wwPDB EM Validation Summary Report

Jan 1, 2025 – 10:39 AM EST

PDB ID	:	8TEK
EMDB ID	:	EMD-41189
Title	:	Baseplate of Nexin-dynein regulatory complex from Tetrahymena thermophila
Authors	:	Ghanaeian, A.G.; Black, C.S.; Yang, S.K.; Bui, K.H.
Deposited on	:	2023-07-06
Resolution	:	3.60 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:

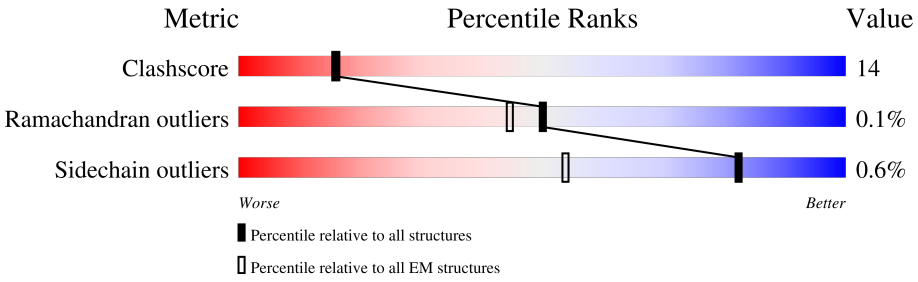
EMDB validation analysis	:	0.0.1.dev113
MolProbity	:	4.02b-467
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.60 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	826	11% 15% 9% 76%
2	B	506	12% 30% 11% 59%
3	D	472	22% 30% 12% 58%
4	E	468	23% 33% 14% 53%
5	M	644	8% 16% 9% 75%
6	N	963	15% 81%
7	O	893	13% 7% 80%
8	P	794	8% 10% 7% 83%

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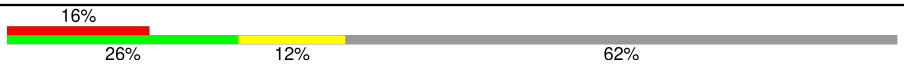
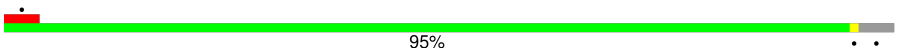
Mol	Chain	Length	Quality of chain
9	T	361	
10	g	195	

2 Entry composition (i)

There are 10 unique types of molecules in this entry. The entry contains 15250 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 Dynein regulatory complex protein 1/2 N-terminal domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	200	Total	C	N	O	S	0	0
			1745	1125	309	302	9		

- Molecule 2 is a protein called Coiled-coil protein, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	208	Total	C	N	O	S	0	0
			1758	1110	320	322	6		

- Molecule 3 is a protein called Growth-arrest-specific microtubule-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	199	Total	C	N	O	S	0	0
			1663	1056	277	329	1		

- Molecule 4 is a protein called Growth-arrest-specific microtubule-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	219	Total	C	N	O	S	0	0
			1794	1125	323	344	2		

- Molecule 5 is a protein called Cilia- and flagella-associated protein 91.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	M	164	Total	C	N	O	S	0	0
			1373	851	259	260	3		

- Molecule 6 is a protein called Flagella associated protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	N	187	Total	C	N	O	S	0	0
			1550	971	266	308	5		

- Molecule 7 is a protein called Coiled-coil protein, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	O	178	Total	C	N	O	S	0	0
			1516	944	273	296	3		

- Molecule 8 is a protein called DUF4201 domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	P	138	Total	C	N	O	S	0	0
			1150	701	216	231	2		

- Molecule 9 is a protein called Flagellar associated protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	T	137	Total	C	N	O	S	0	0
			1145	726	202	215	2		

- Molecule 10 is a protein called CFAP20.

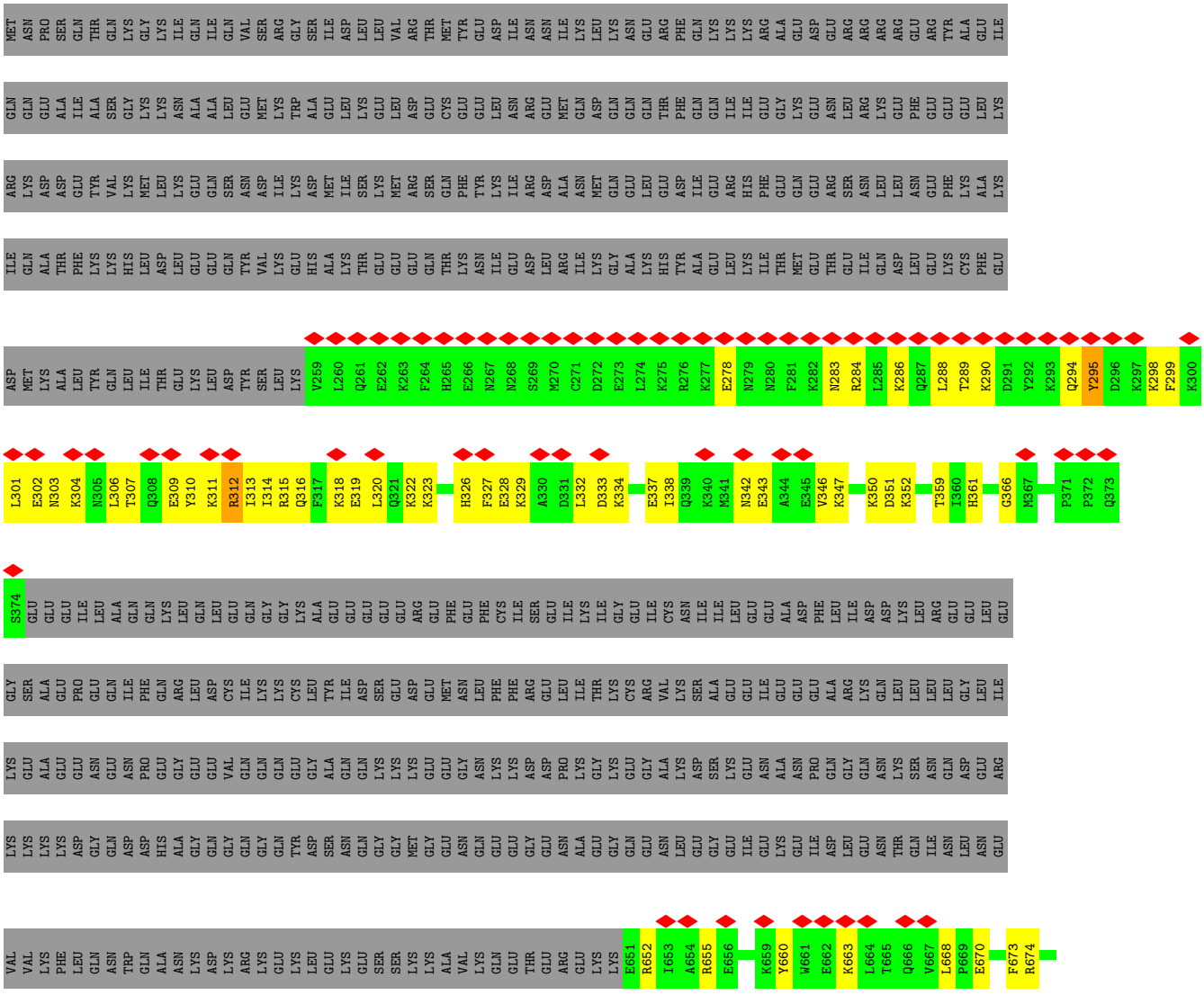
Mol	Chain	Residues	Atoms					AltConf	Trace
10	g	187	Total	C	N	O	S	0	0
			1556	1003	269	277	7		

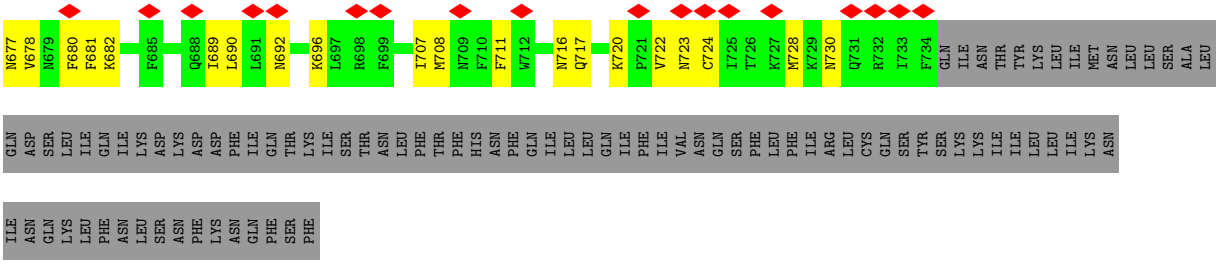
3 Residue-property plots (i)

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: Dynein regulatory complex protein 1/2 N-terminal domain-containing protein

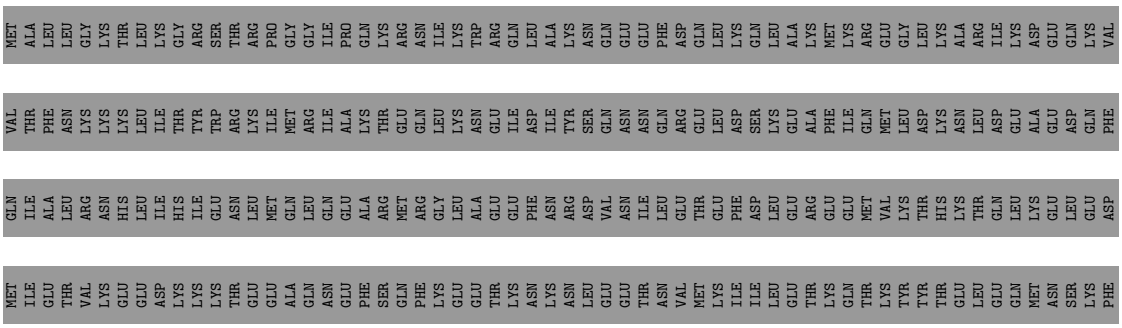
Chain A:

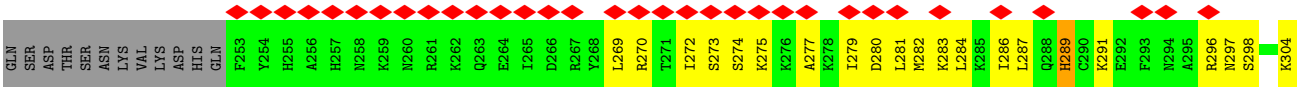


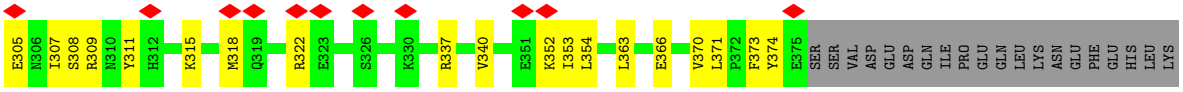


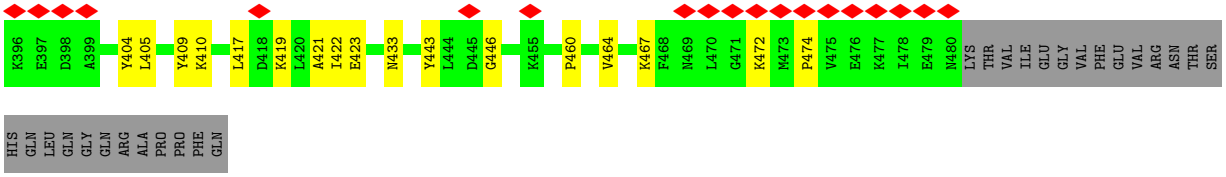
• Molecule 2: Coiled-coil protein, putative

