



wwPDB EM Validation Summary Report ⓘ

Mar 2, 2026 – 06:21 PM JST

PDB ID : 22XK / pdb_000022xk
EMDB ID : EMD-67812
Title : MexBYB-Ka asymmetry
Authors : Wang, J.; Nakagawa, A.; Yamashita, E.
Deposited on : 2026-01-27
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.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.48.1

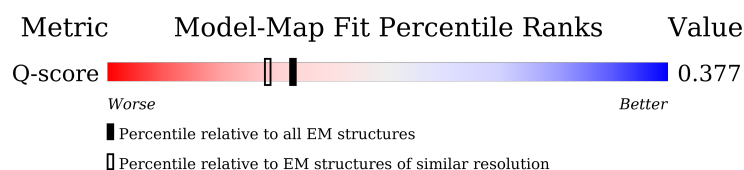
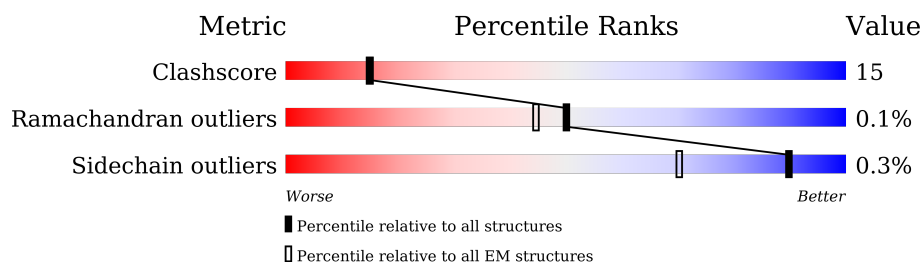
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.60 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	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	12797 (3.10 - 4.10)

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 ≥ 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	1049	
1	B	1049	
1	C	1049	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 22657 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 MexBYB.

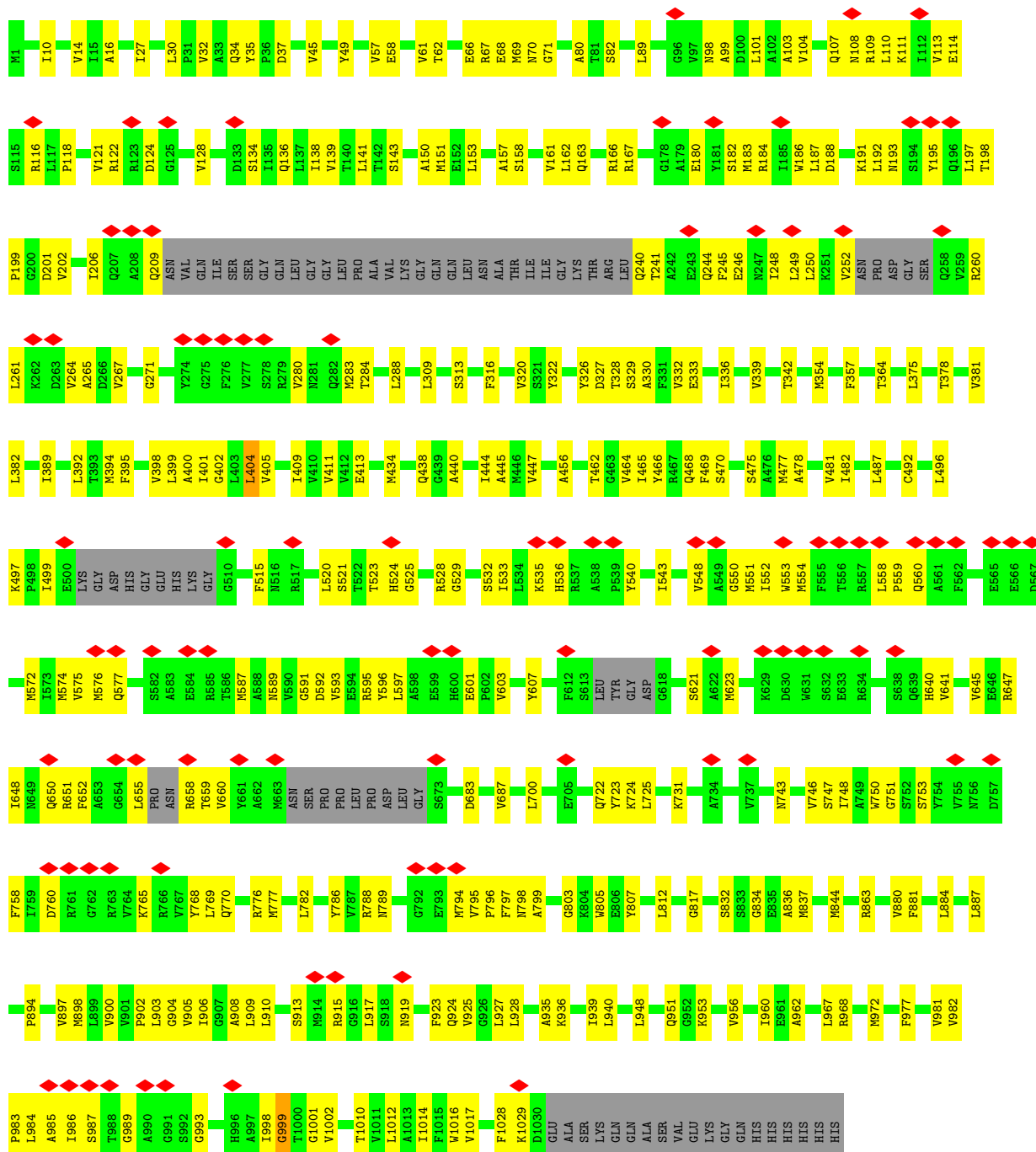
Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	997	Total	C	N	O	S	0	0
			7597	4880	1275	1403	39		
1	C	971	Total	C	N	O	S	0	0
			7400	4761	1239	1361	39		
1	A	1005	Total	C	N	O	S	0	0
			7660	4919	1287	1415	39		



