



wwPDB EM Validation Summary Report ⓘ

Mar 28, 2026 – 10:46 PM UTC

PDB ID : 6V6B / pdb_00006v6b
EMDB ID : EMD-21067
Title : Structures of GCP2 and GCP3 in the native human gamma-tubulin ring complex
Authors : Wieczorek, M.; Urnavicius, L.; Ti, S.; Molloy, K.R.; Chait, B.T.; Kapoor, T.M.
Deposited on : 2019-12-04
Resolution : 3.80 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

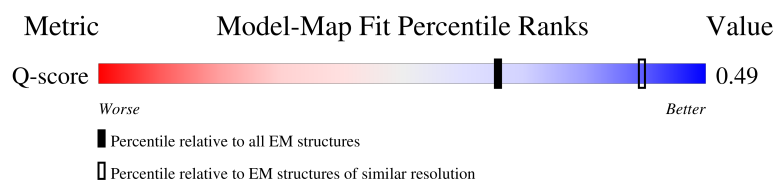
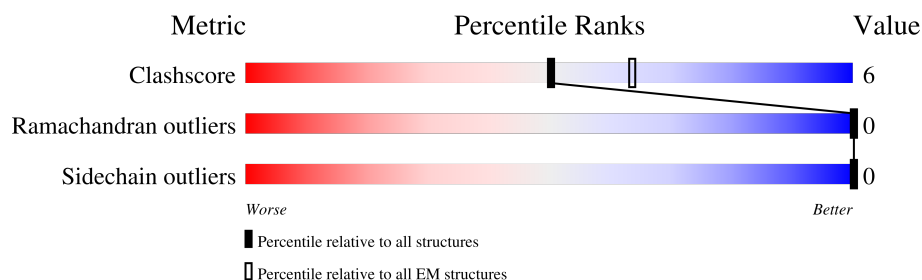
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.80 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	10198 (3.30 - 4.30)

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	B	907	
2	C	930	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 9115 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 Gamma-tubulin complex component 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	572	Total	C	N	O	S	0	0
			4744	3034	832	853	25		

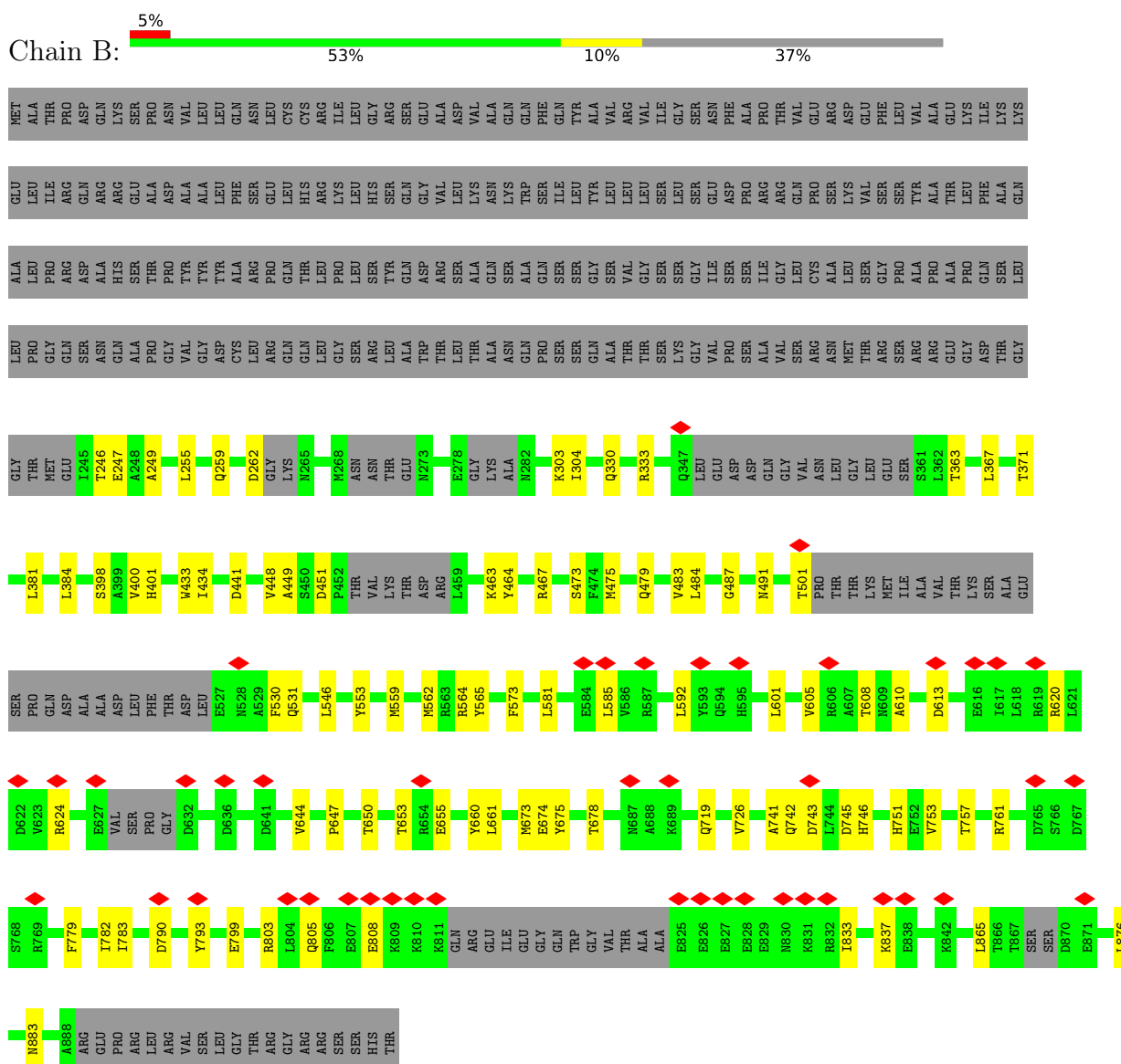
- Molecule 2 is a protein called Gamma-tubulin complex component 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	539	Total	C	N	O	S	0	0
			4371	2825	721	795	30		

