Full wwPDB EM Validation Report

Mar 19, 2026 – 09:04 PM UTC

PDB ID	:	7BOG / pdb_00007bog
EMDB ID	:	EMD-12242
Title	:	Bacterial 30S ribosomal subunit assembly complex state E (body domain)
Authors	:	Schedlbauer, A.; Iturrioz, I.; Ochoa-Lizarralde, B.; Diercks, T.; Lopez-Alonso, J.; Kaminishi, T.; Capuni, R.; Astigarraga, E.; Gil-Carton, D.; Fucini, P.; Connell, S.
Deposited on	:	2021-01-25
Resolution	:	2.75 Å(reported)
Based on initial model	:	4YBB

This is a Full wwPDB EM Validation 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 ①) were used in the production of this report:

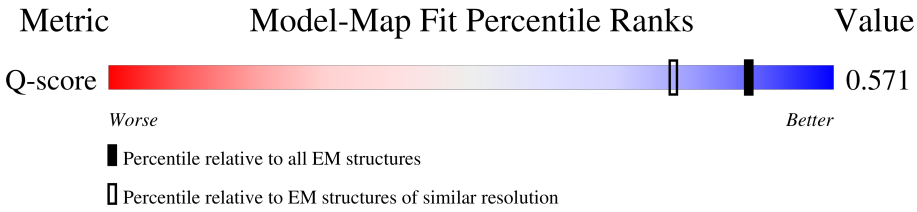
EMDB validation analysis	:	0.0.1.dev132
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	FAILED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.75 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	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Q-score	25397	10570 (2.25 - 3.25)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition (i)

There are 14 unique types of molecules in this entry. The entry contains 33589 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 RNA chain called 16S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	A	1071	23015	10266	4236	7442	1071	0	0

- Molecule 2 is a protein called 30S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	205	1643	1026	315	298	4	0	0

- Molecule 3 is a protein called 30S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	156	1152	717	217	212	6	0	0

- Molecule 4 is a protein called 30S ribosomal protein S6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	F	106	862	545	156	154	7	0	0

- Molecule 5 is a protein called 30S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	H	129	979	616	173	184	6	0	0

- Molecule 6 is a protein called 30S ribosomal protein S11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	K	117	877	540	174	160	3	0	0

- Molecule 7 is a protein called 30S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	L	123	Total	C	N	O	S	0	0
			957	591	196	165	5		

- Molecule 8 is a protein called 30S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	O	88	Total	C	N	O	S	0	0
			714	439	144	130	1		

- Molecule 9 is a protein called 30S ribosomal protein S16.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	P	82	Total	C	N	O	S	0	0
			649	406	128	114	1		

- Molecule 10 is a protein called 30S ribosomal protein S17.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	Q	80	Total	C	N	O	S	0	0
			648	411	121	113	3		

- Molecule 11 is a protein called 30S ribosomal protein S18.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	R	65	Total	C	N	O	S	0	0
			535	339	100	95	1		

- Molecule 12 is a protein called 30S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	T	86	Total	C	N	O	S	0	0
			670	414	138	115	3		

- Molecule 13 is a protein called 30S ribosome-binding factor.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	V	99	Total	C	N	O	S	0	0
			783	497	137	144	5		

- Molecule 14 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	AltConf
14	A	103	Total Mg 103 103	0
14	D	1	Total Mg 1 1	0
14	K	1	Total Mg 1 1	0

MolProbity failed to run properly - this section is therefore empty.

3 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	57144	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 ($e^-/Å^2$)	38.8	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	0.094	Depositor
Minimum map value	-0.027	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.016	Depositor
Map size (Å)	419.99997, 419.99997, 419.99997	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.05, 1.05, 1.05	Depositor

4 Model quality

4.1 Standard geometry

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4.2 Too-close contacts

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles

4.3.1 Protein backbone

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4.3.2 Protein sidechains

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains

8 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
1	G7M	A	527	1	23,26,27	0.57	0	34,39,42	1.14	3 (8%)
1	UR3	A	1498	1	19,22,23	0.98	1 (5%)	26,32,35	1.77	2 (7%)
1	MA6	A	1518	1	23,26,27	1.49	4 (17%)	33,38,41	2.46	15 (45%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
7	D2T	L	89	7	8,9,10	0.99	1 (12%)	6,11,13	1.72	1 (16%)
1	5MC	A	1407	1	19,22,23	1.60	3 (15%)	26,32,35	1.12	3 (11%)
1	MA6	A	1519	1	23,26,27	1.51	4 (17%)	33,38,41	2.45	15 (45%)
1	2MG	A	1516	1	23,26,27	1.24	3 (13%)	33,38,41	2.20	9 (27%)
1	PSU	A	516	1,14	18,21,22	1.41	4 (22%)	21,30,33	2.05	5 (23%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	G7M	A	527	1	-	3/7/25/26	0/3/3/3
1	UR3	A	1498	1	-	0/7/25/26	0/2/2/2
1	MA6	A	1518	1	-	1/11/29/30	0/3/3/3
7	D2T	L	89	7	-	2/7/12/14	-
1	5MC	A	1407	1	-	0/7/25/26	0/2/2/2
1	MA6	A	1519	1	-	4/11/29/30	0/3/3/3
1	2MG	A	1516	1	-	0/9/27/28	0/3/3/3
1	PSU	A	516	1,14	-	0/7/25/26	0/2/2/2

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1407	5MC	C5-C4	5.75	1.48	1.44
1	A	1519	MA6	C5-C4	4.64	1.47	1.39
1	A	1518	MA6	C5-C4	4.58	1.47	1.39
1	A	1516	2MG	C5-C4	2.93	1.46	1.38
1	A	516	PSU	C4-N3	-2.91	1.33	1.38
1	A	1519	MA6	C5-C6	2.87	1.48	1.41
1	A	1518	MA6	C5-C6	2.86	1.48	1.41
1	A	516	PSU	C6-C5	2.85	1.38	1.35
1	A	1407	5MC	C6-C5	2.83	1.39	1.34
7	L	89	D2T	O-C	2.70	1.30	1.20
1	A	1516	2MG	C6-N1	-2.49	1.34	1.38
1	A	1519	MA6	C8-N7	2.44	1.36	1.31
1	A	1518	MA6	C8-N7	2.37	1.36	1.31
1	A	1519	MA6	C5-N7	-2.21	1.35	1.39
1	A	1516	2MG	C5-N7	-2.18	1.34	1.39
1	A	1407	5MC	C6-N1	-2.16	1.34	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	516	PSU	C2-N3	-2.16	1.33	1.37
1	A	1518	MA6	C5-N7	-2.15	1.35	1.39
1	A	1498	UR3	C2-N1	2.07	1.41	1.38
1	A	516	PSU	C2-N1	-2.01	1.34	1.36

