



wwPDB EM Validation Summary Report ⓘ

Nov 29, 2022 – 10:46 PM JST

PDB ID : 7XBW
EMDB ID : EMD-33107
Title : Cryo-EM structure of the human chemokine receptor CX3CR1 in complex with Gil
Authors : Lu, M.; Zhao, W.; Han, S.; Zhu, Y.; Wu, B.; Zhao, Q.
Deposited on : 2022-03-22
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.dev43
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

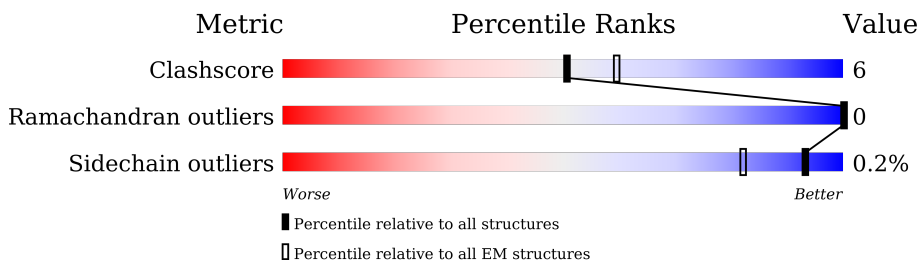
1 Overall quality at a glance

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	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	C	354	
2	D	346	
3	E	71	
4	R	361	

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 6663 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 Guanine nucleotide-binding protein G(i) subunit alpha-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	C	216	1657	1058	274	313	12	0	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	47	CYS	SER	engineered mutation	UNP P63096
C	202	THR	GLY	engineered mutation	UNP P63096
C	203	ALA	GLY	engineered mutation	UNP P63096
C	245	ALA	GLU	engineered mutation	UNP P63096
C	326	SER	ALA	engineered mutation	UNP P63096

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	329	2394	1492	417	467	18	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	-5	HIS	-	expression tag	UNP P62873
D	-4	HIS	-	expression tag	UNP P62873
D	-3	HIS	-	expression tag	UNP P62873
D	-2	HIS	-	expression tag	UNP P62873
D	-1	HIS	-	expression tag	UNP P62873
D	0	HIS	-	expression tag	UNP P62873

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	53	352	225	58	67	2	0	0

- Molecule 4 is a protein called CX3C chemokine receptor 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	R	288	2176	1460	338	368	10	0	0

There are 49 discrepancies between the modelled and reference sequences:

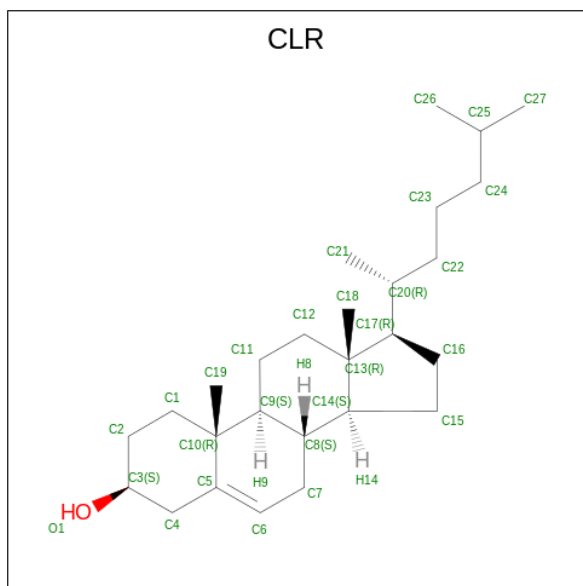
Chain	Residue	Modelled	Actual	Comment	Reference
R	120	LEU	ILE	engineered mutation	UNP P49238
R	221	SER	CYS	engineered mutation	UNP P49238
R	250	VAL	MET	engineered mutation	UNP P49238
R	316	GLU	-	expression tag	UNP P49238
R	317	PHE	-	expression tag	UNP P49238
R	318	LEU	-	expression tag	UNP P49238
R	319	GLU	-	expression tag	UNP P49238
R	320	VAL	-	expression tag	UNP P49238
R	321	LEU	-	expression tag	UNP P49238
R	322	PHE	-	expression tag	UNP P49238
R	323	GLN	-	expression tag	UNP P49238
R	324	GLY	-	expression tag	UNP P49238
R	325	PRO	-	expression tag	UNP P49238
R	326	TRP	-	expression tag	UNP P49238
R	327	SER	-	expression tag	UNP P49238
R	328	HIS	-	expression tag	UNP P49238
R	329	PRO	-	expression tag	UNP P49238
R	330	GLN	-	expression tag	UNP P49238
R	331	PHE	-	expression tag	UNP P49238
R	332	GLU	-	expression tag	UNP P49238
R	333	LYS	-	expression tag	UNP P49238
R	334	GLY	-	expression tag	UNP P49238
R	335	GLY	-	expression tag	UNP P49238
R	336	GLY	-	expression tag	UNP P49238
R	337	SER	-	expression tag	UNP P49238
R	338	GLY	-	expression tag	UNP P49238
R	339	GLY	-	expression tag	UNP P49238
R	340	GLY	-	expression tag	UNP P49238
R	341	SER	-	expression tag	UNP P49238
R	342	GLY	-	expression tag	UNP P49238
R	343	GLY	-	expression tag	UNP P49238

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Chain	Residue	Modelled	Actual	Comment	Reference
R	344	SER	-	expression tag	UNP P49238
R	345	ALA	-	expression tag	UNP P49238
R	346	TRP	-	expression tag	UNP P49238
R	347	SER	-	expression tag	UNP P49238
R	348	HIS	-	expression tag	UNP P49238
R	349	PRO	-	expression tag	UNP P49238
R	350	GLN	-	expression tag	UNP P49238
R	351	PHE	-	expression tag	UNP P49238
R	352	GLU	-	expression tag	UNP P49238
R	353	LYS	-	expression tag	UNP P49238
R	354	ASP	-	expression tag	UNP P49238
R	355	TYR	-	expression tag	UNP P49238
R	356	LYS	-	expression tag	UNP P49238
R	357	ASP	-	expression tag	UNP P49238
R	358	ASP	-	expression tag	UNP P49238
R	359	ASP	-	expression tag	UNP P49238
R	360	ASP	-	expression tag	UNP P49238
R	361	LYS	-	expression tag	UNP P49238

- Molecule 5 is CHOLESTEROL (three-letter code: CLR) (formula: $C_{27}H_{46}O$).

