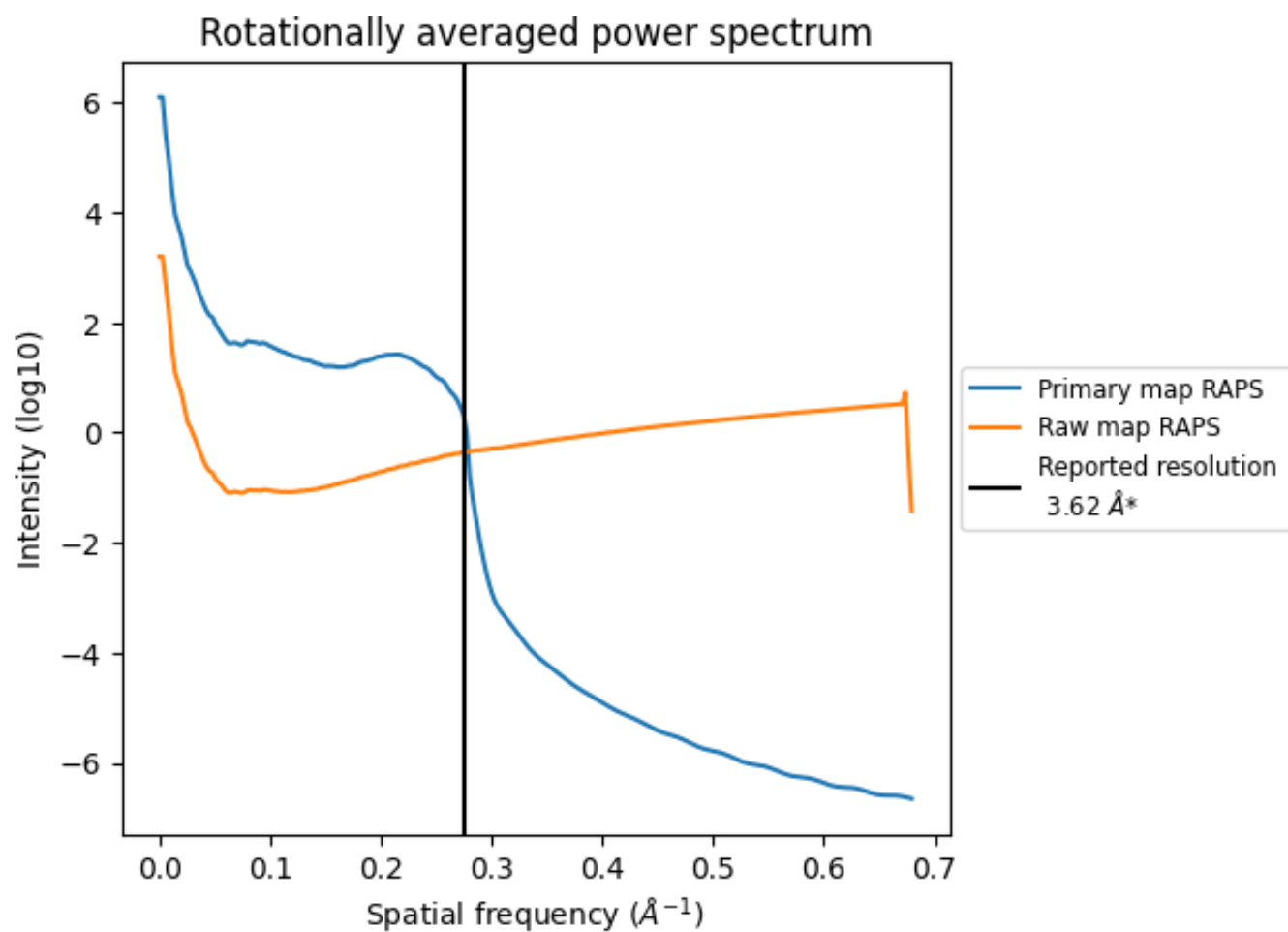
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 73 nm³; this corresponds to an approximate mass of 66 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ

