



wwPDB EM Validation Summary Report ⓘ

Nov 10, 2024 – 03:55 pm GMT

PDB ID : 8PSK
EMDB ID : EMD-17854
Title : Asymmetric unit of the yeast fatty acid synthase in the non-rotated state with ACP at the ketosynthase domain (FASx sample)
Authors : Singh, K.; Bunzel, G.; Graf, B.; Yip, K.M.; Stark, H.; Chari, A.
Deposited on : 2023-07-13
Resolution : 2.80 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.dev113
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
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) : 2.39

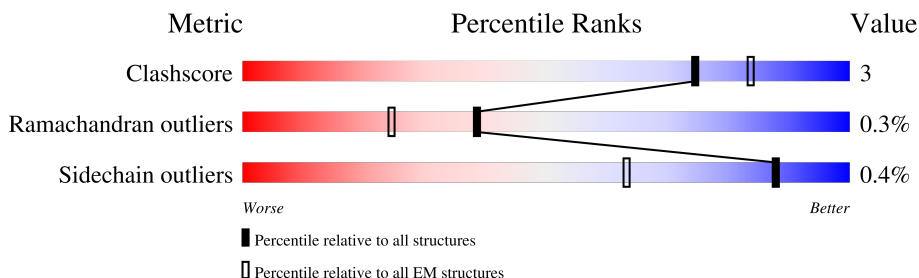
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	1887	<div> <div>9%</div> <div>77%</div> <div>7%</div> <div>16%</div> </div>
1	B	1887	<div> <div>8%</div> <div>91%</div> </div>
2	G	2051	<div> <div>7%</div> <div>90%</div> <div>9%</div> </div>

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 29604 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.

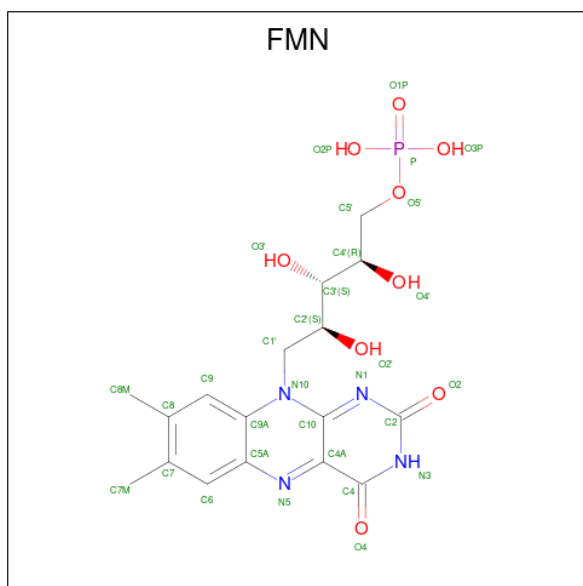
- Molecule 1 is a protein called Fatty acid synthase subunit alpha.

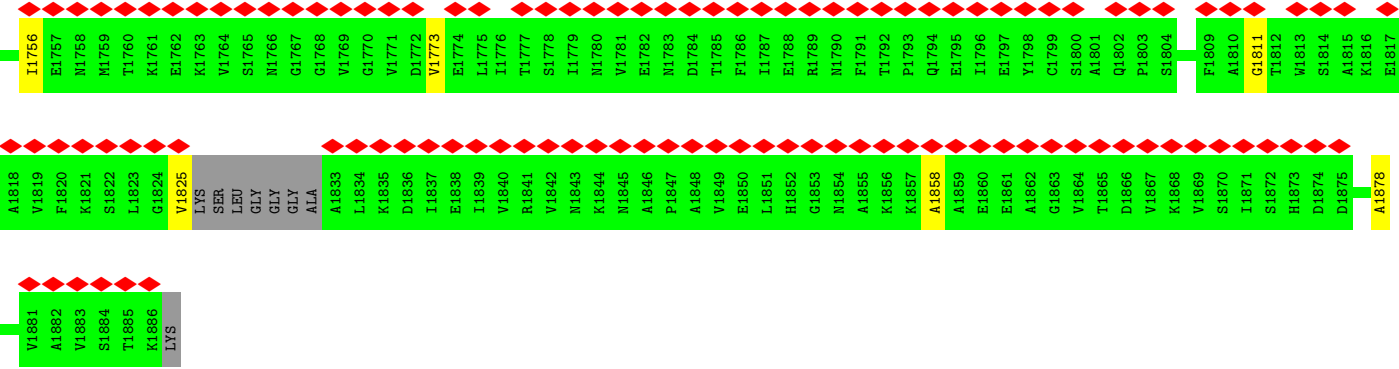
Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1579	Total	C	N	O	S	0	0
			12346	7817	2084	2398	47		
1	B	163	Total	C	N	O	S	0	0
			1223	775	205	240	3		

- Molecule 2 is a protein called Fatty acid synthase subunit beta.

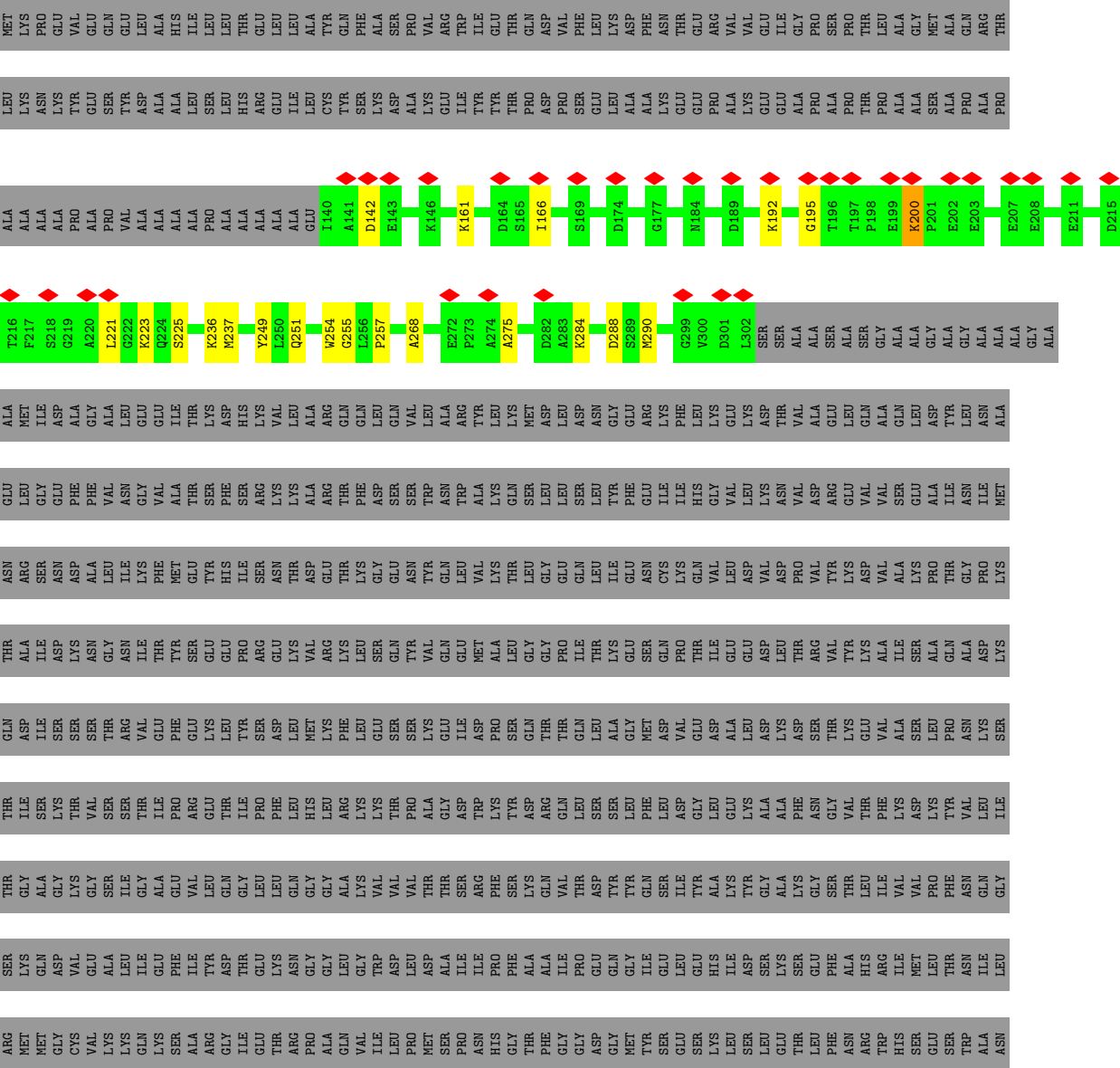
Mol	Chain	Residues	Atoms					AltConf	Trace
2	G	2034	Total	C	N	O	S	0	0
			16004	10258	2661	3029	56		

- Molecule 3 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).