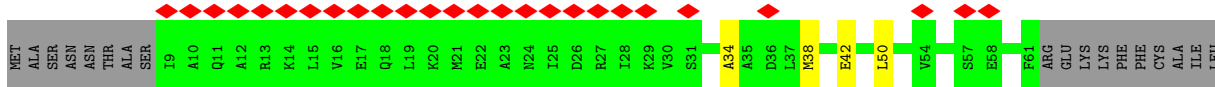


Mol	Chain	Residues	Atoms			AltConf
5	R	1	Total	C	O	0
			84	81	3	
5	R	1	Total	C	O	0
			84	81	3	

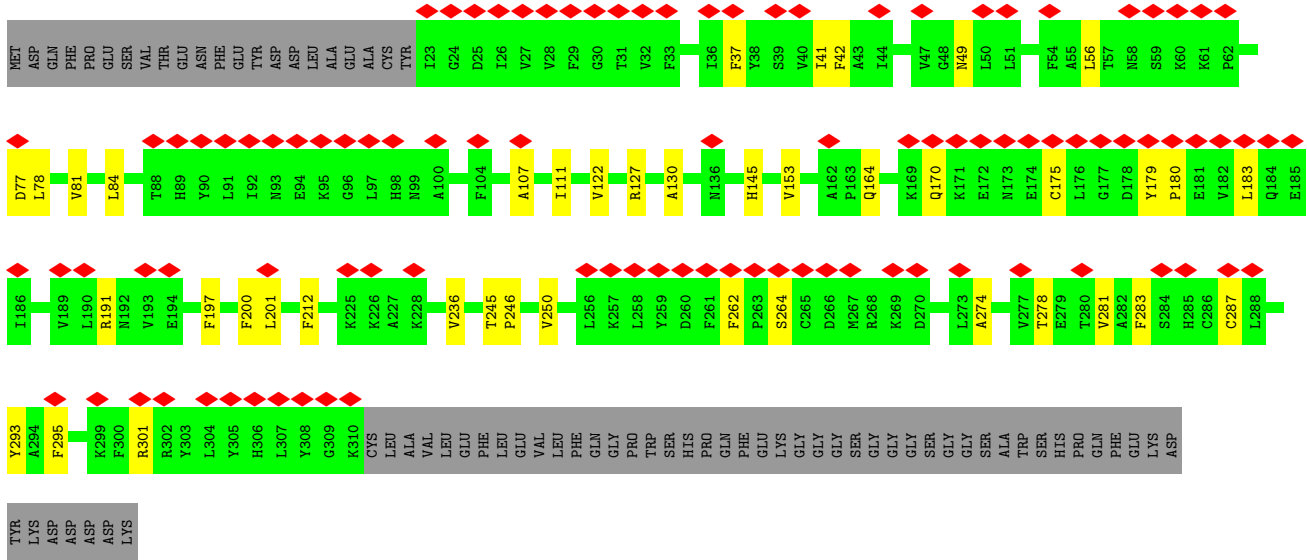
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Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
5	R	1	84	81	3	0



• Molecule 4: CX3C chemokine receptor 1



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	702722	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 ($e^-/\text{\AA}^2$)	2.1875	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.259	Depositor
Minimum map value	-0.175	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.0315	Depositor
Map size (\AA)	267.52, 267.52, 267.52	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.045, 1.045, 1.045	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: CLR

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	C	0.24	0/1685	0.41	0/2278
2	D	0.24	0/2441	0.44	0/3334
3	E	0.26	0/358	0.39	0/495
4	R	0.25	0/2233	0.41	0/3059
All	All	0.24	0/6717	0.42	0/9166

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	C	1657	0	1573	18	0
2	D	2394	0	2203	38	0
3	E	352	0	317	3	0
4	R	2176	0	2132	26	0
5	R	84	0	135	1	0
All	All	6663	0	6360	77	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 77 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)
2:D:80:ILE:HG22	2:D:92:ALA:HA	1.74	0.69
4:R:179:TYR:OH	4:R:191:ARG:NH1	2.26	0.69
4:R:42:PHE:HB2	4:R:84:LEU:HD11	1.74	0.68
2:D:294:CYS:HB3	2:D:308:LEU:HD22	1.75	0.67
2:D:279:SER:HA	2:D:320:VAL:HG11	1.77	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	C	210/354 (59%)	204 (97%)	6 (3%)	0	100	100
2	D	327/346 (94%)	320 (98%)	7 (2%)	0	100	100
3	E	51/71 (72%)	49 (96%)	2 (4%)	0	100	100
4	R	286/361 (79%)	278 (97%)	8 (3%)	0	100	100
All	All	874/1132 (77%)	851 (97%)	23 (3%)	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	C	171/306 (56%)	170 (99%)	1 (1%)	86	96
2	D	240/289 (83%)	240 (100%)	0	100	100
3	E	30/58 (52%)	30 (100%)	0	100	100
4	R	220/315 (70%)	220 (100%)	0	100	100
All	All	661/968 (68%)	660 (100%)	1 (0%)	93	98

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	257	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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
5	CLR	R	401	-	31,31,31	1.77	5 (16%)	48,48,48	1.34	8 (16%)
5	CLR	R	402	-	31,31,31	1.78	5 (16%)	48,48,48	1.37	8 (16%)
5	CLR	R	403	-	31,31,31	1.78	5 (16%)	48,48,48	1.33	7 (14%)

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
5	CLR	R	401	-	-	7/10/68/68	0/4/4/4
5	CLR	R	402	-	-	4/10/68/68	0/4/4/4
5	CLR	R	403	-	-	6/10/68/68	0/4/4/4

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	R	403	CLR	C6-C5	6.33	1.46	1.33
5	R	401	CLR	C6-C5	6.31	1.46	1.33
5	R	402	CLR	C6-C5	6.27	1.46	1.33
5	R	402	CLR	O1-C3	-4.39	1.30	1.43
5	R	401	CLR	O1-C3	-4.36	1.30	1.43

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	R	401	CLR	C4-C5-C10	3.26	120.75	116.42
5	R	402	CLR	C4-C5-C10	3.21	120.69	116.42
5	R	403	CLR	C12-C11-C9	3.12	118.53	113.11
5	R	403	CLR	C4-C5-C10	3.08	120.51	116.42
5	R	402	CLR	C12-C11-C9	3.04	118.38	113.11

There are no chirality outliers.

5 of 17 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	R	401	CLR	C13-C17-C20-C21
5	R	401	CLR	C13-C17-C20-C22
5	R	401	CLR	C16-C17-C20-C21
5	R	403	CLR	C21-C20-C22-C23

