



# wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 07:45 AM UTC

PDB ID : 9SGR / pdb\_00009sgr  
EMDB ID : EMD-54878  
Title : S315N KatG mutant no heme  
Authors : Chaplin, A.; Allport, T.  
Deposited on : 2025-08-22  
Resolution : 2.60 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](mailto: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>.

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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

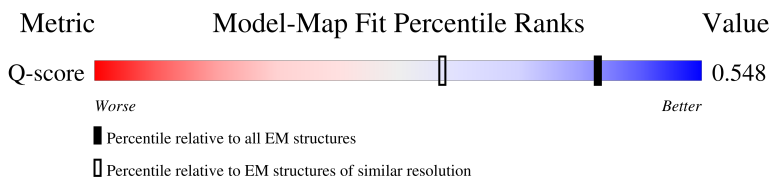
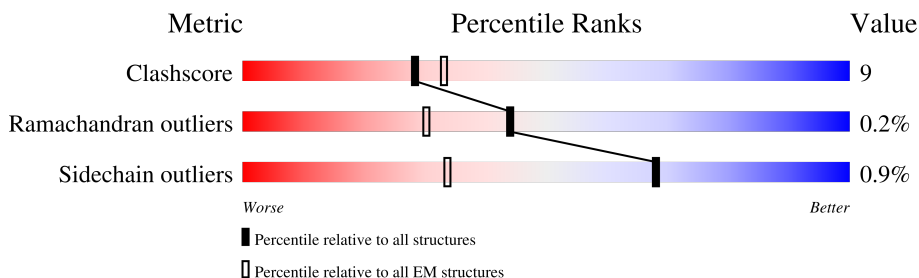
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*



The reported resolution of this entry is 2.60 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	8728 ( 2.10 - 3.10 )

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  $\geq 3$ , 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	772	
1	B	772	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 8303 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 Catalase-peroxidase.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	549	Total	C	N	O	S	1	0
			4140	2645	711	769	15		
1	B	550	Total	C	N	O	S	1	0
			4163	2657	713	778	15		

There are 66 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-31	HIS	-	expression tag	UNP A5U3S7
A	-30	HIS	-	expression tag	UNP A5U3S7
A	-29	HIS	-	expression tag	UNP A5U3S7
A	-28	HIS	-	expression tag	UNP A5U3S7
A	-27	HIS	-	expression tag	UNP A5U3S7
A	-26	HIS	-	expression tag	UNP A5U3S7
A	-25	ASN	-	expression tag	UNP A5U3S7
A	-24	THR	-	expression tag	UNP A5U3S7
A	-23	SER	-	expression tag	UNP A5U3S7
A	-22	GLY	-	expression tag	UNP A5U3S7
A	-21	SER	-	expression tag	UNP A5U3S7
A	-20	GLY	-	expression tag	UNP A5U3S7
A	-19	GLY	-	expression tag	UNP A5U3S7
A	-18	GLY	-	expression tag	UNP A5U3S7
A	-17	GLY	-	expression tag	UNP A5U3S7
A	-16	GLY	-	expression tag	UNP A5U3S7
A	-15	ARG	-	expression tag	UNP A5U3S7
A	-14	LEU	-	expression tag	UNP A5U3S7
A	-13	ASX	-	expression tag	UNP A5U3S7
A	-12	PRO	-	expression tag	UNP A5U3S7
A	-11	ARG	-	expression tag	UNP A5U3S7
A	-10	GLY	-	expression tag	UNP A5U3S7
A	-9	SER	-	expression tag	UNP A5U3S7
A	-8	MET	-	expression tag	UNP A5U3S7
A	-7	SER	-	expression tag	UNP A5U3S7
A	-6	GLU	-	expression tag	UNP A5U3S7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	ASN	-	expression tag	UNP A5U3S7
A	-4	LEU	-	expression tag	UNP A5U3S7
A	-3	TYR	-	expression tag	UNP A5U3S7
A	-2	PHE	-	expression tag	UNP A5U3S7
A	-1	GLN	-	expression tag	UNP A5U3S7
A	0	GLY	-	expression tag	UNP A5U3S7
A	315	ASN	SER	engineered mutation	UNP A5U3S7
B	-31	HIS	-	expression tag	UNP A5U3S7
B	-30	HIS	-	expression tag	UNP A5U3S7
B	-29	HIS	-	expression tag	UNP A5U3S7
B	-28	HIS	-	expression tag	UNP A5U3S7
B	-27	HIS	-	expression tag	UNP A5U3S7
B	-26	HIS	-	expression tag	UNP A5U3S7
B	-25	ASN	-	expression tag	UNP A5U3S7
B	-24	THR	-	expression tag	UNP A5U3S7
B	-23	SER	-	expression tag	UNP A5U3S7
B	-22	GLY	-	expression tag	UNP A5U3S7
B	-21	SER	-	expression tag	UNP A5U3S7
B	-20	GLY	-	expression tag	UNP A5U3S7
B	-19	GLY	-	expression tag	UNP A5U3S7
B	-18	GLY	-	expression tag	UNP A5U3S7
B	-17	GLY	-	expression tag	UNP A5U3S7
B	-16	GLY	-	expression tag	UNP A5U3S7
B	-15	ARG	-	expression tag	UNP A5U3S7
B	-14	LEU	-	expression tag	UNP A5U3S7
B	-13	ASX	-	expression tag	UNP A5U3S7
B	-12	PRO	-	expression tag	UNP A5U3S7
B	-11	ARG	-	expression tag	UNP A5U3S7
B	-10	GLY	-	expression tag	UNP A5U3S7
B	-9	SER	-	expression tag	UNP A5U3S7
B	-8	MET	-	expression tag	UNP A5U3S7
B	-7	SER	-	expression tag	UNP A5U3S7
B	-6	GLU	-	expression tag	UNP A5U3S7
B	-5	ASN	-	expression tag	UNP A5U3S7
B	-4	LEU	-	expression tag	UNP A5U3S7
B	-3	TYR	-	expression tag	UNP A5U3S7
B	-2	PHE	-	expression tag	UNP A5U3S7
B	-1	GLN	-	expression tag	UNP A5U3S7
B	0	GLY	-	expression tag	UNP A5U3S7
B	315	ASN	SER	engineered mutation	UNP A5U3S7



