



# wwPDB EM Validation Summary Report ⓘ

May 2, 2026 – 03:19 PM EDT

PDB ID : 9EFV / pdb\_00009efv  
EMDB ID : EMD-47981  
Title : Cryo-EM structure of CSN-N8CUL1 in complex with CSN5i-3  
Authors : Shi, H.; Zheng, N.  
Deposited on : 2024-11-20  
Resolution : 3.03 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](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:

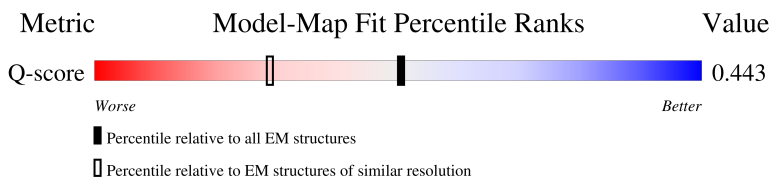
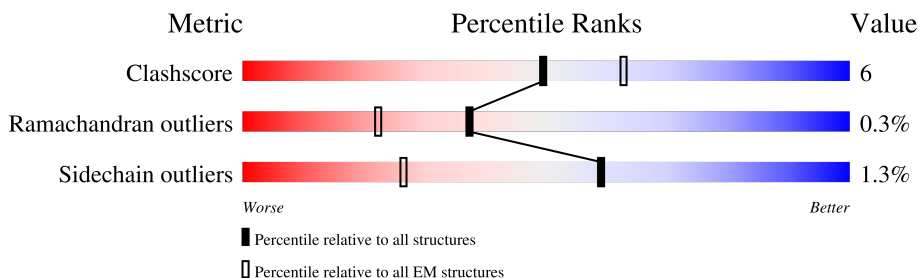
EMDB validation analysis : 0.0.1.dev132  
Mogul : 2022.3.0, CSD as543be (2022)  
MolProbity : 4-5-2 with Phenix2.0  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

# 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 3.03 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	13929 ( 2.53 - 3.53 )

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	A	491	
2	B	443	
3	C	423	
4	D	406	

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Mol	Chain	Length	Quality of chain
5	E	334	
6	F	327	
7	G	264	
8	H	209	
9	I	81	
10	J	776	
11	K	108	

## 2 Entry composition

There are 13 unique types of molecules in this entry. The entry contains 24947 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 COP9 signalosome complex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	405	Total	C	N	O	S	0	0
			3243	2049	569	603	22		

- Molecule 2 is a protein called COP9 signalosome complex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	408	Total	C	N	O	S	0	0
			3342	2126	574	627	15		

- Molecule 3 is a protein called COP9 signalosome complex subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	405	Total	C	N	O	S	0	0
			3222	2051	541	604	26		

- Molecule 4 is a protein called COP9 signalosome complex subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	386	Total	C	N	O	S	0	0
			3105	1962	537	592	14		

- Molecule 5 is a protein called COP9 signalosome complex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	277	Total	C	N	O	S	0	0
			2215	1424	364	414	13		

- Molecule 6 is a protein called COP9 signalosome complex subunit 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	275	Total	C	N	O	S	0	0
			2201	1407	366	415	13		

- Molecule 7 is a protein called COP9 signalosome complex subunit 7b.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	213	Total	C	N	O	S	0	0
			1687	1070	287	324	6		

- Molecule 8 is a protein called COP9 signalosome complex subunit 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	172	Total	C	N	O	S	0	0
			1374	880	239	251	4		

- Molecule 9 is a protein called NEDD8.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	76	Total	C	N	O	S	0	0
			599	378	104	115	2		

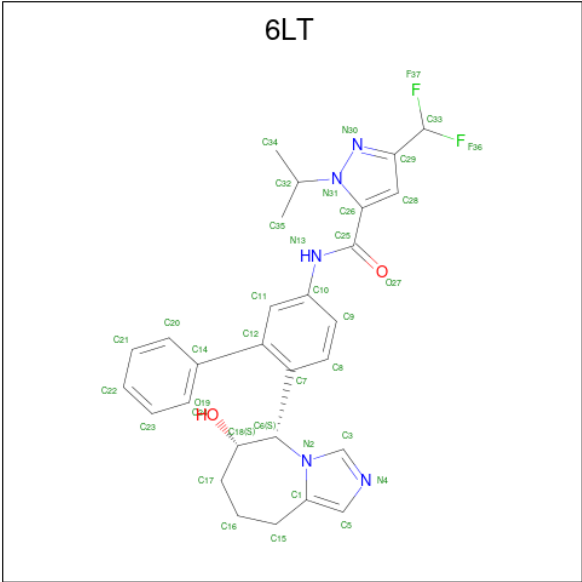
- Molecule 10 is a protein called Cullin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	400	Total	C	N	O	S	0	0
			3225	2057	546	604	18		

- Molecule 11 is a protein called E3 ubiquitin-protein ligase RBX1.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	82	Total	C	N	O	S	0	0
			693	443	127	114	9		

- Molecule 12 is 3-(difluoromethyl)-N-{6-[(5S,6S)-6-hydroxy-6,7,8,9-tetrahydro-5H-imidazo[1,5-a]azepin-5-yl][1,1'-biphenyl]-3-yl}-1-(propan-2-yl)-1H-pyrazole-5-carboxamide (CCD ID: 6LT) (formula: C<sub>28</sub>H<sub>29</sub>F<sub>2</sub>N<sub>5</sub>O<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
12	E	1	Total	C	F	N	O	0
			37	28	2	5	2	