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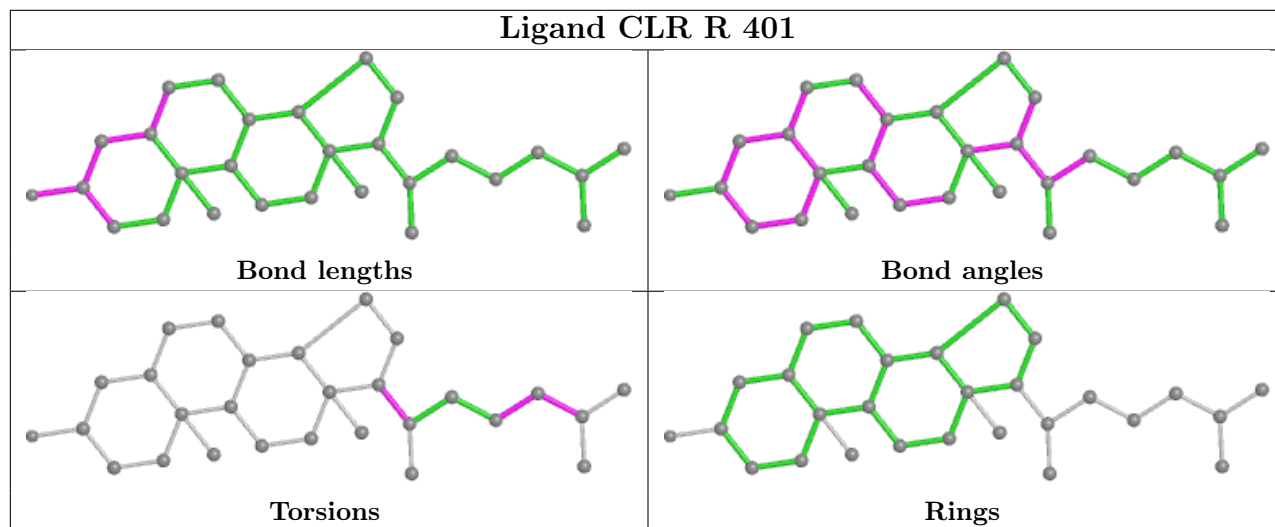
Mol	Chain	Res	Type	Atoms
5	R	401	CLR	C16-C17-C20-C22

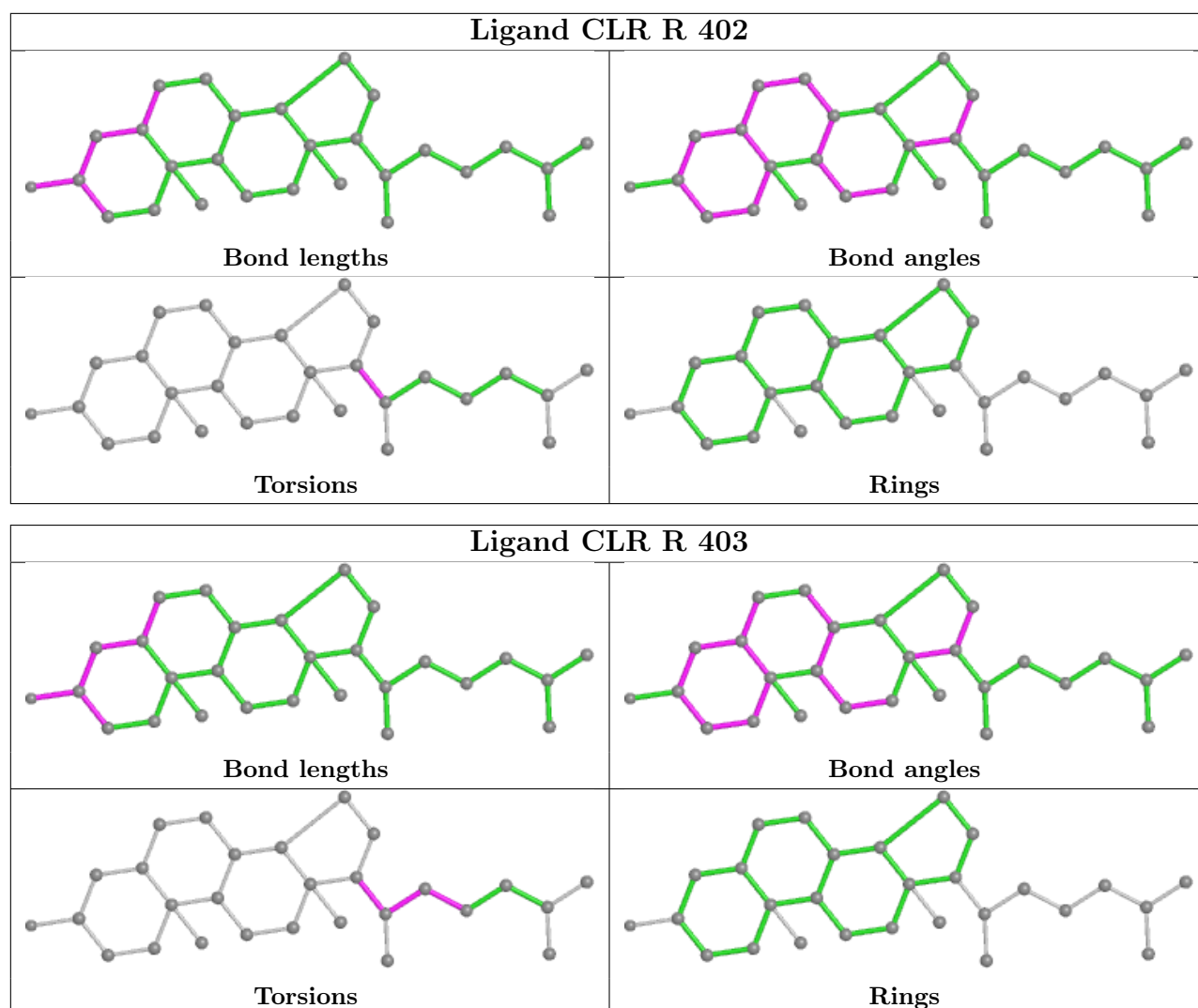
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	R	403	CLR	1	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.

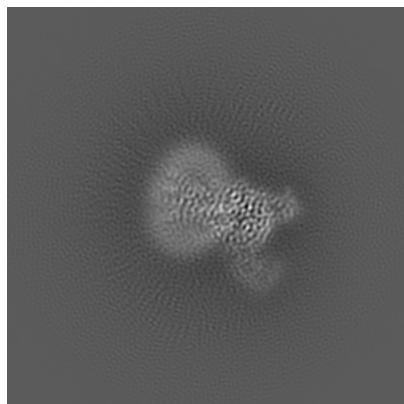
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-33107. These allow visual inspection of the internal detail of the map and identification of artifacts.