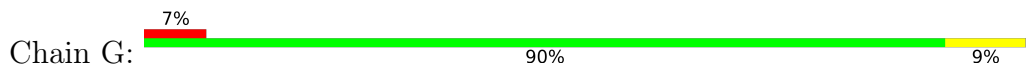




● Molecule 1: Fatty acid synthase subunit alpha



- Molecule 2: Fatty acid synthase subunit beta



T2015	D1903	L1746	L1489	E849	F496	C269	T89	MET
E2024	D1908	K1747	L1464	M850	R526	A270	E90	ASP
V2029	F1916	T1748	L1471	I854	D538	T271	F91	ALA
Y2030	L1919	I1751	E1471	H855	E546	S274	N93	TRR
D2031	Q1920	I1755	K1476	L864	D287	D287	L96	S5
T2032	K1921	Y1762	S1481	F868	S291	S291	E97	T6
T2033	I1922	K1763	S1482	D869	F292	F292	G98	R7
G2034	D1923	T1777	T1526	E870	L586	F293	A105	P8
E2040	I1924	P1778	V1531	N874	L593	V296	E111	H13
Q2050	E1926	P1779	L1542	F899	M597	V302	E112	G14
SER	L1927	K1795	P1547	A905	T598	I306	N113	S15
	Q1928	T1803	F1584	A915	C600	T114	T114	L16
	K1929	F1804	V1596	T916	T601	T119	T119	E17
	S1930	A1805	V1616	M917	V602	I123	I123	L20
	L1931	E1811	D1614	V922	G623	I127	I127	L21
	S1932	V1840	M1615	L926	K643	R130	R130	V22
	E1933	D1845	V1629	M1265	L651	I131	I131	P23
	E1935	E1846	V1638	D1272	M658	M132	M132	A25
	V1936	L1847	K1639	E1316	W661	D138	D138	S26
	E1937	G1848	T1642	G1330	V690	N142	N142	F27
	L1940	F1941	V1650	D1316	E693	E151	E151	F28
	F1941	E1942	L1651	G1330	K701	Q155	Q155	L33
	I1943	I1857	L1651	I1335	K706	A158	A158	Q34
	I1944	R1861	I1657	I1338	H741	I159	I159	E35
	E1945	V1862	T1663	F1339	S755	D167	D167	K39
	E1946	A1863	F1664	P1340	R759	V184	V184	I40
	S1947	A1864	V1665	V1048	S769	G185	G185	L41
	K1949	S1865	T1667	L1054	R759	D186	D186	P42
	K1950	Q1868	T1667	F1103	S769	L187	L187	E43
	S1951	L1871	S1671	V1109	D790	D204	D204	E46
	A1952	K1876	Q1672	ASP	L800	K207	K207	G47
	V1953	E1876	E1673	VAL	M806	D229	D229	F48
	P1955	R1877	Q1674	GLN	A808	Y230	Y230	A49
	R1956	V1878	I1711	GLN	V811	I234	I234	A50
	P1957	L1881	E1739	ASP	A817	P235	P235	D51
	L1958	L1885	T1740	SER	S848	I236	I236	D52
	K1959	L1885	I1741	ASP		S237	S237	L55
	E1961	I1888	V1742	SER		T494	T494	E73
	R1962	I1888	D1743	SER		L246	L246	F74
	G1963	N1892	G1744	VAL		K268	K268	S75
	F1964	Y1898	K1745	SER				K76
	V1970							V77
	G1971							G78
	K1986							F80
	P1987							D81
	Y2010							Q82
								V83
								L86
								C87
								L88

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	252925	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 ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	5000	Depositor
Maximum defocus (nm)	25000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.234	Depositor
Minimum map value	-0.108	Depositor
Average map value	-0.002	Depositor
Map value standard deviation	0.012	Depositor
Recommended contour level	0.04	Depositor
Map size (Å)	253.19998, 253.19998, 253.19998	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.055, 1.055, 1.055	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: FMN

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	0.68	0/12579	0.83	2/17001 (0.0%)
1	B	0.67	0/1241	0.79	0/1675
2	G	0.64	0/16369	0.80	0/22210
All	All	0.66	0/30189	0.81	2/40886 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1515	ARG	NE-CZ-NH1	7.33	123.97	120.30
1	A	1388	MET	CG-SD-CE	-5.68	91.11	100.20

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	12346	0	12279	69	0
1	B	1223	0	1265	9	0
2	G	16004	0	15984	109	0
3	G	31	0	19	4	0
All	All	29604	0	29547	178	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 3.

The worst 5 of 178 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:1557:ILE:HD11	1:A:1642:THR:HG21	1.72	0.70
2:G:246:LEU:HD13	2:G:296:VAL:HG23	1.76	0.66
2:G:643:LYS:HG3	2:G:1162:ASP:O	1.95	0.66
2:G:287:ASP:OD1	2:G:291:SER:OG	2.14	0.66
2:G:1616:VAL:HG22	2:G:1650:VAL:HG21	1.78	0.65

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	1569/1887 (83%)	1514 (96%)	53 (3%)	2 (0%)	48	77
1	B	161/1887 (8%)	145 (90%)	14 (9%)	2 (1%)	11	34
2	G	2030/2051 (99%)	1921 (95%)	103 (5%)	6 (0%)	37	67
All	All	3760/5825 (64%)	3580 (95%)	170 (4%)	10 (0%)	38	67

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1545	SER
1	A	1585	LYS
1	B	275	ALA
2	G	274	SER
2	G	769	SER

5.3.2 Protein sidechains ⓘ

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	1336/1566 (85%)	1332 (100%)	4 (0%)	91	97
1	B	135/1566 (9%)	131 (97%)	4 (3%)	36	70
2	G	1773/1789 (99%)	1767 (100%)	6 (0%)	91	97
All	All	3244/4921 (66%)	3230 (100%)	14 (0%)	88	96

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	237	MET
2	G	1023	ARG
2	G	1962	ARG
2	G	1942	GLU
2	G	1946	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
2	G	354	ASN
2	G	1595	ASN
2	G	718	ASN
2	G	1872	GLN
2	G	1355	ASN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is 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
3	FMN	G	2101	-	33,33,33	1.28	3 (9%)	48,50,50	1.15	5 (10%)

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
3	FMN	G	2101	-	-	5/18/18/18	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	2101	FMN	C9A-C5A	3.96	1.47	1.41
3	G	2101	FMN	C5A-N5	-2.77	1.34	1.39
3	G	2101	FMN	C8-C7	2.45	1.47	1.40

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	2101	FMN	C4-C4A-N5	3.10	122.65	118.23
3	G	2101	FMN	C4A-C10-N10	2.53	120.18	116.48
3	G	2101	FMN	C10-N1-C2	2.36	121.62	116.90
3	G	2101	FMN	C4A-C10-N1	-2.26	119.50	124.73
3	G	2101	FMN	C10-C4A-N5	-2.07	120.46	124.86

There are no chirality outliers.