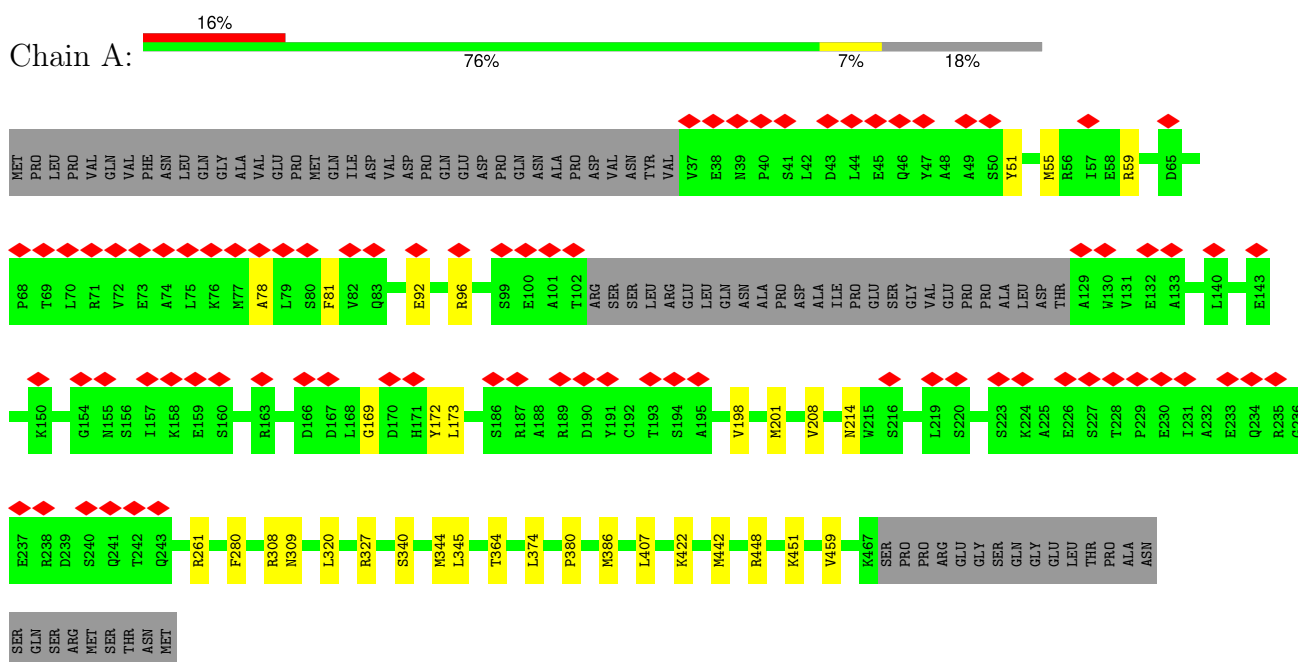
- Molecule 13 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
13	E	1	Total	Zn	0
			1	1	
13	K	3	Total	Zn	0
			3	3	

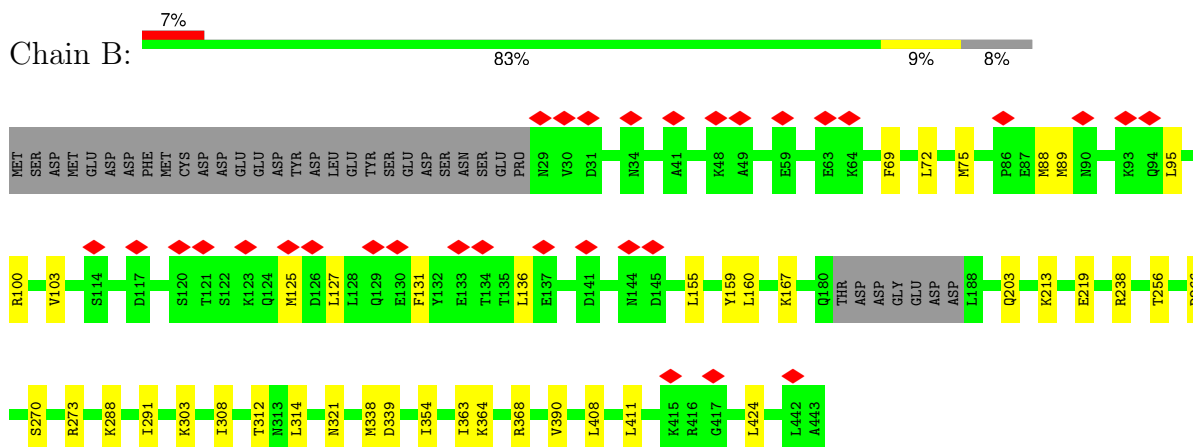
### 3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: COP9 signalosome complex subunit 1



- Molecule 2: COP9 signalosome complex subunit 2

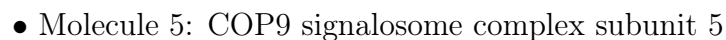


- Molecule 3: COP9 signalosome complex subunit 3

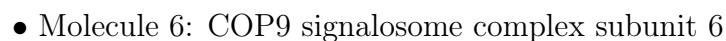
Frequency	Percentage
Daily	81%
Weekly	14%
Monthly	5%



