wwPDB EM Validation Summary Report

Aug 17, 2025 – 12:49 AM JST

PDB ID	:	8YAH / pdb_00008yah
EMDB ID	:	EMD-39099
Title	:	full length AP5 complex bound to SPG11-SPG15
Authors	:	Su, M.-Y.
Deposited on	:	2024-02-09
Resolution	:	3.30 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:

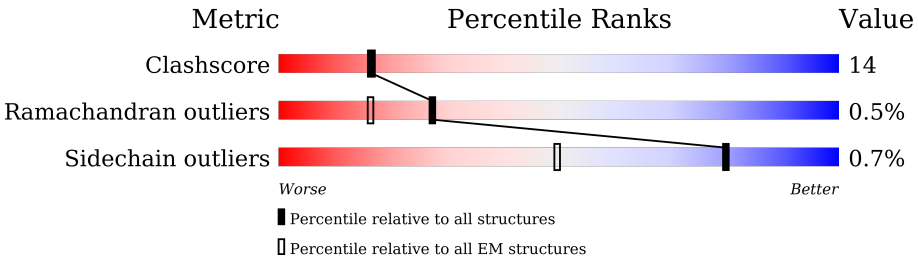
EMDB validation analysis	:	0.0.1.dev126
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.45.1

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 3.30 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	808	67% 16% 17%
2	B	878	49% 13% 37%
3	C	200	60% 30% 9%
4	E	490	74% 22%
5	D	2443	15% 84%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 14309 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 AP-5 complex subunit zeta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	671	Total	C	N	O	S	0	0
			4219	2652	755	796	16		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP Q3U829
A	2	ALA	-	expression tag	UNP Q3U829

- Molecule 2 is a protein called AP-5 complex subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	551	Total	C	N	O	S	0	0
			3645	2329	653	646	17		

- Molecule 3 is a protein called AP-5 complex subunit sigma-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	182	Total	C	N	O	S	0	0
			1295	835	242	215	3		

- Molecule 4 is a protein called AP-5 complex subunit mu-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	468	Total	C	N	O	S	0	0
			3114	1995	547	564	8		

- Molecule 5 is a protein called Spatacsin.

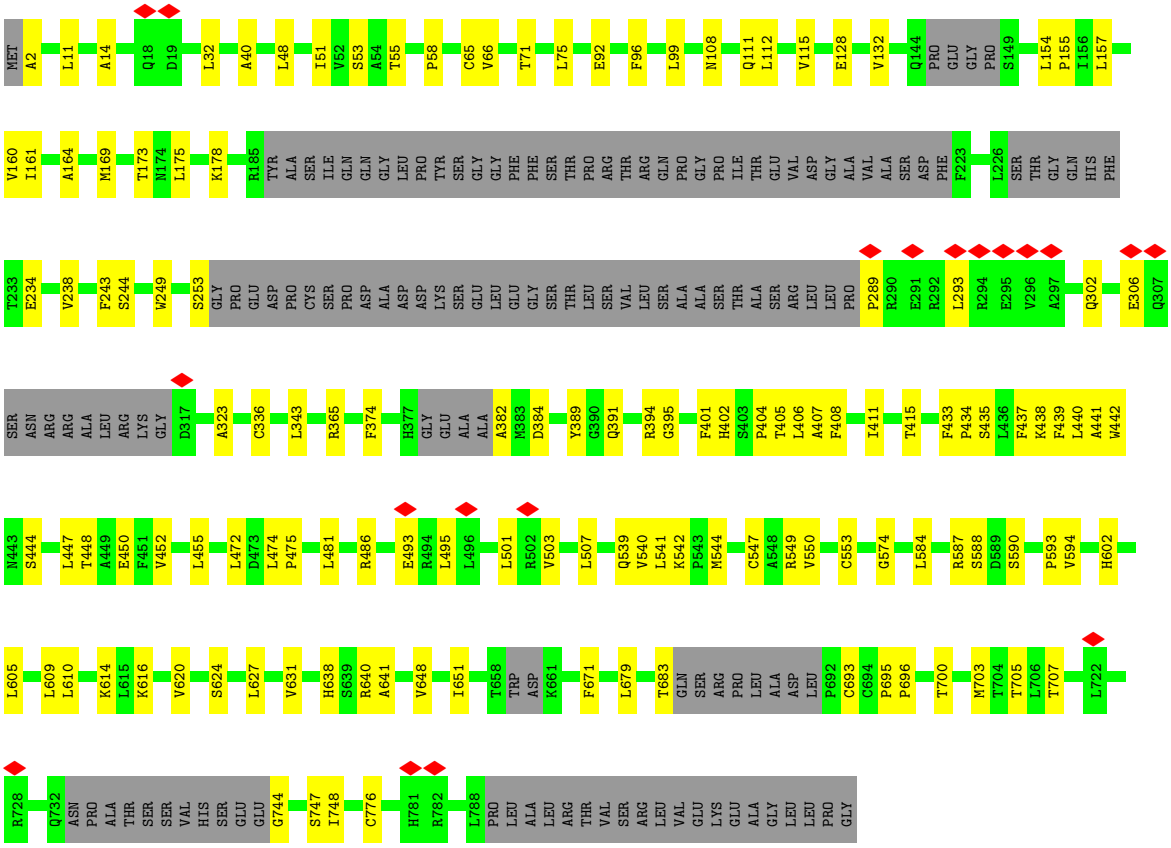
Mol	Chain	Residues	Atoms				AltConf	Trace
5	D	402	Total	C	N	O	0	0
			2036	1211	408	417		

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.

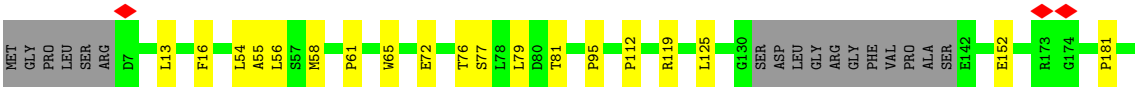
• Molecule 1: AP-5 complex subunit zeta-1

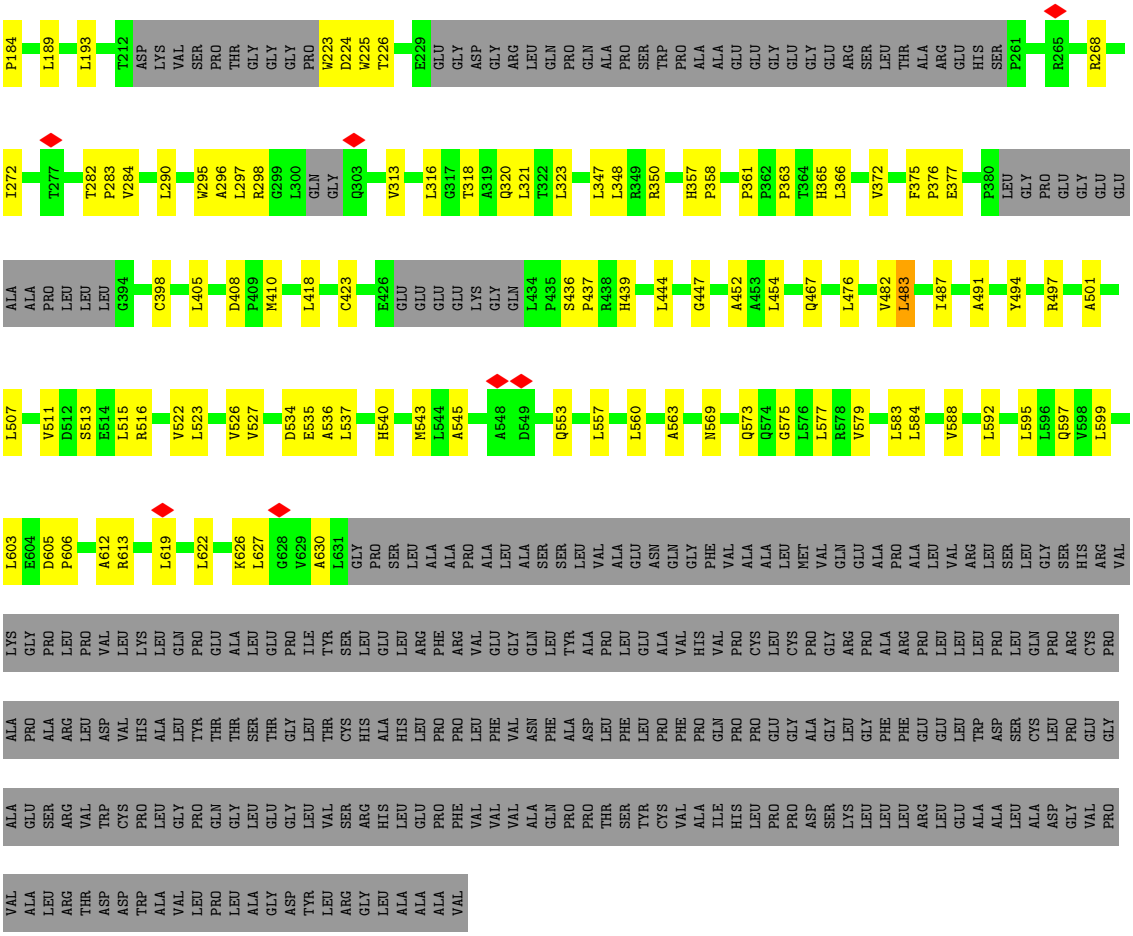
Chain A:



• Molecule 2: AP-5 complex subunit beta-1

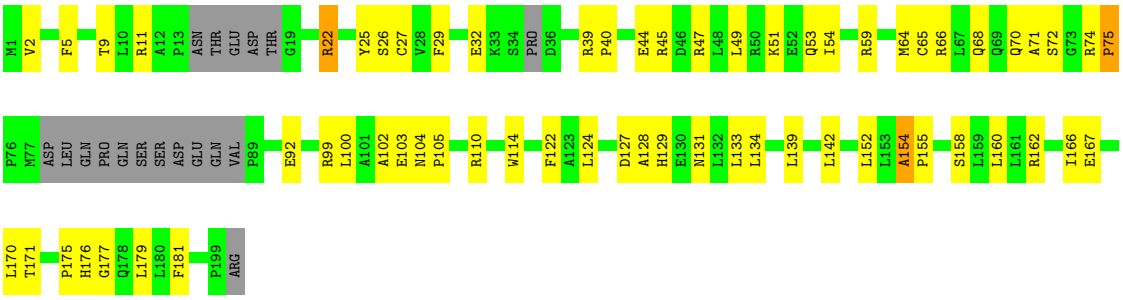
Chain B:





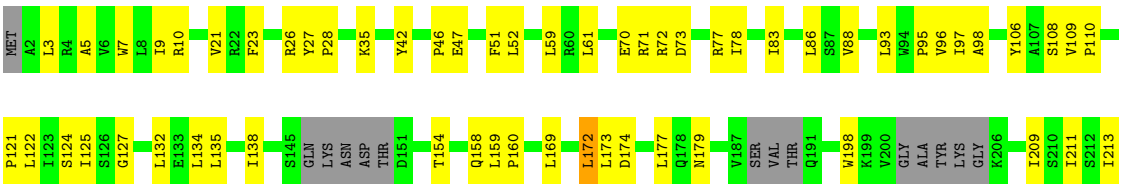
• Molecule 3: AP-5 complex subunit sigma-1

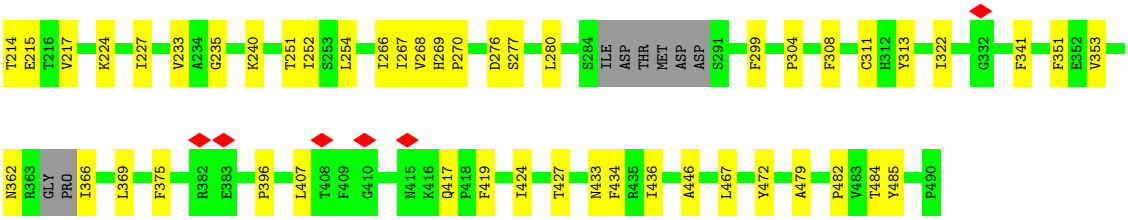
Chain C:



• Molecule 4: AP-5 complex subunit mu-1

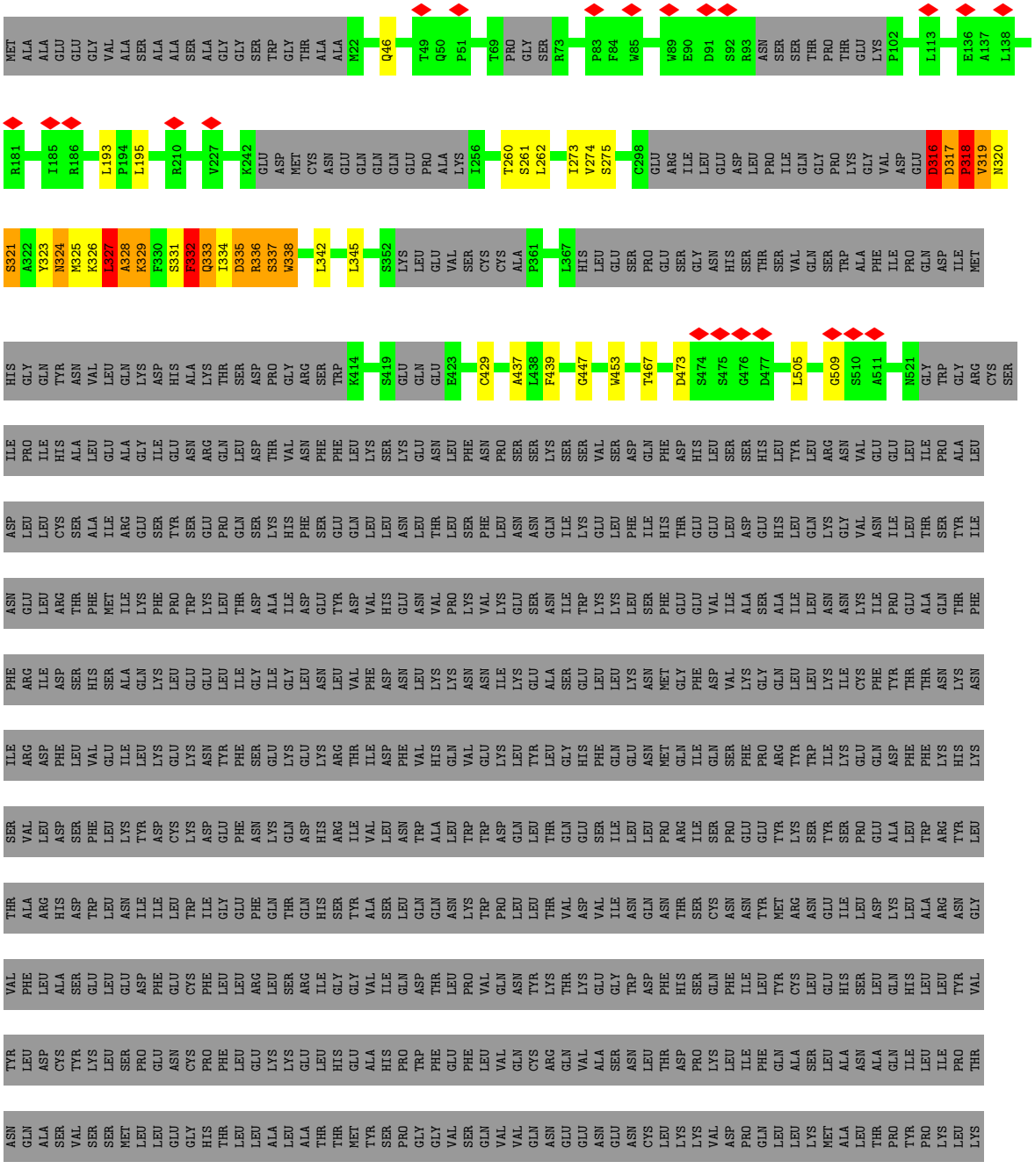
Chain E:





• Molecule 5: Spatacsin

Chain D:



THR ALA LEU PHE PRO GLN CYS THR PRO PRO SER VAL LEU PRO SER ASP ILE THR ILE TYR HIS LEU ILE GLN SER LEU SER PRO PHE ASP PRO SER ARG LEU PHE GLY TRP GLN SER ALA ASN THR LEU ALA ILE GLY ASP ALA TRP SER HIS LEU PRO HIS PHE SER SER PRO ASP LEU