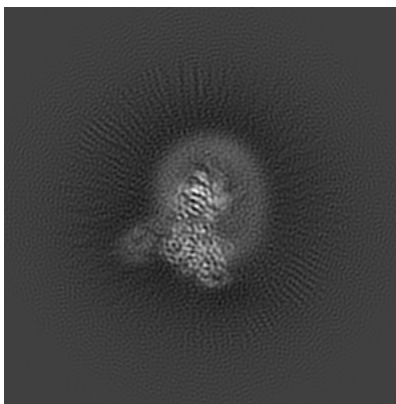
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

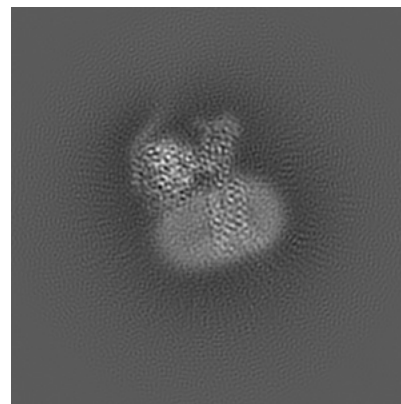
6.1.1 Primary map



X

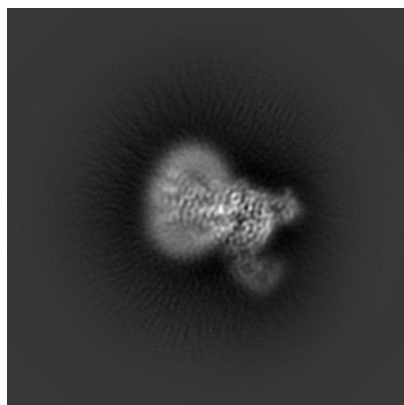


Y

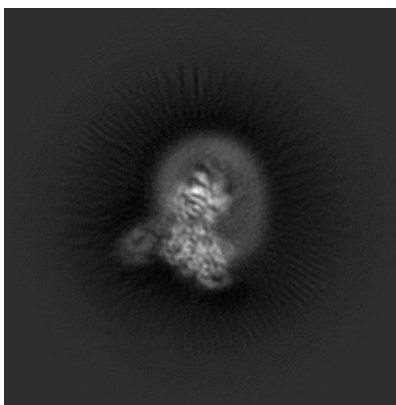


Z

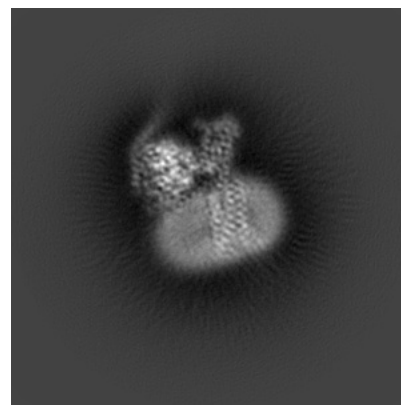
6.1.2 Raw map



X



Y

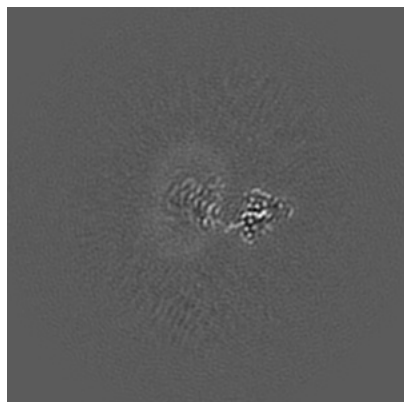


Z

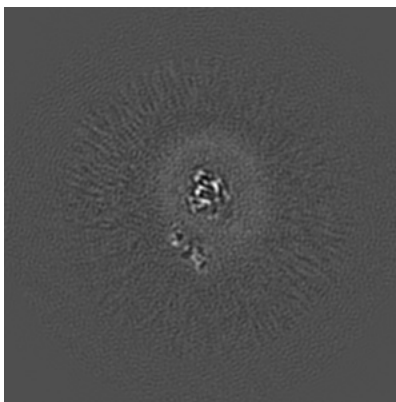
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

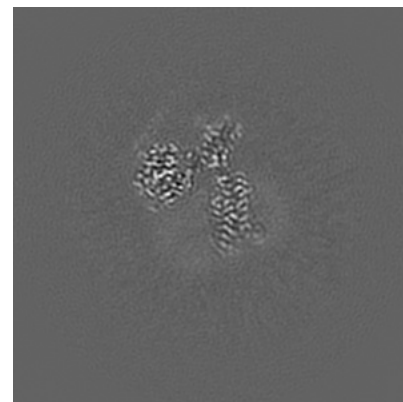
6.2.1 Primary map



X Index: 128

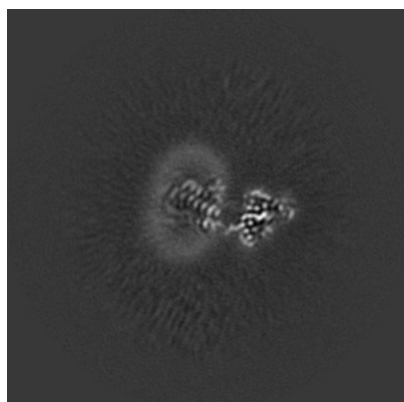


Y Index: 128

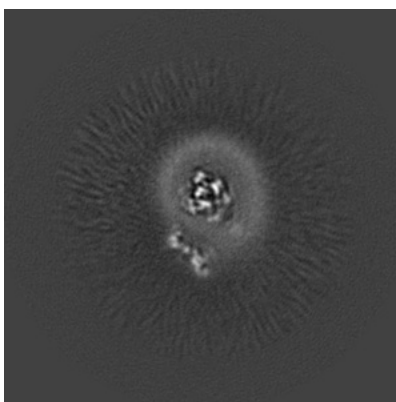


Z Index: 128

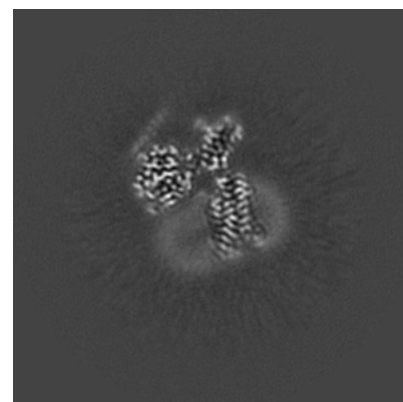
6.2.2 Raw map



X Index: 128



Y Index: 128

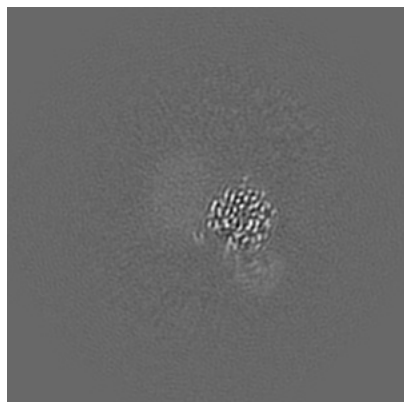


Z Index: 128

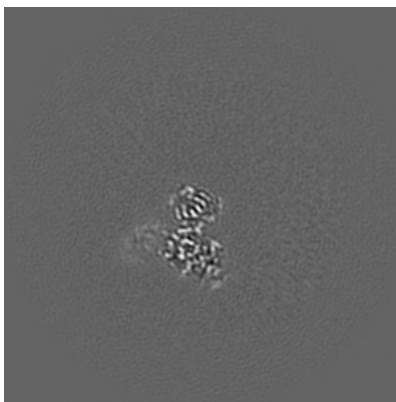
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