ALA	PRO	GLU	LEU	ASN	TRP	LEU	SER	TRP	PRO	ASP	ASN	ALA	SER	L141	V151	K152	Y155	G156	L159	S160	W161	L164	I165	V166	F181	G182	F183	G184	F185	D189	Q190	W191	E192	P193	ASP	GLU	VAL	TYR	TRP	GLY	LYS	GLU	ALA	LYS	LEU	GLY	THR	ASP	ARG	GLY	LYS	ARG	ASP			
LEU	GLU	ASN	PRO	LEU	SER	LYS	ALA	ALA	VAL	GLN	MET	GLY	GLY	LEU	ILE	TYR	VAL	ASN	PRO	GLU	GLY	PRO	D240	P241	A244	I248	A256	G268	F272	GLY	LYS	THR	HIS	GLY	ALA	TRP	GLN	PRO	TYR	THR	ALA	ASP	LEU	VAL	GLY	PRO	GLU	ALA	ALA	PRO	GLN	MET				
GLY	LEU	GLY	TRP	LYS	SER	SER	TYR	GLY	THR	GLY	THR	THR	GLY	LYS	ASP	ALA	ILE	THR	ASN	GLY	ILE	GLU	VAL	VAL	TRP	THR	ASN	THR	PRO	THR	LYS	D329	T344	LYS	SER	PRO	PRO	ALA	GLY	ALA	TRP	GLN	TYR	THR	ALA	LYS	ASP	GLY	ALA	GLY	ILE	PRO	ASP	PRO	PHE	GLY
GLY	PRO	GLY	ARG	SER	PRO	THR	MET	L378	L384	R385	V386	F408	A409	K410	R418	D419	M420	R425	Y426	Q434	I435	L436	L437	W438	D448	L449	V450	I455	A456	S457	L458	K459	S460	Q461	R484	Q485	K488	P501	V507	G512	D513	L514	N535	I536	V545											
L546	A550	A551	I552	E553	V565	P566	F567	E577	D580	V581	E582	S583	F584	L587	E588	P589	G593	L598	G599	K600	L604	P605	Y608	M609	L610	L611	L616	L619	M624	L643	P646	N660	T667	S692	E703	E709	V710	V721																		
F724	V725	W728	V731	M732	R733	L734	D738	V739	E740																																															

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	79721	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 ( $e^-/\text{\AA}^2$ )	48.279	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.184	Depositor
Minimum map value	-0.073	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.006	Depositor
Recommended contour level	0.0346	Depositor
Map size (Å)	237.312, 237.312, 237.312	wwPDB
Map dimensions	288, 288, 288	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.824, 0.824, 0.824	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	0.13	0/4242	0.35	0/5782
1	B	0.13	0/4266	0.32	0/5812
All	All	0.13	0/8508	0.33	0/11594

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	4140	0	3946	82	0
1	B	4163	0	3982	75	0
All	All	8303	0	7928	153	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 9.

The worst 5 of 153 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:159:LEU:HD21	1:A:164:LEU:HD23	1.53	0.87
1:B:159:LEU:HD11	1:B:164:LEU:HB2	1.59	0.84

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:458:LEU:HD11	1:B:546:LEU:HD23	1.67	0.74
1:A:703:GLU:N	1:A:703:GLU:OE1	2.24	0.71
1:A:450:VAL:HG13	1:A:454:GLU:HB2	1.73	0.70

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	540/772 (70%)	516 (96%)	24 (4%)	0	100	100
1	B	541/772 (70%)	520 (96%)	19 (4%)	2 (0%)	30	51
All	All	1081/1544 (70%)	1036 (96%)	43 (4%)	2 (0%)	44	66

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	513	ASP
1	B	600	LYS

### 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	408/607 (67%)	406 (100%)	2 (0%)	81	92

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	414/607 (68%)	409 (99%)	5 (1%)	63	83
All	All	822/1214 (68%)	815 (99%)	7 (1%)	68	87

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	185	PHE
1	B	384	LEU
1	B	738	ASP
1	B	667	THR
1	B	64	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	500	GLN
1	A	637	ASN
1	B	578	GLN
1	B	434	GLN
1	A	116	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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.

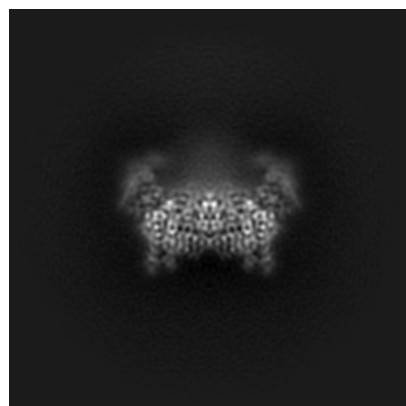
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-54878. These allow visual inspection of the internal detail of the map and identification of artifacts.

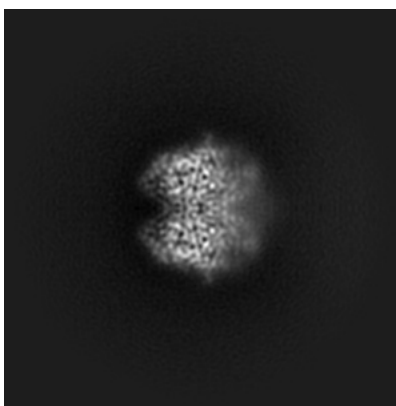
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