VAL ASN LYS TYR ALA ILE VAL GLU ARG LEU ASN PHE ALA TYR TYR LEU HIS ASN GLY ARG PRO SER PHE ALA PHE GLY THR PHE LEU VAL GLN GLU LEU ILE LYS SER LYS THR PRO LYS GLN LEU ILE GLN GLN VAL GLY ASN GLU ALA TYR VAL ILE GLY LEU SER SER PHE HIS ILE

PRO SER ILE GLY ALA ALA CYS VAL CYS PHE LEU GLU LEU LEU GLY LEU ASP SER LEU LYS LEU ARG VAL ASP MET LYS VAL ALA ASN ILE ILE LEU SER TYR LYS CYS ARG ASN GLU ASP ALA GLN TYR SER PHE ILE ARG GLU SER VAL ALA GLU LYS LEU SER LYS LEU ALA ASP GLY

GLU LYS THR THR THR GLU GLU LEU LEU VAL LEU LEU GLU GLU GLY THR TRP ASN SER ILE GLN GLN GLN GLU ILE LYS ARG LEU SER SER GLU SER SER SER GLN TRP ALA LEU VAL VAL GLN PHE CYS ARG LEU HIS ASN MET LYS LEU SER ILE SER TYR LEU ARG GLU CYS ALA LYS

ALA ASN ASP TRP LEU GLN PHE ILE ILE HIS SER GLN LEU HIS ASN TYR HIS PRO ALA GLU VAL LYS SER LEU ILE GLN TYR PHE SER PRO VAL ILE GLN ASP HIS LEU ARG LEU ALA PHE GLU ASN LEU PRO SER VAL PRO THR SER LYS MET ASP SER ASP GLN VAL CYS ASN LYS CYS

PRO GLN GLU LEU GLN GLY SER LYS GLN GLU MET THR ASP LEU PHE GLU ILE LEU LEU GLN CYS SER GLU GLU PRO ASP SER TRP HIS TRP LEU LEU VAL GLU ALA VAL LYS GLN GLN ALA PRO ILE LEU SER VAL LEU ALA SER CYS LEU GLN GLY ALA SER ALA ILE SER CYS LEU CYS

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PRO LEU LEU LEU VAL MET GLU MET TYR GLU LEU CYS MET PHE PHE ARG ASN TYR LYS GLU ALA GLU ALA LYS LEU LEU GLU PHE GLN LYS SER LEU GLU THR LEU ASN THR ALA ALA THR LYS VAL HIS PRO VAL ILE PRO ALA MET TRP LEU GLU ASP GLN VAL CYS PHE LEU LEU LYS

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ALA LEU ASN THR SER LYS TYR LEU GLU LEU ASN SER LEU PRO SER LYS GLU THR CYS GLU ASN ARG LEU ASP TRP LYS GLU GLN GLU SER LEU ASN PHE LEU ILE GLY ARG LEU LEU ASP ASP GLY CYS VAL HIS GLU ALA SER ARG VAL CYS ARG TYR PHE HIS PHE TYR ASN PRO ASP

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PRO SER SER ASN GLU VAL VAL THR ASN LEU GLU VAL LEU THR THR SER LYS CYS LEU HIS GLY LYS ASN TYR CYS ARG GLN VAL LEU CYS LEU TYR ASP LEU ALA LYS GLU LEU GLY CYS SER TYR THR ASP VAL ALA ALA GLN ASP GLY GLU ALA MET LEU ARG LYS ILE LEU ALA SER GLN

GLN PRO ASP ARG CYS LYS ARG ALA GLN ALA PHE ILE SER THR GLN GLY LEU LYS PRO ASP THR VAL ALA GLU LEU VAL ALA GLU GLU VAL THR ARG GLU LEU LEU THR SER SER GLN GLY THR GLY HIS LYS GLN MET PHE ASN PRO THR GLU GLU SER GLN THR PHE LEU GLN LEU THR

THR LEU CYS GLN ASP ARG THR LEU VAL GLY MET LYS LEU LEU ASP LYS ILE SER SER VAL PRO HIS GLY GLU LEU SER CYS THR THR GLU LEU LEU ILE LEU ALA HIS HIS CYS PHE THR LEU THR CYS HIS MET GLU GLY ILE ILE ARG VAL LEU GLN ALA ALA HIS MET LEU THR ASP

ASN HIS LEU ALA PRO SER GLU GLU TYR GLY LEU VAL VAL ARG LEU LEU THR GLY ILE GLY ARG TYR ASN GLU MET THR TYR ILE PHE ASP LEU LEU HIS LYS LYS HIS TYR PHE GLU VAL LEU MET ARG LYS LYS LEU ASP PRO SER GLY THR LEU LYS THR ALA LEU LEU ASP TYR ILE

LYS ARG CYS ARG PRO GLY ASP SER GLU LYS HIS ASN MET ILE ALA LEU CYS PHE SER MET CYS ARG GLU ILE GLY GLU ASN HIS GLU ALA ALA ALA ARG ILE GLN LEU LYS LEU ILE GLU SER GLN PRO TRP GLU ASP SER LEU LYS ASP GLY HIS GLN LEU LYS GLN LEU LEU LEU LYS

ALA LEU THR LEU MET LEU ASP ALA ALA GLU SER TYR ALA LYS ASP SER CYS VAL ARG GLN ALA GLN HIS CYS GLN ARG LEU THR LYS LEU ILE THR LEU GLN ILE HIS PHE LEU ASN THR GLY GLN ASN THR MET LEU ILE ASN LEU GLY ARG HIS LYS LEU MET ASP CYS ILE LEU ALA


LEU PRO ARG PHE TYR GLN ALA SER ILE VAL ALA GLU ALA TYR ASP PHE VAL PRO ASP TRP ALA GLU ILE LEU TYR GLN GLN VAL ILE LEU LYS GLY ASP PHE ASN TYR LEU GLU GLU PHE LYS GLN GLN ARG LEU LEU LYS SER SER ILE PHE GLU GLU ILE SER LYS LYS TYR LYS GLN


HIS GLN PRO THR ASP MET VAL MET GLU ASN LEU LYS LYS LEU LEU THR TYR CYS GLU ASP VAL TYR LEU TYR TYR LYS LEU ALA TYR GLU HIS LYS PHE TYR GLU ILE VAL ASN VAL LEU LEU LYS ASP PRO GLN THR GLY CYS CYS LEU LYS ASP MET LEU ALA GLY

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	586806	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 ($e^-/Å^2$)	1.2386	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.223	Depositor
Minimum map value	-0.548	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.020	Depositor
Recommended contour level	0.15	Depositor
Map size (Å)	510.0, 510.0, 510.0	wwPDB
Map dimensions	600, 600, 600	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.85, 0.85, 0.85	Depositor

5 Model quality

5.1 Standard geometry

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|$ >5	RMSZ	#$\|Z\|$ >5
1	A	0.21	0/4274	0.37	0/5893
2	B	0.38	4/3720 (0.1%)	0.76	9/5124 (0.2%)
3	C	0.44	2/1319 (0.2%)	0.47	0/1800
4	E	0.33	1/3187 (0.0%)	0.49	3/4389 (0.1%)
5	D	0.72	12/2029 (0.6%)	0.85	18/2807 (0.6%)
All	All	0.40	19/14529 (0.1%)	0.60	30/20013 (0.1%)

The worst 5 of 19 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	482	PRO	CG-CD	-12.32	1.08	1.50
3	C	22	ARG	CA-C	-10.80	1.39	1.52
2	B	437	PRO	CG-CD	-10.36	1.15	1.50
2	B	376	PRO	CB-CG	-9.67	1.01	1.49
5	D	323	TYR	C-O	-9.62	1.11	1.24

The worst 5 of 30 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	376	PRO	CB-CG-CD	20.90	172.98	106.10
2	B	437	PRO	N-CD-CG	-20.55	72.38	103.20
2	B	437	PRO	CA-CB-CG	-19.68	67.10	104.50
2	B	376	PRO	N-CD-CG	-18.10	76.05	103.20
2	B	376	PRO	CA-CB-CG	-16.21	73.70	104.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4219	0	3439	104	0
2	B	3645	0	3273	99	0
3	C	1295	0	1244	88	0
4	E	3114	0	2607	81	0
5	D	2036	0	981	57	0
All	All	14309	0	11544	360	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 14.