All (5) torsion outliers are listed below:

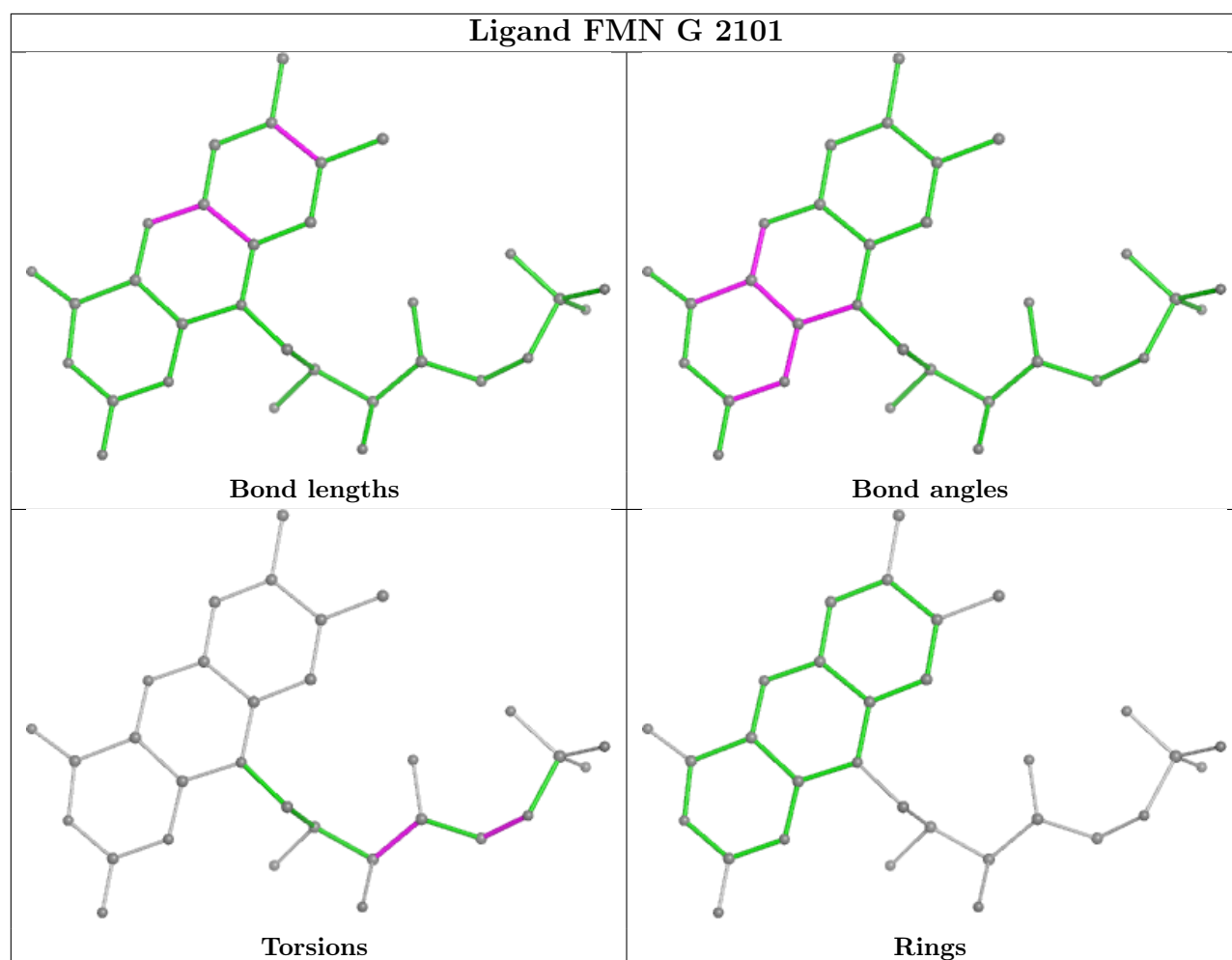
Mol	Chain	Res	Type	Atoms
3	G	2101	FMN	C2'-C3'-C4'-C5'
3	G	2101	FMN	O3'-C3'-C4'-C5'
3	G	2101	FMN	O3'-C3'-C4'-O4'
3	G	2101	FMN	C2'-C3'-C4'-O4'
3	G	2101	FMN	C4'-C5'-O5'-P

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	G	2101	FMN	4	0

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 than 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.



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.

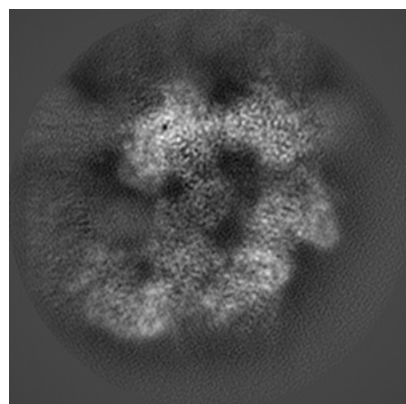
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-17854. These allow visual inspection of the internal detail of the map and identification of artifacts.

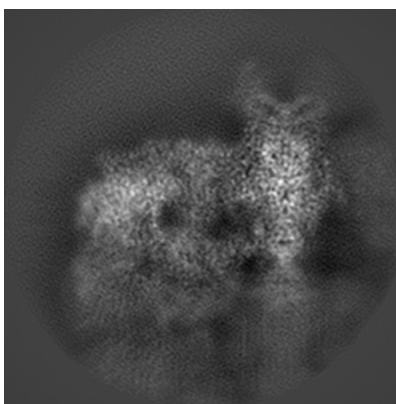
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

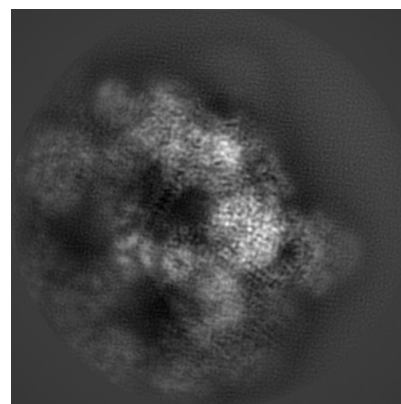
6.1.1 Primary map



X

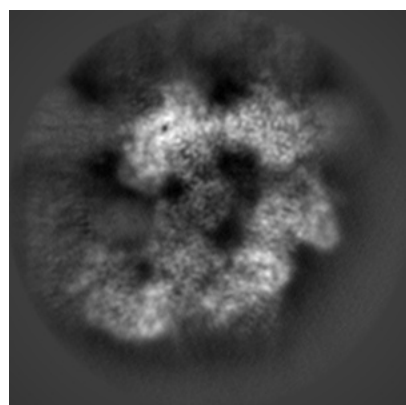


Y

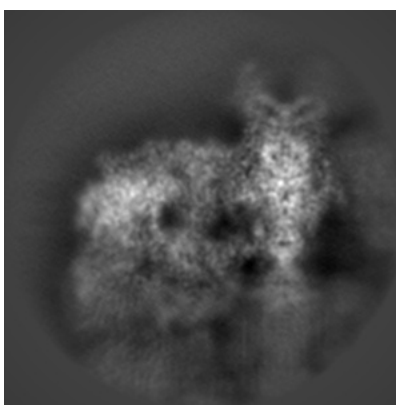


Z

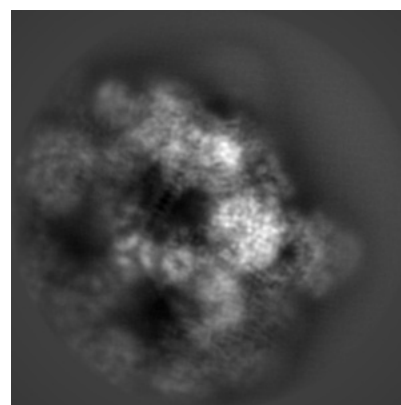
6.1.2 Raw map



X



Y

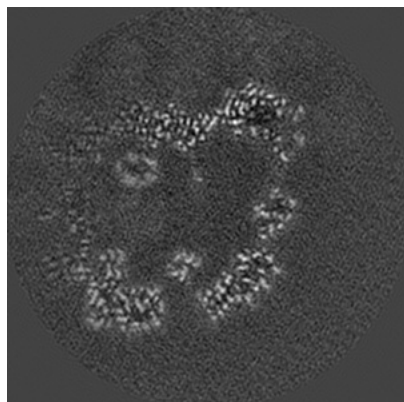


Z

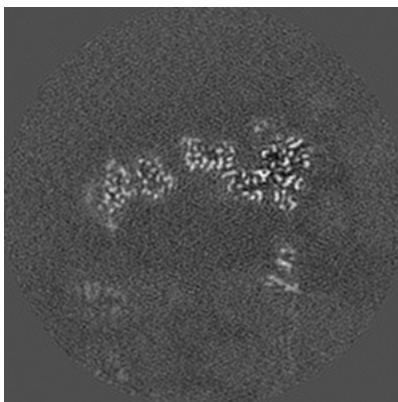
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

