



wwPDB EM Validation Summary Report ⓘ

Sep 7, 2021 – 12:42 PM BST

PDB ID : 7OTQ
EMDB ID : EMD-13065
Title : Cryo-EM structure of ALC1/CHD1L bound to a PARylated nucleosome
Authors : Bacic, L.; Gaullier, G.; Deindl, S.
Deposited on : 2021-06-10
Resolution : 4.80 Å(reported)
Based on initial models : 6RYR, 6JYL

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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

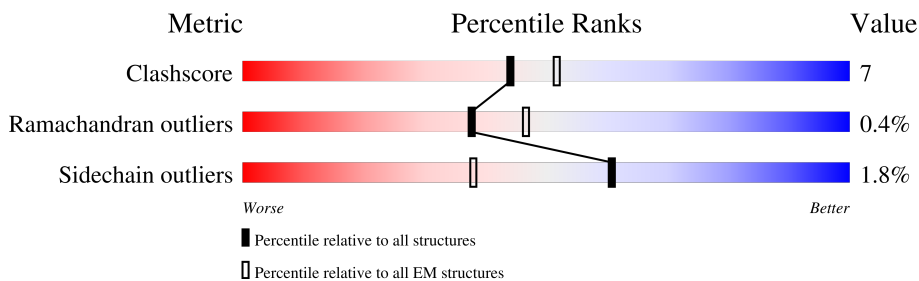
EMDB validation analysis : 0.0.0.dev97
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.1

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 4.80 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.



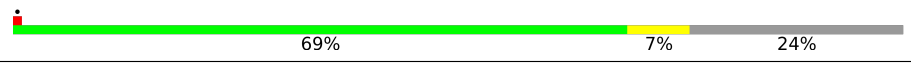


Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	K	872	
2	A	136	
2	E	136	
3	B	103	
3	F	103	
4	C	130	
4	G	130	
5	D	123	

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Mol	Chain	Length	Quality of chain
5	H	123	
6	I	160	
7	J	160	

2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 29140 atoms, of which 13365 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 Chromodomain-helicase-DNA-binding protein 1-like.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
1	K	459	7359	2347	3688	625	682	17	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	15	MET	-	initiating methionine	UNP Q86WJ1
K	880	ALA	-	expression tag	UNP Q86WJ1
K	881	HIS	-	expression tag	UNP Q86WJ1
K	882	HIS	-	expression tag	UNP Q86WJ1
K	883	HIS	-	expression tag	UNP Q86WJ1
K	884	HIS	-	expression tag	UNP Q86WJ1
K	885	HIS	-	expression tag	UNP Q86WJ1
K	886	HIS	-	expression tag	UNP Q86WJ1

- Molecule 2 is a protein called Histone H3.2.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
2	A	97	1642	506	841	155	138	2	0	0
2	E	97	1639	504	839	155	139	2	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	102	ALA	GLY	conflict	UNP P84233
A	110	ALA	CYS	engineered mutation	UNP P84233
E	102	ALA	GLY	conflict	UNP P84233
E	110	ALA	CYS	engineered mutation	UNP P84233

- Molecule 3 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace	
3	B	87	Total	C	H	N	O	S	0	0
			1459	442	756	142	118	1		
3	F	78	Total	C	H	N	O	S	0	0
			1279	391	660	120	107	1		

- Molecule 4 is a protein called Histone H2A type 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	C	103	Total	C	H	N	O	0	0
			1642	501	847	155	139		
4	G	105	Total	C	H	N	O	0	0
			1674	510	865	158	141		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	99	ARG	GLY	conflict	UNP P06897
C	123	SER	ALA	conflict	UNP P06897
G	99	ARG	GLY	conflict	UNP P06897
G	123	SER	ALA	conflict	UNP P06897

- Molecule 5 is a protein called Histone H2B 1.1.

Mol	Chain	Residues	Atoms					AltConf	Trace	
5	D	95	Total	C	H	N	O	S	0	0
			1519	469	774	134	140	2		
5	H	93	Total	C	H	N	O	S	0	0
			1474	457	748	130	137	2		

There are 4 discrepancies between the modelled and reference sequences:

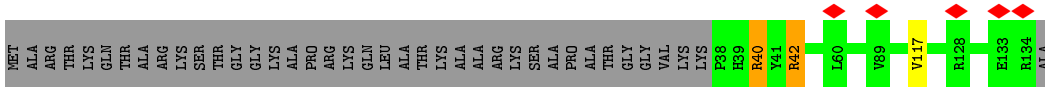
Chain	Residue	Modelled	Actual	Comment	Reference
D	0	MET	-	initiating methionine	UNP P02281
D	29	THR	SER	conflict	UNP P02281
H	0	MET	-	initiating methionine	UNP P02281
H	29	THR	SER	conflict	UNP P02281

- Molecule 6 is a DNA chain called DNA (149-MER) Widom 601 sequence.

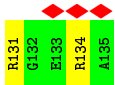
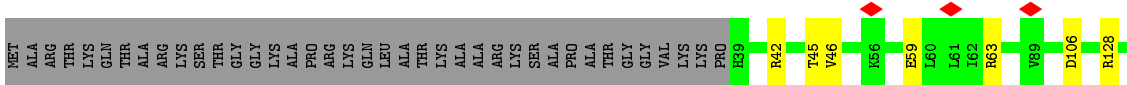
Mol	Chain	Residues	Atoms					AltConf	Trace	
6	I	149	Total	C	H	N	O	P	0	0
			4709	1443	1673	555	890	148		

- Molecule 7 is a DNA chain called DNA (149-MER) Widom 601 sequence.

