



# wwPDB EM Validation Summary Report ⓘ

Nov 16, 2022 – 04:58 AM JST

PDB ID : 6LNB  
EMDB ID : EMD-0929  
Title : CryoEM structure of Cascade-ThiQ-dsDNA complex  
Authors : Wang, B.; Xu, W.; Yang, H.  
Deposited on : 2019-12-28  
Resolution : 3.18 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:

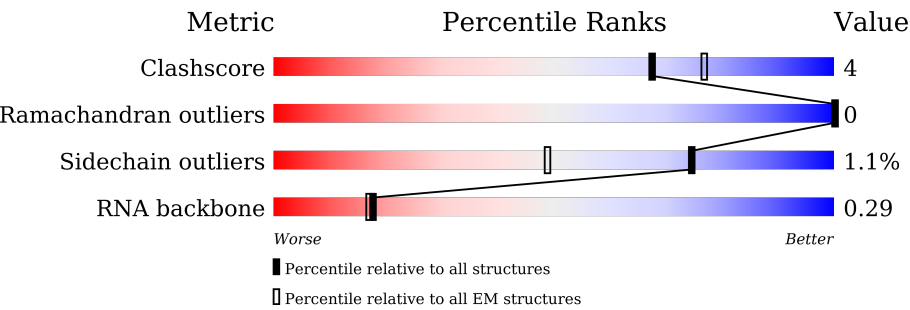
EMDB validation analysis : 0.0.1.dev43  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.2

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.18 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
RNA backbone	4643	859

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	B	354	<div><div>77%</div><div>8%</div><div>15%</div></div>
1	C	354	<div><div>86%</div><div>8%</div><div>6%</div></div>
1	D	354	<div><div>89%</div><div>6%</div><div>5%</div></div>
1	E	354	<div><div>89%</div><div>6%</div><div>5%</div></div>
1	F	354	<div><div>88%</div><div>7%</div><div>5%</div></div>
1	G	354	<div><div>87%</div><div>9%</div><div>..</div></div>
2	H	640	<div><div>67%</div><div>12%</div><div>20%</div></div>

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Mol	Chain	Length	Quality of chain
3	A	199	
4	I	394	
4	J	394	
5	M	60	
6	N	51	
7	O	51	

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 29583 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 CRISPR-associated protein Cas7.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	G	342	Total	C	N	O	S	0	0
			2725	1732	468	511	14		
1	F	336	Total	C	N	O	S	0	0
			2685	1710	461	499	15		
1	E	335	Total	C	N	O	S	0	0
			2681	1708	460	499	14		
1	D	336	Total	C	N	O	S	0	0
			2675	1702	460	499	14		
1	C	333	Total	C	N	O	S	0	0
			2659	1693	455	497	14		
1	B	301	Total	C	N	O	S	0	0
			2443	1562	419	449	13		

- Molecule 2 is a protein called CRISPR-associated protein Cas8.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	510	Total	C	N	O	S	0	0
			4001	2529	697	755	20		

- Molecule 3 is a protein called CRISPR-associated protein Cas6.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	A	197	Total	C	N	O	S	0	0
			1611	1024	286	294	7		

- Molecule 4 is a protein called Transposition protein TniQ.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	J	359	Total	C	N	O	S	0	0
			2937	1884	506	531	16		
4	I	376	Total	C	N	O	S	0	0
			3070	1971	527	553	19		

- Molecule 5 is a RNA chain called CRISPR RNA (60-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
5	M	60	Total	C	N	O	P	0	0
			1276	570	225	422	59		

- Molecule 6 is a DNA chain called Target DNA strand (51-MER).

