



Full wwPDB EM Validation Report ⓘ

Mar 8, 2026 – 01:13 AM UTC

PDB ID : 8SO9 / pdb_00008so9
EMDB ID : EMD-40650
Title : Phosphoinositide phosphate 3 kinase gamma
Authors : Chen, C.-L.; Tesmer, J.J.G.
Deposited on : 2023-04-28
Resolution : 3.03 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.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

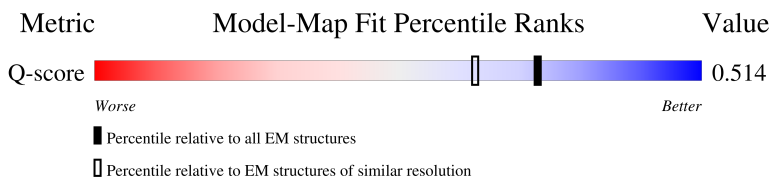
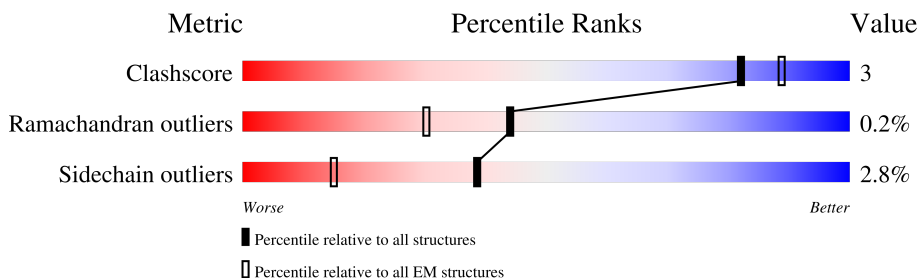
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.03 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	13929 (2.53 - 3.53)

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	1108	 85% 5% 9%
2	B	890	 50% 7% 42%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 24636 atoms, of which 12386 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 phosphatidylinositol-4,5-bisphosphate 3-kinase.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	1008	Total	C	H	N	O	S	0	0
			16409	5256	8236	1395	1481	41		

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	MET	-	initiating methionine	UNP A0A8D1WUA4
A	-4	HIS	-	expression tag	UNP A0A8D1WUA4
A	-3	HIS	-	expression tag	UNP A0A8D1WUA4
A	-2	HIS	-	expression tag	UNP A0A8D1WUA4
A	-1	HIS	-	expression tag	UNP A0A8D1WUA4
A	0	HIS	-	expression tag	UNP A0A8D1WUA4
A	1	HIS	-	expression tag	UNP A0A8D1WUA4

- Molecule 2 is a protein called Phosphoinositide 3-kinase regulatory subunit 5.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	515	Total	C	H	N	O	S	0	0
			8227	2608	4150	701	748	20		

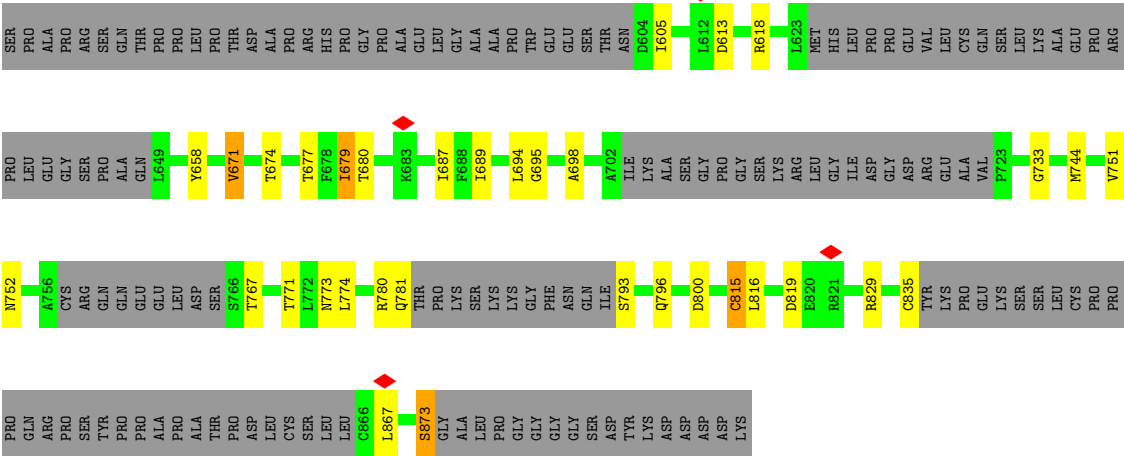
There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	878	GLY	-	expression tag	UNP A0A8D0T2D6
B	879	GLY	-	expression tag	UNP A0A8D0T2D6
B	880	GLY	-	expression tag	UNP A0A8D0T2D6
B	881	GLY	-	expression tag	UNP A0A8D0T2D6
B	882	SER	-	expression tag	UNP A0A8D0T2D6
B	883	ASP	-	expression tag	UNP A0A8D0T2D6
B	884	TYR	-	expression tag	UNP A0A8D0T2D6
B	885	LYS	-	expression tag	UNP A0A8D0T2D6
B	886	ASP	-	expression tag	UNP A0A8D0T2D6
B	887	ASP	-	expression tag	UNP A0A8D0T2D6

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Chain	Residue	Modelled	Actual	Comment	Reference
B	888	ASP	-	expression tag	UNP A0A8D0T2D6
B	889	ASP	-	expression tag	UNP A0A8D0T2D6
B	890	LYS	-	expression tag	UNP A0A8D0T2D6



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	269357	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 ($e^-/\text{\AA}^2$)	55	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	48.819	Depositor
Minimum map value	-26.632	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.984	Depositor
Recommended contour level	3.5	Depositor
Map size (Å)	345.6, 345.6, 345.6	wwPDB
Map dimensions	320, 320, 320	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.08, 1.08, 1.08	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	0.19	0/8359	0.33	0/11322
2	B	0.18	0/4155	0.39	0/5633
All	All	0.19	0/12514	0.35	0/16955

