



## Full wwPDB EM Validation Report ⓘ

Jul 14, 2024 – 09:29 pm BST

PDB ID : 7Z8L  
EMDB ID : EMD-14556  
Title : Cytoplasmic dynein light intermediate chain (B1) bound to the motor domain (A2).  
Authors : Chaaban, S.; Carter, A.P.  
Deposited on : 2022-03-17  
Resolution : 4.90 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

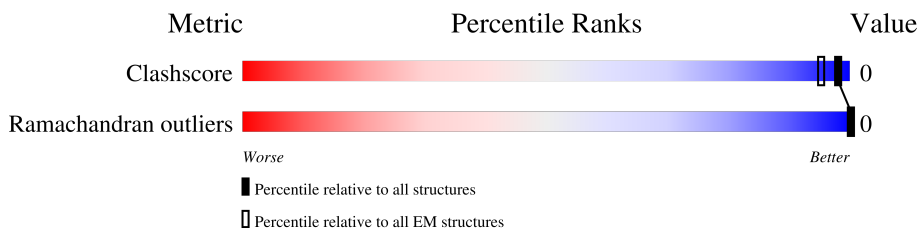
EMDB validation analysis : 0.0.1.dev92  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

# 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 4.90 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

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  $\geq 3$ , 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	f	4646	
2	q	492	

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 16513 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 Cytoplasmic dynein 1 heavy chain 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
1	f	3047	15087	8992	3047	3048	0	0

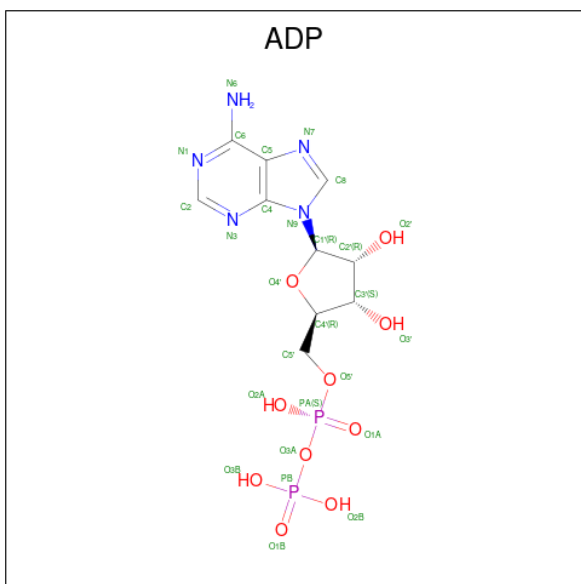
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
f	1567	GLU	ARG	conflict	UNP Q14204
f	1610	GLU	LYS	conflict	UNP Q14204

- Molecule 2 is a protein called Cytoplasmic dynein 1 light intermediate chain 2.

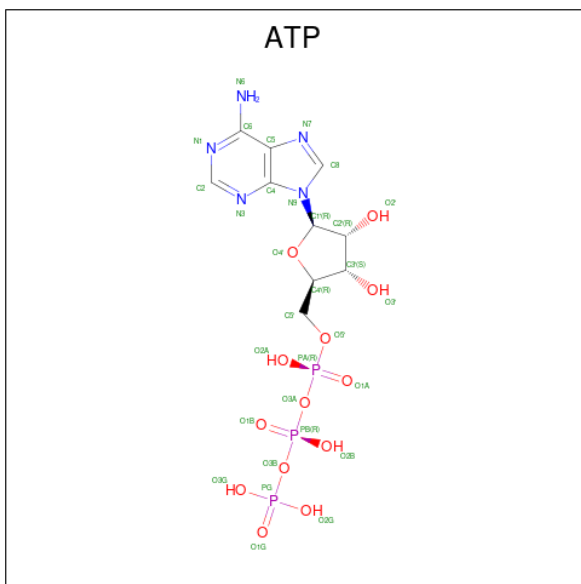
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	q	264	1305	777	264	264	0	0

- Molecule 3 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:  $C_{10}H_{15}N_5O_{10}P_2$ ).



Mol	Chain	Residues	Atoms					AltConf
3	f	1	Total	C	N	O	P	0
			27	10	5	10	2	

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula:  $C_{10}H_{16}N_5O_{13}P_3$ ).

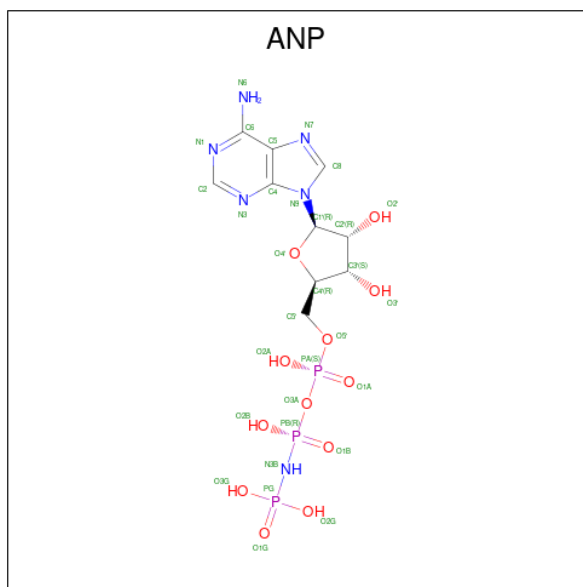


Mol	Chain	Residues	Atoms					AltConf
4	f	1	Total	C	N	O	P	0
			31	10	5	13	3	

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
5	f	1	Total	Mg	0
			1	1	

- Molecule 6 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula:  $C_{10}H_{17}N_6O_{12}P_3$ ).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
6	f	1	31	10	6	12	3	0
6	f	1	Total	C	N	O	P	0
			31	10	6	12	3	





G80	K81	K82	G83	H94	D95	E96	D97	R98	D99	D100	L113	A125	H143	P166	M185	E186	P187	GLU	GLY	CYS	GLN	GLY	SER	PRO	GLN	ARG	ARG	GLY	PRO	LEU	THR	SER	GLY	SER	ASP	GLU	GLU	ASN	ASN	VAL	ALA	LEU	PRO	L214	G215	C234	D235	A236	V237	L240	E241																					
K242	E243	H244	D245	Y246	R247	D248	E249	A268	L269	V274	K275	H295	F296	T297	T298	P299	A300	L301	V302	V303	E304	K305	D306	P311	A312	D315	N316	E317	K318	K319	I320	A321	E325	N326	F327	T328	T329	V330	K331	P332	E333	D334	A335	Y336	E337	D338	F339	I340	VAL	LYS	PRO	PRO	VAL																			
ARG	LYS	LEU	VAL	HIS	ASP	LYS	GLU	LEU	ALA	ALA	GLU	ASP	GLU	GLN	VAL	PHE	ASN	ALA	LEU	MET	LYS	GLN	GLY	VAL	SER	LEU	LEU	ALA	ALA	LYS	GLN	ASN	PRO	ALA	THR	PRO	THR	THR	ARG	ALA	ALA	THR	SER	GLY	SER	PRO	PRO	ALA	ALA	GLY	ARG	F327	T328	T329	V330	K331	P332	E333	D334	A335	Y336	E337	D338	F339	I340	VAL	LYS	PRO	PRO	VAL		
SER	ASN	VAL	GLN	GLU	LEU	ASP	ARG	THR	THR	LYS	PRO	ILE	LYS	ASN	ASN	VAL	ASN	VAL	ALA	ALA	THR	ASN	SER	GLU	GLY	VAL	SER	LEU	LEU	ALA	PHE	LYS	ASN	ASN	LEU	LEU	LEU	SER	THR	LYS	LYS	THR	SER	GLY	SER	PRO	PRO	GLY	SER	VAL	VAL	GLN	THR	ALA	THR	THR	LYS	LYS	GLY	GLY	PRO	GLY	ALA	LYS	LYS	THR	THR	LYS	VAL	VAL	THR	LEU
SER	ASN	VAL	GLN	GLU	LEU	ASP	ARG	THR	THR	LYS	PRO	ILE	LYS	ASN	ASN	VAL	ASN	VAL	ALA	ALA	THR	ASN	SER	GLU	GLY	VAL	SER	LEU	LEU	ALA	PHE	LYS	ASN	ASN	LEU	LEU	LEU	SER	THR	LYS	LYS	THR	SER	GLY	SER	PRO	PRO	GLY	SER	VAL	VAL	GLN	THR	ALA	THR	THR	LYS	LYS	GLY	GLY	PRO	GLY	ALA	LYS	LYS	THR	THR	LYS	VAL	VAL	THR	LEU



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	105050	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 ( $e^-/\text{\AA}^2$ )	53	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.158	Depositor
Minimum map value	-0.041	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.0393	Depositor
Map size (Å)	631.7215, 631.7215, 631.7215	wwPDB
Map dimensions	310, 310, 310	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	2.0378113, 2.0378113, 2.0378113	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: ANP, ATP, MG, ADP

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	f	0.60	0/15083	0.62	0/21019
2	q	0.84	1/1303 (0.1%)	0.93	0/1812
All	All	0.63	1/16386 (0.0%)	0.65	0/22831

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	q	296	PHE	C-O	-7.54	1.09	1.23

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	f	15087	0	6670	0	0
2	q	1305	0	570	0	0
3	f	27	0	12	0	0
4	f	31	0	12	0	0
5	f	1	0	0	0	0
6	f	62	0	26	0	0
All	All	16513	0	7290	0	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 0.