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1498	UR3	C4-N3-C2	-7.08	118.88	124.58
1	A	1516	2MG	C2-N3-C4	6.92	120.65	112.00
1	A	516	PSU	N1-C2-N3	6.40	121.92	115.17
1	A	1516	2MG	C5-C4-N3	-5.89	119.02	128.39
1	A	1519	MA6	C5-C4-N3	-5.72	118.84	126.72
1	A	1518	MA6	C5-C4-N3	-5.67	118.91	126.72
1	A	1518	MA6	C10-N6-C6	-4.58	108.86	120.52
1	A	1519	MA6	C9-N6-C6	-4.55	108.95	120.52
1	A	1518	MA6	N3-C4-N9	4.42	134.69	127.17
1	A	1516	2MG	N9-C4-N3	4.34	134.63	125.95
1	A	1519	MA6	C10-N6-C6	-4.28	109.63	120.52
1	A	1519	MA6	N3-C4-N9	4.28	134.44	127.17
1	A	1518	MA6	C9-N6-C6	-4.23	109.75	120.52
1	A	1518	MA6	C2-N1-C6	4.12	121.89	111.83
1	A	1519	MA6	C2-N1-C6	4.12	121.89	111.83
1	A	516	PSU	C4-N3-C2	-4.10	120.72	126.37
1	A	1519	MA6	C4-C5-N7	-3.93	106.09	110.58
1	A	1518	MA6	C2-N3-C4	3.76	121.02	111.83
1	A	1519	MA6	C2-N3-C4	3.72	120.92	111.83
1	A	1518	MA6	C4-C5-N7	-3.69	106.36	110.58
1	A	516	PSU	O2-C2-N1	-3.65	119.02	122.79
1	A	1518	MA6	N1-C2-N3	-3.41	123.41	128.58
1	A	1498	UR3	C5-C4-N3	3.36	119.47	115.04
1	A	1519	MA6	N1-C2-N3	-3.30	123.58	128.58
1	A	1516	2MG	C6-C5-N7	3.23	136.18	130.29
1	A	1407	5MC	C5-C6-N1	-3.16	119.88	123.31
1	A	527	G7M	C8-N7-C5	-3.16	103.83	107.78
1	A	1518	MA6	N1-C6-N6	3.12	120.66	116.86
7	L	89	D2T	O-C-CA	-3.02	117.02	124.77
1	A	1519	MA6	N1-C6-N6	2.92	120.42	116.86
1	A	1518	MA6	C4-N9-C8	2.89	108.77	105.74
1	A	527	G7M	C2'-C3'-C4'	-2.89	97.03	102.61
1	A	1519	MA6	C5-N7-C8	2.77	107.81	103.45
1	A	1518	MA6	C5-N7-C8	2.72	107.72	103.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1516	2MG	N1-C2-N2	2.71	119.32	116.56
1	A	1519	MA6	C4-N9-C8	2.69	108.56	105.74
1	A	1407	5MC	C5-C4-N3	-2.68	119.01	121.75
1	A	1519	MA6	C10-N6-C9	-2.58	107.90	116.18
1	A	1516	2MG	C4-C5-N7	-2.53	106.66	110.67
1	A	1518	MA6	C5-C6-N6	-2.38	121.56	125.33
1	A	1516	2MG	CM2-N2-C2	-2.31	118.69	123.65
1	A	1516	2MG	O6-C6-C5	-2.28	120.51	126.53
1	A	1516	2MG	N2-C2-N3	-2.26	117.62	120.51
1	A	1518	MA6	N9-C8-N7	-2.25	110.74	113.94
1	A	1518	MA6	C10-N6-C9	-2.23	109.01	116.18
1	A	1519	MA6	N9-C8-N7	-2.19	110.82	113.94
1	A	1407	5MC	O2-C2-N3	-2.15	118.94	122.33
1	A	1519	MA6	C5-C6-N6	-2.10	122.01	125.33
1	A	527	G7M	O4'-C4'-C3'	-2.10	100.99	105.15
1	A	516	PSU	O4'-C1'-C2'	2.07	108.02	105.15
1	A	1519	MA6	C6-C5-N7	2.06	136.72	133.43
1	A	516	PSU	C5-C6-N1	-2.05	119.29	122.14
1	A	1518	MA6	C6-C5-N7	2.01	136.64	133.43

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	1519	MA6	C5-C6-N6-C9
1	A	1519	MA6	C5-C6-N6-C10
1	A	1519	MA6	N1-C6-N6-C10
1	A	527	G7M	O4'-C4'-C5'-O5'
1	A	527	G7M	C3'-C4'-C5'-O5'
1	A	1519	MA6	N1-C6-N6-C9
1	A	1518	MA6	C5-C6-N6-C9
7	L	89	D2T	CG-CB-SB-CB1
1	A	527	G7M	C4'-C5'-O5'-P
7	L	89	D2T	CA-CB-SB-CB1

There are no ring outliers.

No monomer is involved in short contacts.

4.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

4.6 Ligand geometry (i)

Of 105 ligands modelled in this entry, 105 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.

4.7 Other polymers (i)

There are no such residues in this entry.

4.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

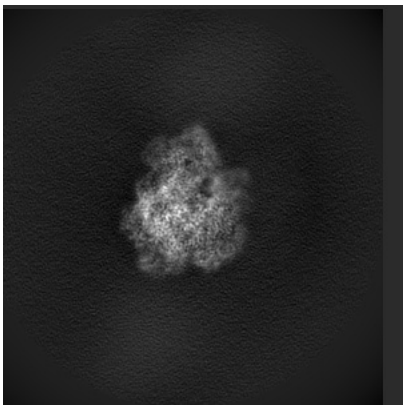
5 Map visualisation

This section contains visualisations of the EMDB entry EMD-12242. These allow visual inspection of the internal detail of the map and identification of artifacts.

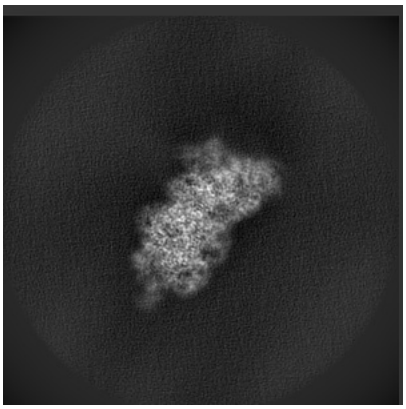
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