SER
VAL
GLU
LYS
GLY
GLN
HIS
HIS
HIS
HIS
HIS
HIS

• Molecule 1: MexBYB

Chain C: 9% 63% 29% 7%



• Molecule 1: MexBYB

Chain A: 68% 28%

GLN	G904	V767	F652	R517	A400	R279	Q212	R116	
HIS	V905	L768	A653	H524	L401	V280	ILE	L117	
HIS	L906	L769	G654	H524	G402	V280	SER	P118	
HIS	G907	Q770	L655	R528	L403	M283	SER	V121	
HIS	L910	G771	P656	R528	L404	T284	GLY	R122	
HIS	A911	R772	M657	R528	V405		GLN	V121	
	T912	R776	R658	M553	D406		LEU	R122	
	S913	M777	T659	M554	V410		GLY	I126	
	M914	V660	V660	M554	V410		GLY	I126	
	L917	D781	A662	R557	V415		LEU	K130	
	V921	L782	G663	L563	M419		PRO	K130	
	L927	S783	N664	F571	G423		ALA	I135	
	L933	K784	S665	M572	L424		VAL	Q136	
	E943	Y786	L668	M572	G423		LYS	Q136	
	F944	Y787	P669	L573	S425		GLY	L137	
	E961	R788	M574	M574	S425		GLN	I138	
	R964	D790	V575	V575	E428		GLN	L141	
	R965	K791	F679	M576	R431		LEU	L141	
	R966	G792	R684	Q577	E318		ASN	R147	
	M972	E793	E690	G590	G319		ALA	A150	
	V978	M794	K694	T586	V320		THR	A150	
	P982	Y795	A695	M587	S433		ILE	L153	
	L984	F797	R696	Y596	I437		GLY	G154	
		F800	Q698	L597	L441		LYS	E155	
		A801	R702	V603	V442		T237	I156	
		F821	R708	Y607	G443		R238	I156	
		A839	M713	L614	L444		Q240	A157	
		M844	K724	Y615	A445		T241	E175	
		L847	L725	G616	M446		A242	E180	
		P848	E726	D617	V447		E243	Y181	
		A852	L727	A622	A446		Q244	S83	
		H853	D728	M623	L448		F245	T84	
		V1017	K731	L624	M455		E246	G85	
		V1024	L875	L628	A456		M247	Q86	
		F1028	S876	S632	L464		L348	L89	
			L877	L735	L466		L349		
			A885	I748	L482		V350		
			A886	A749	I482		F351		
			L887	A637	I486		L352		
			Y888	S752	K497		L352		
			E889	S638	K497		V353		
			S890	Q639	K497		H354		
			GLN	H640			F357		
			ALA	V755	E500		ASN		
			SER	N756	K501		PRO		
			VAL	D760	K502		ASP		
			GLU	K765	G503		GLY		
			LYS	R766	I648		SER		
			GLY		N649		Q258		
							V259		
							R260		
							L261		
							D262		
							D263		
							V264		
							A265		
							D266		
							V267		
							G268		
							L269		
							Q272		

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	152219	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS, TFS KRIOS	Depositor
Voltage (kV)	300, 300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50, 50	Depositor
Minimum defocus (nm)	1500, 1500	Depositor
Maximum defocus (nm)	2500, 2500	Depositor
Magnification	Not provided, Not provided	Depositor
Image detector	FEI FALCON III (4k x 4k), FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.738	Depositor
Minimum map value	-0.347	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.018	Depositor
Recommended contour level	0.1	Depositor
Map size ($\text{\AA}$)	345.6, 345.6, 345.6	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.35, 1.35, 1.35	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	0.23	1/7814 (0.0%)	0.43	3/10607 (0.0%)
1	B	0.19	0/7749	0.37	0/10519
1	C	0.18	0/7543	0.40	1/10233 (0.0%)
All	All	0.20	1/23106 (0.0%)	0.40	4/31359 (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
1	A	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	669	PRO	CG-CD	-5.84	1.30	1.50

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	669	PRO	CA-N-CD	-14.05	92.33	112.00
1	A	669	PRO	N-CD-CG	-7.39	92.11	103.20
1	C	999	GLY	N-CA-C	6.13	119.61	112.50
1	A	261	LEU	N-CA-CB	-5.15	108.95	114.10

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	249	LEU	Peptide
1	A	263	ASP	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	7660	0	7748	238	0
1	B	7597	0	7684	206	0
1	C	7400	0	7497	240	0
All	All	22657	0	22929	675	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 15.

The worst 5 of 675 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:658:ARG:HD2	1:A:660:VAL:H	1.37	0.89
1:A:350:VAL:HG12	1:A:354:MET:HE2	1.58	0.85
1:B:708:ARG:O	1:B:708:ARG:NH1	2.10	0.84
1:B:239:LEU:HB3	1:B:244:GLN:HB3	1.58	0.83
1:A:655:LEU:HB2	1:A:658:ARG:HH21	1.43	0.83

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	999/1049 (95%)	951 (95%)	47 (5%)	1 (0%)	48 79
1	B	989/1049 (94%)	941 (95%)	47 (5%)	1 (0%)	48 79
1	C	957/1049 (91%)	905 (95%)	52 (5%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	2945/3147 (94%)	2797 (95%)	146 (5%)	2 (0%)	50 79

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	135	ILE
1	A	135	ILE

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	805/839 (96%)	804 (100%)	1 (0%)	92	97
1	B	799/839 (95%)	797 (100%)	2 (0%)	91	96
1	C	776/839 (92%)	773 (100%)	3 (0%)	89	95
All	All	2380/2517 (95%)	2374 (100%)	6 (0%)	90	96

5 of 6 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	404	LEU
1	C	482	ILE
1	A	623	MET
1	B	794	MET
1	B	258	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	778	ASN
1	A	108	ASN
1	A	589	ASN
1	A	107	GLN
1	B	858	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.

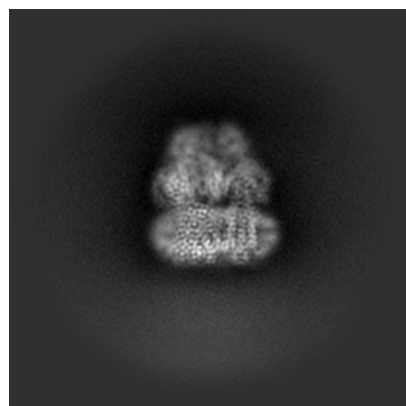
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-67812. These allow visual inspection of the internal detail of the map and identification of artifacts.

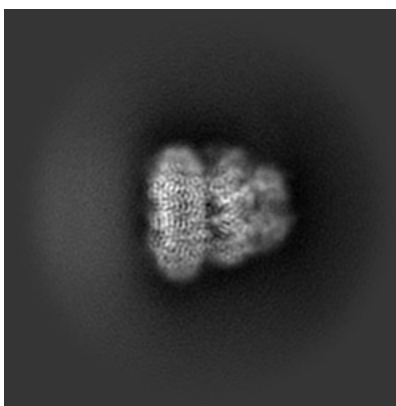
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