There are no clashes within the asymmetric unit.

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	f	3039/4646 (65%)	3004 (99%)	35 (1%)	0	100	100
2	q	260/492 (53%)	255 (98%)	5 (2%)	0	100	100
All	All	3299/5138 (64%)	3259 (99%)	40 (1%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

There are no protein residues with a non-rotameric sidechain to report in this entry.

### 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](#)

Of 5 ligands modelled in this entry, 1 is monoatomic - leaving 4 for Mogul analysis.

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
6	ANP	f	4704	-	29,33,33	0.99	1 (3%)	31,52,52	1.21	4 (12%)
4	ATP	f	4702	5	26,33,33	0.85	0	31,52,52	1.01	2 (6%)
3	ADP	f	4701	-	24,29,29	0.66	0	29,45,45	1.20	3 (10%)
6	ANP	f	4705	-	29,33,33	0.96	2 (6%)	31,52,52	1.25	4 (12%)

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
6	ANP	f	4704	-	-	7/14/38/38	0/3/3/3
4	ATP	f	4702	5	-	2/18/38/38	0/3/3/3
3	ADP	f	4701	-	-	6/12/32/32	0/3/3/3
6	ANP	f	4705	-	-	5/14/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	f	4704	ANP	PG-O1G	3.12	1.51	1.46
6	f	4705	ANP	PG-O1G	2.61	1.50	1.46
6	f	4705	ANP	PB-O2B	-2.33	1.50	1.56

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	f	4705	ANP	PB-O3A-PA	-3.93	118.78	132.62
6	f	4704	ANP	PB-O3A-PA	-3.31	120.94	132.62
3	f	4701	ADP	C3'-C2'-C1'	2.96	105.43	100.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	f	4701	ADP	PA-O3A-PB	-2.72	123.49	132.83
6	f	4705	ANP	O2G-PG-O1G	-2.62	106.87	113.45
6	f	4704	ANP	O1B-PB-N3B	-2.54	108.04	111.77
6	f	4704	ANP	C5-C6-N6	2.46	124.09	120.35
4	f	4702	ATP	C5-C6-N6	2.43	124.04	120.35
6	f	4705	ANP	C5-C6-N6	2.40	123.99	120.35
6	f	4705	ANP	O3G-PG-O1G	-2.35	107.54	113.45
6	f	4704	ANP	O2G-PG-O1G	-2.31	107.65	113.45
3	f	4701	ADP	C2'-C3'-C4'	2.04	106.60	102.64
4	f	4702	ATP	PB-O3B-PG	2.04	139.82	132.83

There are no chirality outliers.

All (20) torsion outliers are listed below:

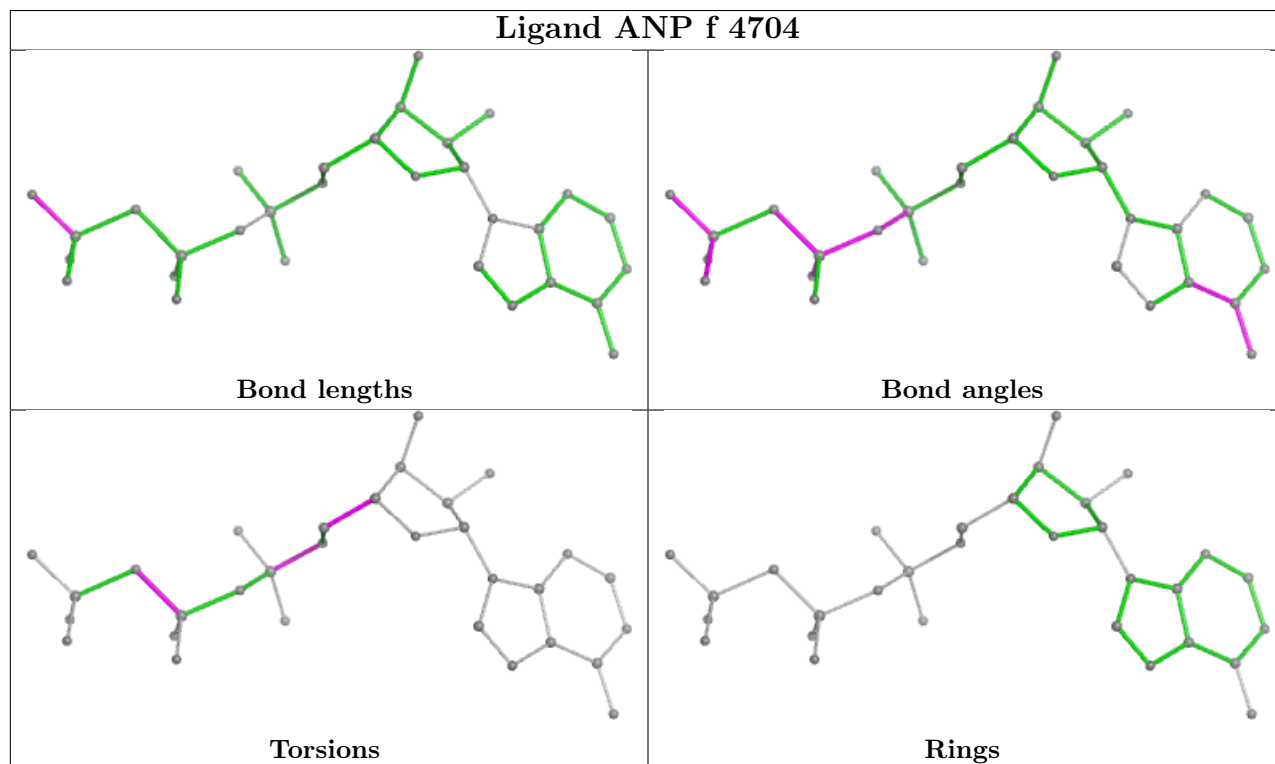
Mol	Chain	Res	Type	Atoms
3	f	4701	ADP	PA-O3A-PB-O2B
3	f	4701	ADP	C5'-O5'-PA-O2A
4	f	4702	ATP	PB-O3B-PG-O2G
4	f	4702	ATP	PB-O3B-PG-O3G
6	f	4704	ANP	PG-N3B-PB-O1B
6	f	4704	ANP	PG-N3B-PB-O3A
6	f	4704	ANP	C5'-O5'-PA-O3A
6	f	4705	ANP	PB-N3B-PG-O1G
6	f	4705	ANP	PG-N3B-PB-O1B
6	f	4705	ANP	C5'-O5'-PA-O1A
6	f	4705	ANP	C5'-O5'-PA-O3A
6	f	4704	ANP	O4'-C4'-C5'-O5'
3	f	4701	ADP	C5'-O5'-PA-O3A
3	f	4701	ADP	C5'-O5'-PA-O1A
6	f	4704	ANP	C5'-O5'-PA-O1A
6	f	4704	ANP	C5'-O5'-PA-O2A
6	f	4705	ANP	C5'-O5'-PA-O2A
6	f	4704	ANP	C3'-C4'-C5'-O5'
3	f	4701	ADP	PA-O3A-PB-O1B
3	f	4701	ADP	O4'-C4'-C5'-O5'