5.1 Orthogonal projections

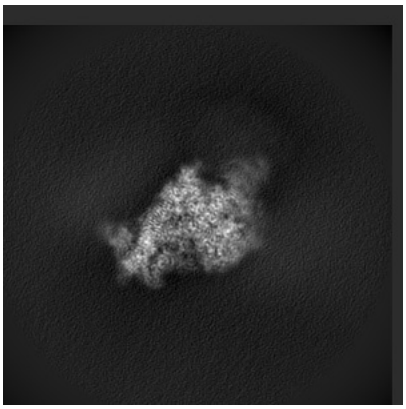
5.1.1 Primary map



X

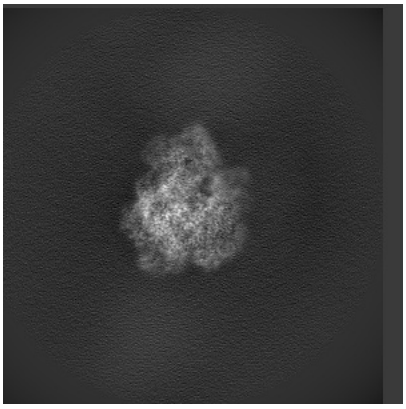


Y

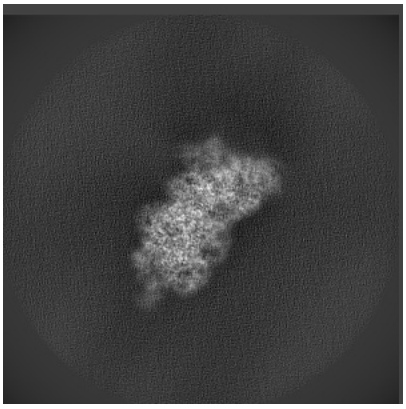


Z

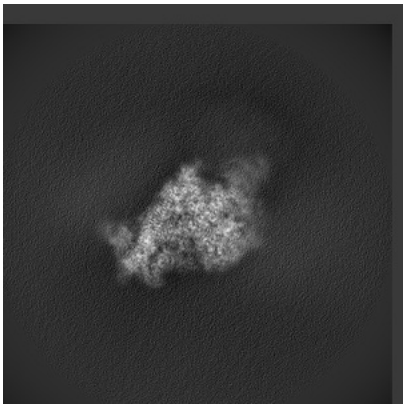
5.1.2 Raw map



X



Y

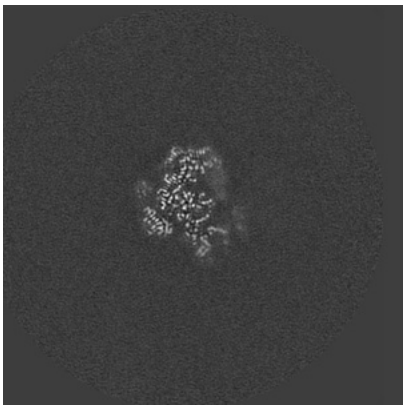


Z

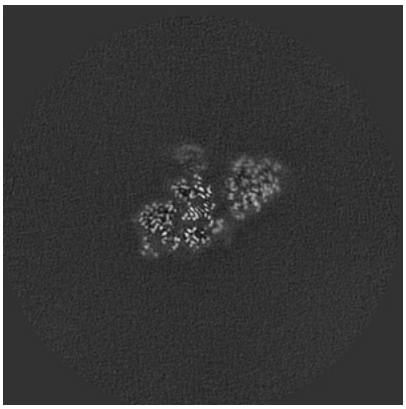
The images above show the map projected in three orthogonal directions.

5.2 Central slices (i)

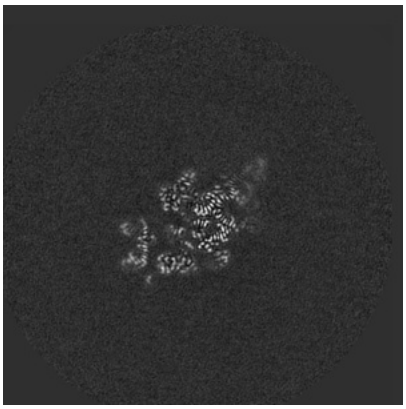
5.2.1 Primary map



X Index: 200

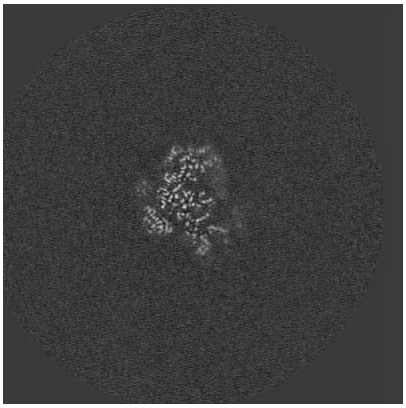


Y Index: 200

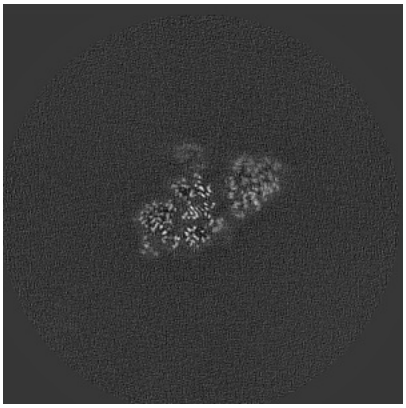


Z Index: 200

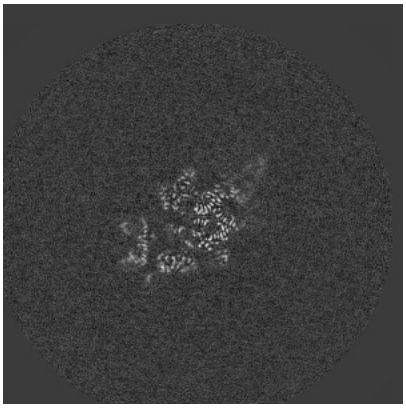
5.2.2 Raw map



X Index: 200



Y Index: 200

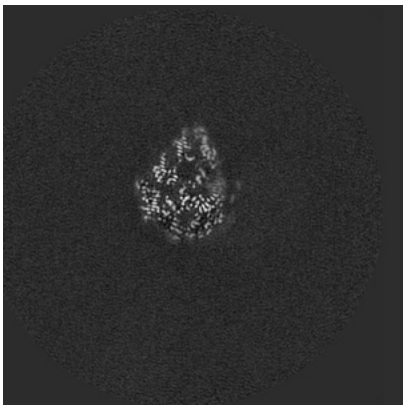


Z Index: 200

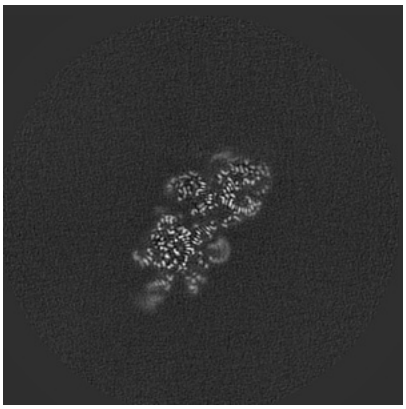
The images above show central slices of the map in three orthogonal directions.