3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Gamma-tubulin complex component 3



• Molecule 2: Gamma-tubulin complex component 2



MET	GLU	ASP	PRO	PHE	ALA	LYS	TYR	ASP	GLU	VAL	ASP	ASN	GLU	LEU	LEU	SER	THR	GLY	ARG	VAL	HIS	GLY	ASP	GLY	ALA	GLU	VAL	TYR	ILE	SER	LEU	GLN	ASN	ARG	THR	THR	THR	THR	VAL	SER	ALA	LYS	VAL	LYS	ILE	ALA	GLU	VAL	PHE	SER	ARG	THR	PRO
GLU	ASP	PHE	LEU	ALA	LYS	TYR	ASP	GLU	VAL	ASP	ASN	GLU	LEU	LEU	ASN	ARG	VAL	HIS	GLY	ASP	PRO	LEU	VAL	TYR	GLY	LEU	LEU	SER	LEU	GLN	ASN	ARG	THR	THR	THR	THR	VAL	ARG	GLU	ALA	LYS	VAL	LYS	ILE	ALA	GLU	VAL	PHE	SER	ARG	THR	PRO	
ASN	VAL	PRO	ALA	ALA	ALA	SER	LEU	ILE	GLY	ILE	GLU	LEU	LEU	GLU	GLU	ARG	LYS	GLN	LEU	PRO	GLY	VAL	SER	VAL	ALA	THR	THR	GLY	GLY	THR	GLN	SER	GLU	LEU	GLN	MET	LEU	ARG	ASP	LYS	GLN	ASN	LYS	GLU	VAL	ILE	PHE	PRO	ALA	TRP			
VAL	TYR	GLU	ARG	PRO	ALA	ALA	LEU	ILE	GLY	ILE	ASP	PHE	LEU	ILE	GLY	ALA	ILE	THR	ASP	THR	ALA	LEU	PRO	ILE	VAL	VAL	LEU	ALA	LEU	TRP	ASN	GLN	SER	LEU	CYS	SER	GLY	VAL	ILE	SER	ALA	HIS	CYS	ASN	LEU	HIS	L232	L236	Q241	S262	A263	Q264	
P285	L286	ALA	GLY	ARG	GLN	S271	F274	L275	V276	D277	I281	L292	A296	S297	Y298	S299	F304	K308	S309	S310	H318	A319	L320	L327	V328	Q350	I356	L366	L387	F416	E420	I423	E441	LEU	ARG	LYS	GLU	ARG	ILE	GLN	GLU	ASP	TYR	ASN									
ASP	LYS	Y455	W456	D457	Q458	R459	Y460	I462	P468	S469	L471	W474	L479	S480	T481	G482	K483	M486	G492	HIS	ASP	VAL	THR	CYS	PRO	VAL	ALA	E502	I503	K508	Q515	E533	E534	E535	E536	A539	R542	Y547	Q552	G553	D554	F555	F556										
M560	E564	L567	E572	R578	L583	M589	F470	T591	D600	L601	K602	I603	D604	H608	D609	L610	I611	THR	GLN	LEU	ARG	VAL	LEU	ALA	ILE	GLU	THR	LYS	GLN	GLU	LYS	ALA	MET	HIS	ALA	ASP	PRO	THR	LEU	ALA	LEU	S639	G640	L641	E642	D647							
P653	R671	V679	E680	R681	S689	N690	K691	T692	ALA	LYS	GLN	HIS	SER	LEU	HIS	SER	ALA	ALA	TRP	F704	R713	E731	P732	T733	E738	D748	F757	L758	D764	T768	ASN	PRO	GLU	L772	L773	K774	S777	M780	Q791	K792	F793	THR	GLN	SER	MET	LYS							
LEU	ASP	GLY	LEU	GLY	GLY	THR	GLN	LEU	HIS	SER	THR	VAL	LEU	GLY	LEU	PRO	ALA	GLY	ALA	ALA	GLU	GLU	ARG	ALA	ARG	LYS	HIS	ALA	HIS	ASP	THR	GLN	VAL	LEU	VAL	GLY	F846	E847	A848	I850	N851	K855	N856	F857	I870	Y871							
S872	THR	SER	ASP	CYS	GLU	HIS	G879	M880	A881	R886	L887	D888	F889	N890	E895	ARG	LEU	LEU	ARG	SER	ALA	GLU	ARG	GLN	LYS	ALA	THR	PRO	GLN	VAL	PRO	VAL	LEU	ARG	GLY	PRO	PRO	ALA	PRO	ALA	ALA	VAL	VAL	THR	ALA	GLN							