Chain B:



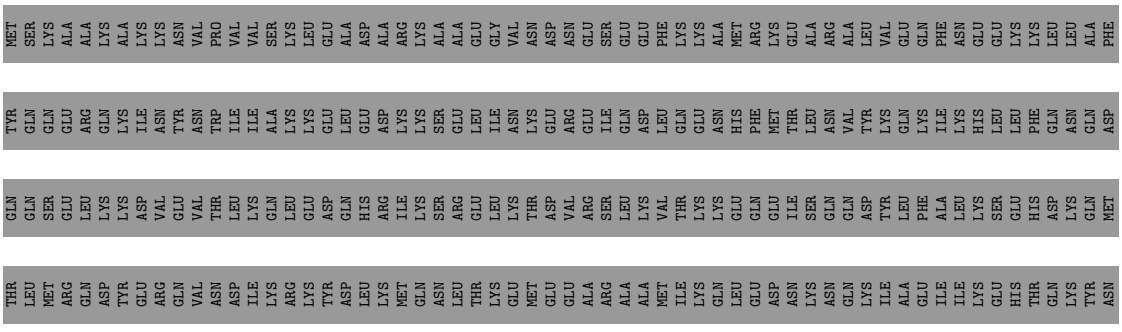


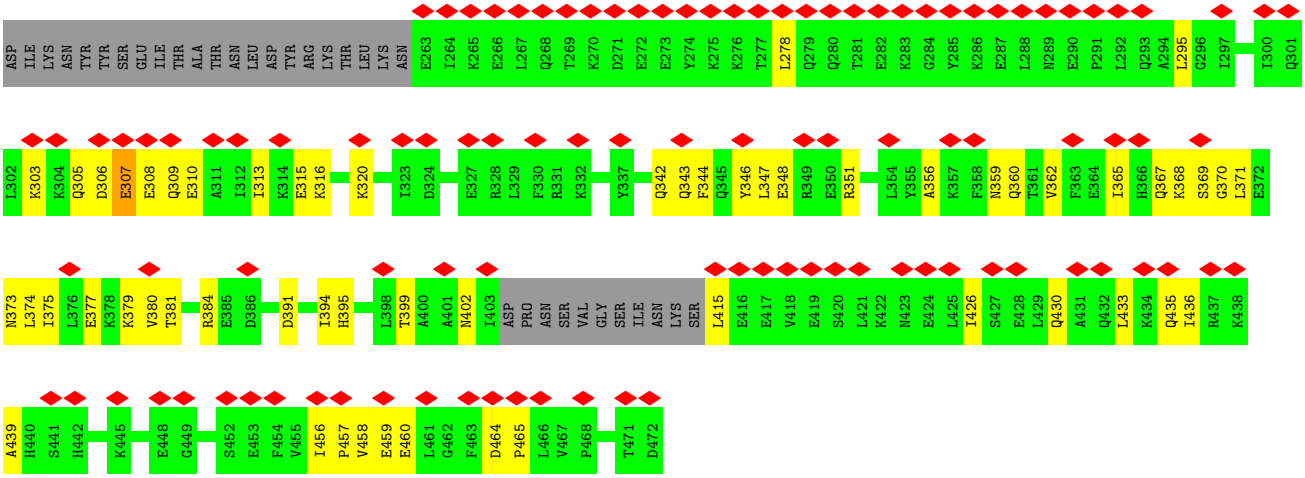




• Molecule 3: Growth-arrest-specific microtubule-binding protein

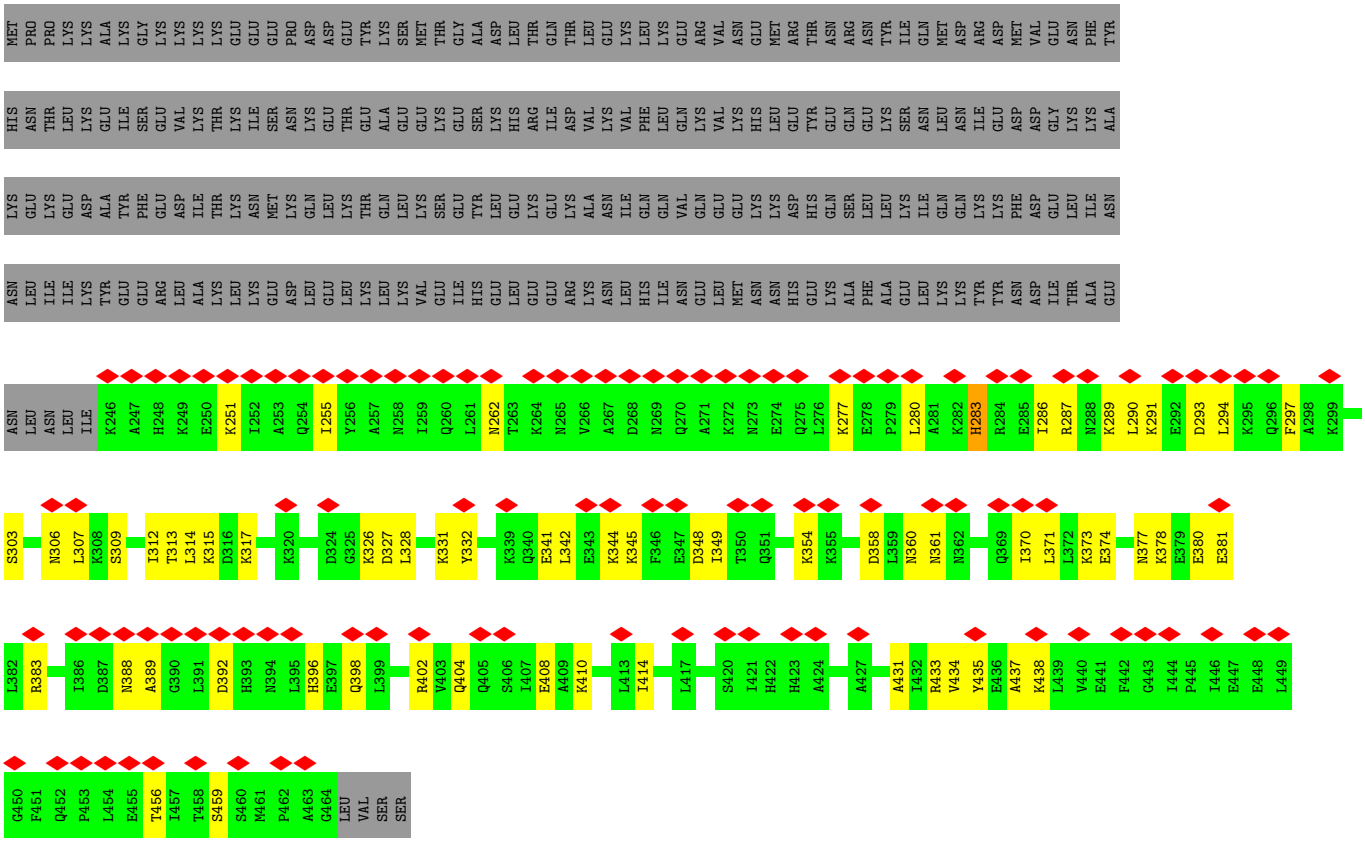
Chain D:





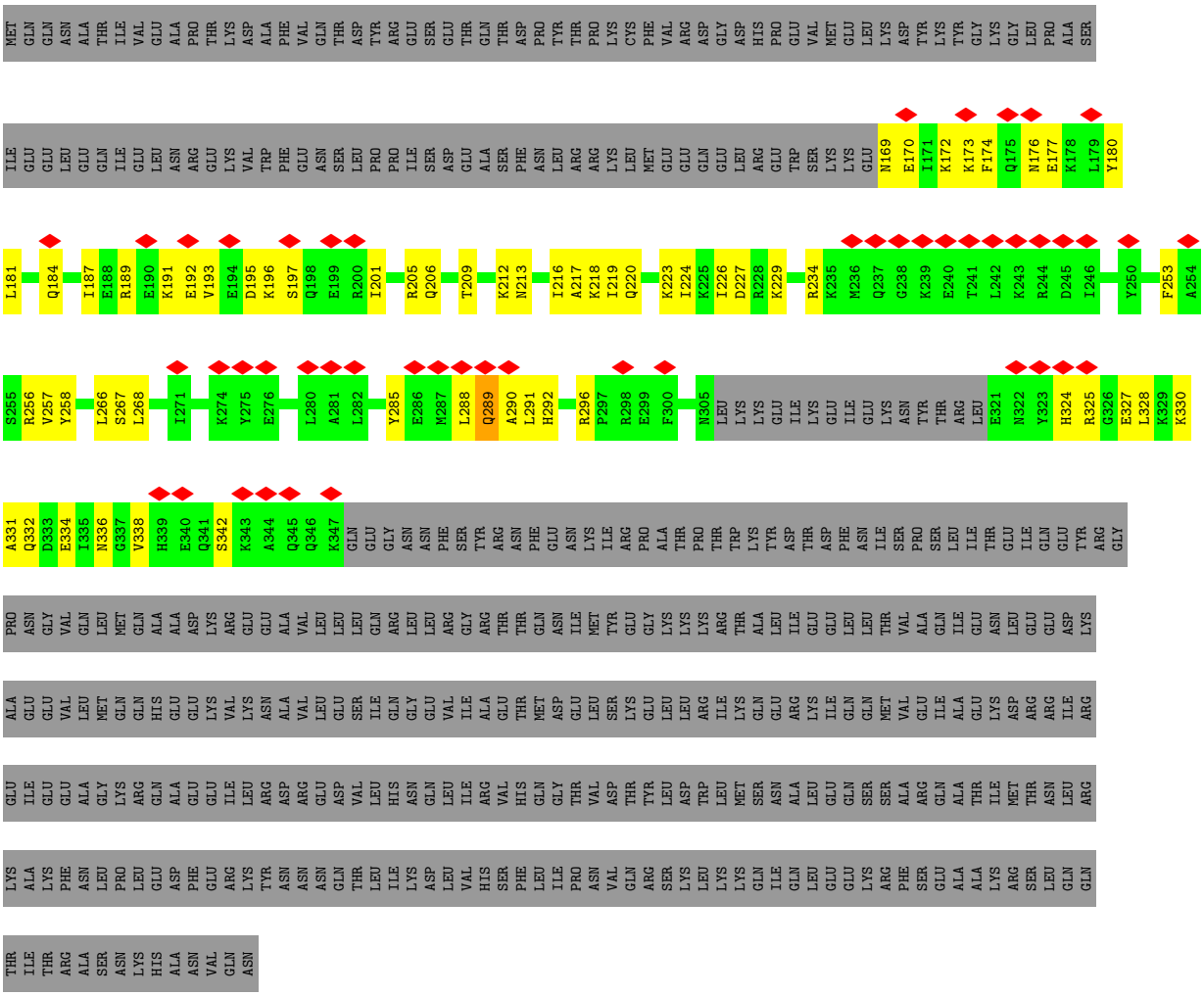
• Molecule 4: Growth-arrest-specific microtubule-binding protein

