wwPDB EM Validation Summary Report (i)

Oct 18, 2026 – 04:13 pm BST

PDB ID	:	29UI / pdb_000029ui
EMDB ID	:	EMD-57387
Title	:	FAM72A-UNG2 bound to the discoidin domain of substrate receptor MKLN1
Authors	:	Sepic, S.; Du, J.; Prabu, J.R.; Schulman, B.A.
Deposited on	:	2026-04-08
Resolution	:	3.00 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 (i) 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:

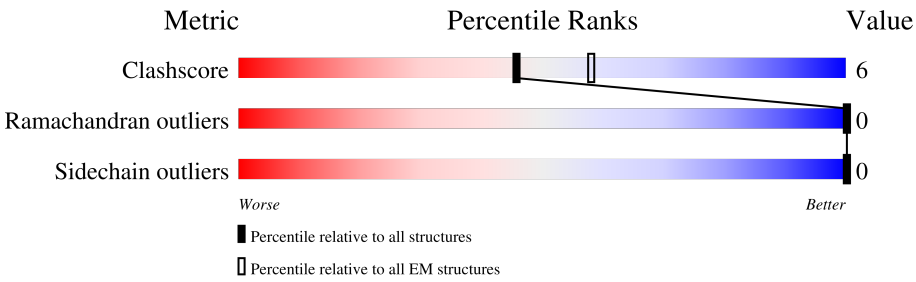
EMDB validation analysis	:	0.0.1.dev133
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.2
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

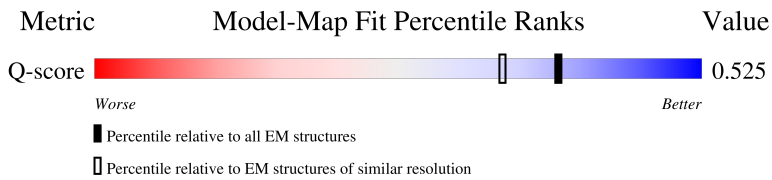
1 Overall quality at a glance (i)

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

The reported resolution of this entry is 3.00 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	14081 (2.50 - 3.50)

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 <=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	149	77% 7% 16%
1	B	149	70% 15% 15%
2	C	314	98%
2	D	314	98%

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Mol	Chain	Length	Quality of chain
3	E	733	33% 6% 61%
3	F	733	32% 7% 61%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6708 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 FAM72A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	B	127	961	613	159	175	14	0	0
1	A	125	955	610	158	173	14	0	0

- Molecule 2 is a protein called Uracil-DNA glycosylase.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	6	37	23	6	7	1	0	0
2	C	6	37	23	6	7	1	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	0	ACE	-	acetylation	UNP P13051
C	0	ACE	-	acetylation	UNP P13051

- Molecule 3 is a protein called Muskelin.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	F	286	2365	1525	395	433	12	0	0
3	E	286	2349	1517	393	427	12	0	0

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
4	B	2	2	2	0

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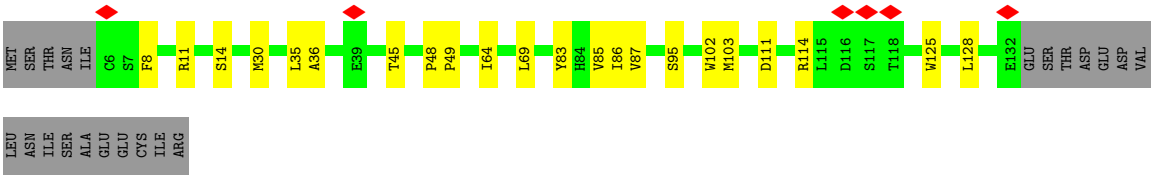
Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
4	A	2	2	2	0

3 Residue-property plots (i)

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.

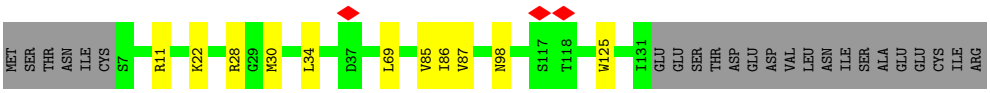
• Molecule 1: Protein FAM72A

Chain B:



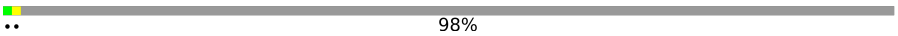
• Molecule 1: Protein FAM72A

Chain A:



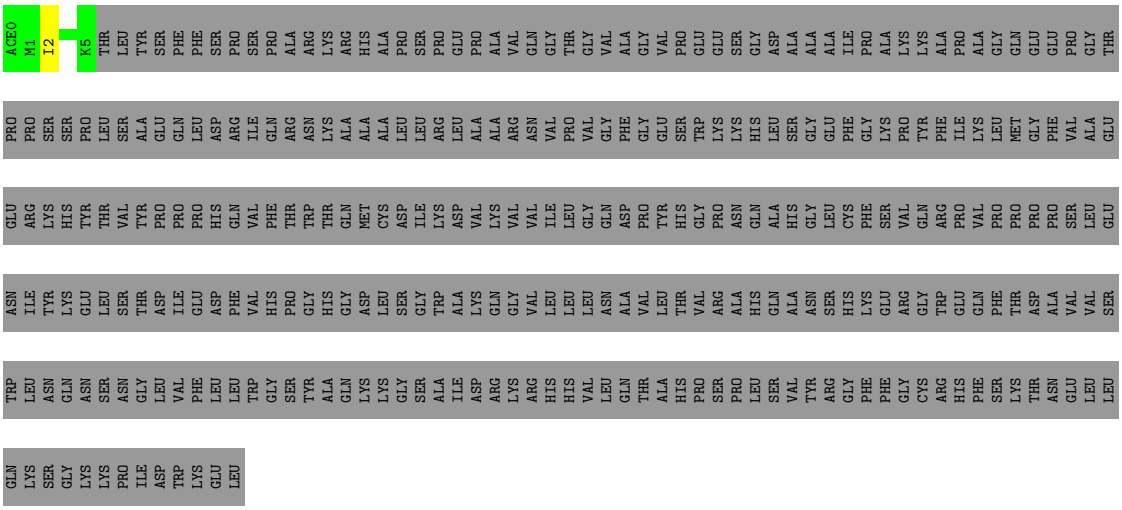
• Molecule 2: Uracil-DNA glycosylase

Chain D:



• Molecule 2: Uracil-DNA glycosylase

Chain C: 98%



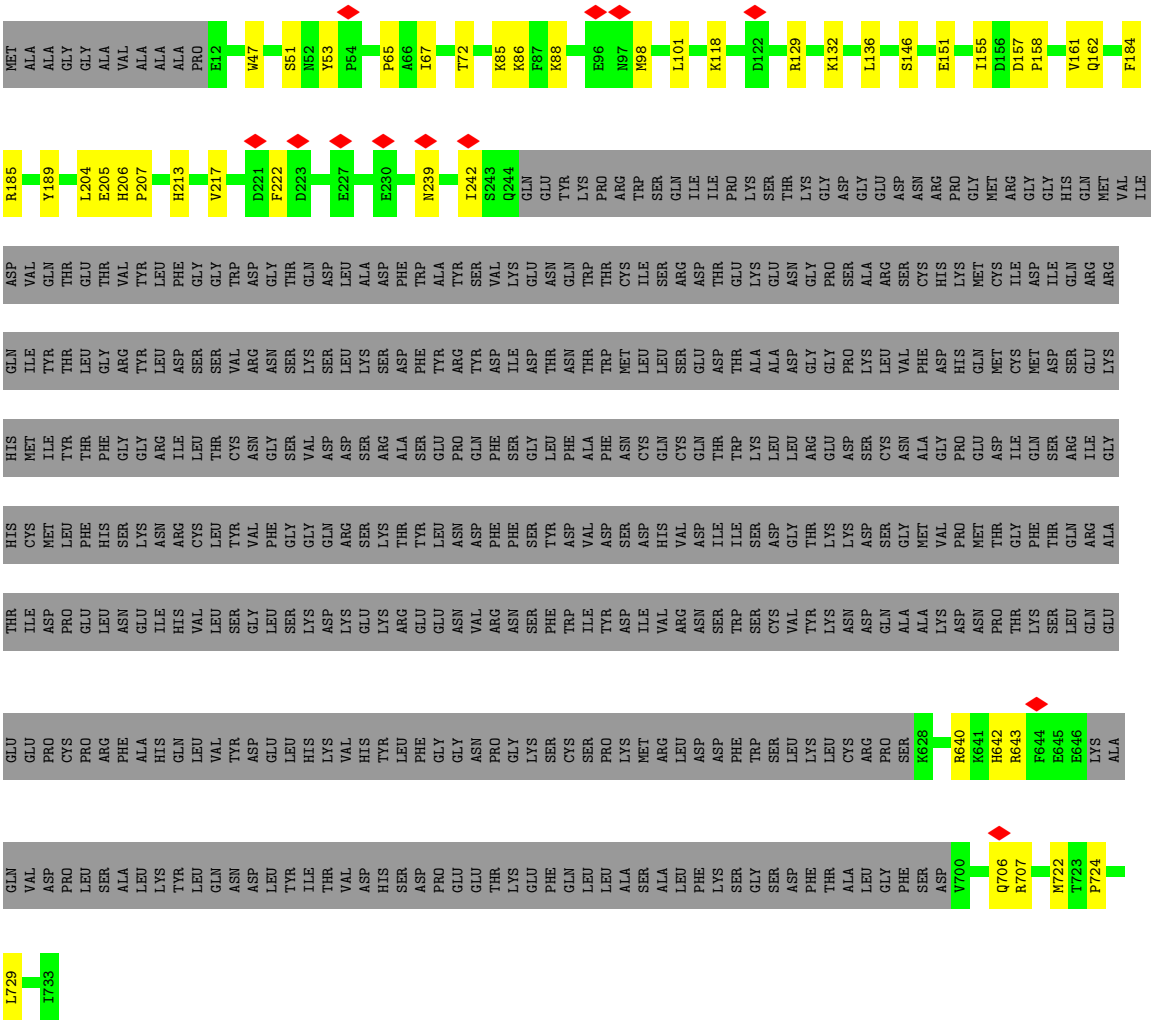
- Molecule 3: Muskelin

Chain F: 32% 7% 61%

- Molecule 3: Muskelin

Chain E:

33%
6%
61%


MET ALA ALA GLY GLY ALA VAL ALA ALA ALA PRO E12 W47 S51 N52 Y53 P54 P65 A66 I67 T72 K85 K86 F87 K88 E96 N97 M98 L101 K118 D122 R129 K132 L136 S146 E151 I155 D156 D157 P158 V161 Q162 F184
R185 Y189 L204 E205 H206 P207 H213 V217 D221 F222 D223 E227 E230 N239 I242 S243 Q244 GLN GLU TYR LYS PRO ARG TRP SER GLN ILE ILE PRO LYS SER THR LYS GLY ASP GLY GLU ASP ASN ARG PRO GLY MET ARG GLY GLY HIS GLN MET VAL ILE
ASP VAL GLN THR GLU THR VAL TYR LEU PHE GLY GLY TRP ASP GLY THR GLN ASP LEU ALA ASP PHE TRP ALA TYR SER VAL LYS GLU ASN GLN TRP THR CYS ILE SER ARG ASP THR GLU LYS GLU ASN GLY PRO SER ALA ARG SER CYS HIS LYS MET CYS ILE ASP ILE GLN ARG ARG
GLN ILE TYR THR LEU GLY ARG TYR LEU ASP SER SER VAL ARG ASN SER LYS SER LEU LYS SER ASP PHE TYR ARG TYR ASP ILE ASP THR ASN THR TRP MET LEU LEU SER GLU ASP THR ALA ALA ASP GLY GLY PRO LYS LEU VAL PHE ASP HIS GLN MET CYS MET ASP SER GLU LYS
HIS MET ILE TYR THR PHE GLY GLY ARG ILE LEU THR CYS ASN GLY SER VAL ASP ASP SER ARG ALA SER GLU PRO GLN PHE SER GLY LEU PHE ALA PHE ASN CYS GLN CYS GLN THR TRP LYS LEU LEU ARG GLU ASP SER CYS ASN ALA GLY PRO GLU ASP ILE GLN SER ARG ILE GLY
HIS CYS MET LEU PHE HIS SER LYS ASN ARG CYS LEU TYR VAL PHE GLY GLN ARG SER LYS THR TYR LEU ASN ASP PHE PHE SER TYR ASP VAL ASP SER ASP HIS VAL ASP ILE ILE SER ASP GLY THR LYS LYS ASP SER GLY MET VAL PRO MET THR GLY PHE THR GLN GLN ARG ALA
THR ILE ASP PRO GLU LEU ASN GLU ILE HIS VAL LEU SER GLY LEU SER LYS ASP LYS GLU LYS ARG GLU GLU ASN VAL ARG ASN SER PHE TRP ILE TYR ASP ILE VAL ARG ASN SER TRP SER CYS VAL TYR LYS ASN ASP GLN ALA ALA LYS ASP ASN PRO THR LYS SER LEU GLN GLU
GLU GLU PRO CYS PRO ARG PHE ALA HIS GLN LEU VAL TYR ASP GLU LEU HIS LYS VAL HIS TYR LEU PHE GLY GLY ASN PRO GLY LYS SER CYS SER PRO LYS MET ARG LEU ASP ASP PHE TRP SER LEU LYS LEU CYS ARG PRO SER K628 R640 K641 H642 R643 F644 E645 E646 LYS ALA
GLN VAL ASP PRO LEU SER ALA LEU LYS TYR LEU GLN ASN ASP LEU TYR ILE THR VAL ASP HIS SER ASP PRO GLU GLU THR LYS GLU PHE GLN LEU LEU LEU ALA SER ALA LEU PHE LYS SER GLY SER ASP PHE THR ALA LEU GLY PHE SER ASP V700 Q706 R707 M722 T723 P724
L729 I733

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	1117642	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 ($e^-/Å^2$)	60	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.013	Depositor
Minimum map value	-0.750	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.012	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	315.7248, 315.7248, 315.7248	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.8222, 0.8222, 0.8222	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, ACE