The worst 5 of 360 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)
3:C:49:LEU:CB	5:D:327:LEU:CD1	1.80	1.52
3:C:49:LEU:HB2	5:D:327:LEU:CD1	1.35	1.42
3:C:49:LEU:CA	5:D:327:LEU:HD13	1.52	1.36
3:C:49:LEU:CG	5:D:327:LEU:CD1	2.12	1.26
3:C:49:LEU:CB	5:D:327:LEU:HD13	1.52	1.15

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	651/808 (81%)	607 (93%)	44 (7%)	0	100 100
2	B	537/878 (61%)	520 (97%)	17 (3%)	0	100 100
3	C	174/200 (87%)	161 (92%)	11 (6%)	2 (1%)	12 40
4	E	456/490 (93%)	394 (86%)	62 (14%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
5	D	386/2443 (16%)	339 (88%)	39 (10%)	8 (2%)	5 27
All	All	2204/4819 (46%)	2021 (92%)	173 (8%)	10 (0%)	27 56

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	75	PRO
3	C	154	ALA
5	D	317	ASP
5	D	328	ALA
5	D	332	PHE

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	306/702 (44%)	305 (100%)	1 (0%)	91 94
2	B	284/692 (41%)	283 (100%)	1 (0%)	89 93
3	C	113/171 (66%)	113 (100%)	0	100 100
4	E	244/430 (57%)	243 (100%)	1 (0%)	89 93
5	D	19/2204 (1%)	15 (79%)	4 (21%)	1 4
All	All	966/4199 (23%)	959 (99%)	7 (1%)	80 88

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	D	316	ASP
5	D	318	PRO
5	D	337	SER
5	D	327	LEU
4	E	172	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	573	GLN
2	B	574	GLN
4	E	179	ASN
3	C	70	GLN
2	B	357	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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.

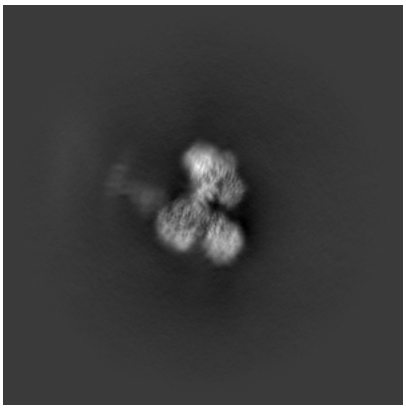
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-39099. These allow visual inspection of the internal detail of the map and identification of artifacts.

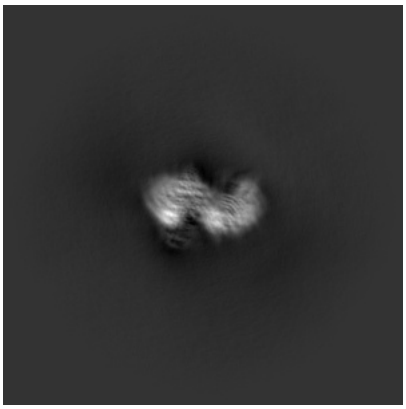
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

6.1.1 Primary map



X



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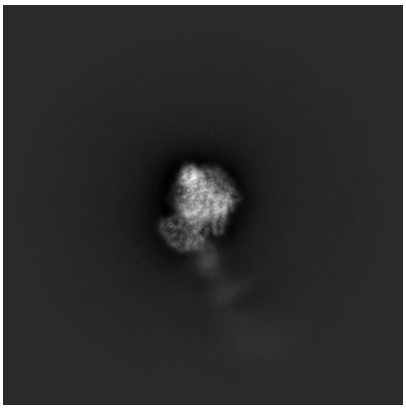
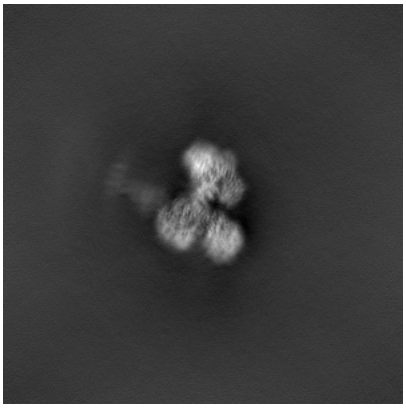
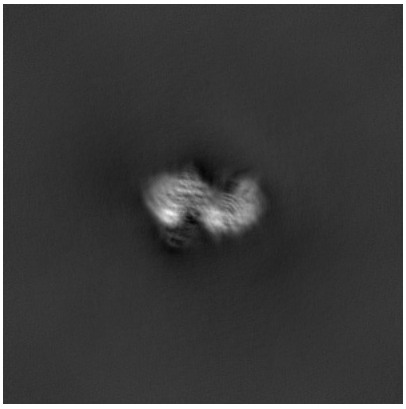


Z

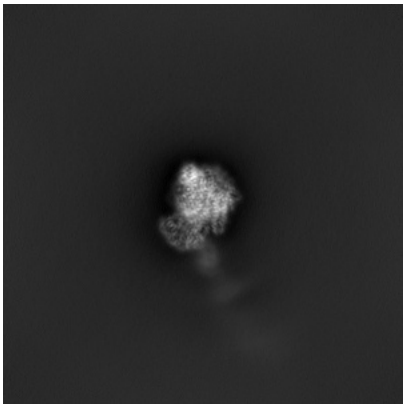
6.1.2 Raw map



X



Y

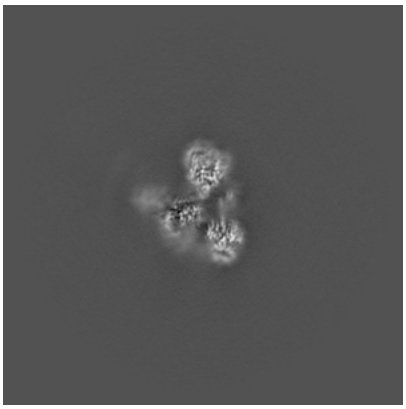


Z

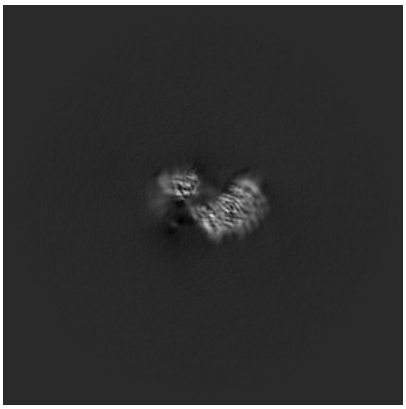
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