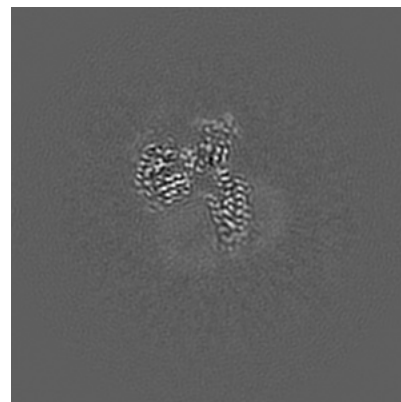
6.3.1 Primary map



X Index: 101

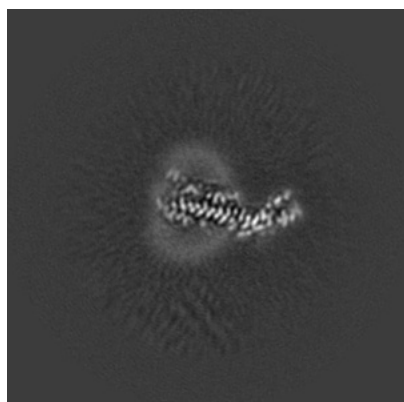


Y Index: 158

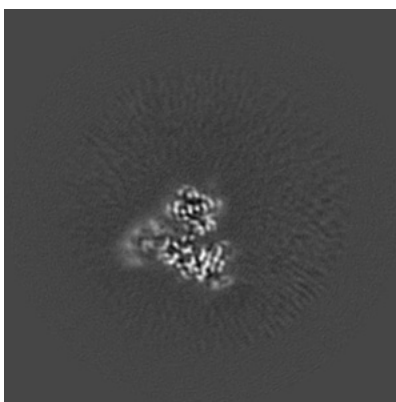


Z Index: 126

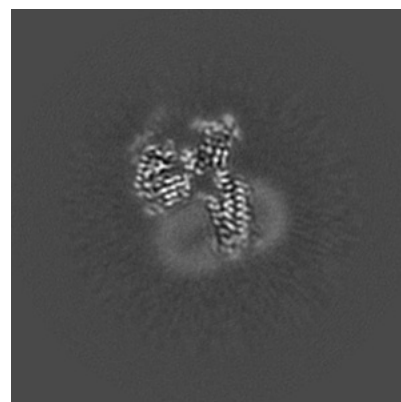
6.3.2 Raw map



X Index: 138



Y Index: 155



Z Index: 126

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

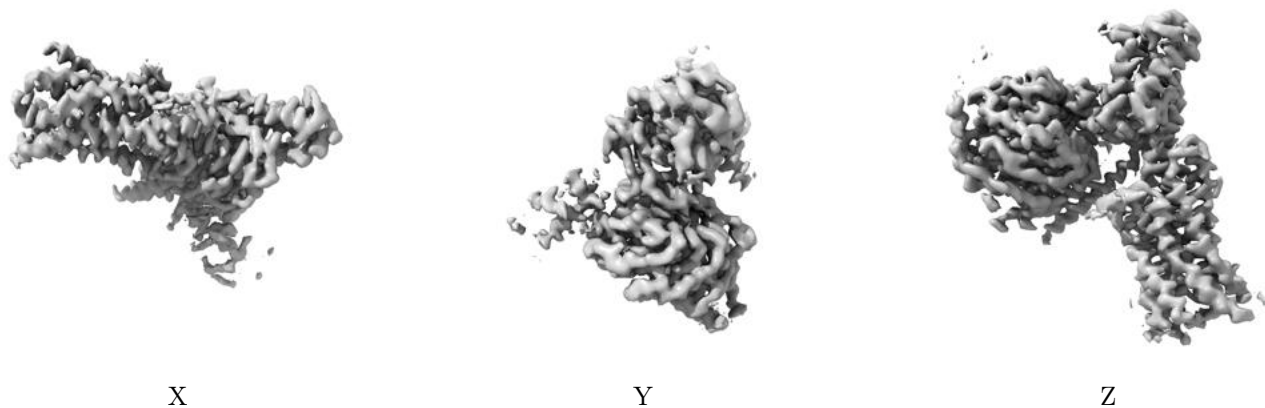
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0315. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.4.2 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.

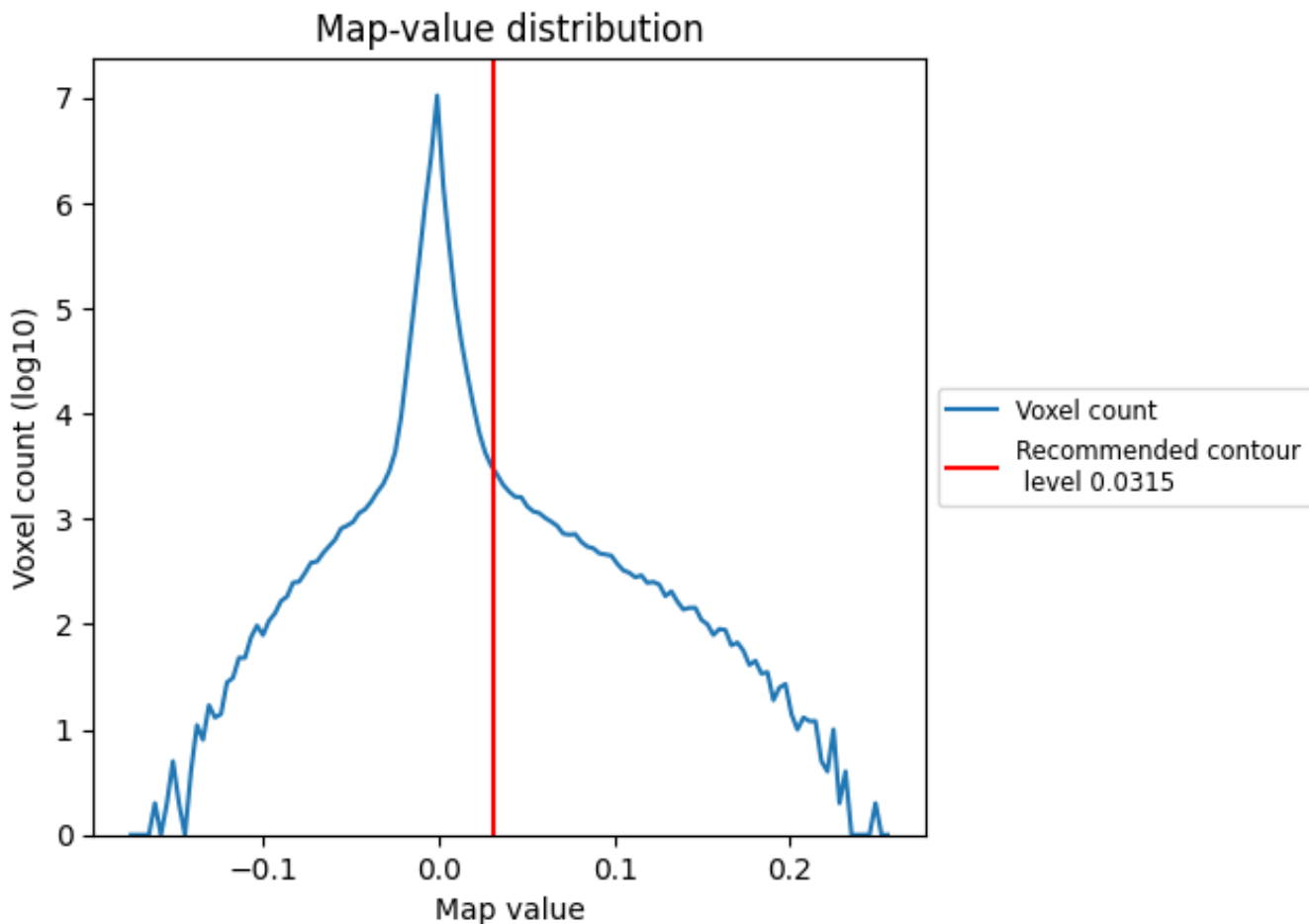
6.5 Mask visualisation [i](#)