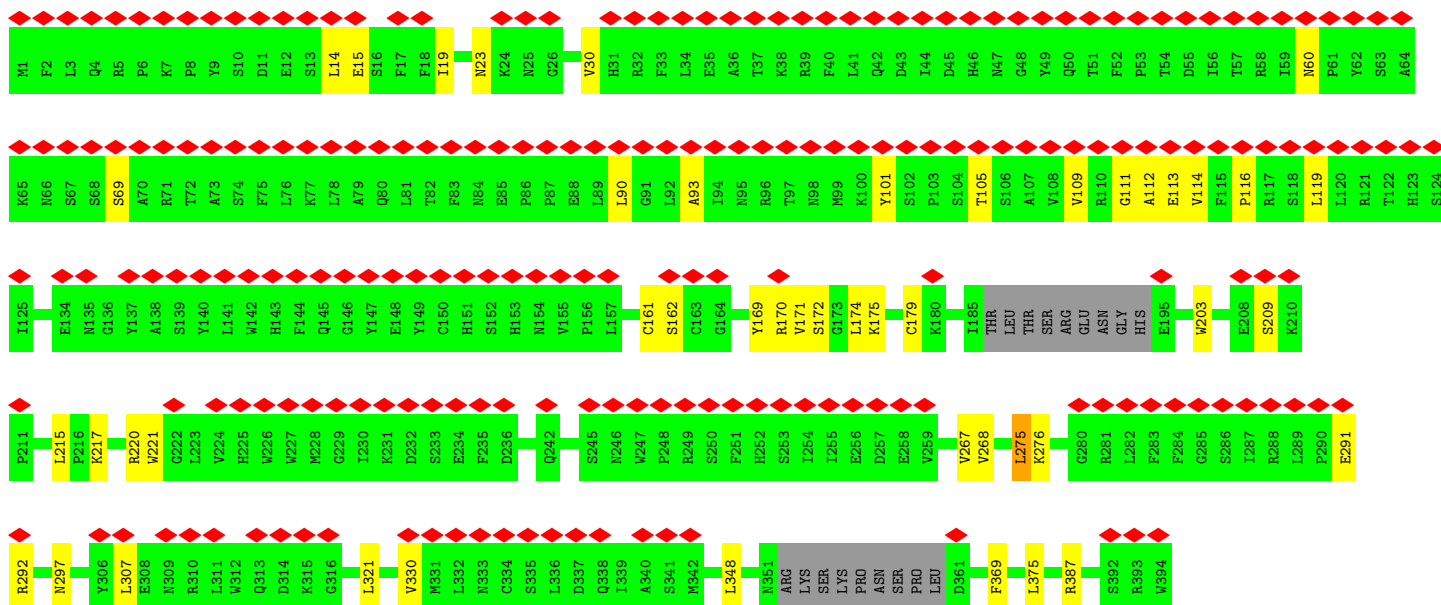
Mol	Chain	Residues	Atoms					AltConf	Trace
6	N	33	Total	C	N	O	P	0	0
			678	320	130	195	33		

- Molecule 7 is a DNA chain called Non-target DNA strand (51-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	O	7	Total	C	N	O	P	0	0
			142	68	25	42	7		

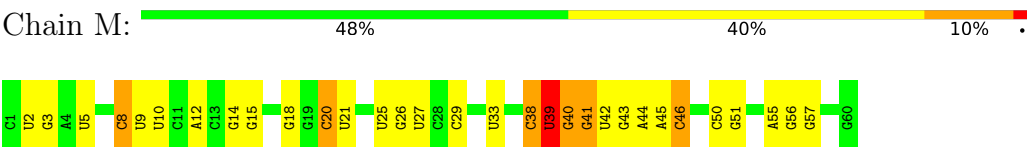


VAL	K2	I8	L11	P12	E13	L14	E18	S19	A22	R26	W47	V52	I56	E79	Q80	L81	Q82	Y83	F84	C96	T97	R102	R103	I107	R117	R126	A126	R129	Y149	L152	T159	M160	R164	L185	N166	I167	R168	M169
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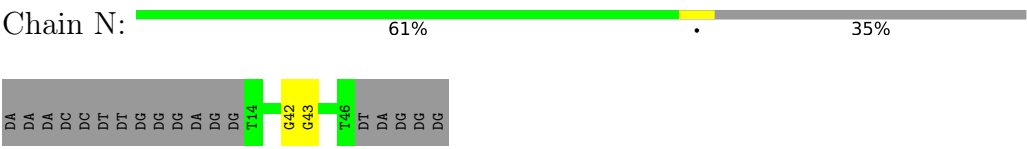