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	351714	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 ($e^-/\text{\AA}^2$)	45	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.147	Depositor
Minimum map value	-0.106	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.0233	Depositor
Map size (Å)	491.28003, 491.28003, 491.28003	wwPDB
Map dimensions	368, 368, 368	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.335, 1.335, 1.335	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	B	0.19	0/4839	0.32	0/6522
2	C	0.20	0/4461	0.33	0/6020
All	All	0.20	0/9300	0.32	0/12542

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	B	4744	0	4722	56	0
2	C	4371	0	4360	47	0
All	All	9115	0	9082	102	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 6.

The worst 5 of 102 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:B:608:THR:HG23	1:B:610:ALA:H	1.52	0.72
1:B:464:TYR:OH	1:B:491:ASN:ND2	2.24	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:259:GLN:NE2	2:C:350:GLN:OE1	2.23	0.71
2:C:536:GLU:HG3	2:C:539:ALA:HB3	1.78	0.65
2:C:276:VAL:HG23	2:C:277:ASP:H	1.63	0.64

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	B	552/907 (61%)	530 (96%)	22 (4%)	0	100	100
2	C	521/930 (56%)	488 (94%)	33 (6%)	0	100	100
All	All	1073/1837 (58%)	1018 (95%)	55 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	B	519/798 (65%)	519 (100%)	0	100	100
2	C	481/816 (59%)	481 (100%)	0	100	100
All	All	1000/1614 (62%)	1000 (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 21 such sidechains are listed below:

Mol	Chain	Res	Type
2	C	342	HIS
2	C	540	HIS
2	C	851	ASN
2	C	682	GLN
2	C	486	ASN

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.

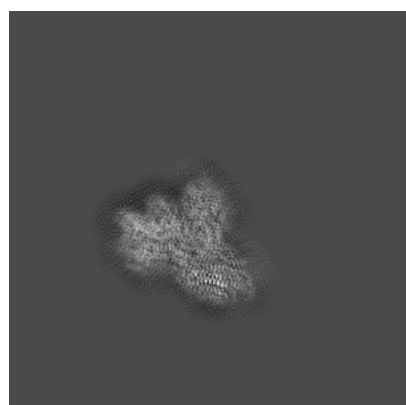
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-21067. These allow visual inspection of the internal detail of the map and identification of artifacts.

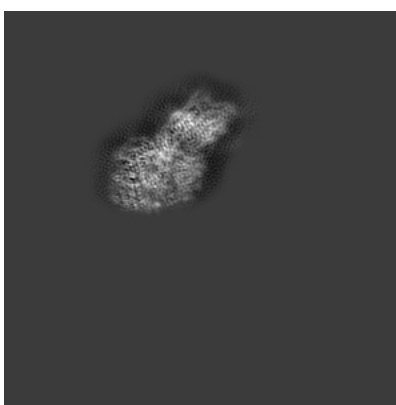
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

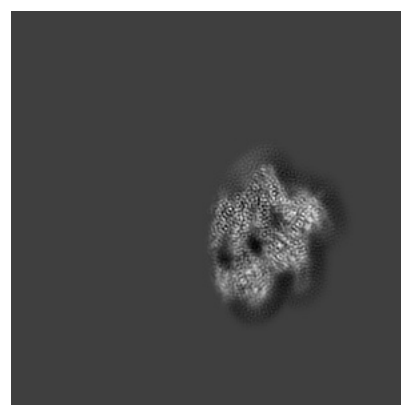
6.1.1 Primary map



X



Y



Z

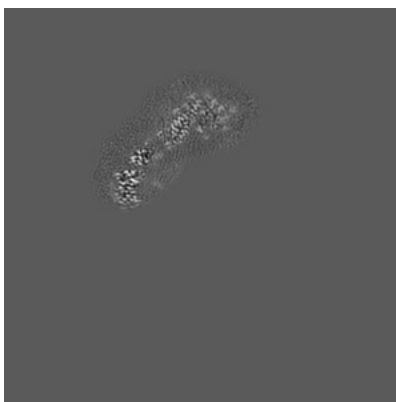
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

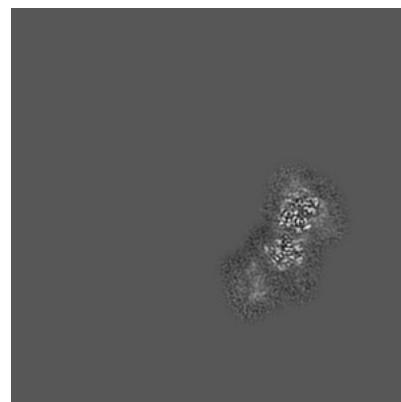
6.2.1 Primary map



X Index: 184



Y Index: 184



Z Index: 184

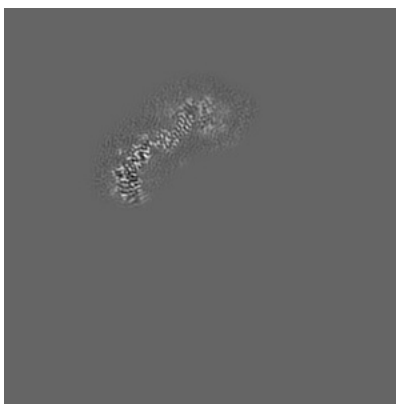
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