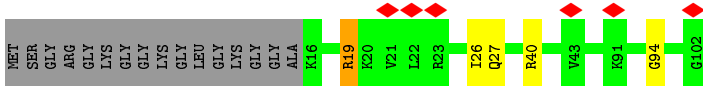
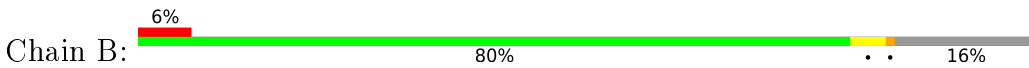
Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	P		
7	J	149	4744	1454	1674	571	896	149	0	0



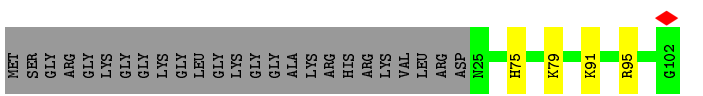
• Molecule 2: Histone H3.2



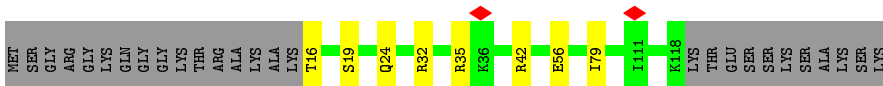
• Molecule 3: Histone H4



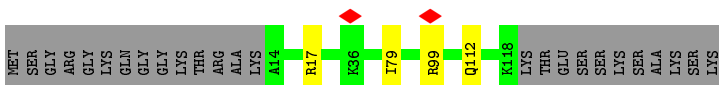
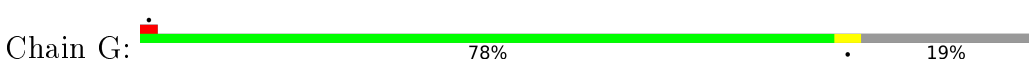
• Molecule 3: Histone H4



• Molecule 4: Histone H2A type 1



• Molecule 4: Histone H2A type 1

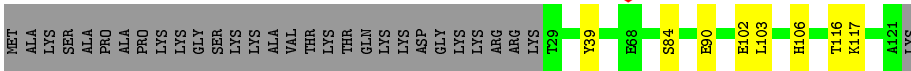


• Molecule 5: Histone H2B 1.1





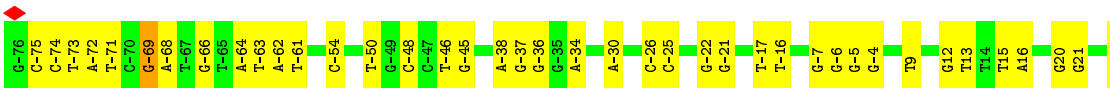
• Molecule 5: Histone H2B 1.1



• Molecule 6: DNA (149-MER) Widom 601 sequence



• Molecule 7: DNA (149-MER) Widom 601 sequence



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	5487	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 ($e^-/\text{\AA}^2$)	45	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.822	Depositor
Minimum map value	-0.395	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.022	Depositor
Recommended contour level	0.15	Depositor
Map size (Å)	430.08, 430.08, 430.08	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.0752, 1.0752, 1.0752	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	K	0.25	0/3743	0.49	0/5051
2	A	0.26	0/813	0.56	0/1091
2	E	0.27	0/811	0.56	0/1087
3	B	0.26	0/711	0.57	0/948
3	F	0.27	0/626	0.57	0/837
4	C	0.26	0/805	0.54	0/1088
4	G	0.25	0/819	0.52	0/1106
5	D	0.26	0/756	0.47	0/1015
5	H	0.27	0/737	0.47	0/993
6	I	0.61	0/3403	1.05	7/5246 (0.1%)
7	J	0.60	0/3446	1.05	2/5321 (0.0%)
All	All	0.43	0/16670	0.80	9/23783 (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
3	B	0	1
4	G	0	1
All	All	0	2

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	I	66	DC	O4'-C1'-N1	7.57	113.30	108.00
6	I	73	DA	O4'-C1'-N9	7.14	113.00	108.00
6	I	-18	DC	C1'-O4'-C4'	-5.67	104.43	110.10
6	I	63	DA	O4'-C4'-C3'	-5.64	102.25	104.50
6	I	73	DA	C1'-O4'-C4'	-5.63	104.47	110.10

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	B	40	ARG	Sidechain
4	G	17	ARG	Sidechain

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	K	3671	3688	3687	41	0
2	A	801	841	841	4	0
2	E	800	839	838	10	0
3	B	703	756	755	3	0
3	F	619	660	659	3	0
4	C	795	847	846	5	0
4	G	809	865	864	1	0
5	D	745	774	773	2	0
5	H	726	748	747	6	0
6	I	3036	1673	1673	63	0
7	J	3070	1674	1674	61	0
All	All	15775	13365	13357	158	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 7.

The worst 5 of 158 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)
6:I:-46:DC:N4	7:J:45:DT:O4	2.18	0.76
1:K:289:TYR:OH	1:K:304:GLU:OE1	2.05	0.73
6:I:53:DT:O4	7:J:-54:DC:N4	2.23	0.71
6:I:6:DC:N4	7:J:-7:DG:N7	2.39	0.70
6:I:66:DC:H1'	6:I:67:DA:C8	2.28	0.69

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	K	457/872 (52%)	420 (92%)	32 (7%)	5 (1%)	14	51
2	A	95/136 (70%)	95 (100%)	0	0	100	100
2	E	95/136 (70%)	94 (99%)	1 (1%)	0	100	100
3	B	85/103 (82%)	84 (99%)	1 (1%)	0	100	100
3	F	76/103 (74%)	71 (93%)	5 (7%)	0	100	100
4	C	101/130 (78%)	99 (98%)	2 (2%)	0	100	100
4	G	103/130 (79%)	98 (95%)	5 (5%)	0	100	100
5	D	93/123 (76%)	92 (99%)	1 (1%)	0	100	100
5	H	91/123 (74%)	89 (98%)	2 (2%)	0	100	100
All	All	1196/1856 (64%)	1142 (96%)	49 (4%)	5 (0%)	38	72

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	K	240	ILE
1	K	267	ALA
1	K	206	ILE
1	K	74	GLY
1	K	75	LEU

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	K	403/748 (54%)	393 (98%)	10 (2%)	47	68
2	A	84/110 (76%)	82 (98%)	2 (2%)	49	69
2	E	83/110 (76%)	83 (100%)	0	100	100
3	B	72/79 (91%)	71 (99%)	1 (1%)	67	81
3	F	63/79 (80%)	62 (98%)	1 (2%)	62	79
4	C	82/102 (80%)	81 (99%)	1 (1%)	71	84
4	G	83/102 (81%)	81 (98%)	2 (2%)	49	69
5	D	81/103 (79%)	80 (99%)	1 (1%)	71	84
5	H	79/103 (77%)	78 (99%)	1 (1%)	69	82
All	All	1030/1536 (67%)	1011 (98%)	19 (2%)	61	77

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	D	29	THR
4	G	112	GLN
5	H	39	TYR
4	G	79	ILE
1	K	480	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
5	D	46	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 monosaccharides 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.