5.3 Largest variance slices (i)

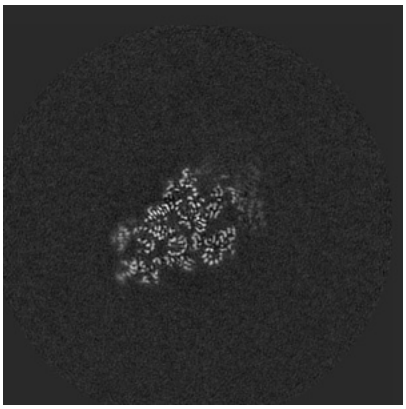
5.3.1 Primary map



X Index: 215

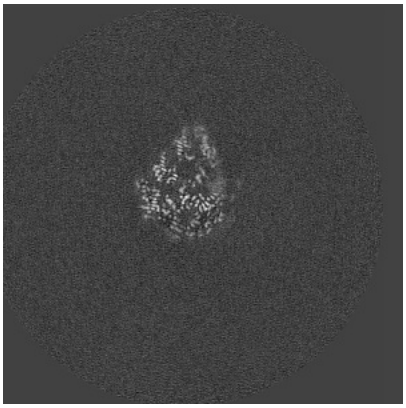


Y Index: 170



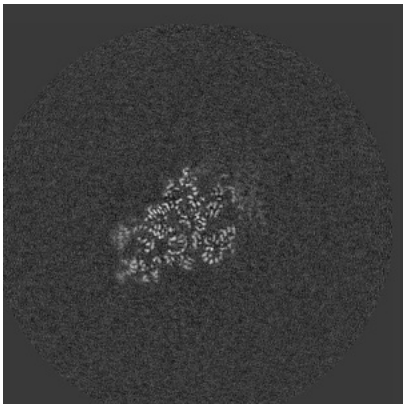
Z Index: 189

5.3.2 Raw map



X Index: 215

Y Index: 172

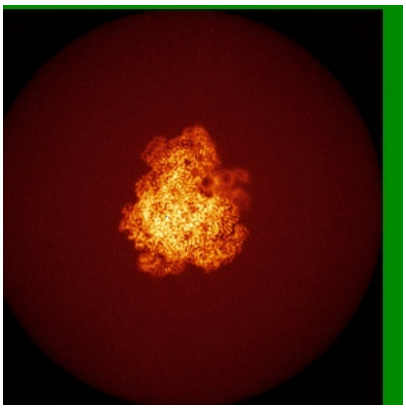


Z Index: 189

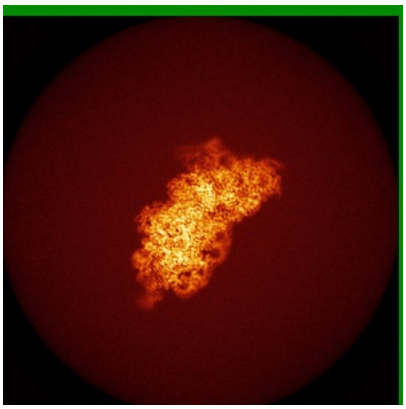
The images above show the largest variance slices of the map in three orthogonal directions.

5.4 Orthogonal standard-deviation projections (False-color) (i)

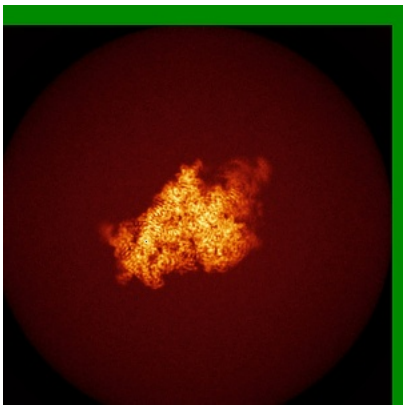
5.4.1 Primary map



X

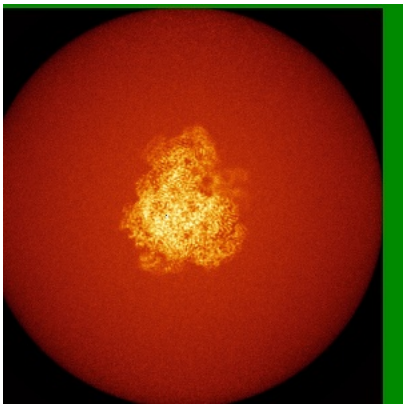


Y

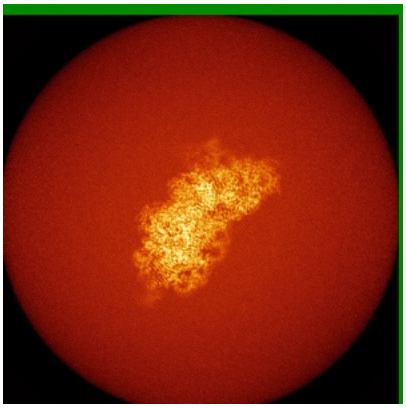


Z

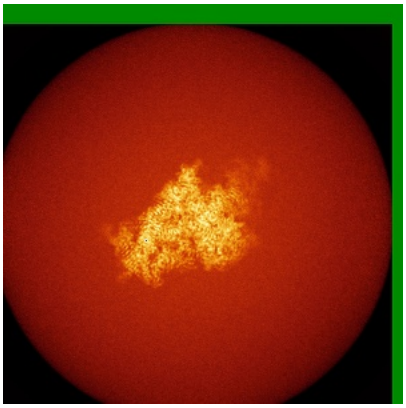
5.4.2 Raw map



X



Y

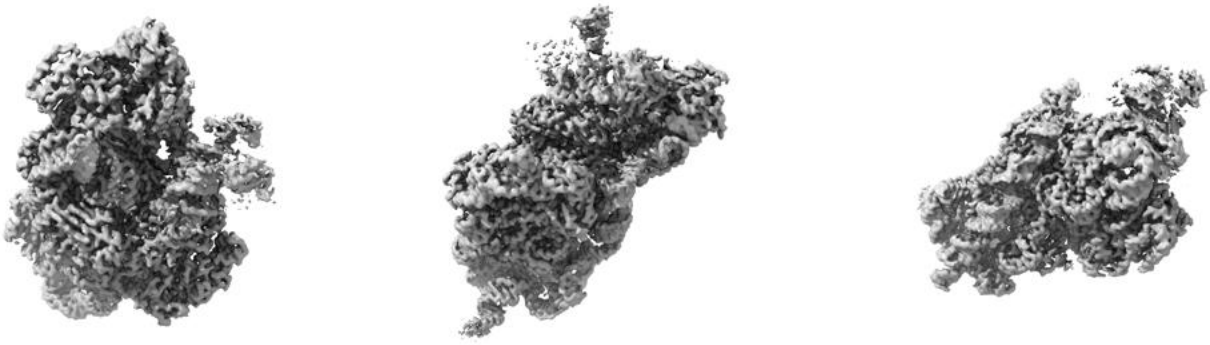


Z

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.

5.5 Orthogonal surface views (i)

5.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.016. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

5.5.2 Raw map

X Y Z

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.