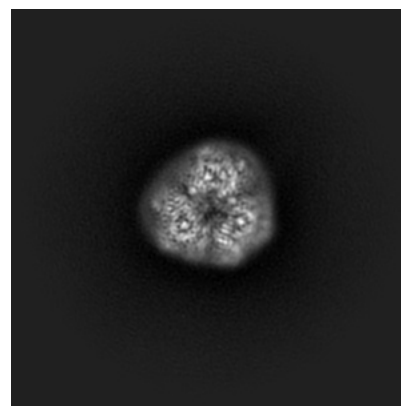
6.1.1 Primary map



X

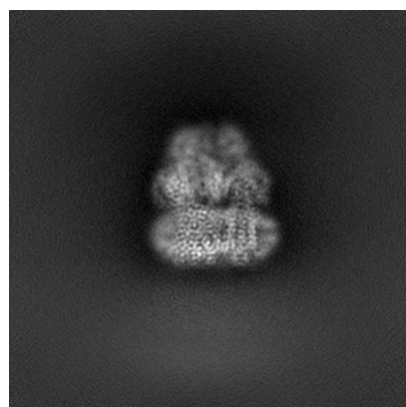


Y

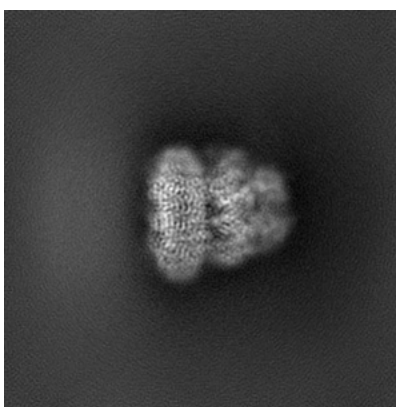


Z

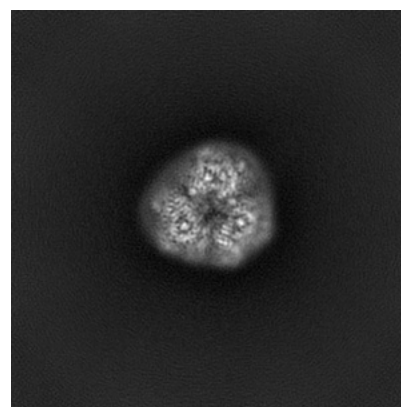
6.1.2 Raw map



X



Y

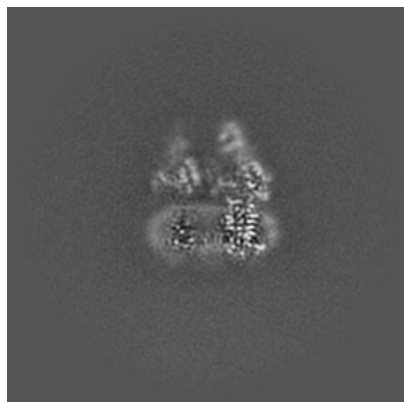


Z

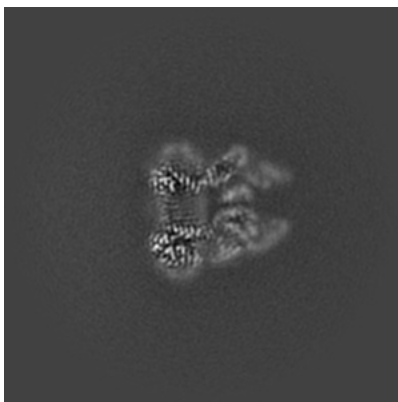
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

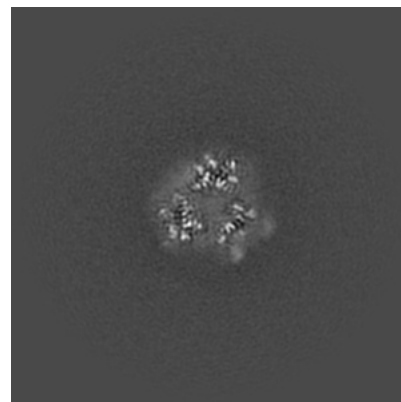
6.2.1 Primary map



X Index: 128

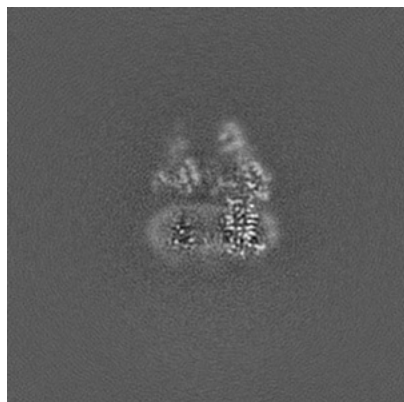


Y Index: 128

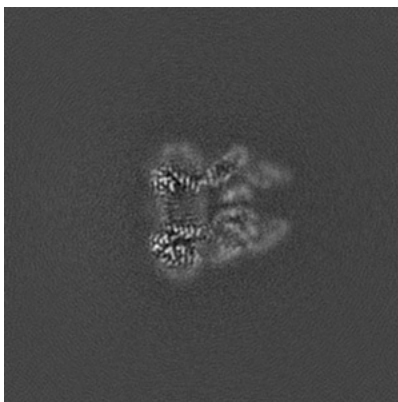


Z Index: 128

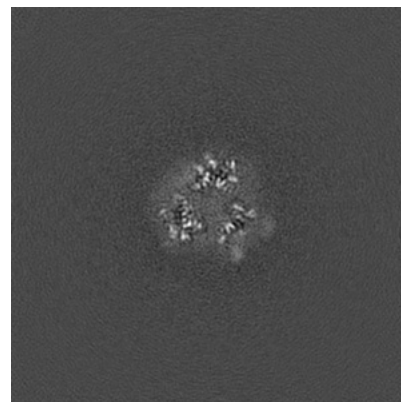
6.2.2 Raw map



X Index: 128



Y Index: 128

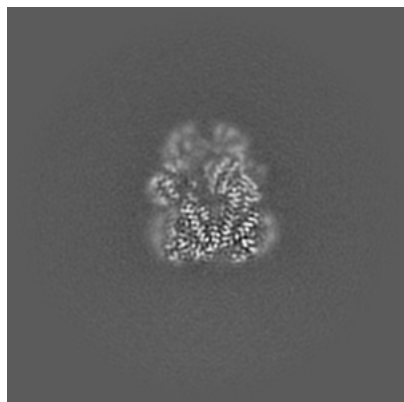


Z Index: 128

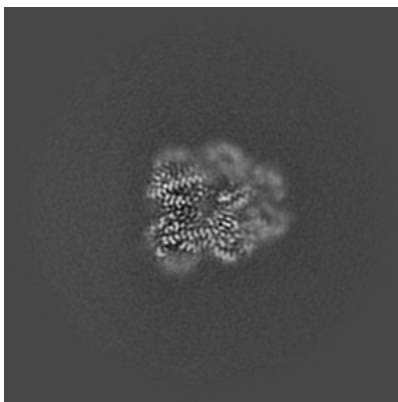
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