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	8173	8236	8229	32	0
2	B	4077	4150	4142	30	0
All	All	12250	12386	12371	62	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 (62) 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:391:GLN:NE2	1:A:633:CYS:SG	2.51	0.83
2:B:815:CYS:SG	2:B:816:LEU:N	2.56	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:651:LEU:O	1:A:684:ARG:NH2	2.20	0.75
1:A:47:SER:O	1:A:53:THR:N	2.21	0.73
1:A:982:ARG:O	1:A:1078:LYS:NZ	2.24	0.71
1:A:988:THR:OG1	1:A:990:ASP:OD1	2.08	0.64
1:A:114:GLN:NE2	1:A:329:CYS:O	2.28	0.64
1:A:66:ASN:OD1	1:A:69:GLN:N	2.28	0.61
1:A:1017:TYR:OH	1:A:1054:ALA:O	2.21	0.59
2:B:538:ARG:NH2	2:B:835:CYS:SG	2.81	0.54
2:B:303:GLU:O	2:B:306:LEU:HG	2.08	0.54
2:B:733:GLY:N	2:B:800:ASP:OD2	2.40	0.53
2:B:22:HIS:O	2:B:618:ARG:NH1	2.41	0.53
2:B:299:ASP:O	2:B:302:GLN:HG2	2.11	0.51
2:B:613:ASP:OD1	2:B:873:SER:OG	2.16	0.50
1:A:167:ASN:O	1:A:168:VAL:HG13	2.11	0.50
1:A:798:ILE:HG22	1:A:798:ILE:O	2.13	0.49
2:B:534:SER:OG	2:B:535:ASN:N	2.46	0.49
1:A:362:ARG:HG2	1:A:413:TRP:CE3	2.48	0.48
1:A:345:ASP:OD1	1:A:346:HIS:N	2.46	0.48
1:A:968:ILE:HD12	1:A:969:LEU:N	2.29	0.48
1:A:959:ASN:OD1	1:A:960:LEU:N	2.47	0.48
2:B:539:LEU:O	2:B:543:ARG:N	2.45	0.48
1:A:395:CYS:SG	1:A:396:GLN:N	2.88	0.47
1:A:164:ASP:OD2	1:A:166:SER:OG	2.32	0.46
2:B:695:GLY:O	2:B:698:ALA:N	2.48	0.46
2:B:538:ARG:O	2:B:539:LEU:C	2.58	0.45
1:A:750:LYS:O	1:A:751:SER:C	2.59	0.45
2:B:780:ARG:HG2	2:B:781:GLN:N	2.32	0.45
2:B:526:SER:HB2	2:B:605:ILE:HD12	1.98	0.45
1:A:640:VAL:O	1:A:643:ILE:HG12	2.17	0.44
2:B:525:ILE:O	2:B:529:VAL:N	2.44	0.44
1:A:847:ILE:HD12	1:A:1034:MET:SD	2.57	0.44
1:A:327:ASP:OD1	1:A:328:ASP:N	2.51	0.44
1:A:691:ILE:HG22	1:A:691:ILE:O	2.17	0.44
1:A:990:ASP:OD1	1:A:991:PHE:N	2.52	0.43
2:B:751:VAL:HG22	2:B:774:LEU:HD23	2.01	0.43
2:B:79:ALA:N	2:B:80:PRO:CD	2.82	0.43
2:B:308:GLU:OE1	2:B:308:GLU:HA	2.17	0.43
1:A:279:GLU:O	1:A:280:TYR:C	2.61	0.42
1:A:182:THR:HB	1:A:183:PRO:HD3	2.00	0.42
1:A:773:ASN:OD1	1:A:773:ASN:C	2.62	0.42
1:A:693:HIS:CD2	1:A:789:PRO:HG3	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:230:PHE:CD1	2:B:230:PHE:C	2.97	0.42
1:A:59:LEU:HD21	1:A:77:ARG:CG	2.50	0.42
2:B:299:ASP:O	2:B:300:ILE:C	2.62	0.42
2:B:752:ASN:H	2:B:773:ASN:HB2	1.84	0.42
2:B:677:THR:HB	2:B:829:ARG:HB3	2.00	0.41
1:A:328:ASP:N	1:A:328:ASP:OD1	2.53	0.41
1:A:364:LYS:HD2	1:A:413:TRP:CE2	2.56	0.41
2:B:658:TYR:CD1	2:B:658:TYR:C	2.98	0.41
2:B:141:TYR:CD1	2:B:141:TYR:C	2.98	0.41
2:B:533:TYR:O	2:B:534:SER:C	2.63	0.41
2:B:671:VAL:HG23	2:B:689:ILE:HB	2.01	0.41
1:A:1033:MET:O	1:A:1034:MET:C	2.64	0.41
2:B:519:VAL:O	2:B:519:VAL:HG12	2.20	0.41
2:B:679:ILE:HG23	2:B:680:THR:N	2.37	0.40
2:B:816:LEU:O	2:B:819:ASP:HB2	2.21	0.40
1:A:562:ASP:OD1	1:A:562:ASP:N	2.52	0.40
2:B:142:GLN:HE21	2:B:142:GLN:HB2	1.79	0.40
1:A:874:ASP:OD1	1:A:875:LYS:NZ	2.51	0.40
2:B:238:GLU:O	2:B:241:SER:OG	2.36	0.40

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	994/1108 (90%)	943 (95%)	49 (5%)	2 (0%)	43 73
2	B	497/890 (56%)	461 (93%)	35 (7%)	1 (0%)	43 73
All	All	1491/1998 (75%)	1404 (94%)	84 (6%)	3 (0%)	44 73

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	762	GLN
1	A	1034	MET
2	B	305	LEU

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	907/993 (91%)	896 (99%)	11 (1%)	63	79
2	B	454/770 (59%)	427 (94%)	27 (6%)	18	47
All	All	1361/1763 (77%)	1323 (97%)	38 (3%)	38	67

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	232	THR
1	A	269	ASP
1	A	328	ASP
1	A	330	THR
1	A	333	THR
1	A	537	ASP
1	A	583	LEU
1	A	724	CYS
1	A	773	ASN
1	A	968	ILE
1	A	1036	MET
2	B	38	CYS
2	B	76	ASP
2	B	77	LEU
2	B	134	LEU
2	B	142	GLN
2	B	156	HIS
2	B	209	CYS
2	B	258	GLN
2	B	306	LEU
2	B	311	LEU

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Mol	Chain	Res	Type
2	B	529	VAL
2	B	531	ARG
2	B	537	ARG
2	B	539	LEU
2	B	671	VAL
2	B	674	THR
2	B	679	ILE
2	B	687	ILE
2	B	694	LEU
2	B	744	MET
2	B	767	THR
2	B	771	THR
2	B	793	SER
2	B	796	GLN
2	B	815	CYS
2	B	867	LEU
2	B	873	SER

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	64	HIS
1	A	391	GLN
1	A	522	ASN
1	A	688	ASN
1	A	693	HIS
1	A	735	GLN
1	A	776	ASN
2	B	258	GLN
2	B	309	GLN
2	B	670	GLN
2	B	773	ASN

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 [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.