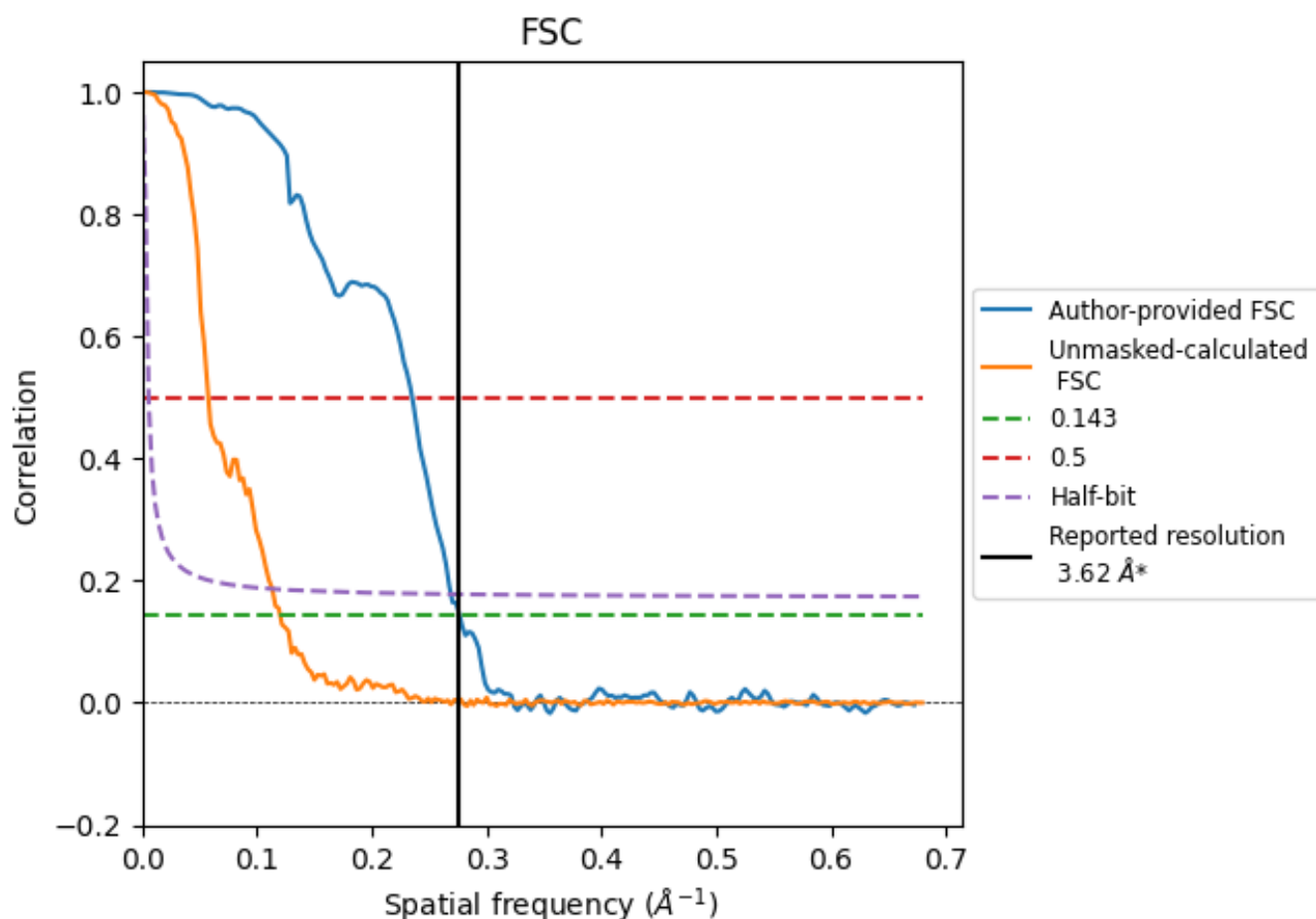


*Reported resolution corresponds to spatial frequency of 0.276 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.276 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

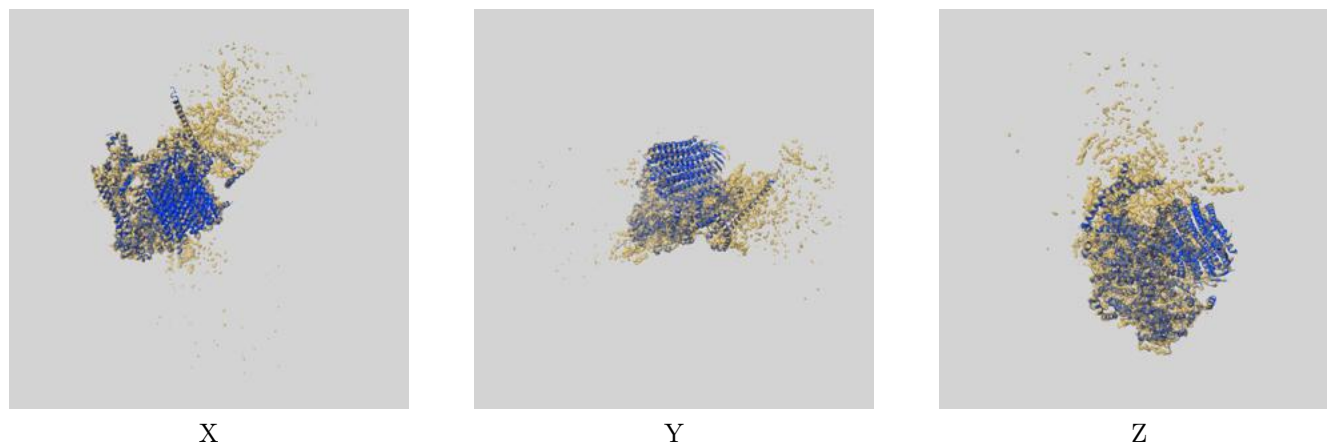
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.62	-	-
Author-provided FSC curve	3.62	4.25	3.72
Unmasked-calculated*	8.33	17.36	8.83