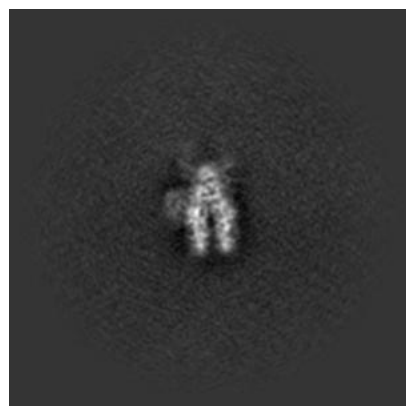
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13065. These allow visual inspection of the internal detail of the map and identification of artifacts.

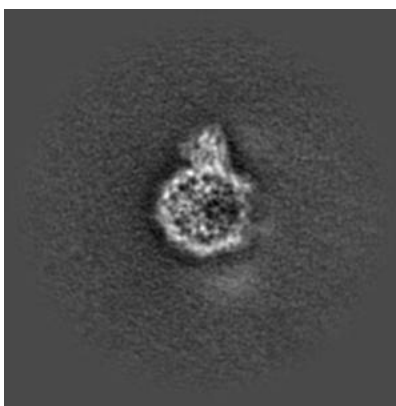
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

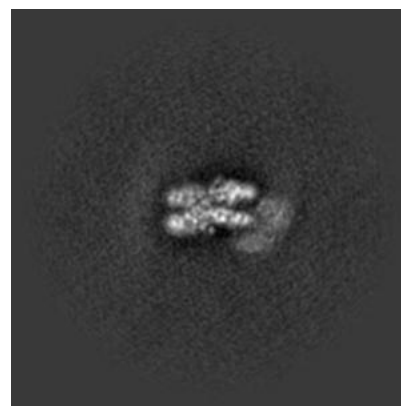
6.1.1 Primary map



X

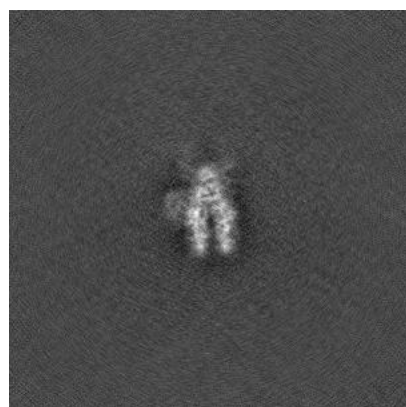


Y

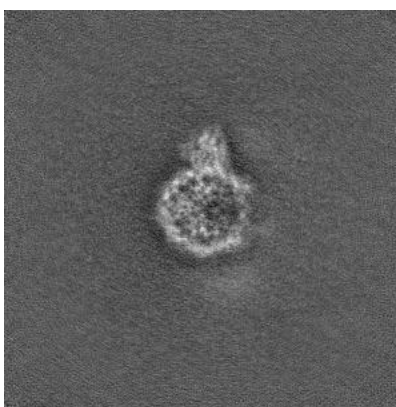


Z

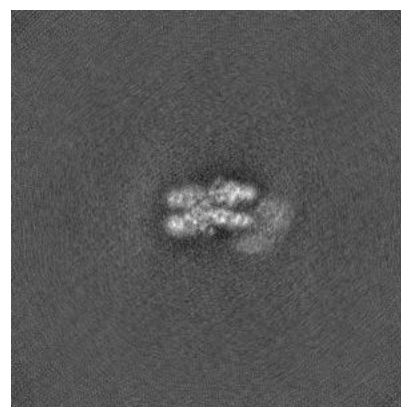
6.1.2 Raw map



X



Y

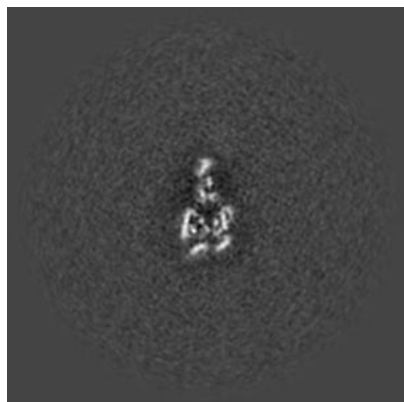


Z

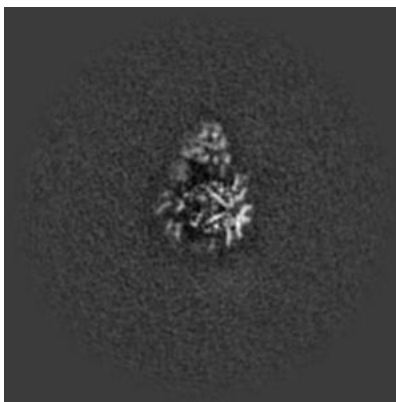
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