Chain E:



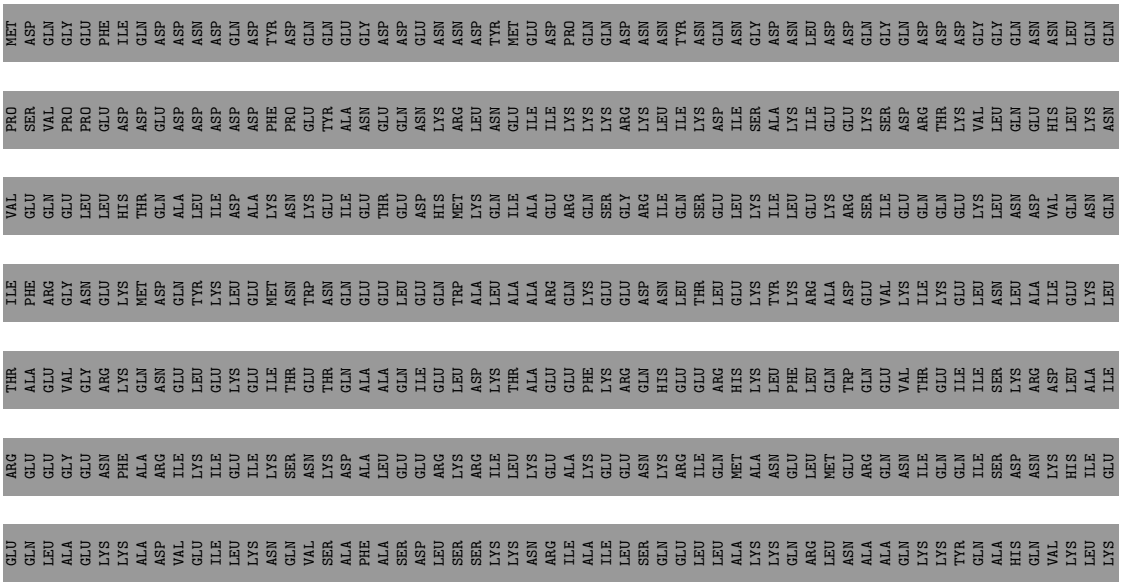
• Molecule 5: Cilia- and flagella-associated protein 91

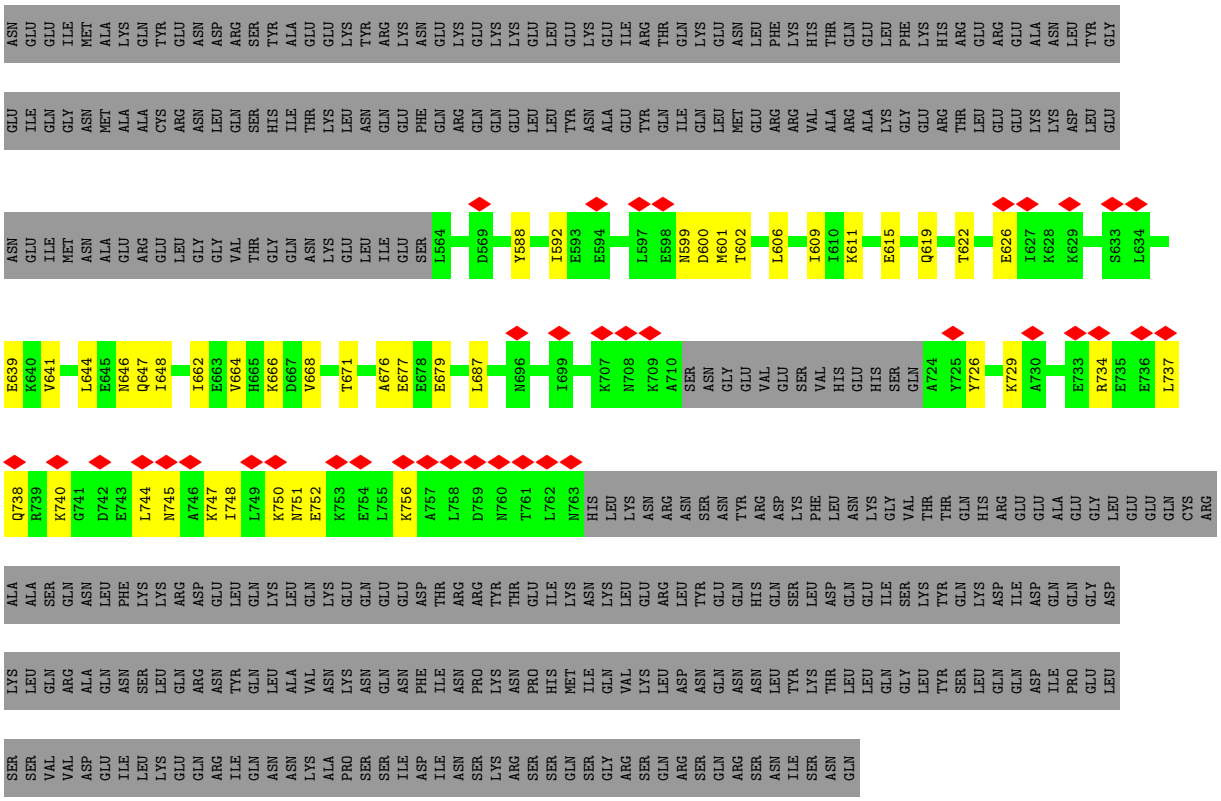
Chain M:



• Molecule 6: Flagella associated protein

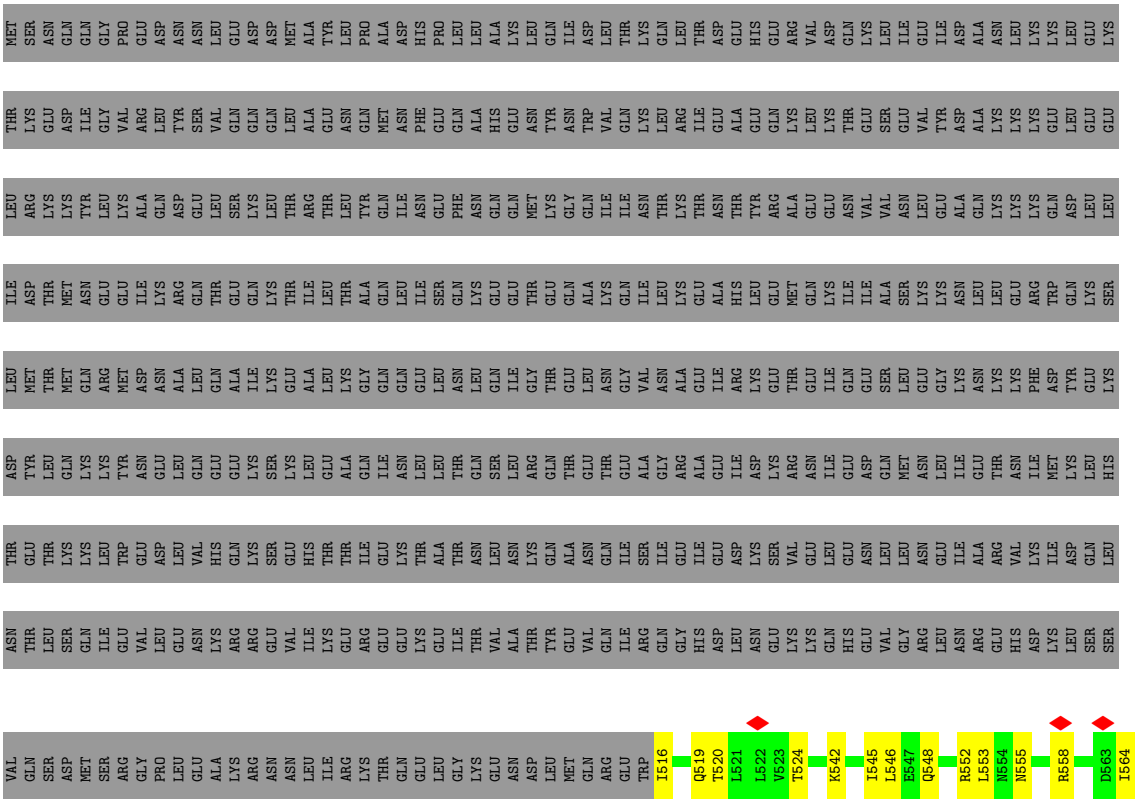
Chain N:

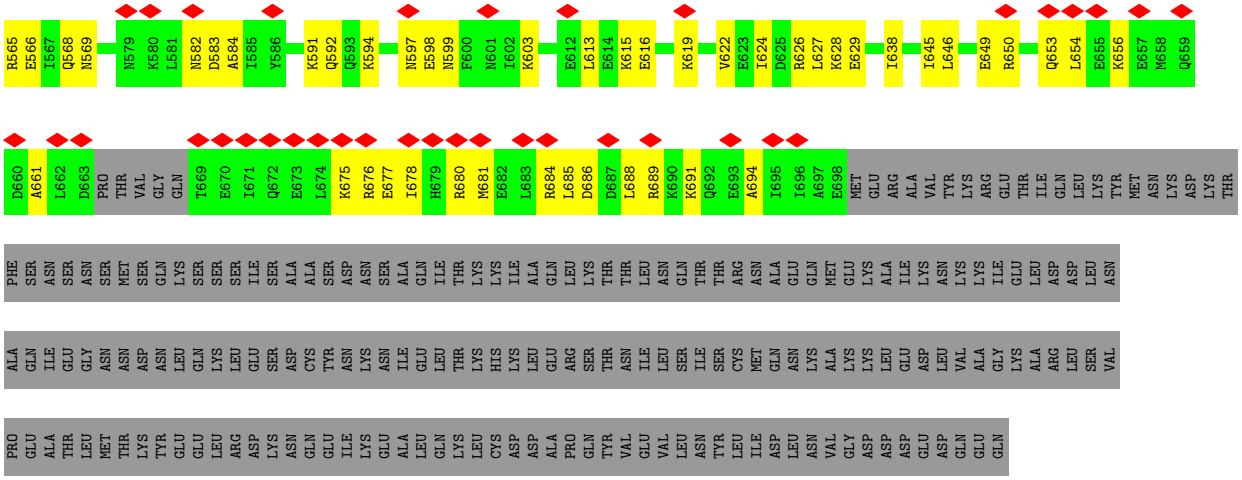




• Molecule 7: Coiled-coil protein, putative

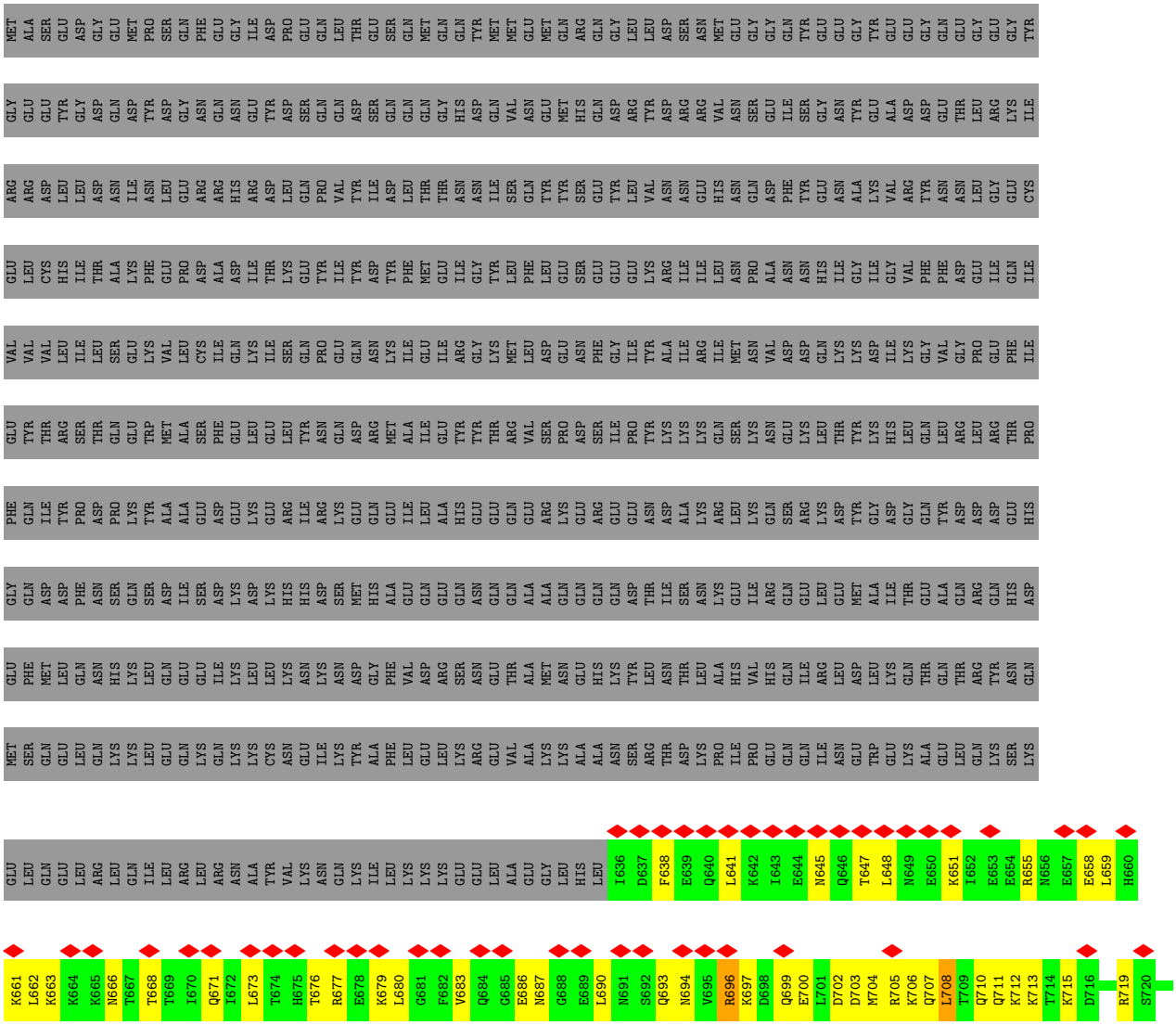
Chain O:

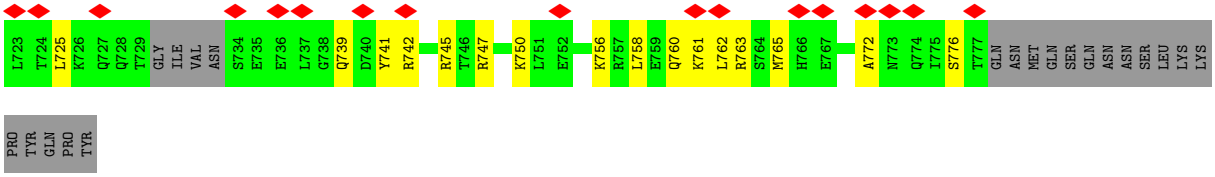




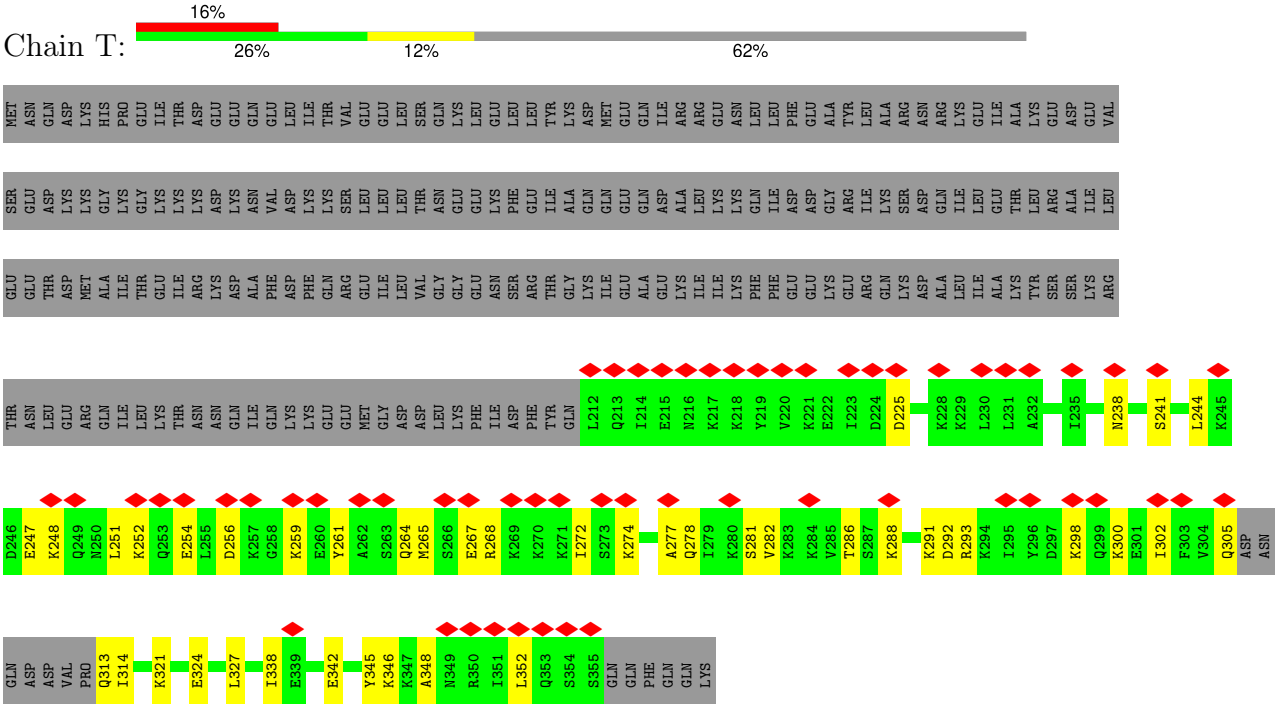
• Molecule 8: DUF4201 domain-containing protein

Chain P:

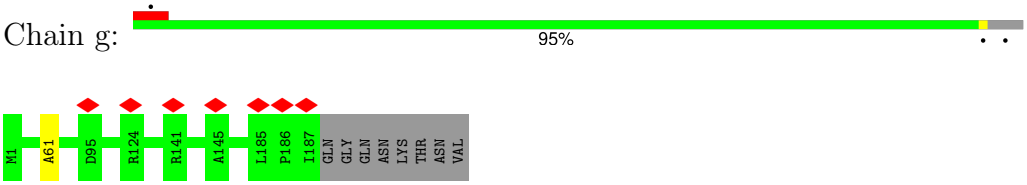




• Molecule 9: Flagellar associated protein



• Molecule 10: CFAP20



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	211502	Depositor
Resolution determination method	OTHER	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	45	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.089	Depositor
Minimum map value	-0.044	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.016	Depositor
Map size (Å)	701.44, 701.44, 701.44	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.37, 1.37, 1.37	Depositor

5 Model quality

5.1 Standard geometry

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	2.99	6/1781 (0.3%)	0.50	0/2375
2	B	0.62	1/1780 (0.1%)	0.54	2/2371 (0.1%)
3	D	0.25	0/1682	0.48	0/2254
4	E	0.24	0/1814	0.46	0/2428
5	M	0.23	0/1387	0.53	0/1843
6	N	0.24	0/1560	0.41	0/2081
7	O	0.24	0/1522	0.50	0/2026
8	P	0.23	0/1154	0.53	1/1534 (0.1%)
9	T	0.23	0/1151	0.41	0/1522
10	g	0.25	0/1591	0.55	0/2149
All	All	1.06	7/15422 (0.0%)	0.49	3/20583 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
3	D	0	1
10	g	0	1
All	All	0	2

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	295	TYR	CD2-CE2	66.23	2.38	1.39
1	A	295	TYR	CD1-CE1	65.39	2.37	1.39
1	A	295	TYR	CE2-CZ	48.39	2.01	1.38
1	A	295	TYR	CE1-CZ	46.72	1.99	1.38
1	A	295	TYR	CG-CD1	36.16	1.86	1.39

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	289	HIS	CA-CB-CG	10.03	130.66	113.60
2	B	289	HIS	ND1-CG-CD2	-5.32	98.56	106.00
8	P	708	LEU	CA-CB-CG	5.13	127.10	115.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	D	307	GLU	Peptide
10	g	61	ALA	Peptide

5.2 Too-close contacts (i)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1745	0	1790	108	0
2	B	1758	0	1824	83	0
3	D	1663	0	1692	55	0
4	E	1794	0	1858	57	0
5	M	1373	0	1402	59	0
6	N	1550	0	1602	34	0
7	O	1516	0	1584	45	0
8	P	1150	0	1186	46	0
9	T	1145	0	1242	30	0
10	g	1556	0	1586	0	0
All	All	15250	0	15766	407	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 14.