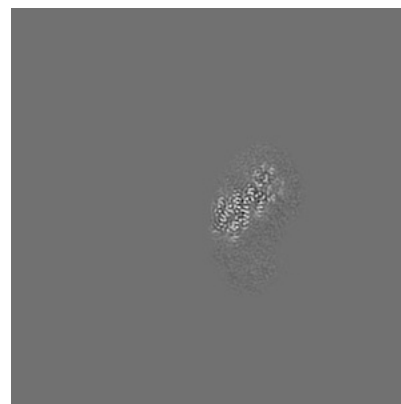
6.3.1 Primary map



X Index: 233



Y Index: 190

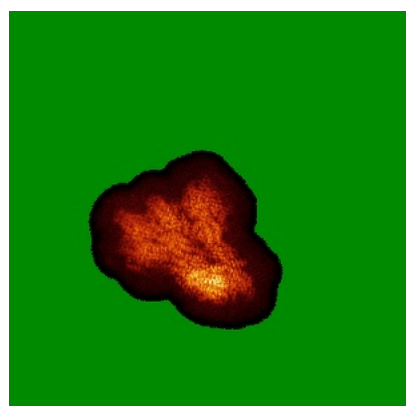


Z Index: 118

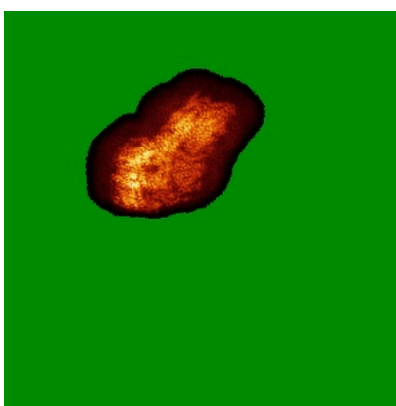
The images above show the largest variance slices of the map in three orthogonal directions.

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

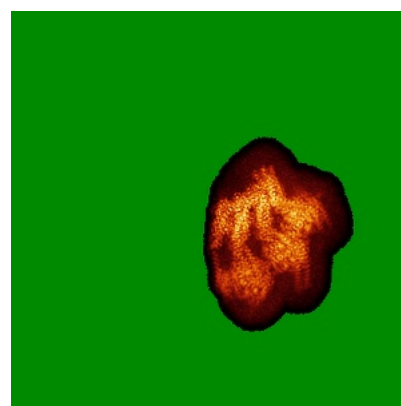
6.4.1 Primary map



X



Y

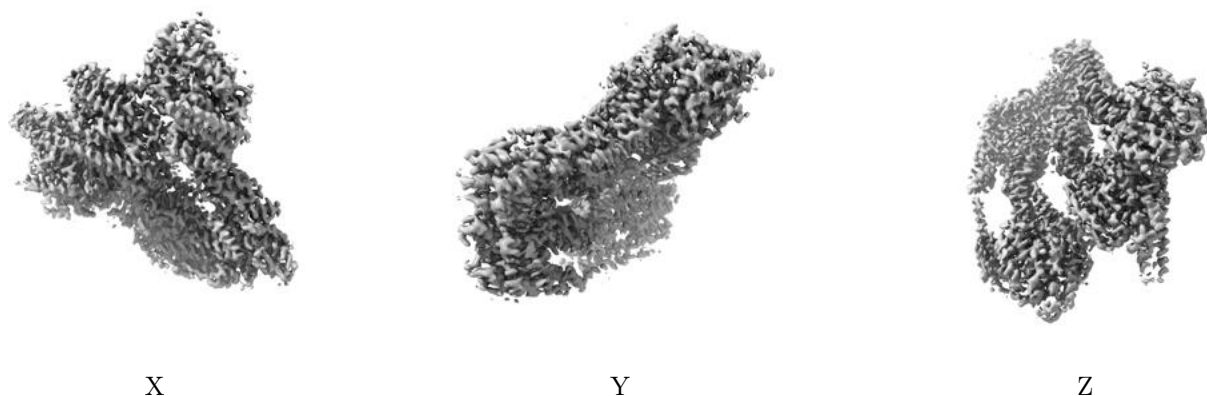


Z

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 0.0233. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