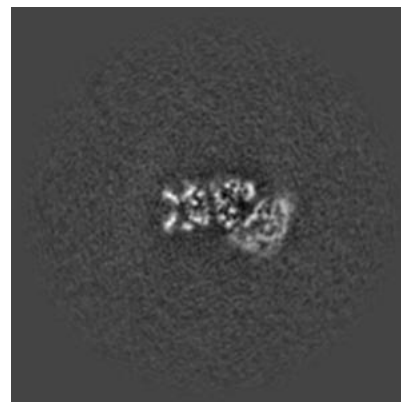
6.2.1 Primary map



X Index: 200

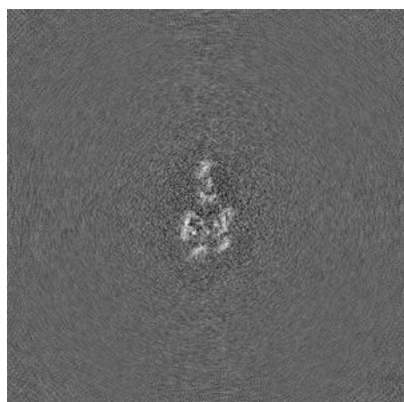


Y Index: 200

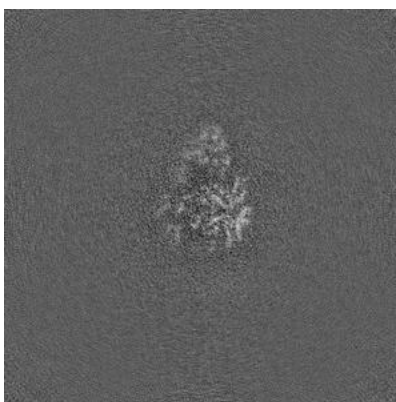


Z Index: 200

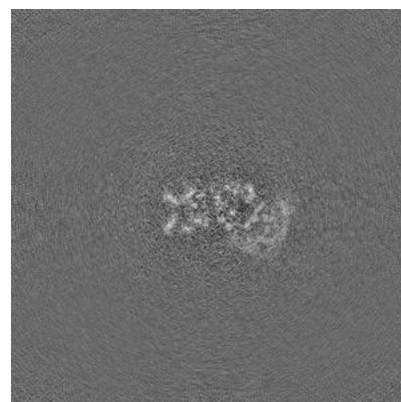
6.2.2 Raw map



X Index: 200



Y Index: 200

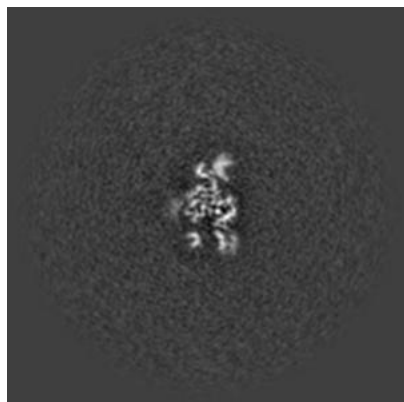


Z Index: 200

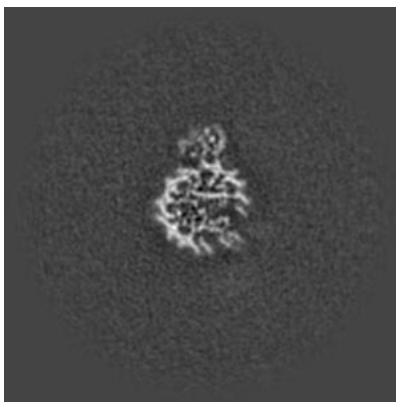
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