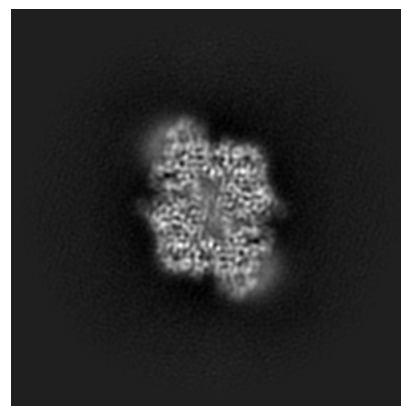
#### 6.1.1 Primary map



X

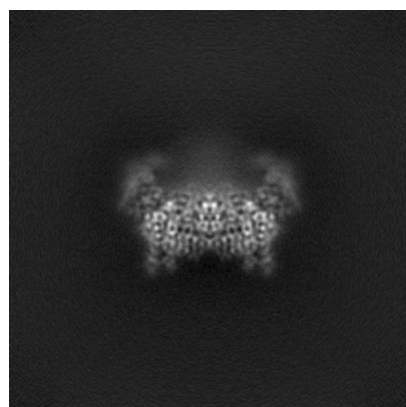


Y

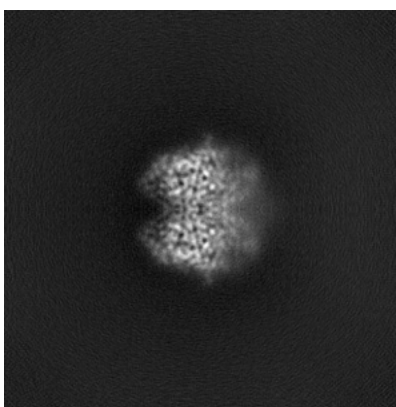


Z

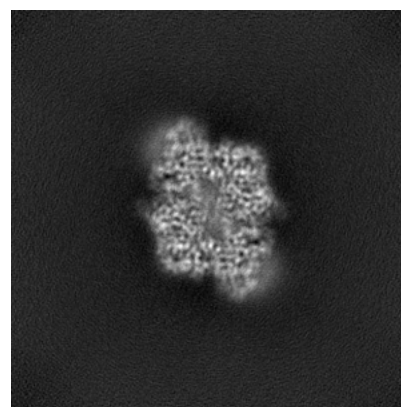
#### 6.1.2 Raw map



X



Y

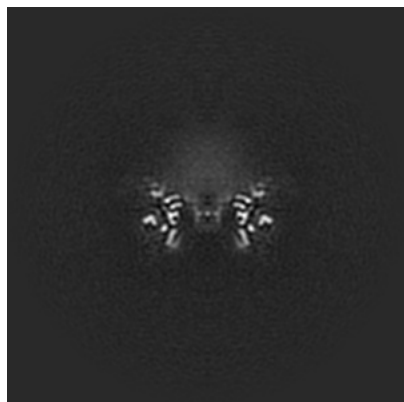


Z

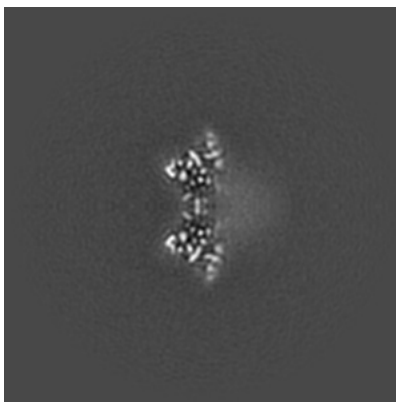
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

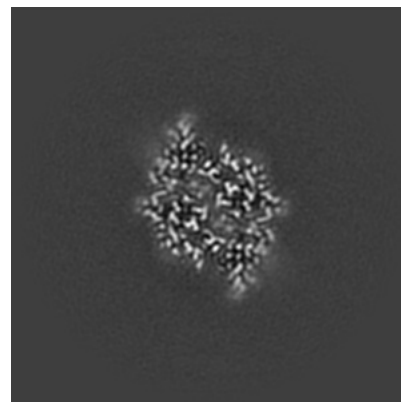
### 6.2.1 Primary map



X Index: 144

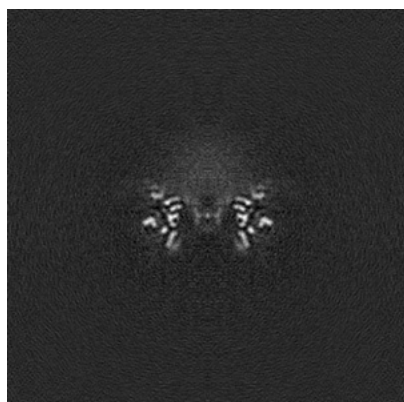


Y Index: 144

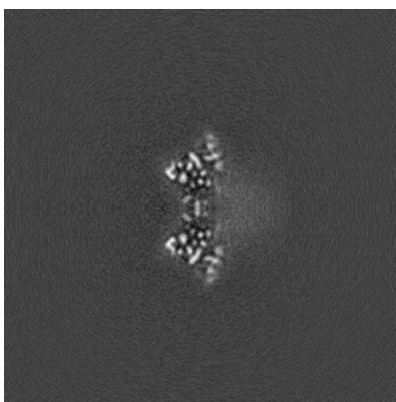


Z Index: 144

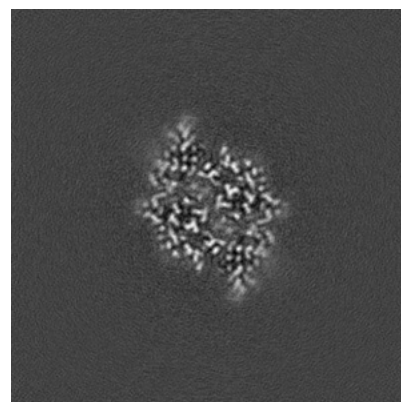
### 6.2.2 Raw map



X Index: 144



Y Index: 144

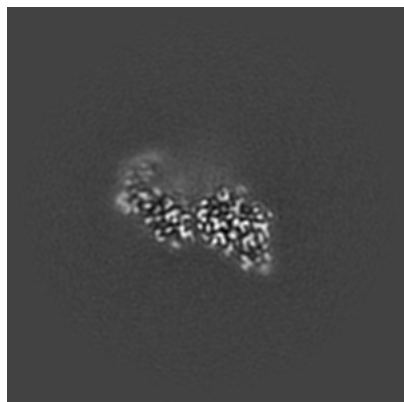


Z Index: 144

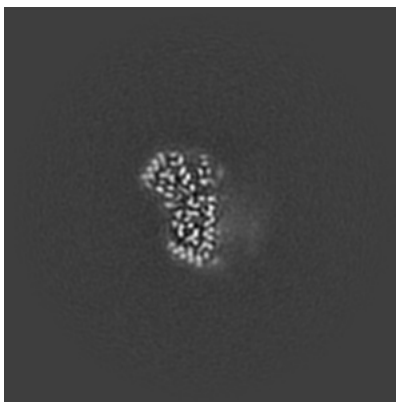
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