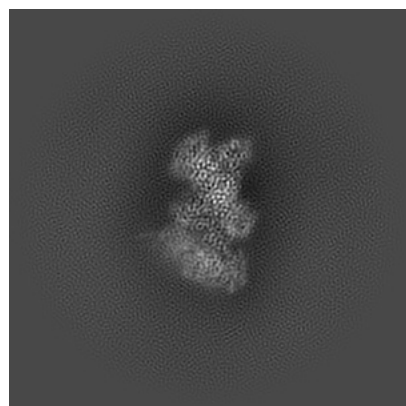
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-40650. These allow visual inspection of the internal detail of the map and identification of artifacts.

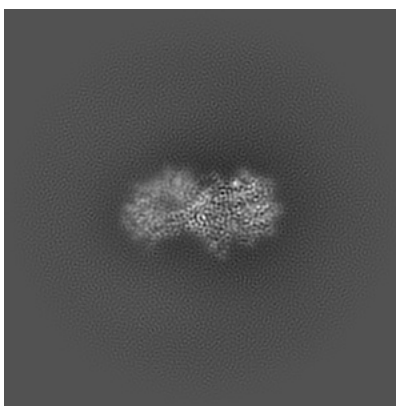
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

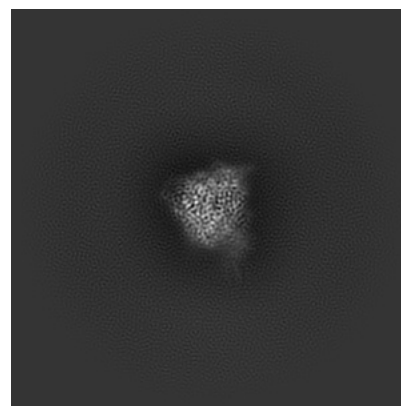
6.1.1 Primary map



X

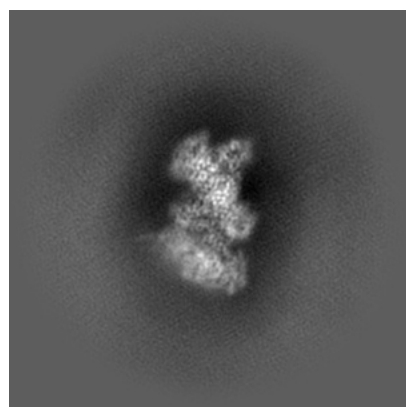


Y

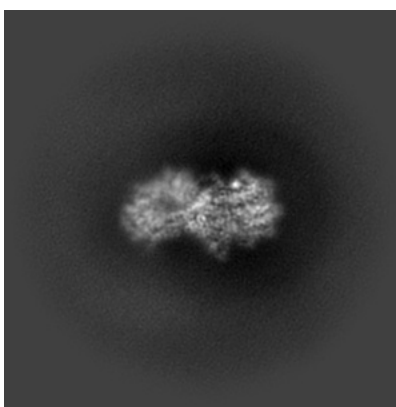


Z

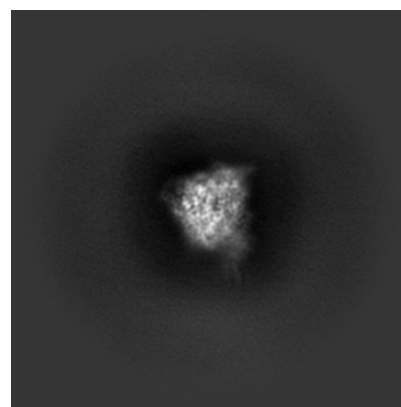
6.1.2 Raw map



X



Y

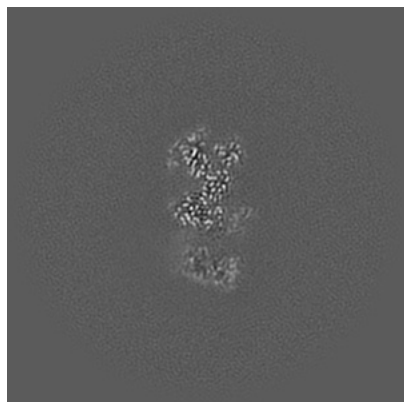


Z

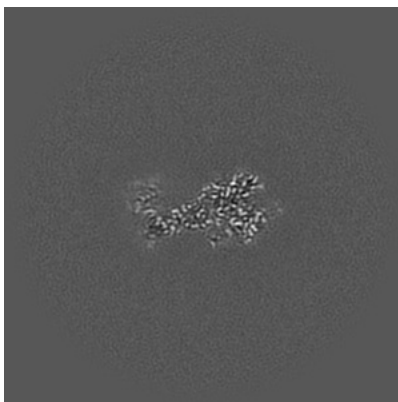
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

