Full wwPDB EM Validation Report

May 18, 2025 – 09:50 PM EDT

PDB ID	:	8DTI / pdb_00008dti
EMDB ID	:	EMD-27699
Title	:	Cryo-EM structure of Arabidopsis SPY in complex with GDP-fucose
Authors	:	Kumar, S.; Zhou, Y.; Dillard, L.; Borgnia, M.J.; Bartesaghi, A.; Zhou, P.
Deposited on	:	2022-07-25
Resolution	:	3.80 Å(reported)

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 ⓘ) were used in the production of this report:

EMDB validation analysis	:	0.0.1.dev118
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	FAILED
buster-report	:	1.1.7 (2018)
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)	:	2.43.1

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 3.80 Å.

There are no overall percentile quality scores available for this entry.

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

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 9455 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 Probable UDP-N-acetylglucosamine--peptide N-acetylglucosaminyltransferase SPINDLY.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	629	Total	C	N	O	S	0	0
			4684	2990	790	872	32		
1	B	629	Total	C	N	O	S	0	0
			4695	2996	794	874	31		

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	915	GLY	-	expression tag	UNP Q96301
A	916	GLY	-	expression tag	UNP Q96301
A	917	SER	-	expression tag	UNP Q96301
A	918	GLU	-	expression tag	UNP Q96301
A	919	ASN	-	expression tag	UNP Q96301
A	920	LEU	-	expression tag	UNP Q96301
A	921	TYR	-	expression tag	UNP Q96301
A	922	PHE	-	expression tag	UNP Q96301
A	923	GLN	-	expression tag	UNP Q96301
A	924	GLY	-	expression tag	UNP Q96301
A	925	GLY	-	expression tag	UNP Q96301
A	926	SER	-	expression tag	UNP Q96301
A	927	HIS	-	expression tag	UNP Q96301
A	928	HIS	-	expression tag	UNP Q96301
A	929	HIS	-	expression tag	UNP Q96301
A	930	HIS	-	expression tag	UNP Q96301
A	931	HIS	-	expression tag	UNP Q96301
A	932	HIS	-	expression tag	UNP Q96301
A	933	HIS	-	expression tag	UNP Q96301
A	934	HIS	-	expression tag	UNP Q96301
A	935	HIS	-	expression tag	UNP Q96301
A	936	HIS	-	expression tag	UNP Q96301
A	937	GLY	-	expression tag	UNP Q96301
A	938	GLY	-	expression tag	UNP Q96301
A	939	TRP	-	expression tag	UNP Q96301

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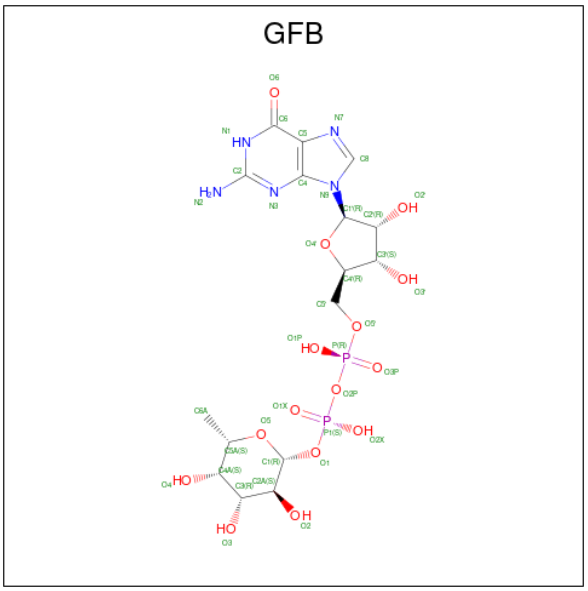
Chain	Residue	Modelled	Actual	Comment	Reference
A	940	SER	-	expression tag	UNP Q96301
A	941	HIS	-	expression tag	UNP Q96301
A	942	PRO	-	expression tag	UNP Q96301
A	943	GLN	-	expression tag	UNP Q96301
A	944	PHE	-	expression tag	UNP Q96301
A	945	GLU	-	expression tag	UNP Q96301
A	946	LYS	-	expression tag	UNP Q96301
B	915	GLY	-	expression tag	UNP Q96301
B	916	GLY	-	expression tag	UNP Q96301
B	917	SER	-	expression tag	UNP Q96301
B	918	GLU	-	expression tag	UNP Q96301
B	919	ASN	-	expression tag	UNP Q96301
B	920	LEU	-	expression tag	UNP Q96301
B	921	TYR	-	expression tag	UNP Q96301
B	922	PHE	-	expression tag	UNP Q96301
B	923	GLN	-	expression tag	UNP Q96301
B	924	GLY	-	expression tag	UNP Q96301
B	925	GLY	-	expression tag	UNP Q96301
B	926	SER	-	expression tag	UNP Q96301
B	927	HIS	-	expression tag	UNP Q96301
B	928	HIS	-	expression tag	UNP Q96301
B	929	HIS	-	expression tag	UNP Q96301
B	930	HIS	-	expression tag	UNP Q96301
B	931	HIS	-	expression tag	UNP Q96301
B	932	HIS	-	expression tag	UNP Q96301
B	933	HIS	-	expression tag	UNP Q96301
B	934	HIS	-	expression tag	UNP Q96301
B	935	HIS	-	expression tag	UNP Q96301
B	936	HIS	-	expression tag	UNP Q96301
B	937	GLY	-	expression tag	UNP Q96301
B	938	GLY	-	expression tag	UNP Q96301
B	939	TRP	-	expression tag	UNP Q96301
B	940	SER	-	expression tag	UNP Q96301
B	941	HIS	-	expression tag	UNP Q96301
B	942	PRO	-	expression tag	UNP Q96301
B	943	GLN	-	expression tag	UNP Q96301
B	944	PHE	-	expression tag	UNP Q96301
B	945	GLU	-	expression tag	UNP Q96301
B	946	LYS	-	expression tag	UNP Q96301

- Molecule 2 is GUANOSINE-5'-DIPHOSPHATE-BETA-L-FUCOPYRANOSE (CCD ID: GFB) (formula: $C_{16}H_{25}N_5O_{15}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
2	A	1	Total	C	N	O	P	0
			38	16	5	15	2	
2	B	1	Total	C	N	O	P	0
			38	16	5	15	2	

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	182947	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 ($e^-/Å^2$)	52.4	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	56.301	Depositor
Minimum map value	-41.943	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.976	Depositor
Recommended contour level	5.4	Depositor
Map size (Å)	345.6, 345.6, 345.6	wwPDB
Map dimensions	320, 320, 320	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.08, 1.08, 1.08	Depositor

4 Model quality

4.1 Standard geometry

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

4.2 Too-close contacts

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

4.3 Torsion angles

4.3.1 Protein backbone

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

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

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

4.5 Carbohydrates

There are no oligosaccharides in this entry.