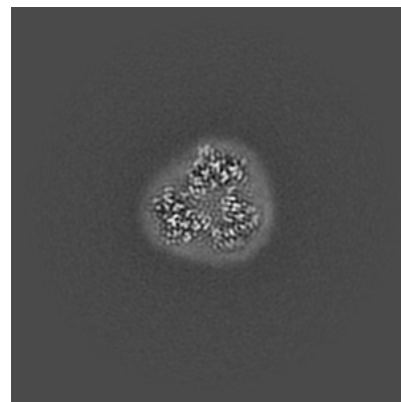
6.3.1 Primary map



X Index: 140

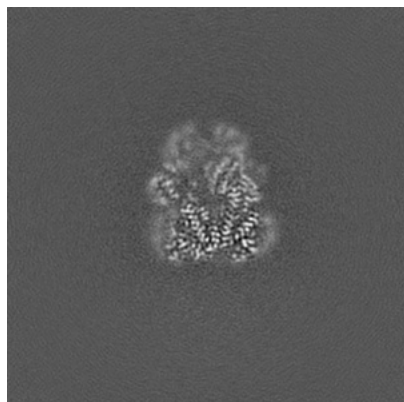


Y Index: 111

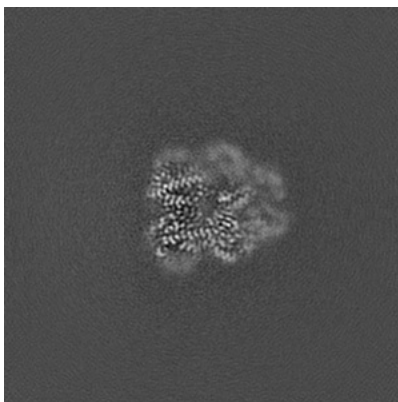


Z Index: 103

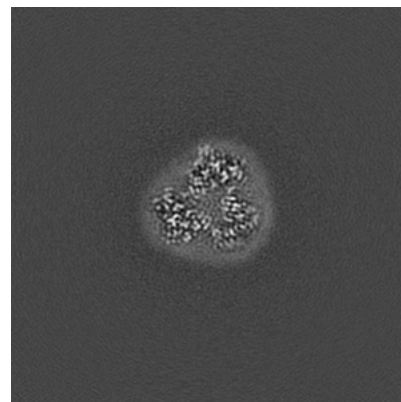
6.3.2 Raw map



X Index: 140



Y Index: 111

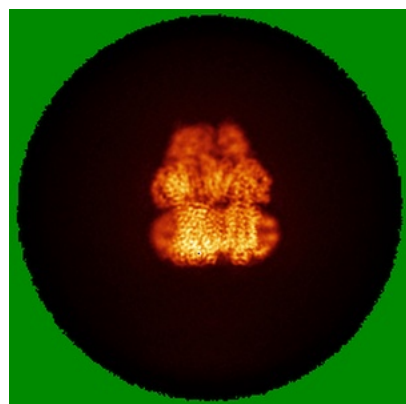


Z Index: 103

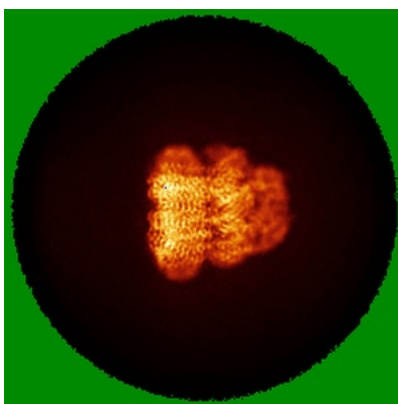
The images above show the largest variance slices of the map in three orthogonal directions.

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

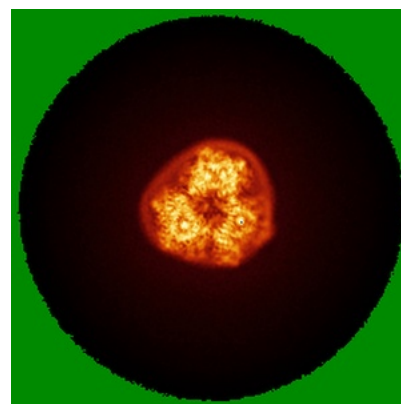
6.4.1 Primary map



X

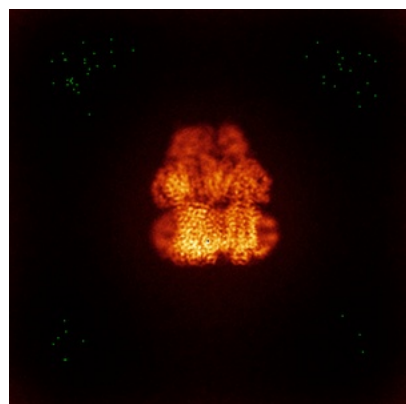


Y

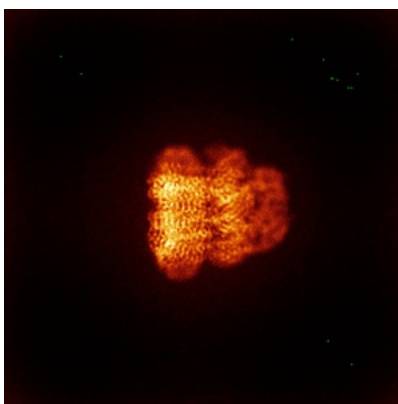


Z

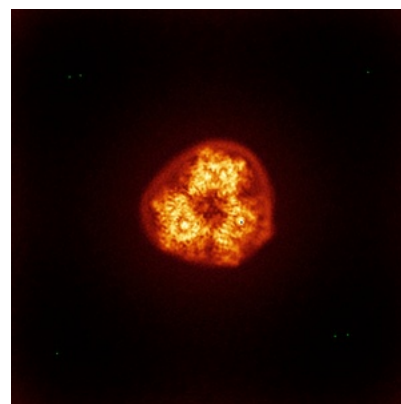
6.4.2 Raw map



X



Y

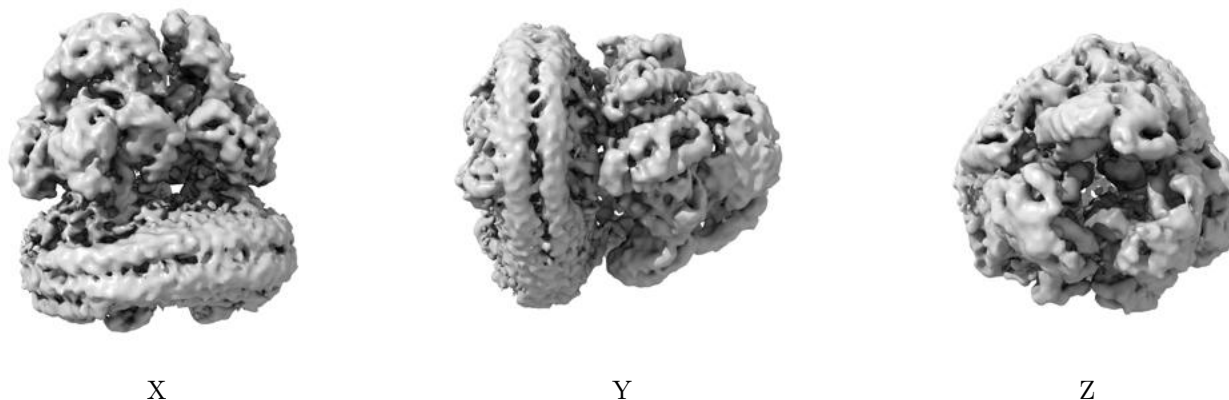


Z

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.