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	0.14	0/975	0.26	0/1323
1	B	0.14	0/981	0.27	0/1333
2	C	0.10	0/34	0.34	0/44
2	D	0.16	0/34	0.32	0/44
3	E	0.13	0/2410	0.27	0/3259
3	F	0.13	0/2427	0.26	0/3281
All	All	0.13	0/6861	0.27	0/9284

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	955	0	936	8	0
1	B	961	0	929	14	0
2	C	37	0	36	2	0
2	D	37	0	36	2	0
3	E	2349	0	2288	30	0
3	F	2365	0	2303	31	0
4	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	2	0	0	0	0
All	All	6708	0	6528	82	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 82 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:30:MET:HG2	1:A:98:ASN:HD22	1.45	0.81
1:B:45:THR:HG21	1:B:49:PRO:HG3	1.75	0.69
3:F:729:LEU:HD11	3:E:729:LEU:HD11	1.75	0.67
3:F:71:ILE:HG22	3:F:115:PHE:HB2	1.77	0.66
1:B:45:THR:HG22	1:B:102:TRP:HB2	1.79	0.63

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	123/149 (83%)	122 (99%)	1 (1%)	0	100	100
1	B	125/149 (84%)	122 (98%)	3 (2%)	0	100	100
2	C	4/314 (1%)	4 (100%)	0	0	100	100
2	D	4/314 (1%)	3 (75%)	1 (25%)	0	100	100
3	E	280/733 (38%)	274 (98%)	6 (2%)	0	100	100
3	F	280/733 (38%)	277 (99%)	3 (1%)	0	100	100
All	All	816/2392 (34%)	802 (98%)	14 (2%)	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	110/136 (81%)	110 (100%)	0	100	100
1	B	109/136 (80%)	109 (100%)	0	100	100
2	C	3/261 (1%)	3 (100%)	0	100	100
2	D	3/261 (1%)	3 (100%)	0	100	100
3	E	259/662 (39%)	259 (100%)	0	100	100
3	F	263/662 (40%)	263 (100%)	0	100	100
All	All	747/2118 (35%)	747 (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 11 such sidechains are listed below:

Mol	Chain	Res	Type
3	E	186	GLN
3	E	706	GLN
1	A	79	ASN
1	A	51	ASN
3	F	111	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 4 ligands modelled in this entry, 4 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 (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

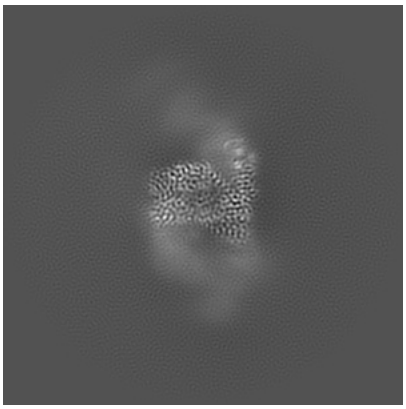
6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-57387. These allow visual inspection of the internal detail of the map and identification of artifacts.

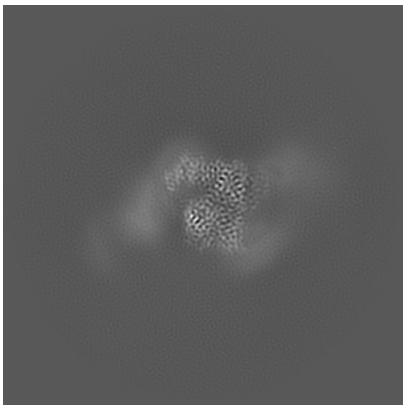
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections (i)

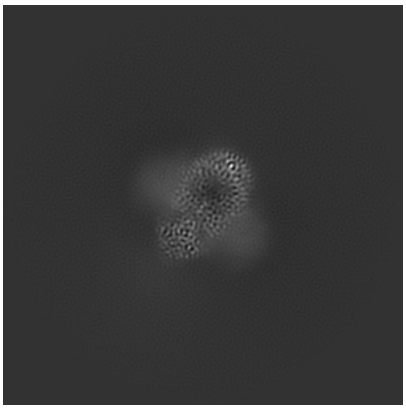
6.1.1 Primary map



X

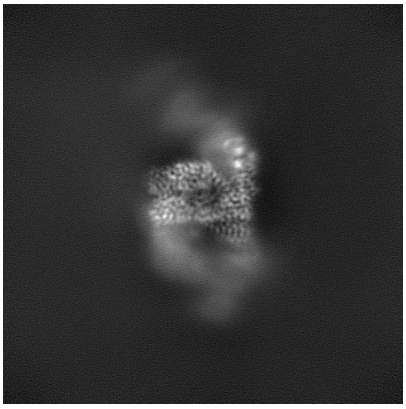


Y



Z

6.1.2 Raw map



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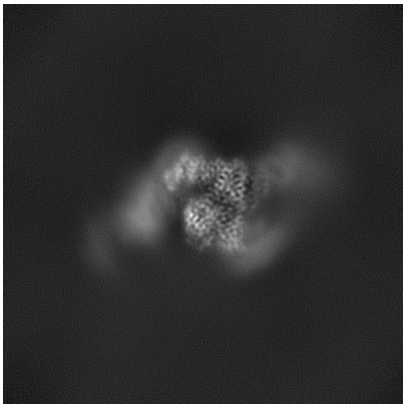
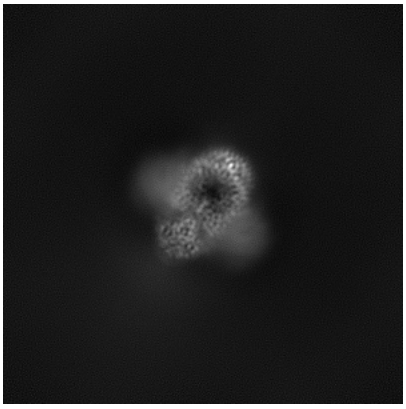


Y

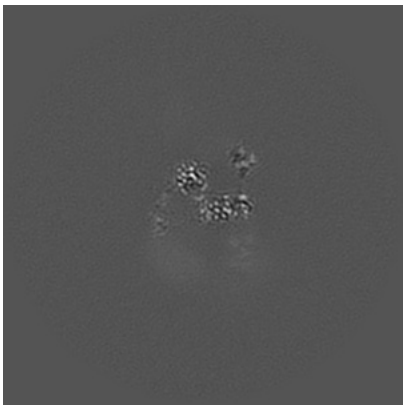


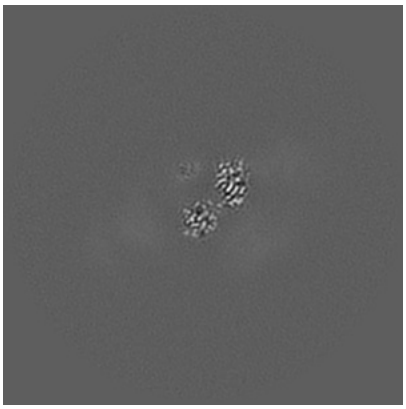
Z

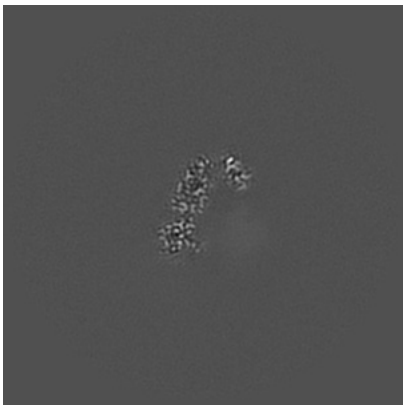
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