83% 11% 5%



Frequency	Percentage
Daily	59%
Sometimes	24%
Never	17%

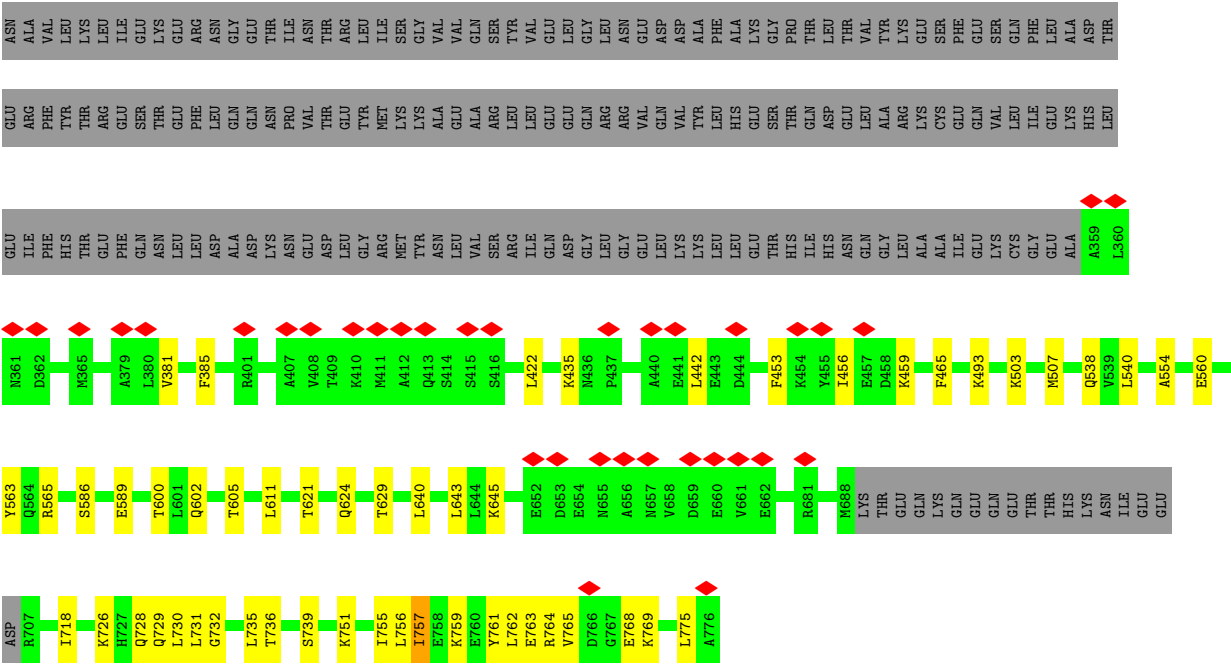


Frequency	Percentage
Daily	61%
Weekly	22%
Monthly	16%

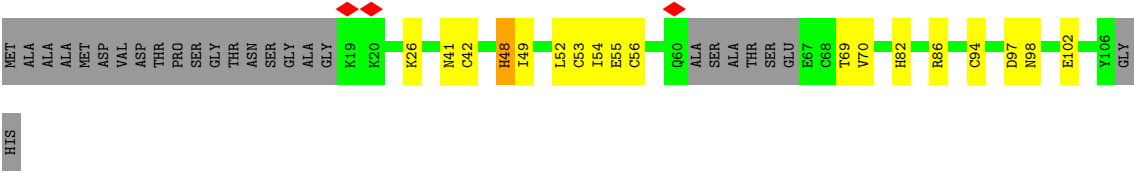








• Molecule 11: E3 ubiquitin-protein ligase RBX1



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	174577	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	60	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.260	Depositor
Minimum map value	-0.346	Depositor
Average map value	0.008	Depositor
Map value standard deviation	0.024	Depositor
Recommended contour level	0.08	Depositor
Map size (Å)	330.80002, 330.80002, 330.80002	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.827, 0.827, 0.827	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: ZN, 6LT

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	0.10	0/3296	0.27	0/4439
2	B	0.11	0/3399	0.31	0/4571
3	C	0.10	0/3281	0.28	0/4431
4	D	0.10	0/3156	0.27	0/4264
5	E	0.15	0/2262	0.39	0/3052
6	F	0.18	0/2247	0.41	0/3044
7	G	0.08	0/1707	0.22	0/2309
8	H	0.11	0/1407	0.30	0/1912
9	I	0.16	0/604	0.39	0/808
10	J	0.11	0/3276	0.29	0/4409
11	K	0.13	0/713	0.38	0/965
All	All	0.12	0/25348	0.31	0/34204

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	A	3243	0	3282	19	0
2	B	3342	0	3397	27	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	3222	0	3243	37	0
4	D	3105	0	3109	33	0
5	E	2215	0	2204	56	0
6	F	2201	0	2182	49	0
7	G	1687	0	1730	7	0
8	H	1374	0	1360	21	0
9	I	599	0	638	14	0
10	J	3225	0	3304	36	0
11	K	693	0	655	14	0
12	E	37	0	0	0	0
13	E	1	0	0	0	0
13	K	3	0	0	0	0
All	All	24947	0	25104	283	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 283 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:198:VAL:HA	1:A:201:MET:HE2	1.54	0.87
5:E:69:ALA:HB1	5:E:172:PRO:HG3	1.65	0.78
2:B:256:THR:HG22	11:K:98:ASN:HB3	1.65	0.78
6:F:270:LEU:HD23	6:F:275:PHE:HB2	1.67	0.75
5:E:45:TRP:HE1	5:E:163:GLU:HB3	1.53	0.73

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	401/491 (82%)	386 (96%)	15 (4%)	0	100	100
2	B	404/443 (91%)	375 (93%)	27 (7%)	2 (0%)	24	57
3	C	403/423 (95%)	389 (96%)	13 (3%)	1 (0%)	43	73
4	D	384/406 (95%)	367 (96%)	17 (4%)	0	100	100
5	E	269/334 (80%)	242 (90%)	26 (10%)	1 (0%)	30	61
6	F	271/327 (83%)	251 (93%)	16 (6%)	4 (2%)	8	32
7	G	211/264 (80%)	208 (99%)	3 (1%)	0	100	100
8	H	168/209 (80%)	166 (99%)	2 (1%)	0	100	100
9	I	74/81 (91%)	69 (93%)	5 (7%)	0	100	100
10	J	396/776 (51%)	374 (94%)	22 (6%)	0	100	100
11	K	78/108 (72%)	72 (92%)	6 (8%)	0	100	100
All	All	3059/3862 (79%)	2899 (95%)	152 (5%)	8 (0%)	37	67

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	404	VAL
2	B	270	SER
5	E	25	ILE
6	F	270	LEU
2	B	291	ILE

### 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	353/429 (82%)	352 (100%)	1 (0%)	86	88
2	B	371/405 (92%)	368 (99%)	3 (1%)	73	83
3	C	362/377 (96%)	357 (99%)	5 (1%)	59	78
4	D	332/347 (96%)	329 (99%)	3 (1%)	70	82
5	E	240/283 (85%)	233 (97%)	7 (3%)	37	67

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
6	F	246/276 (89%)	241 (98%)	5 (2%)	48	73
7	G	185/229 (81%)	183 (99%)	2 (1%)	65	80
8	H	143/173 (83%)	141 (99%)	2 (1%)	59	78
9	I	66/69 (96%)	65 (98%)	1 (2%)	57	77
10	J	362/698 (52%)	358 (99%)	4 (1%)	65	80
11	K	74/90 (82%)	72 (97%)	2 (3%)	39	68
All	All	2734/3376 (81%)	2699 (99%)	35 (1%)	59	79

5 of 35 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
9	I	41	GLN
10	J	442	LEU
10	J	757	ILE
5	E	95	SER
4	D	304	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 35 such sidechains are listed below:

Mol	Chain	Res	Type
10	J	518	ASN
10	J	520	GLN
10	J	683	ASN
4	D	180	ASN
3	C	239	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 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$
12	6LT	E	401	13	37,41,41	0.54	1 (2%)	45,59,59	0.71	0

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
12	6LT	E	401	13	-	1/24/38/38	0/5/5/5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
12	E	401	6LT	N31-N30	-2.38	1.33	1.38

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
12	E	401	6LT	C28-C29-C33-F37

