



wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 12:51 PM EDT

PDB ID : 9BJ8 / pdb_00009bj8
EMDB ID : EMD-44630
Title : human CRL2-ZYG11B complex
Authors : Liu, X.; Gross, J.D.
Deposited on : 2024-04-25
Resolution : 3.78 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

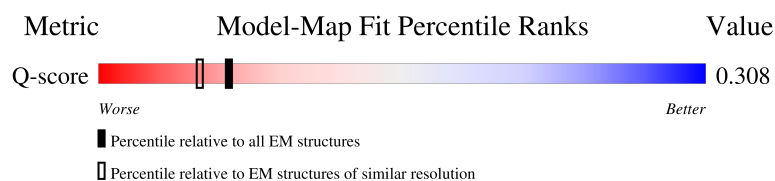
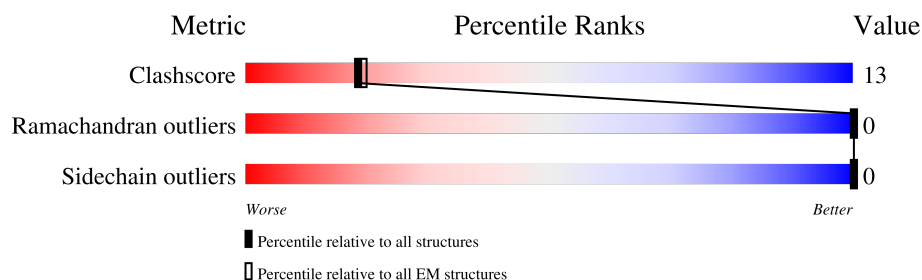
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.78 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.



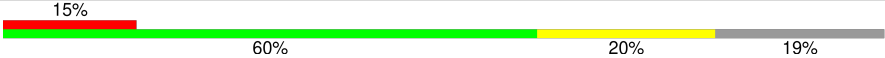
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	10074 (3.28 - 4.27)

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	748	 71% 26% .
2	B	118	 53% 30% 17%
3	C	96	 70% 30%
4	D	744	 69% 31%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	R	108	 A horizontal bar chart showing the quality of chain R. The bar is divided into four segments: a red segment at the beginning labeled '15%', a green segment labeled '60%', a yellow segment labeled '20%', and a grey segment at the end labeled '19%'.

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14069 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 Protein zyg-11 homolog B.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	721	Total	C	N	O	S	0	0
			5714	3627	1000	1051	36		

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	SER	-	expression tag	UNP Q9C0D3
A	-2	HIS	-	expression tag	UNP Q9C0D3
A	-1	MET	-	expression tag	UNP Q9C0D3
A	0	VAL	-	expression tag	UNP Q9C0D3
A	1	ASP	-	expression tag	UNP Q9C0D3

- Molecule 2 is a protein called Elongin-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	98	Total	C	N	O	S	0	0
			775	489	131	151	4		

- Molecule 3 is a protein called Elongin-C.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	96	Total	C	N	O	S	0	0
			760	487	122	145	6		

- Molecule 4 is a protein called Cullin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	744	Total	C	N	O	S	0	0
			6093	3870	1032	1146	45		

- Molecule 5 is a protein called E3 ubiquitin-protein ligase RBX1.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	R	87	Total	C	N	O	S	0	0
			724	460	134	121	9		

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
6	R	3	Total	Zn	0
			3	3	

- Molecule 1: Protein zyg-11 homolog B

SER	HIS	A91	L239	H421	L574	Y685
	MET	R99	L242	Q422	H575	G686
	VAL	K100	D243	Q423	W580	I690
	ASP	C103	I244	L424	I584	G694
	PRO	C103	S245	Q425	I694	L695
	GLU	E109	D246	R436	A602	G696
	ASP	K248	D247	F446	A603	G697
	GLN	L110	Q249	E447	G697	G697
	ALA	D111	L268	A448	I605	L698
	GLY	V115	L268	A448	I606	G699
ALA	ALA	I125	L271	M453	H608	I701
	MET	S126	D272	Q454	D703	K702
	GLU	G127	E308	W455	L610	H704
	GLU	G127	F309	L456	S611	H705
	A13	Q139	E308	C457	R612	H706
	L18	C140	L310	M458	Q615	H710
	L19	C140	T311	L459	A616	V711
	C22	N144	G320	D461	W617	Q712
	L23	R156	E321	Q462	T618	Q713
	L26	C157	F158	W463	L619	I714
K32	L26	F158	Q326	M464	S620	A715
	K32	G163	F340	Q465	R621	V716
	R37	L164	L345	R466	G623	L719
	Q38	R165	L345	M467	R624	H725
	T41	A166	T358	Q483	M625	H729
	L42	L167	K359	Q486	S626	H733
	C43	S168	P360	T489	D629	PRO
	L44	D178	I362	L490	P641	CYS
	Q45	E181	L363	F492	E642	LYS
	E46	V182	V366	I493	M645	LYS
Q48	Q48	L185	V367	W494	Y648	GLN
	Q52	P186	M370	R495	P653	PRO
	E53	R187	R371	Q496	F654	GLN
	V54	L188	Q380	K504	F655	ALA
	R60	I193	L381	F535	L658	ARG
	G74	I201	V401	F544	Q667	LEU
	I75	C207	R402	V547	W672	ASN
	F76	L211	L403	V561	Q675	
	R77	T215	V407	L565	C678	
	Q80	W224	L410	I568	S679	
R85	M81	L411	L412	A569	K680	
	R85	D231	K413	V570	M681	
	C87	A141	A141	V571	P682	
	I88	R234	M415	Q572	S683	
	R89	E416	E417	F573	R624	
	R89	W039	H417	S572		

- Molecule 2: Elongin-B

LYS	M1
PRO	
GLN	F4
ASP	L6
SER	M6
GLY	I7
SER	R8
SER	
ALA	K11
ASN	T12
GLU	T13
GLN	I14
ALA	F15
VAL	T16
GLN	
	E20
	T23
	V24
	F25
	E26
	L27
	K28
	R29
	I30
	I34
	L35
	K36
	R37
	R43
	Q49
	L50
	L51
	T56
	L57
	F62
	T63
	S64
	Q65
	P69
	P72
	K73
	T74
	V75
	F79
	E98
	LEU
	PRO
	ASP
	VAL
	MET