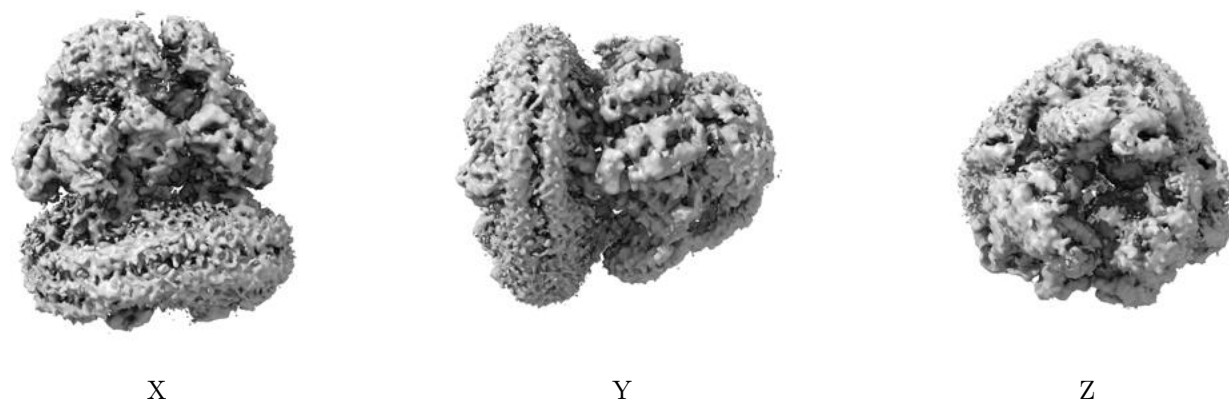
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.1. 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.

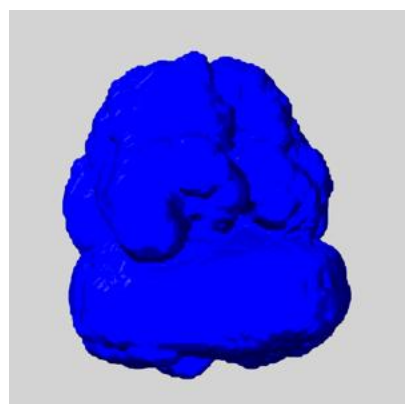
6.6 Mask visualisation [i](#)

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

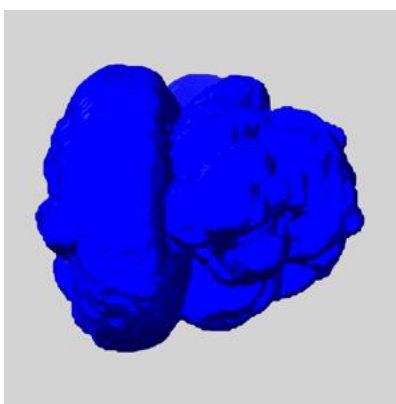
A mask typically either:

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

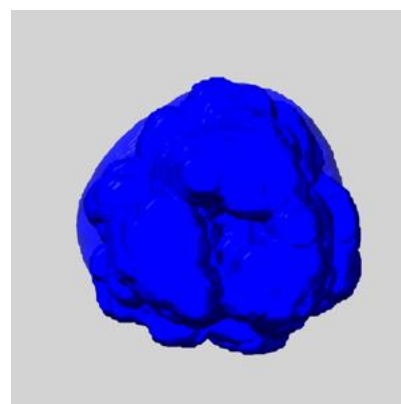
6.6.1 emd_67812_msk_1.map [i](#)