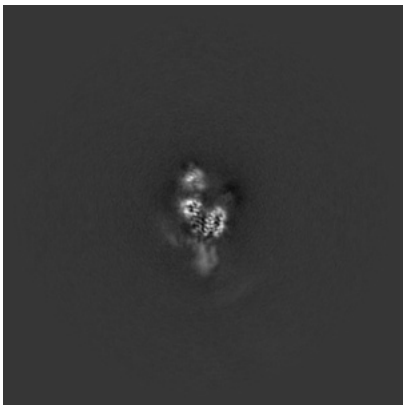
6.2.1 Primary map



X Index: 300

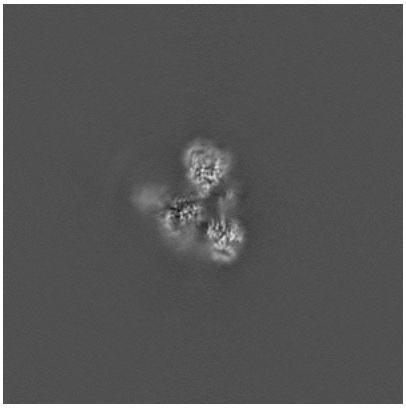


Y Index: 300

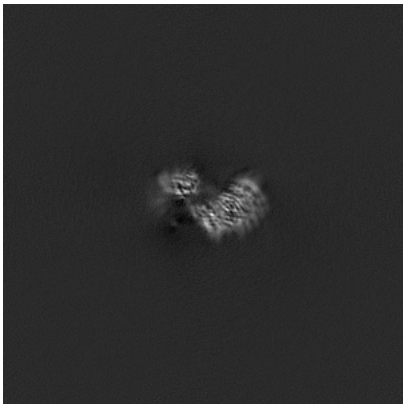


Z Index: 300

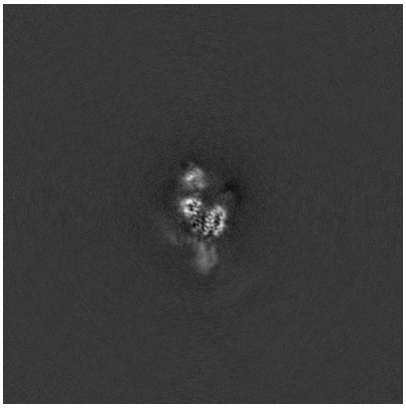
6.2.2 Raw map



X Index: 300



Y Index: 300

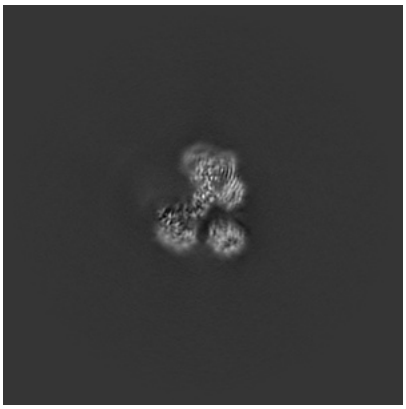


Z Index: 300

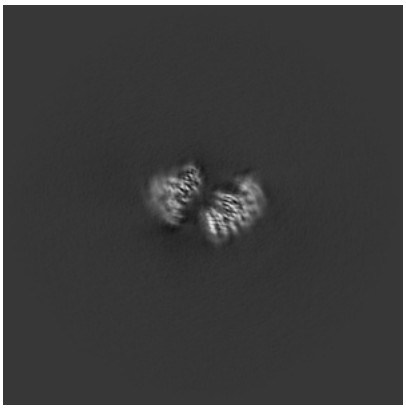
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

6.3.1 Primary map



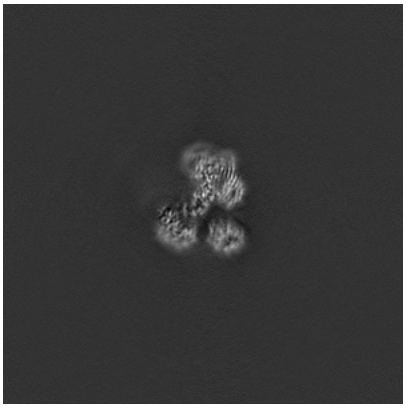
X Index: 284



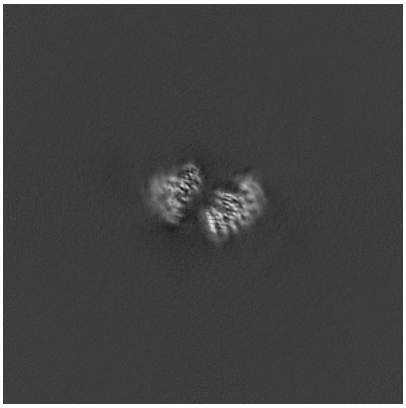
Y Index: 310

Z Index: 253

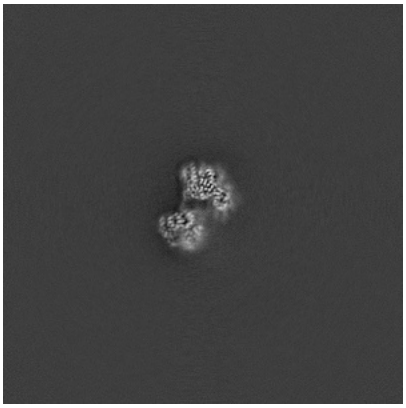
6.3.2 Raw map



X Index: 283



Y Index: 310

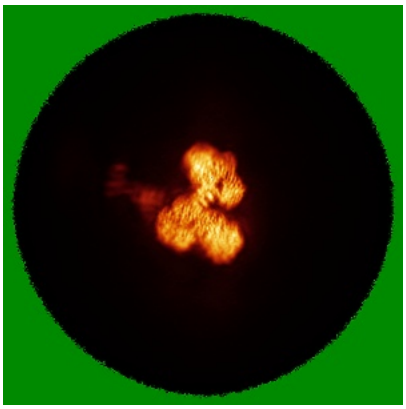


Z Index: 258

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

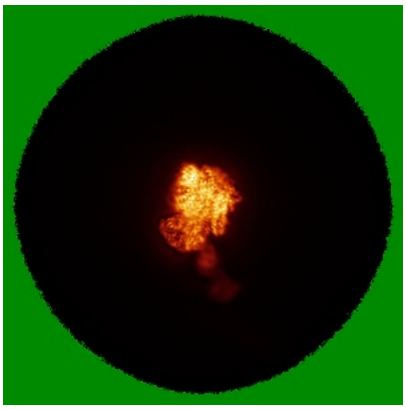
6.4 Orthogonal standard-deviation projections (False-color) (i)

6.4.1 Primary map



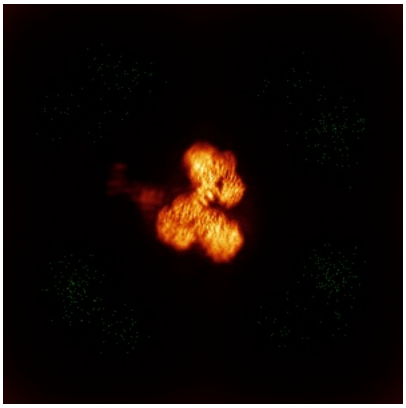
X

Y

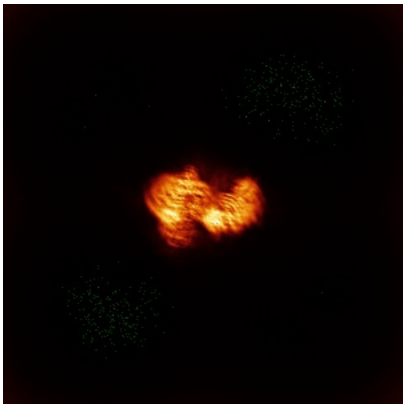


Z

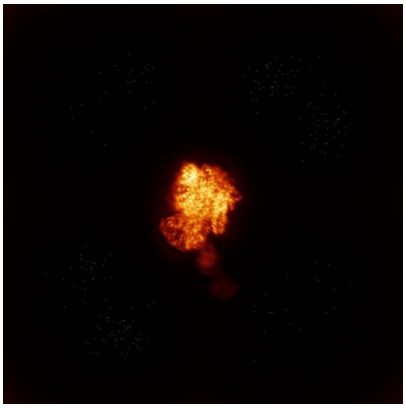
6.4.2 Raw map



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.

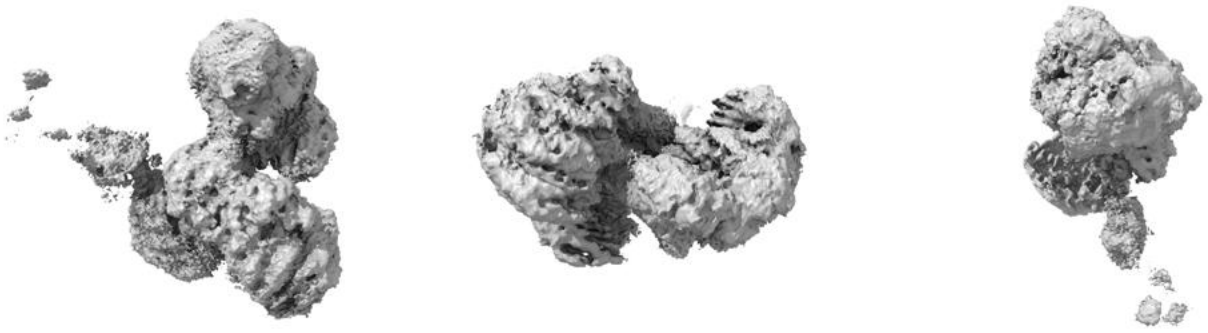
6.5 Orthogonal surface views (i)

6.5.1 Primary map

X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.15. 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.