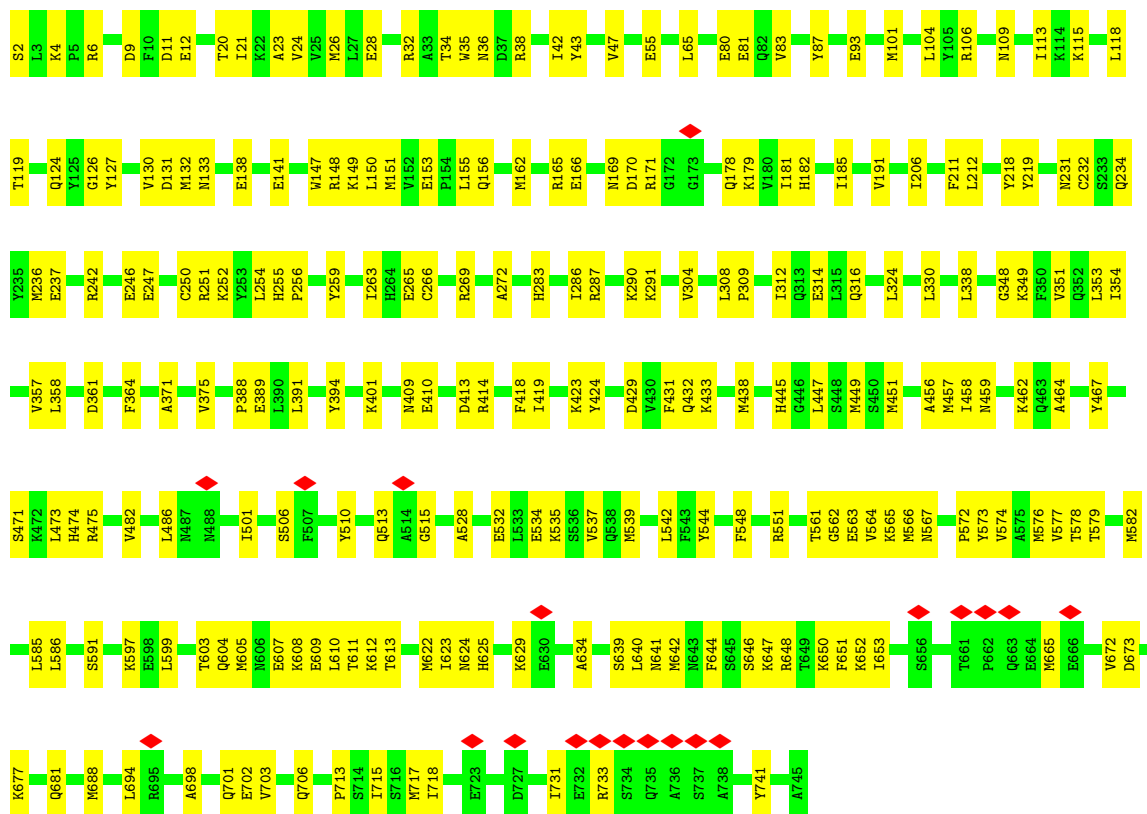
- Molecule 3: Elongin-C



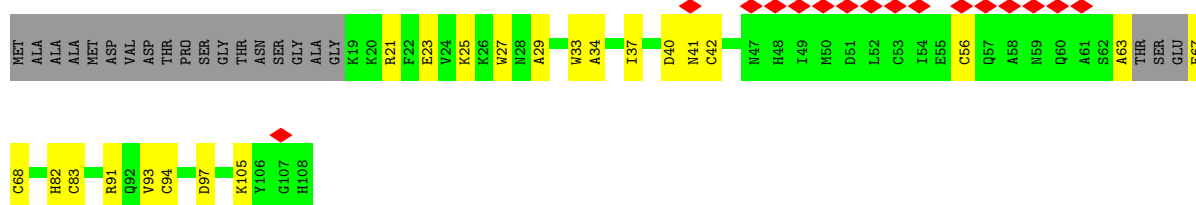
WORLD WIDE
PDB
PROTEIN DATA BANK



• Molecule 4: Cullin-2



• Molecule 5: E3 ubiquitin-protein ligase RBX1



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	177561	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	56.450	Depositor
Minimum map value	-34.759	Depositor
Average map value	0.000	Depositor
Map value standard deviation	1.000	Depositor
Recommended contour level	0.7	Depositor
Map size ($\text{\AA}$)	300.6, 300.6, 300.6	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.83500004, 0.83500004, 0.83500004	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ZN

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	0/5824	0.40	0/7891
2	B	0.14	0/790	0.42	0/1067
3	C	0.13	0/777	0.37	0/1050
4	D	0.14	0/6212	0.38	0/8368
5	R	0.07	0/745	0.25	0/1007
All	All	0.13	0/14348	0.38	0/19383

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 [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	5714	0	5783	143	0
2	B	775	0	771	25	0
3	C	760	0	749	23	0
4	D	6093	0	6079	172	0
5	R	724	0	680	17	0
6	R	3	0	0	0	0
All	All	14069	0	14062	361	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 13.

The worst 5 of 361 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)
4:D:445:HIS:HE1	4:D:447:LEU:HD12	1.36	0.90
3:C:40:GLY:HA3	4:D:106:ARG:HH22	1.42	0.82
4:D:445:HIS:CE1	4:D:447:LEU:HD12	2.15	0.82
2:B:6:MET:HE3	2:B:8:ARG:HD2	1.66	0.78
1:A:672:TRP:HE3	1:A:675:GLN:HE21	1.35	0.74

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	719/748 (96%)	695 (97%)	24 (3%)	0	100	100
2	B	96/118 (81%)	92 (96%)	4 (4%)	0	100	100
3	C	94/96 (98%)	88 (94%)	6 (6%)	0	100	100
4	D	742/744 (100%)	704 (95%)	38 (5%)	0	100	100
5	R	83/108 (77%)	75 (90%)	8 (10%)	0	100	100
All	All	1734/1814 (96%)	1654 (95%)	80 (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	A	641/663 (97%)	641 (100%)	0	100	100
2	B	86/103 (84%)	86 (100%)	0	100	100
3	C	85/85 (100%)	85 (100%)	0	100	100
4	D	680/680 (100%)	680 (100%)	0	100	100
5	R	76/90 (84%)	76 (100%)	0	100	100
All	All	1568/1621 (97%)	1568 (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
4	D	178	GLN
4	D	334	ASN
5	R	82	HIS
4	D	547	HIS
4	D	329	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](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-44630. These allow visual inspection of the internal detail of the map and identification of artifacts.