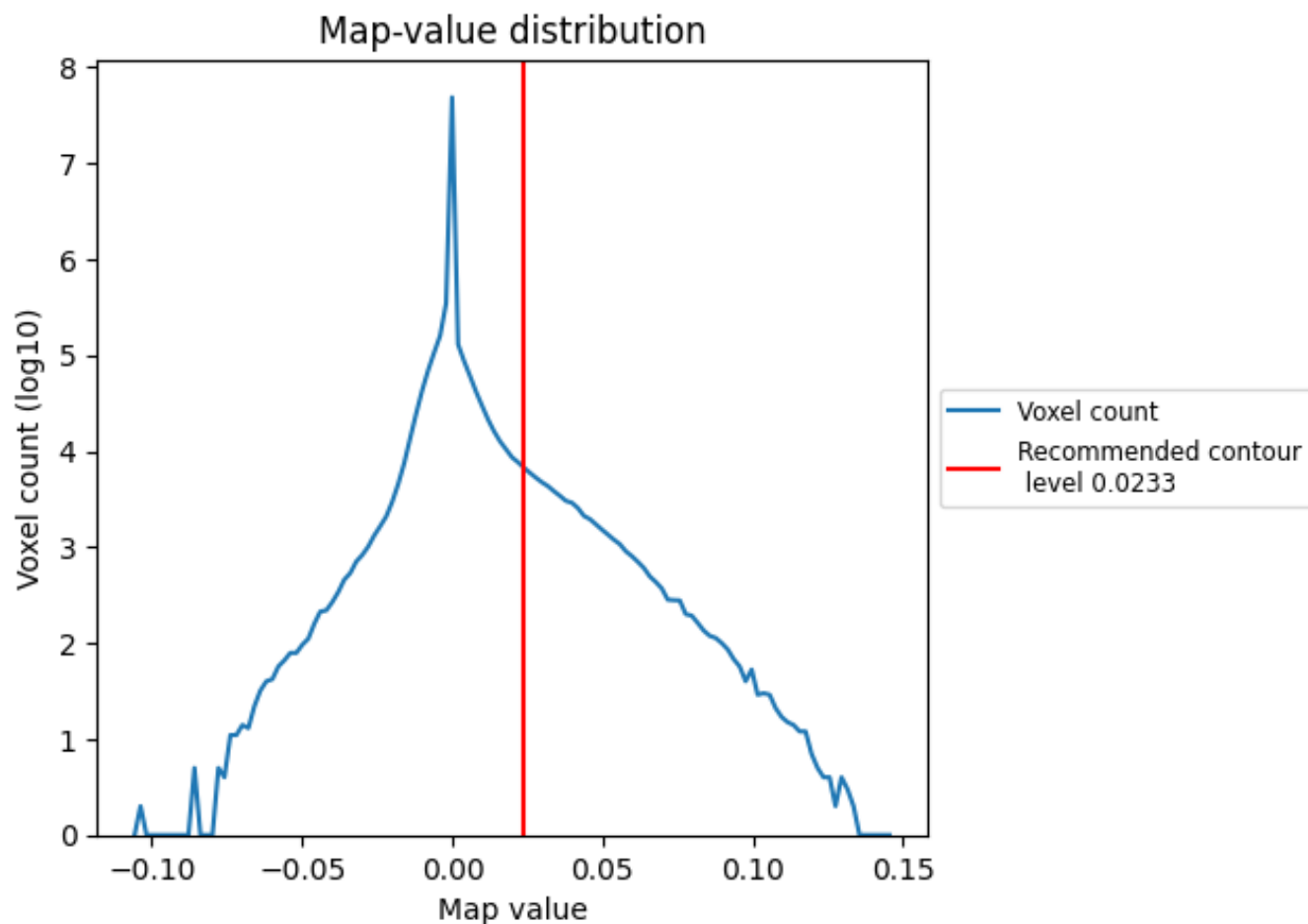
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