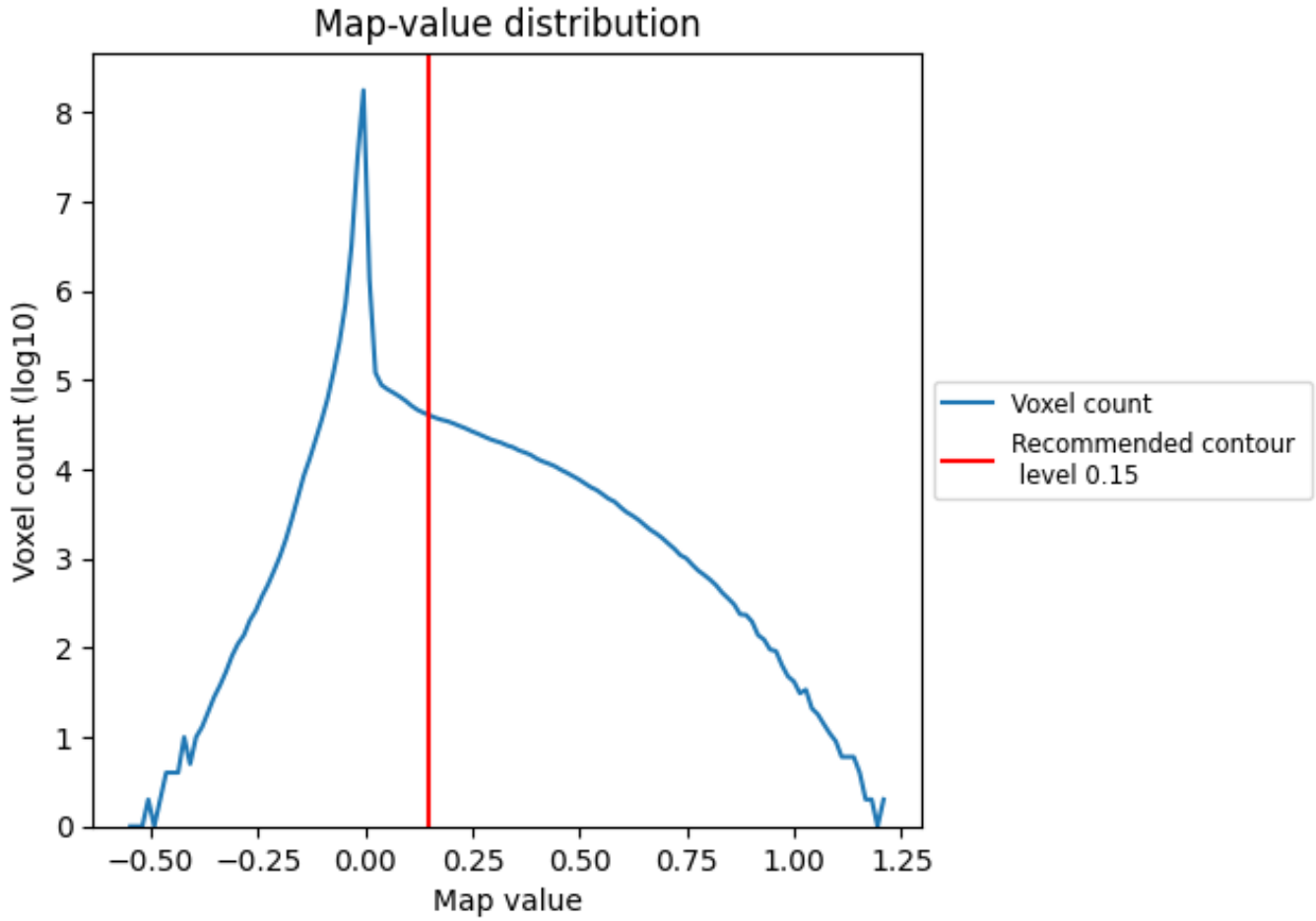
6.6 Mask visualisation (i)

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

7 Map analysis

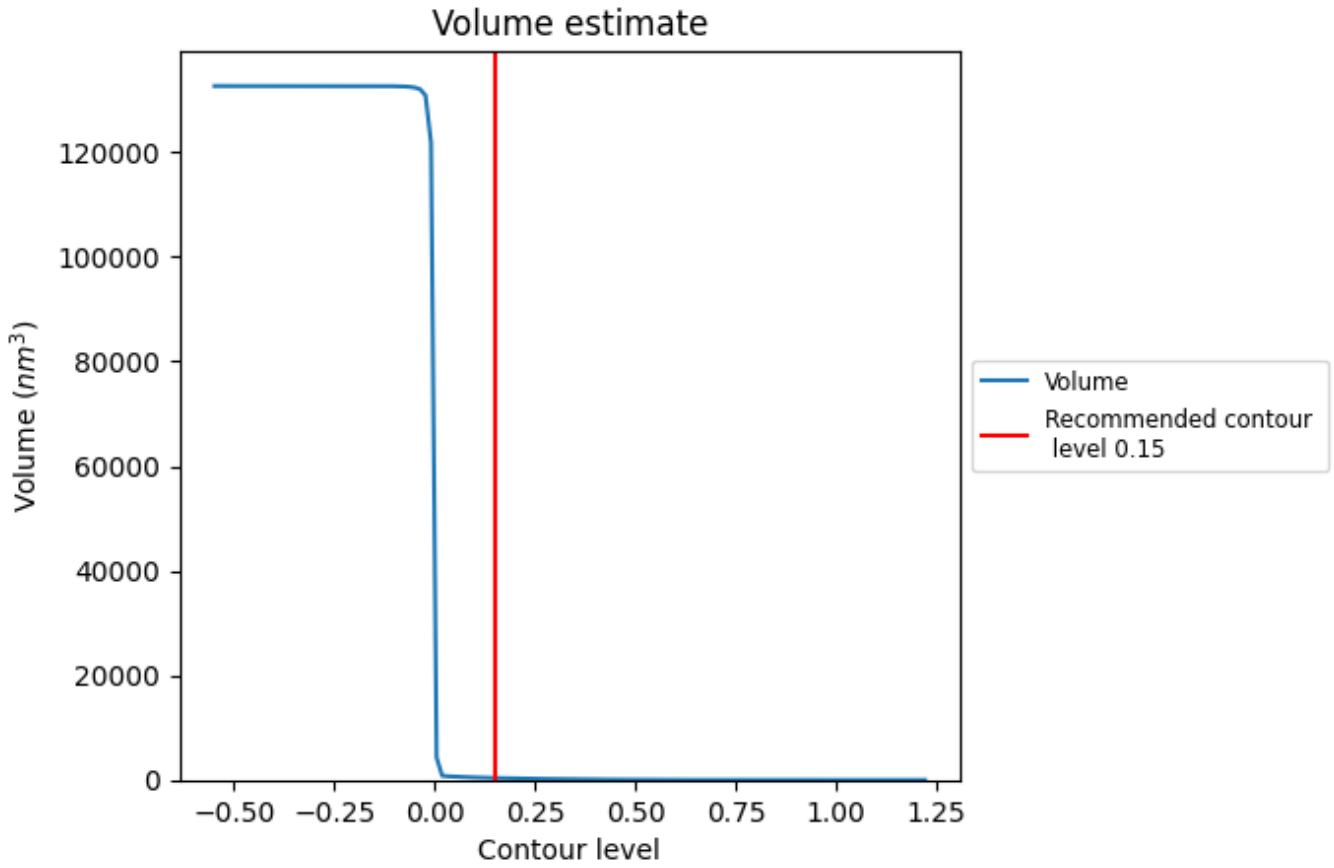
This section contains the results of statistical analysis of the map.

7.1 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.