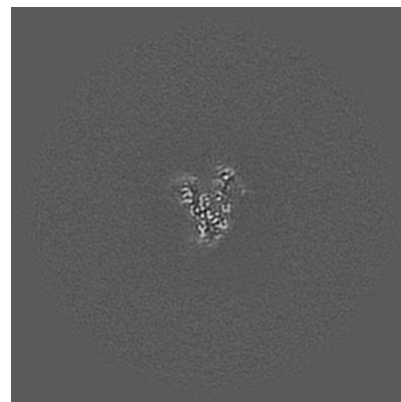
6.2.1 Primary map



X Index: 160

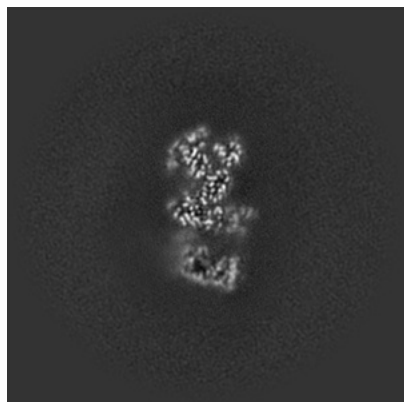


Y Index: 160

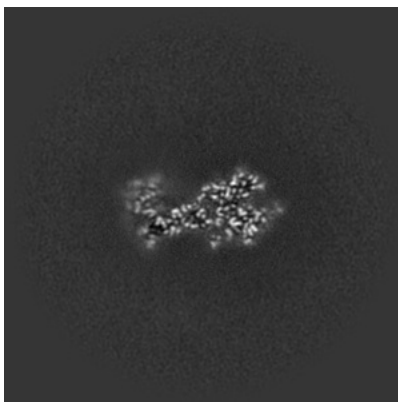


Z Index: 160

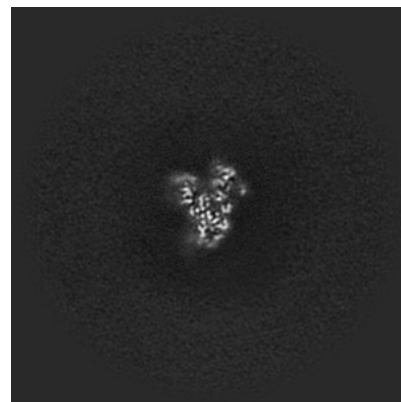
6.2.2 Raw map



X Index: 160



Y Index: 160

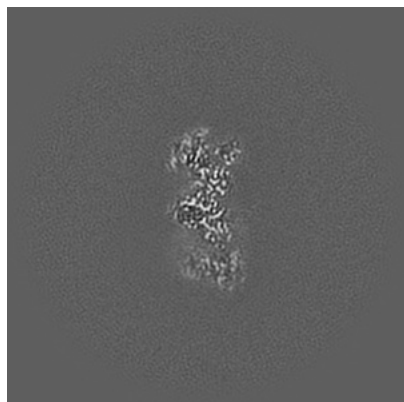


Z Index: 160

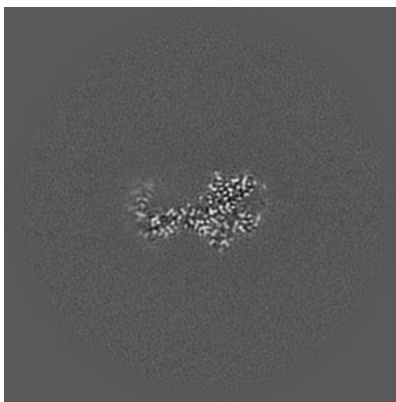
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