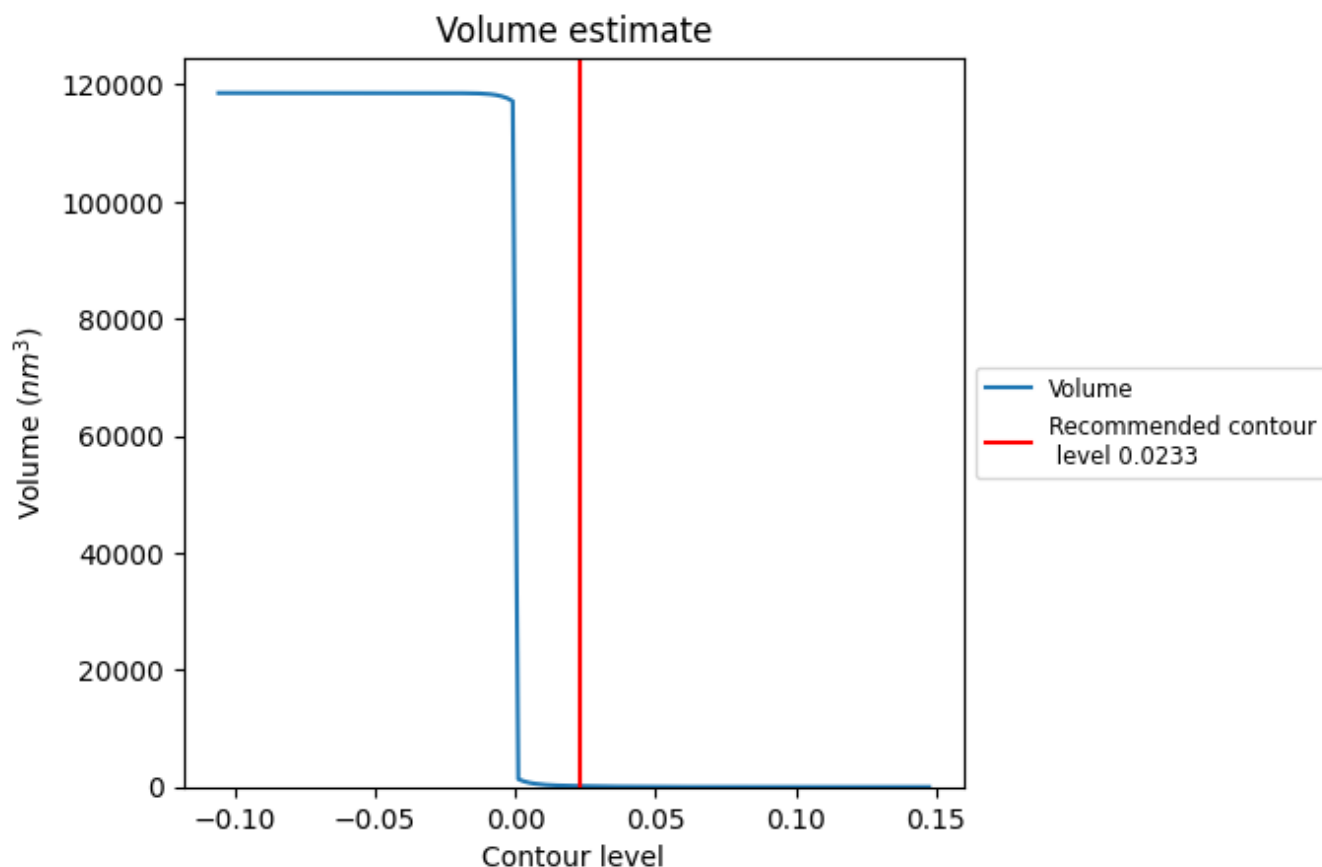
This section contains the results of statistical analysis of the map.

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.

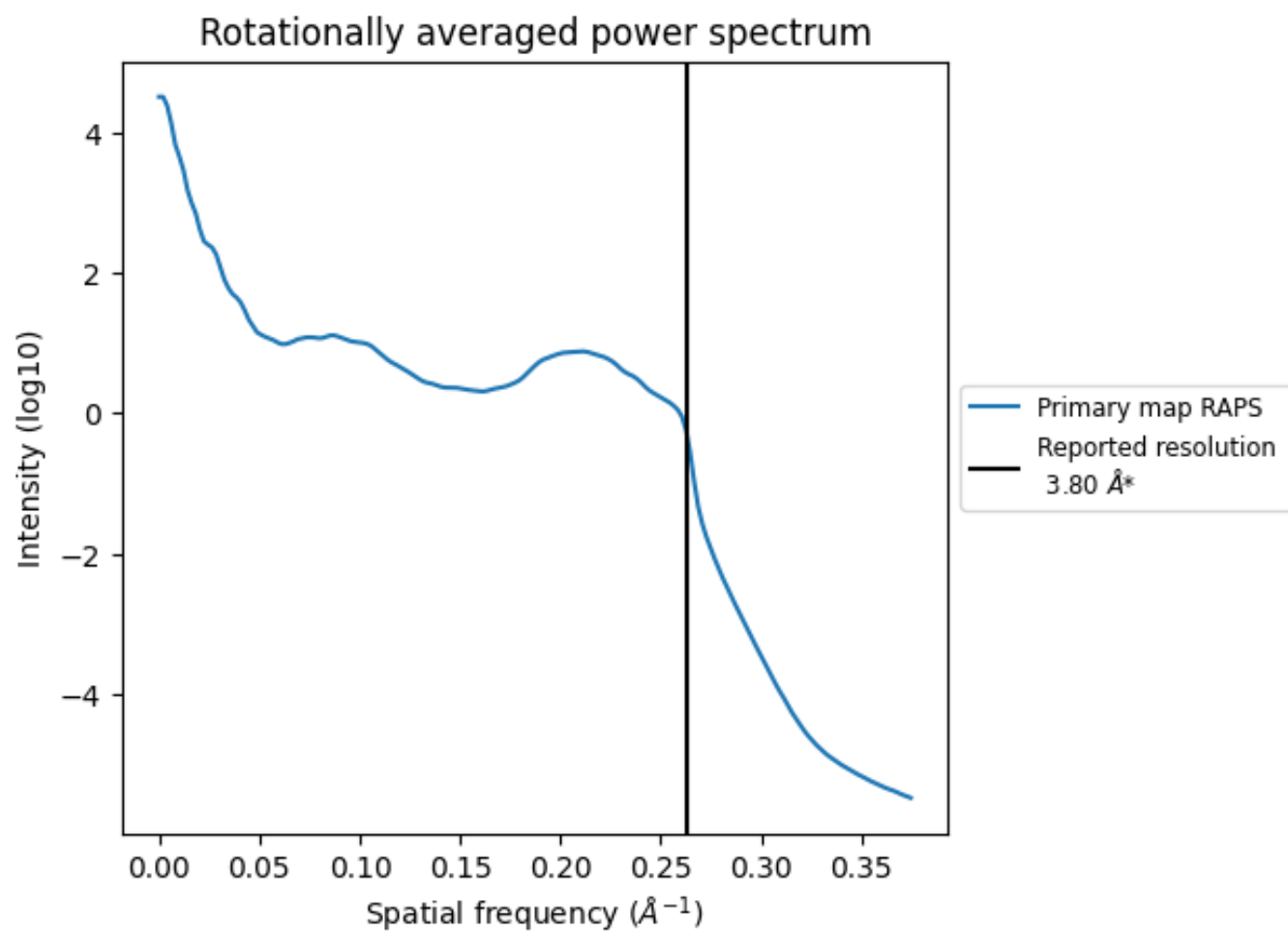
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 148 nm³; this corresponds to an approximate mass of 134 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 0.263 Å⁻¹