4.6 Ligand geometry

2 ligands 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	$\#\|Z\| > 2$
2	GFB	B	1001	-	36,41,41	2.83	15 (41%)	46,64,64	1.30	7 (15%)
2	GFB	A	1001	-	36,41,41	2.84	15 (41%)	46,64,64	1.29	7 (15%)

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
2	GFB	B	1001	-	-	4/17/57/57	0/4/4/4
2	GFB	A	1001	-	-	4/17/57/57	0/4/4/4

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	GFB	C2-N2	6.56	1.49	1.34
2	B	1001	GFB	C2-N2	6.54	1.49	1.34
2	A	1001	GFB	C4-N3	5.62	1.50	1.37
2	B	1001	GFB	C4-N3	5.61	1.50	1.37
2	A	1001	GFB	O4'-C4'	-5.32	1.33	1.45
2	B	1001	GFB	O4'-C4'	-5.27	1.33	1.45
2	A	1001	GFB	P-O2P	5.15	1.65	1.59
2	B	1001	GFB	P-O2P	5.07	1.65	1.59
2	B	1001	GFB	C2-N3	5.07	1.45	1.33
2	A	1001	GFB	C2-N3	5.07	1.45	1.33
2	B	1001	GFB	P1-O2P	4.37	1.64	1.59
2	A	1001	GFB	P1-O2P	4.27	1.64	1.59
2	B	1001	GFB	C2-N1	3.96	1.47	1.37
2	A	1001	GFB	C2-N1	3.96	1.47	1.37
2	B	1001	GFB	C6-N1	3.85	1.43	1.37
2	A	1001	GFB	C6-N1	3.83	1.43	1.37
2	B	1001	GFB	C5-C6	3.76	1.54	1.47
2	A	1001	GFB	C5-C6	3.71	1.54	1.47
2	B	1001	GFB	O2'-C2'	3.55	1.51	1.43
2	A	1001	GFB	O2'-C2'	3.52	1.51	1.43
2	A	1001	GFB	C4A-C3	-2.87	1.44	1.52
2	B	1001	GFB	C4A-C3	-2.81	1.45	1.52
2	B	1001	GFB	P1-O1	2.59	1.67	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	GFB	P1-O1	2.59	1.67	1.59
2	B	1001	GFB	C5-C4	-2.46	1.37	1.43
2	A	1001	GFB	C5-C4	-2.44	1.37	1.43
2	A	1001	GFB	P-O5'	2.38	1.68	1.59
2	B	1001	GFB	P-O5'	2.36	1.68	1.59
2	A	1001	GFB	O3'-C3'	-2.33	1.37	1.43
2	B	1001	GFB	O3'-C3'	-2.31	1.37	1.43

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	1001	GFB	C8-N7-C5	3.29	108.15	102.55
2	B	1001	GFB	C8-N7-C5	3.27	108.11	102.55
2	B	1001	GFB	C5-C6-N1	3.00	119.79	114.07
2	A	1001	GFB	C5-C6-N1	2.99	119.77	114.07
2	B	1001	GFB	C2-N1-C6	-2.97	119.67	125.11
2	A	1001	GFB	C2-N1-C6	-2.95	119.70	125.11
2	B	1001	GFB	O5-C1-O1	-2.88	107.61	111.36
2	A	1001	GFB	O5-C1-O1	-2.86	107.62	111.36
2	B	1001	GFB	C1-O5-C5A	-2.26	109.78	113.63
2	A	1001	GFB	C1-O5-C5A	-2.23	109.82	113.63
2	B	1001	GFB	O6-C6-C5	-2.16	120.03	124.32
2	A	1001	GFB	O6-C6-C5	-2.13	120.10	124.32
2	B	1001	GFB	C6A-C5A-C4A	-2.11	109.21	113.08
2	A	1001	GFB	C6A-C5A-C4A	-2.10	109.24	113.08

There are no chirality outliers.

All (8) torsion outliers are listed below:

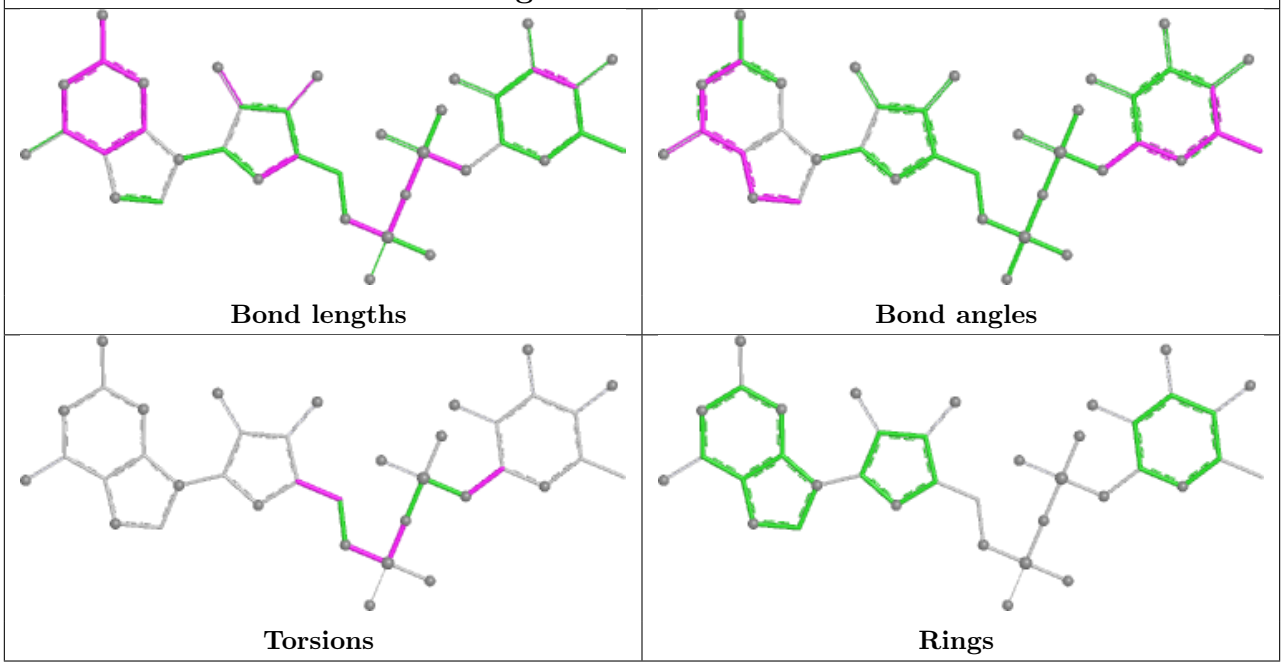
Mol	Chain	Res	Type	Atoms
2	A	1001	GFB	O5-C1-O1-P1
2	B	1001	GFB	O5-C1-O1-P1
2	A	1001	GFB	P1-O2P-P-O5'
2	B	1001	GFB	P1-O2P-P-O5'
2	A	1001	GFB	C5'-O5'-P-O3P
2	B	1001	GFB	C5'-O5'-P-O3P
2	A	1001	GFB	O4'-C4'-C5'-O5'
2	B	1001	GFB	O4'-C4'-C5'-O5'

There are no ring outliers.

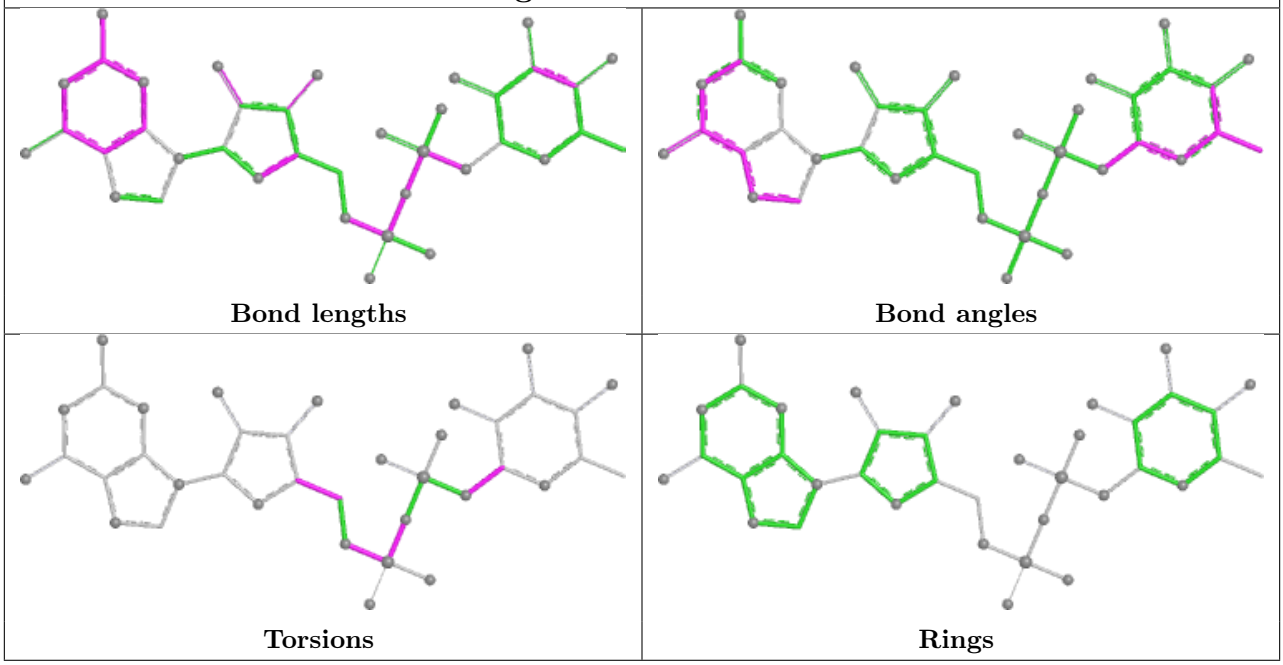
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand GFB B 1001



Ligand GFB A 1001



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.

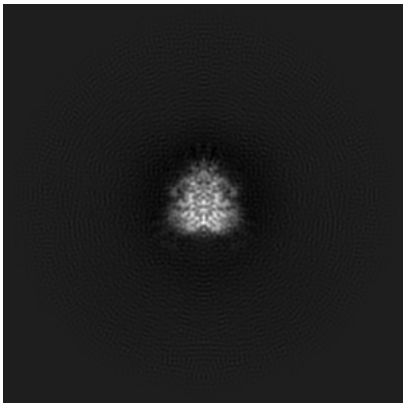
5 Map visualisation

This section contains visualisations of the EMDB entry EMD-27699. These allow visual inspection of the internal detail of the map and identification of artifacts.