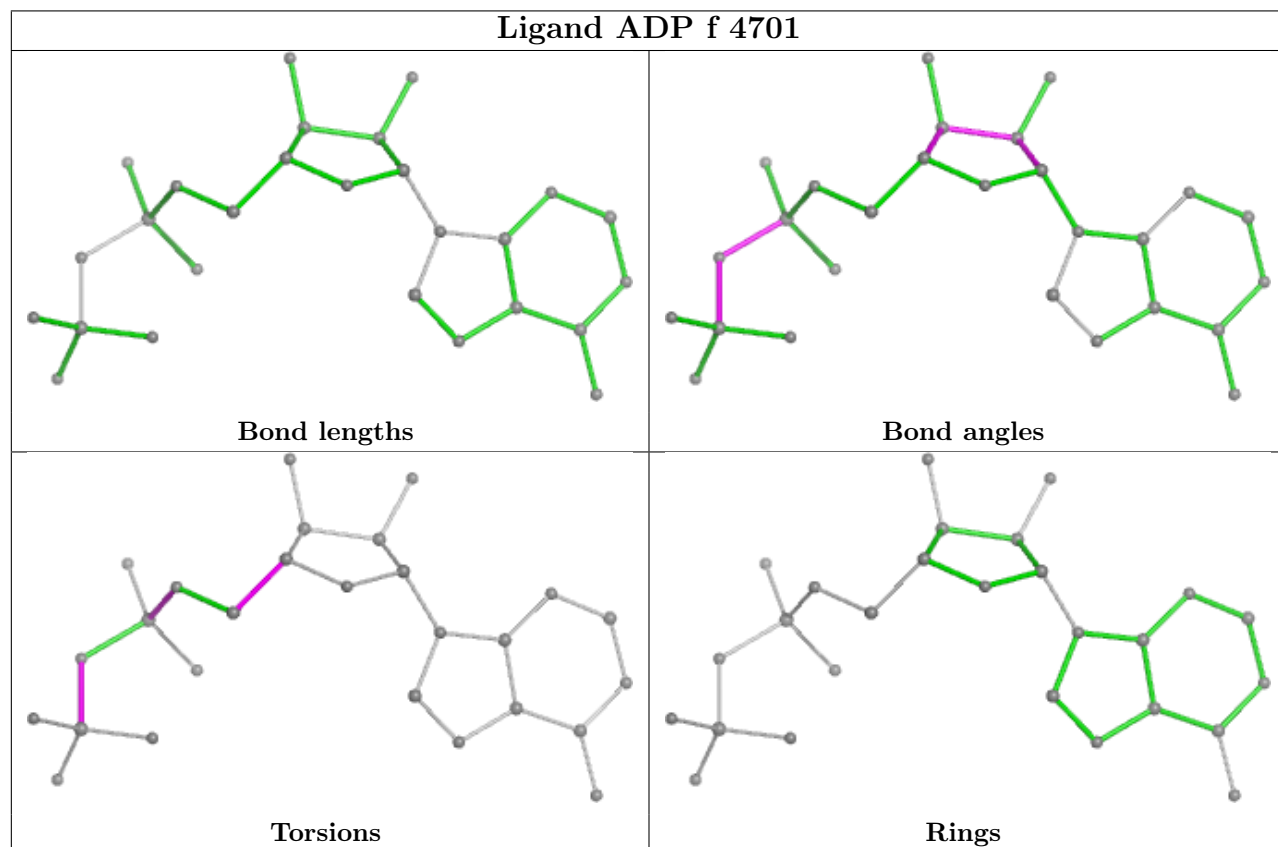
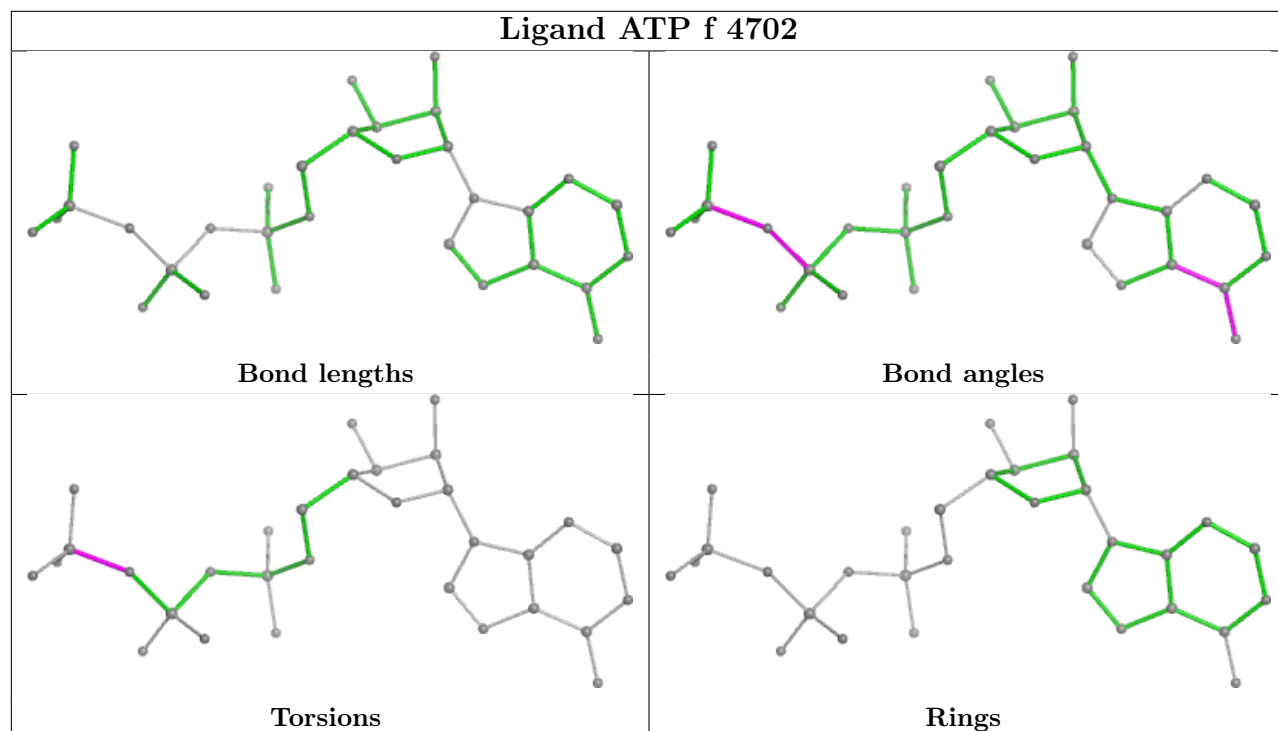
There are no ring outliers.

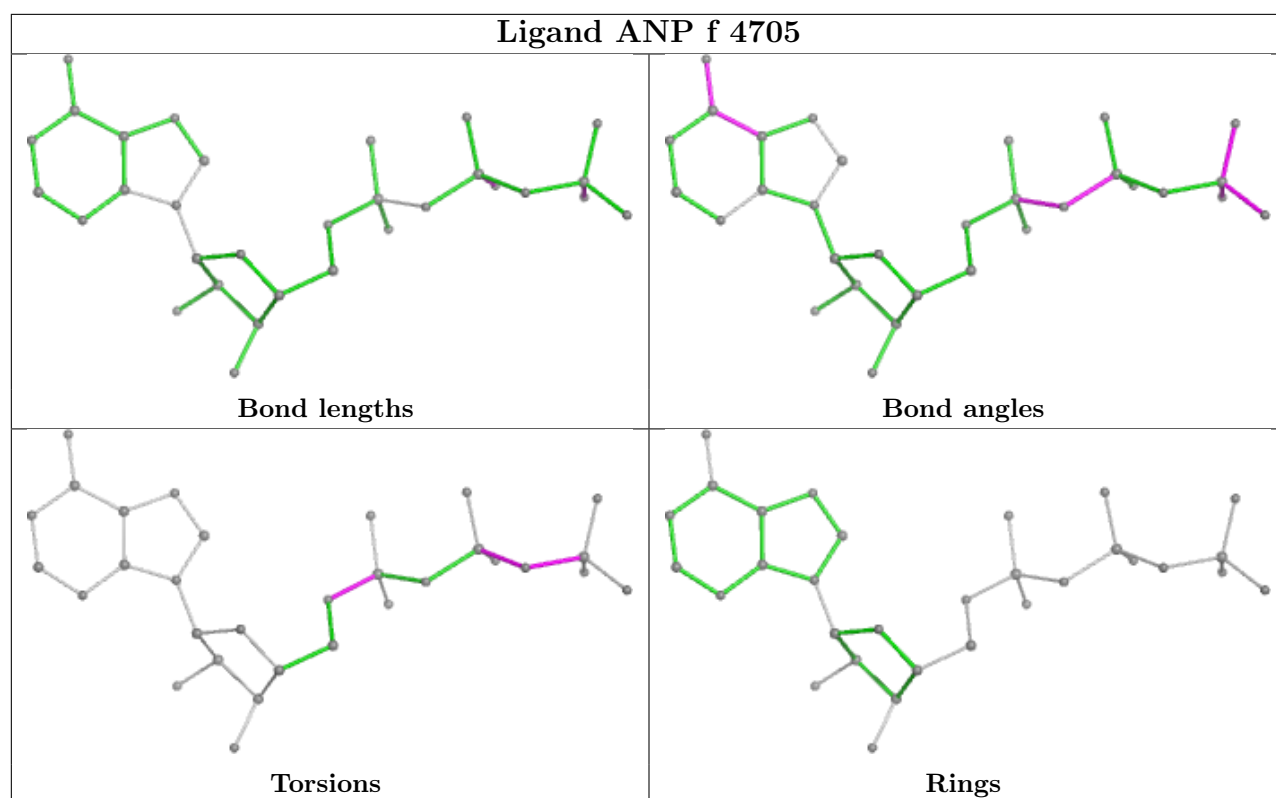
No monomer is involved in short contacts.