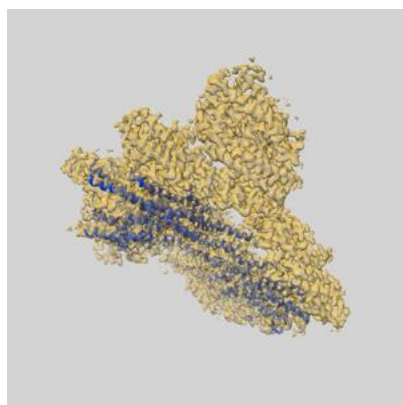
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

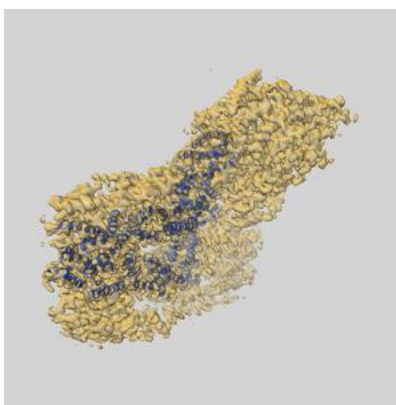
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-21067 and PDB model 6V6B. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

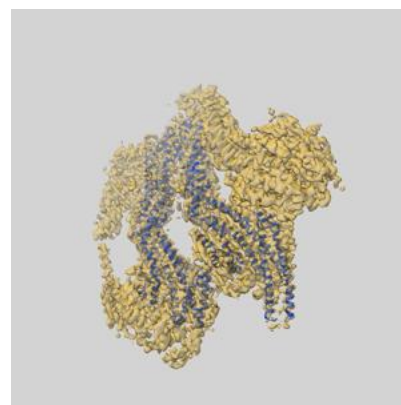
9.1 Map-model overlay [i](#)