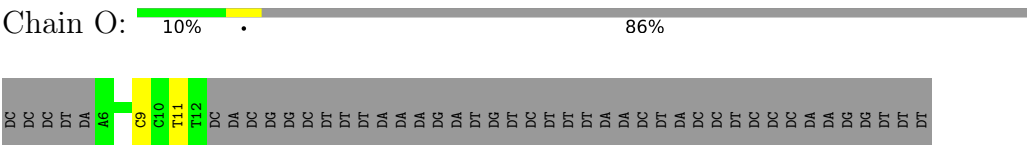
● Molecule 5: CRISPR RNA (60-MER)



● Molecule 6: Target DNA strand (51-MER)



● Molecule 7: Non-target DNA strand (51-MER)



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	206913	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 ( $e^-/\text{\AA}^2$ )	48	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.162	Depositor
Minimum map value	-0.089	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.0015	Depositor
Map size ( $\text{\AA}$ )	276.48, 276.48, 276.48	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.08, 1.08, 1.08	Depositor

## 5 Model quality

### 5.1 Standard geometry

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	B	0.32	0/2510	0.57	1/3406 (0.0%)
1	C	0.36	0/2729	0.62	0/3709
1	D	0.37	0/2746	0.61	0/3735
1	E	0.37	0/2751	0.62	2/3735 (0.1%)
1	F	0.37	0/2755	0.62	1/3742 (0.0%)
1	G	0.35	0/2796	0.59	0/3800
2	H	0.30	0/4090	0.64	3/5552 (0.1%)
3	A	0.31	0/1648	0.67	2/2222 (0.1%)
4	I	0.27	0/3156	0.53	1/4275 (0.0%)
4	J	0.31	0/3018	0.66	5/4089 (0.1%)
5	M	0.55	1/1425 (0.1%)	1.04	8/2220 (0.4%)
6	N	0.68	0/761	0.93	0/1172
7	O	0.65	0/158	0.98	0/241
All	All	0.36	1/30543 (0.0%)	0.66	23/41898 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	D	0	1
2	H	0	1
3	A	0	1
4	I	0	1
4	J	0	3
All	All	0	7

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	M	39	U	C1'-N1	5.13	1.56	1.48

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	M	38	C	N1-C2-O2	10.69	125.31	118.90
5	M	38	C	C2-N1-C1'	9.39	129.13	118.80
5	M	38	C	N3-C2-O2	-8.86	115.70	121.90
1	E	202	ASP	CB-CG-OD1	7.56	125.11	118.30
2	H	160	LEU	CA-CB-CG	6.87	131.09	115.30

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	11	LEU	Peptide
1	D	297	TYR	Peptide
2	H	260	MET	Peptide
4	J	119	LEU	Peptide
4	J	7	LYS	Peptide

## 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	B	2443	0	2374	16	0
1	C	2659	0	2574	16	0
1	D	2675	0	2585	10	0
1	E	2681	0	2612	9	0
1	F	2685	0	2611	11	0
1	G	2725	0	2643	21	0
2	H	4001	0	3971	49	0
3	A	1611	0	1597	26	0
4	I	3070	0	2981	24	0
4	J	2937	0	2844	48	0
5	M	1276	0	647	13	0
6	N	678	0	369	2	0
7	O	142	0	80	2	0
All	All	29583	0	27888	222	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 4.