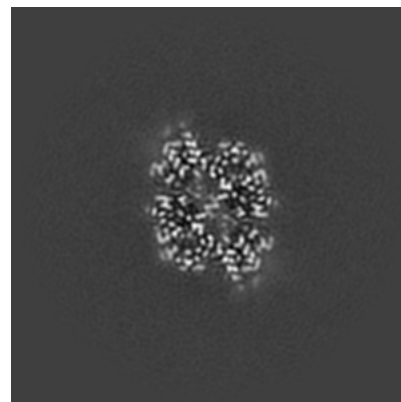
### 6.3.1 Primary map



X Index: 165

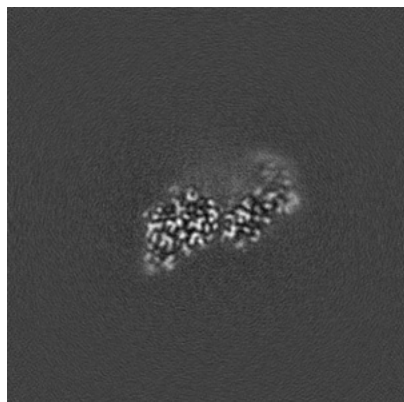


Y Index: 172

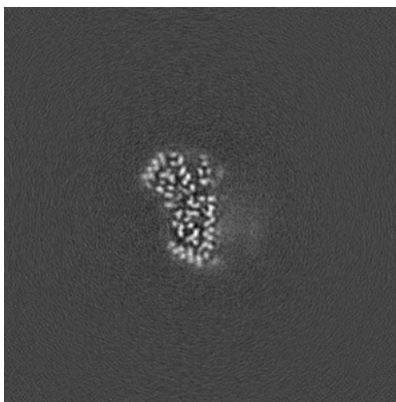


Z Index: 139

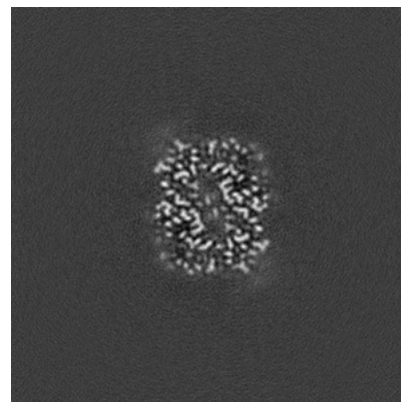
### 6.3.2 Raw map



X Index: 123



Y Index: 172



Z Index: 134

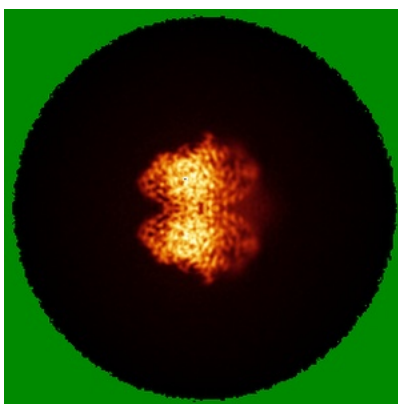
The images above show the largest variance slices of the map in three orthogonal directions.

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

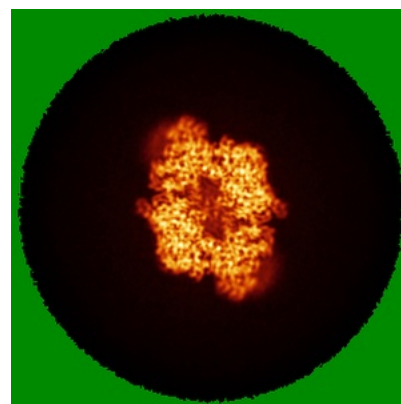
### 6.4.1 Primary map



X

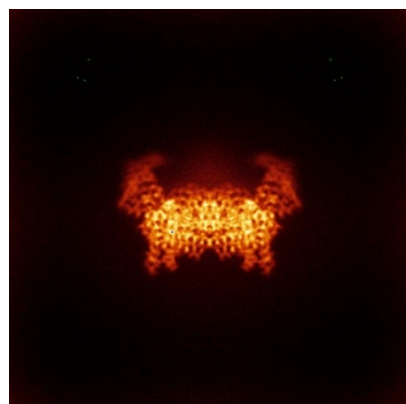


Y

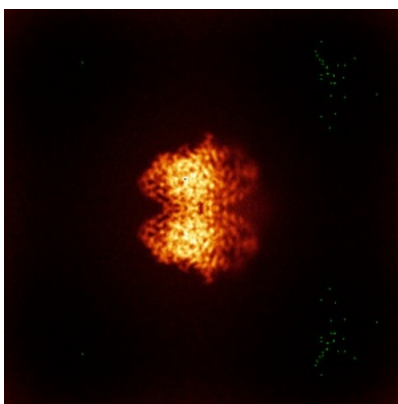


Z

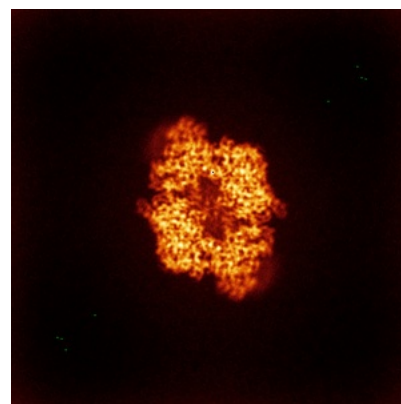
### 6.4.2 Raw map



X



Y



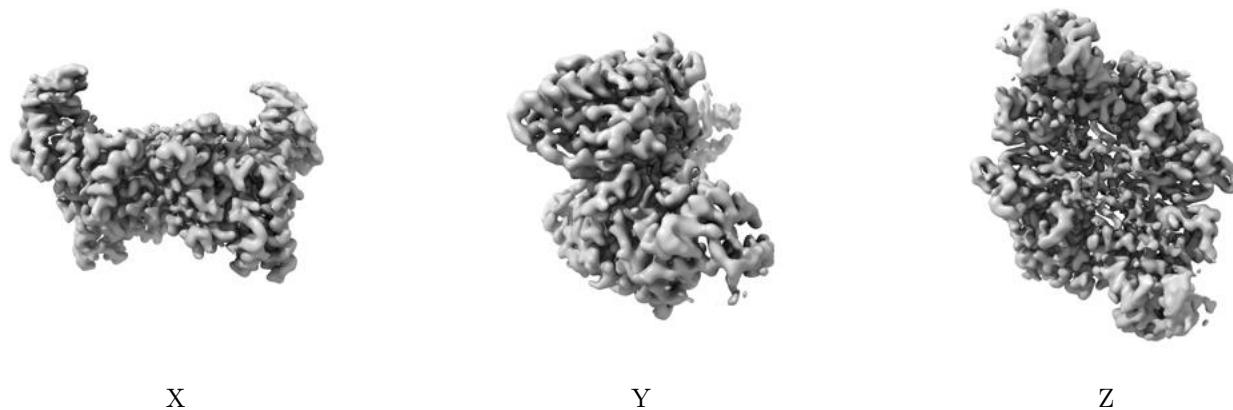
Z

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 0.0346. 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](#)