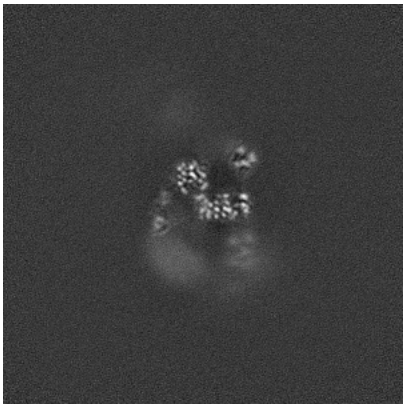
6.2.1 Primary map

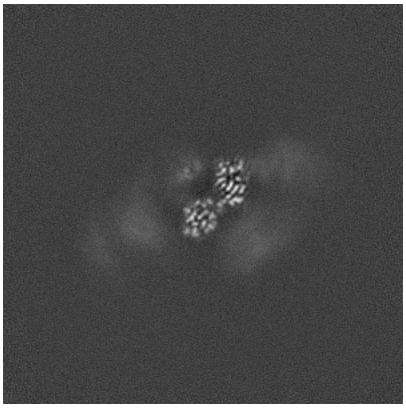

X Index: 192

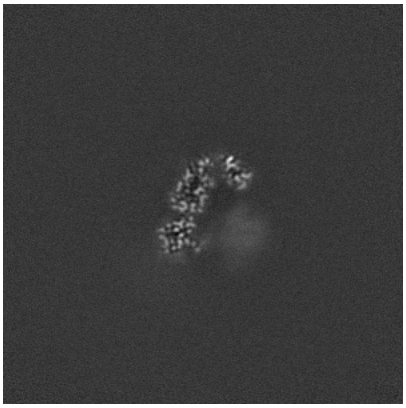

Y Index: 192


Z Index: 192

6.2.2 Raw map


X Index: 192

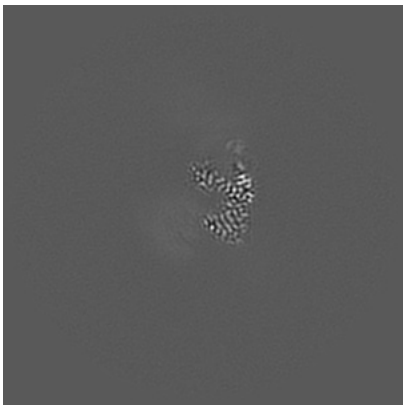

Y Index: 192


Z Index: 192

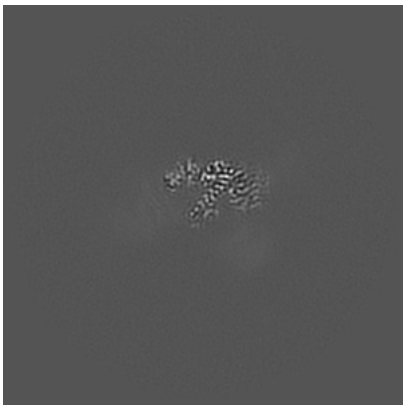
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

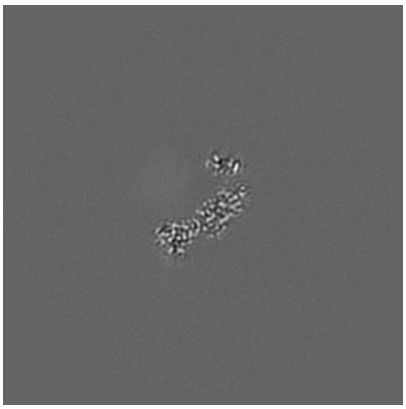
6.3.1 Primary map



X Index: 224

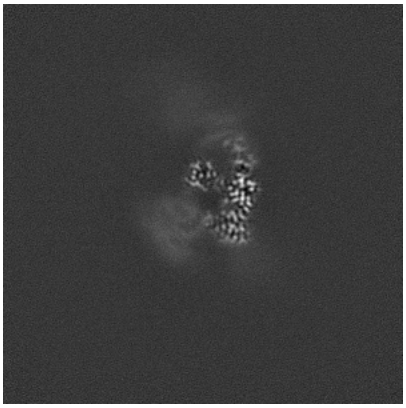


Y Index: 229

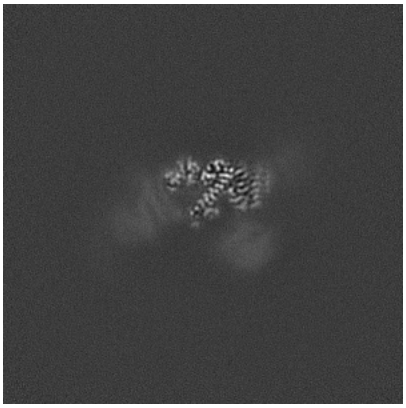


Z Index: 218

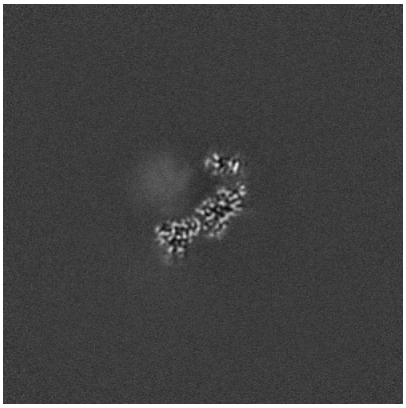
6.3.2 Raw map



X Index: 219



Y Index: 229

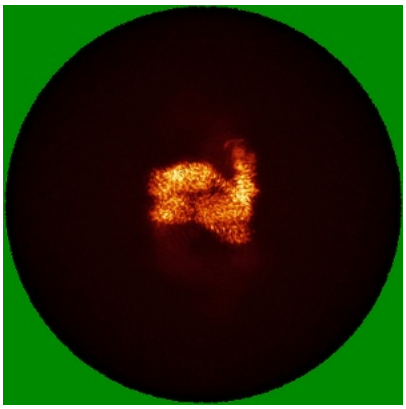


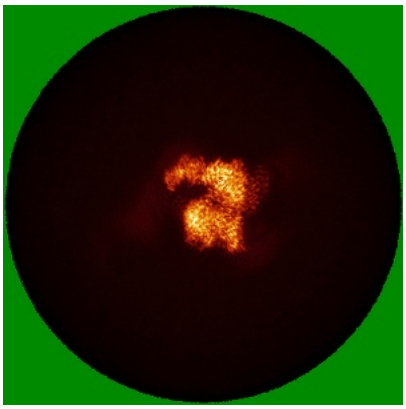
Z Index: 218

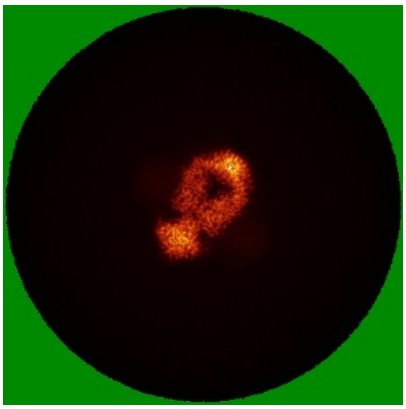
The images above show the largest variance slices of the map in three orthogonal directions.