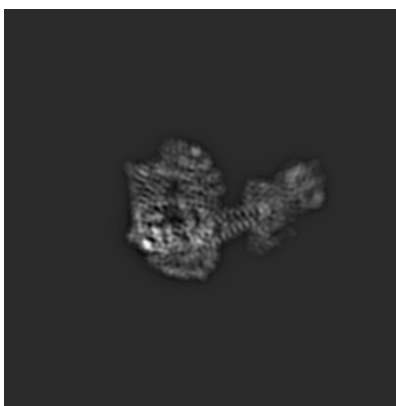
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

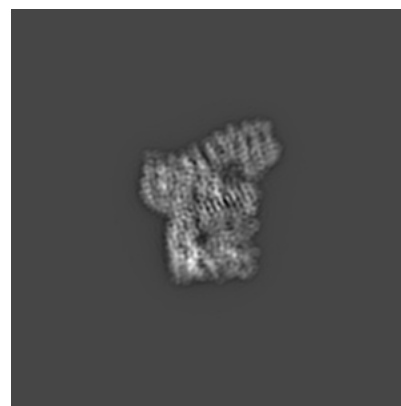
6.1.1 Primary map



X

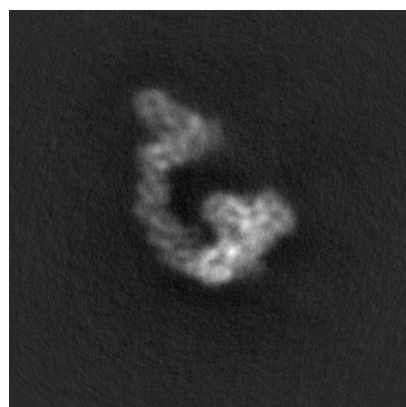


Y

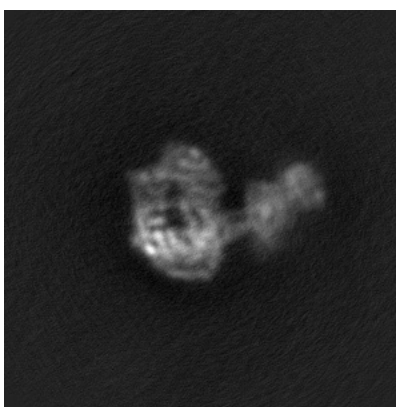


Z

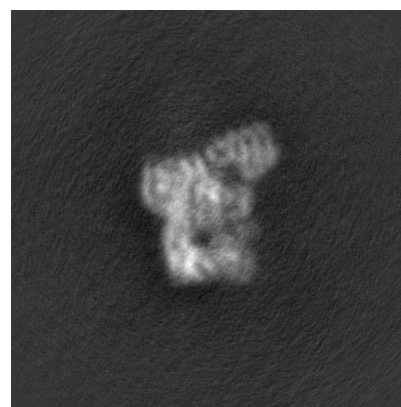
6.1.2 Raw map



X



Y

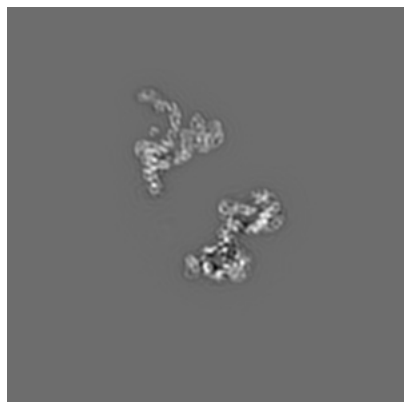


Z

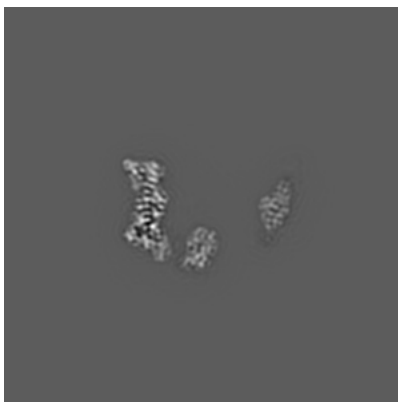
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