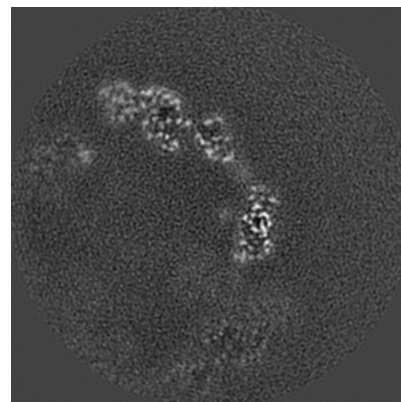
6.2.1 Primary map



X Index: 120

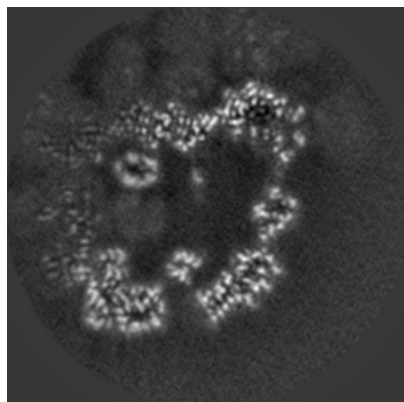


Y Index: 120

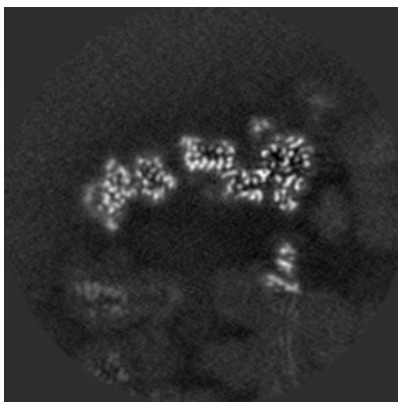


Z Index: 120

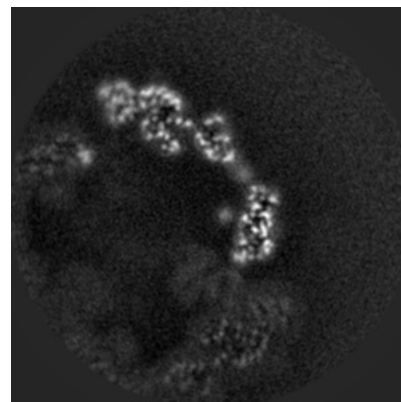
6.2.2 Raw map



X Index: 120



Y Index: 120

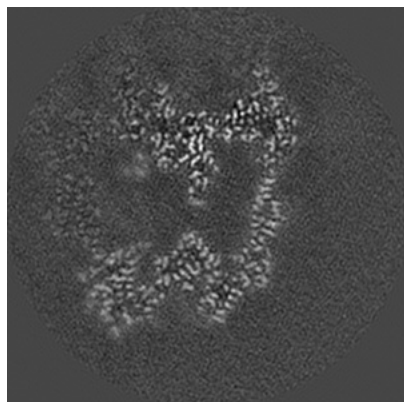


Z Index: 120

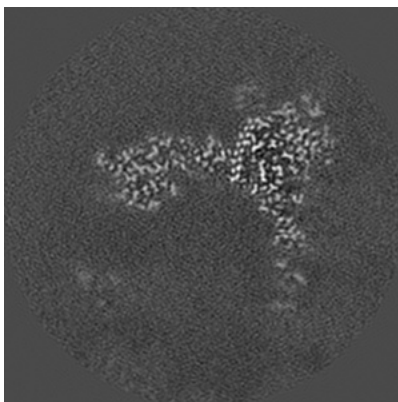
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

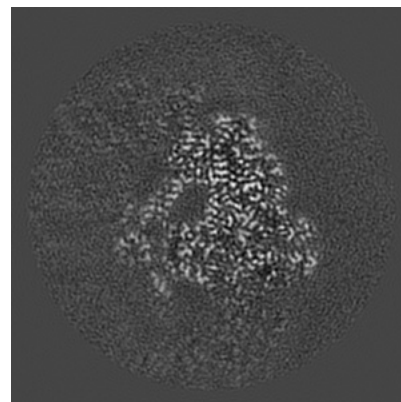
6.3.1 Primary map



X Index: 129

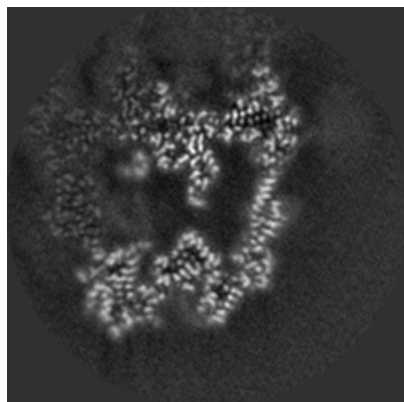


Y Index: 107

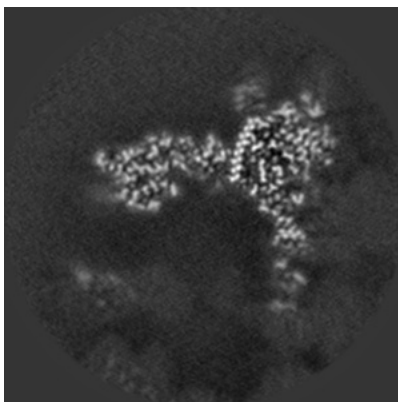


Z Index: 171

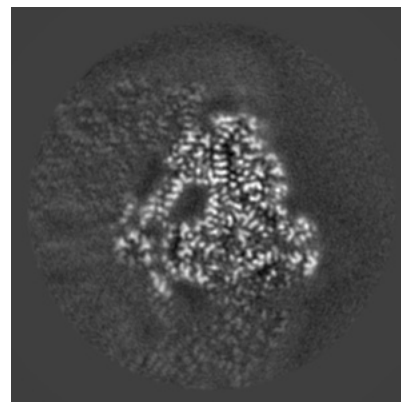
6.3.2 Raw map



X Index: 129



Y Index: 107

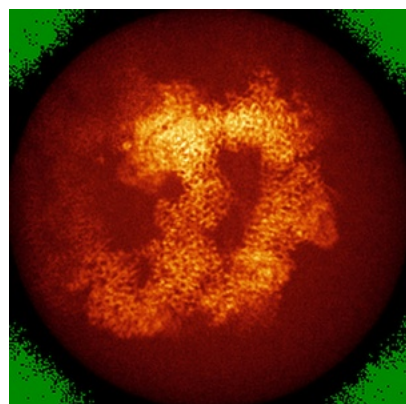


Z Index: 171

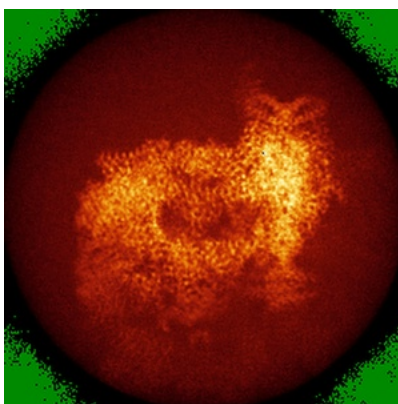
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