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 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.



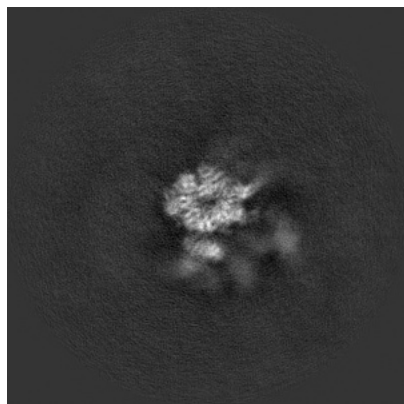
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-14556. These allow visual inspection of the internal detail of the map and identification of artifacts.

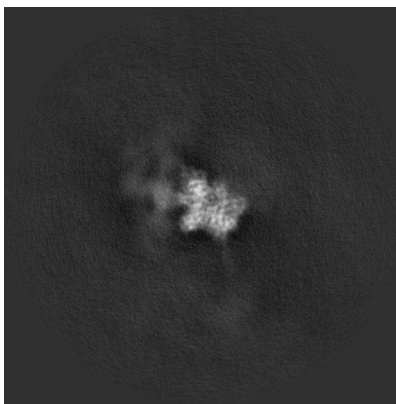
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

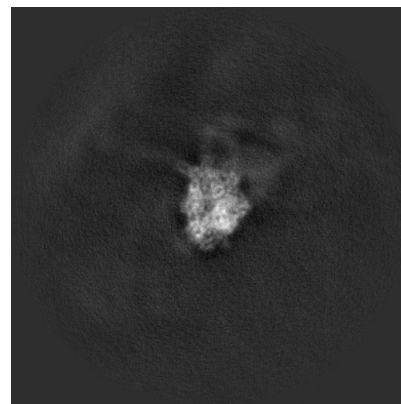
#### 6.1.1 Primary map



X

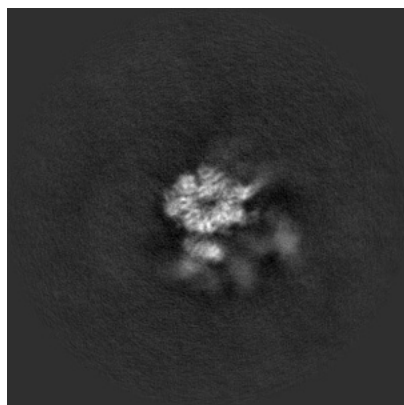


Y

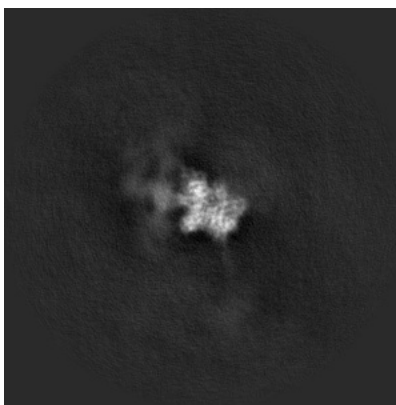


Z

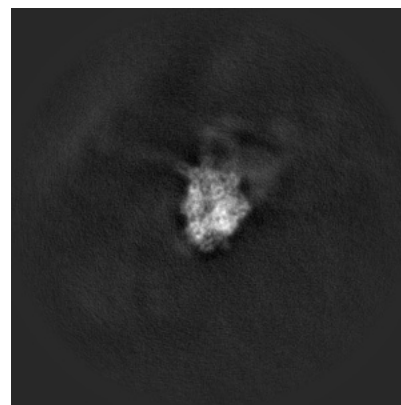
#### 6.1.2 Raw map



X



Y

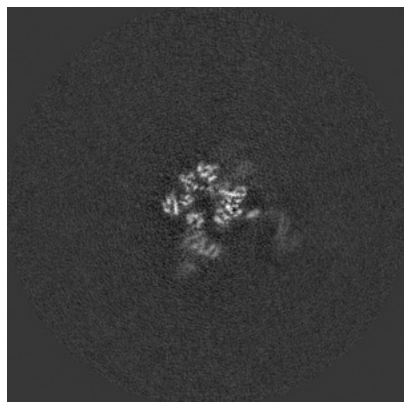


Z

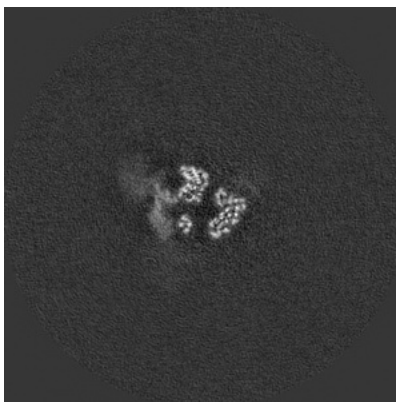
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

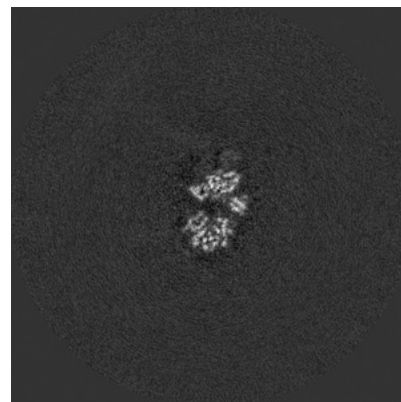
### 6.2.1 Primary map



X Index: 155

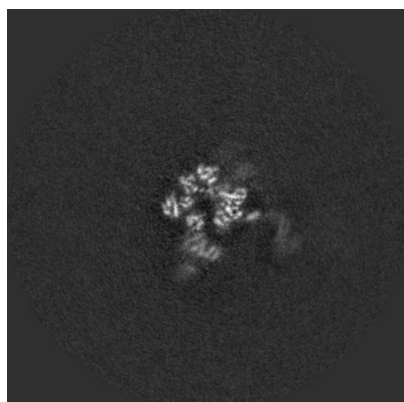


Y Index: 155

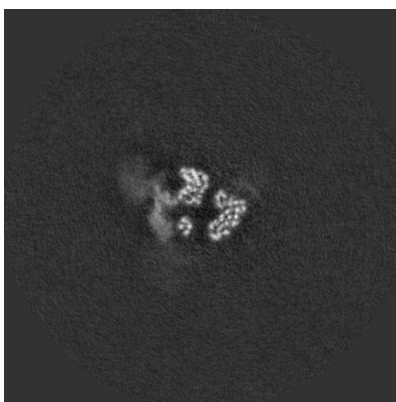


Z Index: 155

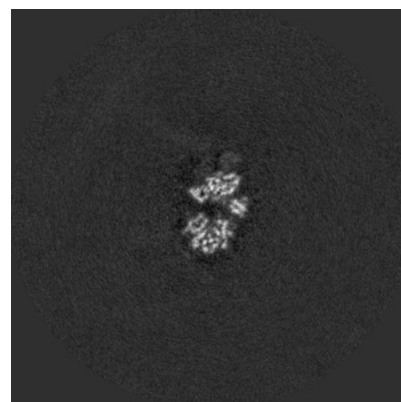
### 6.2.2 Raw map



X Index: 155



Y Index: 155

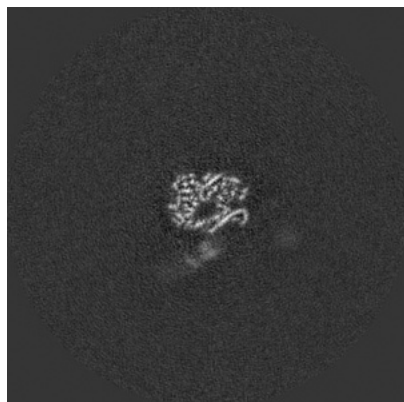


Z Index: 155

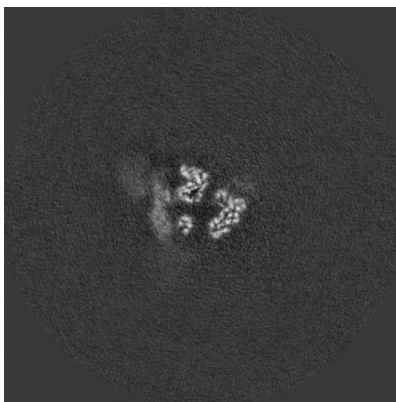
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