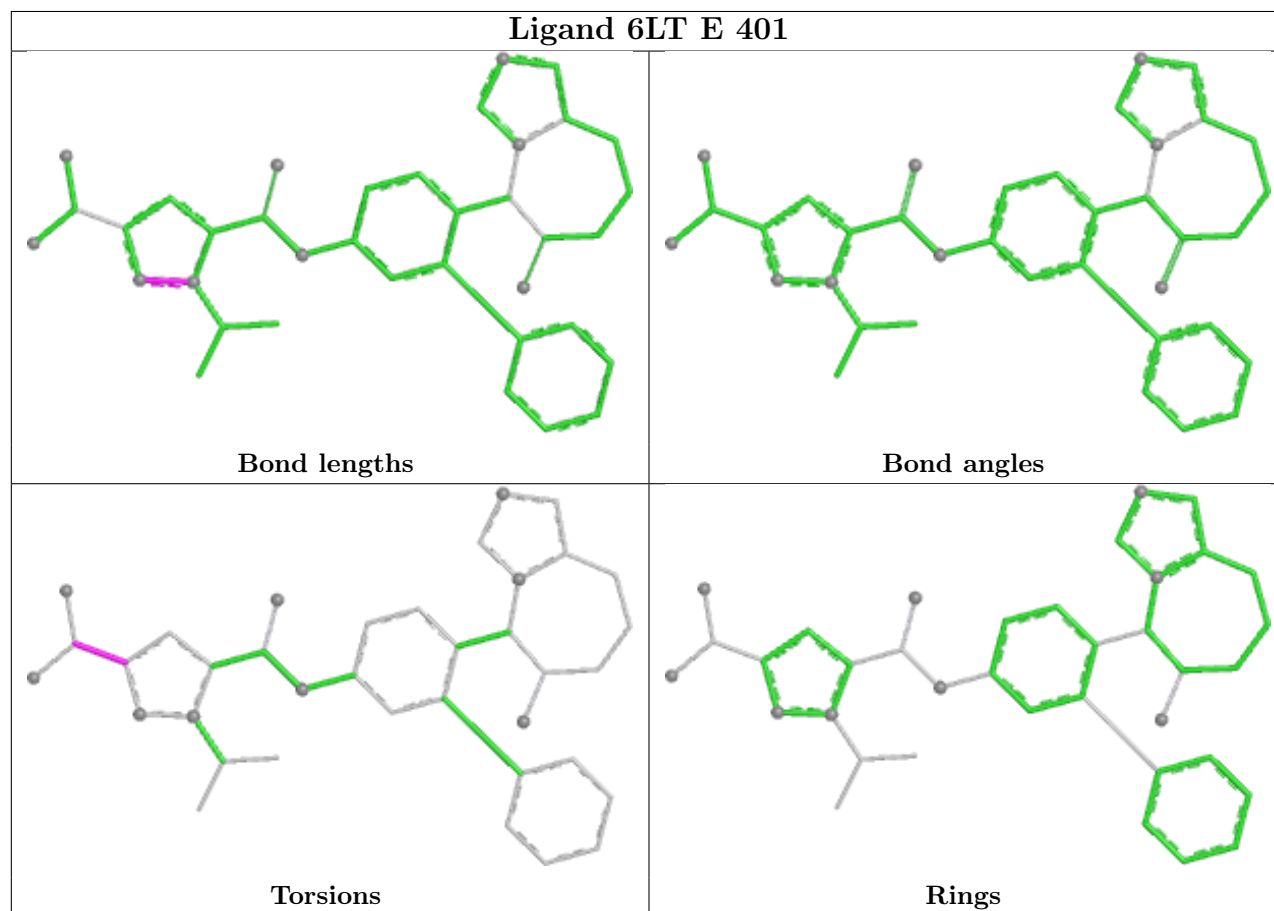
There are no ring outliers.

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.

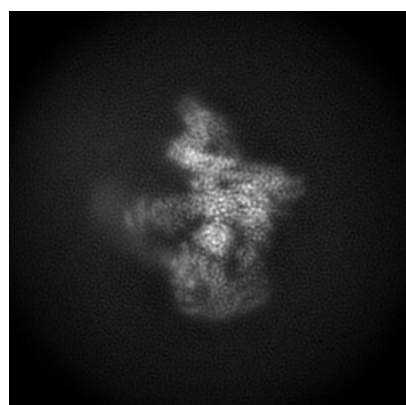
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-47981. These allow visual inspection of the internal detail of the map and identification of artifacts.

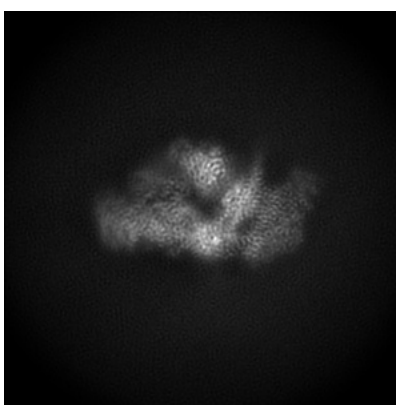
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

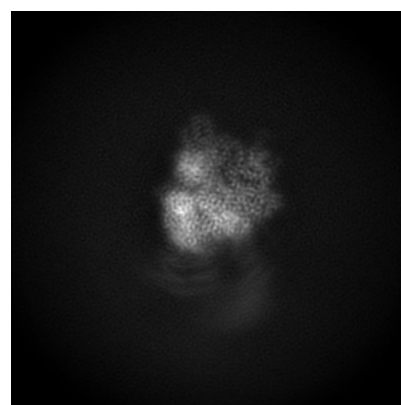
#### 6.1.1 Primary map



X



Y

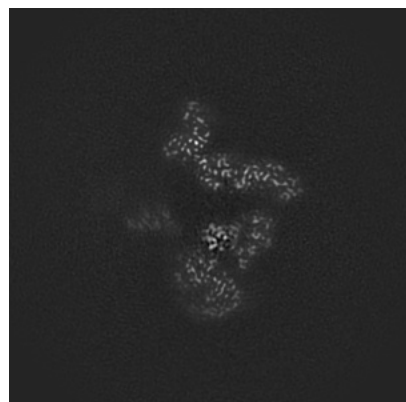


Z

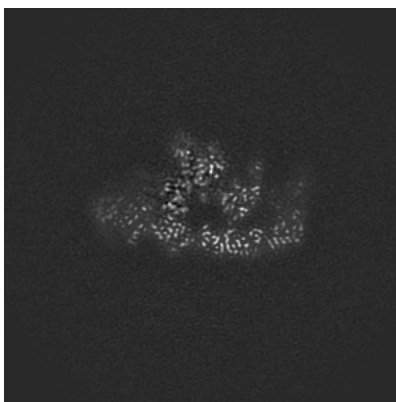
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