The worst 5 of 222 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)
4:J:3:LEU:HD21	4:J:33:PHE:CZ	1.42	1.54
4:J:3:LEU:CD2	4:J:33:PHE:HZ	1.41	1.33
4:J:3:LEU:CD2	4:J:33:PHE:CZ	2.22	1.10
2:H:37:LEU:HD22	2:H:166:LYS:HG2	1.33	1.07
2:H:37:LEU:CD2	2:H:166:LYS:HG2	2.06	0.84

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	B	293/354 (83%)	261 (89%)	32 (11%)	0	100	100
1	C	327/354 (92%)	295 (90%)	32 (10%)	0	100	100
1	D	332/354 (94%)	301 (91%)	31 (9%)	0	100	100
1	E	329/354 (93%)	306 (93%)	23 (7%)	0	100	100
1	F	330/354 (93%)	301 (91%)	29 (9%)	0	100	100
1	G	338/354 (96%)	298 (88%)	40 (12%)	0	100	100
2	H	504/640 (79%)	415 (82%)	89 (18%)	0	100	100
3	A	195/199 (98%)	151 (77%)	44 (23%)	0	100	100
4	I	370/394 (94%)	345 (93%)	25 (7%)	0	100	100
4	J	351/394 (89%)	290 (83%)	61 (17%)	0	100	100
All	All	3369/3751 (90%)	2963 (88%)	406 (12%)	0	100	100

There are no Ramachandran outliers to report.

### 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	B	270/309 (87%)	265 (98%)	5 (2%)	57	80
1	C	290/309 (94%)	289 (100%)	1 (0%)	92	97
1	D	290/309 (94%)	288 (99%)	2 (1%)	84	93
1	E	293/309 (95%)	290 (99%)	3 (1%)	76	89
1	F	293/309 (95%)	289 (99%)	4 (1%)	67	85
1	G	297/309 (96%)	295 (99%)	2 (1%)	84	93
2	H	450/573 (78%)	445 (99%)	5 (1%)	73	88
3	A	179/181 (99%)	176 (98%)	3 (2%)	60	82
4	I	339/356 (95%)	335 (99%)	4 (1%)	71	87
4	J	324/356 (91%)	319 (98%)	5 (2%)	65	85
All	All	3025/3320 (91%)	2991 (99%)	34 (1%)	74	88

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	J	77	LYS
4	J	387	ARG
4	I	217	LYS
1	B	104	ASN
1	C	28	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 27 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	349	HIS
2	H	420	HIS
4	I	23	ASN
2	H	272	HIS
2	H	443	HIS

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
5	M	59/60 (98%)	22 (37%)	0

5 of 22 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
5	M	2	U
5	M	3	G
5	M	8	C
5	M	9	U
5	M	14	G

There are no RNA pucker outliers to report.

## 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](#)

There are no ligands in this entry.

## 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.

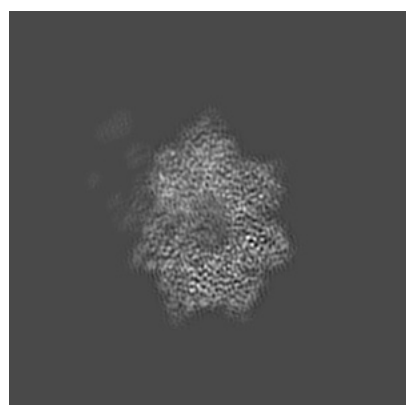
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-0929. These allow visual inspection of the internal detail of the map and identification of artifacts.