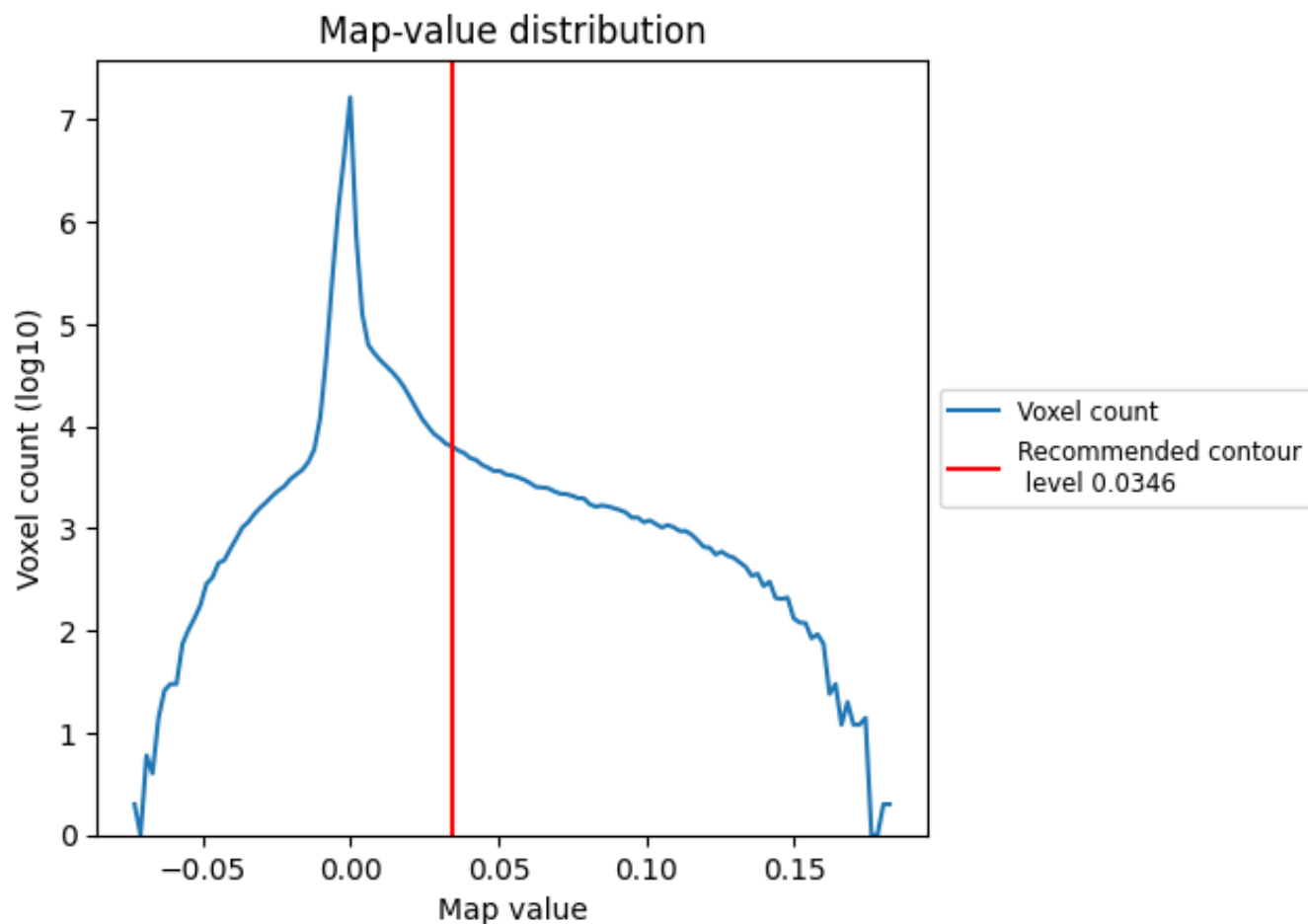
This section was not generated. No masks/segmentation were deposited.



## 7 Map analysis [i](#)

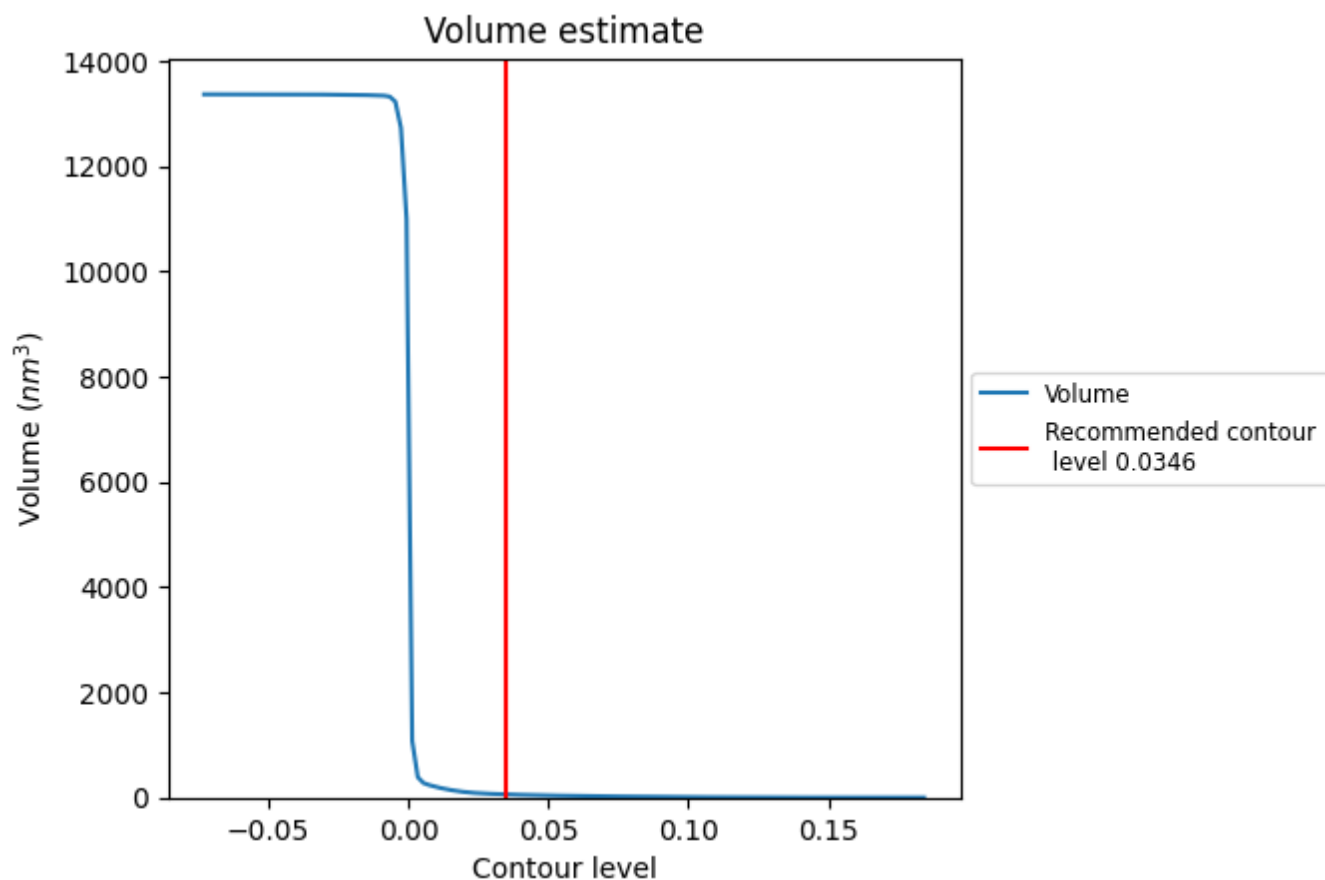
This section contains the results of statistical analysis of the map.