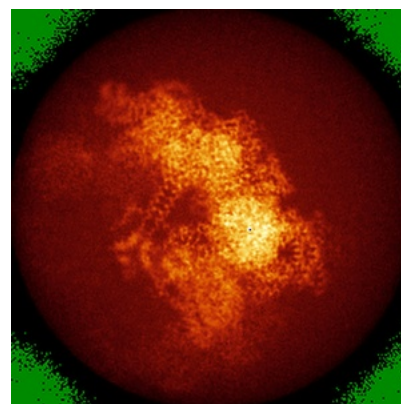
6.4.1 Primary map



X

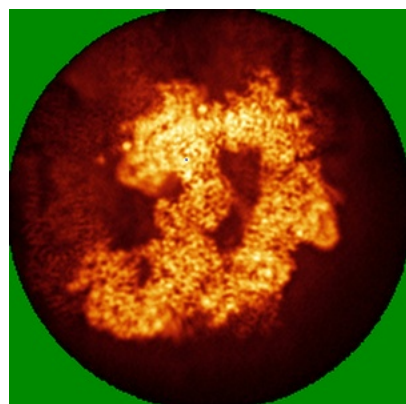


Y

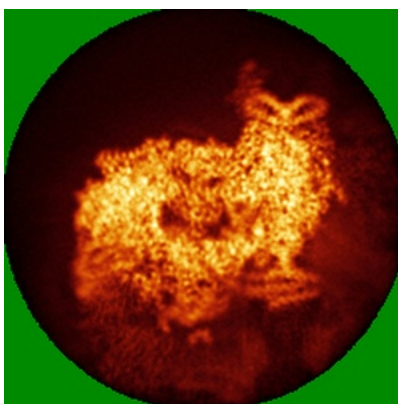


Z

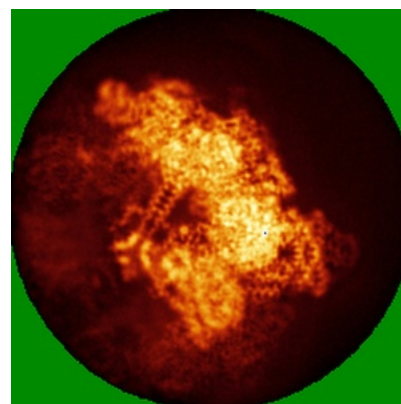
6.4.2 Raw map



X



Y

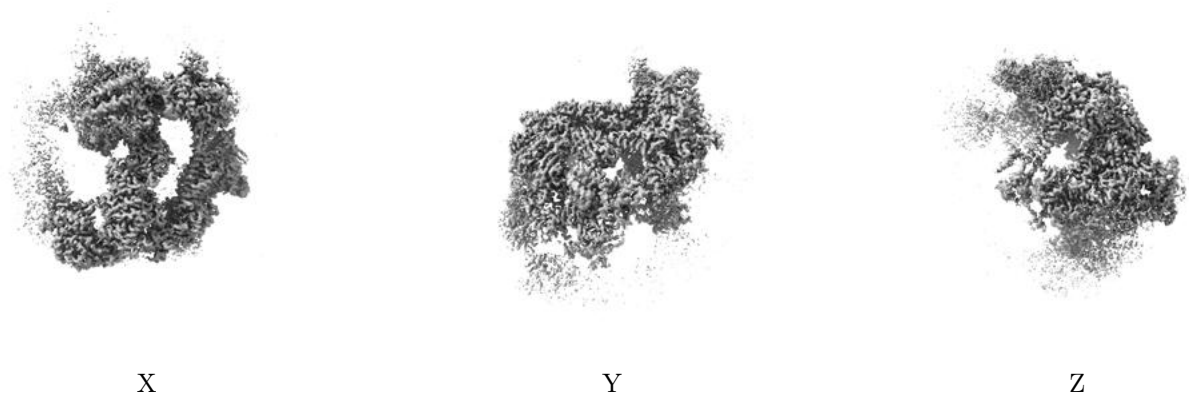


Z

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.

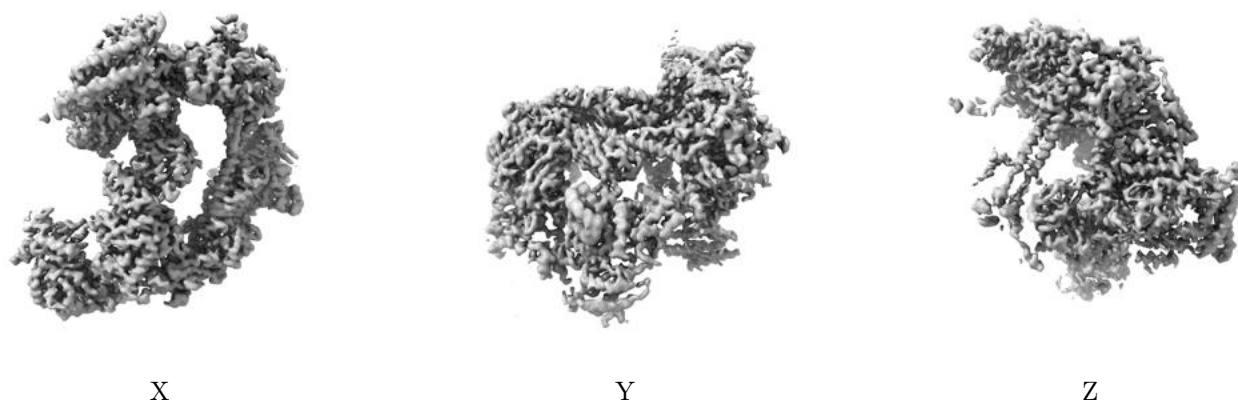
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.04. 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



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.