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

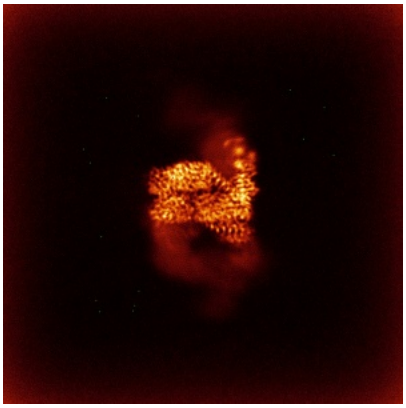
6.4.1 Primary map

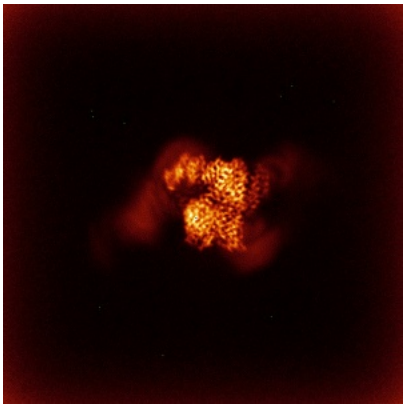

X

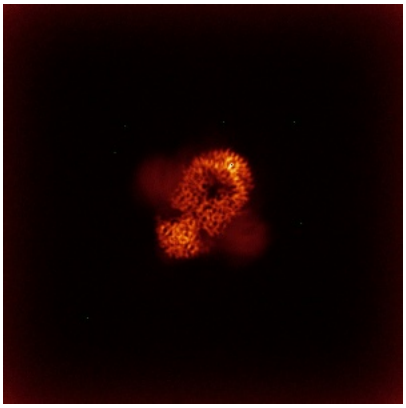

Y


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

X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.1. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

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.

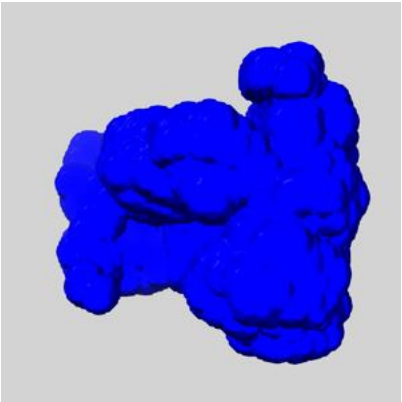
6.6 Mask visualisation (i)

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

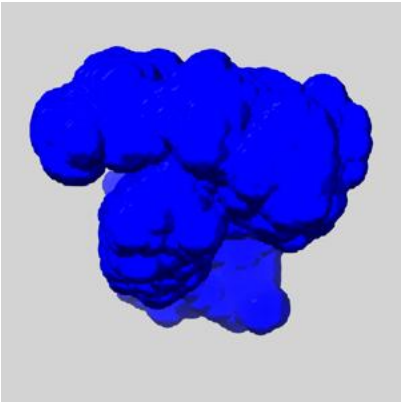
A mask typically either:

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

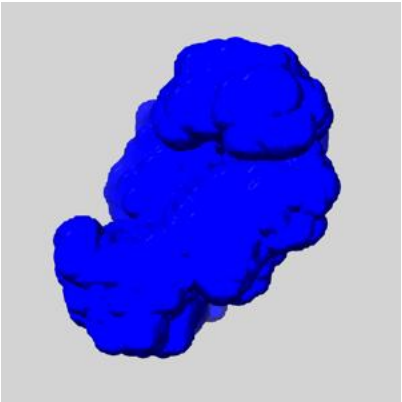
6.6.1 emd_57387_msk_1.map (i)