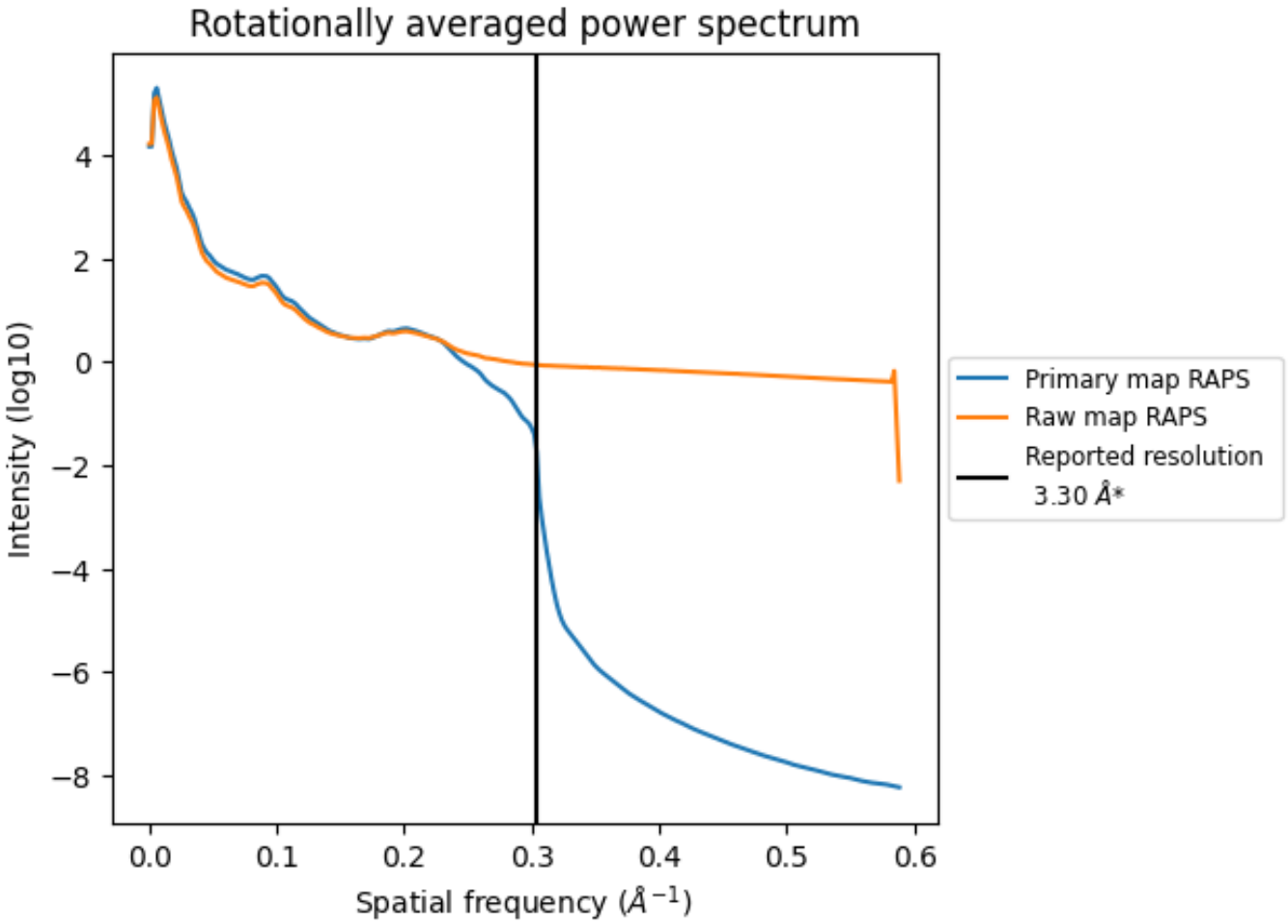
7.2 Volume estimate (i)



The volume at the recommended contour level is 375 nm^3; this corresponds to an approximate mass of 339 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)

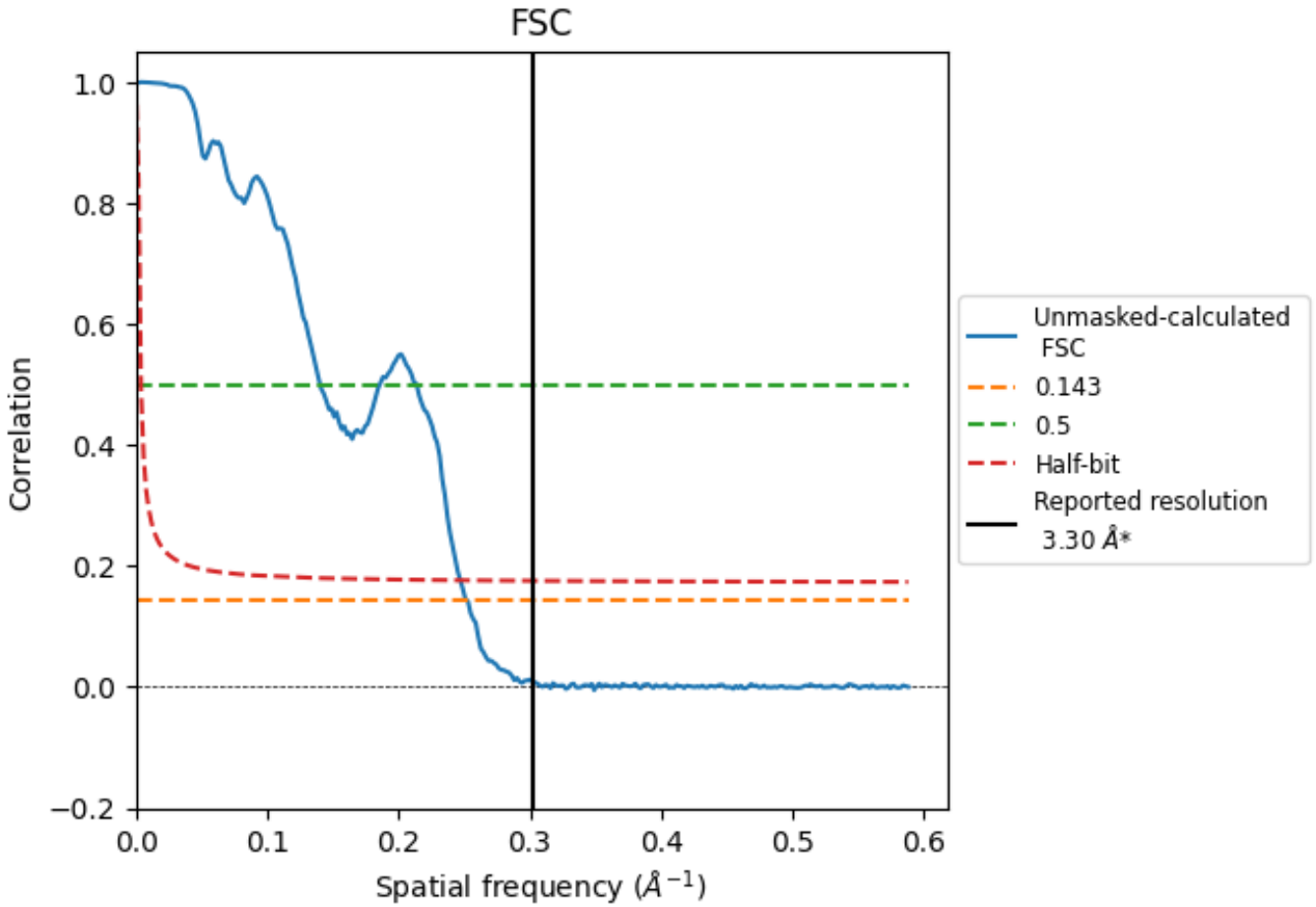


*Reported resolution corresponds to spatial frequency of 0.303 Å^{-1}

8 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.

8.1 FSC



*Reported resolution corresponds to spatial frequency of 0.303 Å^{-1}

8.2 Resolution estimates (i)

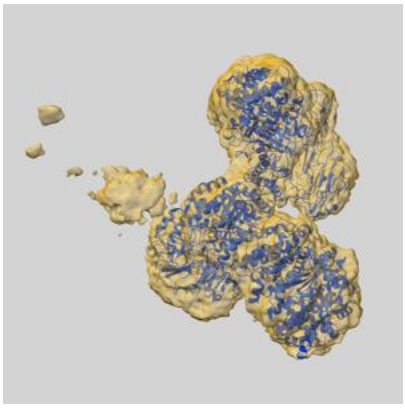
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.30	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.97	7.13	4.05

*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 3.97 differs from the reported value 3.3 by more than 10 %

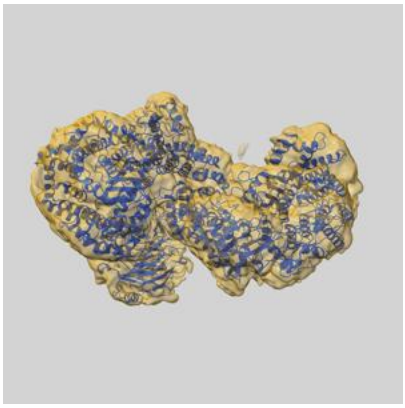
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-39099 and PDB model 8YAH. Per-residue inclusion information can be found in section 3 on page 4.