### 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.

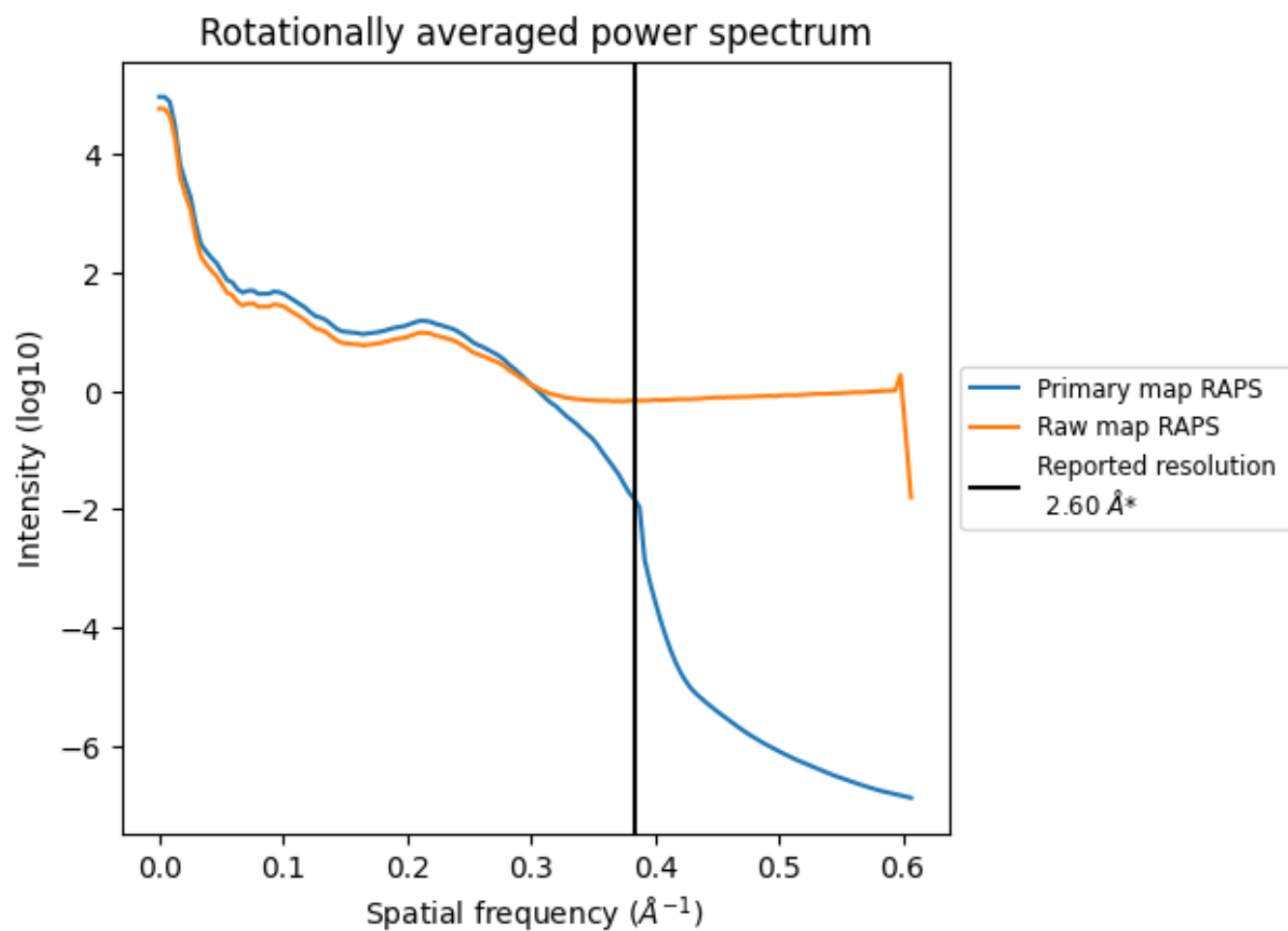
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 61 nm<sup>3</sup>; this corresponds to an approximate mass of 55 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 ⓘ