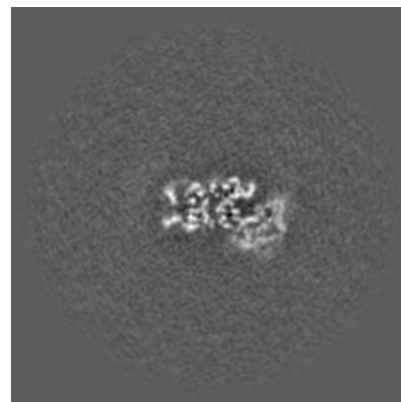
6.3.1 Primary map



X Index: 221

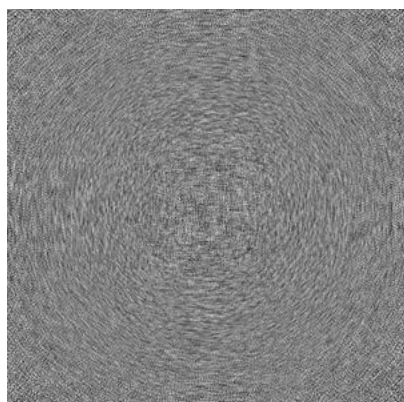


Y Index: 190

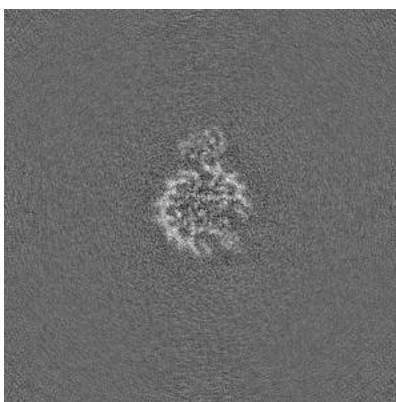


Z Index: 197

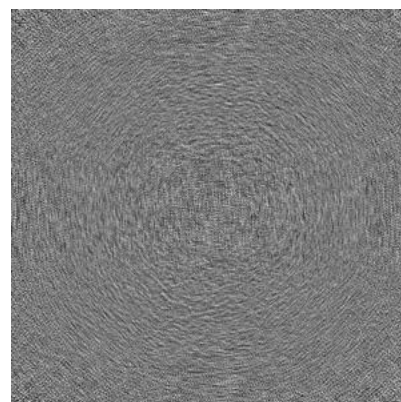
6.3.2 Raw map



X Index: 0



Y Index: 191

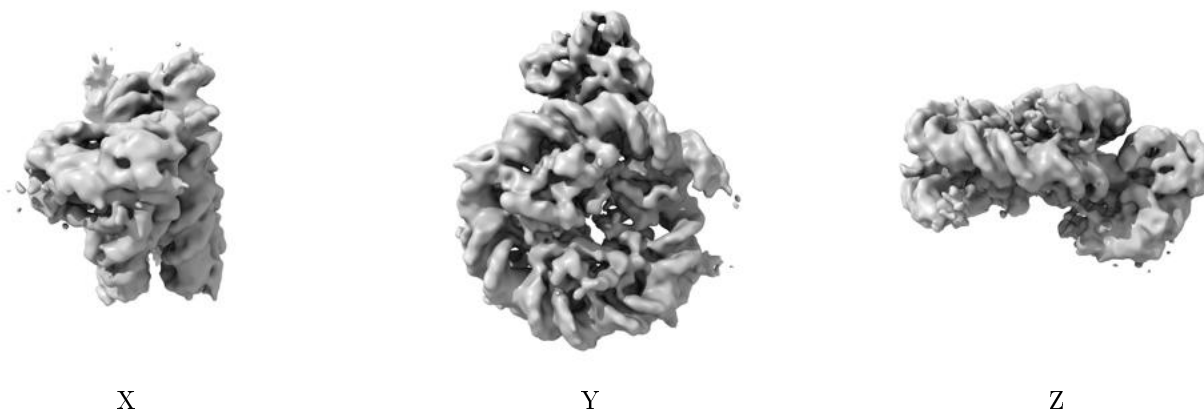


Z Index: 0

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

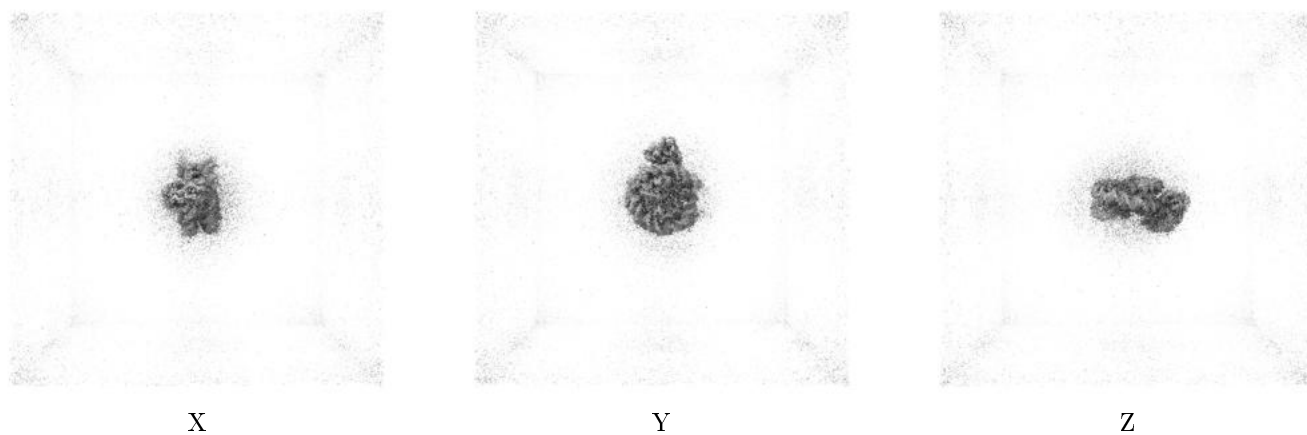
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.15. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.4.2 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.

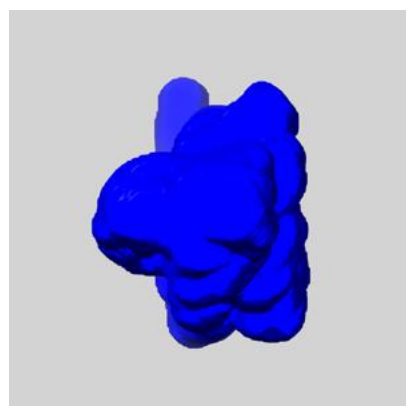
6.5 Mask visualisation [i](#)

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

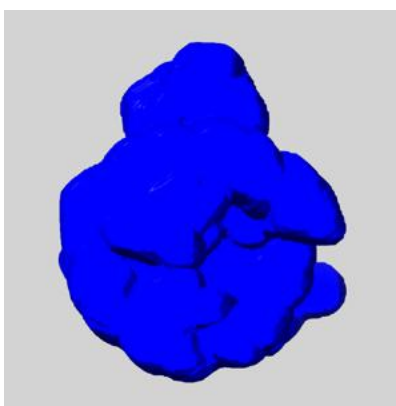
A mask typically either:

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

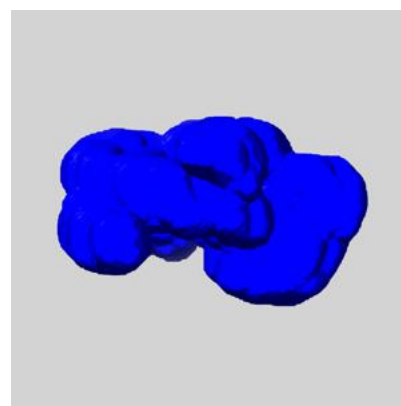
6.5.1 emd_13065_msk_1.map [i](#)