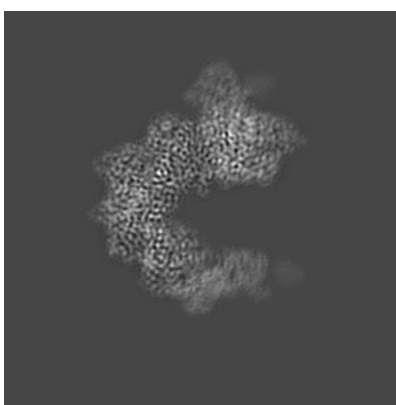
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

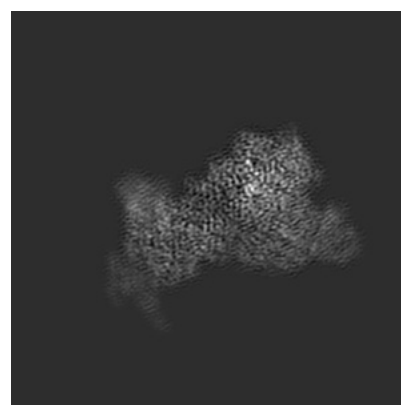
#### 6.1.1 Primary map



X



Y



Z

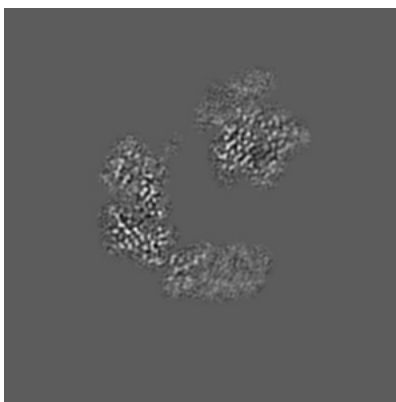
The images above show the map projected in three orthogonal directions.

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

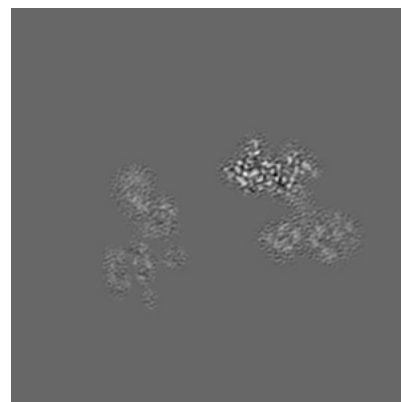
#### 6.2.1 Primary map



X Index: 128



Y Index: 128



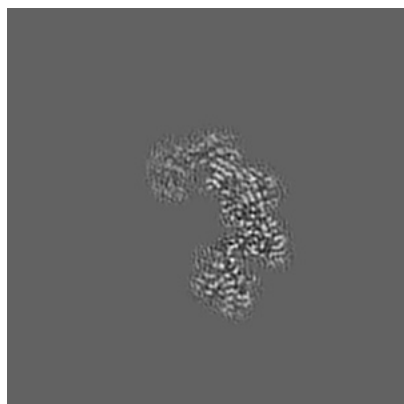
Z Index: 128



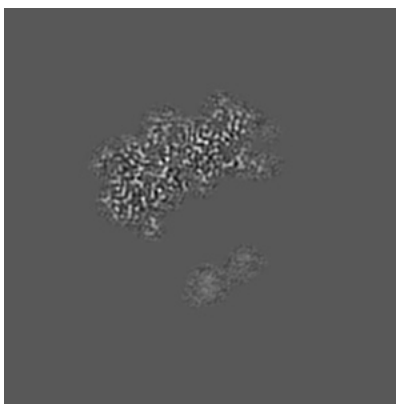
The images above show central slices of the map in three orthogonal directions.

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

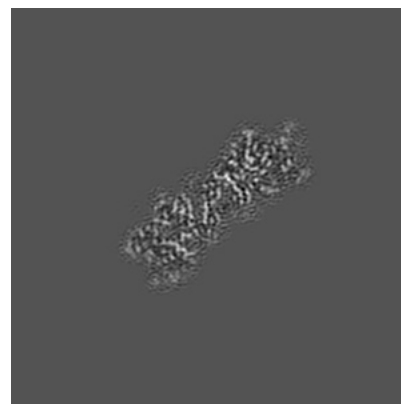
### 6.3.1 Primary map



X Index: 153



Y Index: 146



Z Index: 99

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



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0015. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

