



wwPDB EM Validation Summary Report ⓘ

Mar 8, 2026 – 10:03 AM UTC

PDB ID : 8RGH / pdb_00008rgh
EMDB ID : EMD-19133
Title : Structure of dynein-2 intermediate chain DYNC2I1 (WDR60) in complex with the dynein-2 heavy chain DYNC2H1.
Authors : Mukhopadhyay, A.G.; Toropova, K.; Daly, L.; Wells, J.; Vuolo, L.; Seda, M.; Jenkins, D.; Stephens, D.J.; Roberts, A.J.
Deposited on : 2023-12-13
Resolution : 3.90 Å(reported)

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

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

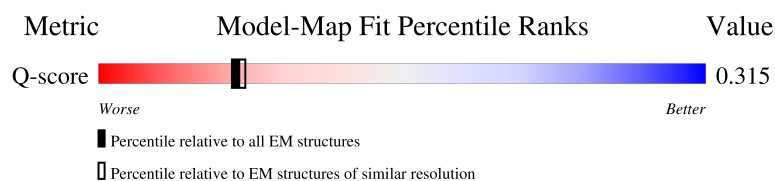
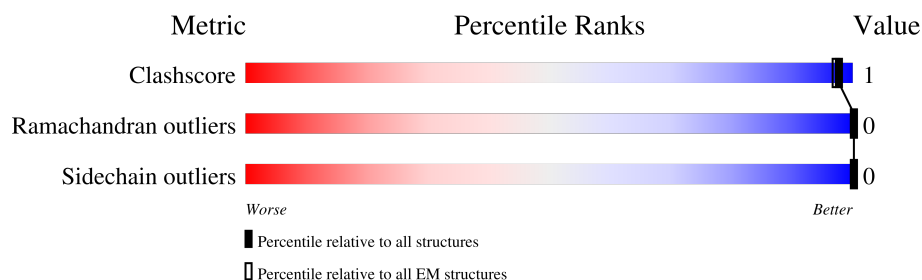
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

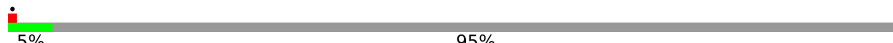
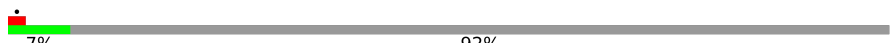
The reported resolution of this entry is 3.90 Å.

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	8855 (3.40 - 4.40)

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	4513	 12% 87%
2	C	1066	 9% 42% 56%
3	D	564	 5% 95%
4	E	351	 7% 92%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	G	96	22% 97%
5	H	96	22% 97%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 9682 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 Methylated-DNA--protein-cysteine methyltransferase,Cytoplasmic dynein 2 heavy chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	577	4757	3040	823	877	17	0	0

There are 47 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-205	GLY	-	expression tag	UNP P16455
A	-176	ARG	GLU	engineered mutation	UNP P16455
A	-174	ILE	LYS	engineered mutation	UNP P16455
A	-173	PHE	LEU	engineered mutation	UNP P16455
A	-144	ALA	CYS	engineered mutation	UNP P16455
A	-91	SER	GLN	engineered mutation	UNP P16455
A	-90	HIS	GLN	engineered mutation	UNP P16455
A	-81	ALA	LYS	engineered mutation	UNP P16455
A	-79	THR	ALA	engineered mutation	UNP P16455
A	-78	ALA	ARG	engineered mutation	UNP P16455
A	-75	LYS	GLY	engineered mutation	UNP P16455
A	-74	THR	GLY	engineered mutation	UNP P16455
A	-72	LEU	MET	engineered mutation	UNP P16455
A	-71	SER	ARG	engineered mutation	UNP P16455
A	-56	GLN	CYS	engineered mutation	UNP P16455
A	-55	GLY	SER	engineered mutation	UNP P16455
A	-54	ASP	SER	engineered mutation	UNP P16455
A	-53	LEU	GLY	engineered mutation	UNP P16455
A	-52	ASP	ALA	engineered mutation	UNP P16455
A	-49	GLY	ASN	engineered mutation	UNP P16455
A	-47	GLU	SER	engineered mutation	UNP P16455
A	-21	LEU	-	linker	UNP P16455
A	-20	GLU	-	linker	UNP P16455
A	-19	VAL	-	linker	UNP P16455
A	-18	LEU	-	linker	UNP P16455
A	-17	PHE	-	linker	UNP P16455
A	-16	GLN	-	linker	UNP P16455

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	-15	GLY	-	linker	UNP P16455
A	-14	PRO	-	linker	UNP P16455
A	-13	ASP	-	linker	UNP P16455
A	-12	TYR	-	linker	UNP P16455
A	-11	ASP	-	linker	UNP P16455
A	-10	ILE	-	linker	UNP P16455
A	-9	PRO	-	linker	UNP P16455
A	-8	THR	-	linker	UNP P16455
A	-7	THR	-	linker	UNP P16455
A	-6	LEU	-	linker	UNP P16455
A	-5	GLU	-	linker	UNP P16455
A	-4	VAL	-	linker	UNP P16455
A	-3	LEU	-	linker	UNP P16455
A	-2	PHE	-	linker	UNP P16455
A	-1	GLN	-	linker	UNP P16455
A	0	GLY	-	linker	UNP P16455
A	1	PRO	-	linker	UNP P16455
A	1413	ARG	LYS	variant	UNP Q8NCM8
A	2871	GLN	ARG	variant	UNP Q8NCM8
A	3680	VAL	ALA	variant	UNP Q8NCM8

- Molecule 2 is a protein called Cytoplasmic dynein 2 intermediate chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	467	Total	C	N	O	S	0	0
			3615	2298	630	671	16		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	225	LYS	ASN	conflict	UNP Q8WVS4
C	292	PHE	SER	conflict	UNP Q8WVS4

- Molecule 3 is a protein called Cytoplasmic dynein 2 intermediate chain 2.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	D	30	Total	C	N	O	0	0
			150	90	30	30		

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	60	GLY	TRP	conflict	UNP Q96EX3
D	537	TRP	-	expression tag	UNP Q96EX3
D	538	SER	-	expression tag	UNP Q96EX3
D	539	HIS	-	expression tag	UNP Q96EX3
D	540	PRO	-	expression tag	UNP Q96EX3
D	541	GLN	-	expression tag	UNP Q96EX3
D	542	PHE	-	expression tag	UNP Q96EX3
D	543	GLU	-	expression tag	UNP Q96EX3
D	544	LYS	-	expression tag	UNP Q96EX3
D	545	GLY	-	expression tag	UNP Q96EX3
D	546	SER	-	expression tag	UNP Q96EX3
D	547	ALA	-	expression tag	UNP Q96EX3
D	548	GLY	-	expression tag	UNP Q96EX3
D	549	SER	-	expression tag	UNP Q96EX3
D	550	ALA	-	expression tag	UNP Q96EX3
D	551	ALA	-	expression tag	UNP Q96EX3
D	552	GLY	-	expression tag	UNP Q96EX3
D	553	SER	-	expression tag	UNP Q96EX3
D	554	GLY	-	expression tag	UNP Q96EX3
D	555	ALA	-	expression tag	UNP Q96EX3
D	556	GLY	-	expression tag	UNP Q96EX3
D	557	TRP	-	expression tag	UNP Q96EX3
D	558	SER	-	expression tag	UNP Q96EX3
D	559	HIS	-	expression tag	UNP Q96EX3
D	560	PRO	-	expression tag	UNP Q96EX3
D	561	GLN	-	expression tag	UNP Q96EX3
D	562	PHE	-	expression tag	UNP Q96EX3
D	563	GLU	-	expression tag	UNP Q96EX3
D	564	LYS	-	expression tag	UNP Q96EX3

- Molecule 4 is a protein called Cytoplasmic dynein 2 light intermediate chain 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	27	Total	C	N	O	S	0	0
			236	143	42	50	1		

- Molecule 5 is a protein called Dynein light chain roadblock-type 1.