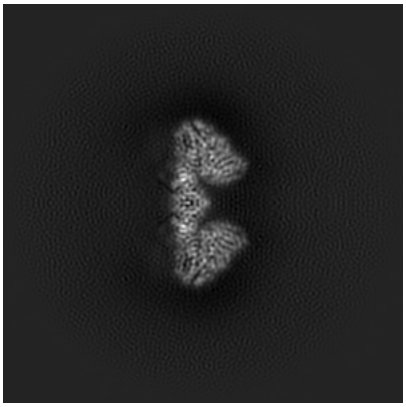
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

5.1 Orthogonal projections

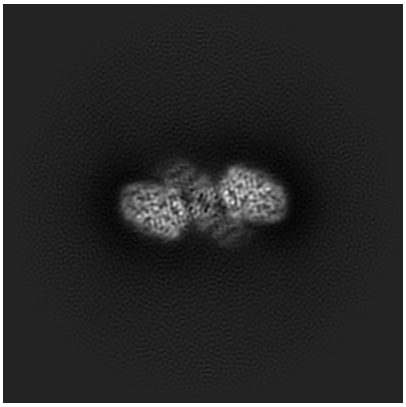
5.1.1 Primary map



X



Y

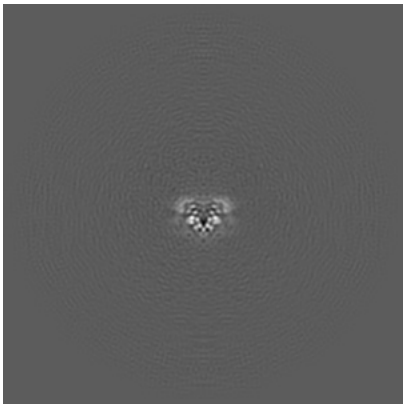


Z

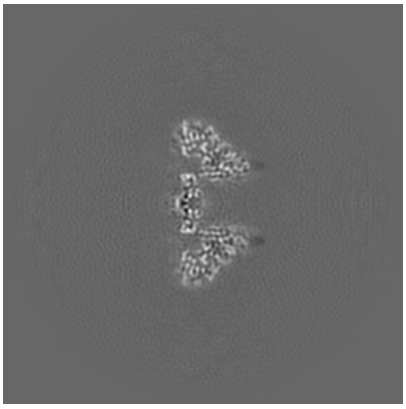
The images above show the map projected in three orthogonal directions.

5.2 Central slices

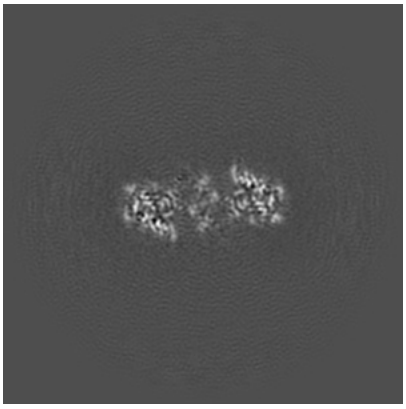
5.2.1 Primary map



X Index: 160



Y Index: 160

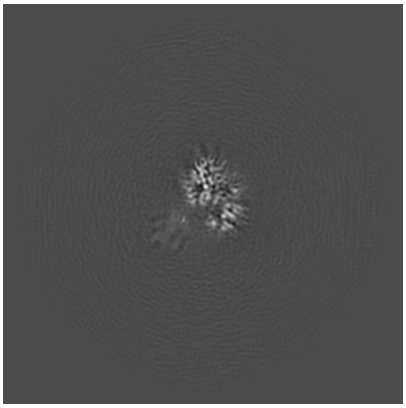


Z Index: 160

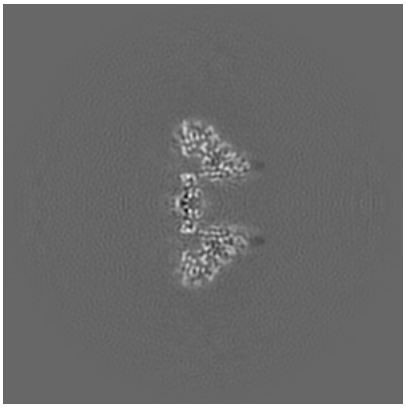
The images above show central slices of the map in three orthogonal directions.

5.3 Largest variance slices (i)

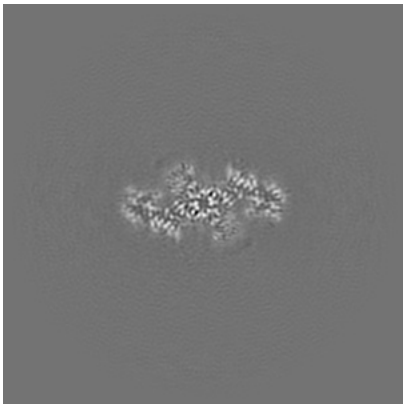
5.3.1 Primary map



X Index: 188



Y Index: 160

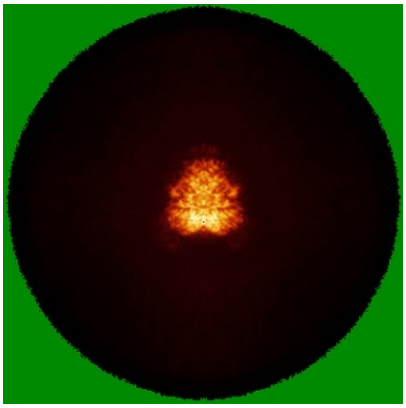


Z Index: 149

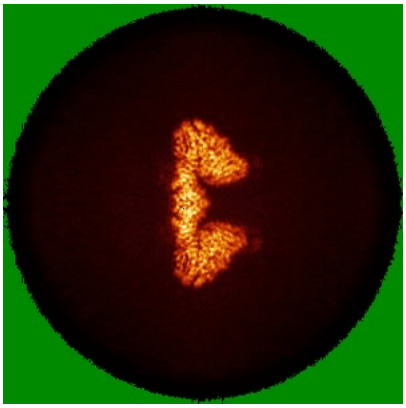
The images above show the largest variance slices of the map in three orthogonal directions.