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

7 Map analysis [i](#)

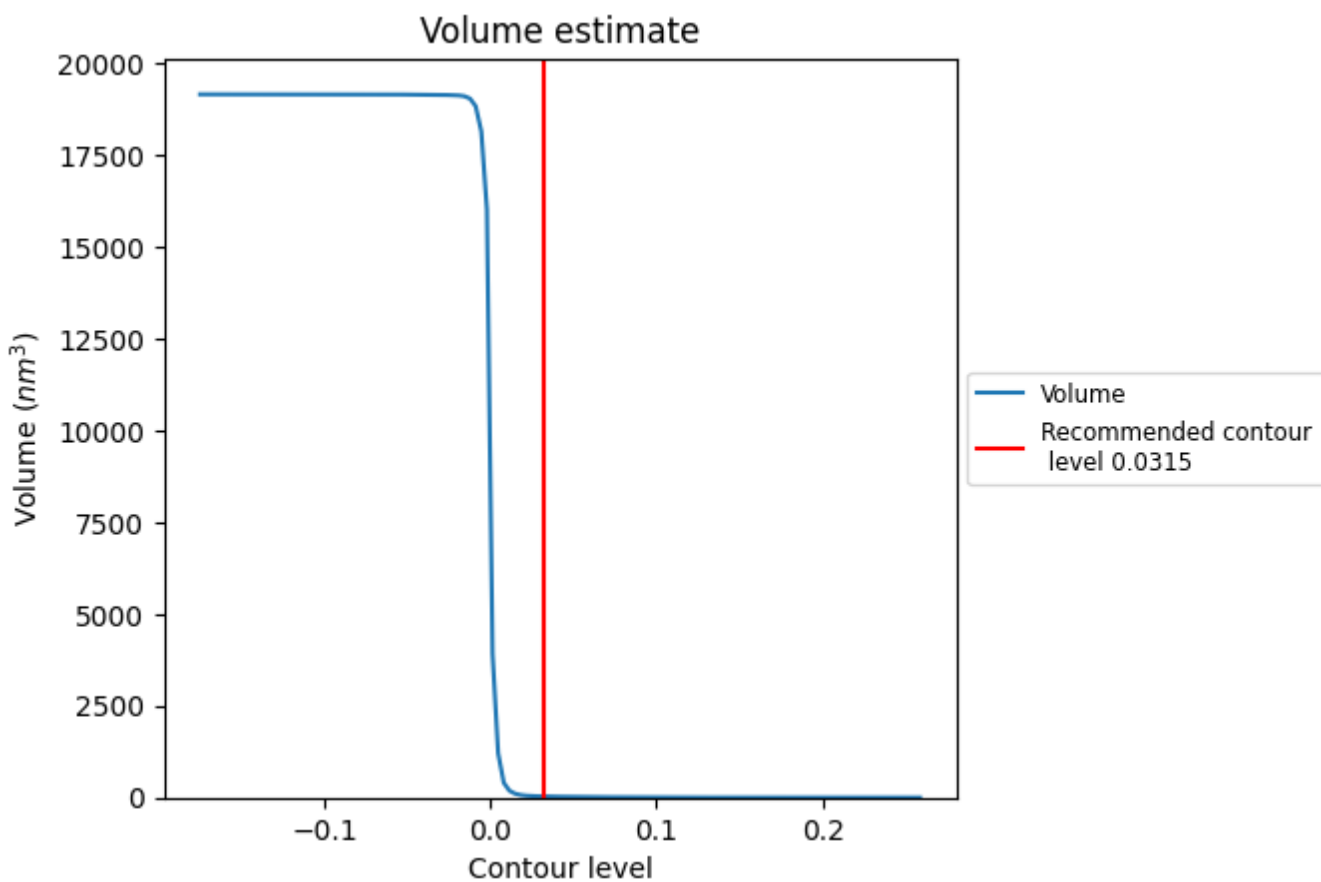
This section contains the results of statistical analysis of the map.

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.

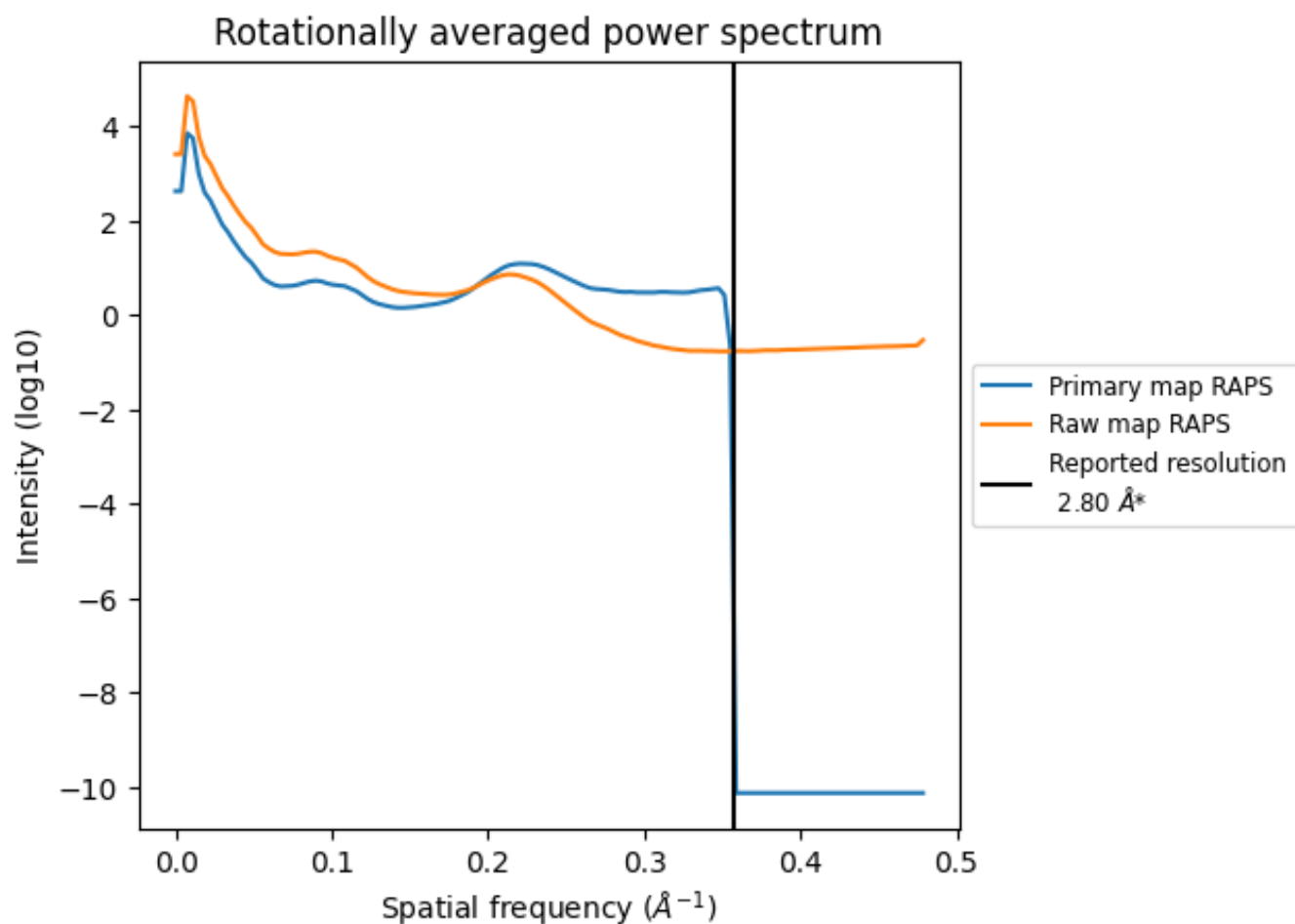
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 31 nm^3 ; this corresponds to an approximate mass of 28 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](#)