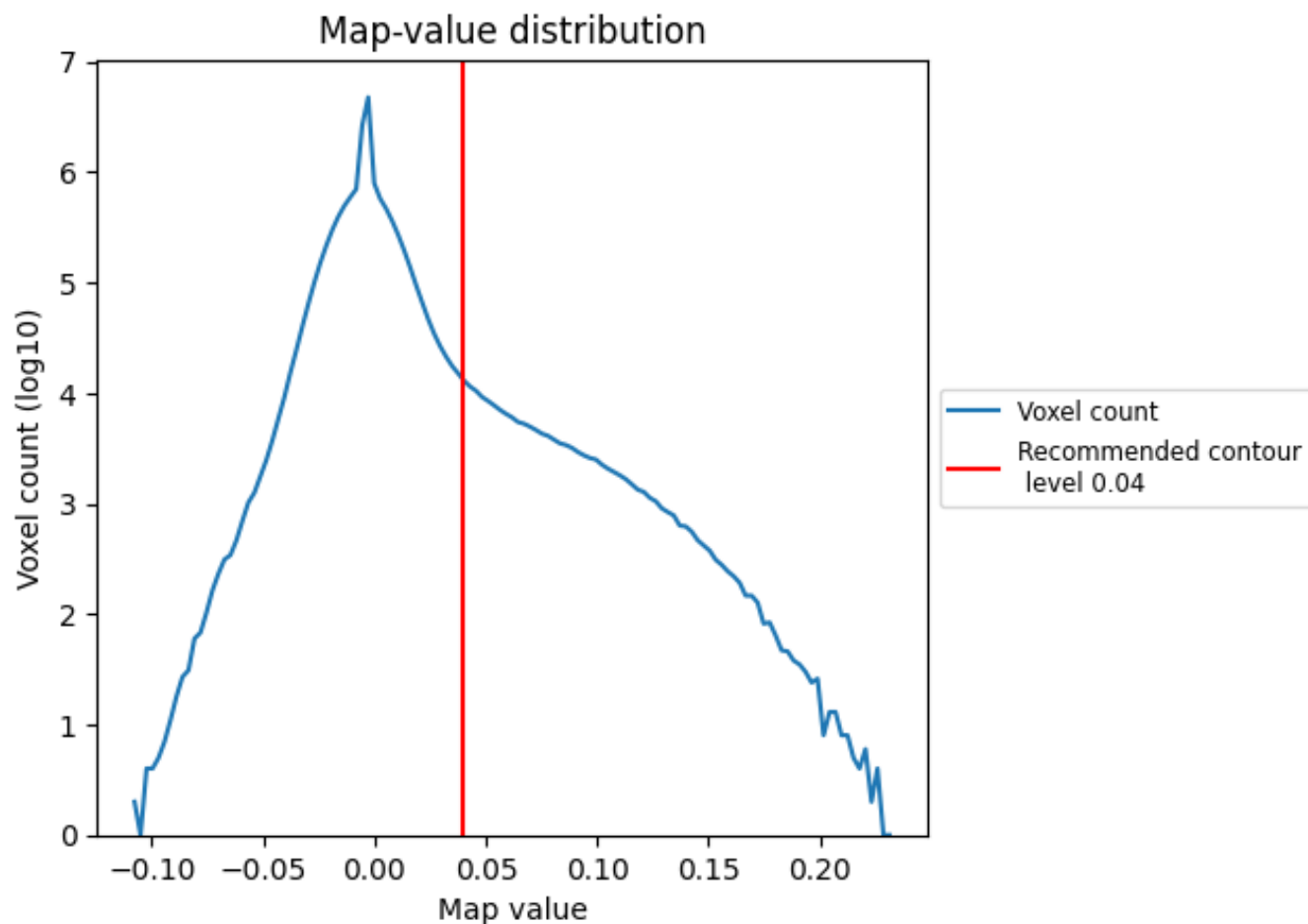
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

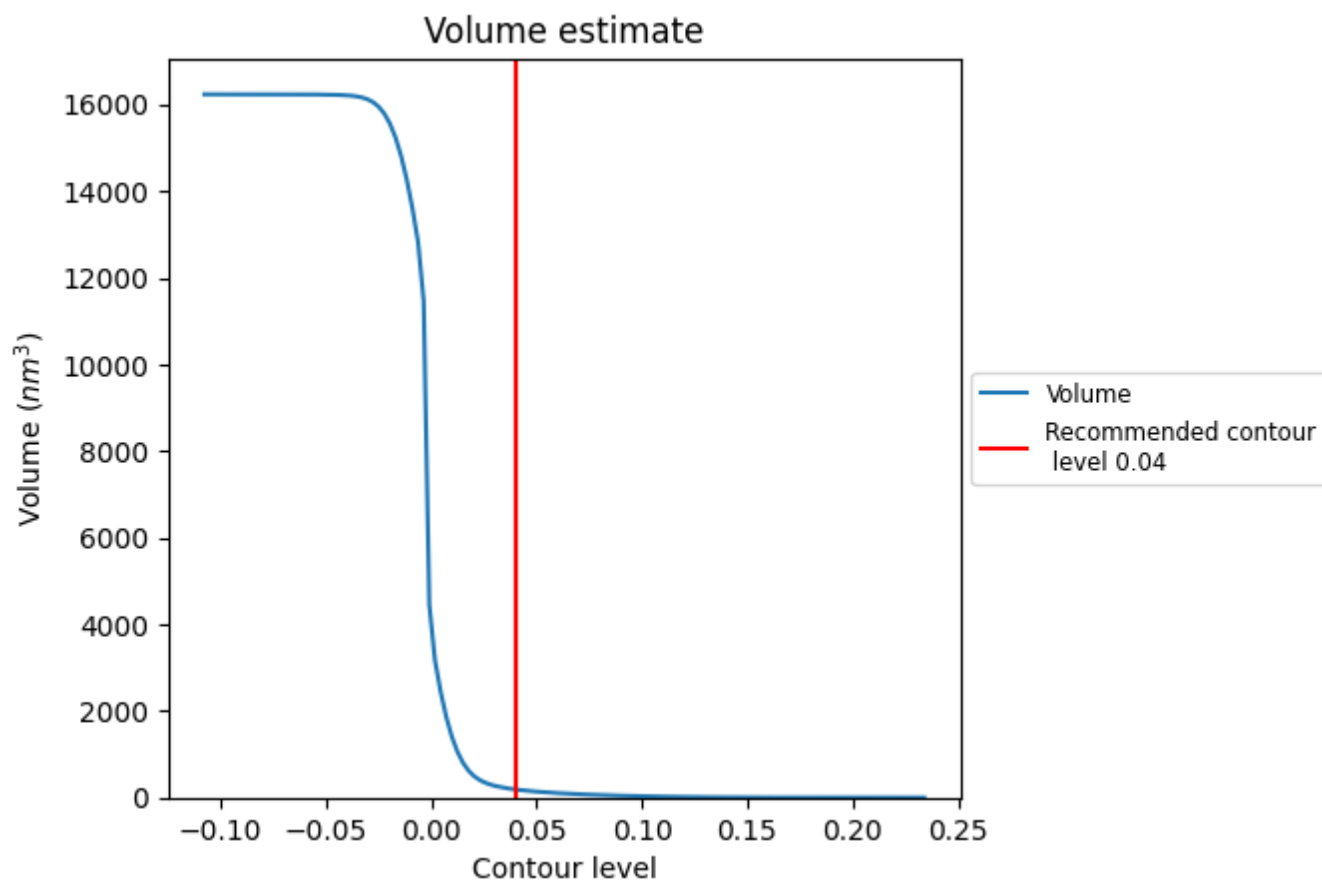
This section contains the results of statistical analysis of the map.

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.

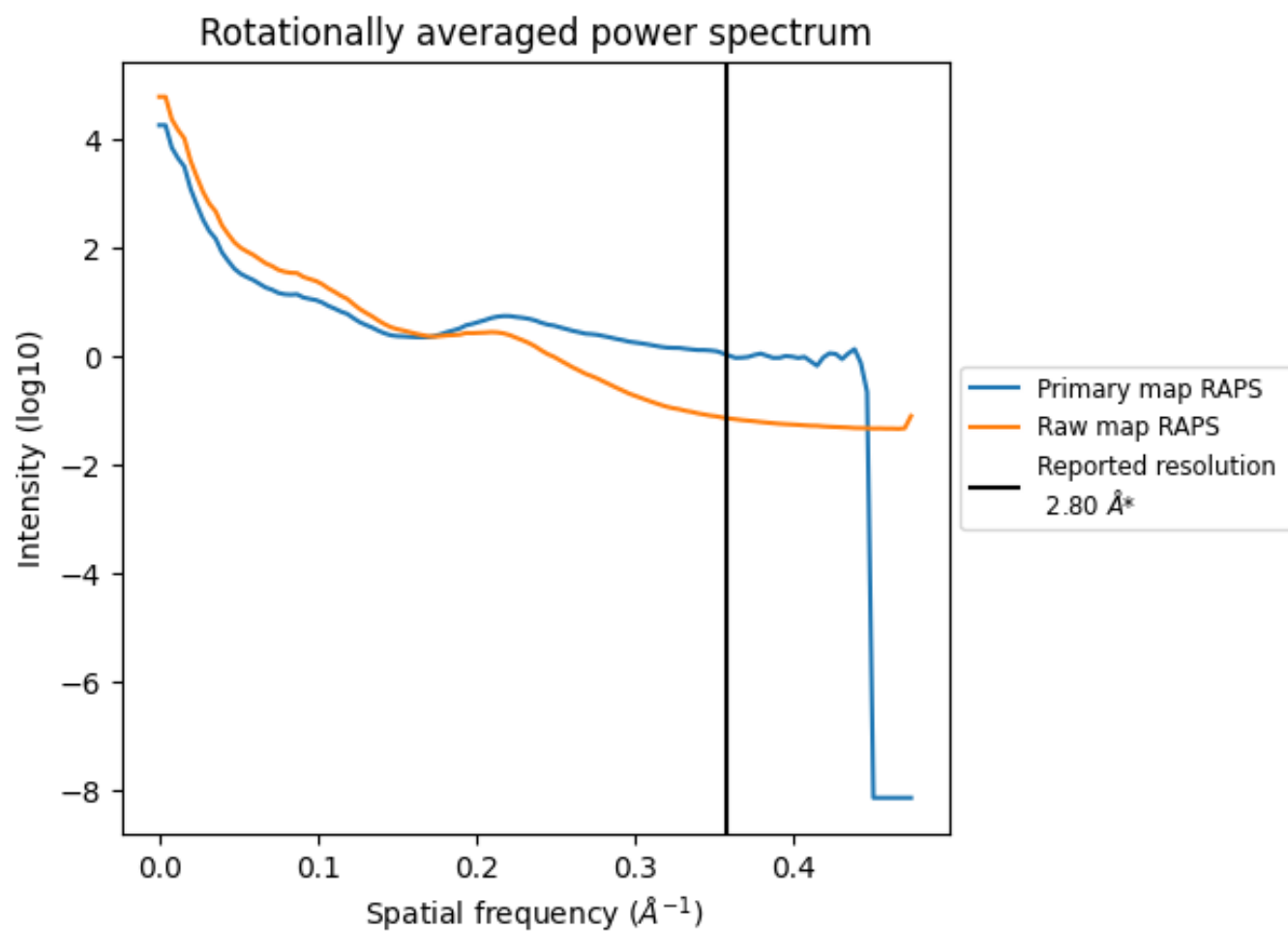
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 186 nm³; this corresponds to an approximate mass of 168 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 ⓘ