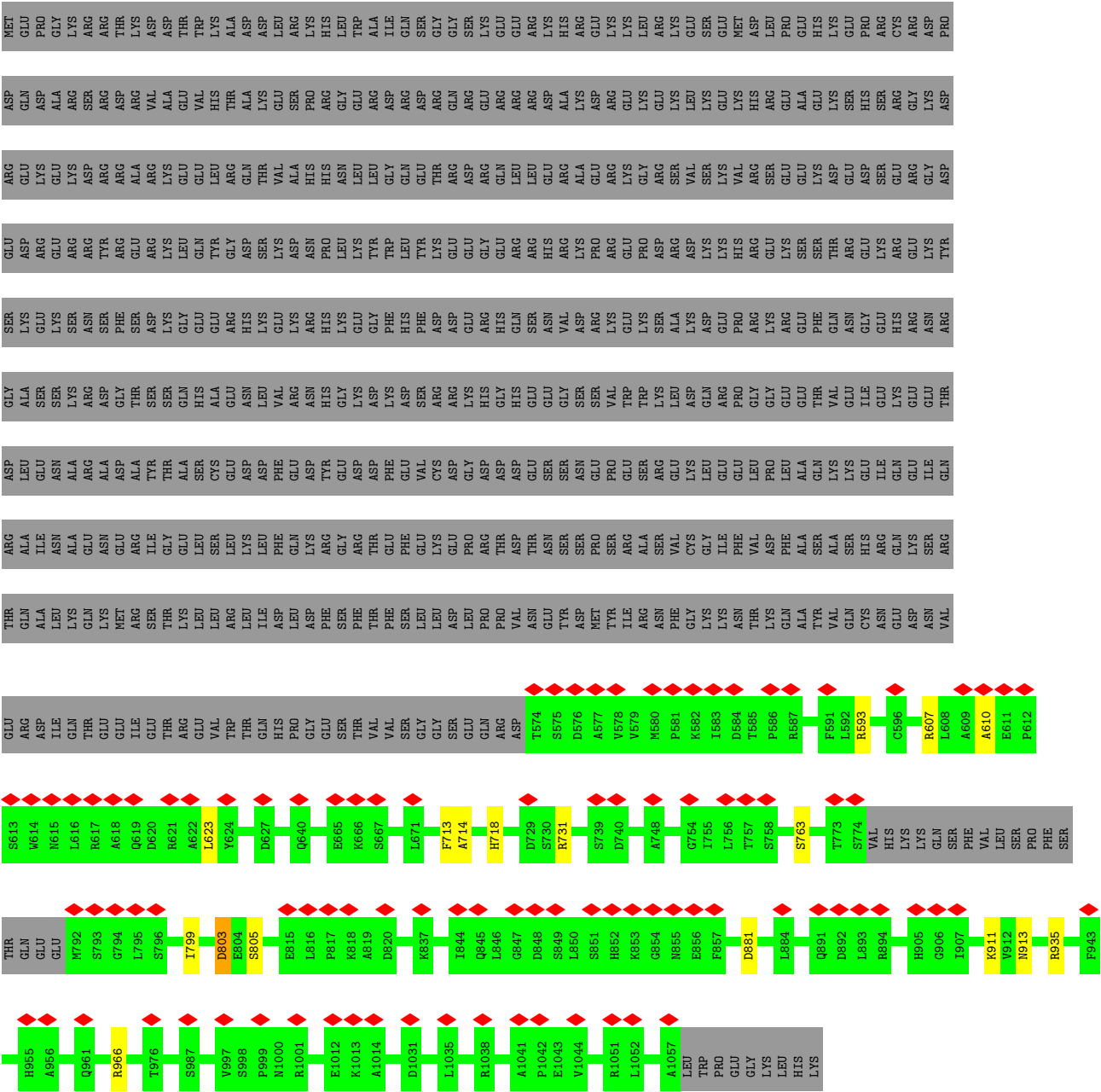
Mol	Chain	Residues	Atoms				AltConf	Trace
5	G	93	Total	C	N	O	0	0
			462	276	93	93		
5	H	93	Total	C	N	O	0	0
			462	276	93	93		



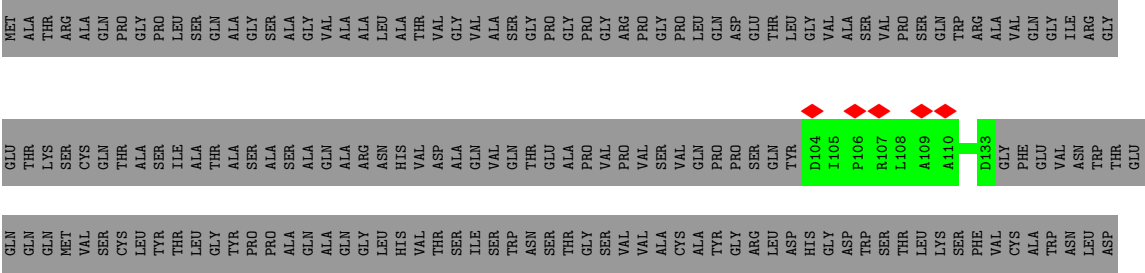


- Molecule 2: Cytoplasmic dynein 2 intermediate chain 1





● Molecule 3: Cytoplasmic dynein 2 intermediate chain 2



[illegible]

- Molecule 4: Cytoplasmic dynein 2 light intermediate chain 1

Chain E: 7% 92%

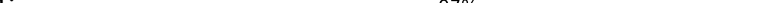
[illegible]

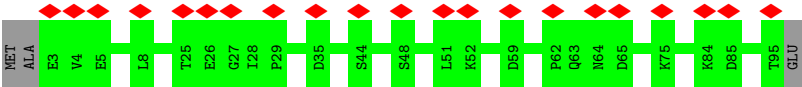
- Molecule 5: Dynein light chain roadblock-type 1

Chain G: 22% 97%

[illegible]

- Molecule 5: Dynein light chain roadblock-type 1

Chain H:  22% 97%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	113479	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50.6	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.590	Depositor
Minimum map value	-0.303	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.017	Depositor
Recommended contour level	0.15	Depositor
Map size ($\text{\AA}$)	248.40001, 248.40001, 248.40001	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.828, 0.828, 0.828	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	0.73	0/4855	1.33	8/6557 (0.1%)
2	C	0.76	0/3700	1.42	9/5039 (0.2%)
3	D	0.68	0/149	1.23	0/207
4	E	0.71	0/238	1.30	0/317
5	G	0.78	0/461	1.39	0/642
5	H	0.72	0/461	1.32	0/642
All	All	0.74	0/9864	1.36	17/13404 (0.1%)

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
1	A	0	3
2	C	0	4
All	All	0	7

There are no bond length outliers.