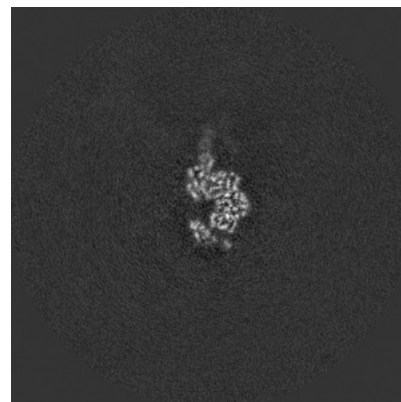
### 6.3.1 Primary map



X Index: 143



Y Index: 156

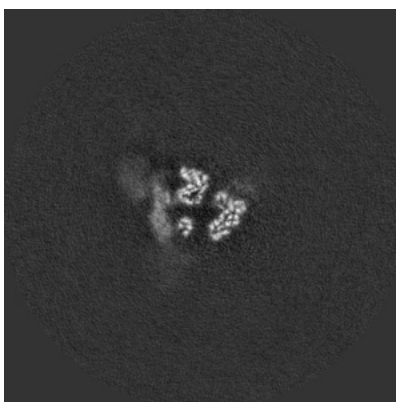


Z Index: 148

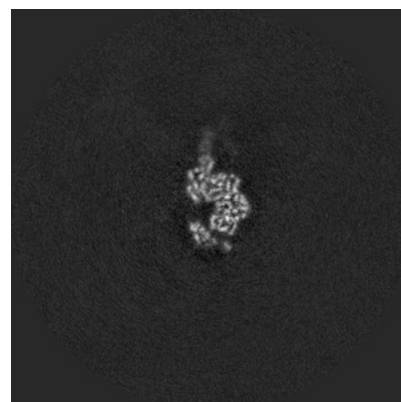
### 6.3.2 Raw map



X Index: 143



Y Index: 156

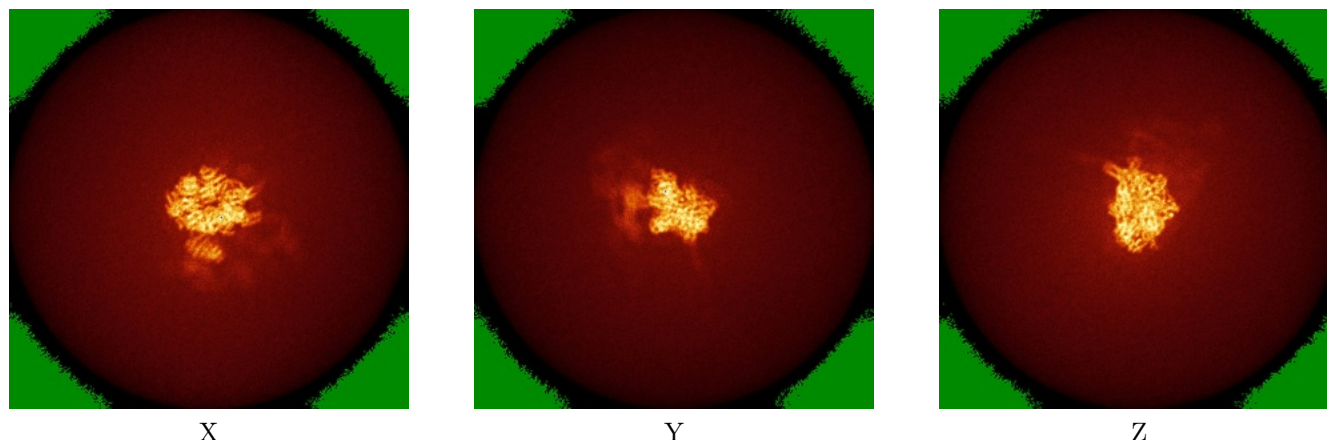


Z Index: 148

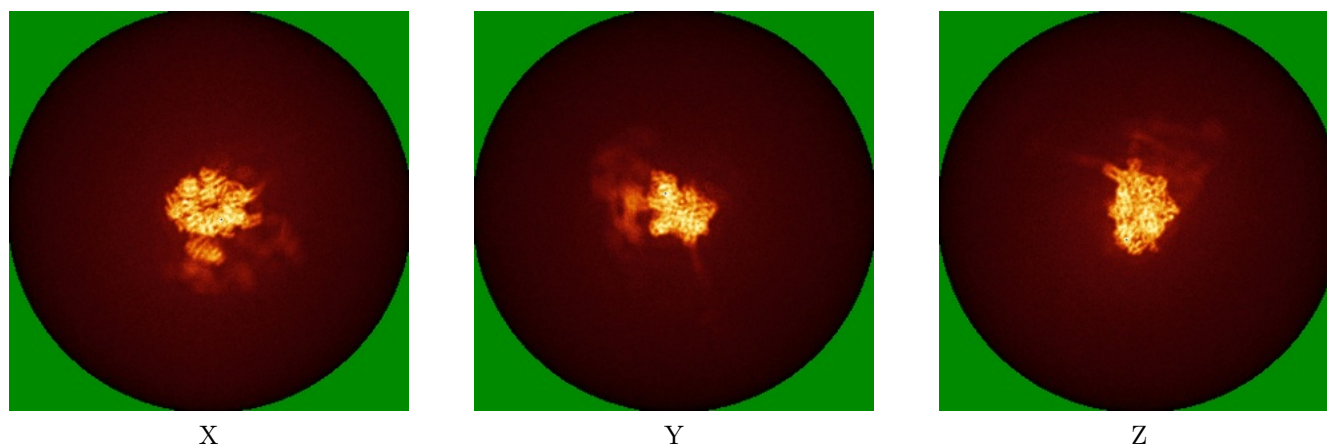
The images above show the largest variance slices of the map in three orthogonal directions.

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

### 6.4.1 Primary map



### 6.4.2 Raw map



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.

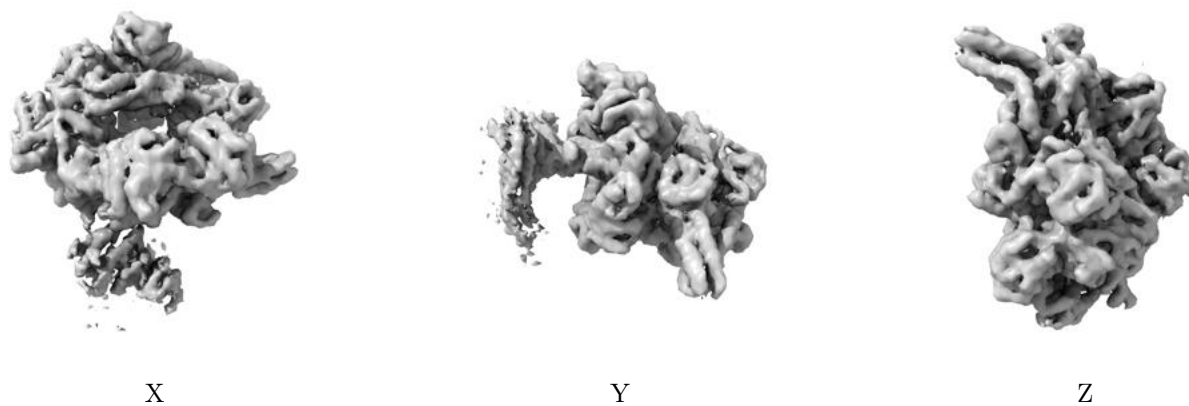
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0393. 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.