X



Y

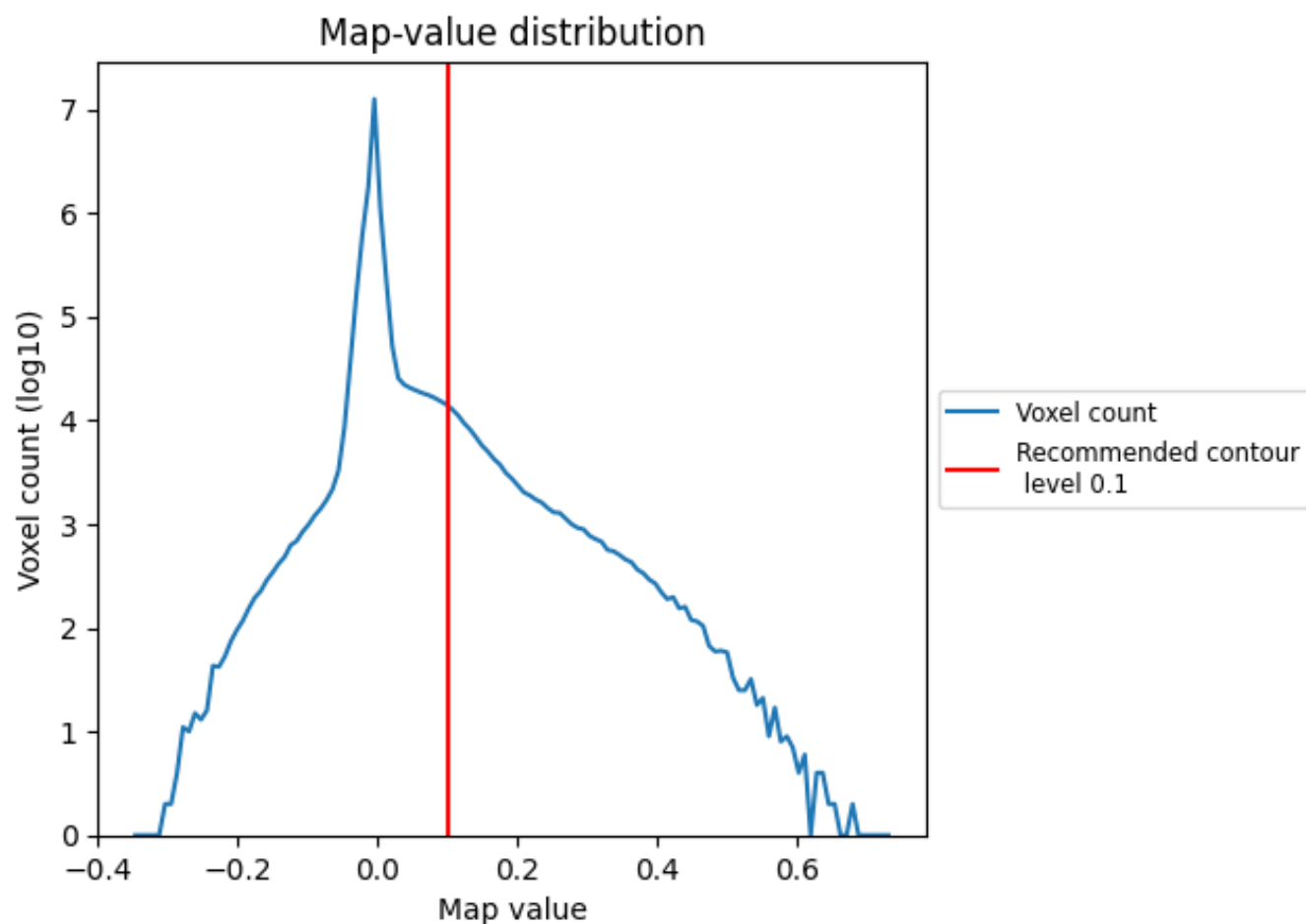


Z

7 Map analysis [i](#)

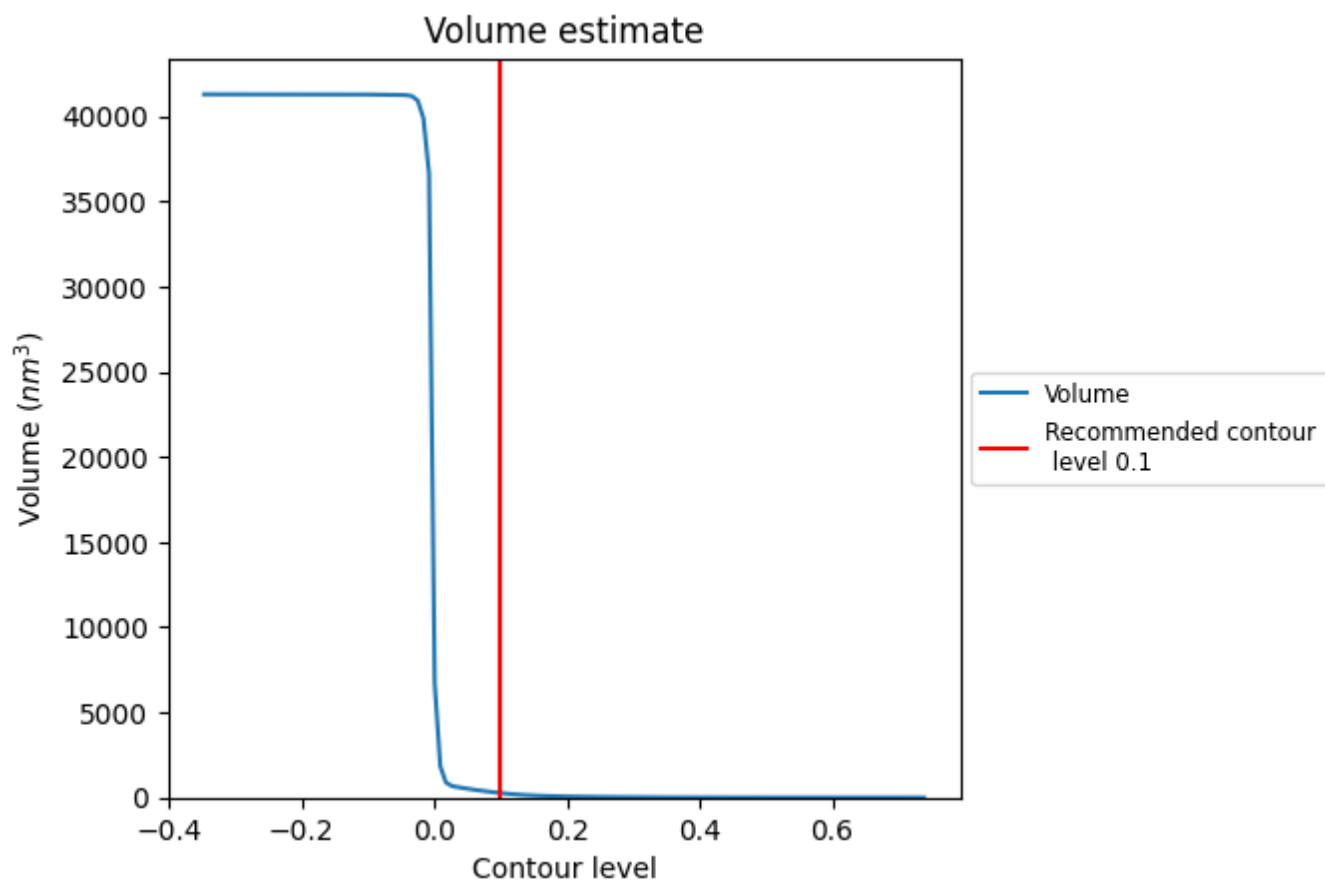
This section contains the results of statistical analysis of the map.

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.

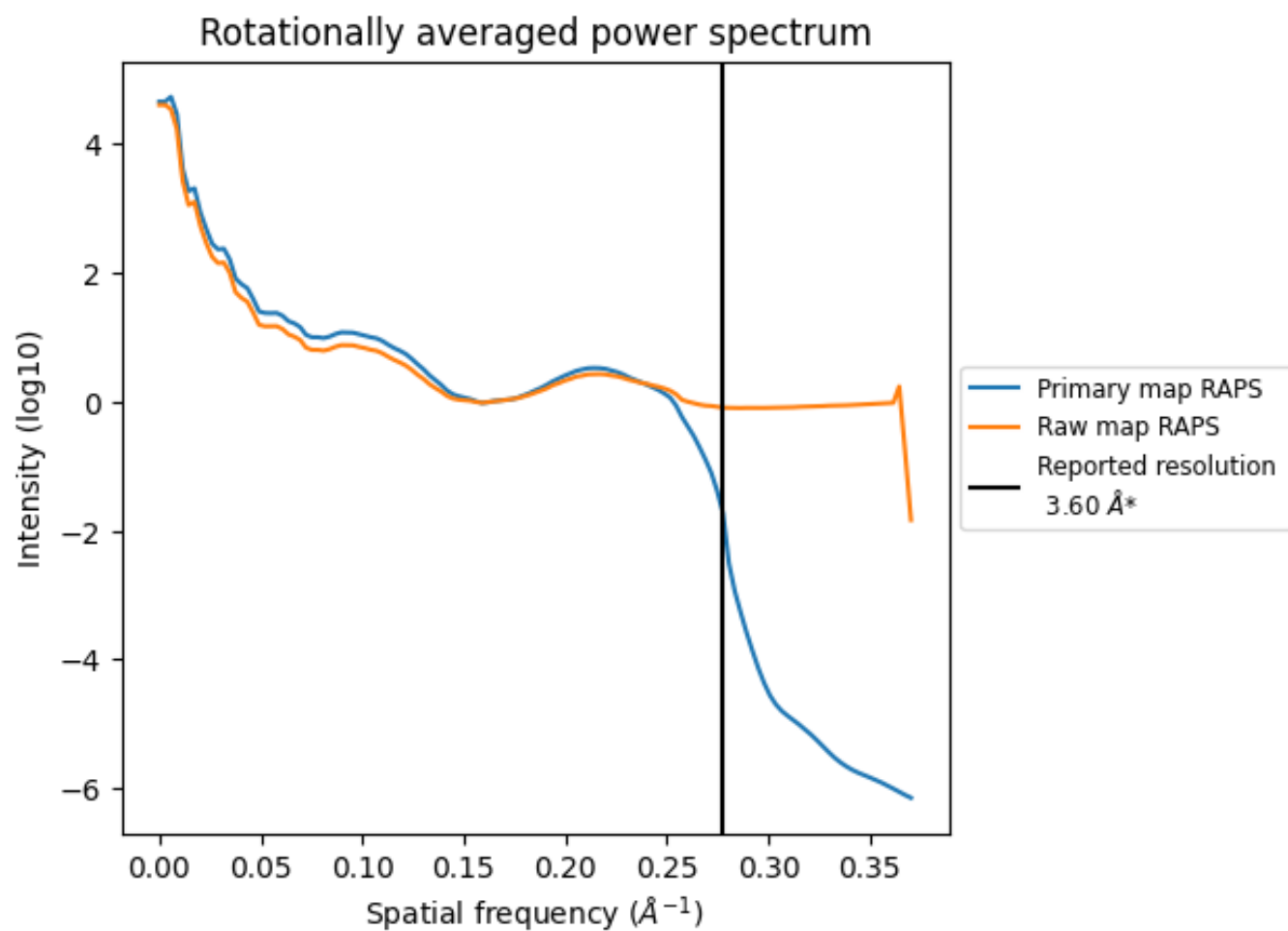
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 266 nm^3 ; this corresponds to an approximate mass of 240 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 ⓘ