6.2.1 Primary map



X Index: 180

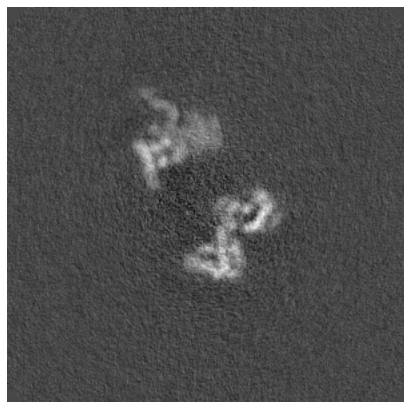


Y Index: 180

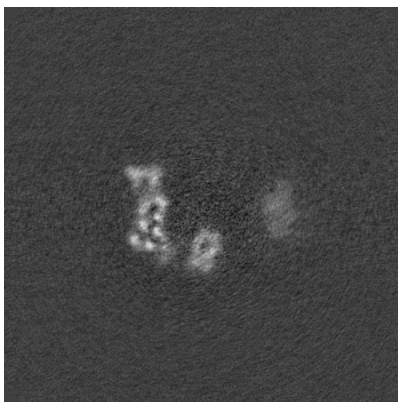


Z Index: 180

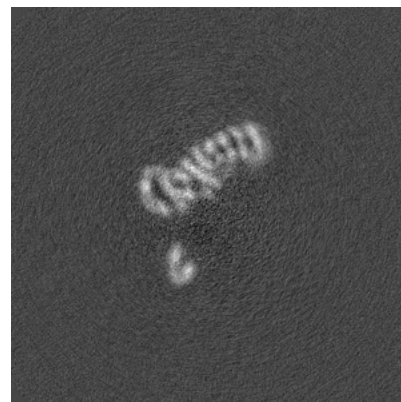
6.2.2 Raw map



X Index: 180



Y Index: 180



Z Index: 180

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

6.3 Largest variance slices [i](#)

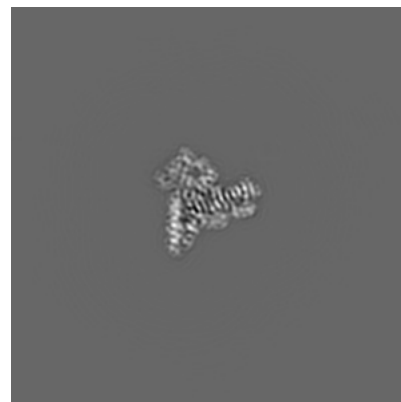
6.3.1 Primary map



X Index: 160

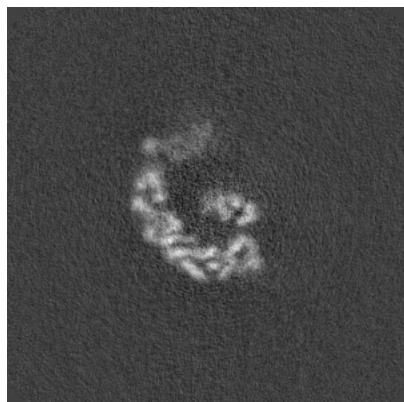


Y Index: 196

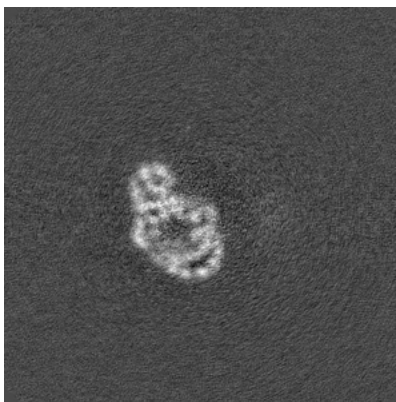


Z Index: 128

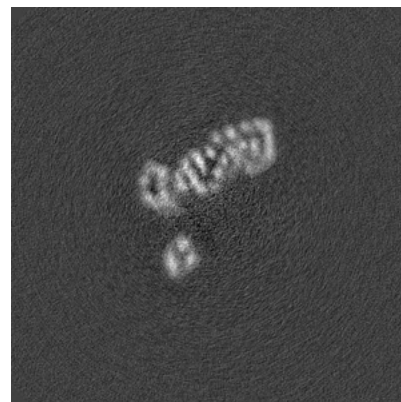
6.3.2 Raw map



X Index: 157



Y Index: 195

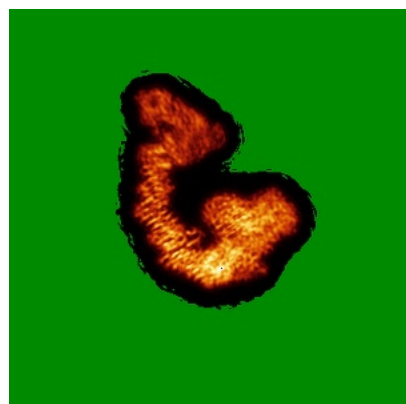


Z Index: 170

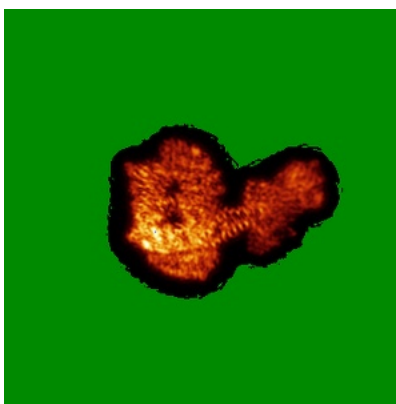
The images above show the largest variance slices of the map in three orthogonal directions.

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

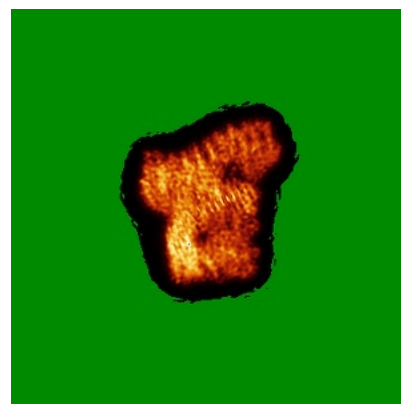
6.4.1 Primary map



X

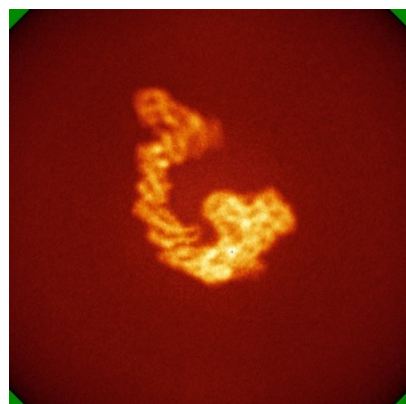


Y

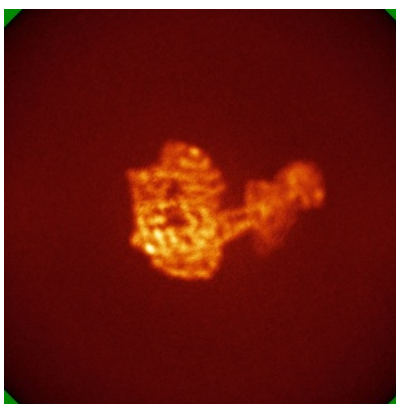


Z

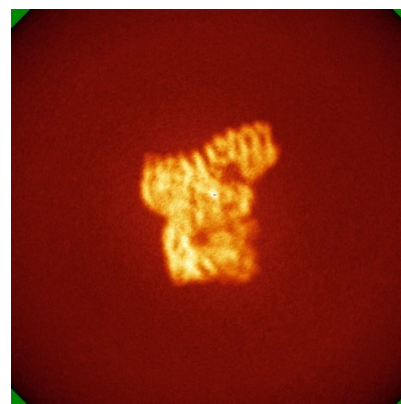
6.4.2 Raw map



X



Y

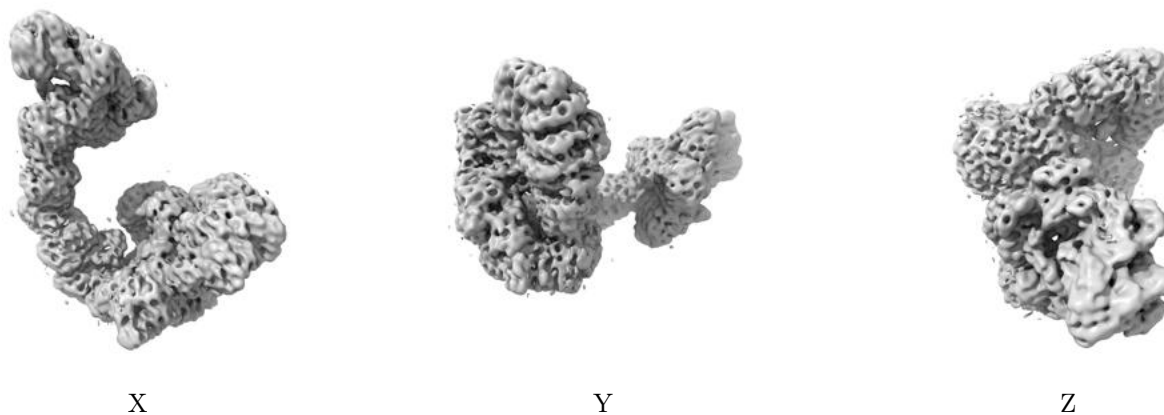


Z

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.