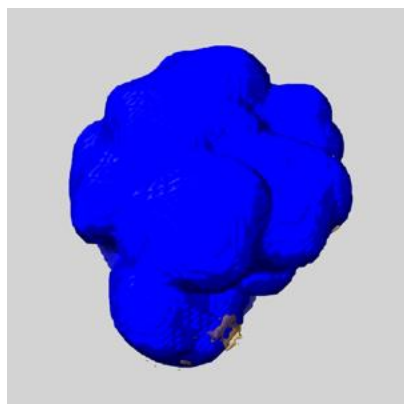
## 6.6 Mask visualisation [i](#)

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

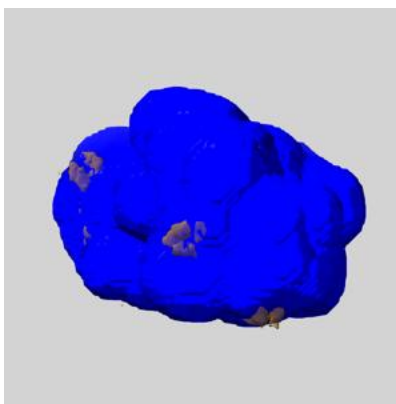
A mask typically either:

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

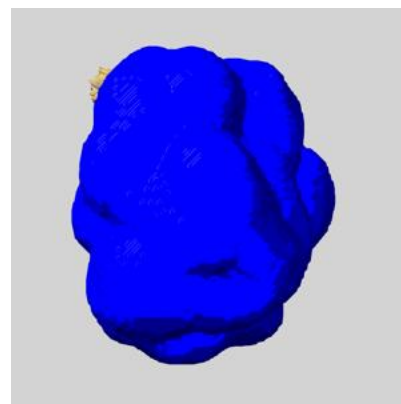
### 6.6.1 emd\_14556\_msk\_1.map [i](#)



X



Y

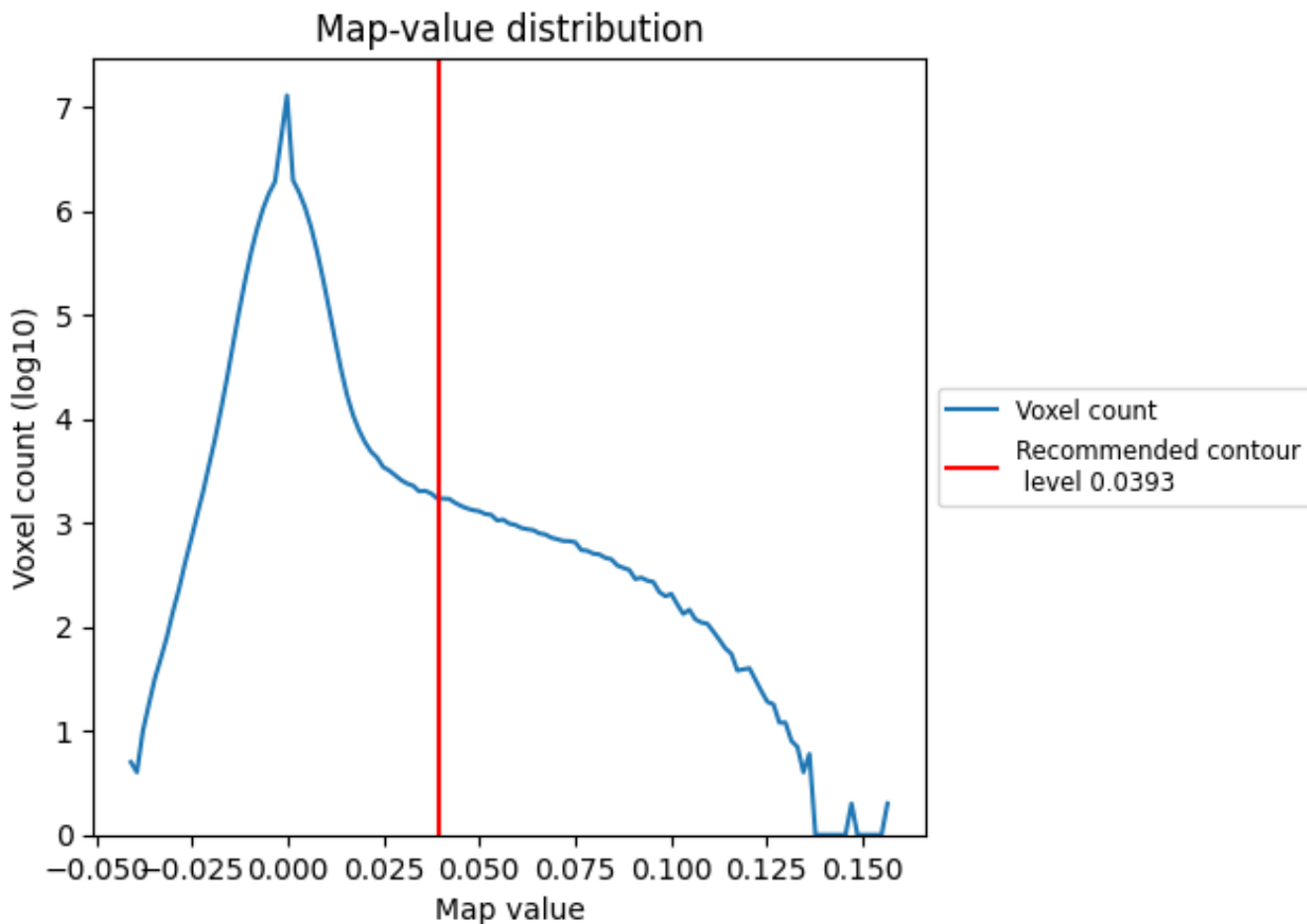


Z

## 7 Map analysis [i](#)

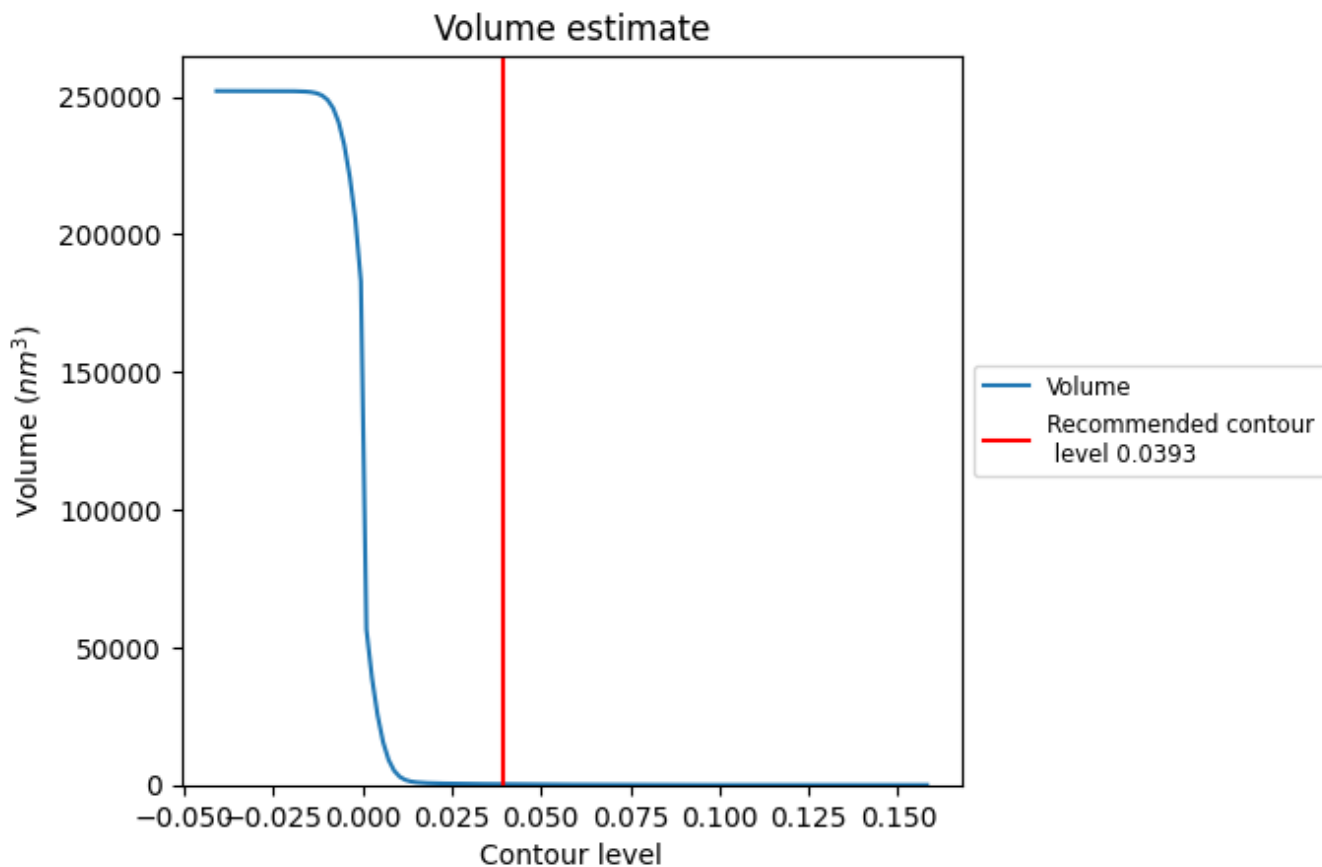
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