X



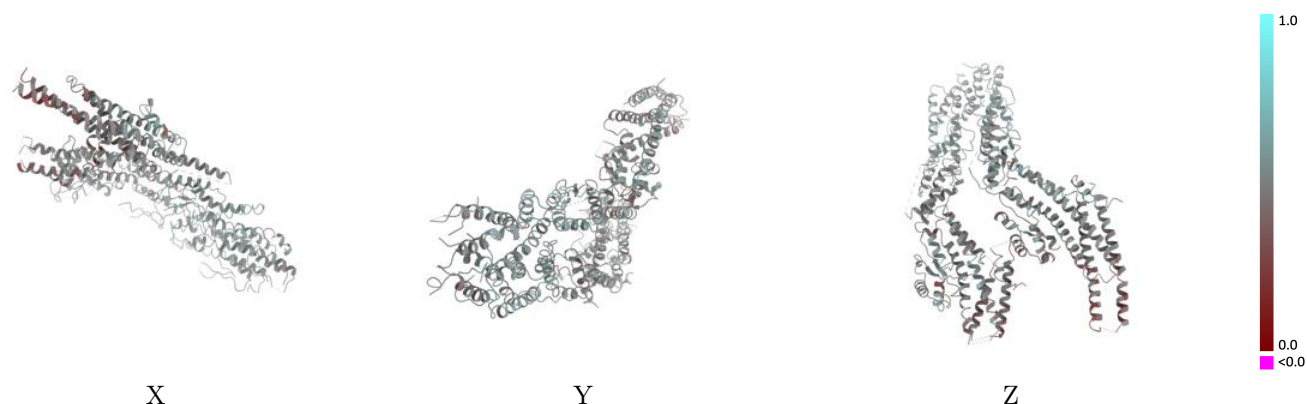
Y



Z

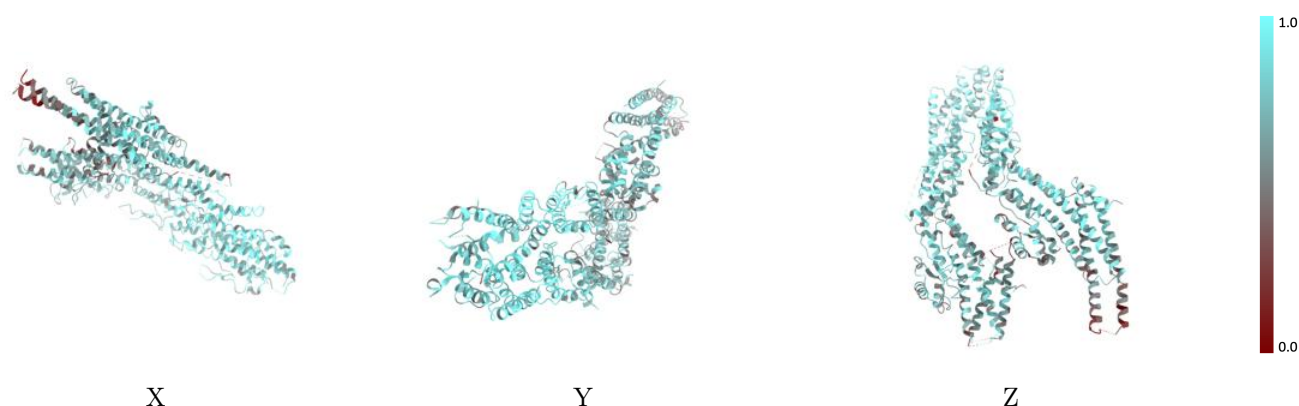
The images above show the 3D surface view of the map at the recommended contour level 0.0233 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



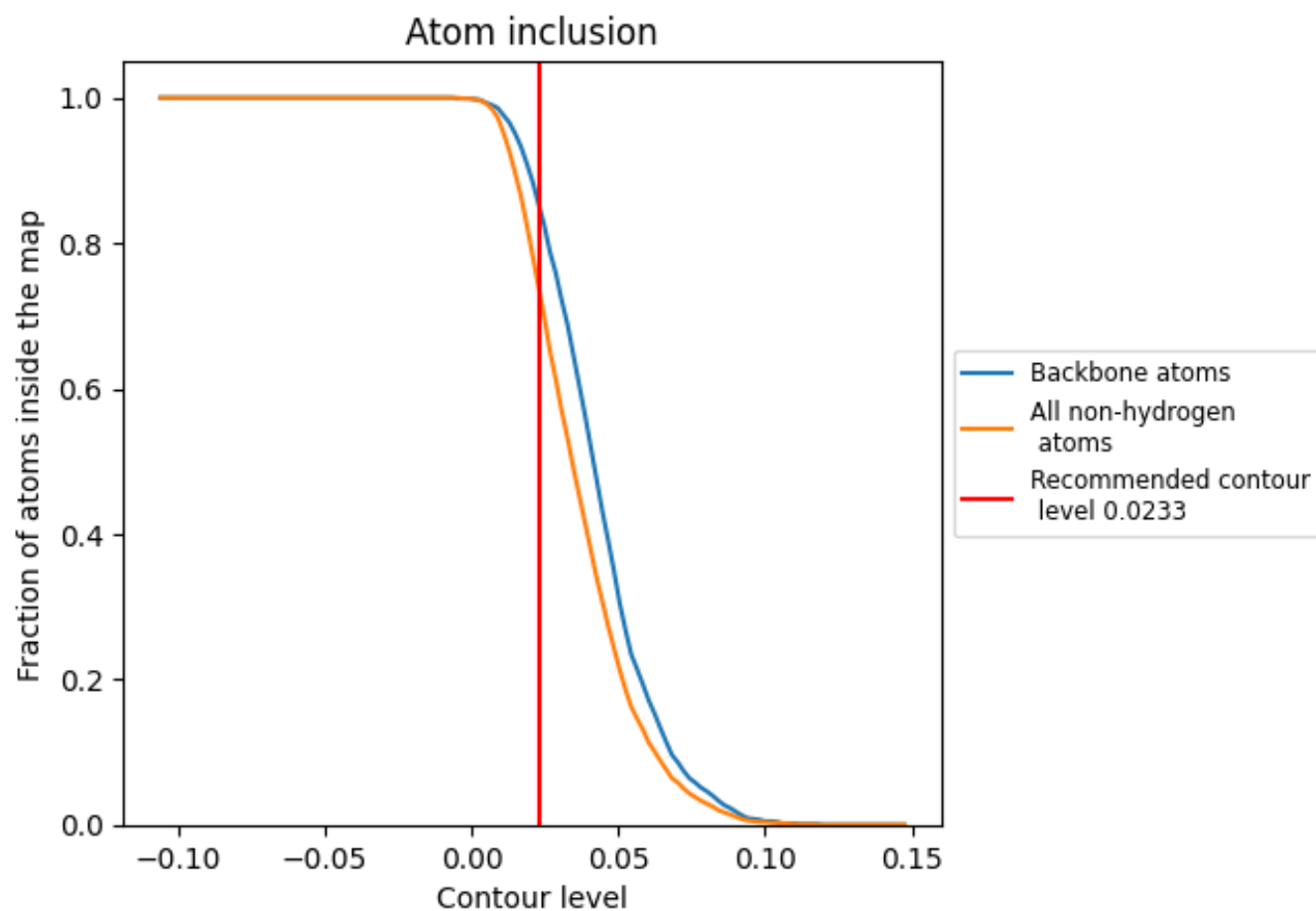
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0233).

9.4 Atom inclusion [i](#)



At the recommended contour level, 85% of all backbone atoms, 73% 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 (0.0233) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7320	0.4900
B	0.7230	0.4880
C	0.7420	0.4920