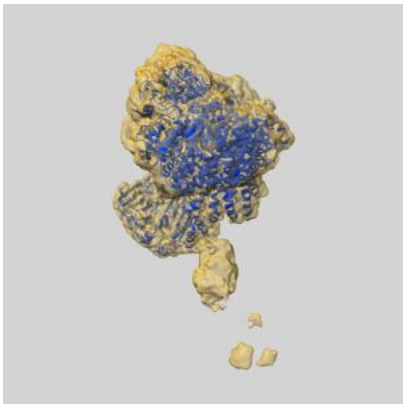
9.1 Map-model overlay



X



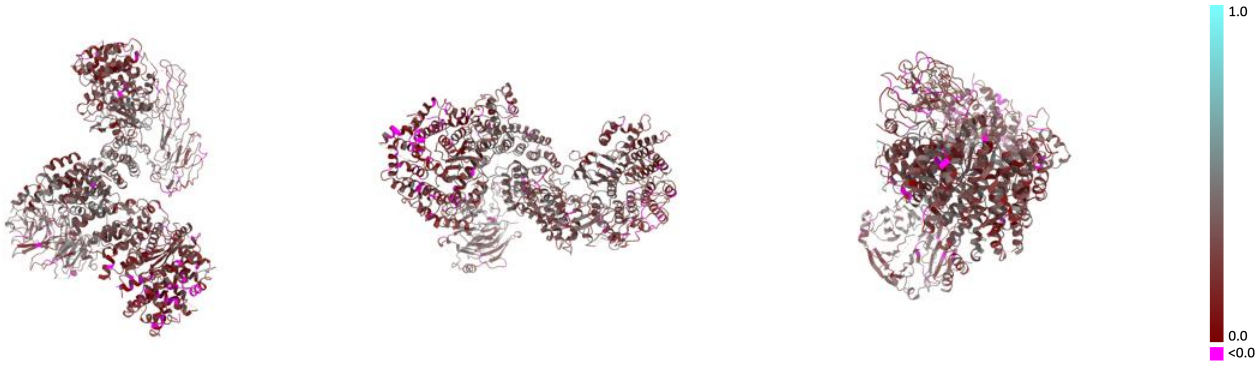
Y



Z

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.

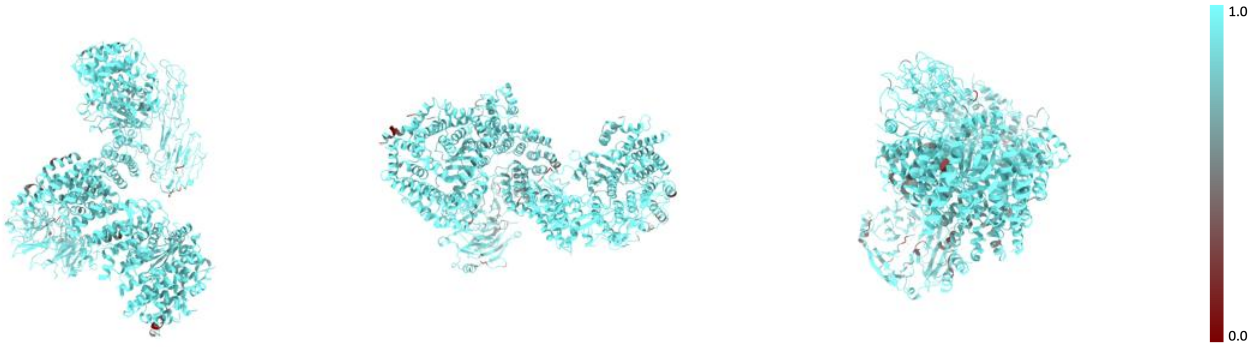
9.2 Q-score mapped to coordinate model (i)



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.

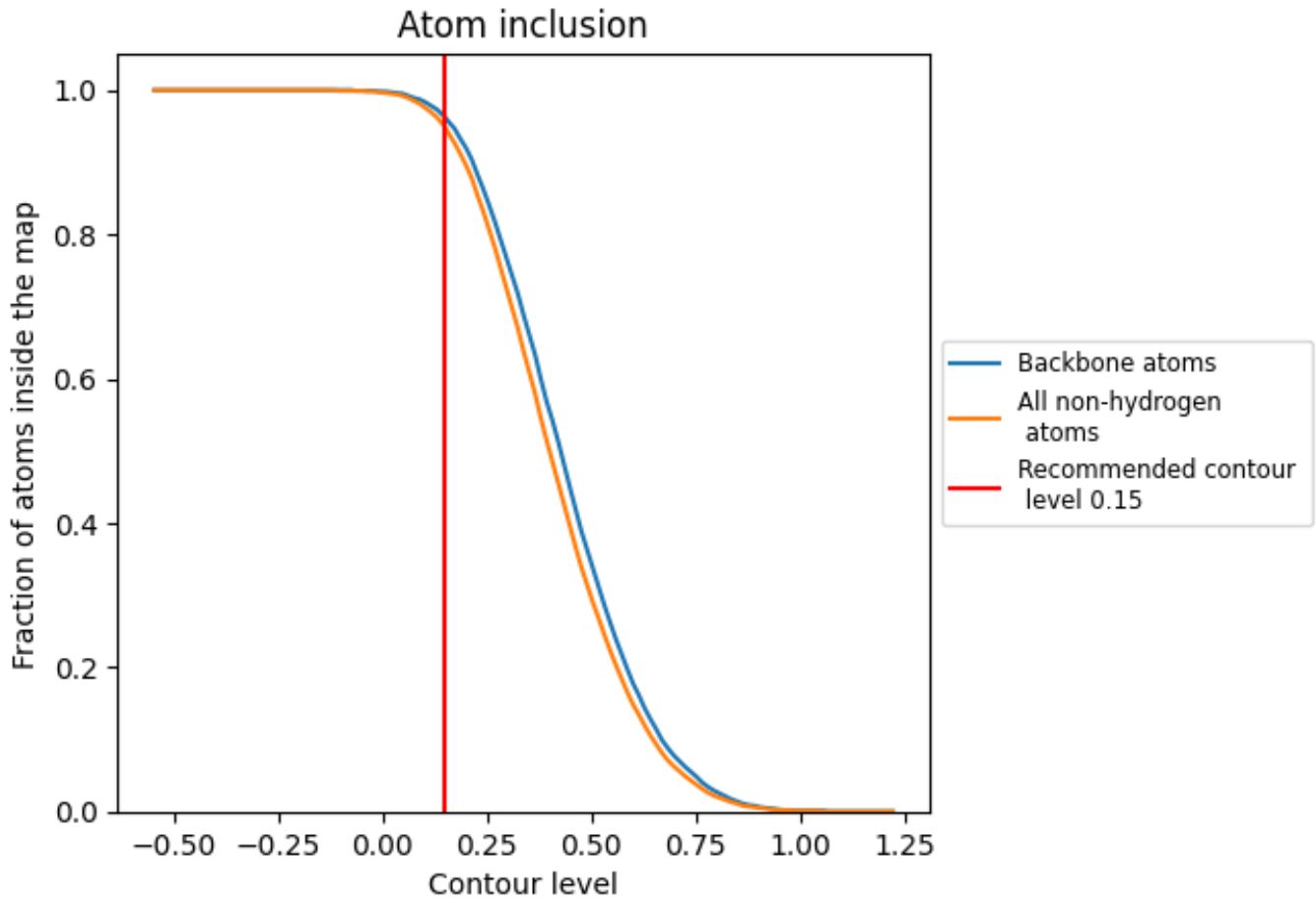
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.15).

9.4 Atom inclusion (i)



At the recommended contour level, 96% of all backbone atoms, 95% 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 (0.15) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9480	0.2860
A	0.9480	0.2590
B	0.9460	0.3060
C	0.9530	0.2230
D	0.9170	0.3220
E	0.9680	0.2990