The worst 5 of 407 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)
1:A:295:TYR:CG	1:A:295:TYR:CD2	1.85	1.63
1:A:295:TYR:CG	1:A:295:TYR:CD1	1.86	1.62
1:A:295:TYR:CZ	1:A:295:TYR:CE1	1.99	1.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:289:HIS:CG	2:B:289:HIS:CB	1.91	1.50
1:A:295:TYR:CZ	1:A:295:TYR:CE2	2.01	1.48

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	196/826 (24%)	188 (96%)	8 (4%)	0	100	100
2	B	204/506 (40%)	194 (95%)	10 (5%)	0	100	100
3	D	195/472 (41%)	185 (95%)	10 (5%)	0	100	100
4	E	217/468 (46%)	206 (95%)	11 (5%)	0	100	100
5	M	160/644 (25%)	151 (94%)	8 (5%)	1 (1%)	22	55
6	N	183/963 (19%)	182 (100%)	1 (0%)	0	100	100
7	O	174/893 (20%)	171 (98%)	3 (2%)	0	100	100
8	P	134/794 (17%)	131 (98%)	3 (2%)	0	100	100
9	T	133/361 (37%)	132 (99%)	1 (1%)	0	100	100
10	g	185/195 (95%)	170 (92%)	15 (8%)	0	100	100
All	All	1781/6122 (29%)	1710 (96%)	70 (4%)	1 (0%)	50	79

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	M	267	SER

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	195/766 (26%)	194 (100%)	1 (0%)	86 93
2	B	195/473 (41%)	195 (100%)	0	100 100
3	D	185/438 (42%)	185 (100%)	0	100 100
4	E	198/434 (46%)	195 (98%)	3 (2%)	60 78
5	M	147/590 (25%)	145 (99%)	2 (1%)	62 79
6	N	173/884 (20%)	173 (100%)	0	100 100
7	O	171/829 (21%)	170 (99%)	1 (1%)	84 92
8	P	132/733 (18%)	129 (98%)	3 (2%)	45 68
9	T	129/335 (38%)	128 (99%)	1 (1%)	79 88
10	g	175/182 (96%)	175 (100%)	0	100 100
All	All	1700/5664 (30%)	1689 (99%)	11 (1%)	82 92

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
8	P	696	ARG
8	P	719	ARG
9	T	346	LYS
8	P	763	ARG
5	M	218	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
10	g	135	ASN
8	P	711	GLN
8	P	645	ASN
7	O	569	ASN
8	P	707	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

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.

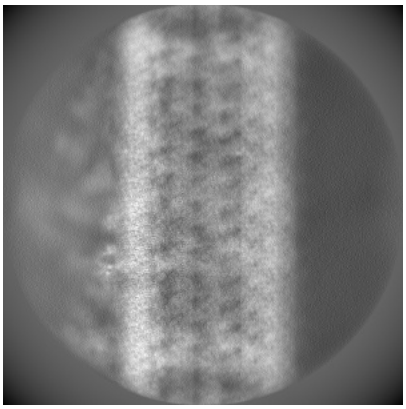
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-41189. These allow visual inspection of the internal detail of the map and identification of artifacts.

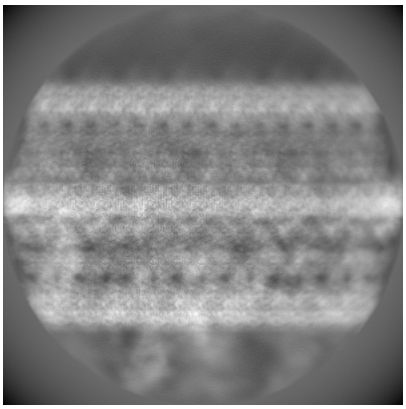
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

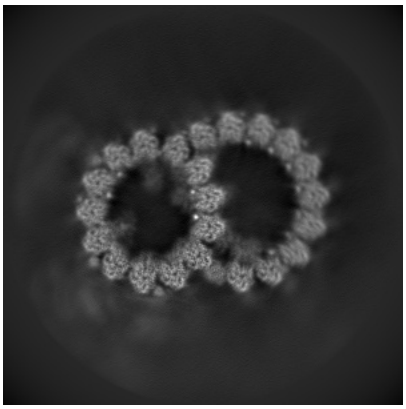
6.1.1 Primary map



X

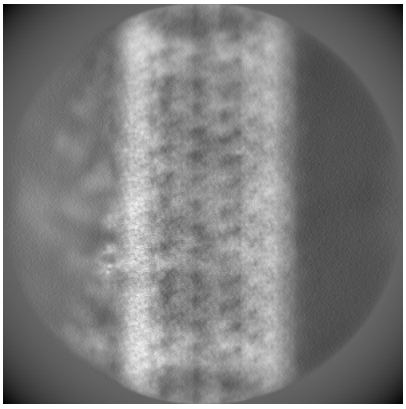


Y

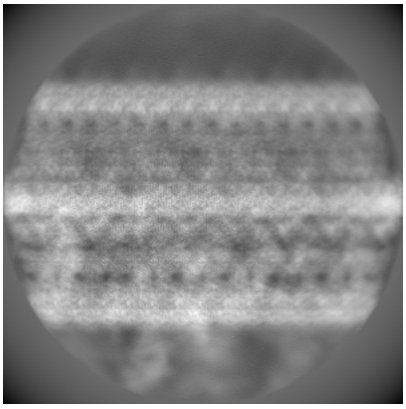


Z

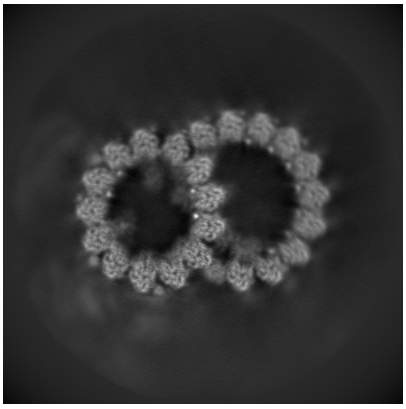
6.1.2 Raw map



X



Y

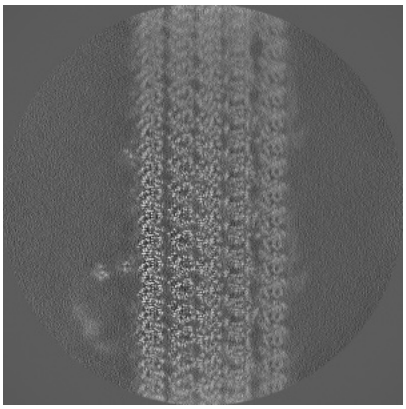


Z

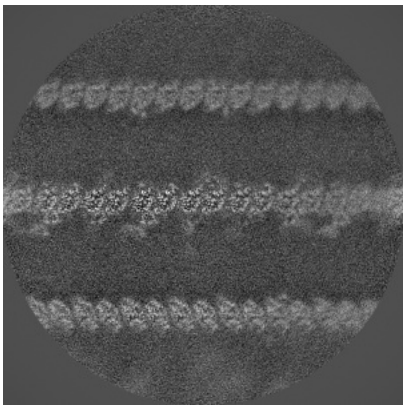
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

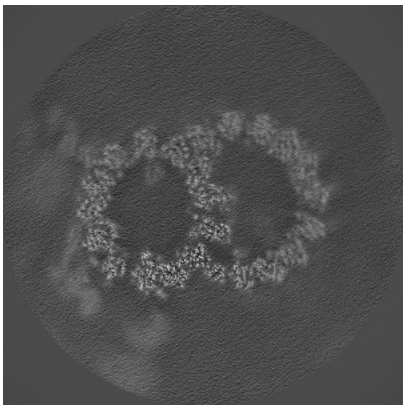
6.2.1 Primary map



X Index: 256

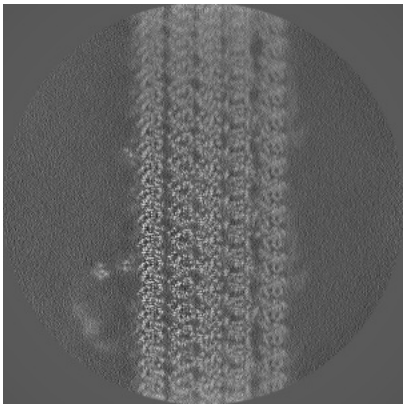


Y Index: 256

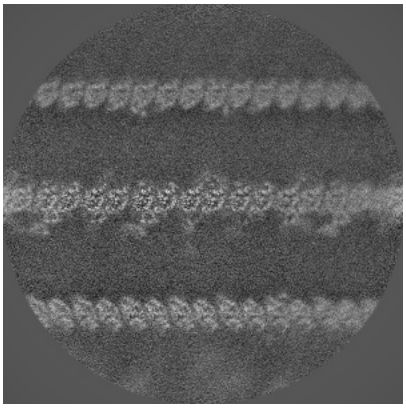


Z Index: 256

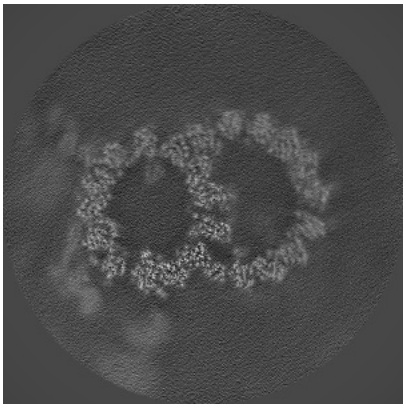
6.2.2 Raw map



X Index: 256



Y Index: 256

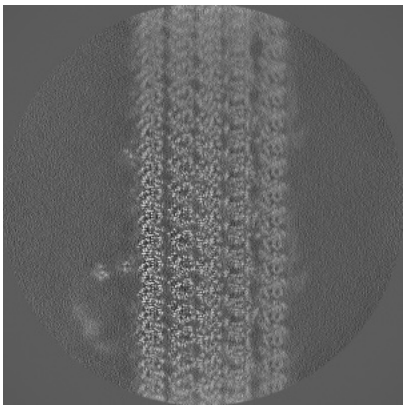


Z Index: 256

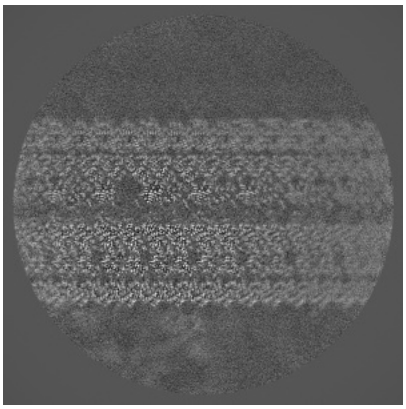
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