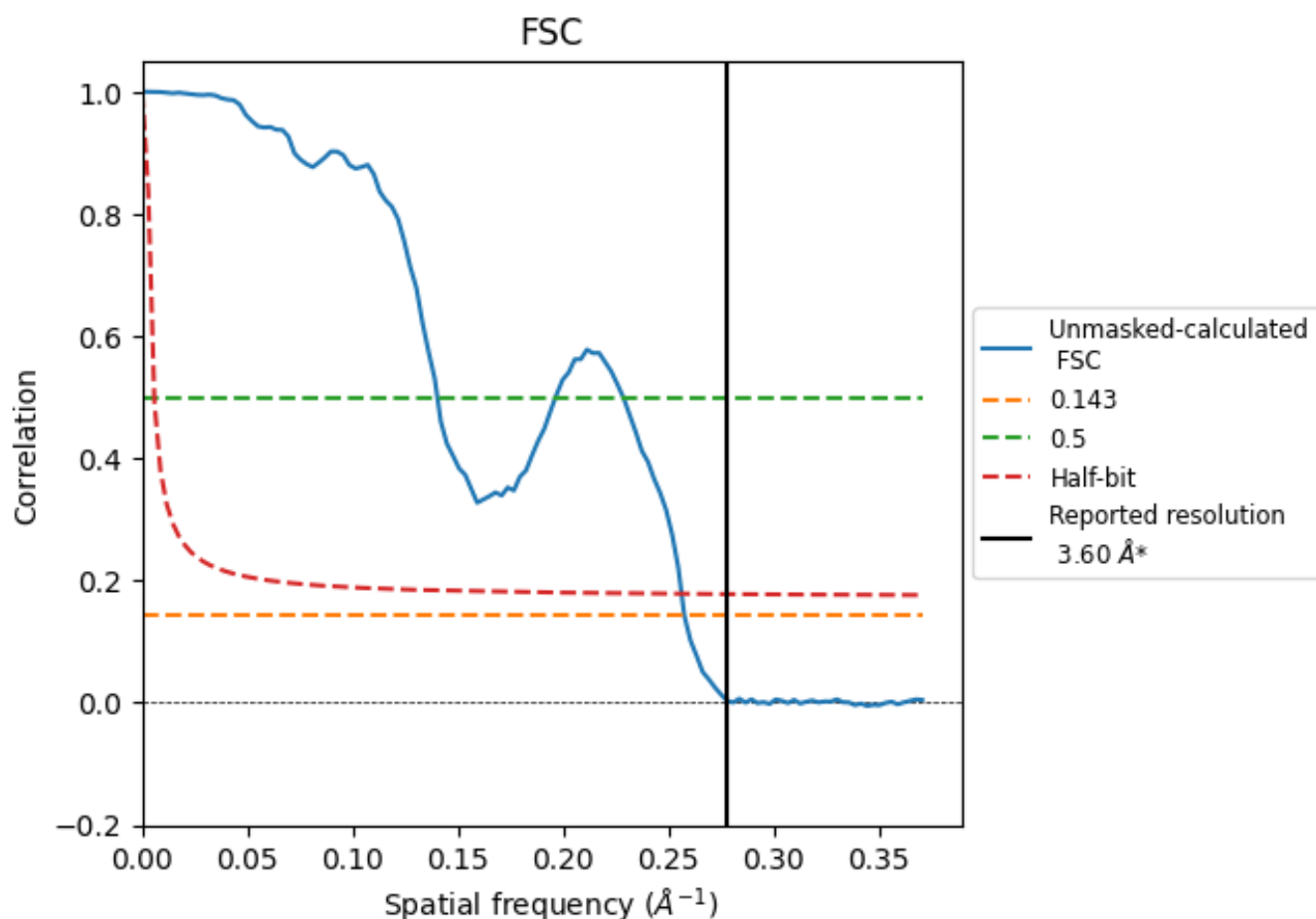


*Reported resolution corresponds to spatial frequency of 0.278 Å⁻¹

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 0.278 Å⁻¹

8.2 Resolution estimates [i](#)

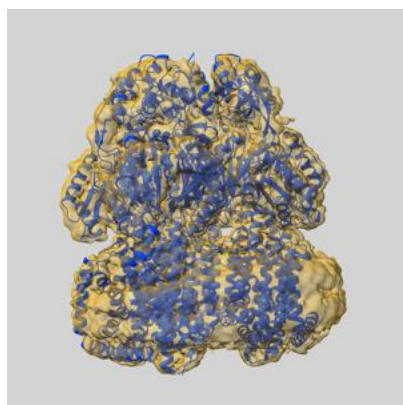
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.60	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.88	7.13	3.90

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

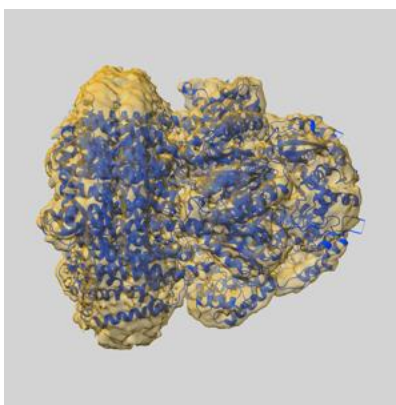
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-67812 and PDB model 22XK. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

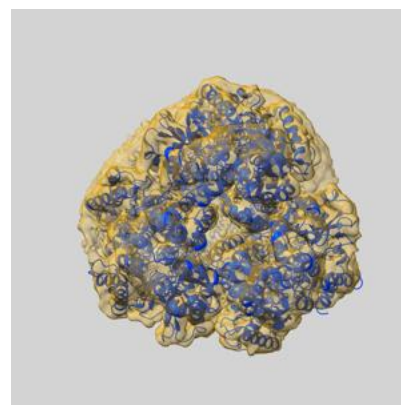
9.1 Map-model overlay [i](#)