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 8.33 differs from the reported value 3.62 by more than 10 %

9 Map-model fit [i](#)

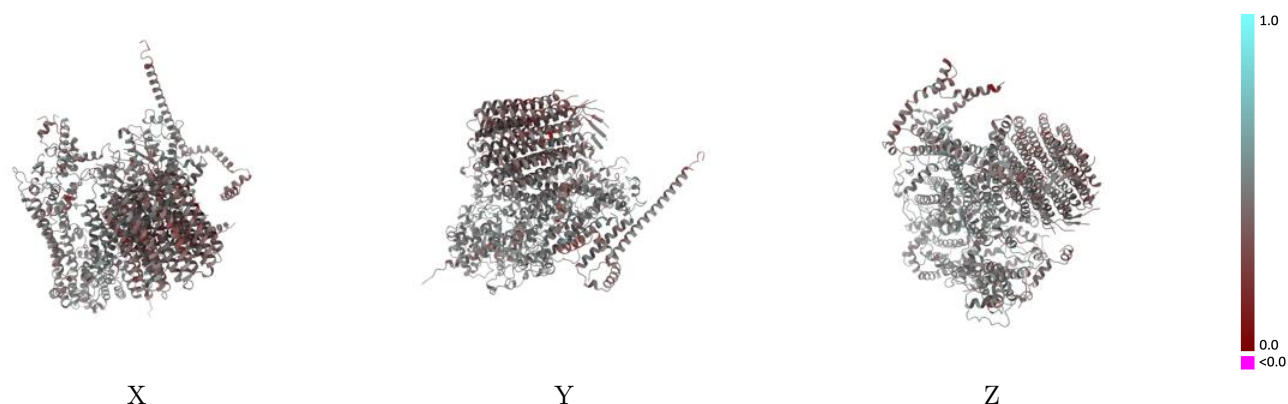
This section contains information regarding the fit between EMDB map EMD-74031 and PDB model 9ZC5. Per-residue inclusion information can be found in section [3](#) on page [7](#).

9.1 Map-model overlay [i](#)



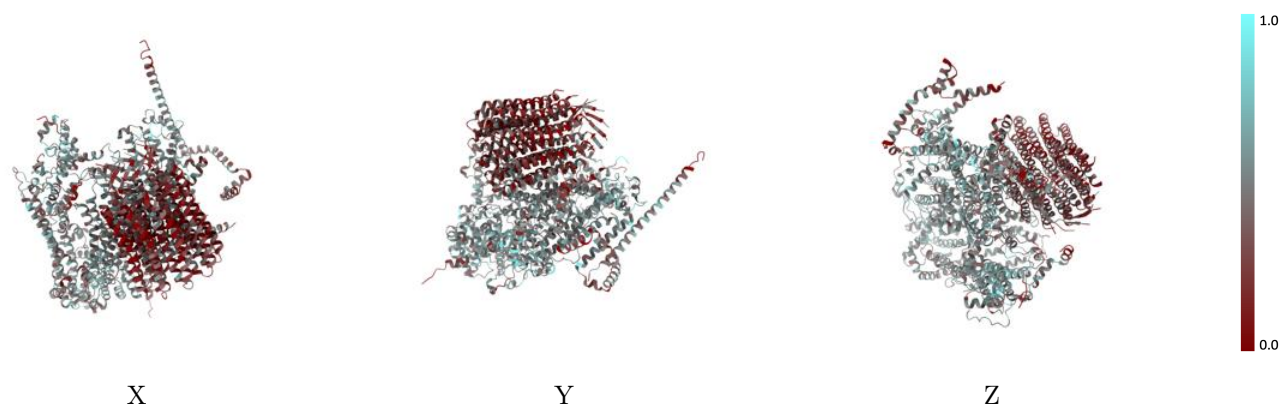
The images above show the 3D surface view of the map at the recommended contour level 0.0673 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