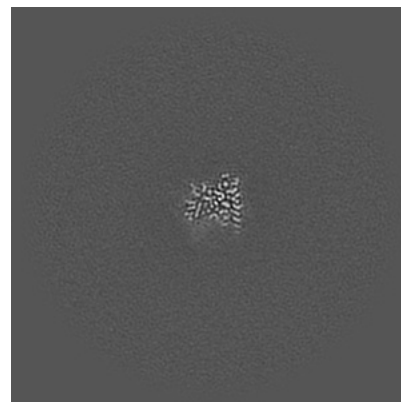
6.3.1 Primary map



X Index: 157

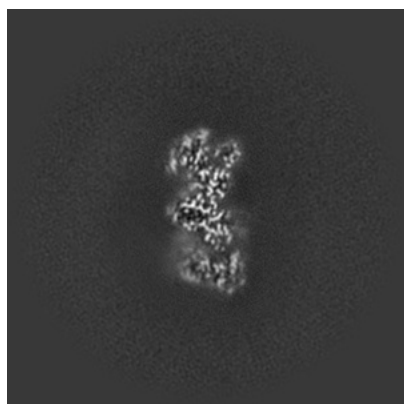


Y Index: 164

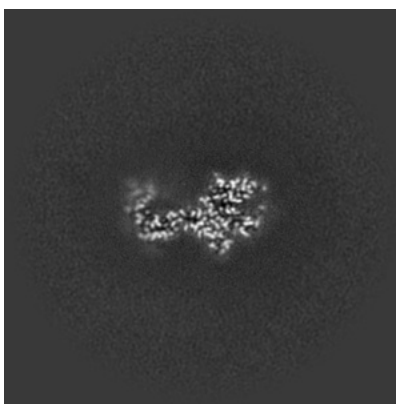


Z Index: 184

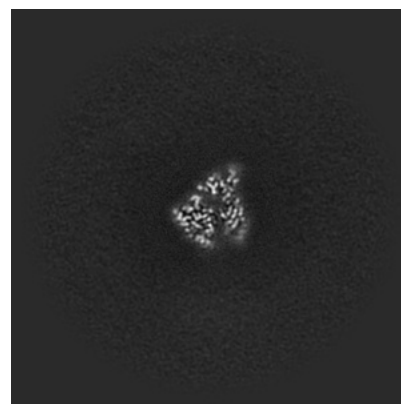
6.3.2 Raw map



X Index: 157



Y Index: 165

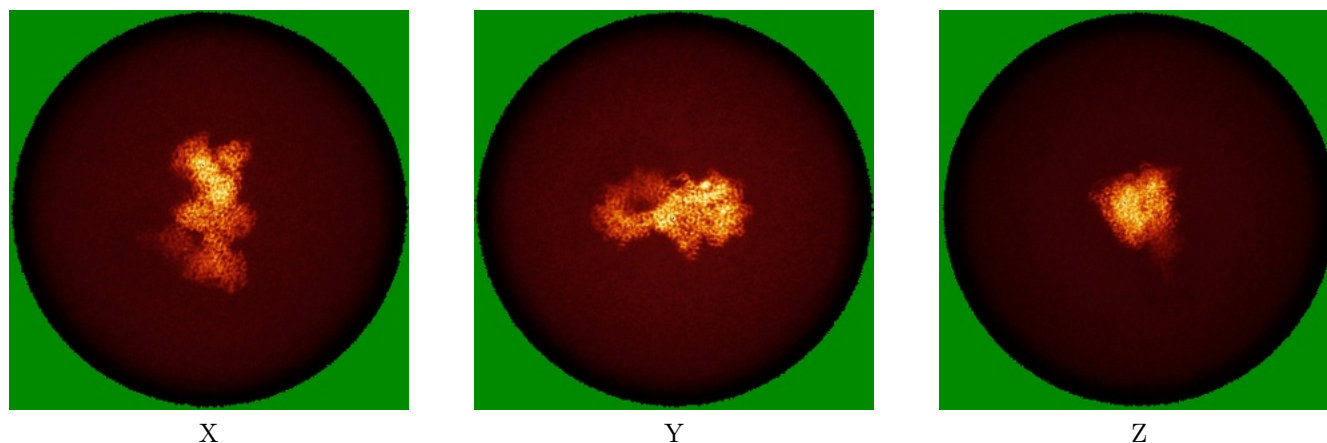


Z Index: 198

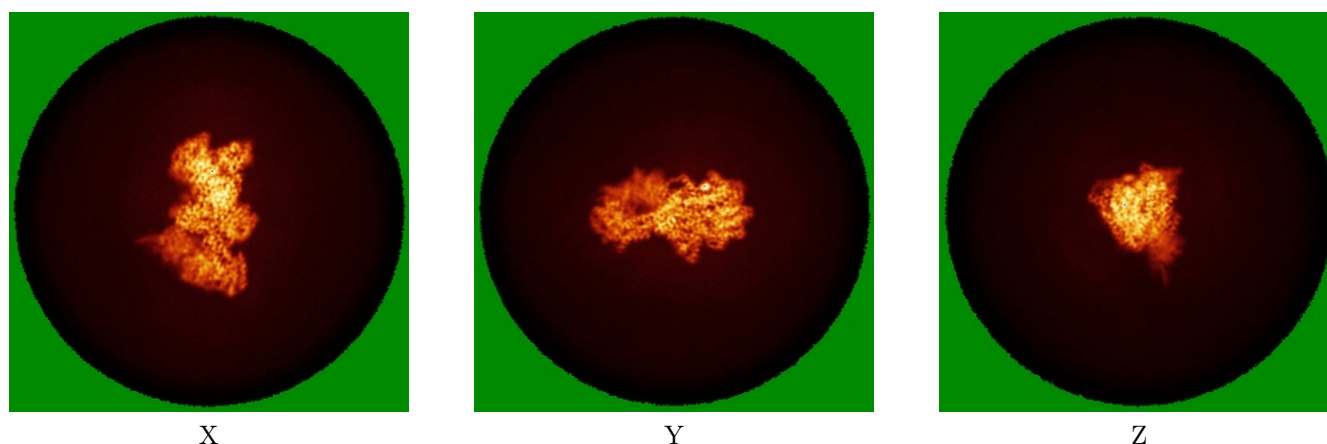
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



6.4.2 Raw map



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](#)

This section was not generated.

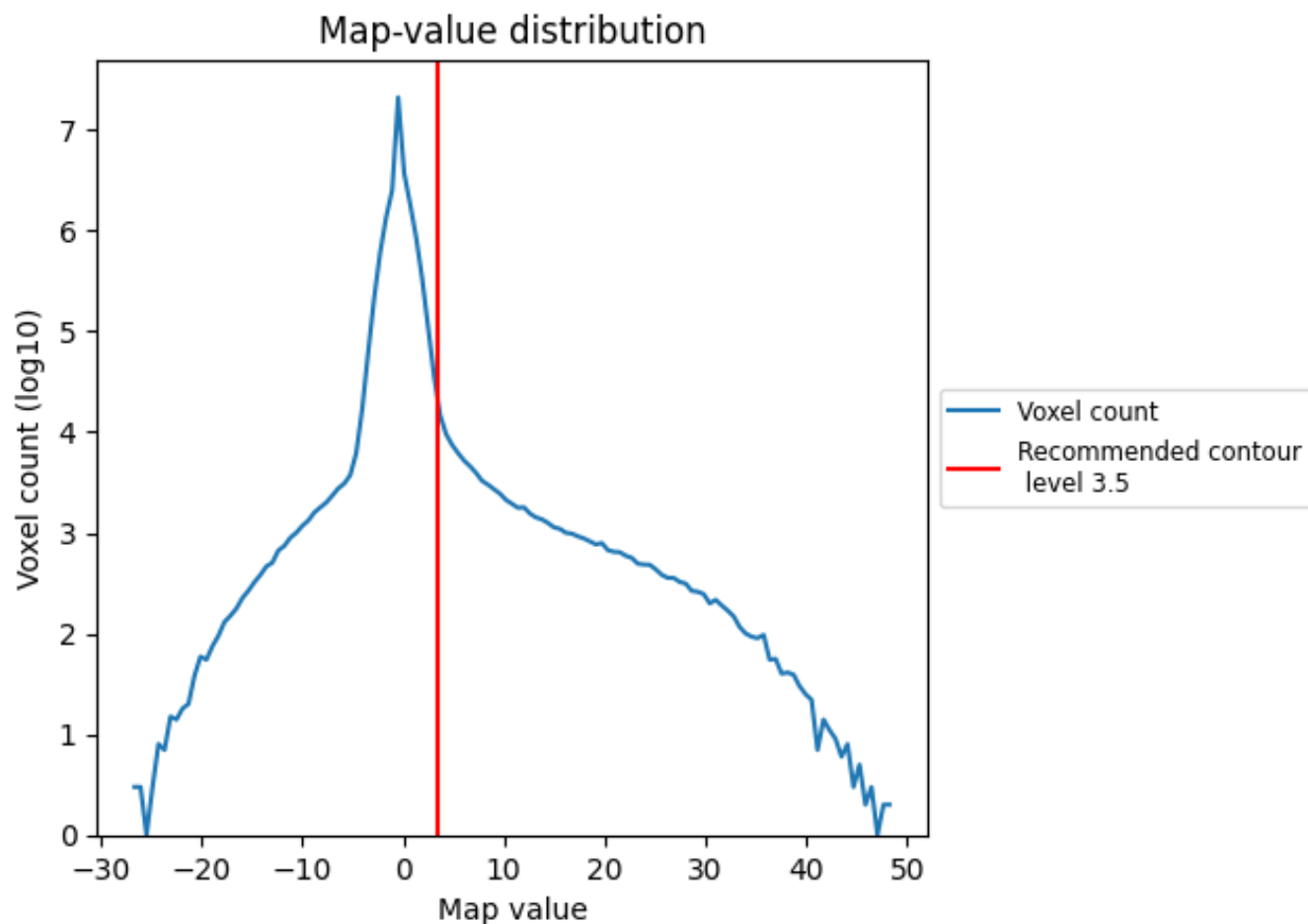
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