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

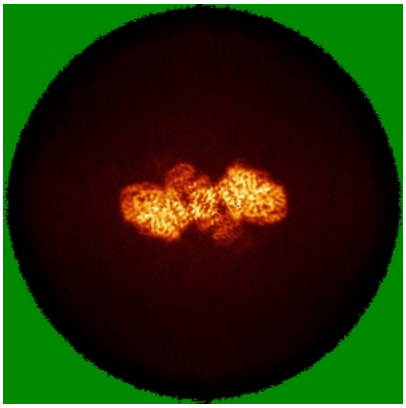
5.4.1 Primary map



X



Y



Z

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 5.4. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

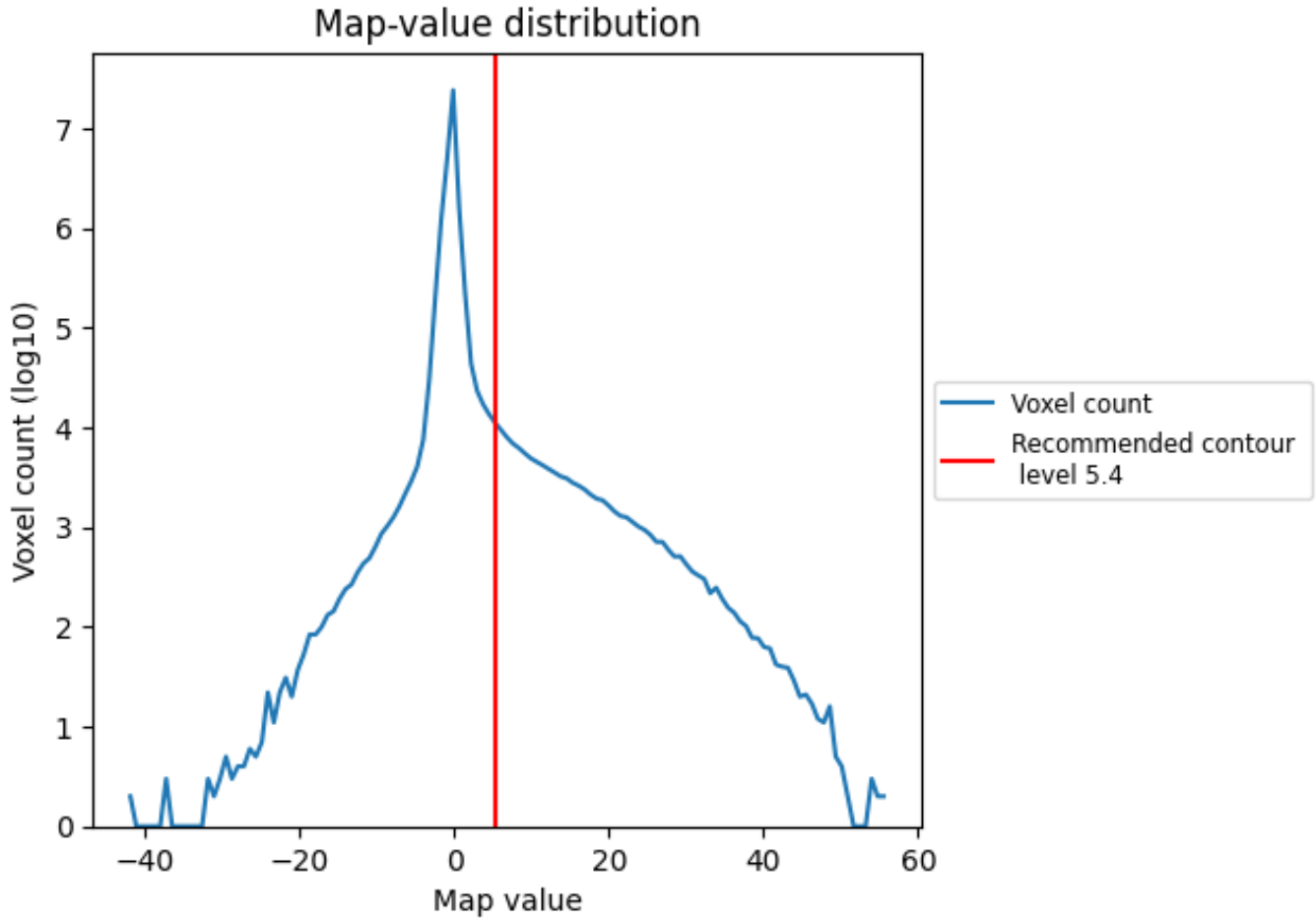
5.6 Mask visualisation (i)