X



Y

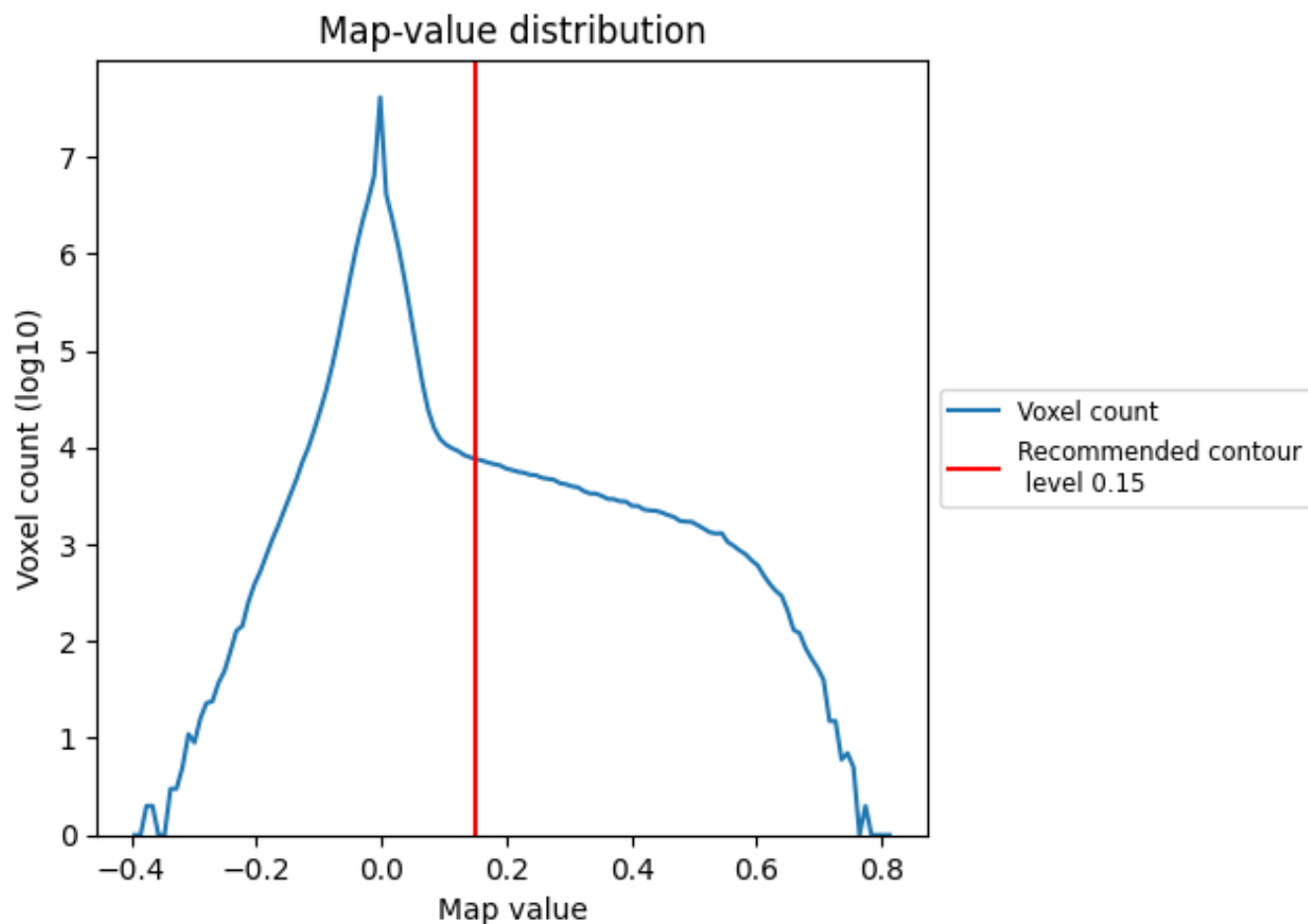


Z

7 Map analysis [i](#)

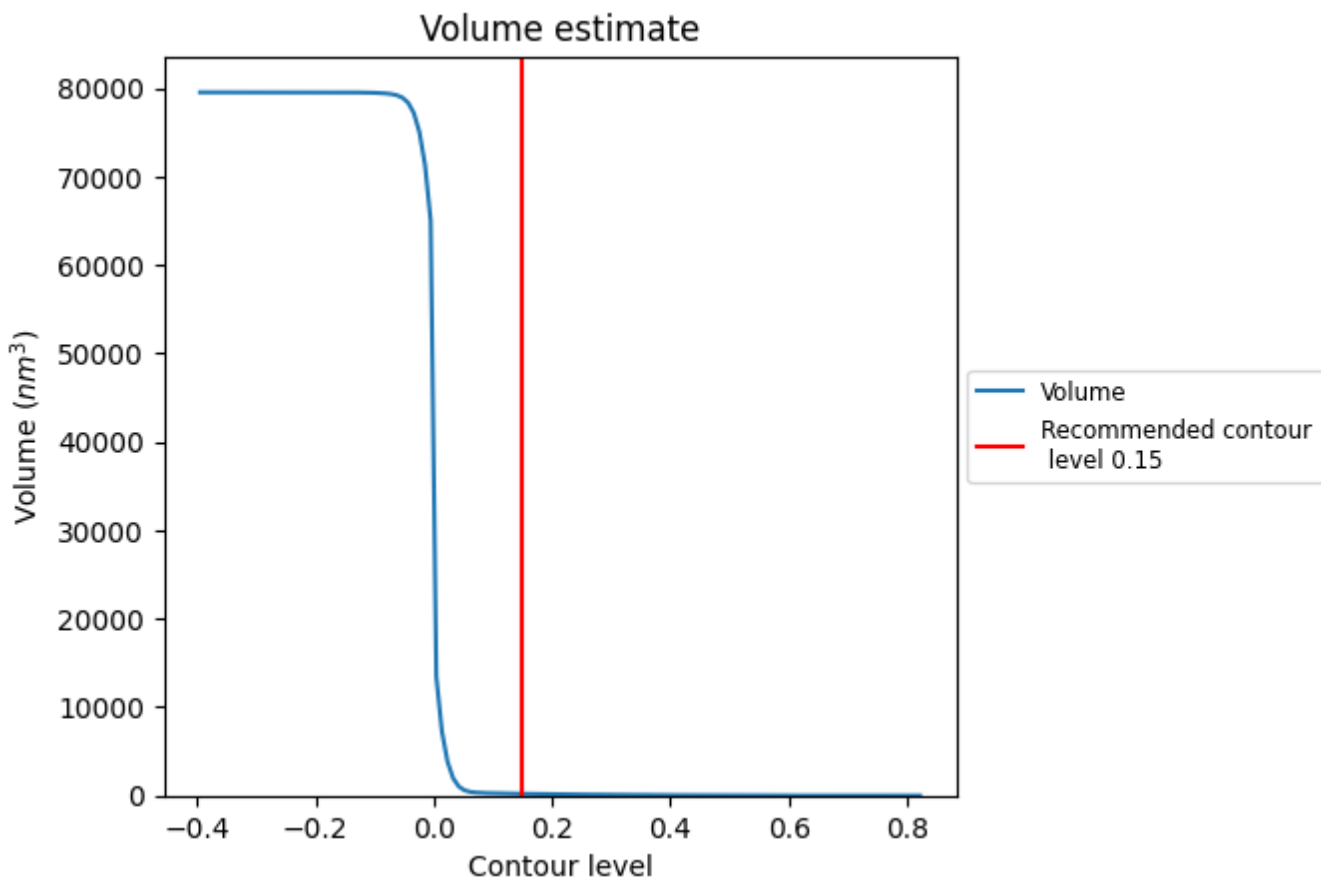
This section contains the results of statistical analysis of the map.

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.