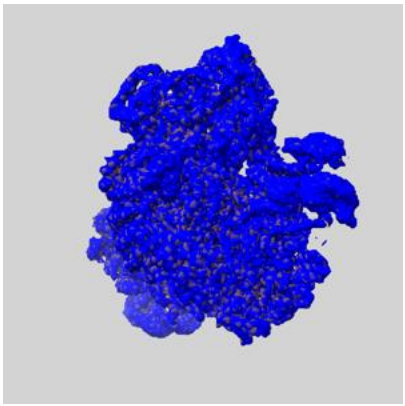
5.6 Mask visualisation

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

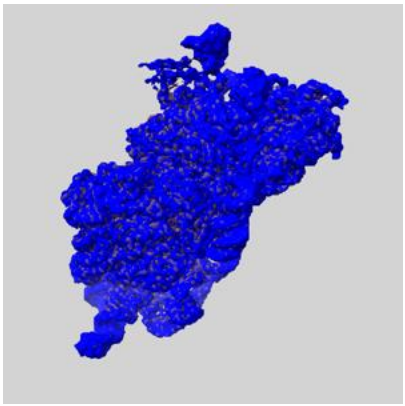
A mask typically either:

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

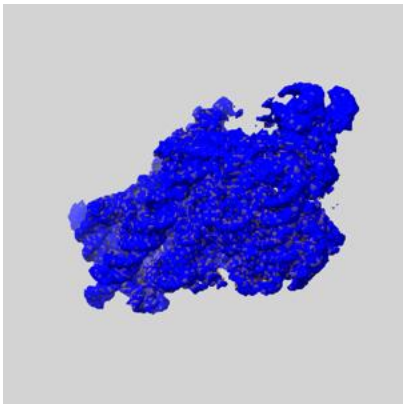
5.6.1 emd_12242_msk_1.map



X



Y

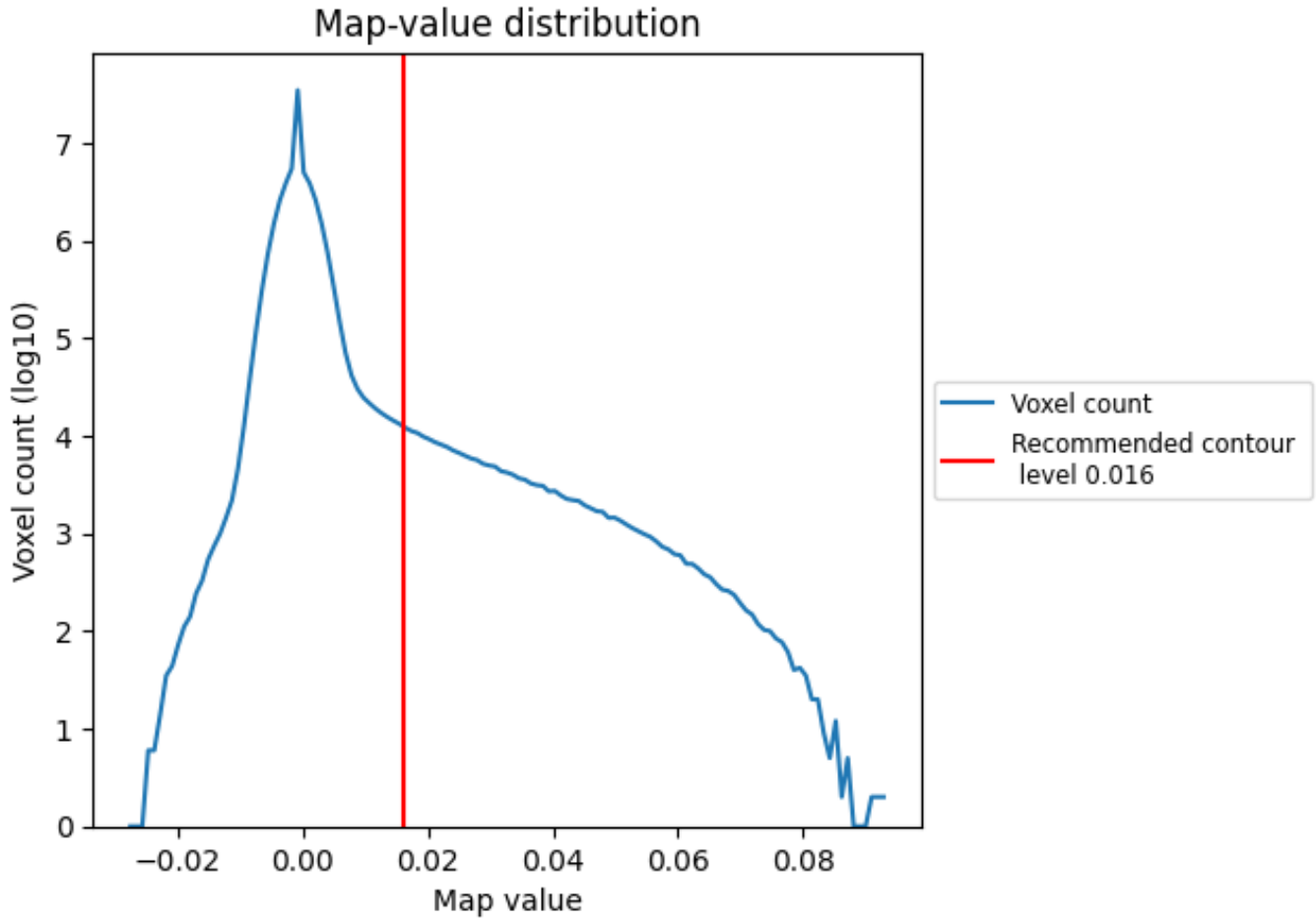


Z

6 Map analysis