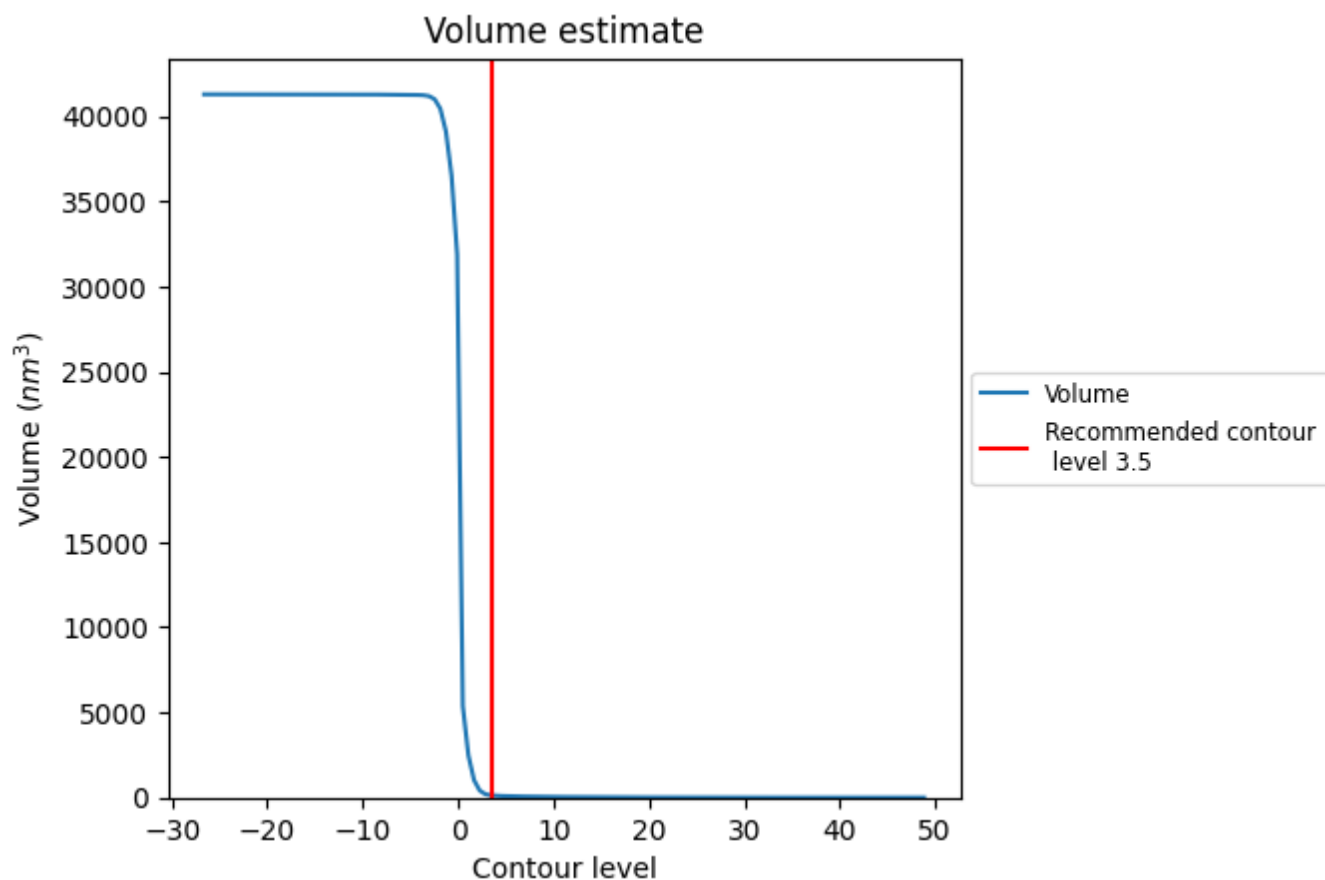
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