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

6 Map analysis

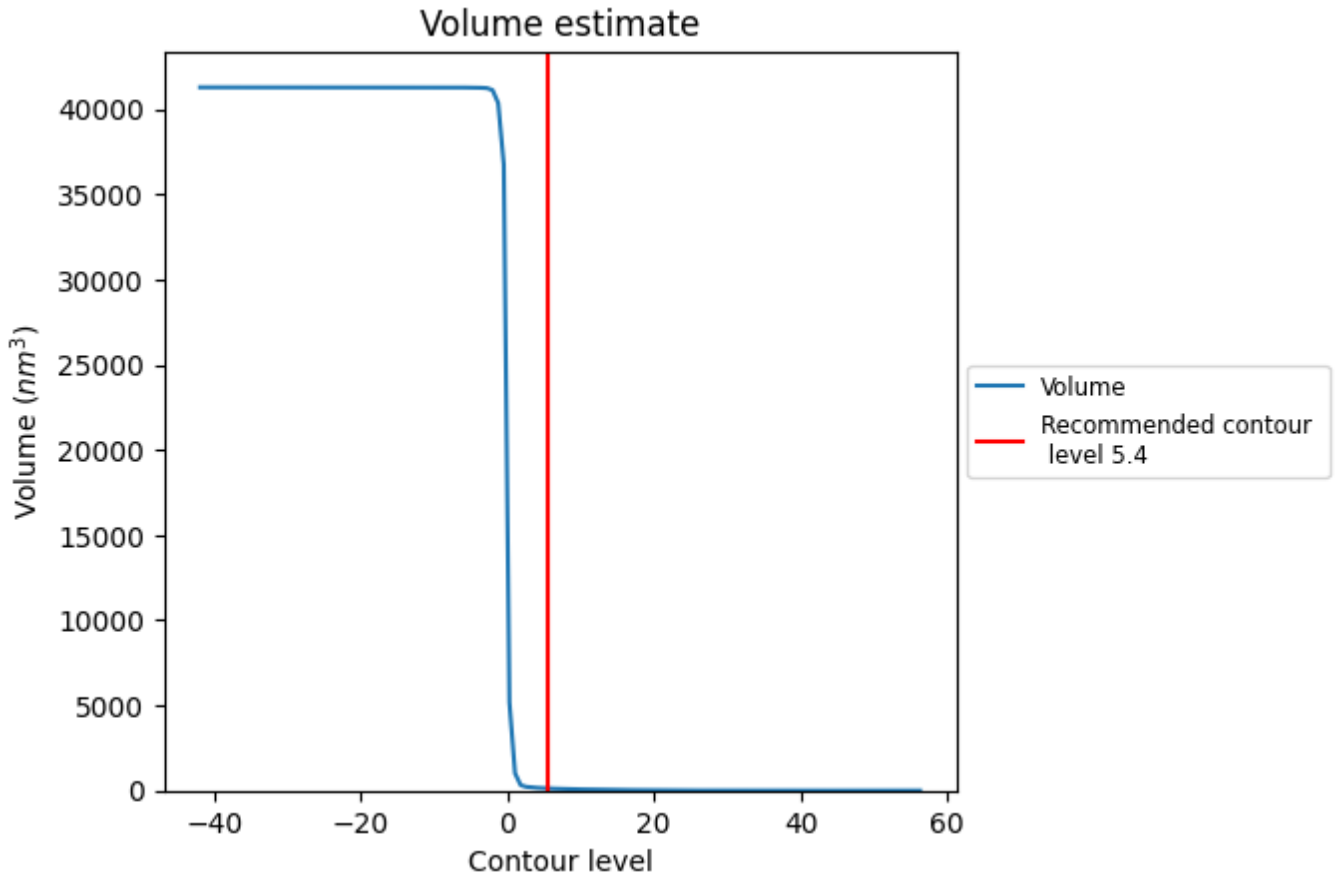
This section contains the results of statistical analysis of the map.

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.

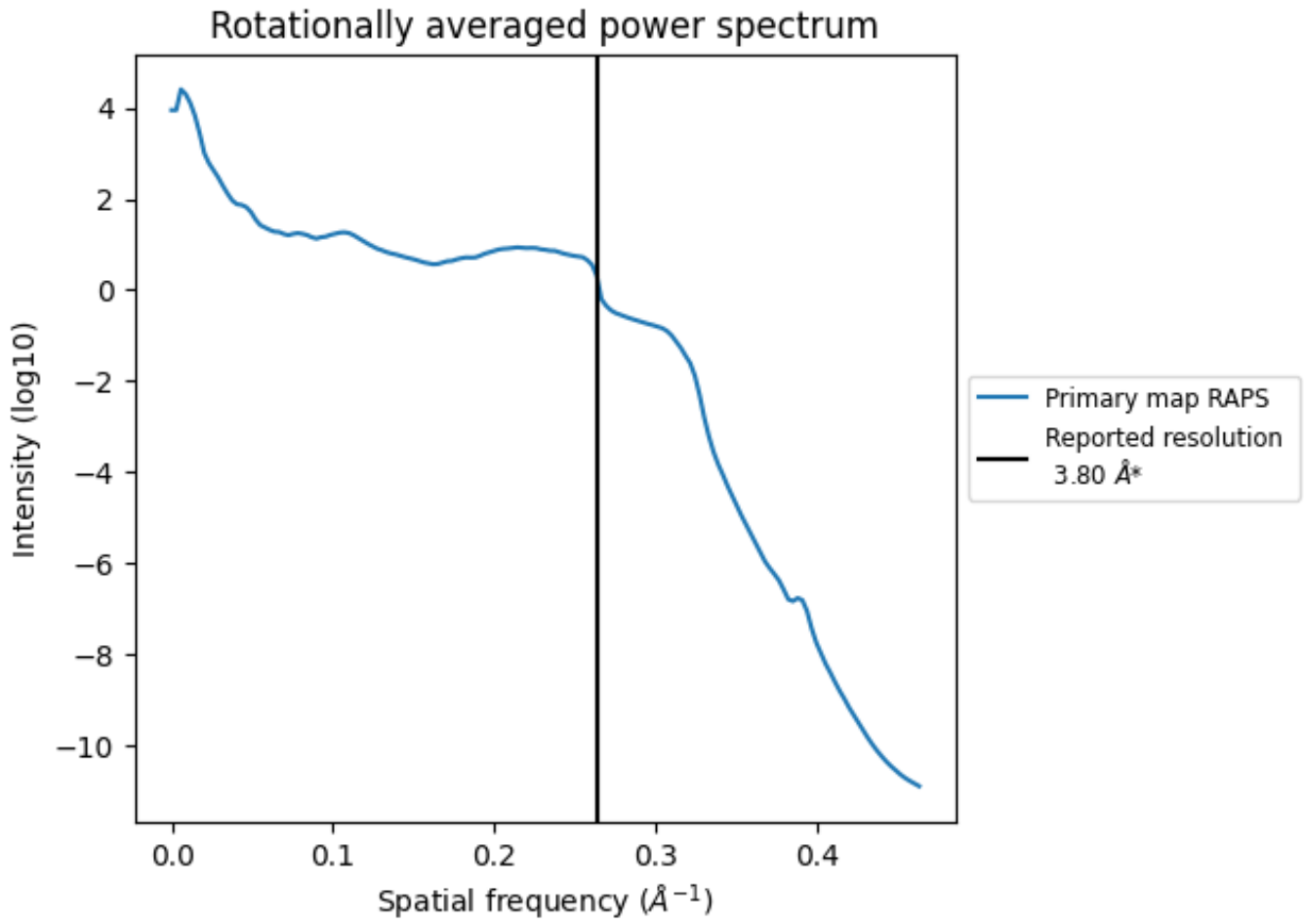
6.2 Volume estimate



The volume at the recommended contour level is 128 nm^3; this corresponds to an approximate mass of 116 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)