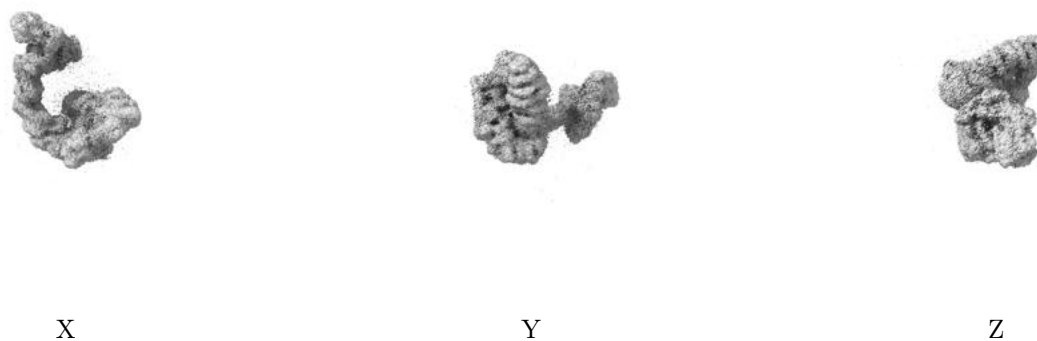
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.7. 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.

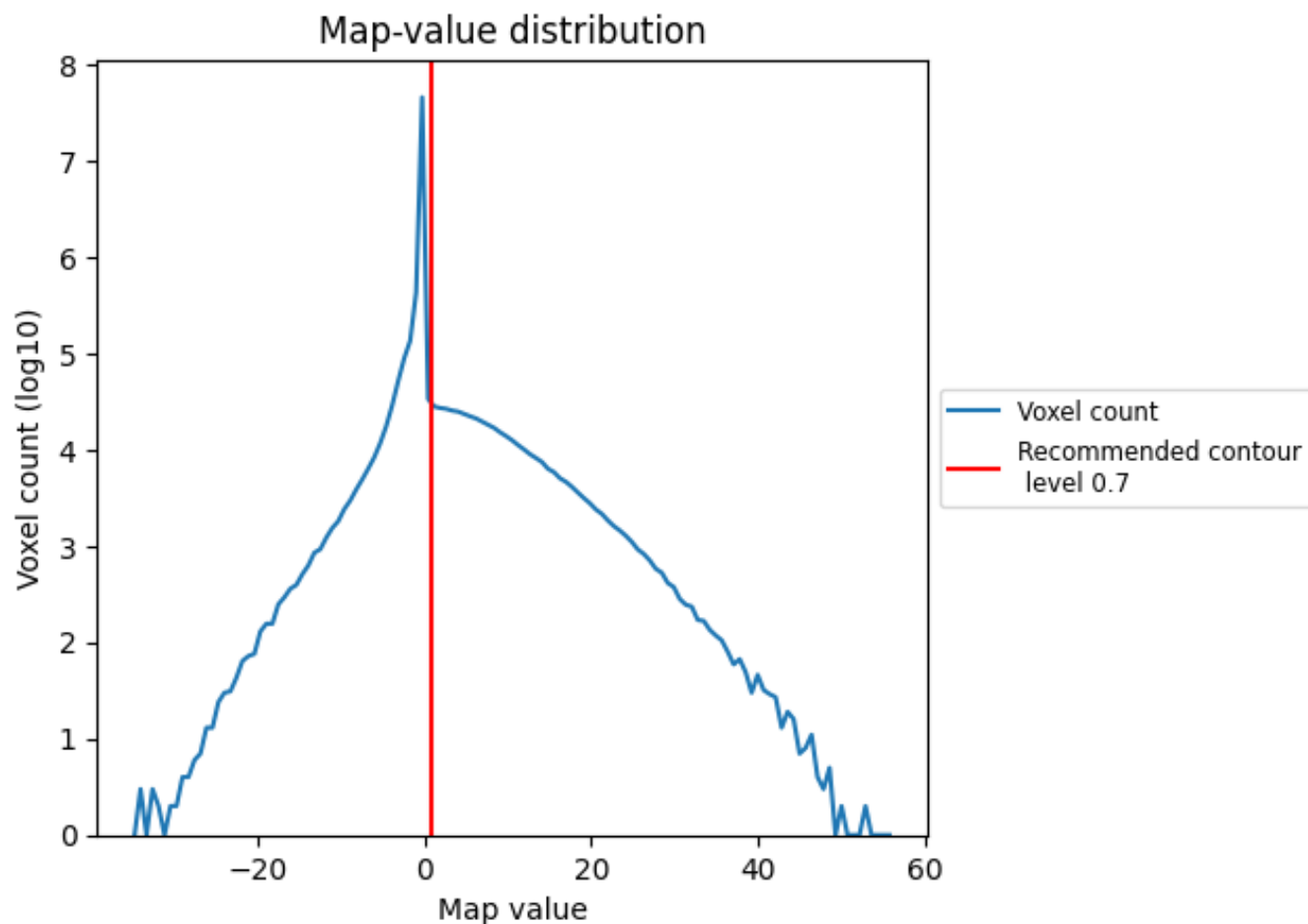
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