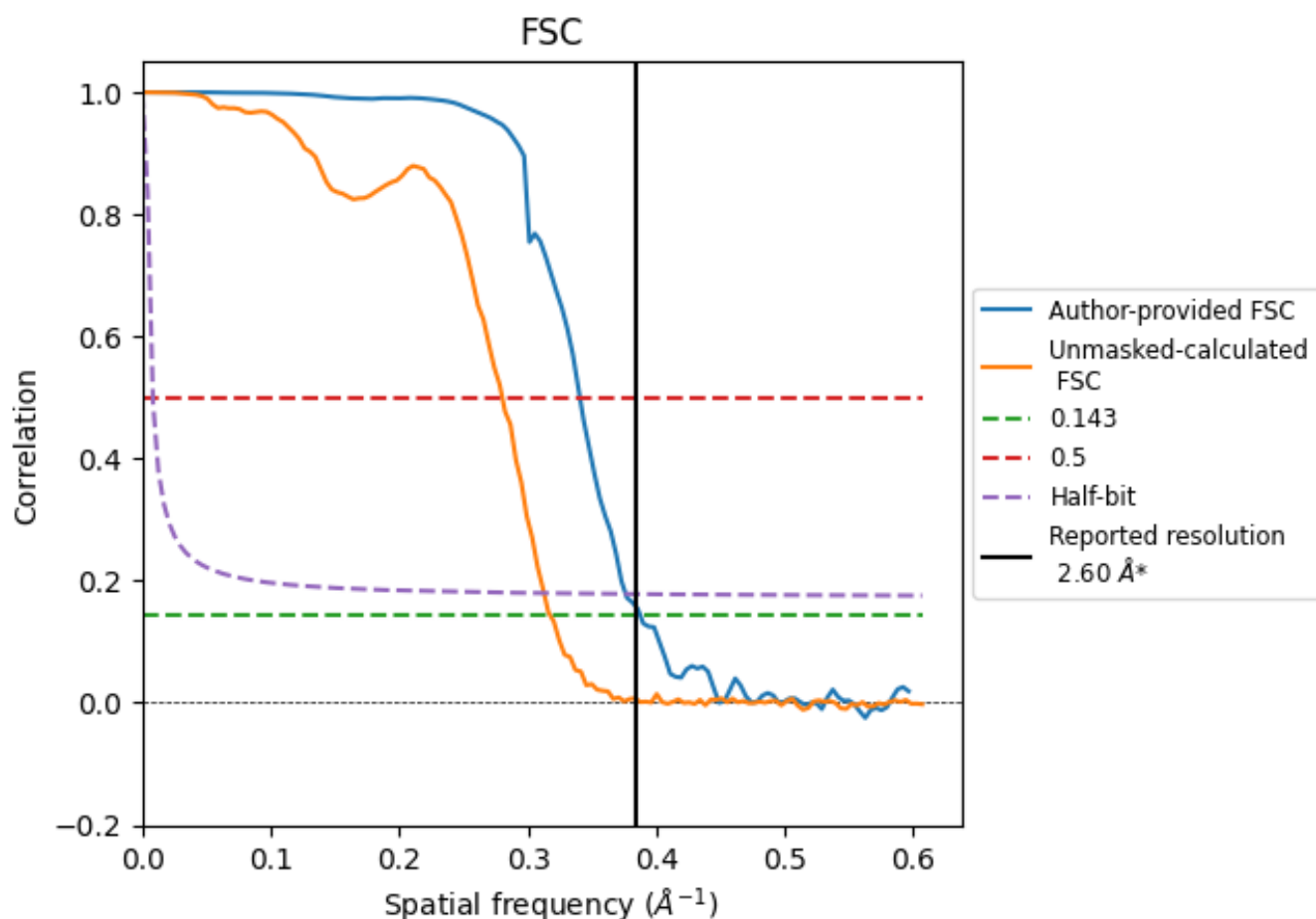


\*Reported resolution corresponds to spatial frequency of 0.385 Å<sup>-1</sup>

## 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  $0.385 \text{ \AA}^{-1}$

## 8.2 Resolution estimates [i](#)

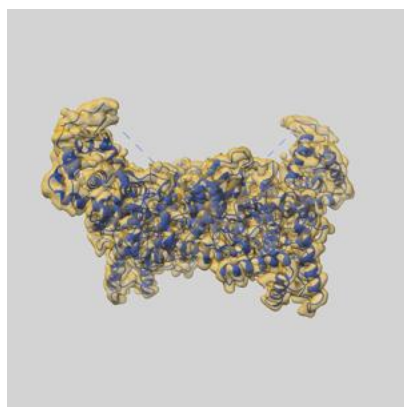
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.60	-	-
Author-provided FSC curve	2.58	2.94	2.66
Unmasked-calculated*	3.15	3.57	3.20

\*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 3.15 differs from the reported value 2.6 by more than 10 %

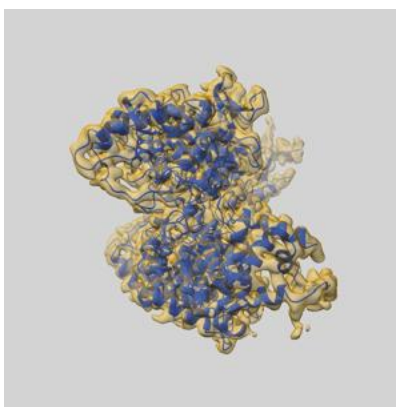
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-54878 and PDB model 9SGR. Per-residue inclusion information can be found in section [3](#) on page [5](#).

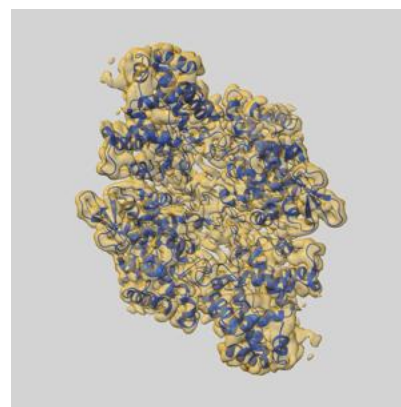
### 9.1 Map-model overlay [i](#)