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	605	ASN	CA-CB-CG	6.59	119.19	112.60
2	C	803	ASP	CA-CB-CG	6.44	119.04	112.60
2	C	610	ALA	N-CA-C	6.33	119.12	111.40
2	C	714	ALA	CA-C-N	6.03	126.34	122.18
2	C	714	ALA	C-N-CA	6.03	126.34	122.18

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	197	TYR	Sidechain
1	A	388	TYR	Sidechain
1	A	587	ARG	Sidechain
2	C	607	ARG	Sidechain
2	C	731	ARG	Sidechain

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	4757	0	4758	7	0
2	C	3615	0	3613	4	0
3	D	150	0	70	0	0
4	E	236	0	222	1	0
5	G	462	0	192	0	0
5	H	462	0	192	0	0
All	All	9682	0	9047	10	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 1.

The worst 5 of 10 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:294:TRP:CD1	1:A:324:LEU:HD13	2.33	0.63
1:A:344:PHE:HA	1:A:347:PHE:CD2	2.46	0.51
2:C:713:PHE:CE1	2:C:799:ILE:HD11	2.48	0.49
1:A:273:TRP:CD1	1:A:338:ARG:HH12	2.32	0.47
1:A:759:HIS:CG	4:E:329:LYS:HB3	2.51	0.45

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	569/4513 (13%)	555 (98%)	14 (2%)	0	100	100
2	C	463/1066 (43%)	429 (93%)	34 (7%)	0	100	100
3	D	28/564 (5%)	28 (100%)	0	0	100	100
4	E	25/351 (7%)	24 (96%)	1 (4%)	0	100	100
5	G	91/96 (95%)	85 (93%)	6 (7%)	0	100	100
5	H	91/96 (95%)	87 (96%)	4 (4%)	0	100	100
All	All	1267/6686 (19%)	1208 (95%)	59 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	521/4008 (13%)	521 (100%)	0	100	100
2	C	407/952 (43%)	407 (100%)	0	100	100
4	E	26/311 (8%)	26 (100%)	0	100	100
All	All	954/5271 (18%)	954 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
2	C	903	GLN
2	C	904	GLN
2	C	1034	HIS
2	C	978	ASN
2	C	996	GLN

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 [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

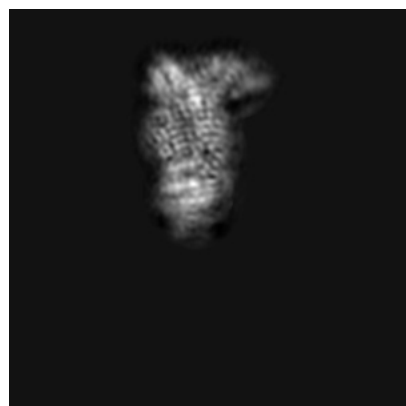
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-19133. These allow visual inspection of the internal detail of the map and identification of artifacts.

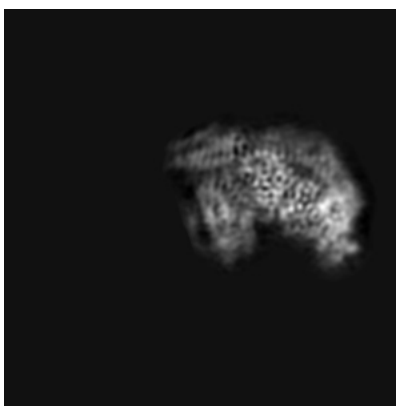
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

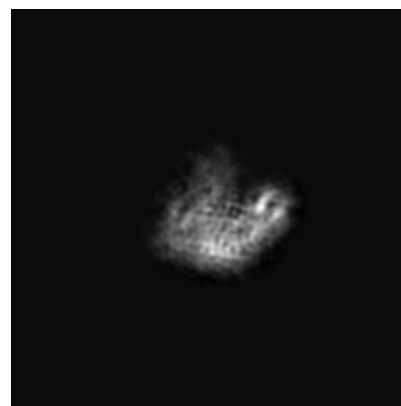
6.1.1 Primary map



X



Y

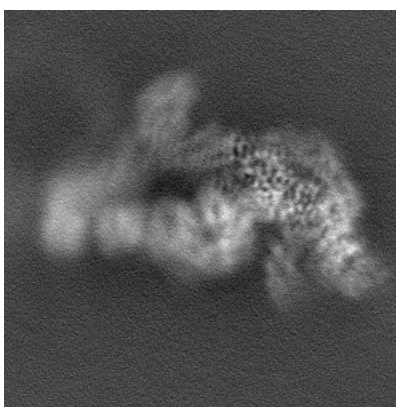


Z

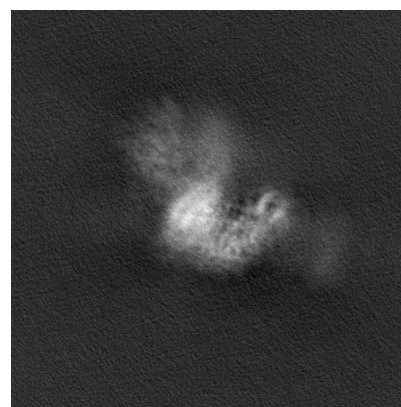
6.1.2 Raw map



X



Y



Z

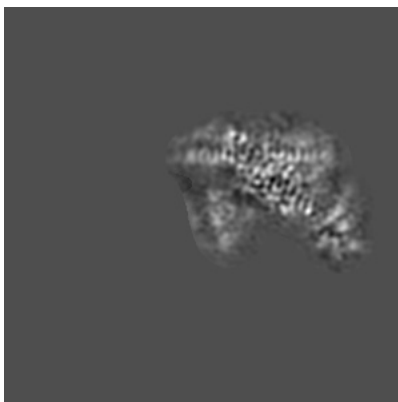
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