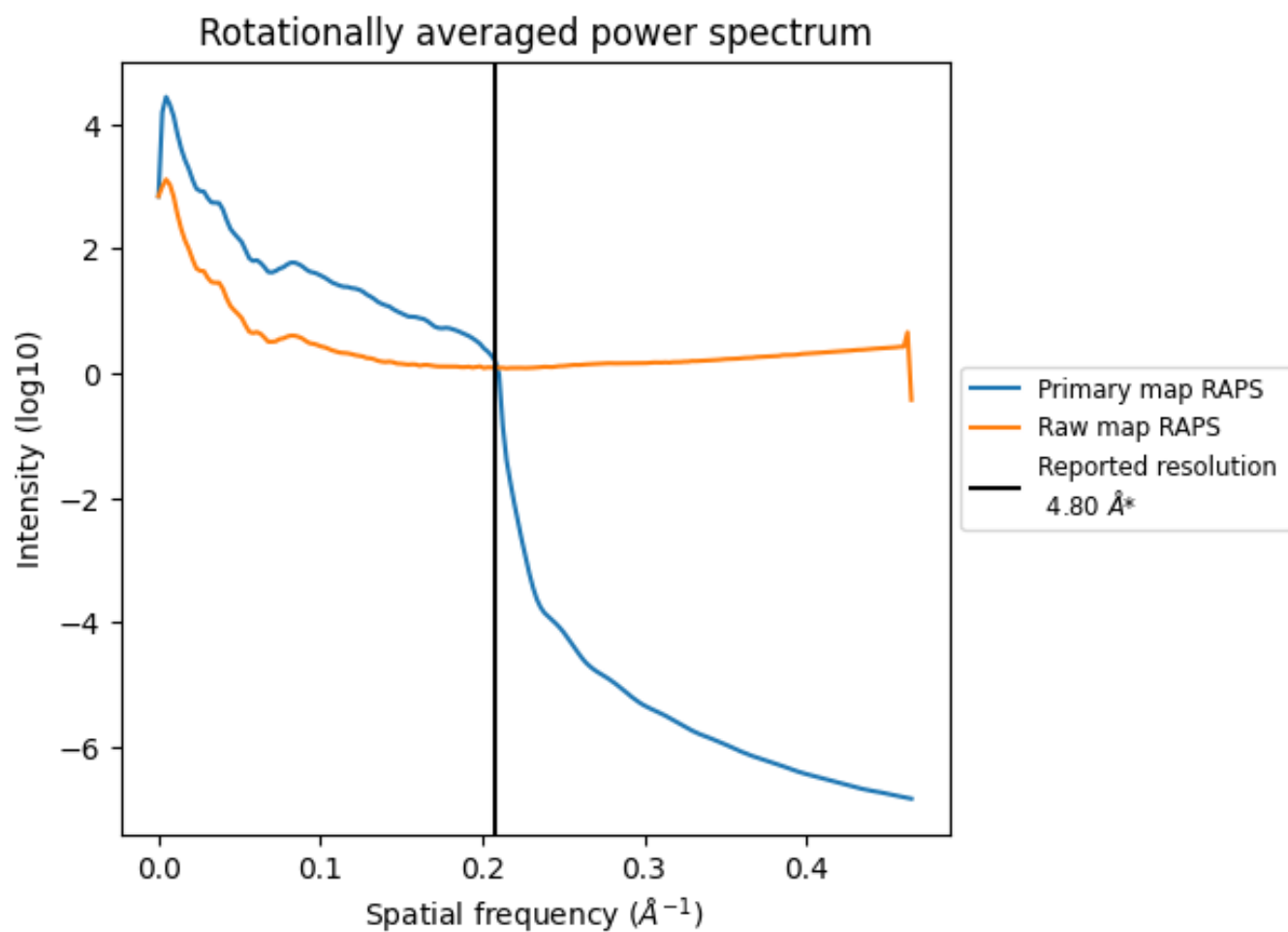
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 201 nm³; this corresponds to an approximate mass of 182 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 i