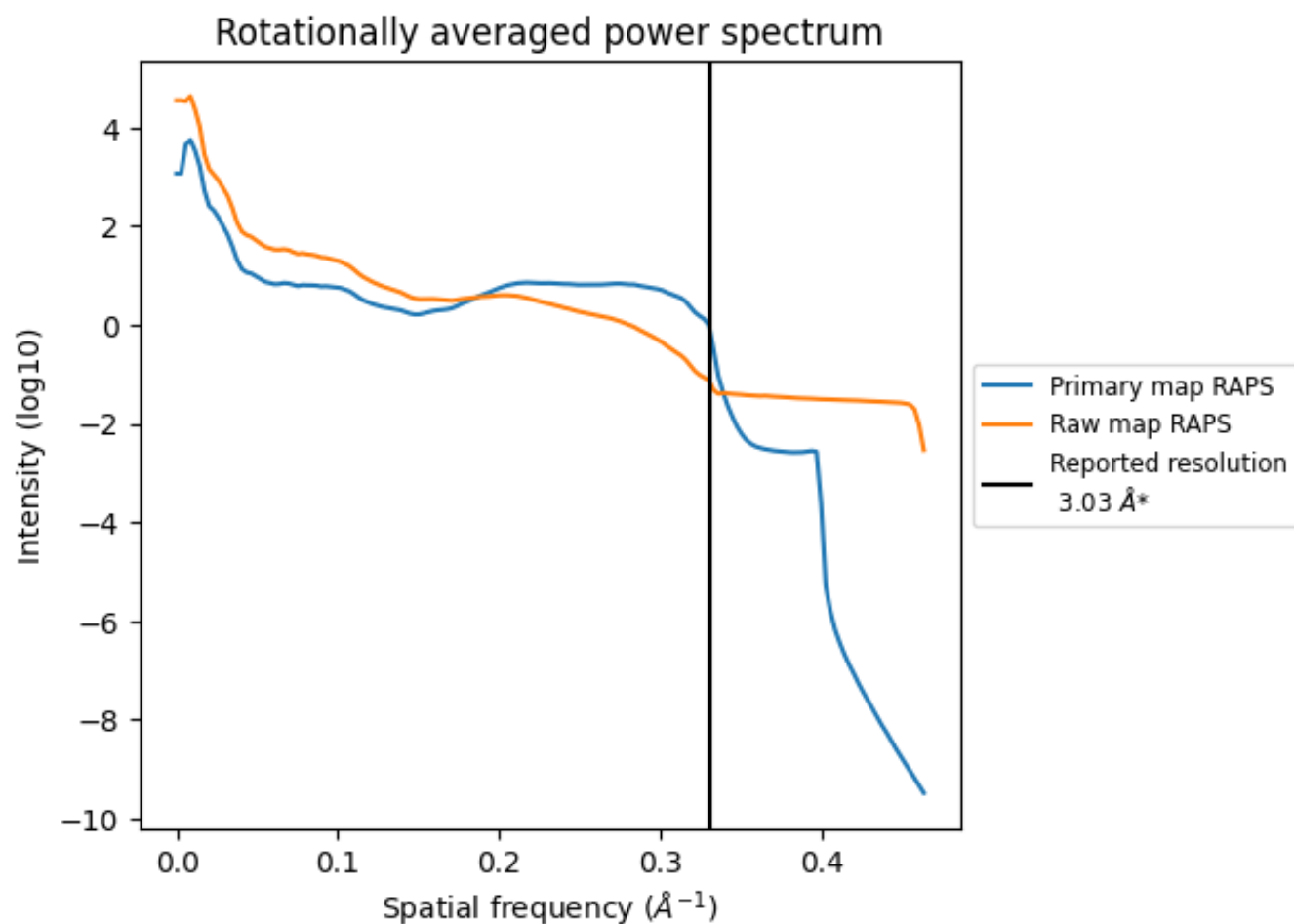
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 128 nm^3 ; this corresponds to an approximate mass of 116 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 ⓘ

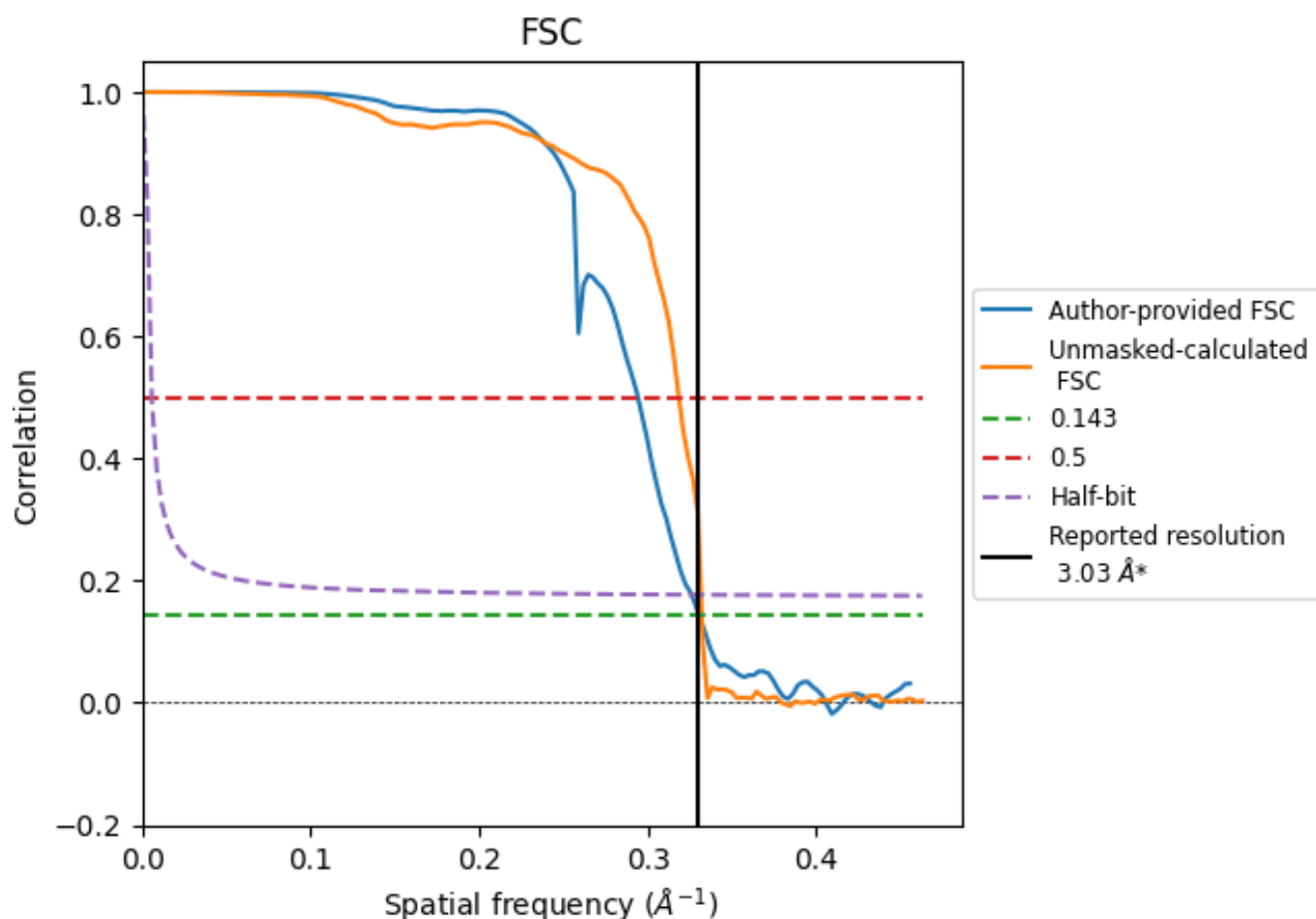


*Reported resolution corresponds to spatial frequency of 0.330 Å⁻¹

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 0.330 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.03	-	-
Author-provided FSC curve	3.03	3.40	3.07
Unmasked-calculated*	3.01	3.14	3.01