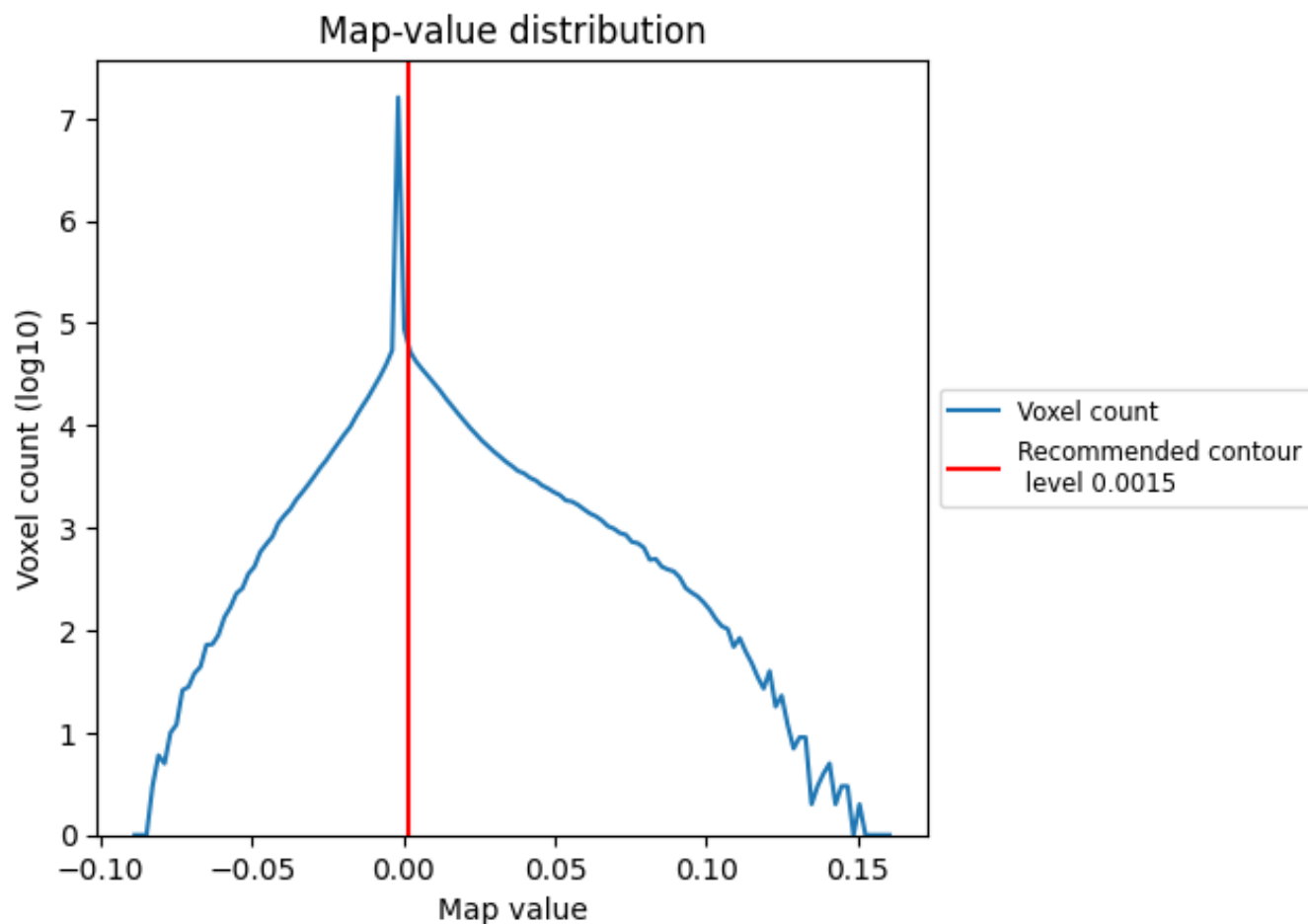
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