X



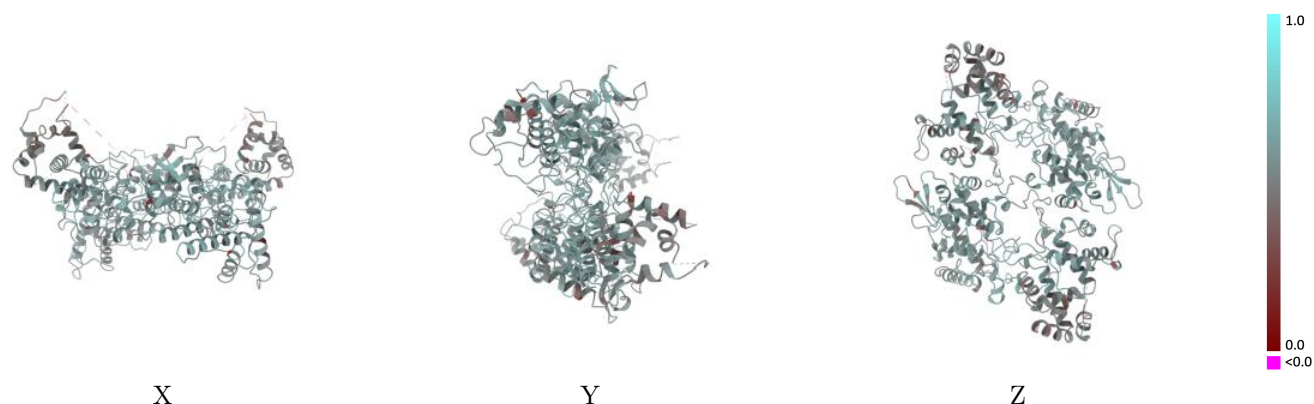
Y



Z

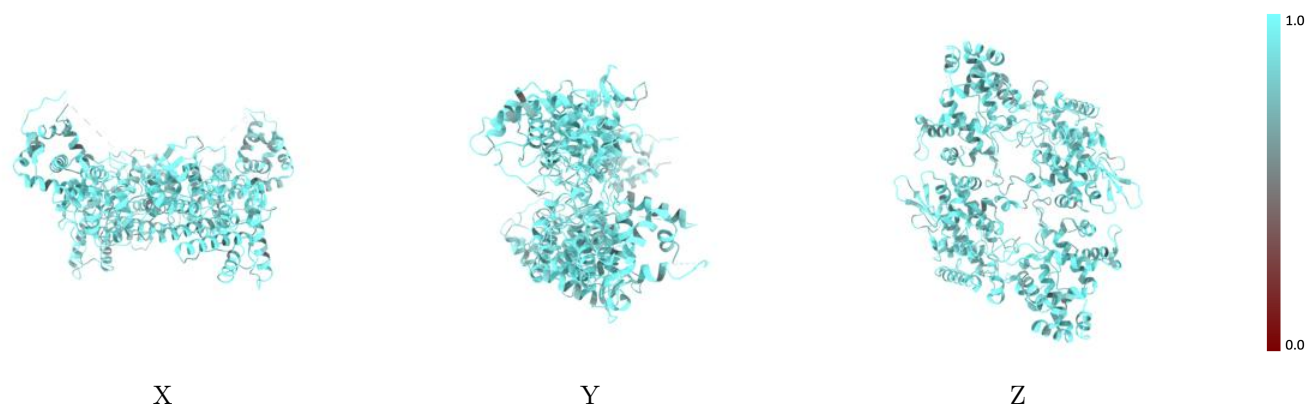
The images above show the 3D surface view of the map at the recommended contour level 0.0346 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



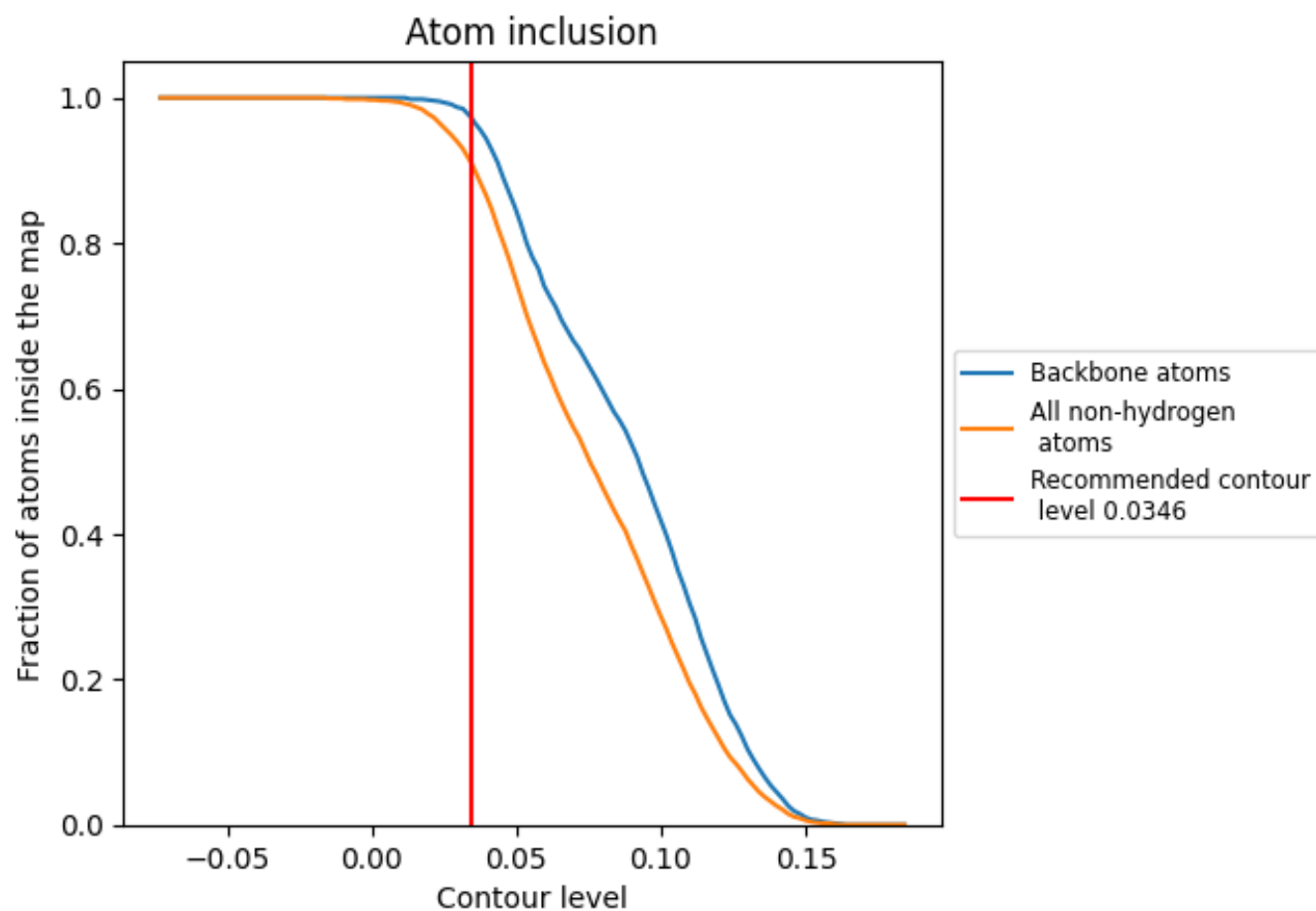
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0346).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 97% 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 (0.0346) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.9090	<div></div> 0.5480
A	<div></div> 0.9080	<div></div> 0.5480
B	<div></div> 0.9100	<div></div> 0.5480