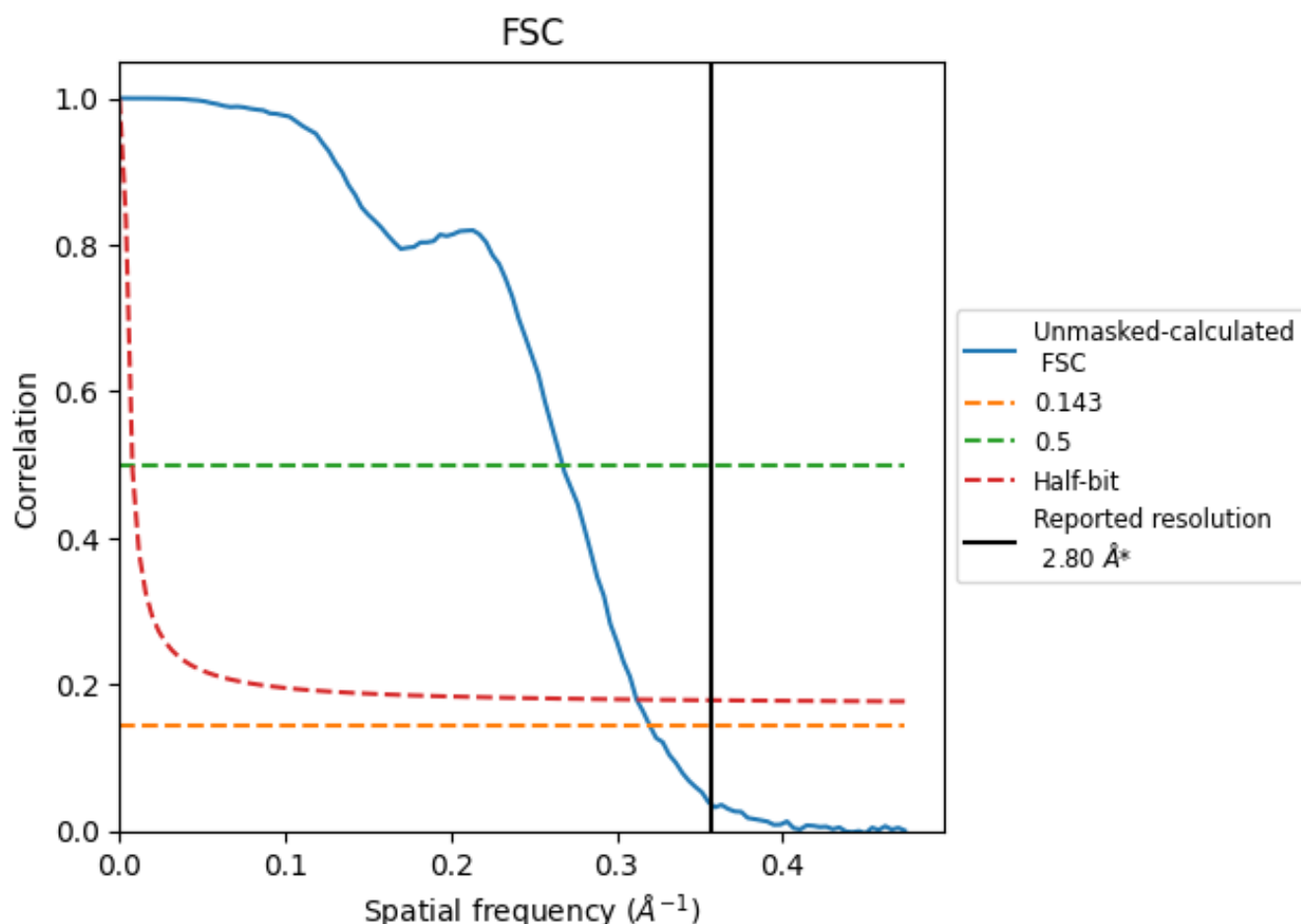


*Reported resolution corresponds to spatial frequency of 0.357 \AA^{-1}

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 0.357 Å⁻¹

8.2 Resolution estimates [i](#)

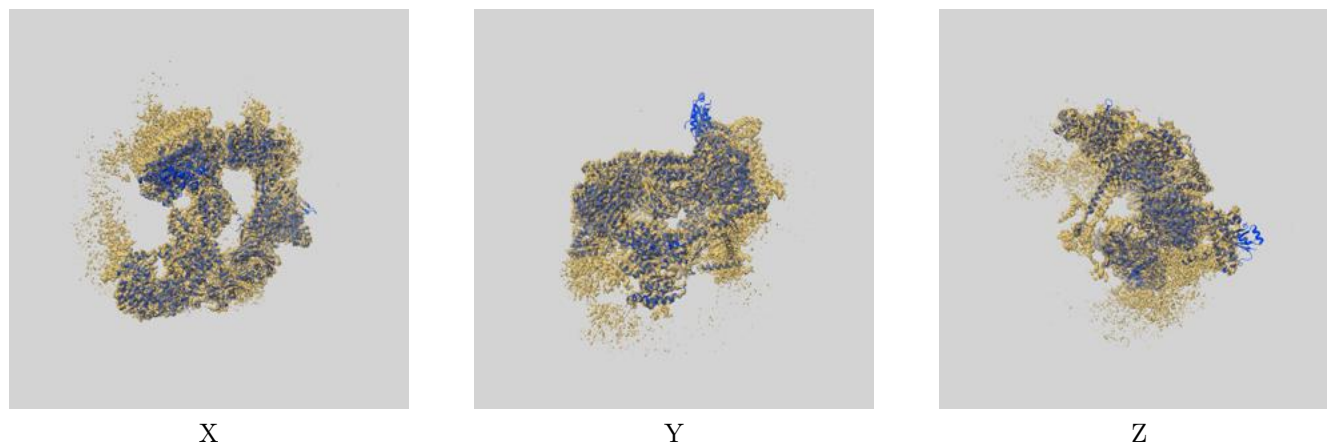
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.80	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.12	3.74	3.21