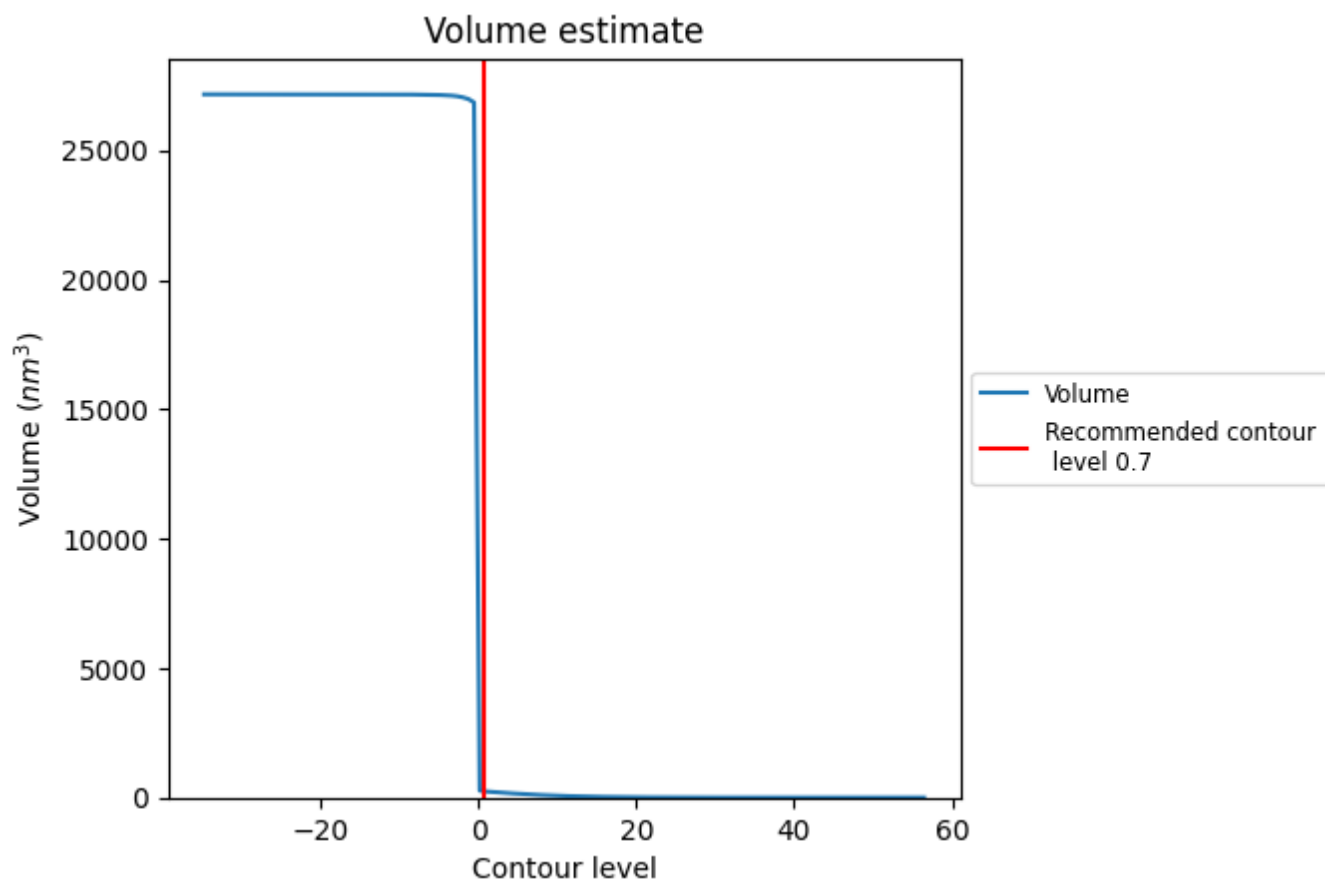
This section contains the results of statistical analysis of the map.

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.

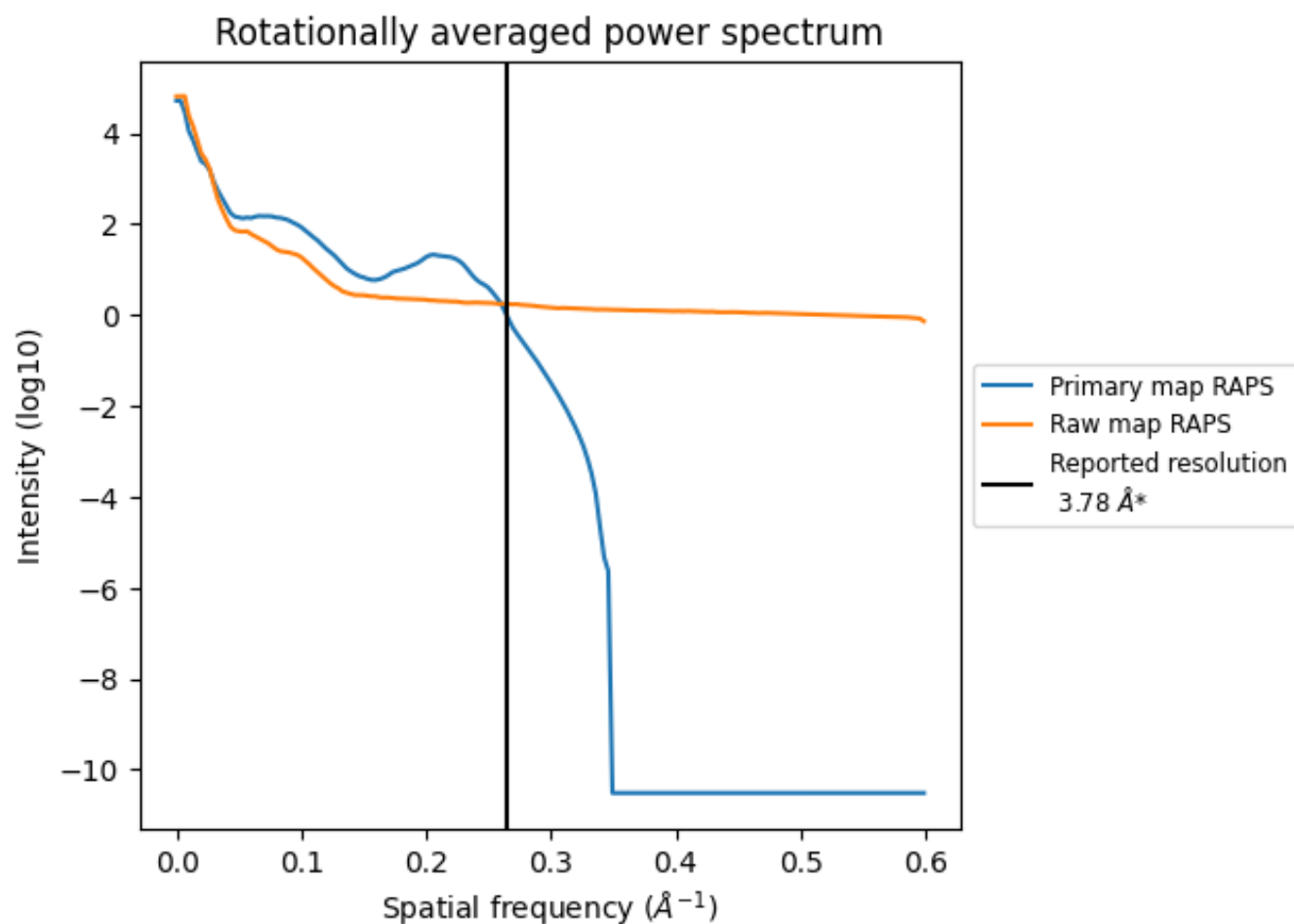
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 244 nm^3 ; this corresponds to an approximate mass of 220 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 ⓘ