X



Y

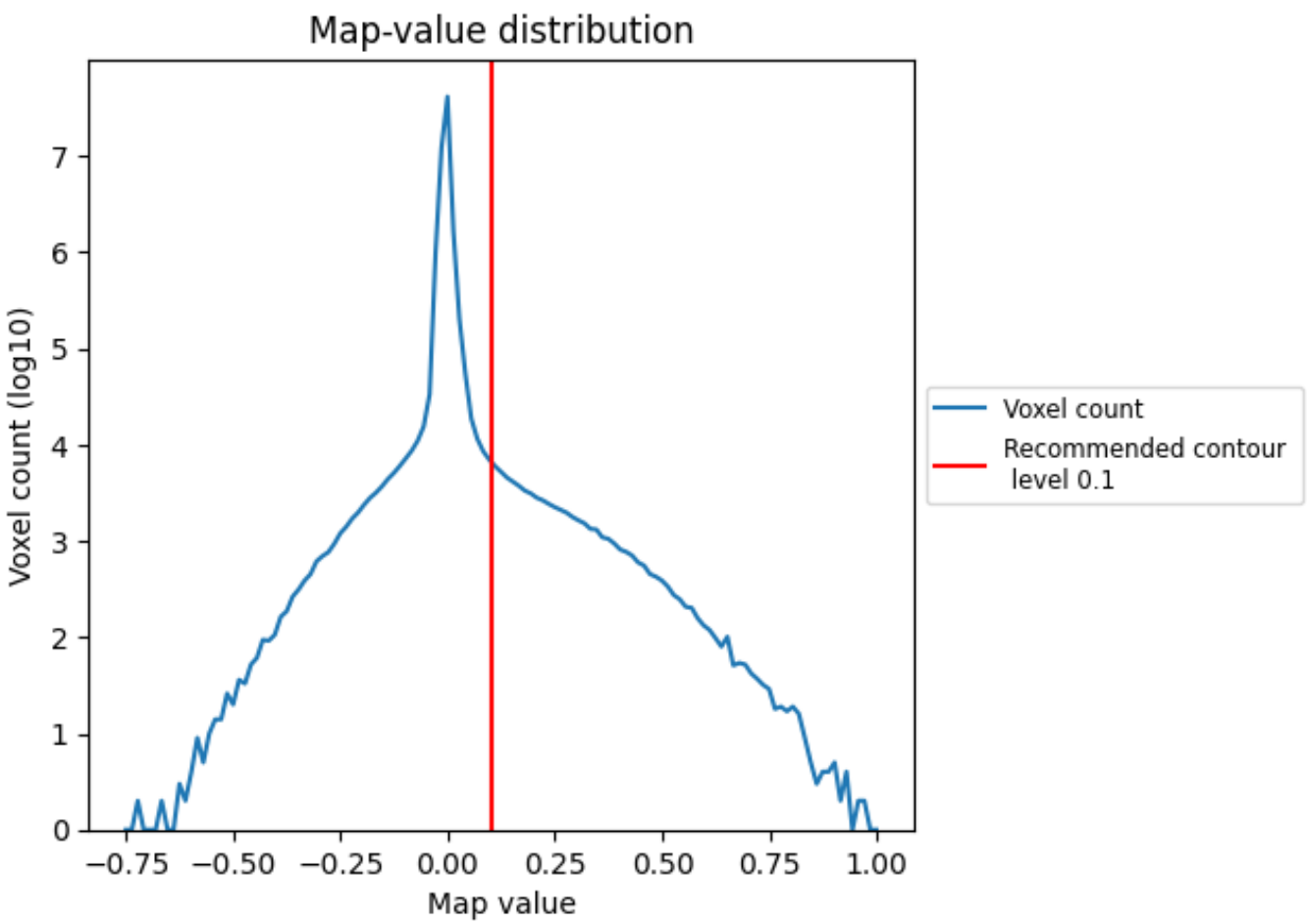


Z

7 Map analysis (i)

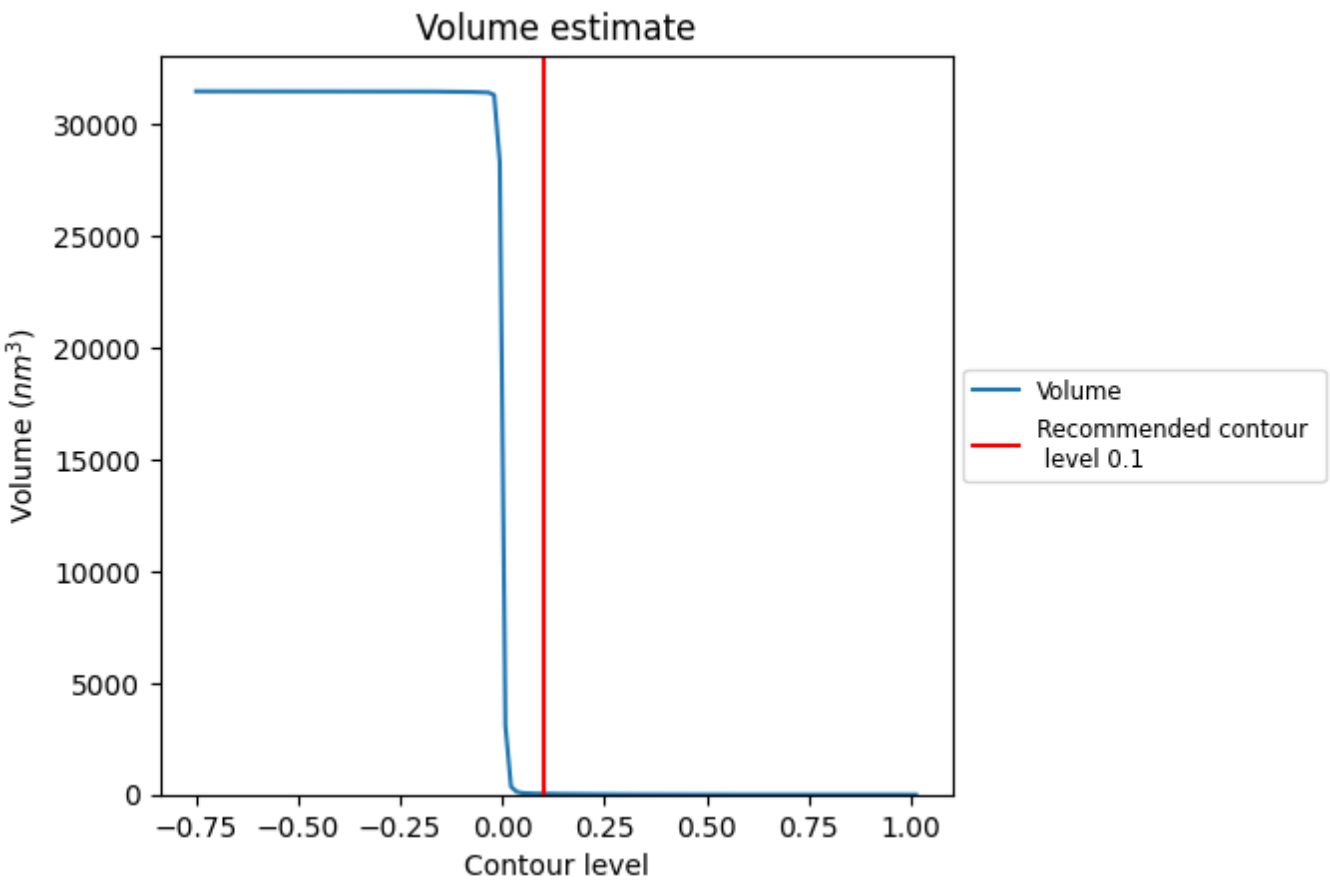
This section contains the results of statistical analysis of the map.

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.

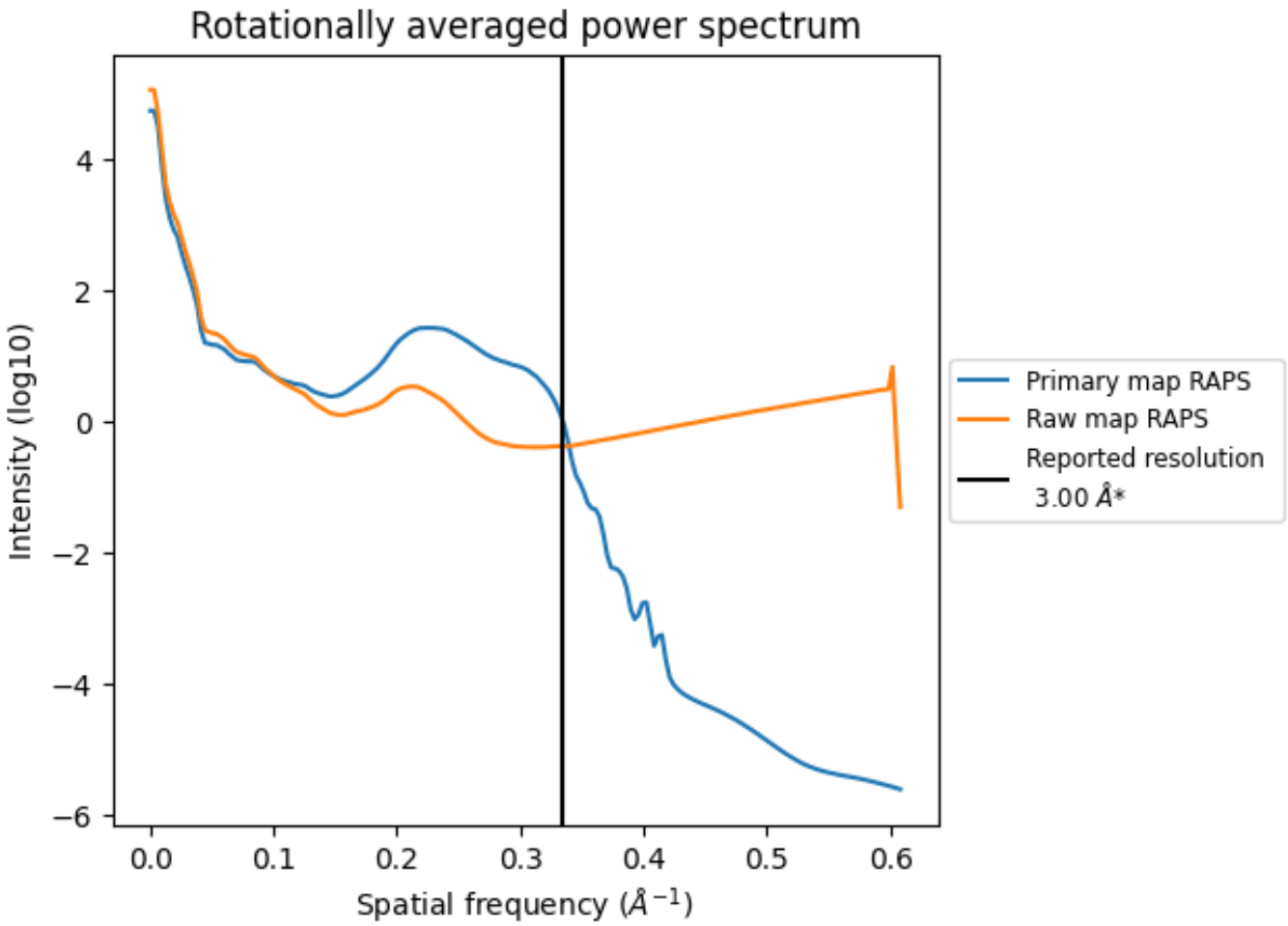
7.2 Volume estimate (i)