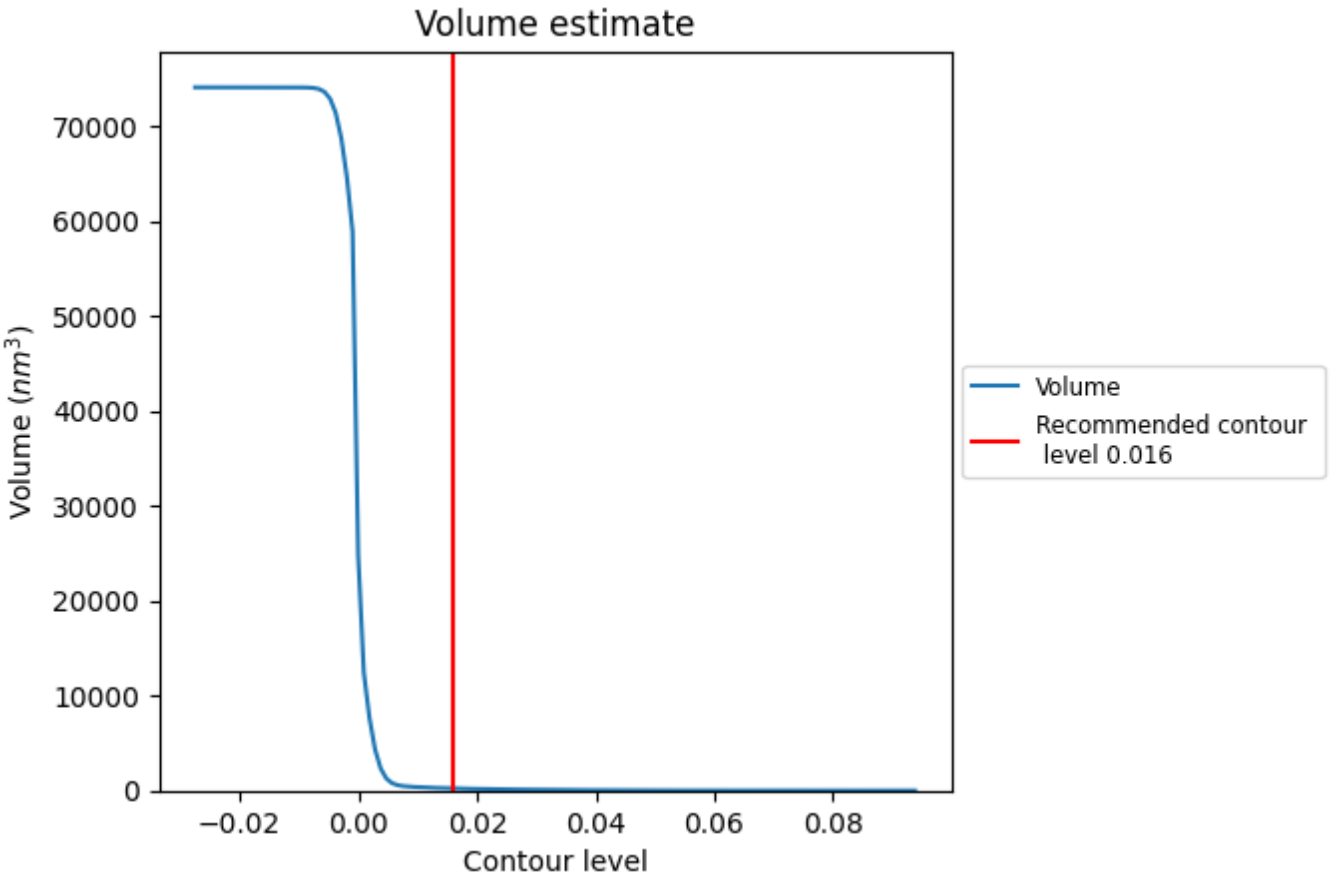
This section contains the results of statistical analysis of the map.

6.1 Map-value distribution



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.

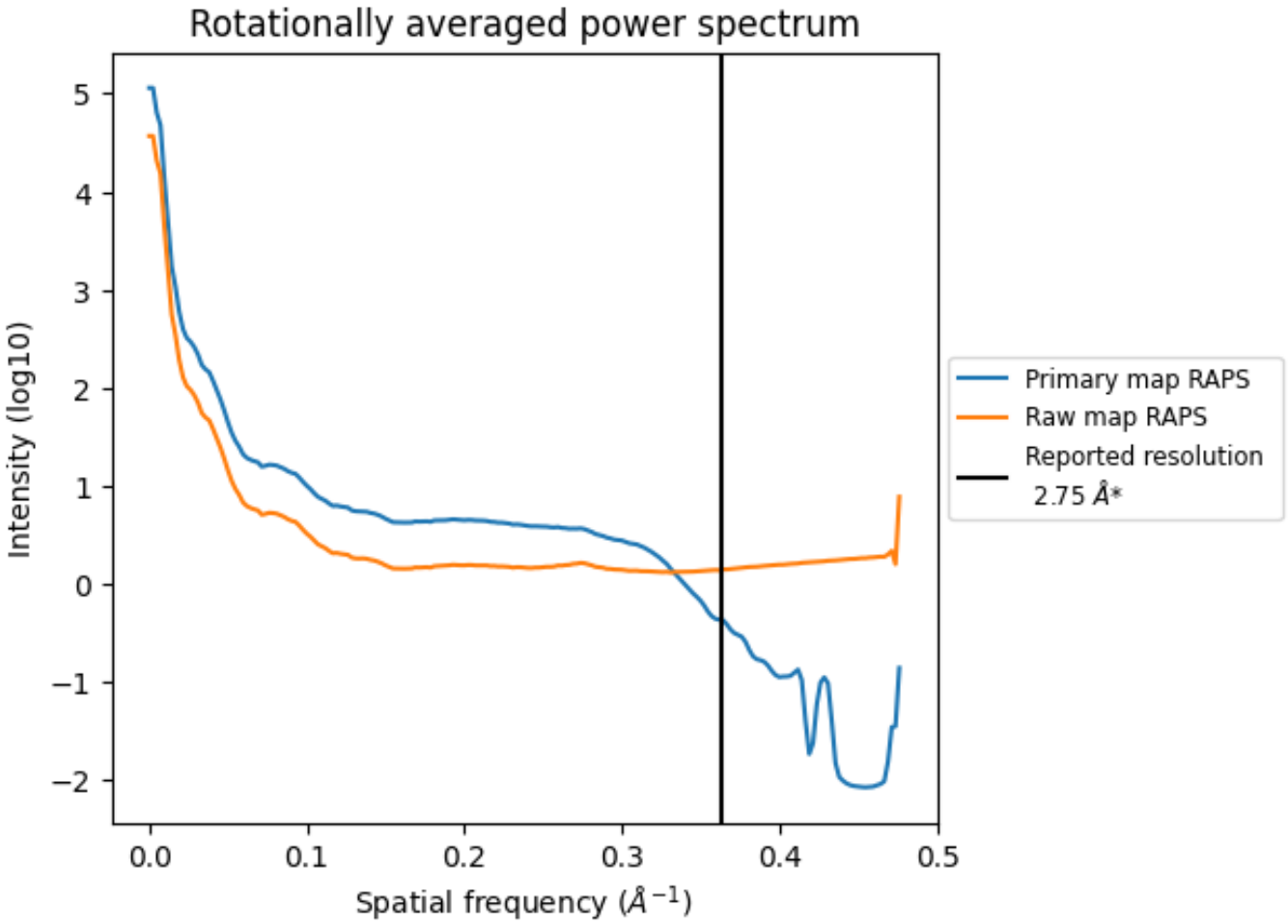
6.2 Volume estimate



The volume at the recommended contour level is 230 nm^3; this corresponds to an approximate mass of 207 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.