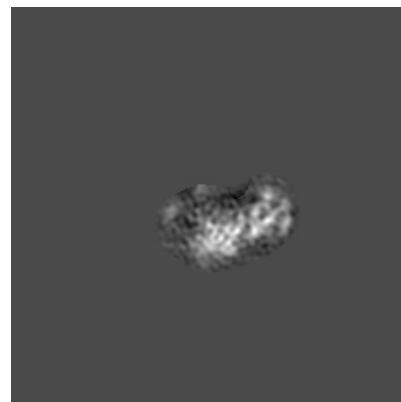
6.2.1 Primary map



X Index: 150

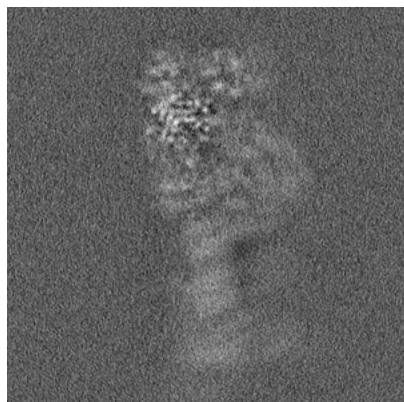


Y Index: 150

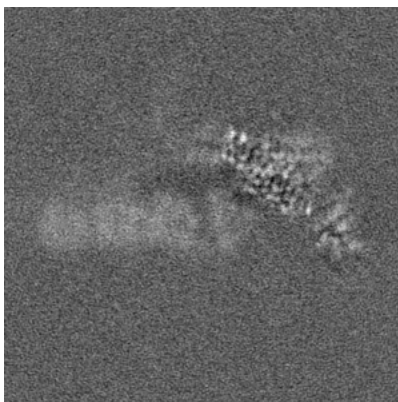


Z Index: 150

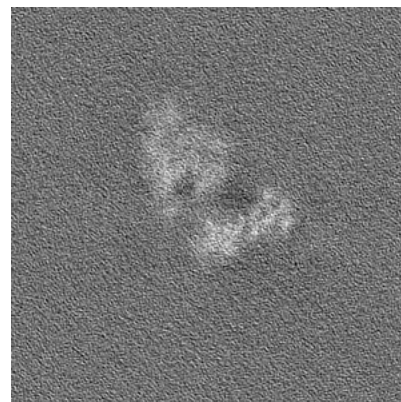
6.2.2 Raw map



X Index: 150



Y Index: 150



Z Index: 150

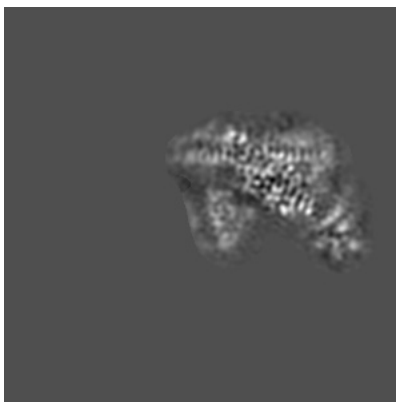
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

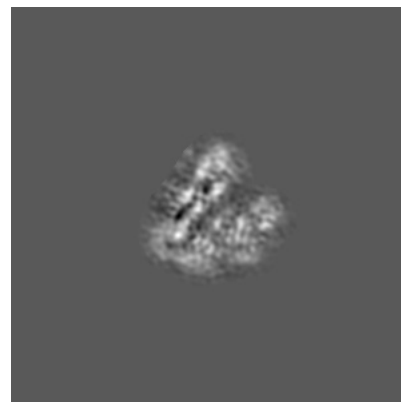
6.3.1 Primary map



X Index: 151



Y Index: 149

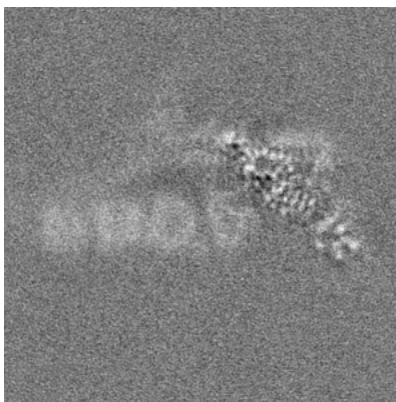


Z Index: 243

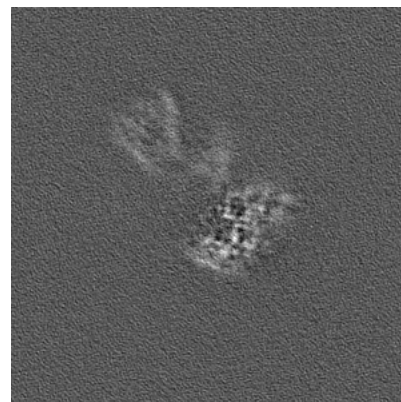
6.3.2 Raw map



X Index: 146



Y Index: 147

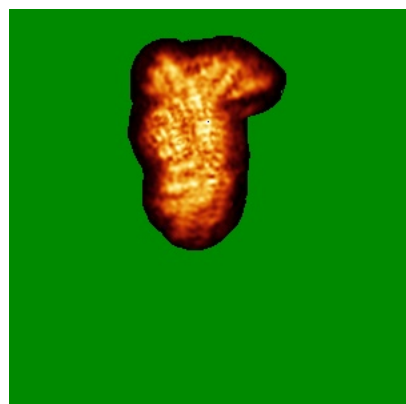


Z Index: 206

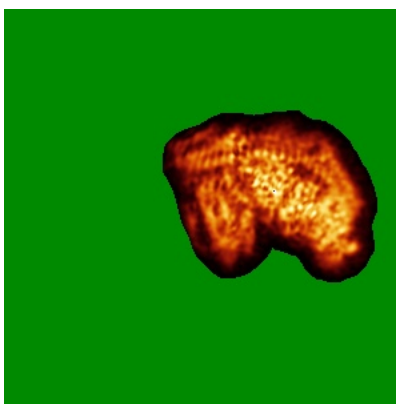
The images above show the largest variance slices of the map in three orthogonal directions.

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

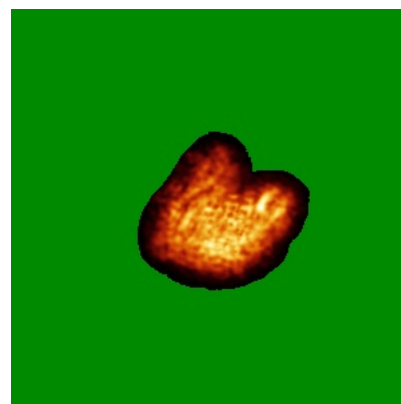
6.4.1 Primary map



X

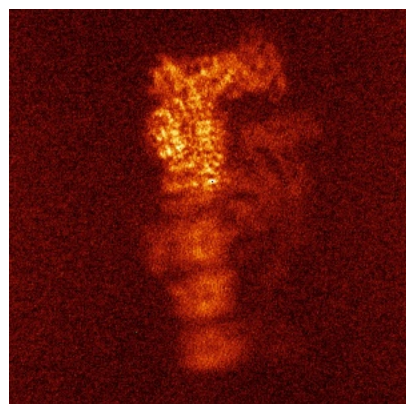


Y

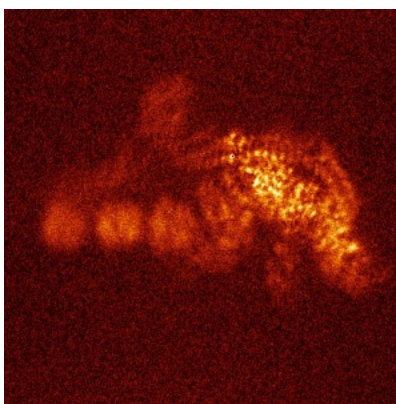


Z

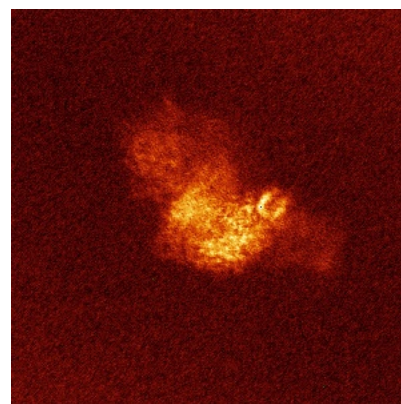
6.4.2 Raw map



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.