*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 3.12 differs from the reported value 2.8 by more than 10 %

9 Map-model fit [i](#)

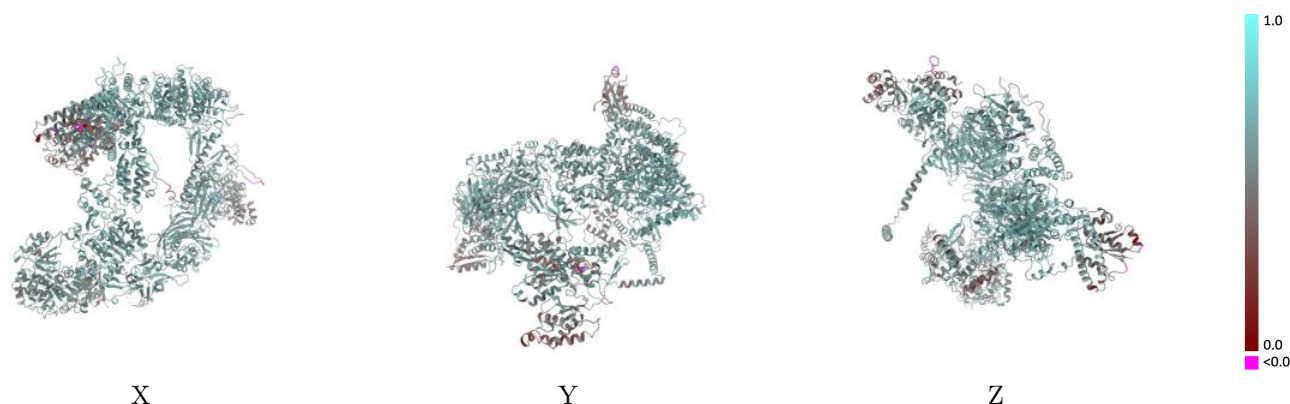
This section contains information regarding the fit between EMDB map EMD-17854 and PDB model 8PSK. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

9.1 Map-model overlay [i](#)



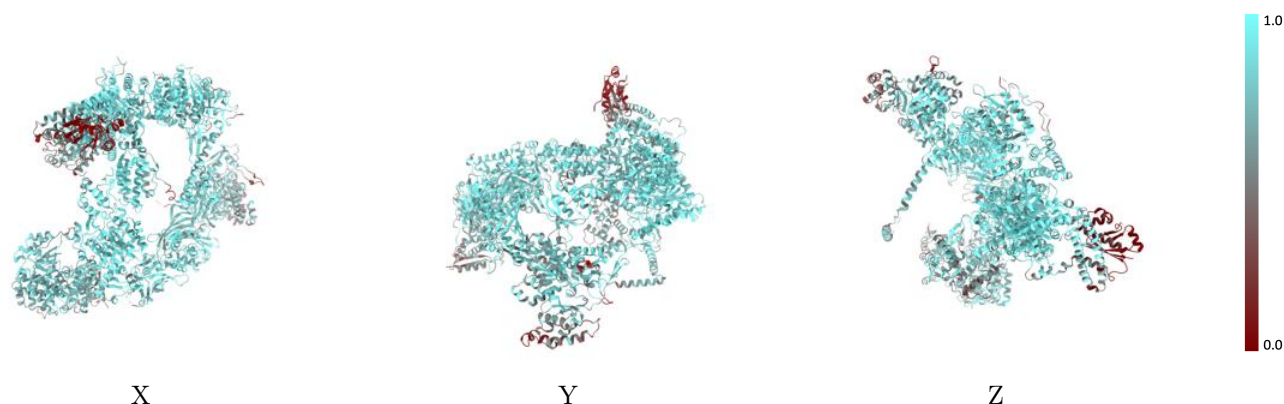
The images above show the 3D surface view of the map at the recommended contour level 0.04 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



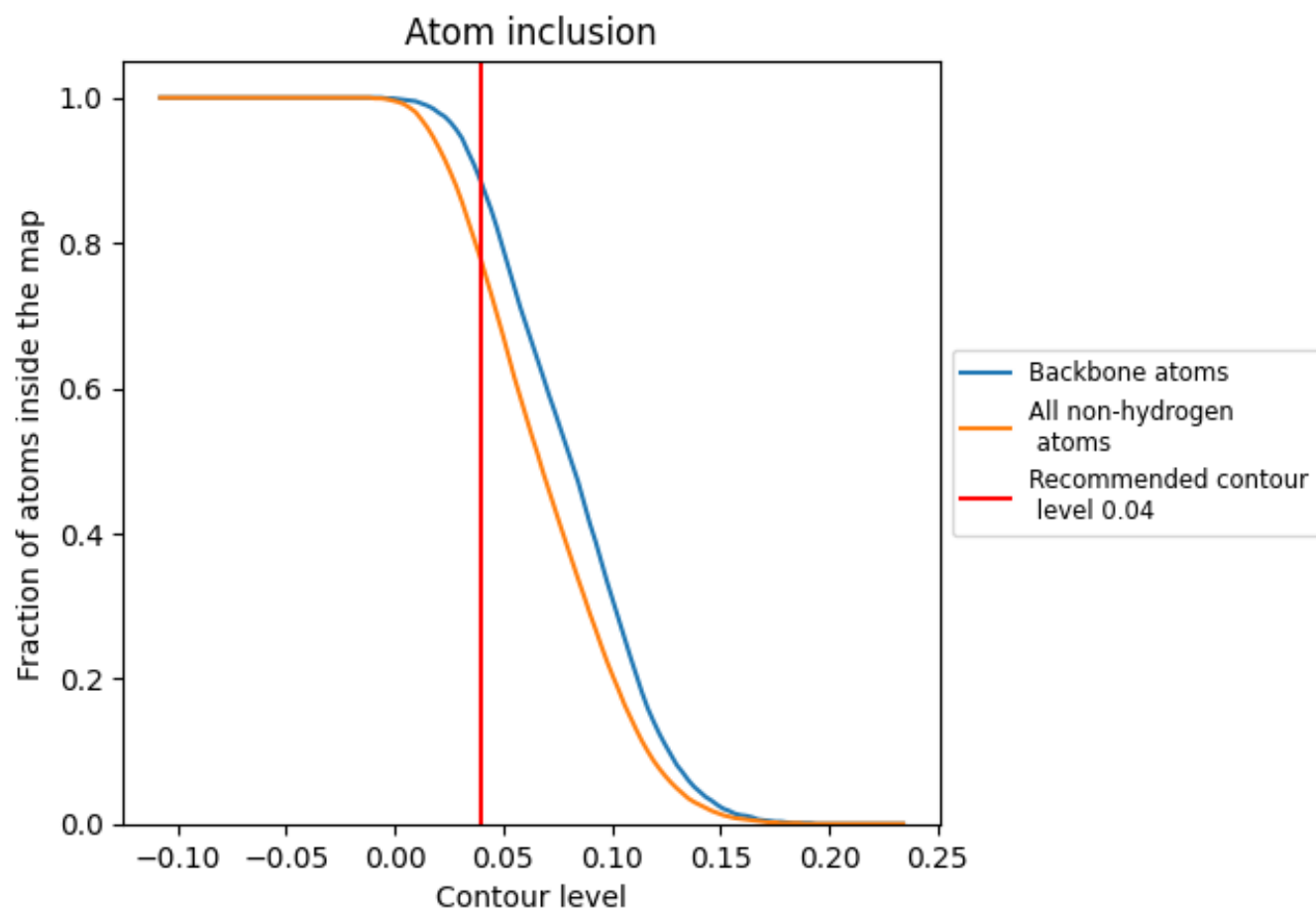
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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](#)



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 (0.04).

9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 77% 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 (0.04) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.7740	<div></div> 0.5780
A	<div></div> 0.7840	<div></div> 0.5980
B	<div></div> 0.5730	<div></div> 0.4710
G	<div></div> 0.7810	<div></div> 0.5700