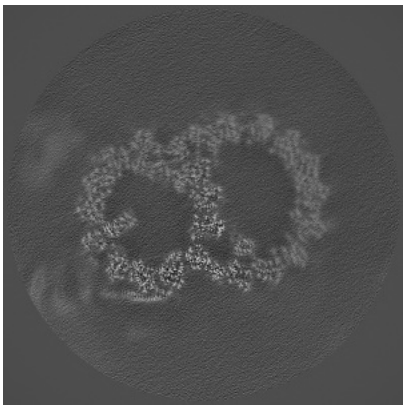
6.3.1 Primary map



X Index: 256

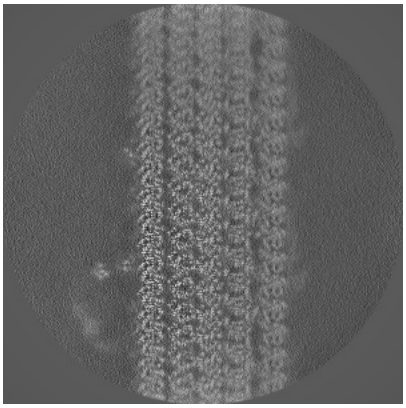


Y Index: 172

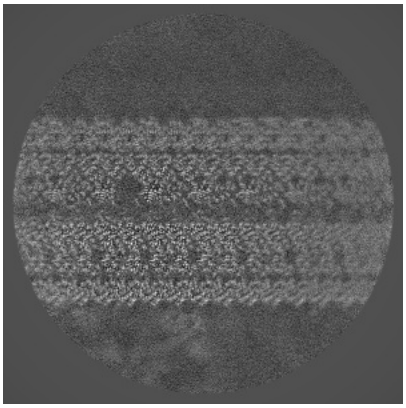


Z Index: 200

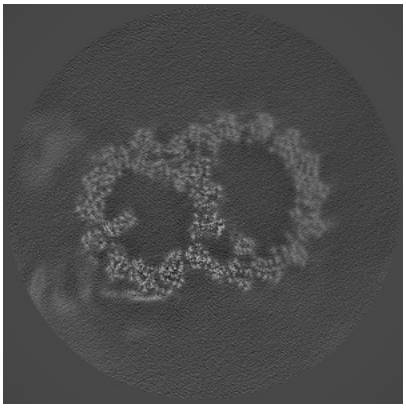
6.3.2 Raw map



X Index: 256



Y Index: 172

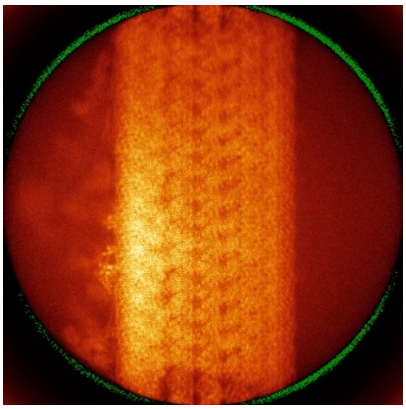


Z Index: 200

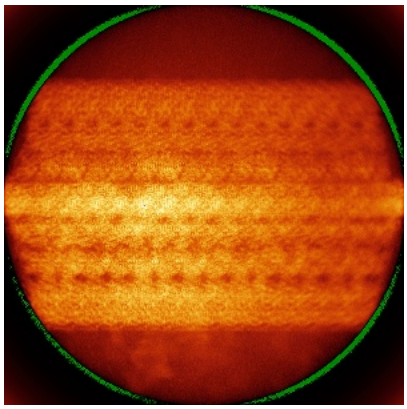
The images above show the largest variance slices of the map in three orthogonal directions.

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

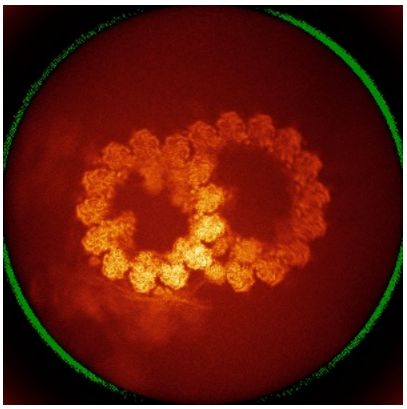
6.4.1 Primary map



X

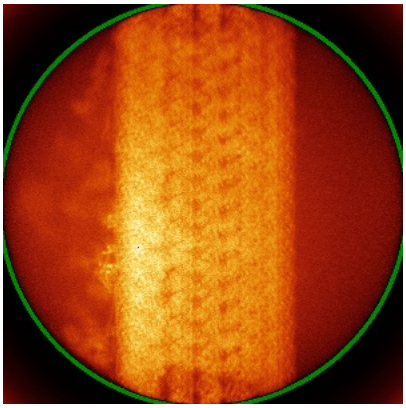


Y

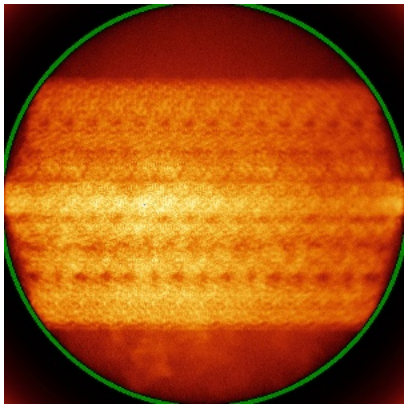


Z

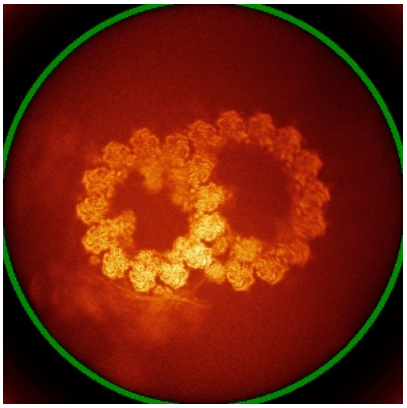
6.4.2 Raw map



X



Y

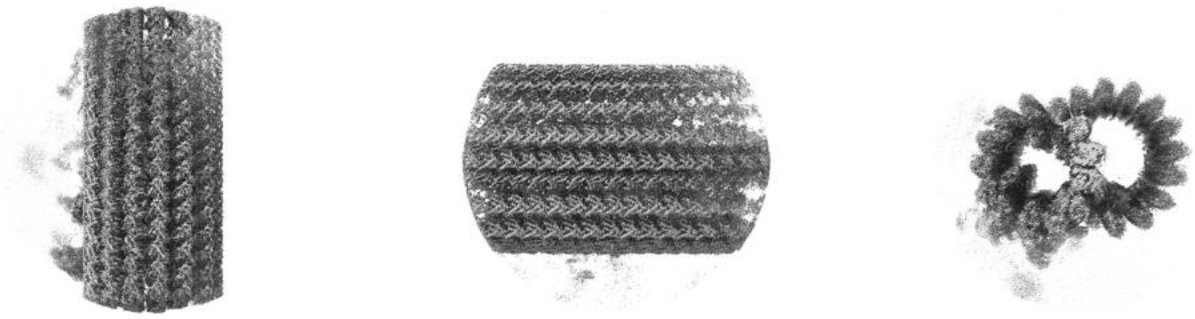


Z

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)

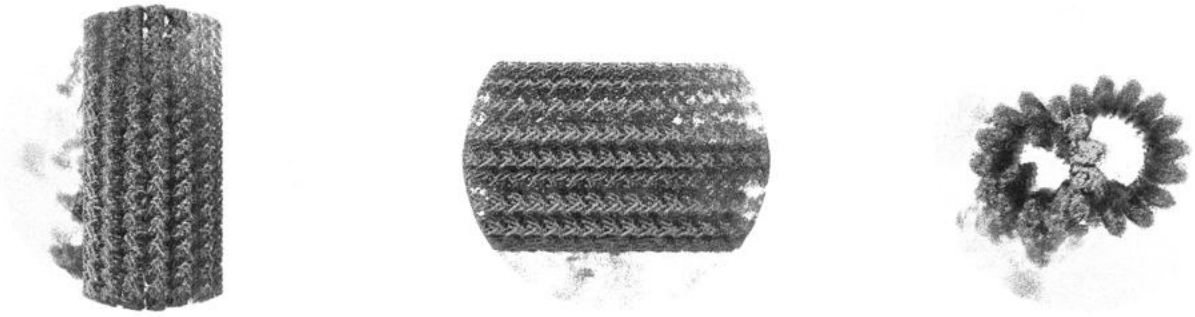
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.016. 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



X Y Z

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.

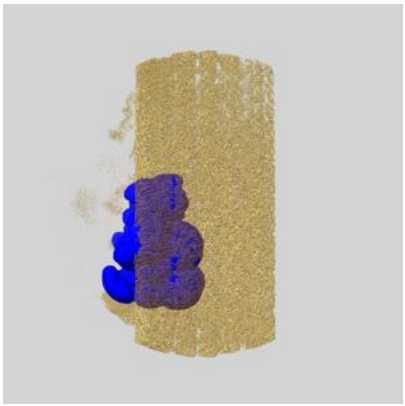
6.6 Mask visualisation (i)

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

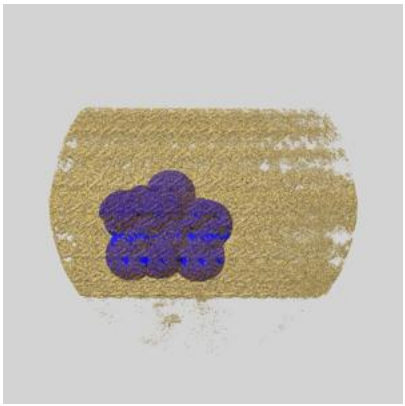
A mask typically either:

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

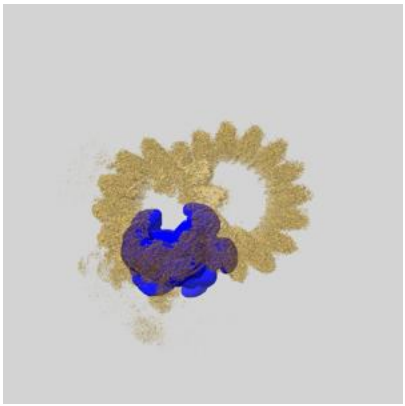
6.6.1 emd_41189_msk_1.map (i)