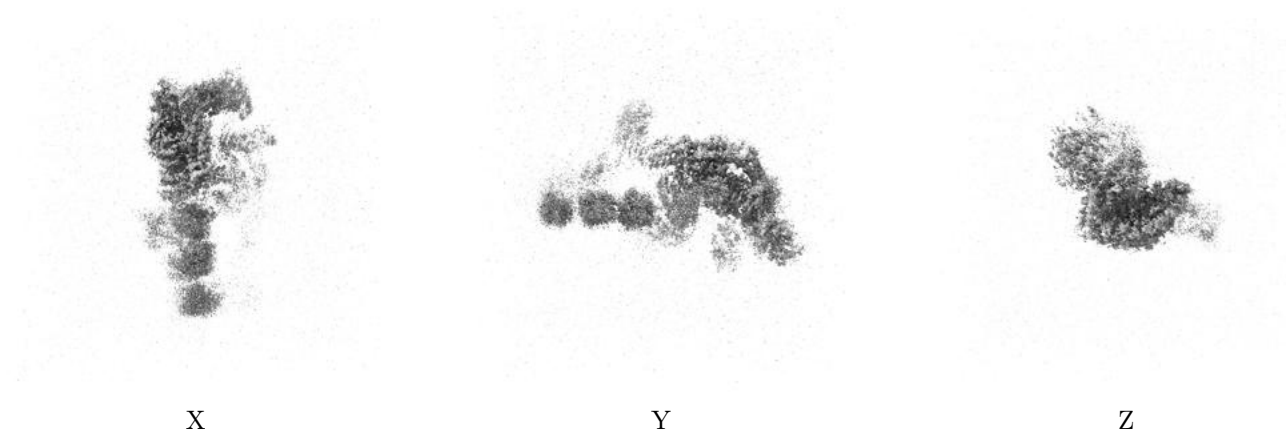
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.15. 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.

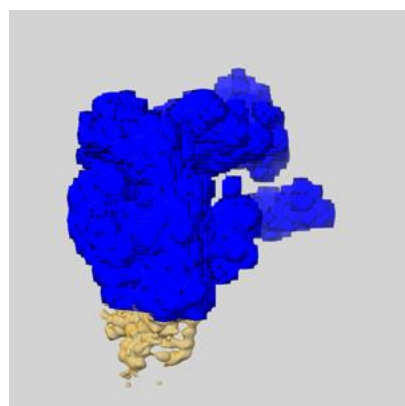
6.6 Mask visualisation [i](#)

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

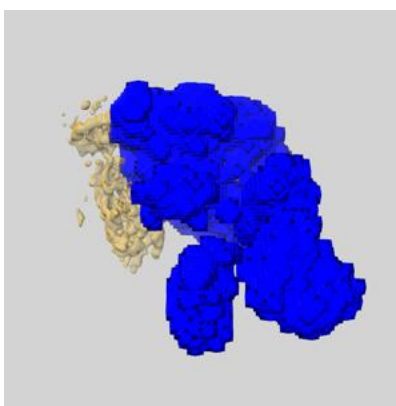
A mask typically either:

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

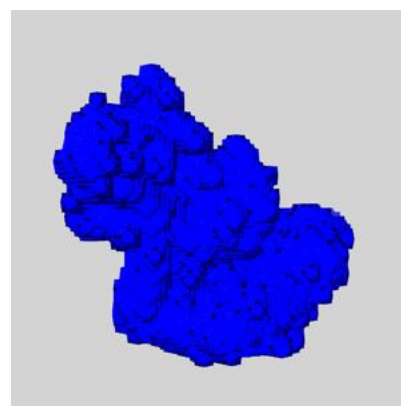
6.6.1 emd_19133_msk_1.map [i](#)