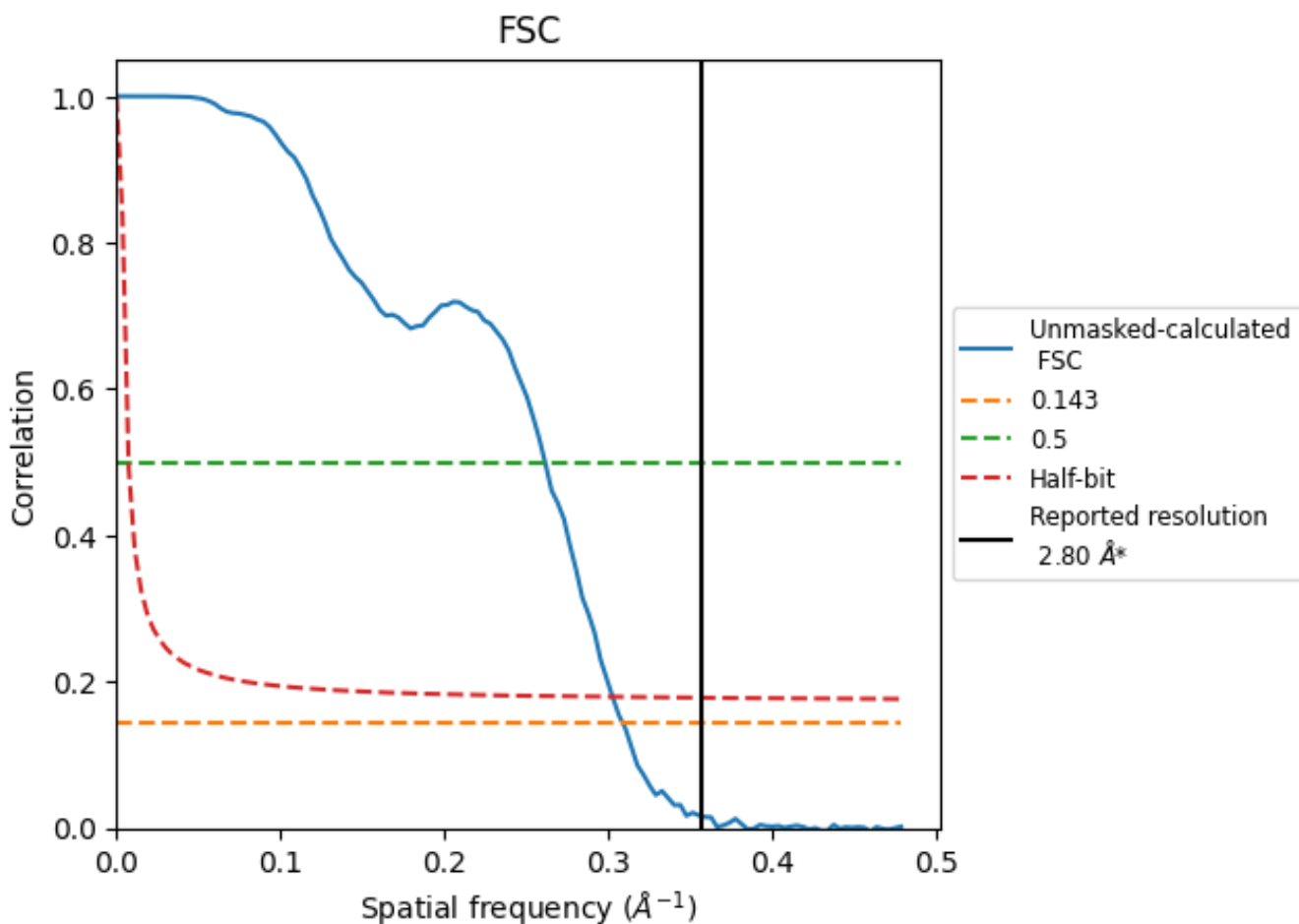


*Reported resolution corresponds to spatial frequency of 0.357 Å⁻¹

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 0.357 Å⁻¹

8.2 Resolution estimates [i](#)

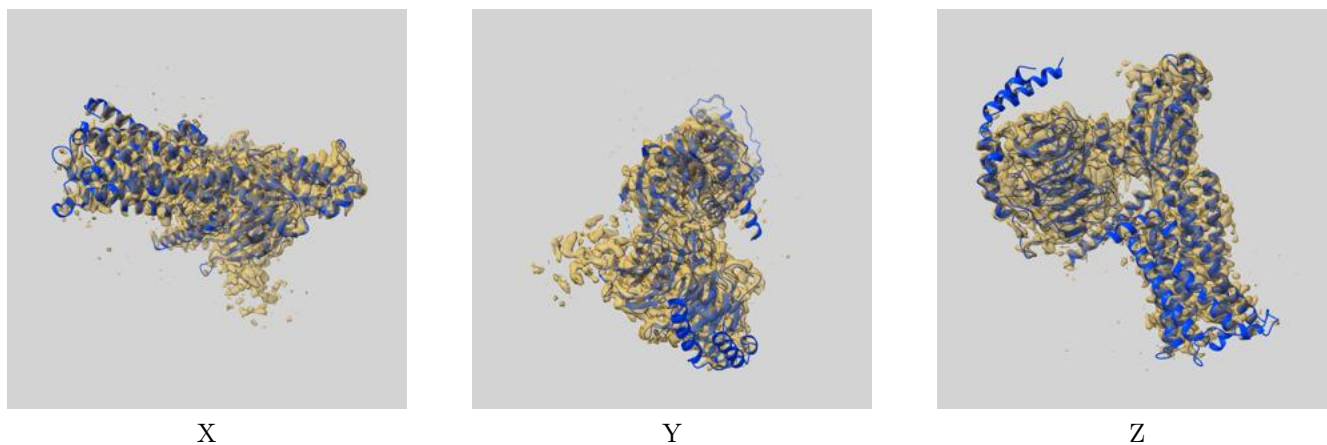
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.80	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.24	3.83	3.31