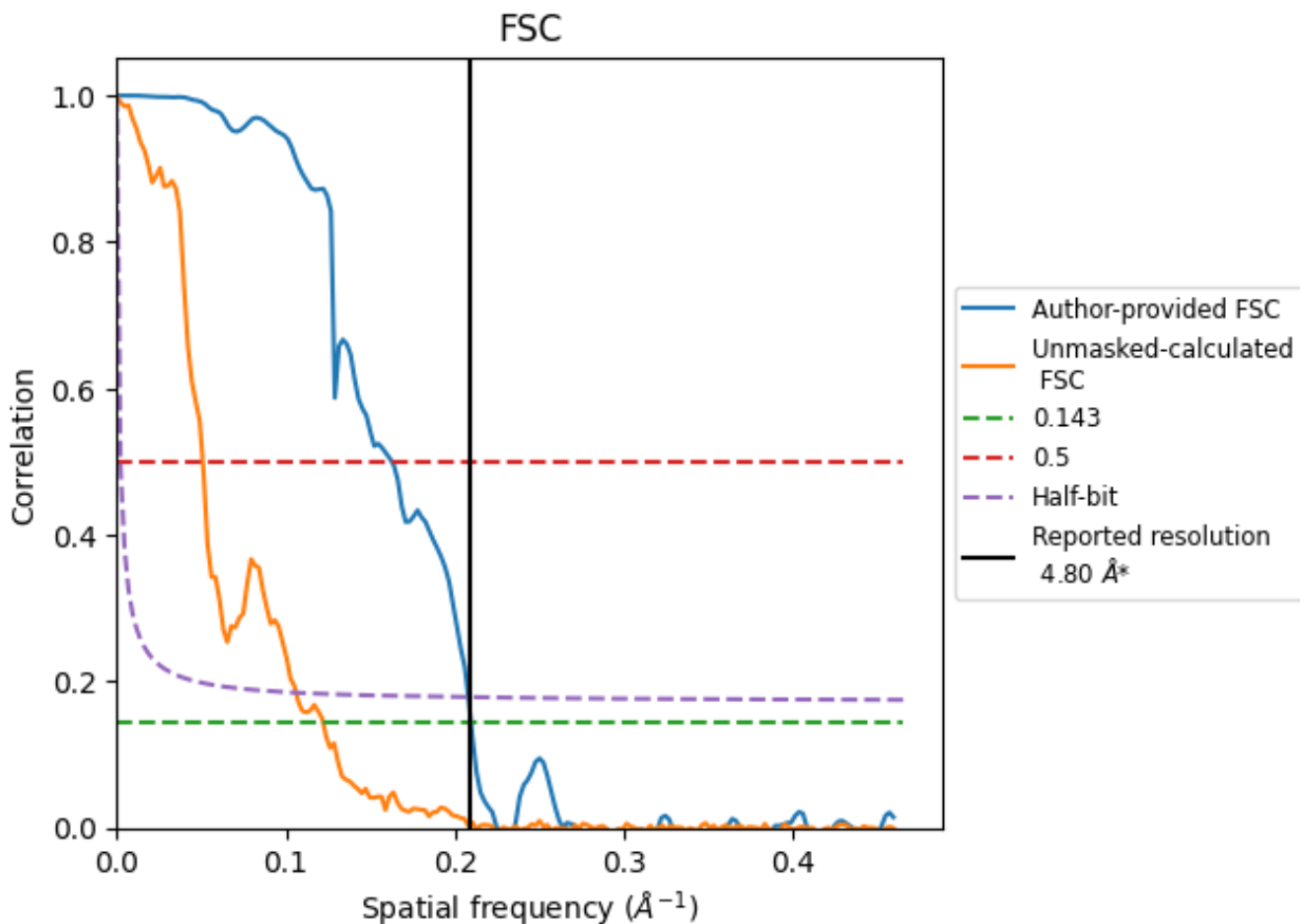


*Reported resolution corresponds to spatial frequency of 0.208 Å⁻¹

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 0.208 Å⁻¹

8.2 Resolution estimates [i](#)

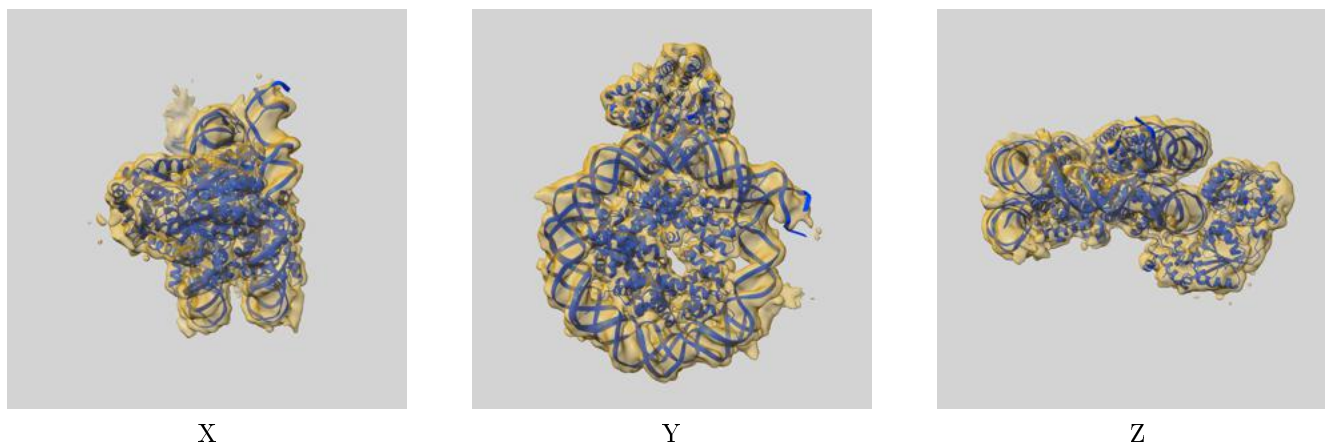
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.80	-	-
Author-provided FSC curve	4.77	6.15	4.81
Unmasked-calculated*	8.19	19.65	9.43

*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 8.19 differs from the reported value 4.8 by more than 10 %

9 Map-model fit [i](#)

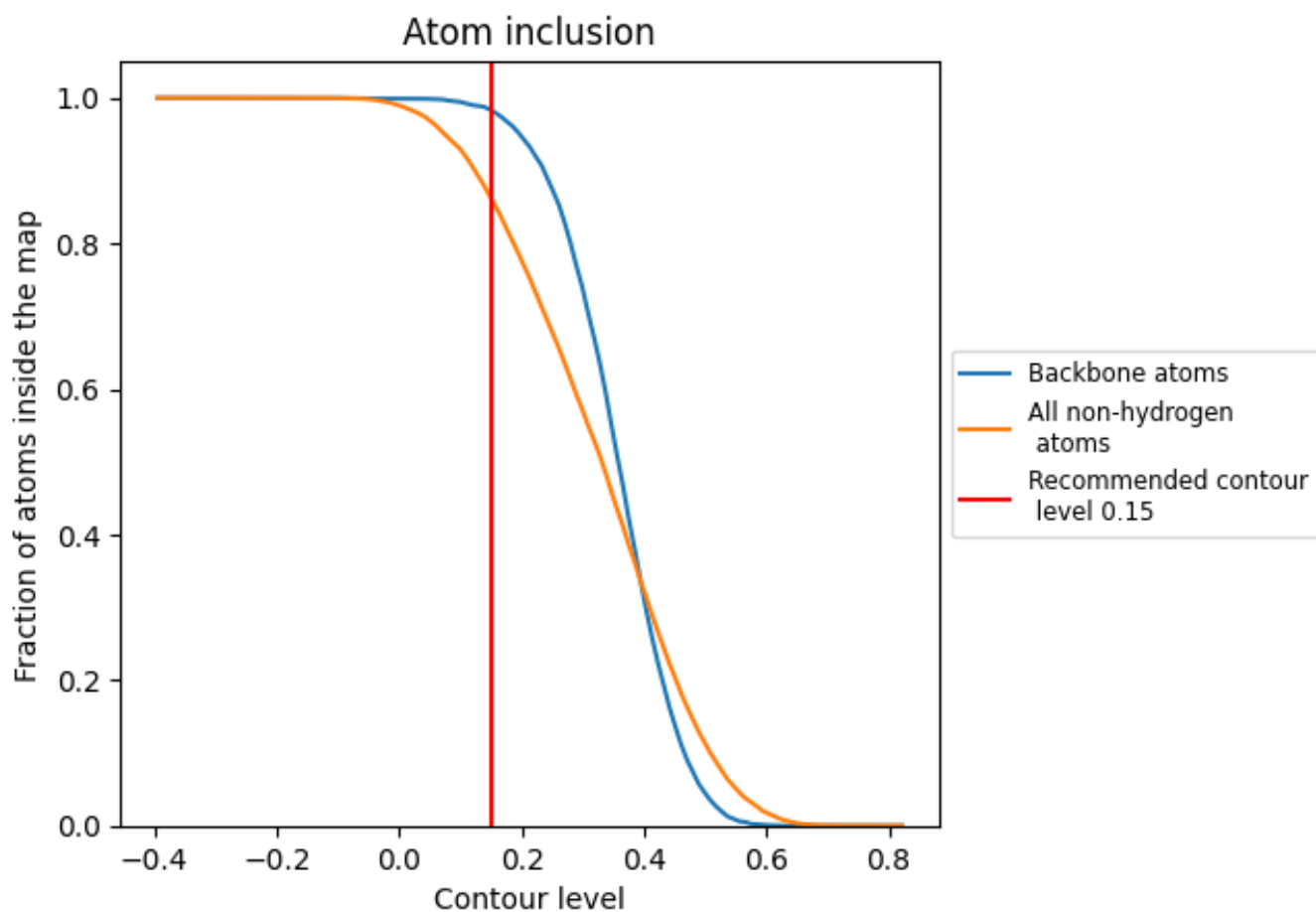
This section contains information regarding the fit between EMDB map EMD-13065 and PDB model 7OTQ. Per-residue inclusion information can be found in section [3](#) on page [7](#).

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.15 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 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 86% of all non-hydrogen atoms, are inside the map.