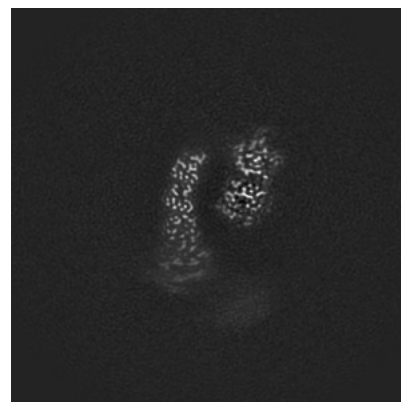
#### 6.2.1 Primary map



X Index: 200



Y Index: 200

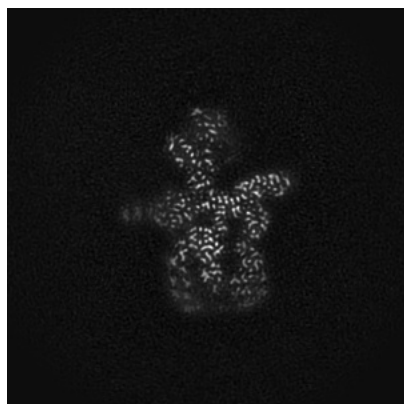


Z Index: 200

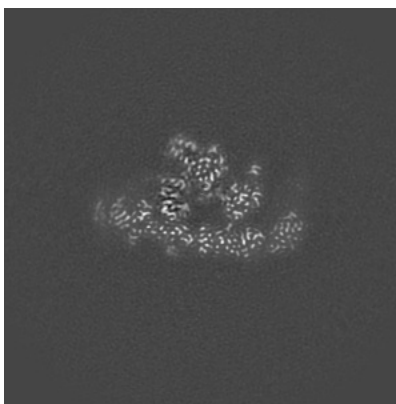
The images above show central slices of the map in three orthogonal directions.

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

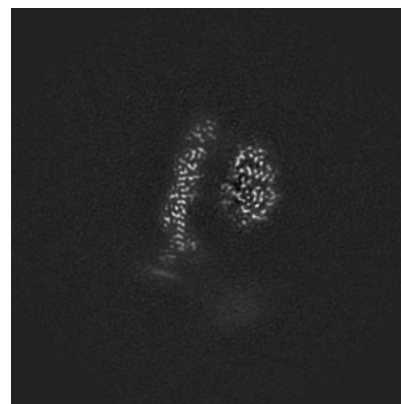
### 6.3.1 Primary map



X Index: 175



Y Index: 203

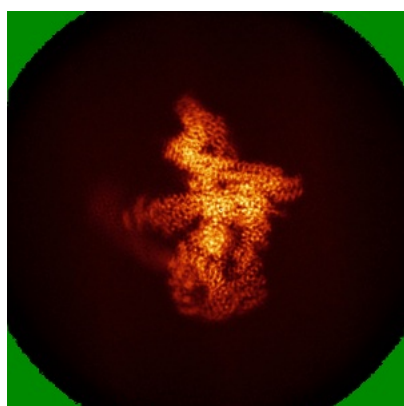


Z Index: 211

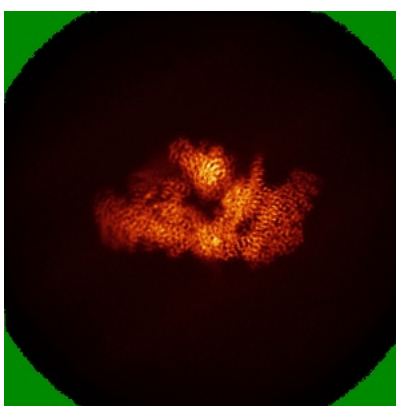
The images above show the largest variance slices of the map in three orthogonal directions.

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

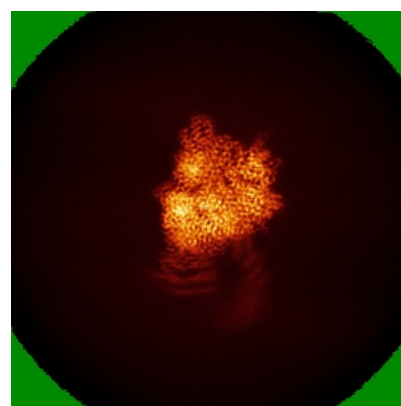
### 6.4.1 Primary map



X



Y



Z

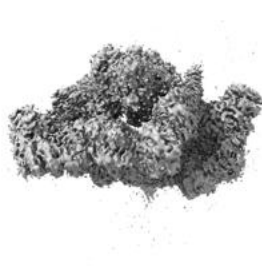
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

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

### 6.5.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.08. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

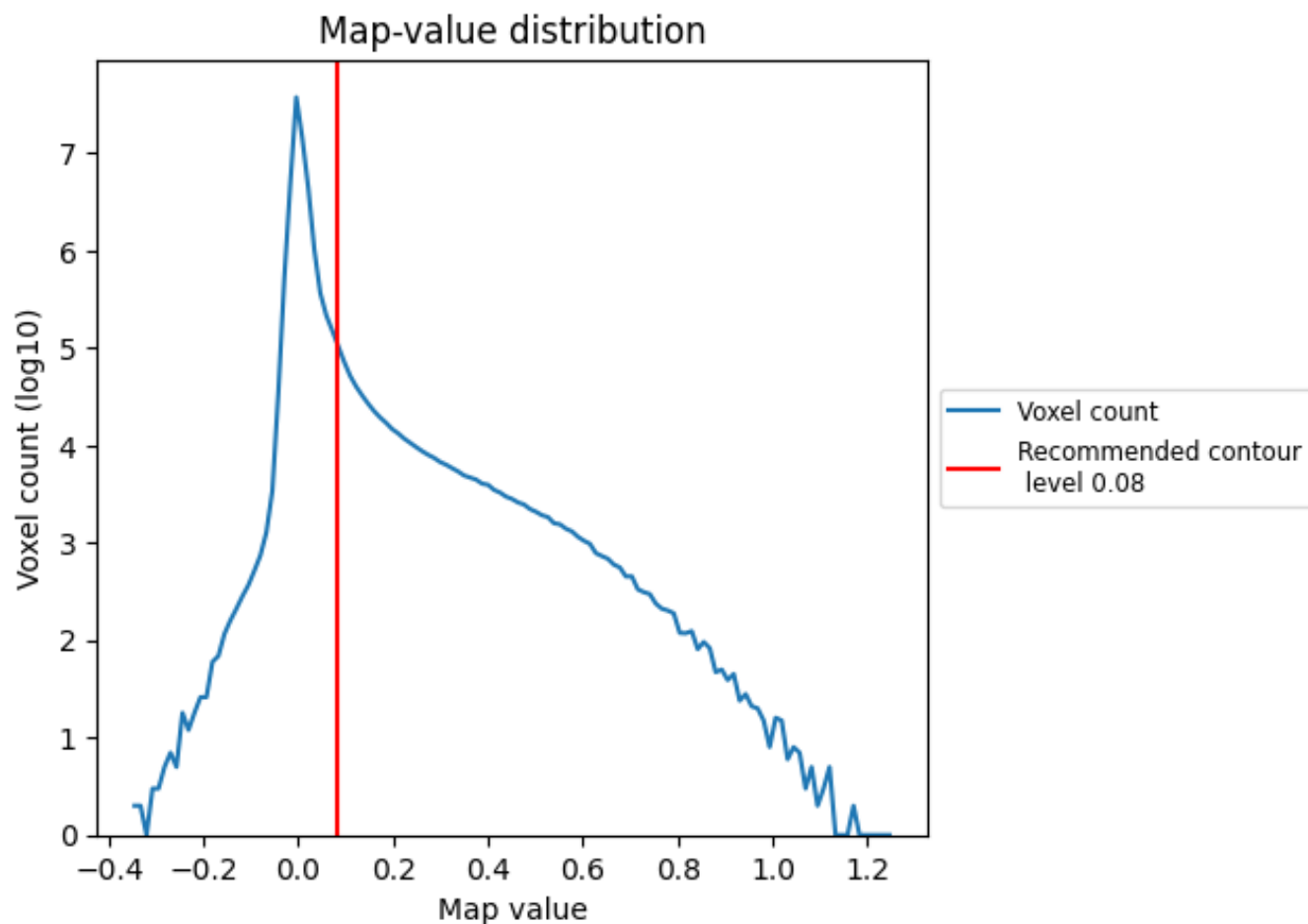
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