X



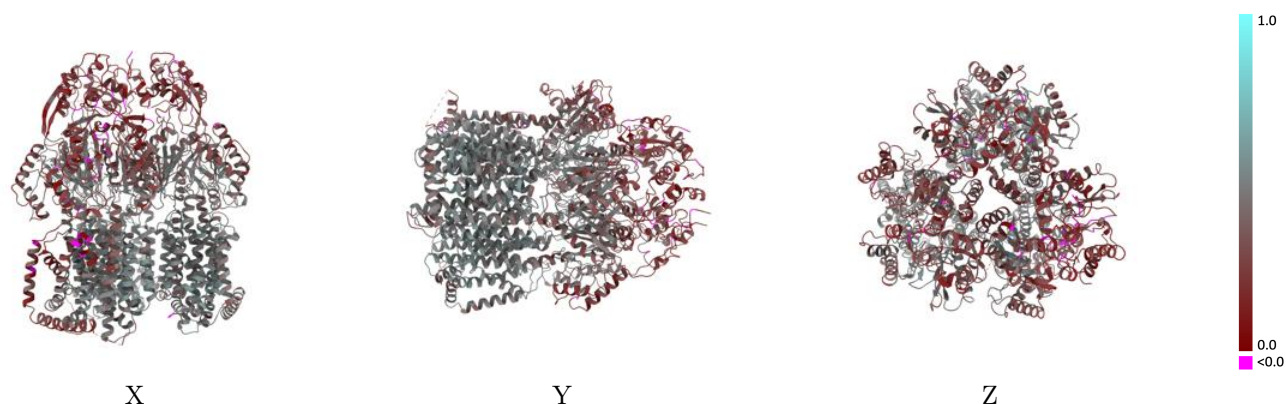
Y



Z

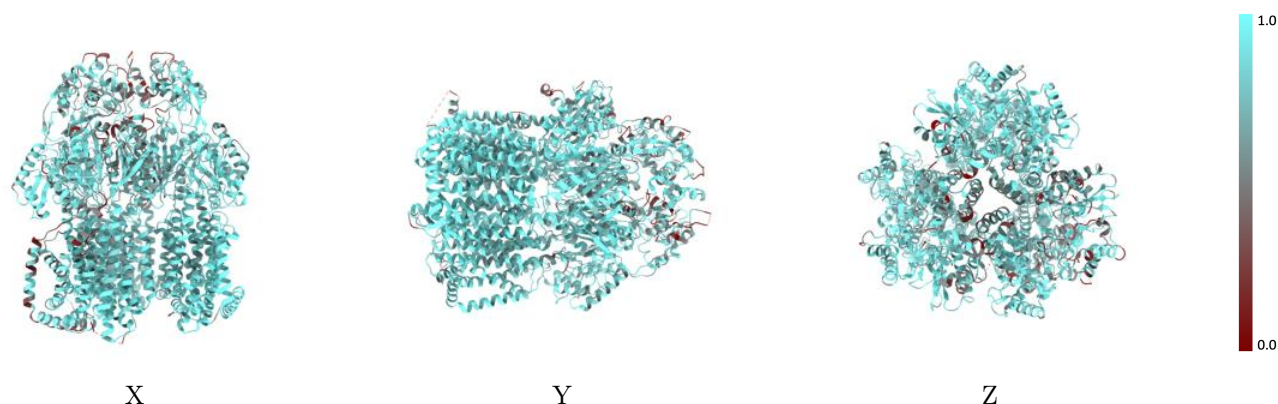
The images above show the 3D surface view of the map at the recommended contour level 0.1 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



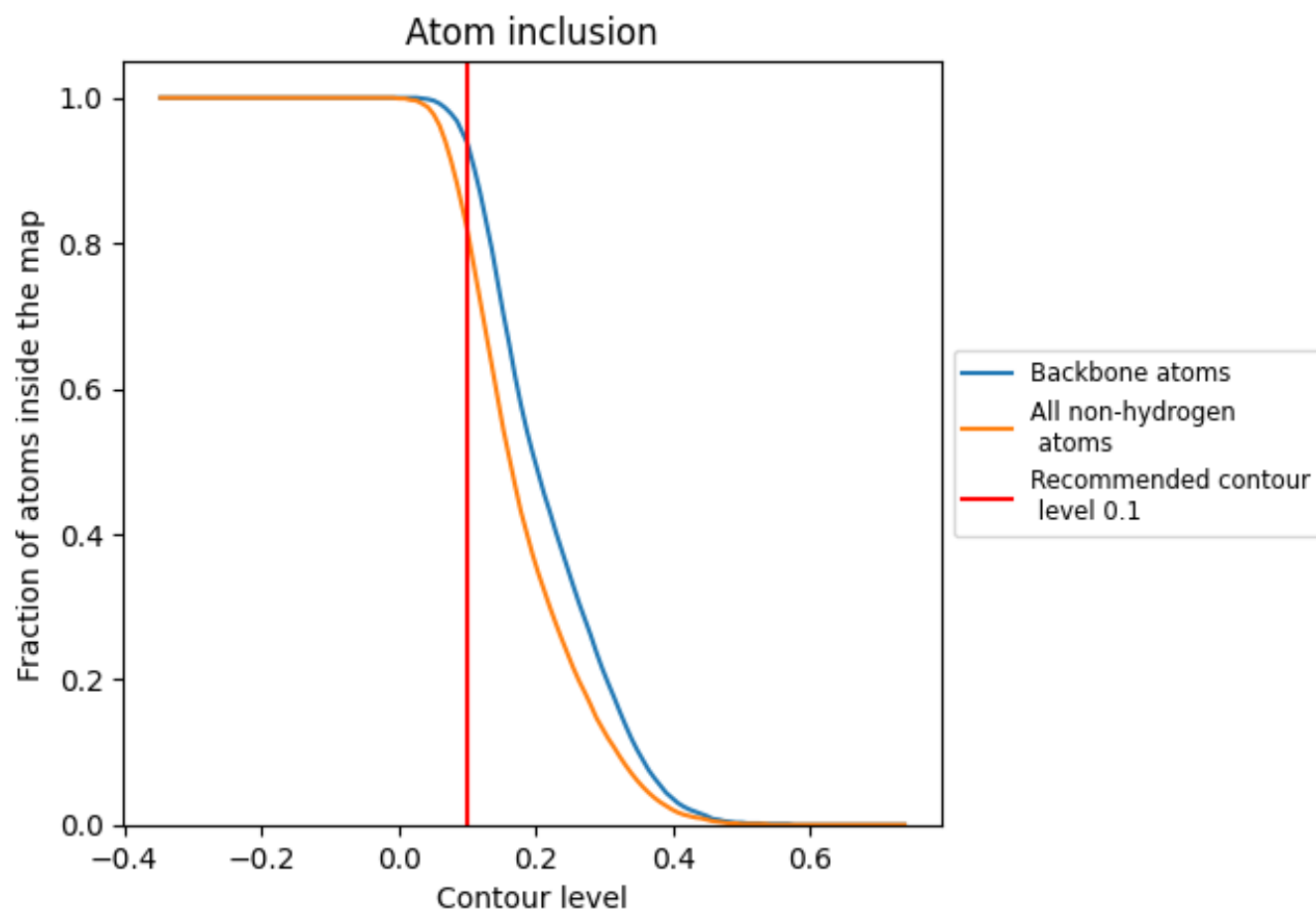
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.1).

9.4 Atom inclusion [i](#)



At the recommended contour level, 94% of all backbone atoms, 82% 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 (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8210	0.3770
A	0.8490	0.3940
B	0.8390	0.4010
C	0.7720	0.3360