## 7.2 Volume estimate [i](#)

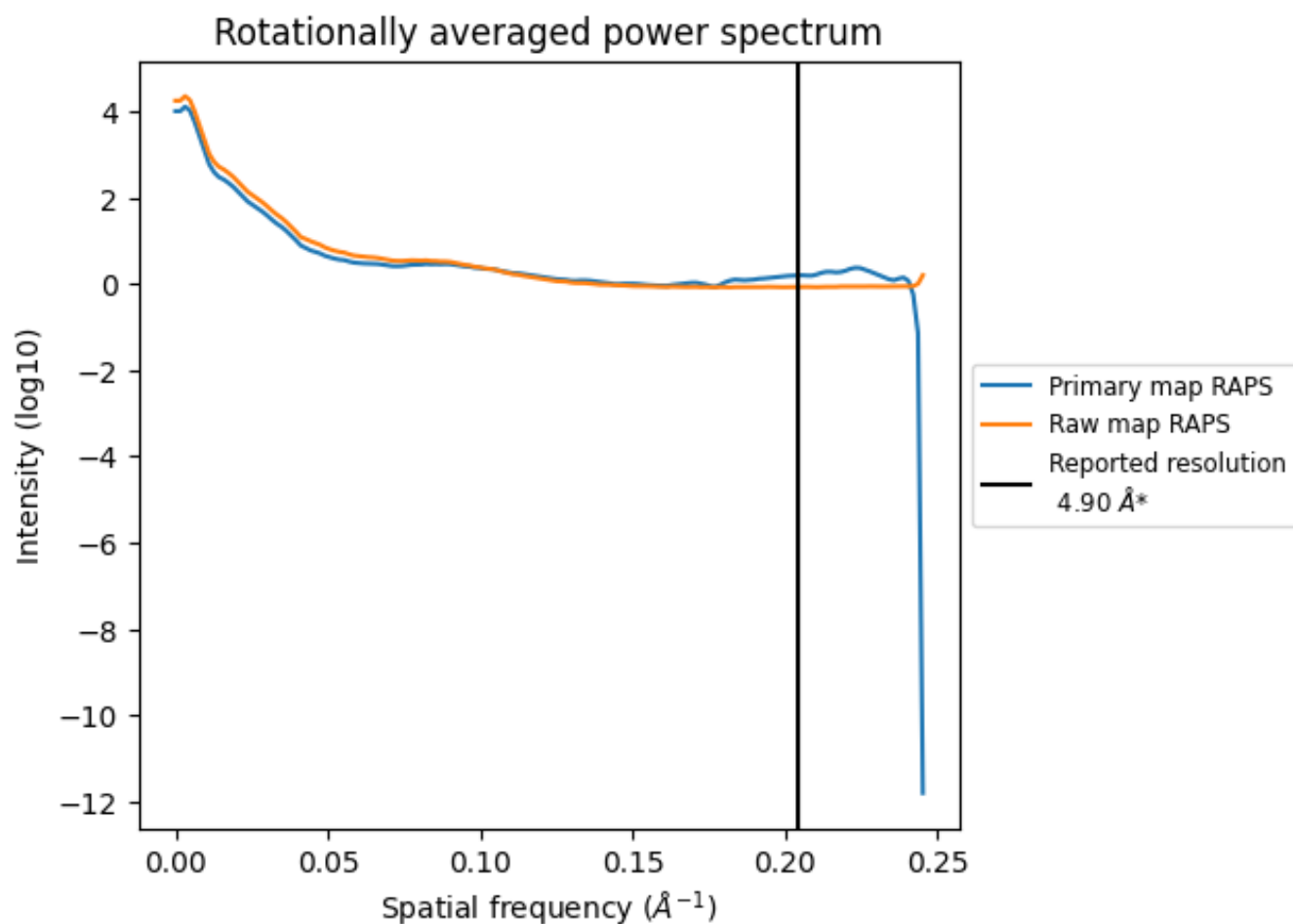


The volume at the recommended contour level is 279  $\text{nm}^3$ ; this corresponds to an approximate mass of 252 kDa.

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](#)

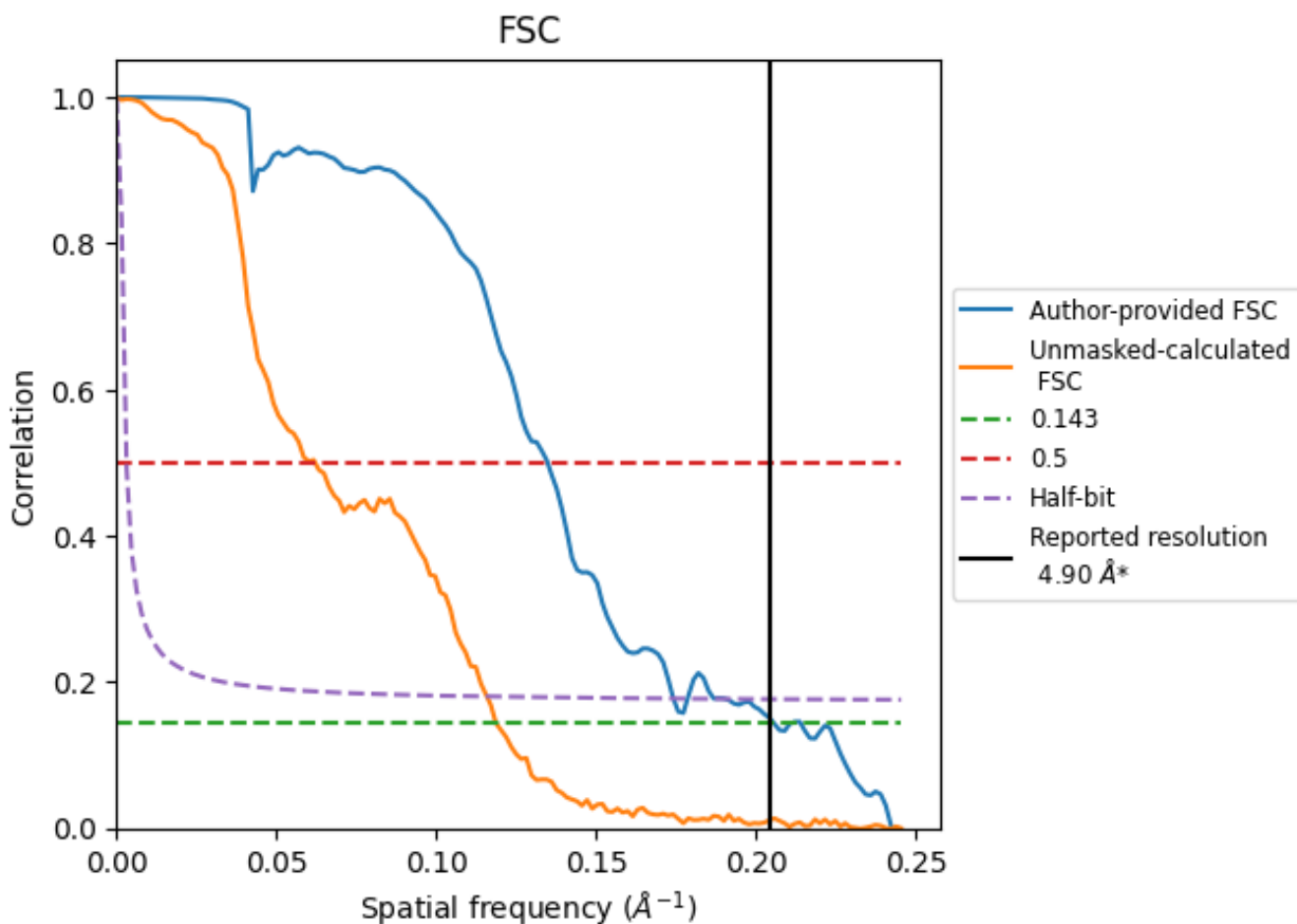


\*Reported resolution corresponds to spatial frequency of 0.204 Å<sup>-1</sup>

## 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 0.204 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

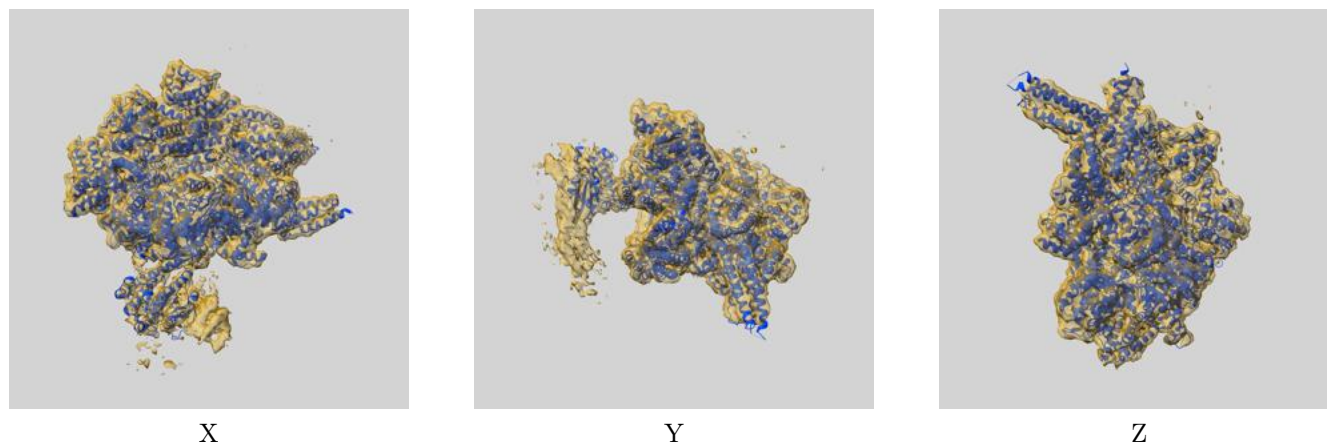
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.90	-	-
Author-provided FSC curve	4.86	7.42	5.74
Unmasked-calculated*	8.42	16.10	8.64