X



Y

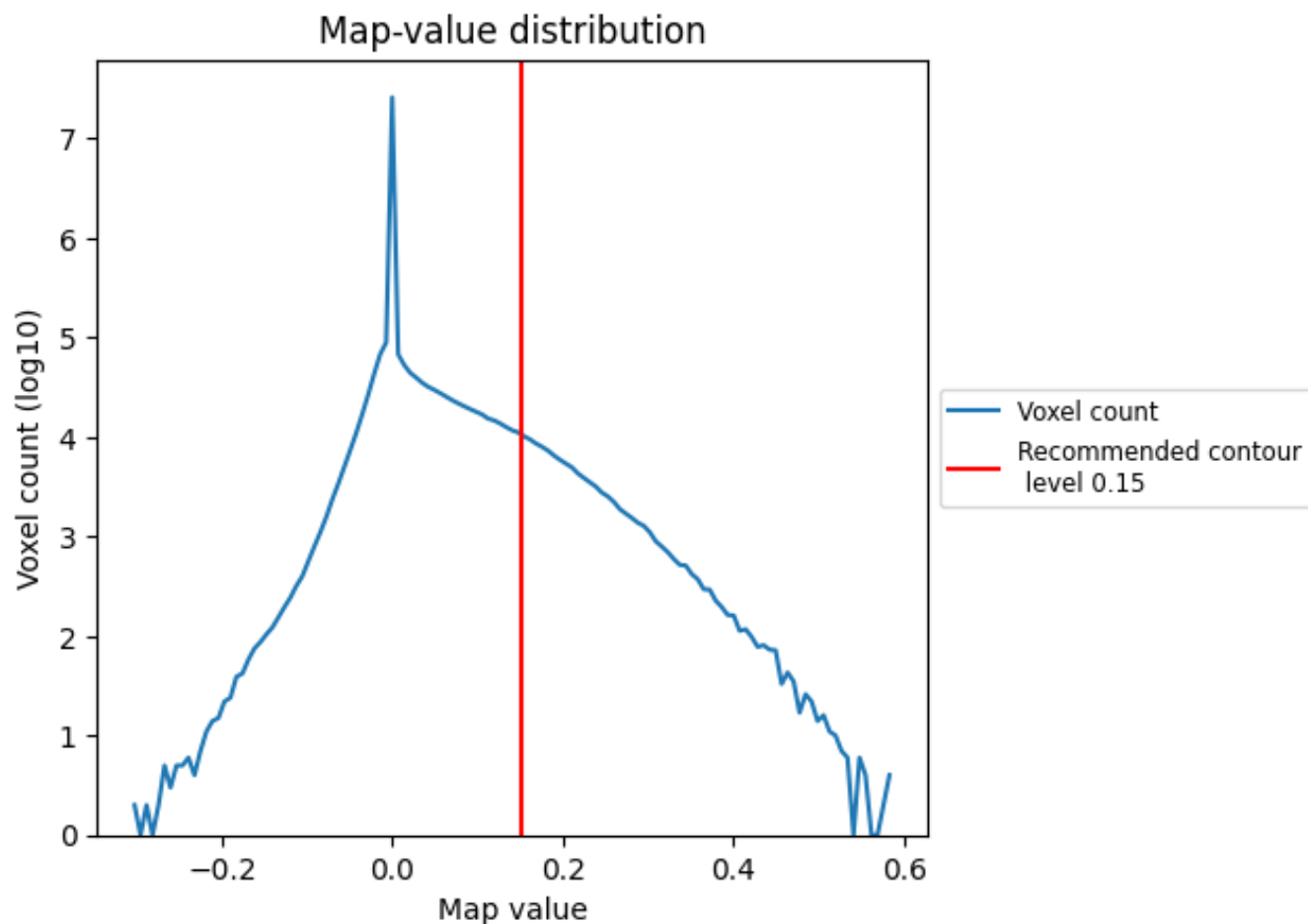


Z

7 Map analysis [i](#)

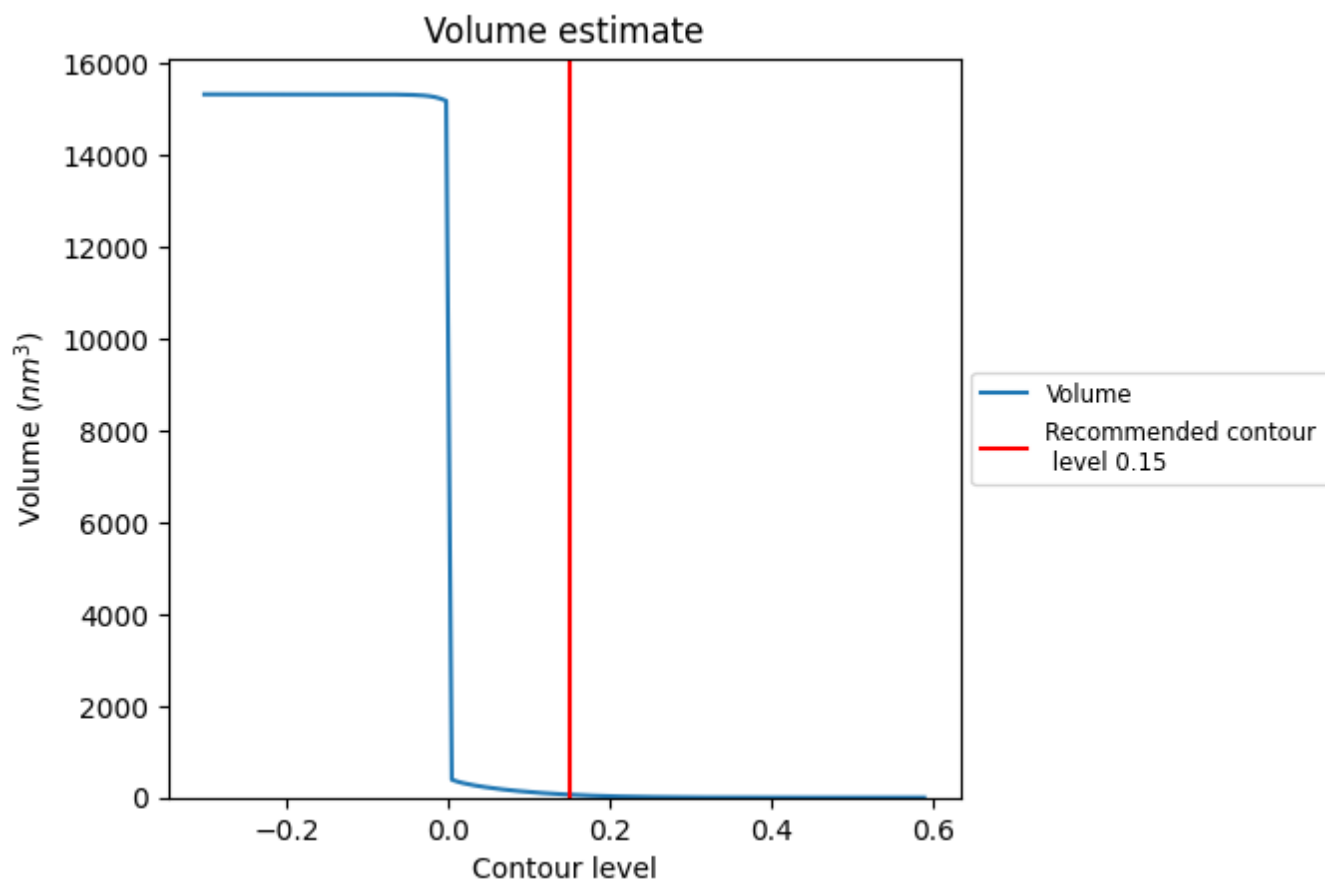
This section contains the results of statistical analysis of the map.

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.

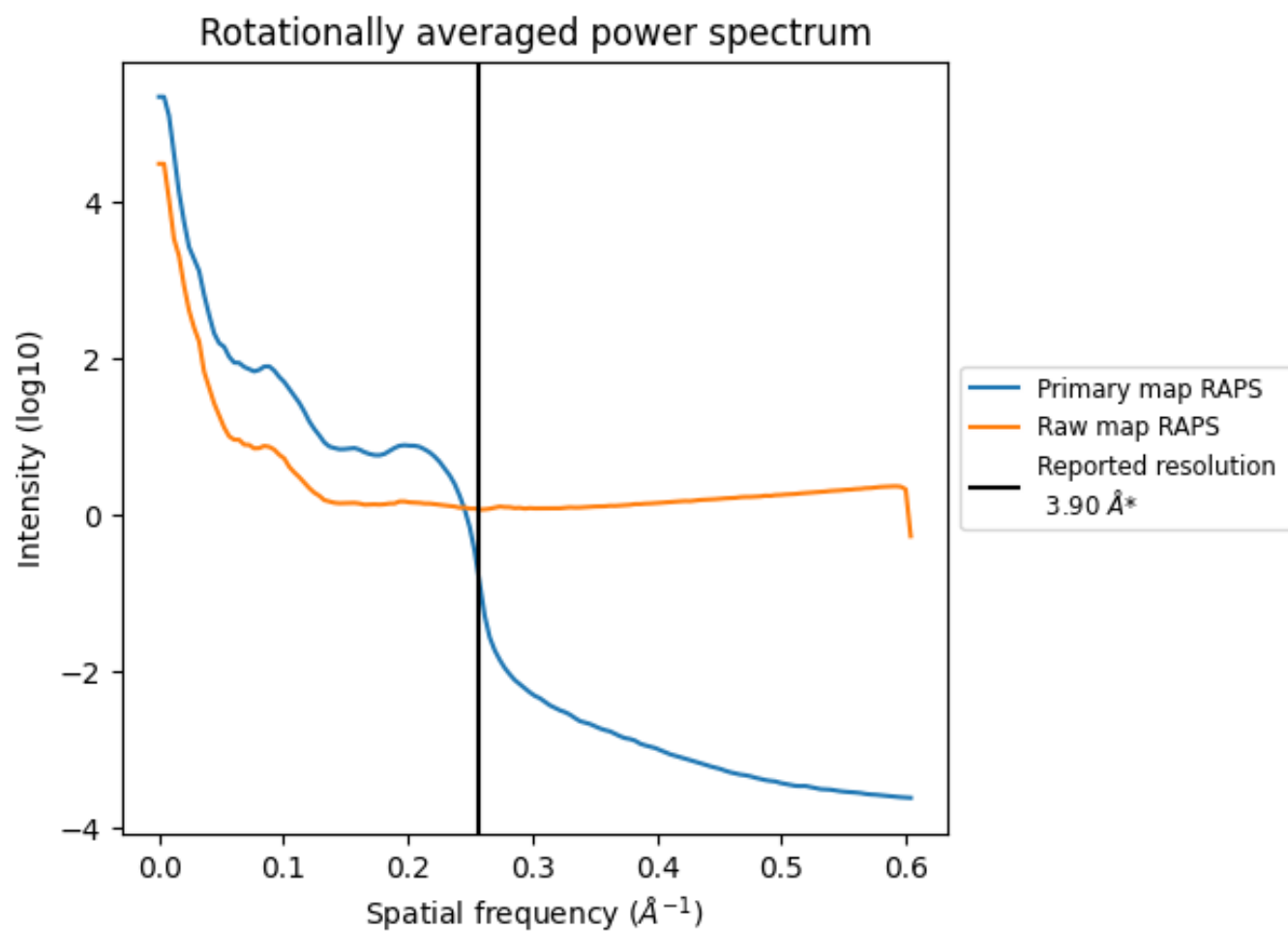
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 63 nm^3 ; this corresponds to an approximate mass of 57 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 ⓘ