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

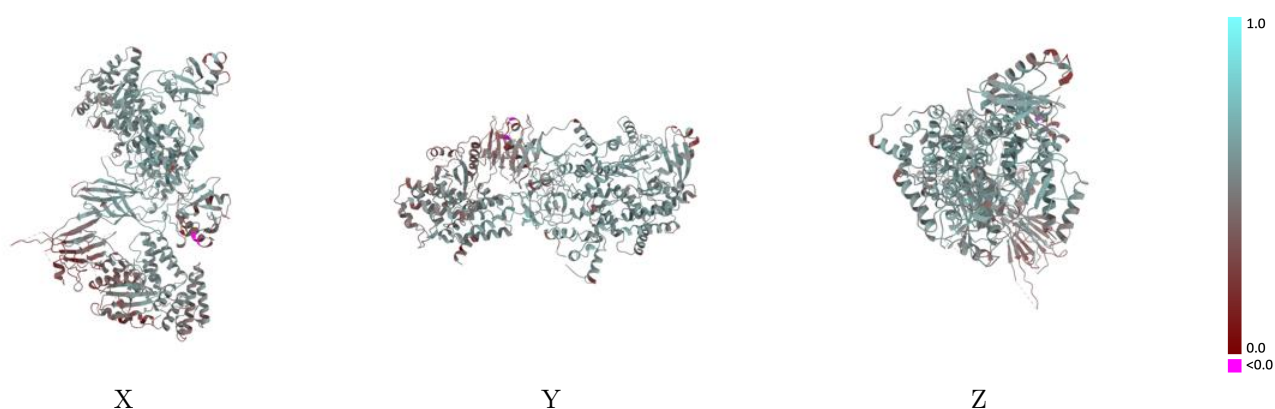
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-40650 and PDB model 8SO9. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay [i](#)

This section was not generated.

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

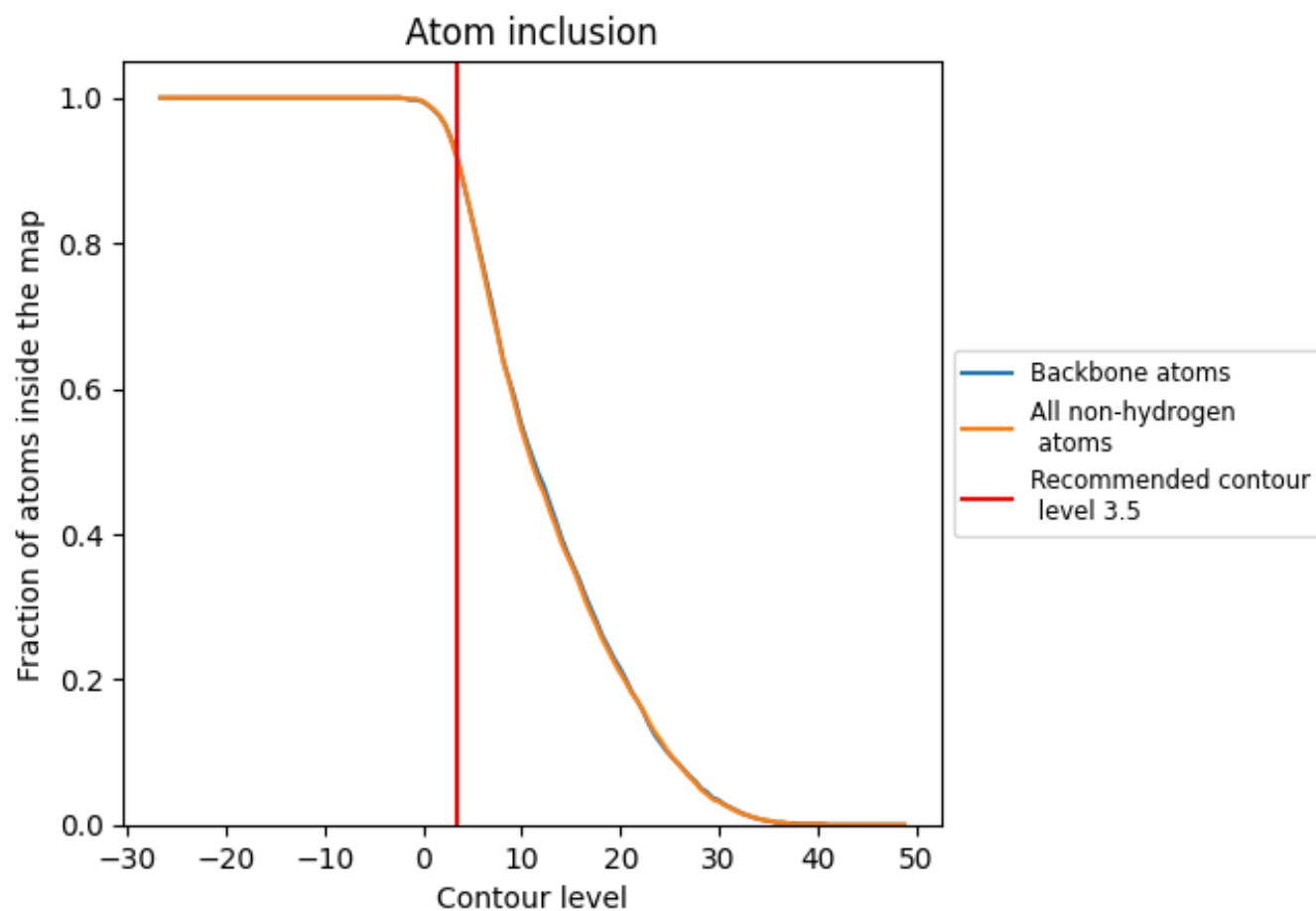


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

This section was not generated.

9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 91% 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 (3.5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9140	0.5140
A	0.9420	0.5470
B	0.8530	0.4470