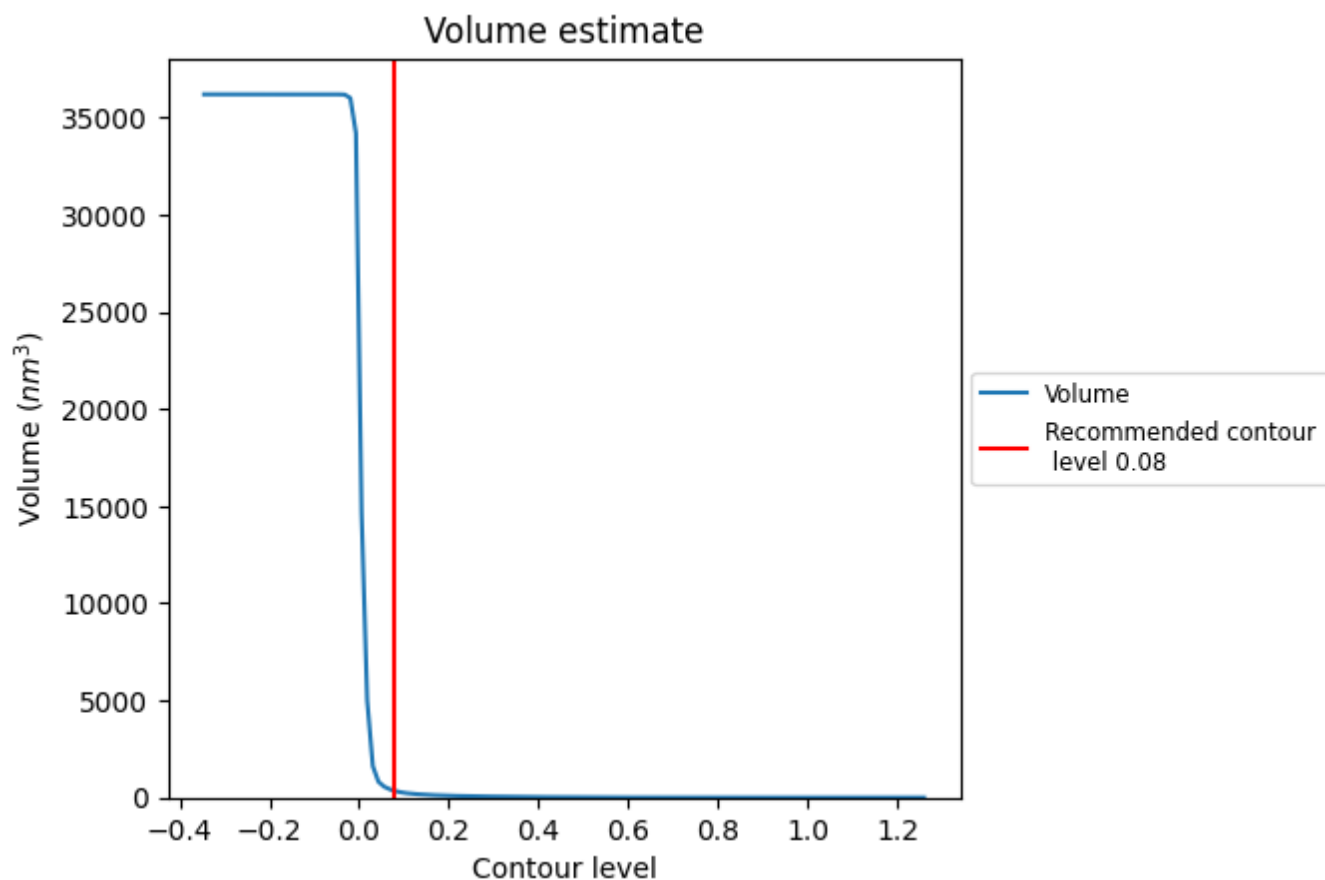
This section contains the results of statistical analysis of the map.