The volume at the recommended contour level is 37 nm^3; this corresponds to an approximate mass of 34 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)

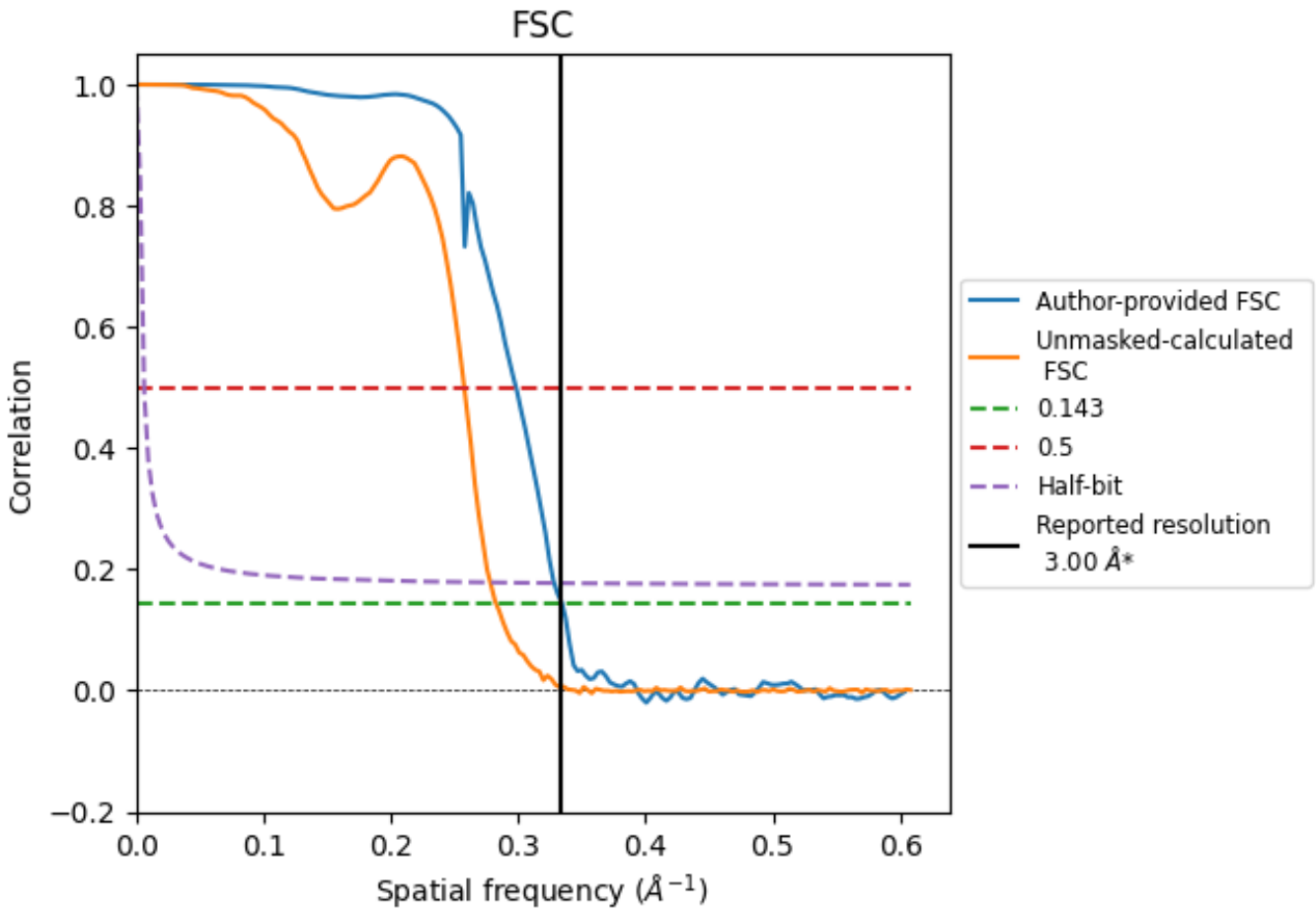


*Reported resolution corresponds to spatial frequency of 0.333 Å^{-1}

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 0.333 Å^{-1}

8.2 Resolution estimates (i)

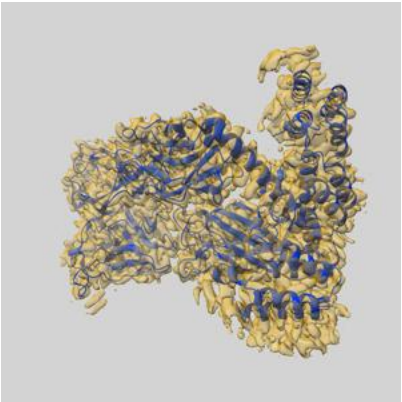
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.00	-	-
Author-provided FSC curve	2.99	3.35	3.05
Unmasked-calculated*	3.54	3.88	3.59

*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 3.54 differs from the reported value 3.0 by more than 10 %

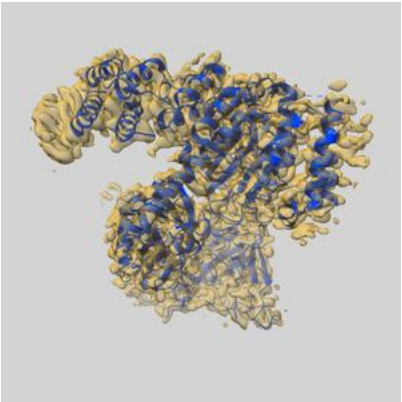
9 Map-model fit (i)

This section contains information regarding the fit between EMDB map EMD-57387 and PDB model 29UI. Per-residue inclusion information can be found in section 3 on page 6.