6.3 Rotationally averaged power spectrum (i)

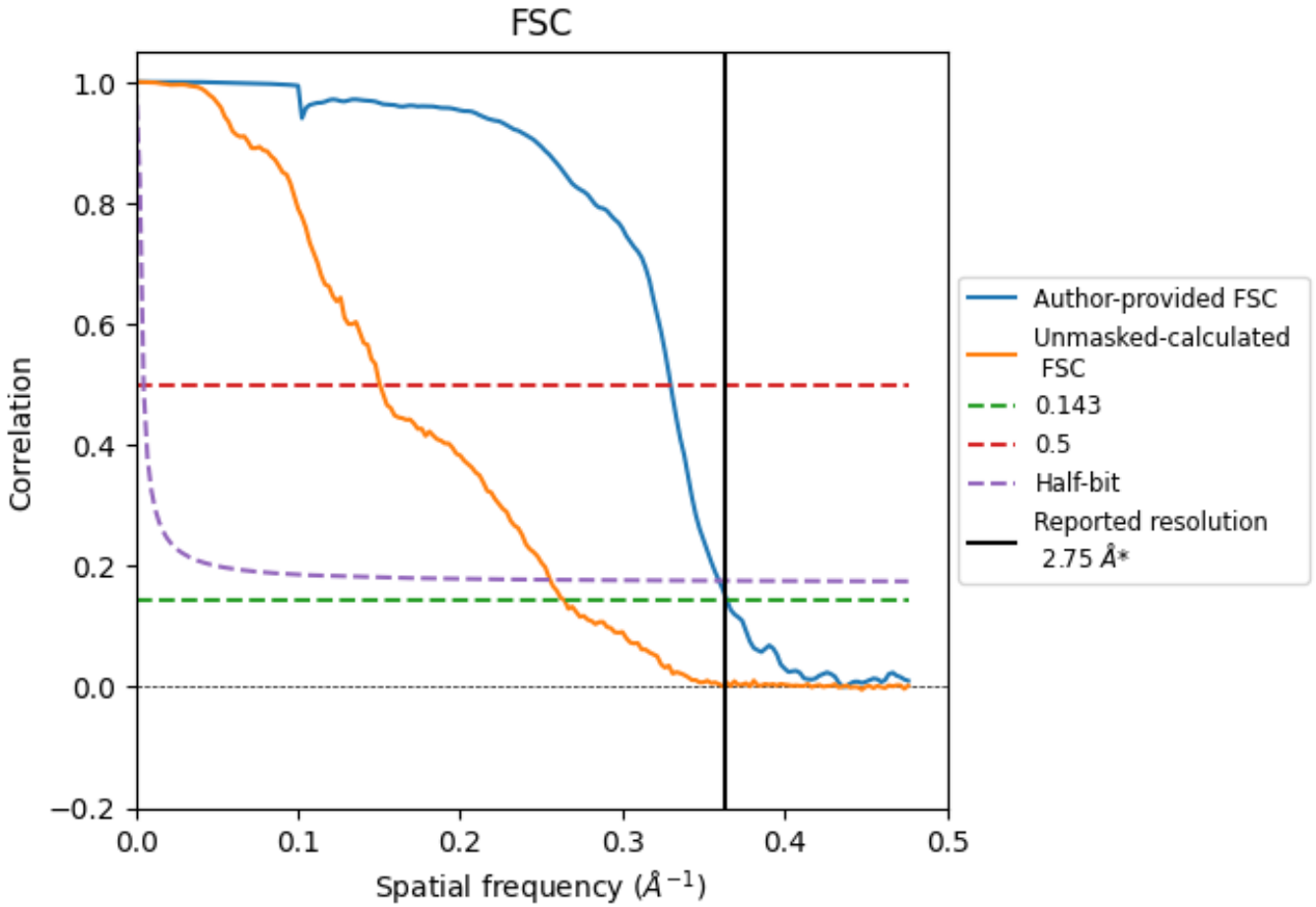


*Reported resolution corresponds to spatial frequency of 0.364 Å^{-1}

7 Fourier-Shell correlation

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.

7.1 FSC



*Reported resolution corresponds to spatial frequency of 0.364 Å^{-1}

7.2 Resolution estimates (i)

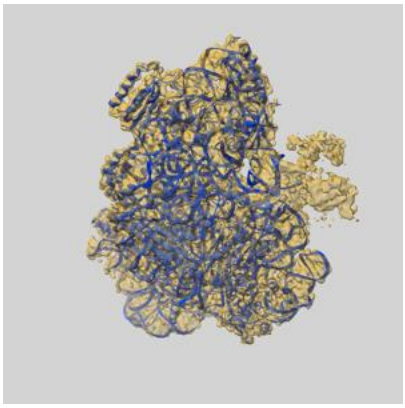
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.75	-	-
Author-provided FSC curve	2.74	3.03	2.78
Unmasked-calculated*	3.78	6.65	3.92

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.78 differs from the reported value 2.75 by more than 10 %

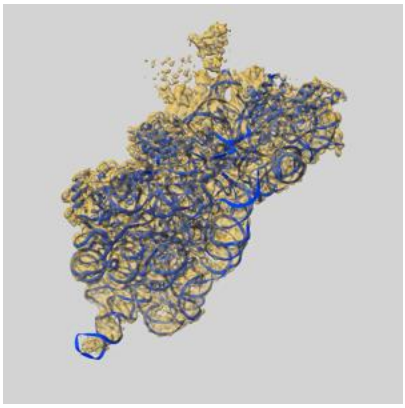
8 Map-model fit

This section contains information regarding the fit between EMDB map EMD-12242 and PDB model 7BOG. Per-residue inclusion information can be found in section ?? on page ??.

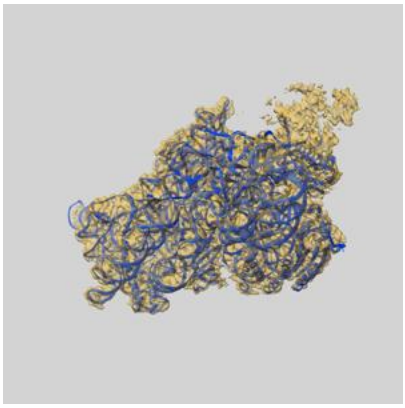
8.1 Map-model overlay



X



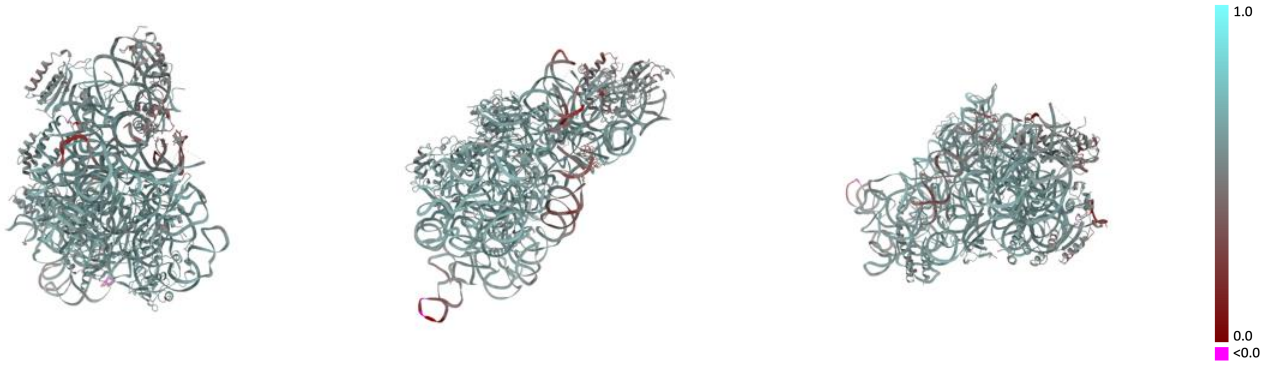
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.016 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.