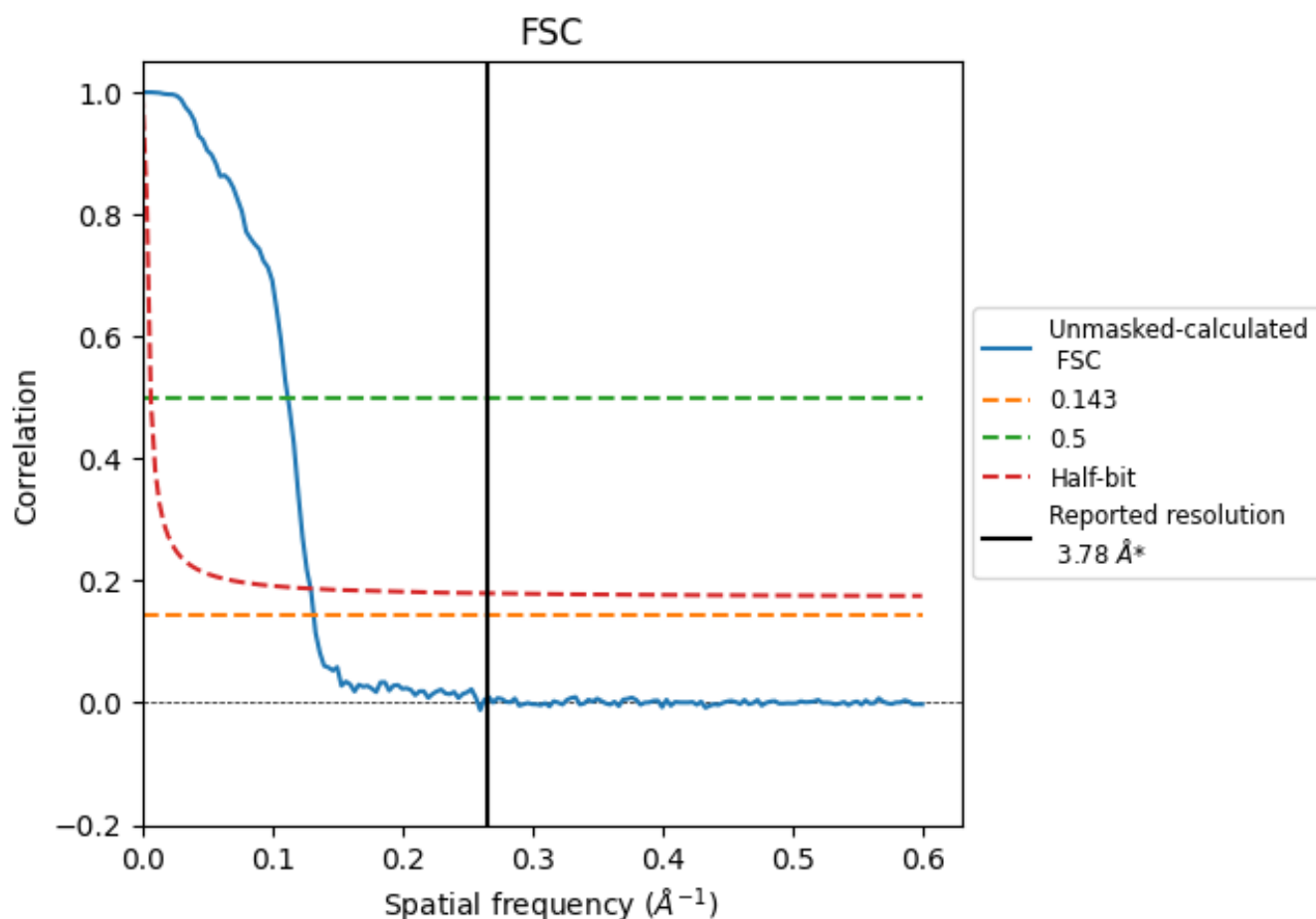


*Reported resolution corresponds to spatial frequency of 0.265 Å⁻¹

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 0.265 Å⁻¹

8.2 Resolution estimates [i](#)

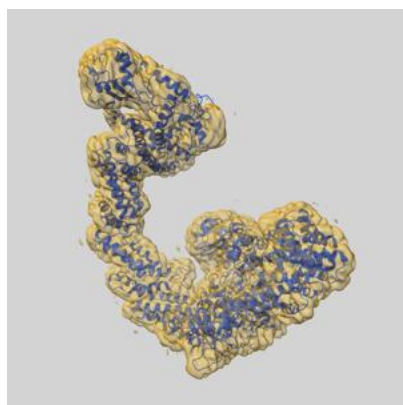
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.78	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	7.59	8.94	7.73

*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 7.59 differs from the reported value 3.78 by more than 10 %

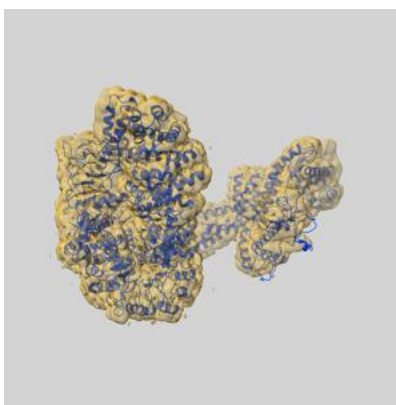
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-44630 and PDB model 9BJ8. Per-residue inclusion information can be found in section [3](#) on page [6](#).

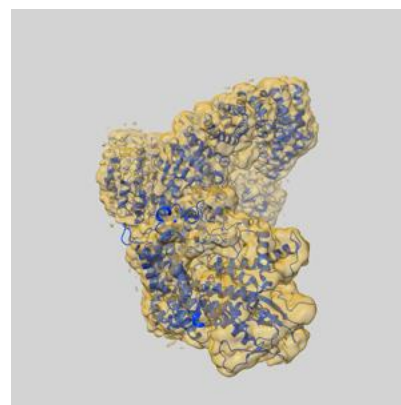
9.1 Map-model overlay [i](#)