### 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.

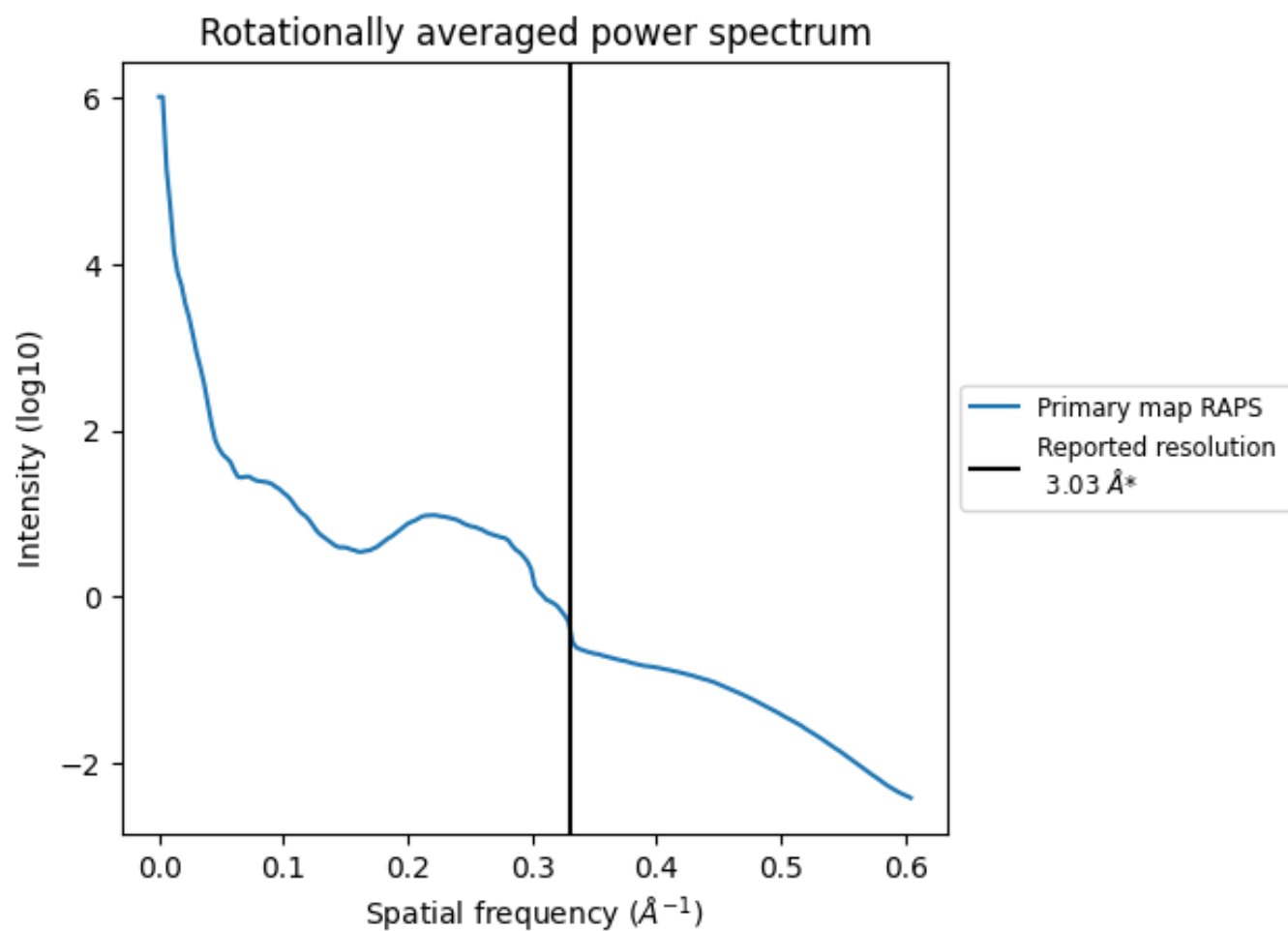
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 341  $\text{nm}^3$ ; this corresponds to an approximate mass of 308 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 0.330 Å<sup>-1</sup>

## 8 Fourier-Shell correlation

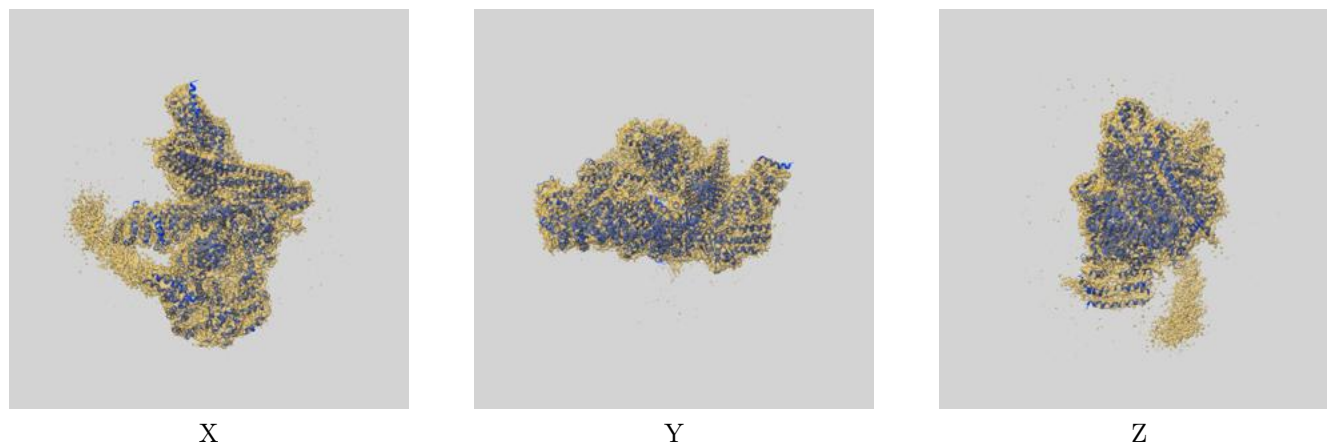
This section was not generated. No FSC curve or half-maps provided.



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

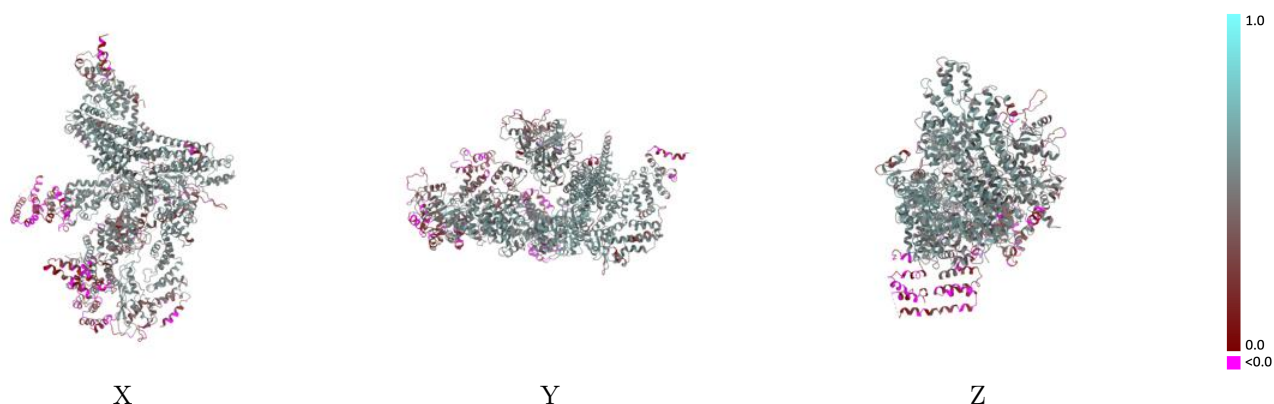
This section contains information regarding the fit between EMDB map EMD-47981 and PDB model 9EFV. Per-residue inclusion information can be found in section 3 on page 7.