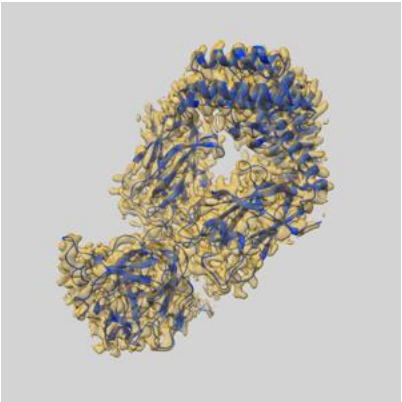
9.1 Map-model overlay (i)



X



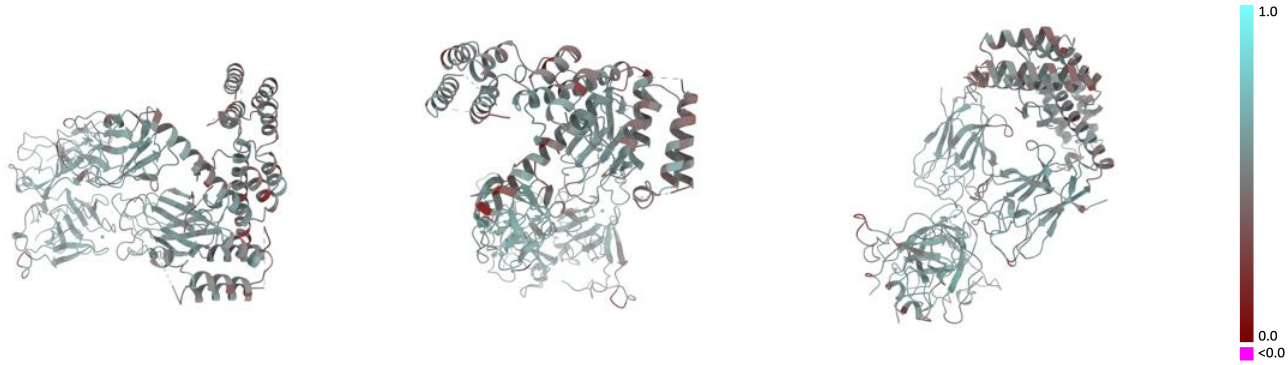
Y



Z

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

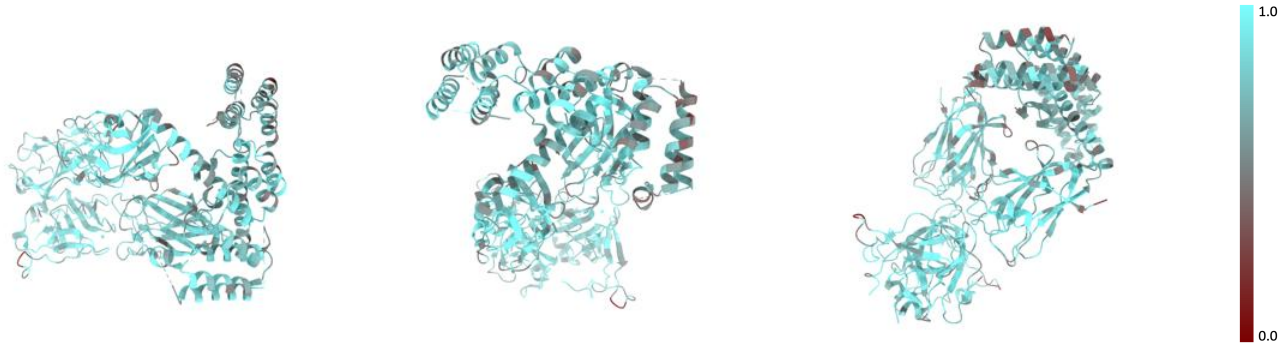
9.2 Q-score mapped to coordinate model (i)



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.

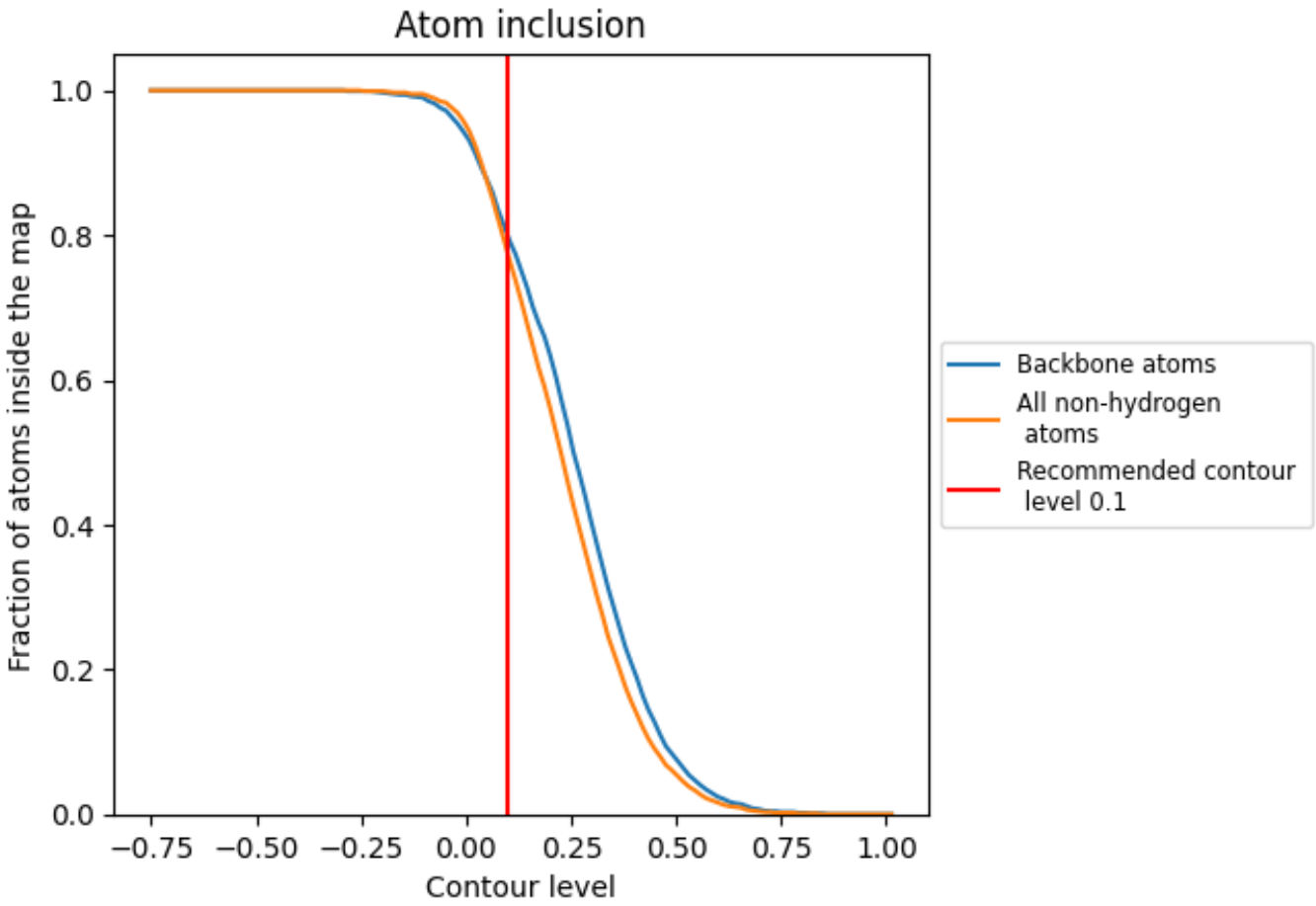
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.1).

9.4 Atom inclusion (i)



At the recommended contour level, 80% of all backbone atoms, 77% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7730	0.5250
A	0.7890	0.5270
B	0.8040	0.5520
C	0.8060	0.5690
D	0.9440	0.5860
E	0.7470	0.5140
F	0.7770	0.5220