\*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 8.42 differs from the reported value 4.9 by more than 10 %

## 9 Map-model fit [i](#)

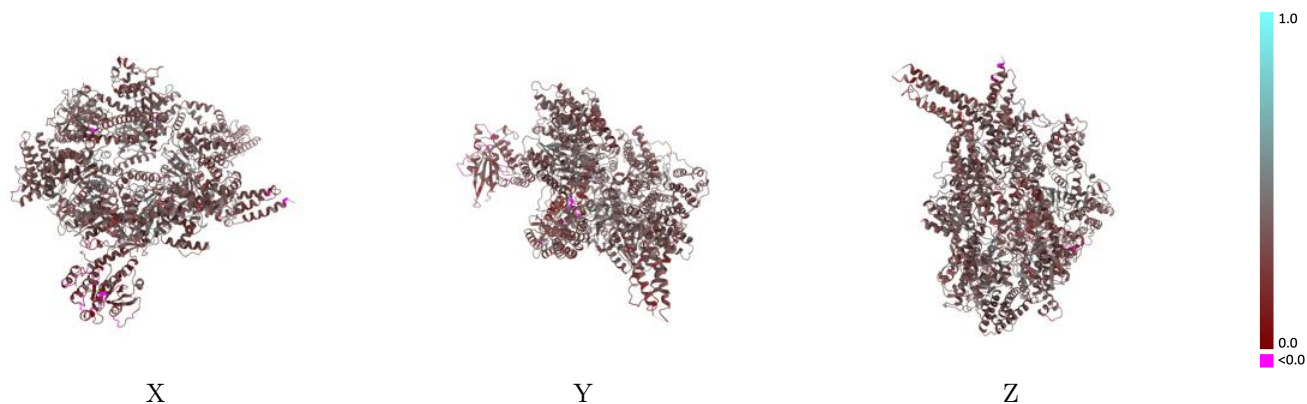
This section contains information regarding the fit between EMDB map EMD-14556 and PDB model 7Z8L. Per-residue inclusion information can be found in section 3 on page 6.

### 9.1 Map-model overlay [i](#)



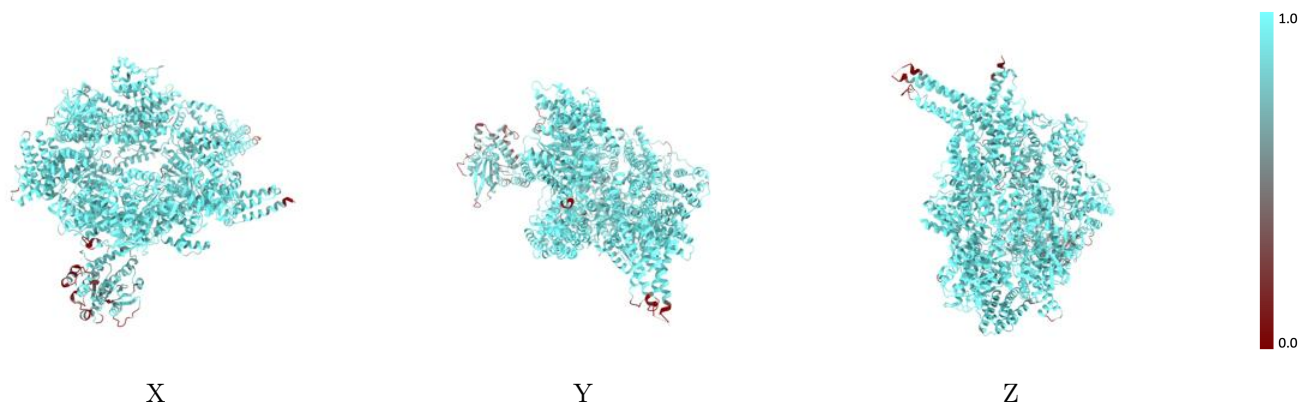
The images above show the 3D surface view of the map at the recommended contour level 0.0393 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



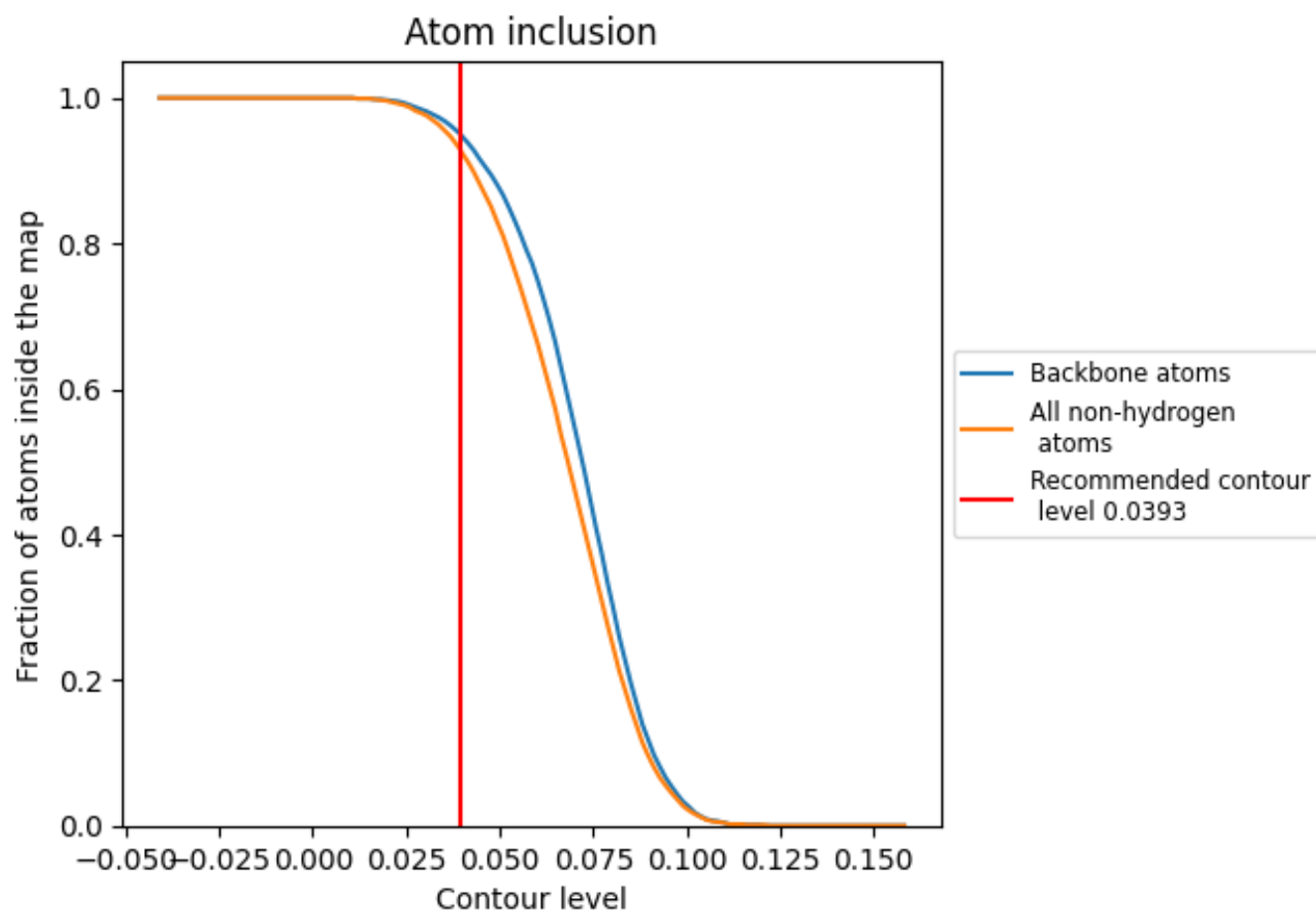
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0393).







## 9.4 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 93% 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 (0.0393) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9300	 0.3370
f	 0.9540	 0.3470
q	 0.6480	 0.2160