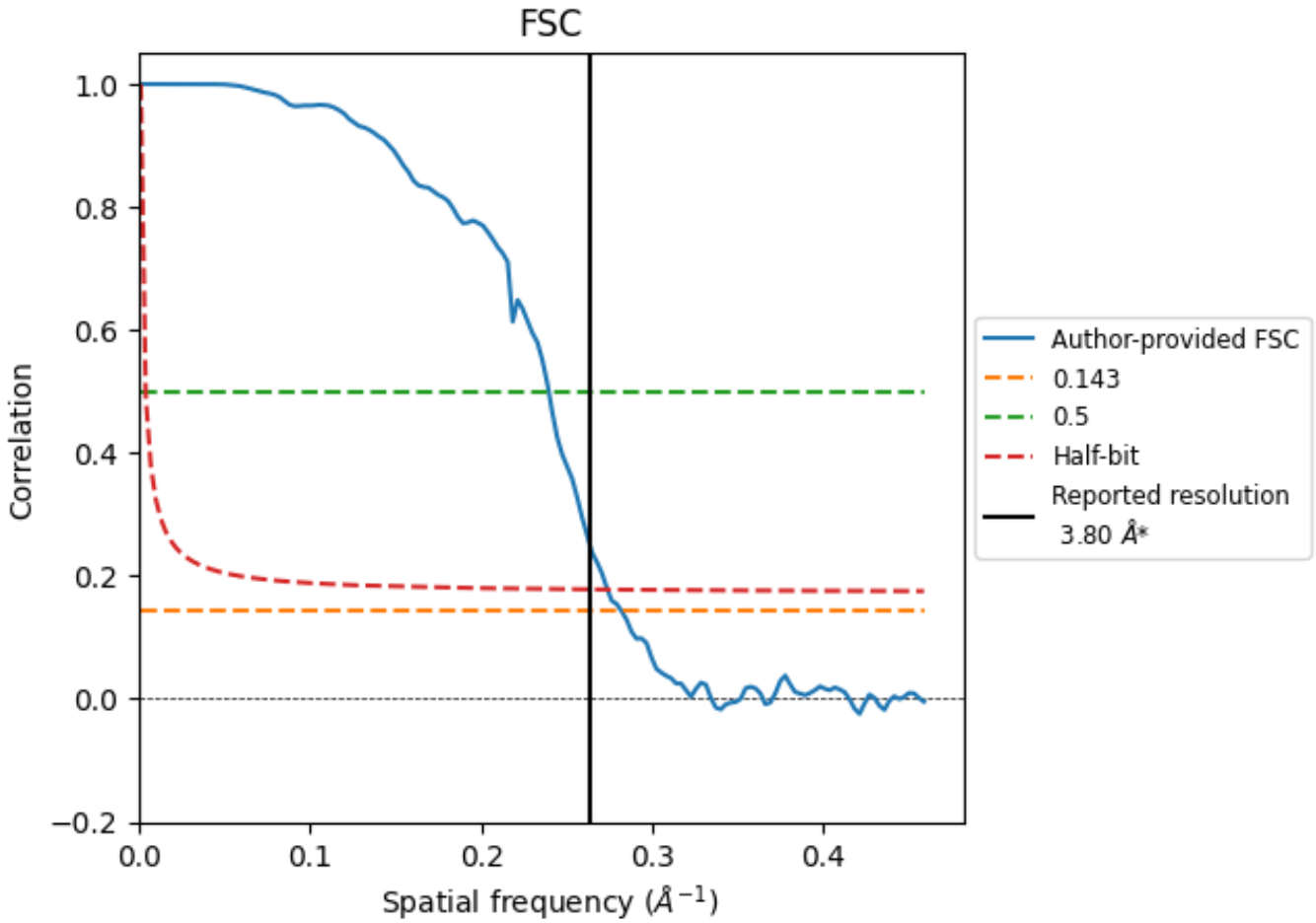


*Reported resolution corresponds to spatial frequency of 0.263 Å^{-1}

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 0.263 $Å^{-1}$

7.2 Resolution estimates (i)

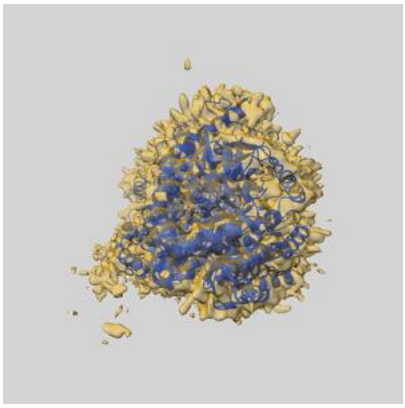
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.80	-	-
Author-provided FSC curve	3.55	4.18	3.65
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

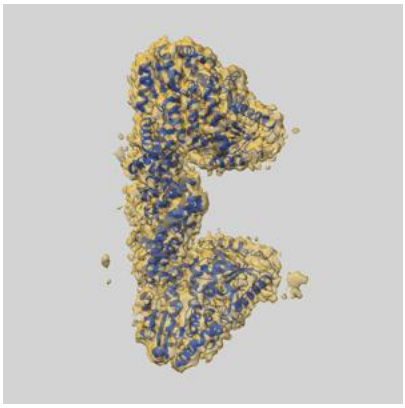
8 Map-model fit

This section contains information regarding the fit between EMDB map EMD-27699 and PDB model 8DTI. Per-residue inclusion information can be found in section ?? on page ??.