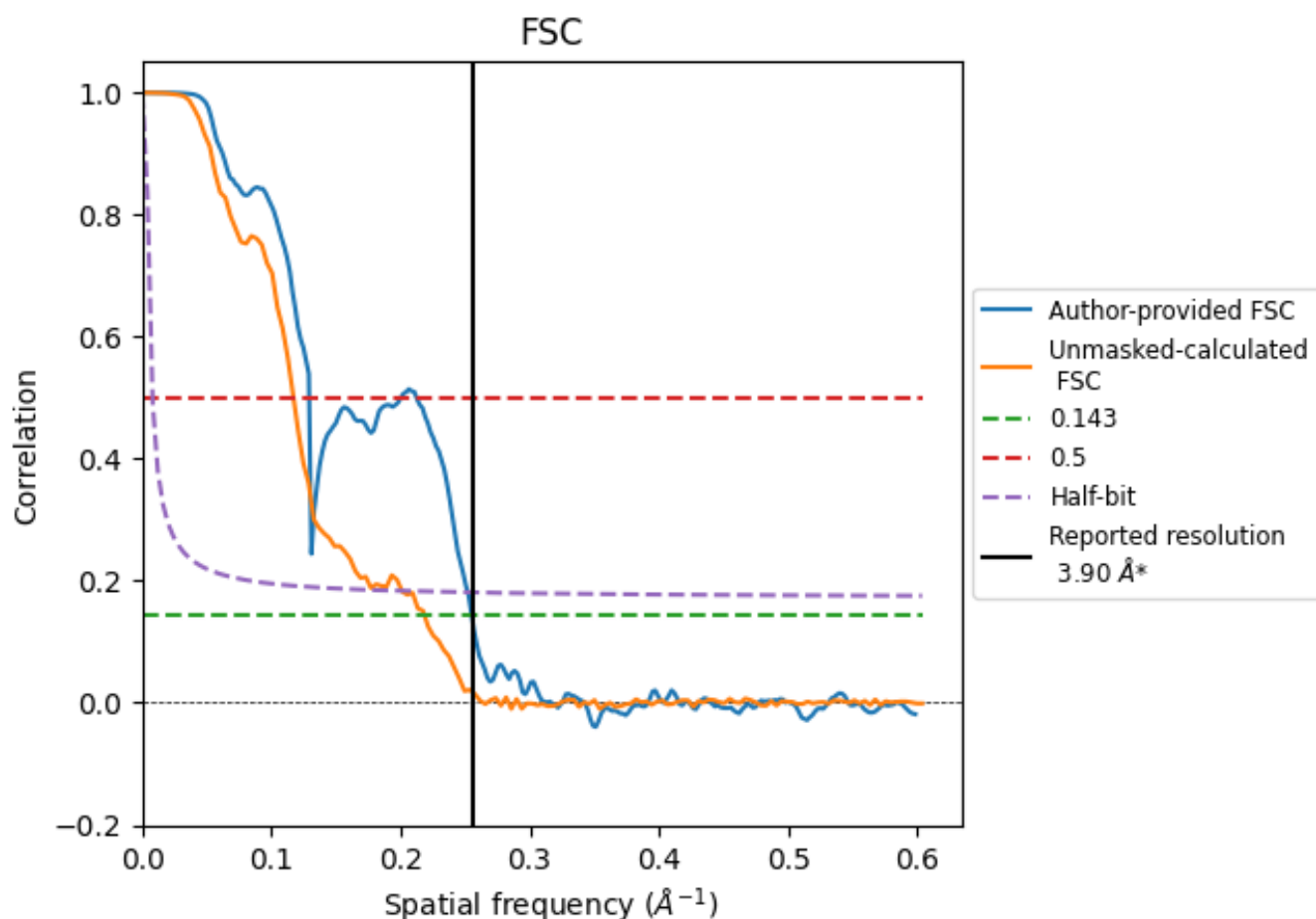


*Reported resolution corresponds to spatial frequency of 0.256 $\text{\AA}^{-1}$

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of $0.256 \text{ \AA}^{-1}$

8.2 Resolution estimates [i](#)

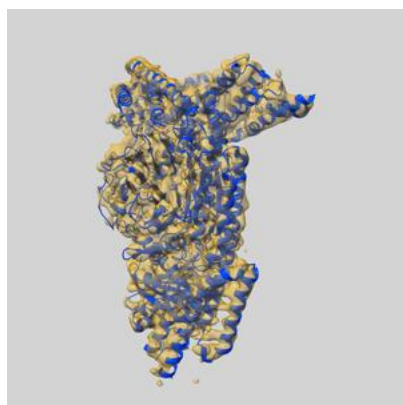
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.90	-	-
Author-provided FSC curve	3.92	7.74	3.96
Unmasked-calculated*	4.57	8.53	4.97

*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 4.57 differs from the reported value 3.9 by more than 10 %

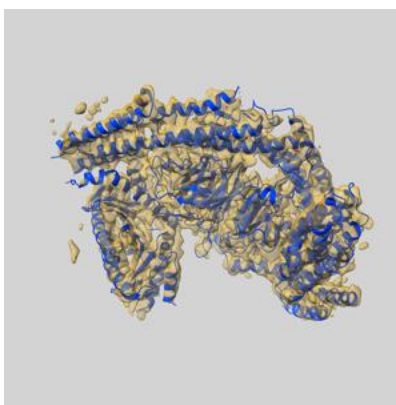
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-19133 and PDB model 8RGH. Per-residue inclusion information can be found in [section 3](#) on [page 7](#).