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



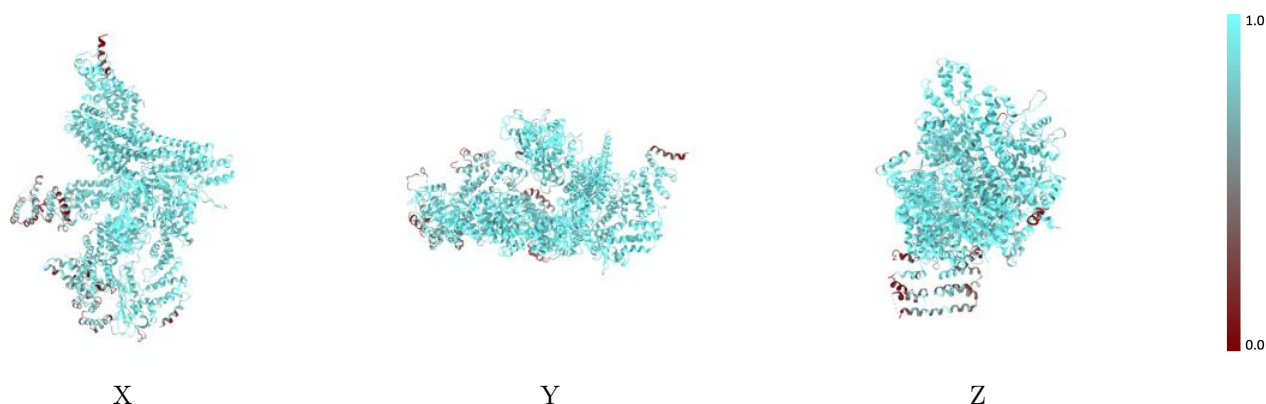
The images above show the 3D surface view of the map at the recommended contour level 0.08 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



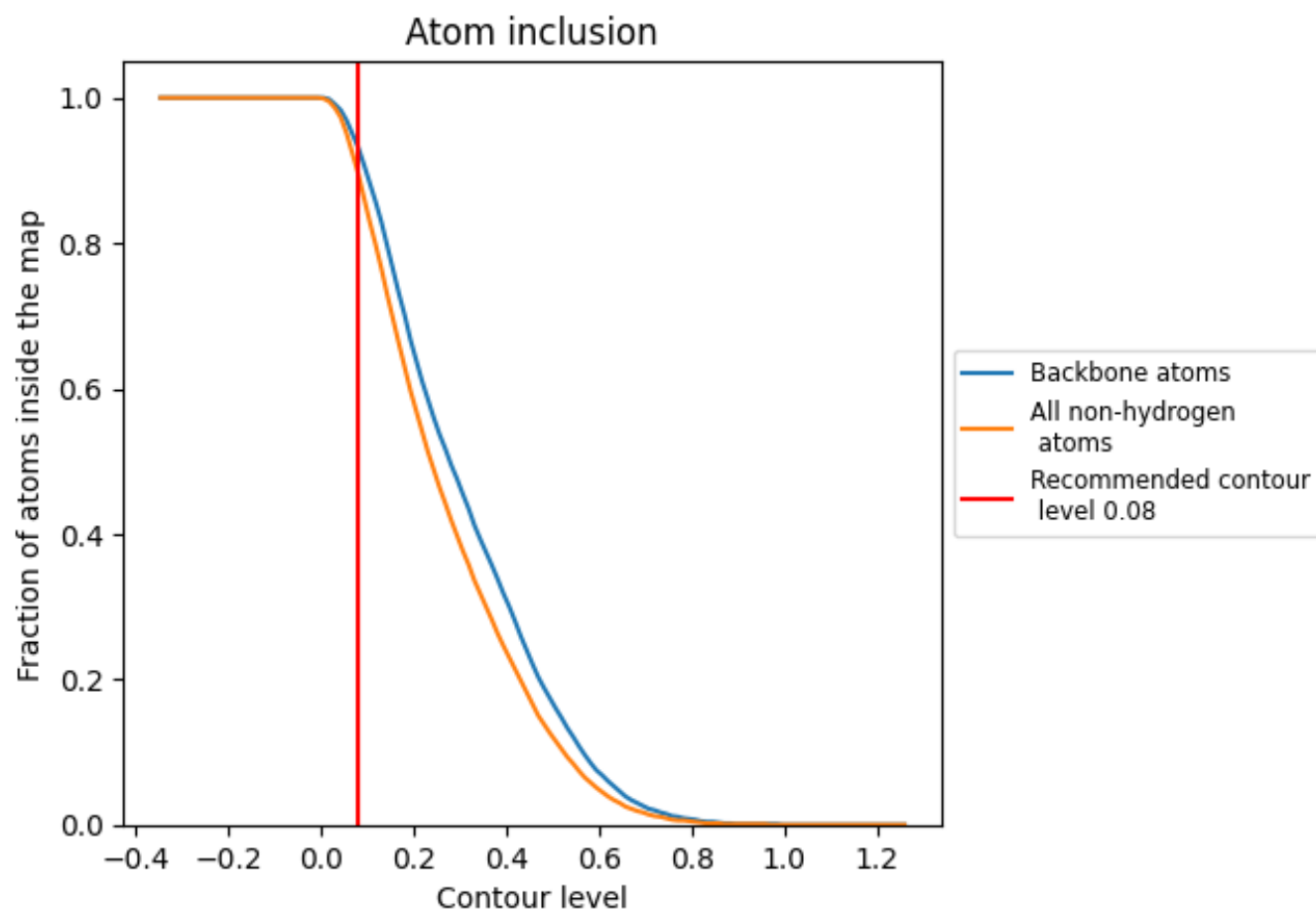
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.08).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 90% 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 (0.08) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.8980	<div></div> 0.4430
A	<div></div> 0.7590	<div></div> 0.3390
B	<div></div> 0.8690	<div></div> 0.4150
C	<div></div> 0.9400	<div></div> 0.5110
D	<div></div> 0.9320	<div></div> 0.4840
E	<div></div> 0.9650	<div></div> 0.4800
F	<div></div> 0.9410	<div></div> 0.4630
G	<div></div> 0.9740	<div></div> 0.5410
H	<div></div> 0.9430	<div></div> 0.4880
I	<div></div> 0.9630	<div></div> 0.4280
J	<div></div> 0.8370	<div></div> 0.3550
K	<div></div> 0.9260	<div></div> 0.4740

1.0

0.0

<0.0