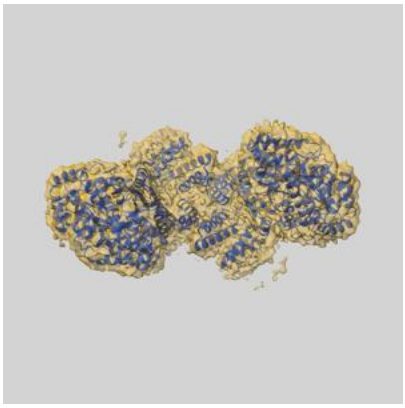
8.1 Map-model overlay



X



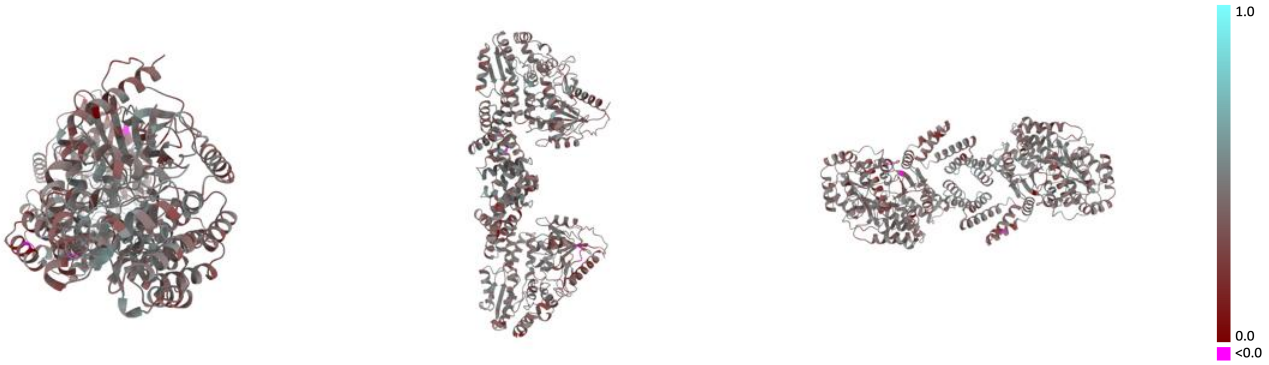
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 5.4 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 (i)



X Y Z

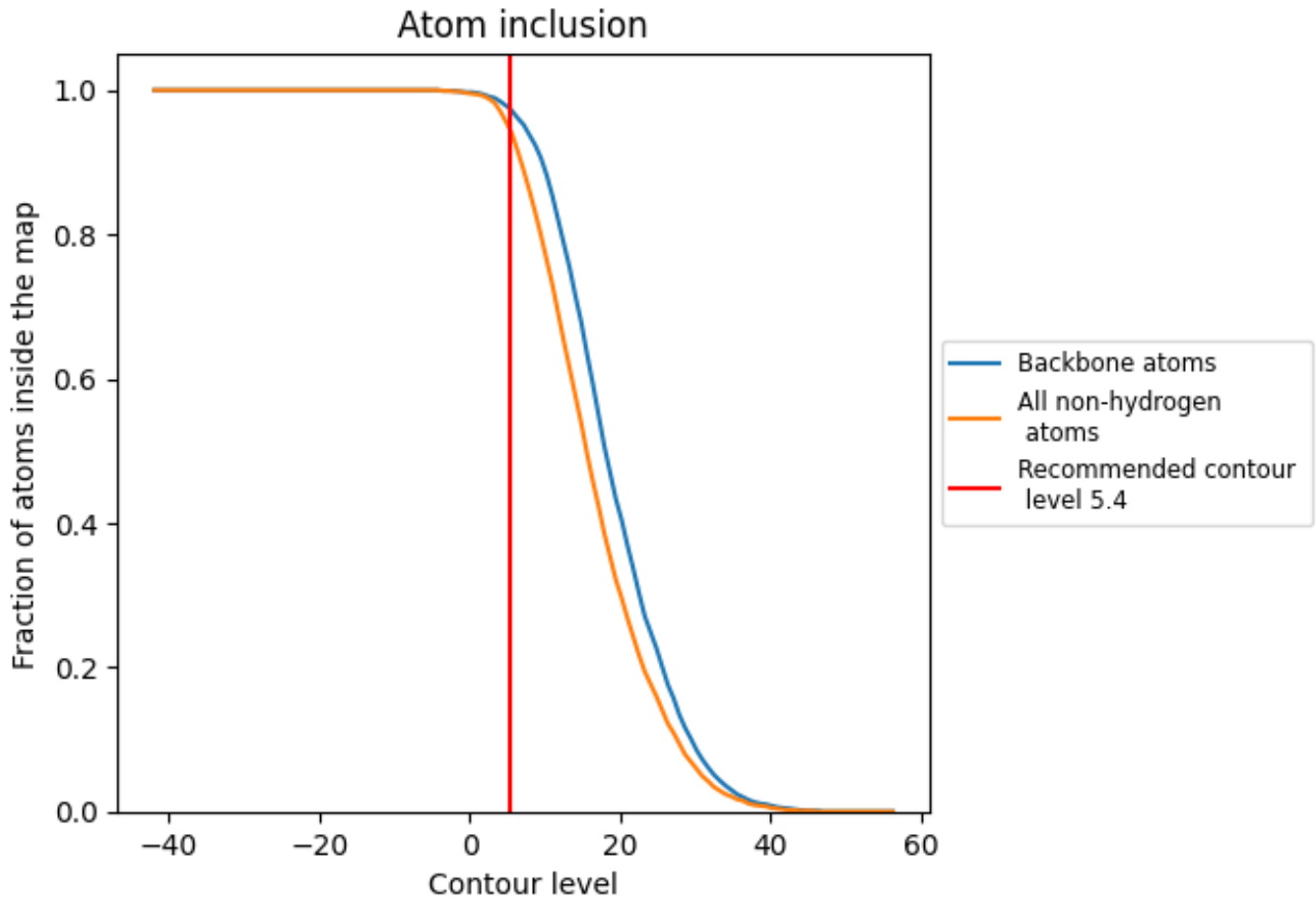
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

8.3 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 (5.4).

8.4 Atom inclusion (i)



At the recommended contour level, 97% of all backbone atoms, 94% of all non-hydrogen atoms, are inside the map.

8.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (5.4) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9450	0.4120
A	0.9350	0.4020
B	0.9550	0.4210