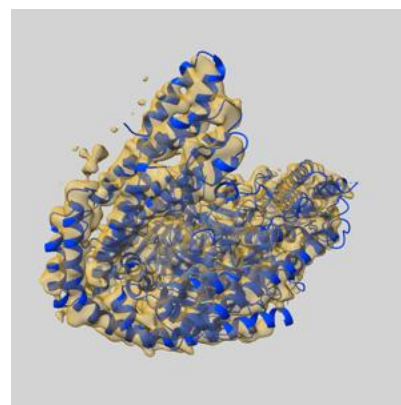
9.1 Map-model overlay [i](#)



X



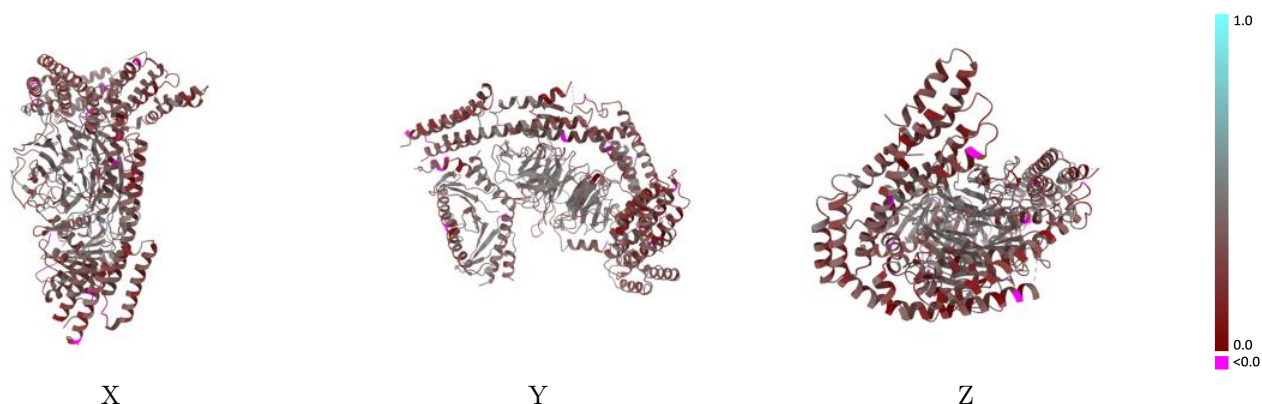
Y



Z

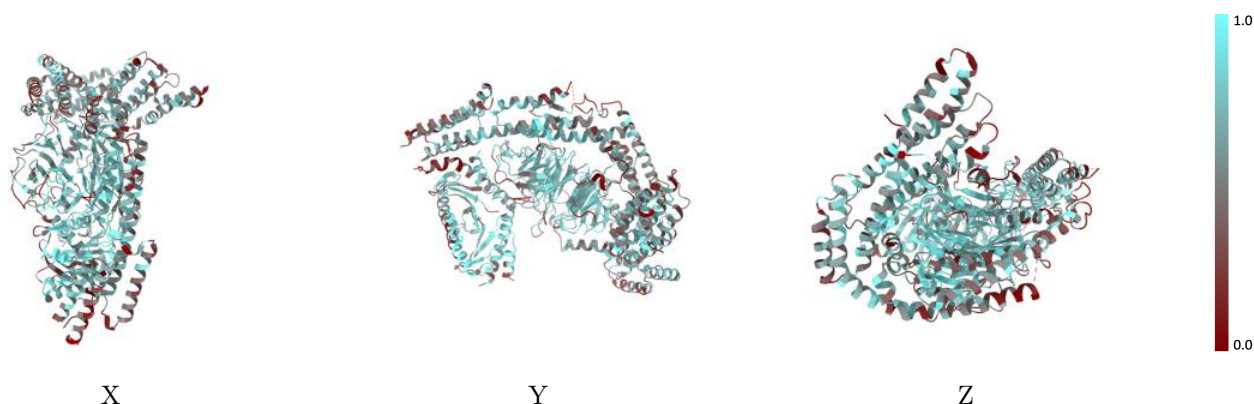
The images above show the 3D surface view of the map at the recommended contour level 0.15 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



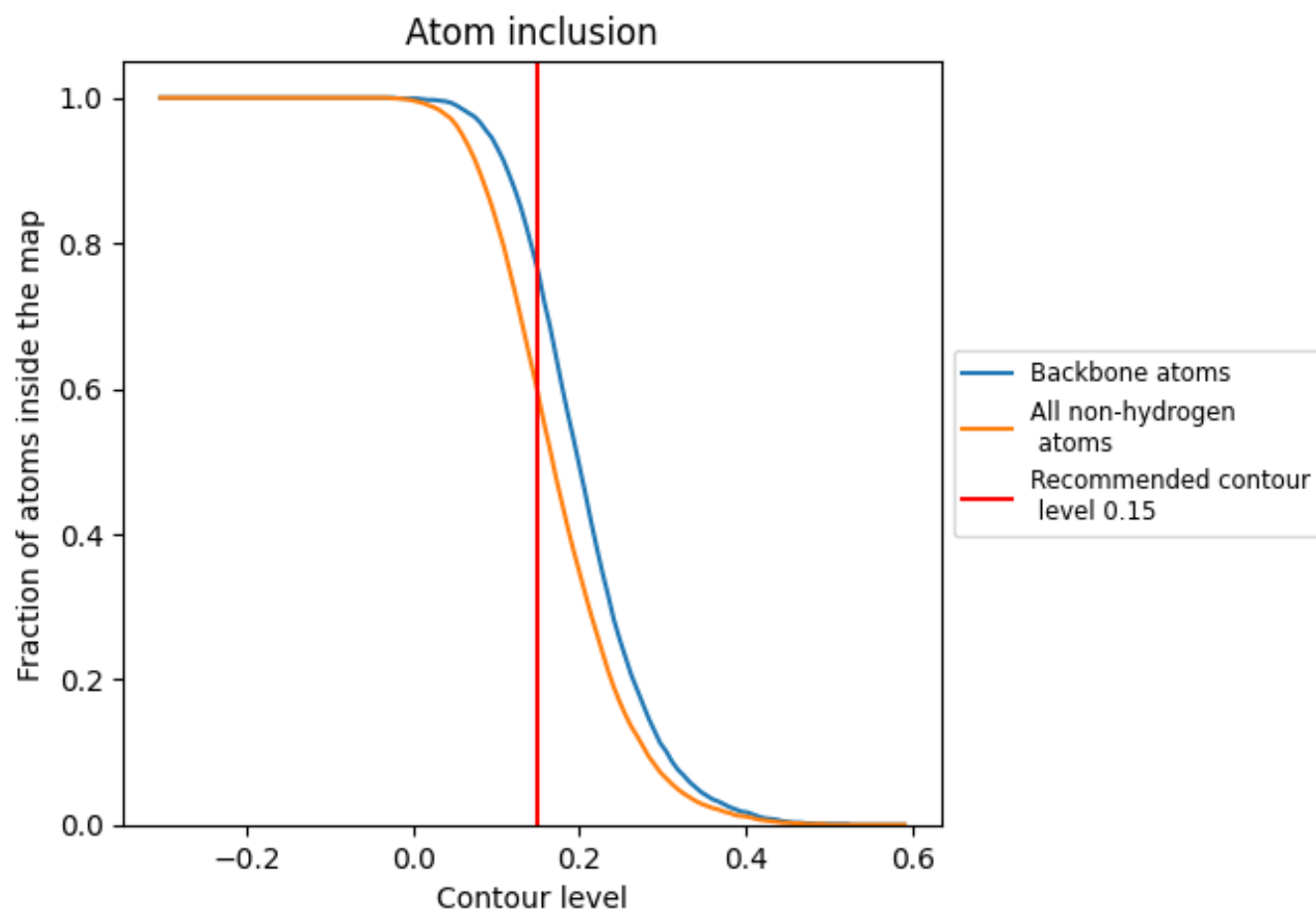
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.15).

9.4 Atom inclusion [i](#)



At the recommended contour level, 76% of all backbone atoms, 59% 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 (0.15) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.5940	0.3150
A	0.5420	0.2760
C	0.6320	0.3690
D	0.7330	0.2720
E	0.5970	0.2980
G	0.6910	0.3090
H	0.6750	0.3170

1.0

0.0

<0.0