X



Y

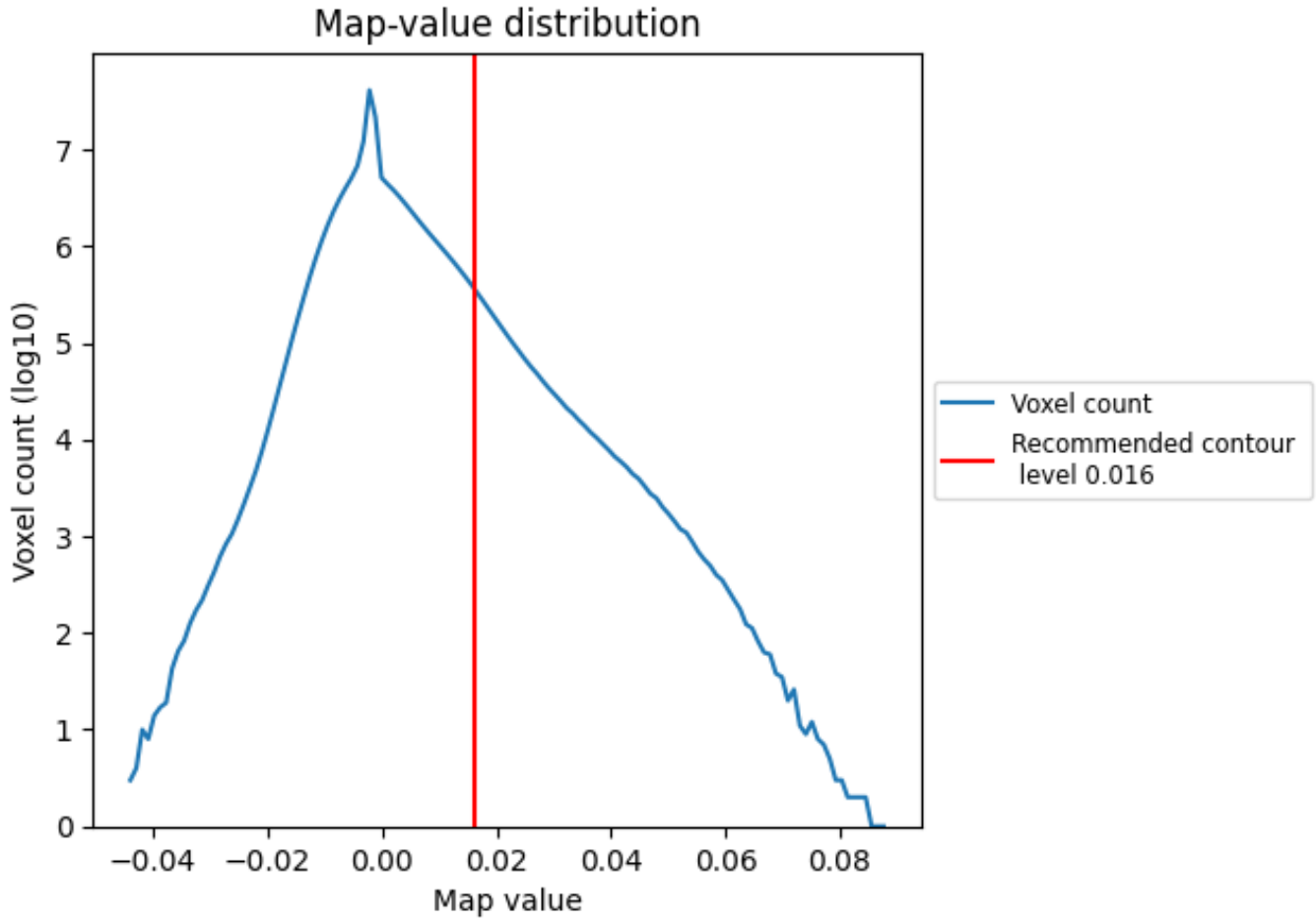


Z

7 Map analysis

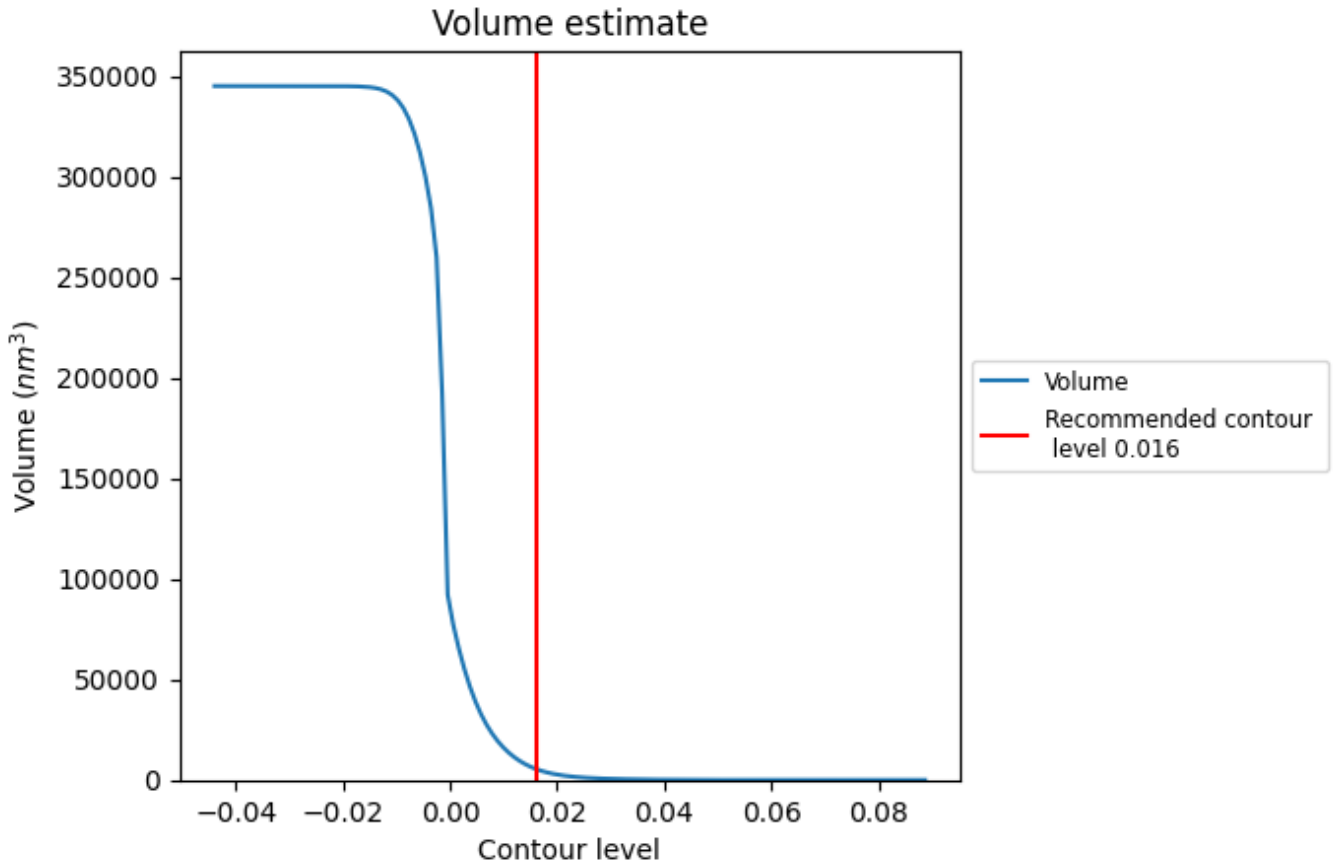
This section contains the results of statistical analysis of the map.

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.

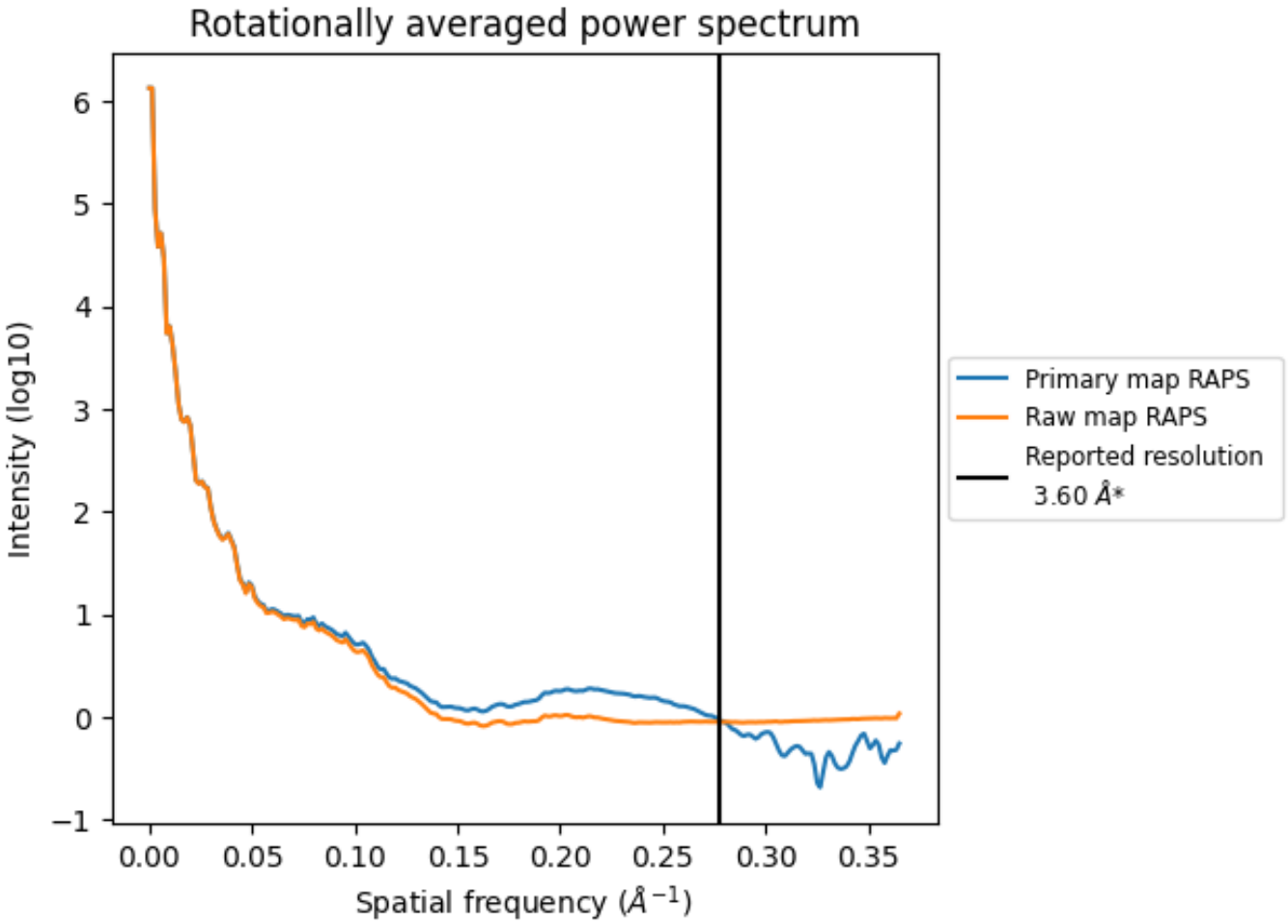
7.2 Volume estimate (i)



The volume at the recommended contour level is 5513 nm^3; this corresponds to an approximate mass of 4980 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)