*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 3.24 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-33107 and PDB model 7XBW. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



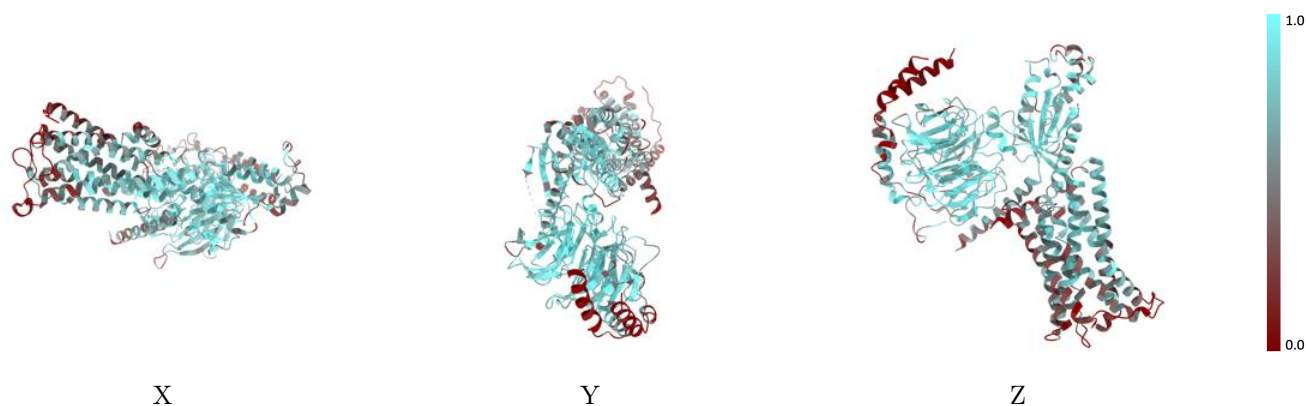
The images above show the 3D surface view of the map at the recommended contour level 0.0315 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



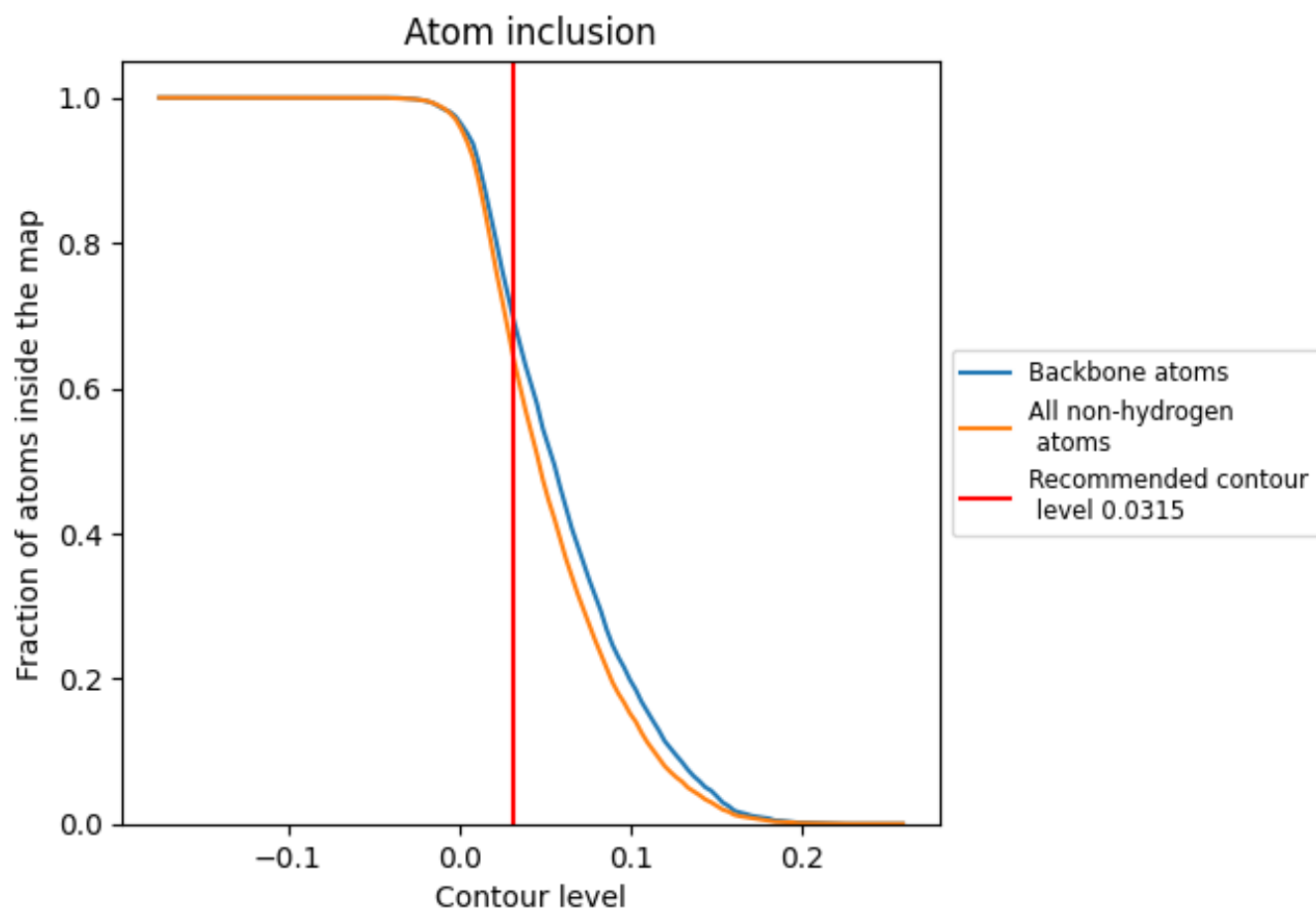
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0315).











9.4 Atom inclusion [i](#)



At the recommended contour level, 70% of all backbone atoms, 64% 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 (0.0315) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6417	 0.4680
C	 0.7025	 0.4910
D	 0.7455	 0.5060
E	 0.4217	 0.4460
R	 0.5224	 0.4130