X



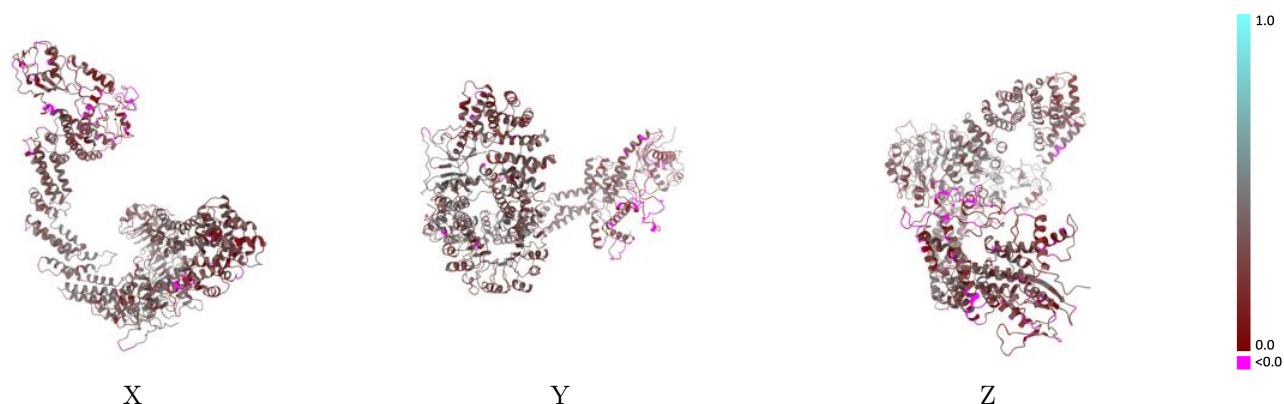
Y



Z

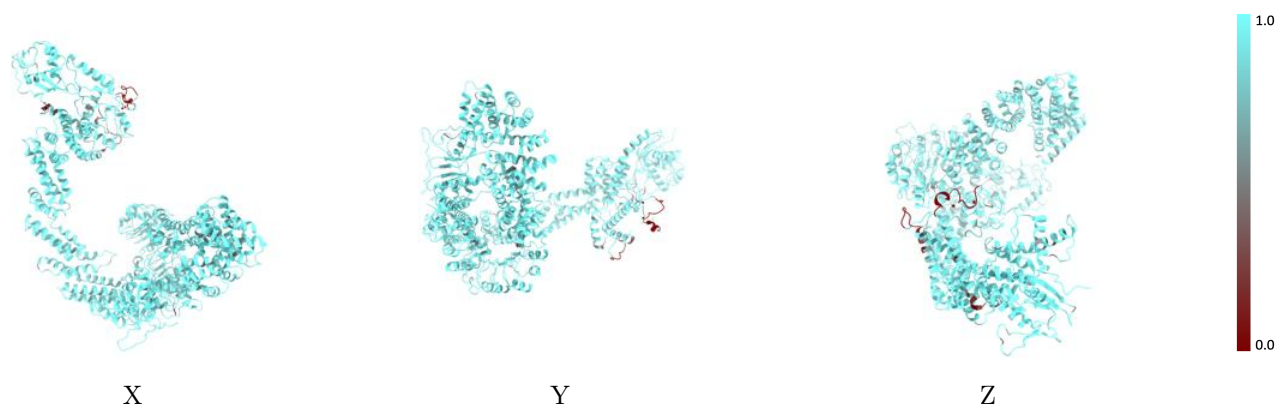
The images above show the 3D surface view of the map at the recommended contour level 0.7 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



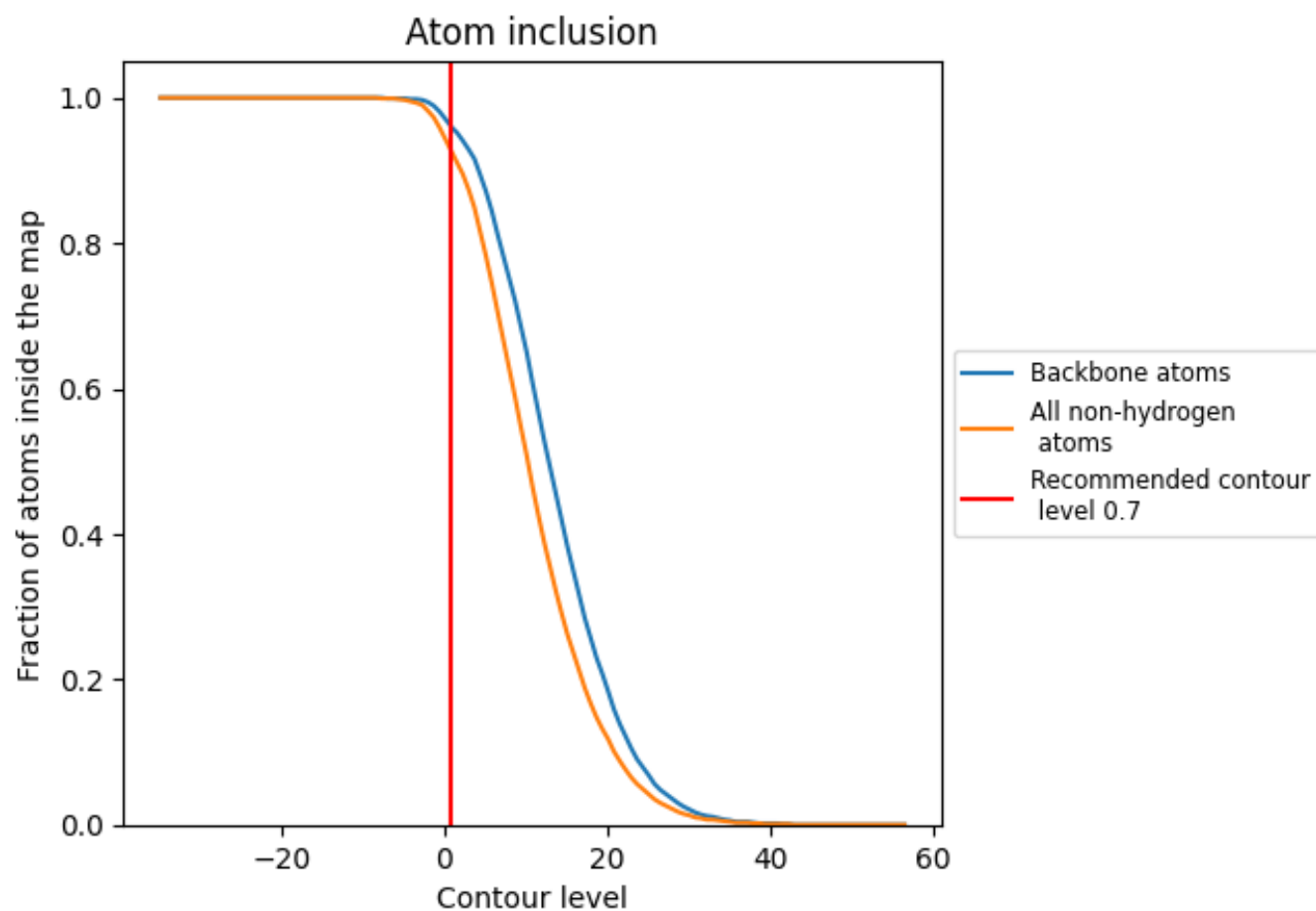
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.7).

9.4 Atom inclusion [i](#)



At the recommended contour level, 96% of all backbone atoms, 93% 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 (0.7) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9310	0.3080
A	0.9430	0.3250
B	0.9620	0.3640
C	0.9720	0.3890
D	0.9320	0.2940
R	0.7470	0.1470