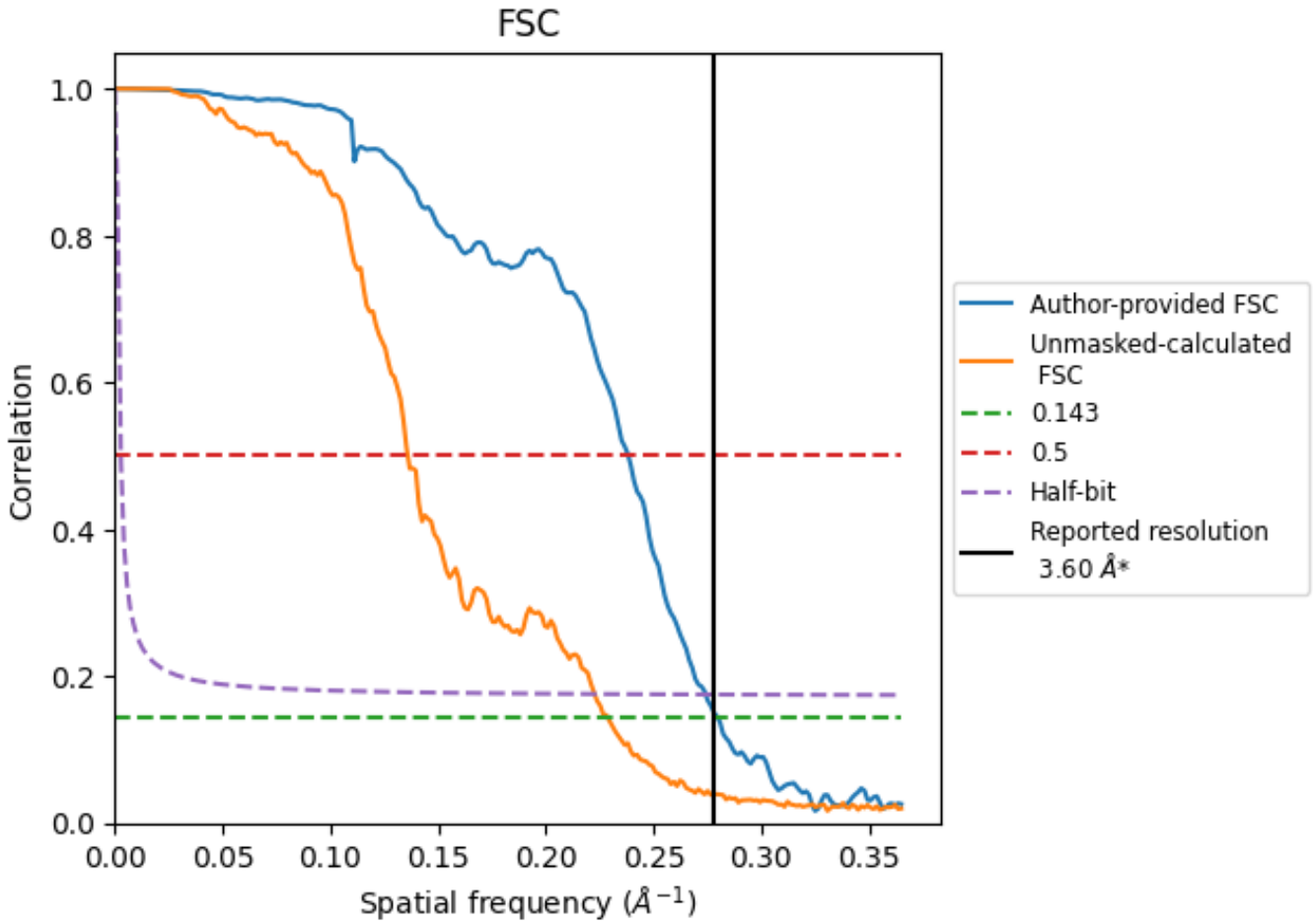


*Reported resolution corresponds to spatial frequency of 0.278 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.278 Å^{-1}

8.2 Resolution estimates (i)

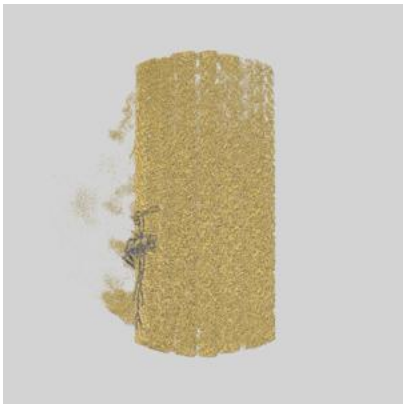
Resolution estimate (Å)	Estimation criterion (FSC cut-off)			
	0.143	0.5	Half-bit	Other
Reported by author	-	-	-	3.60
Author-provided FSC curve	3.57	4.20	3.65	-
Unmasked-calculated*	4.37	7.35	4.49	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

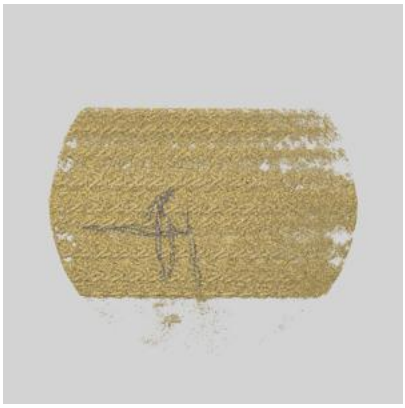
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-41189 and PDB model 8TEK. Per-residue inclusion information can be found in section 3 on page 6.

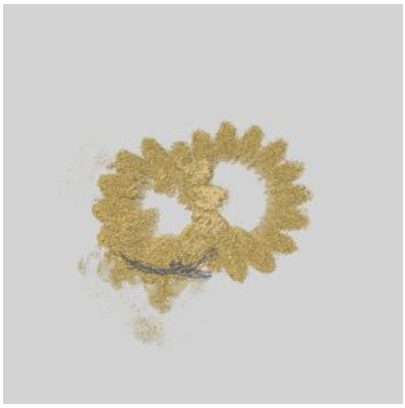
9.1 Map-model overlay



X



Y



Z

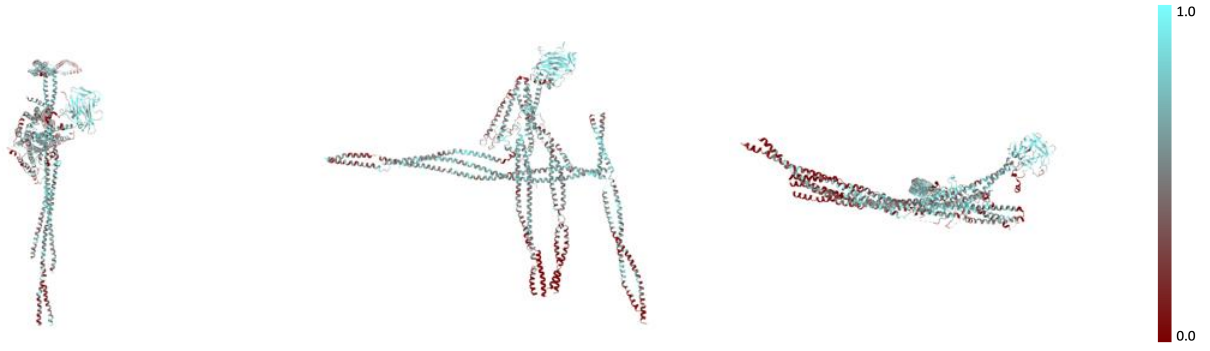
The images above show the 3D surface view of the map at the recommended contour level 0.016 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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.

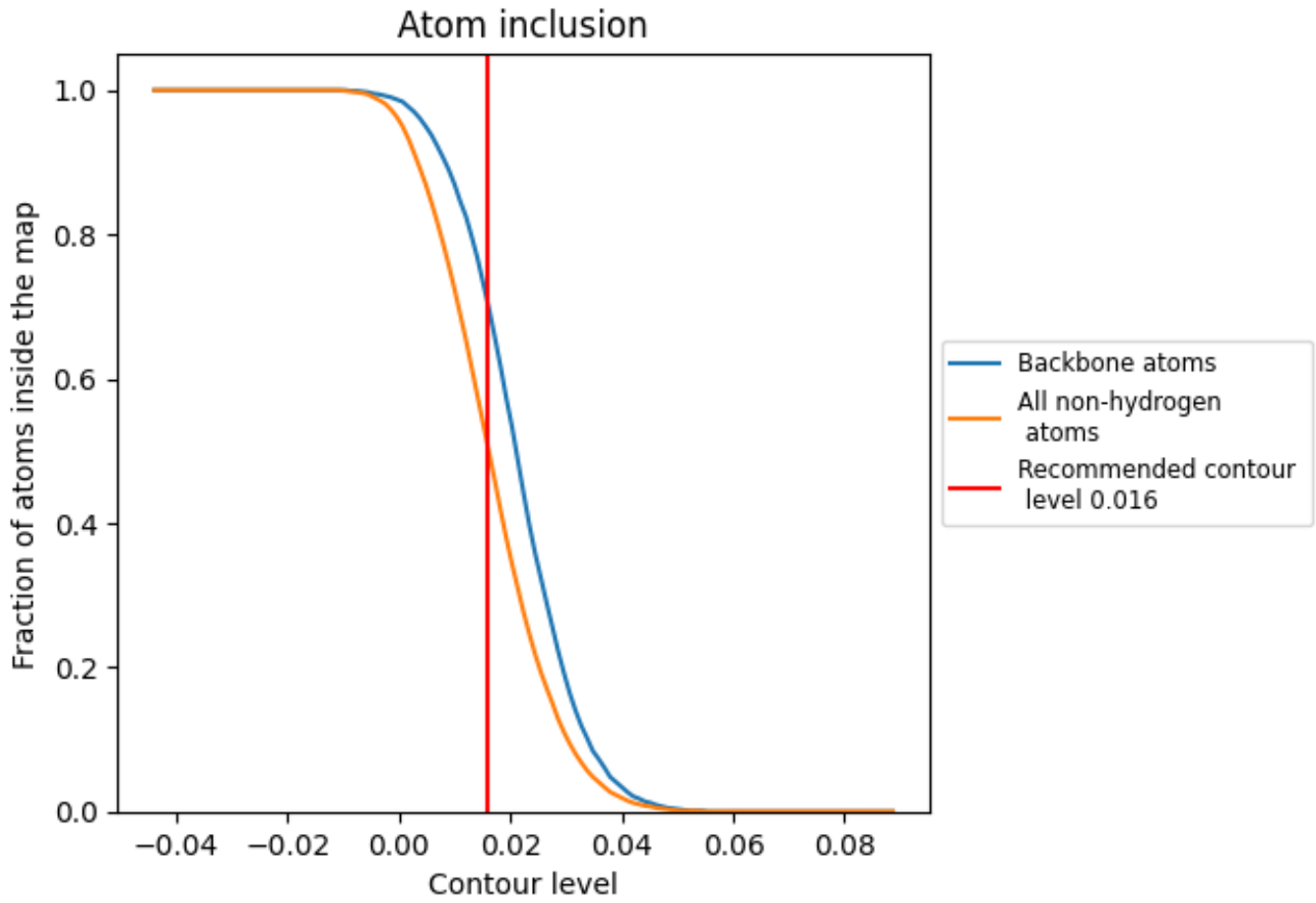
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.016).

9.4 Atom inclusion (i)



At the recommended contour level, 70% of all backbone atoms, 50% 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 (0.016) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.5040	0.2730
A	0.4200	0.2410
B	0.5130	0.3130
D	0.4140	0.1740
E	0.4120	0.1790
M	0.5100	0.2650
N	0.5660	0.3180
O	0.5420	0.2860
P	0.4480	0.2310
T	0.4880	0.2480
g	0.7370	0.4780