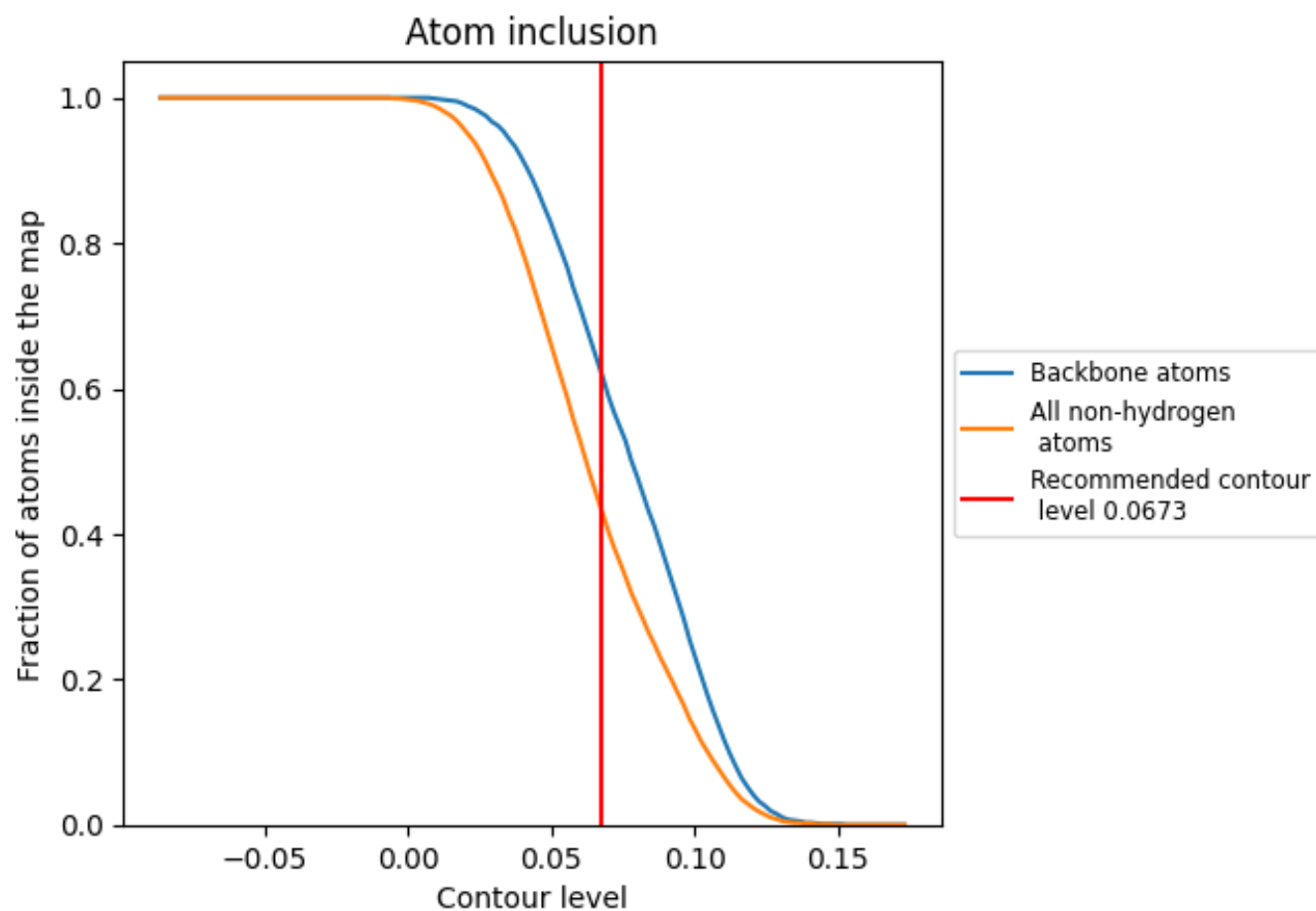
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0673).

9.4 Atom inclusion [i](#)



At the recommended contour level, 62% of all backbone atoms, 44% 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 (0.0673) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4370	 0.4540
A	 0.4880	 0.4470
B	 0.5410	 0.4750
C	 0.1980	 0.3890
D	 0.5450	 0.4750
E	 0.5490	 0.4850
F	 0.5260	 0.4820
G	 0.4560	 0.4680
H	 0.5150	 0.4670
I	 0.4180	 0.4250
J	 0.5340	 0.4750
K	 0.5410	 0.4860
L	 0.4730	 0.4810
M	 0.4230	 0.4310
N	 0.5730	 0.4850
O	 0.5840	 0.4830
P	 0.2030	 0.3790
Q	 0.2270	 0.3960
R	 0.2310	 0.4030
S	 0.2090	 0.3990
T	 0.2220	 0.4190
U	 0.2660	 0.4280
V	 0.2770	 0.4320
W	 0.2860	 0.4310
X	 0.2230	 0.4130