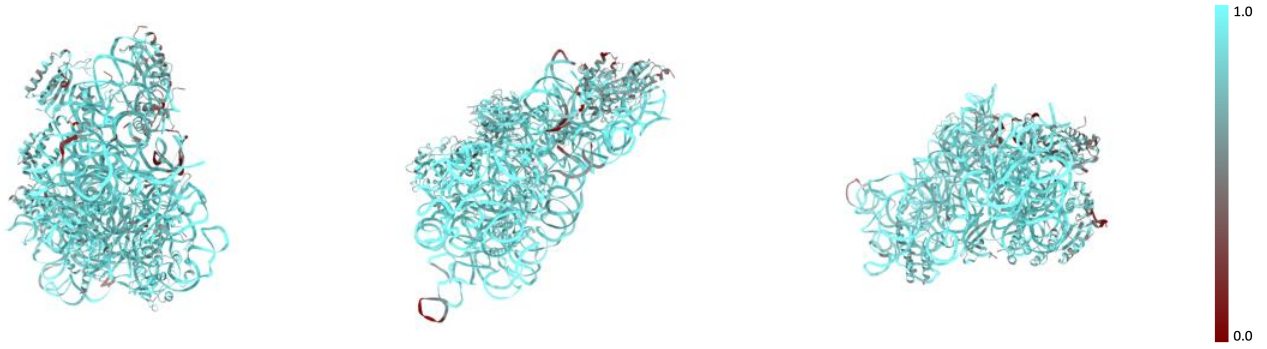
8.2 Q-score mapped to coordinate model



X Y Z

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.

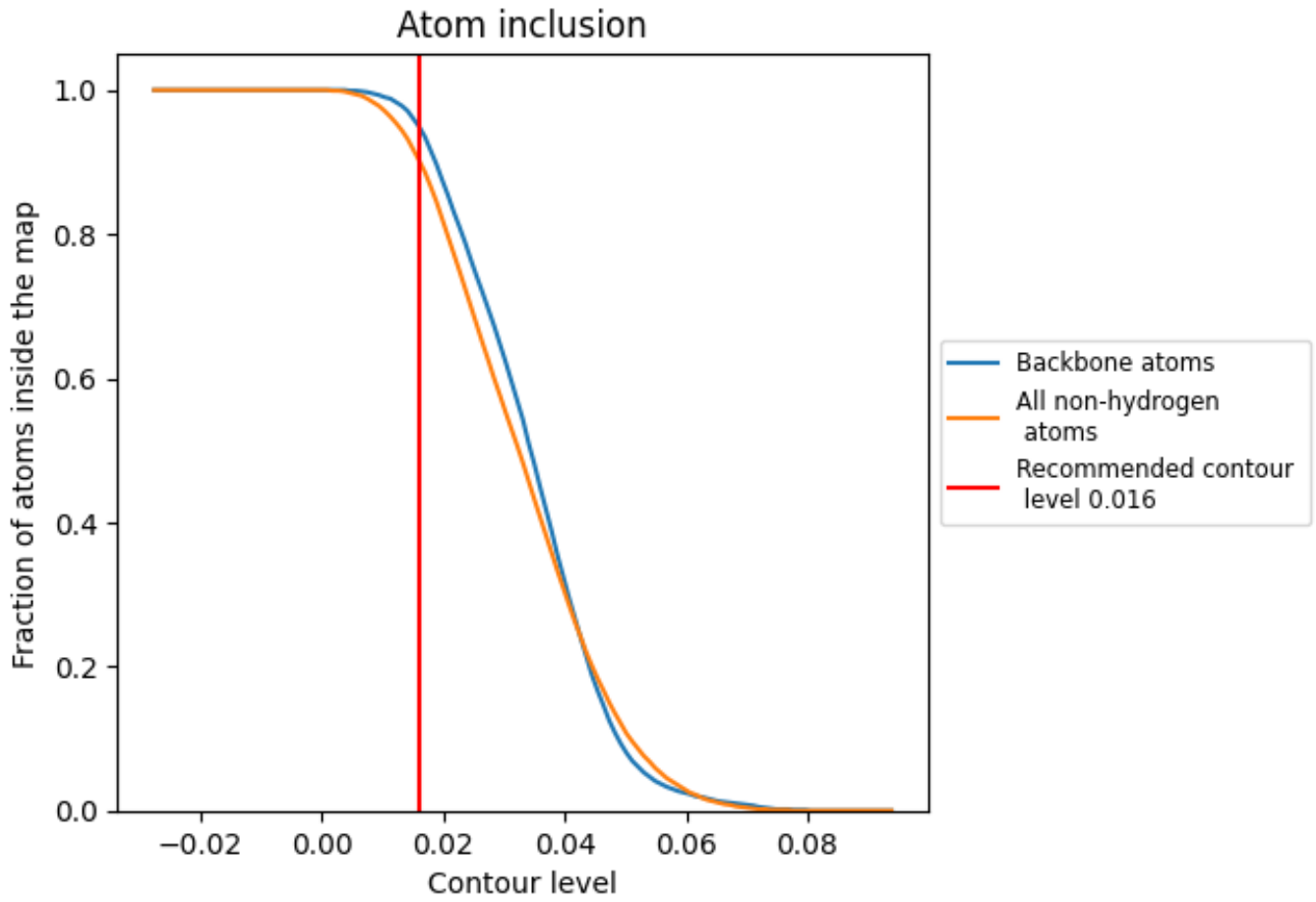
8.3 Atom inclusion mapped to coordinate model



X Y Z

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 (0.016).

8.4 Atom inclusion (i)



At the recommended contour level, 95% of all backbone atoms, 90% of all non-hydrogen atoms, are inside the map.

8.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.016) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9040	0.5710
A	0.9440	0.5770
D	0.8550	0.5840
E	0.8380	0.5760
F	0.7120	0.5120
H	0.8740	0.5980
K	0.6930	0.5010
L	0.8600	0.5910
O	0.8360	0.5570
P	0.8900	0.5970
Q	0.8470	0.5910
R	0.7700	0.5240
T	0.8660	0.5680
V	0.6480	0.4610