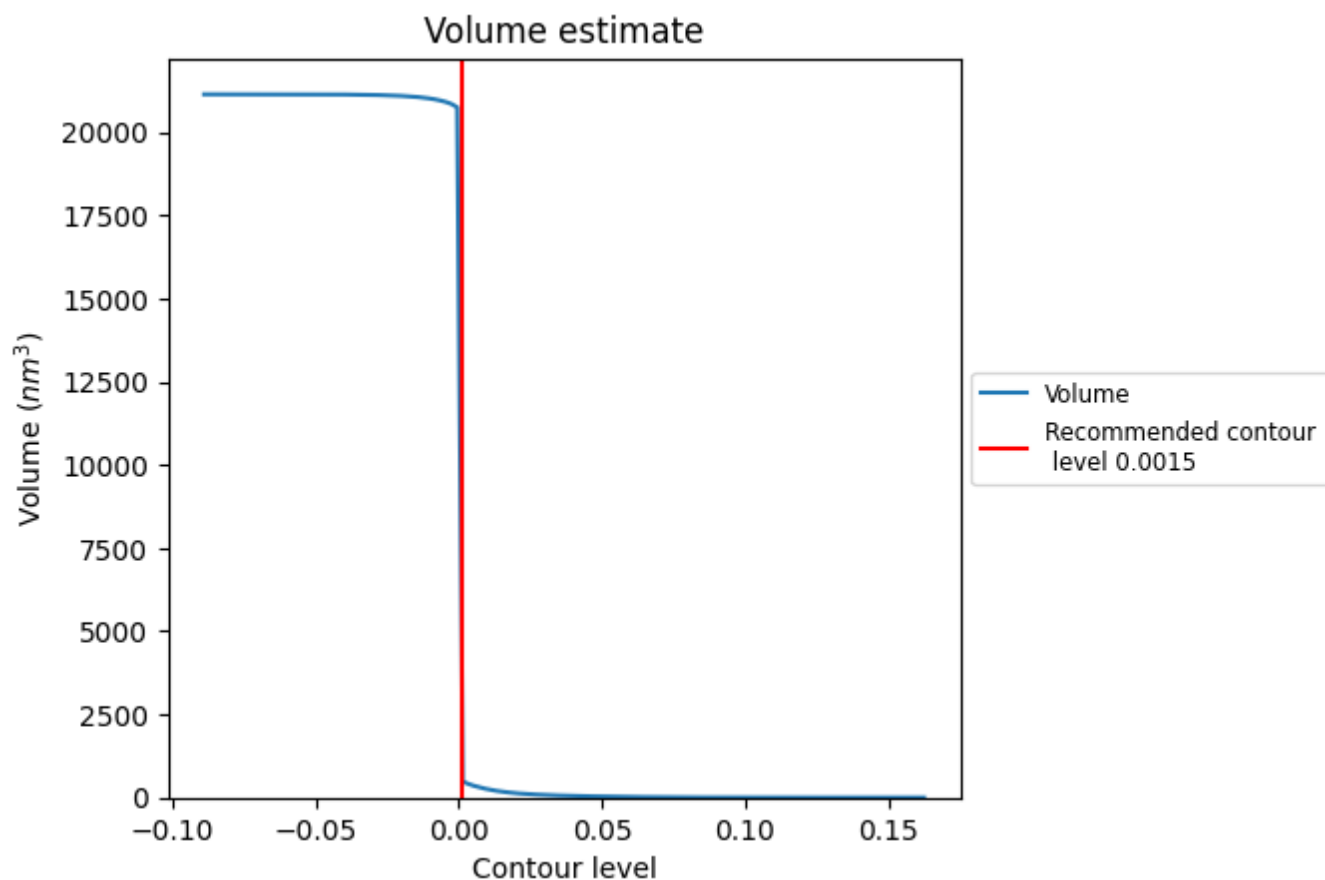
This section contains the results of statistical analysis of the map.

### 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.

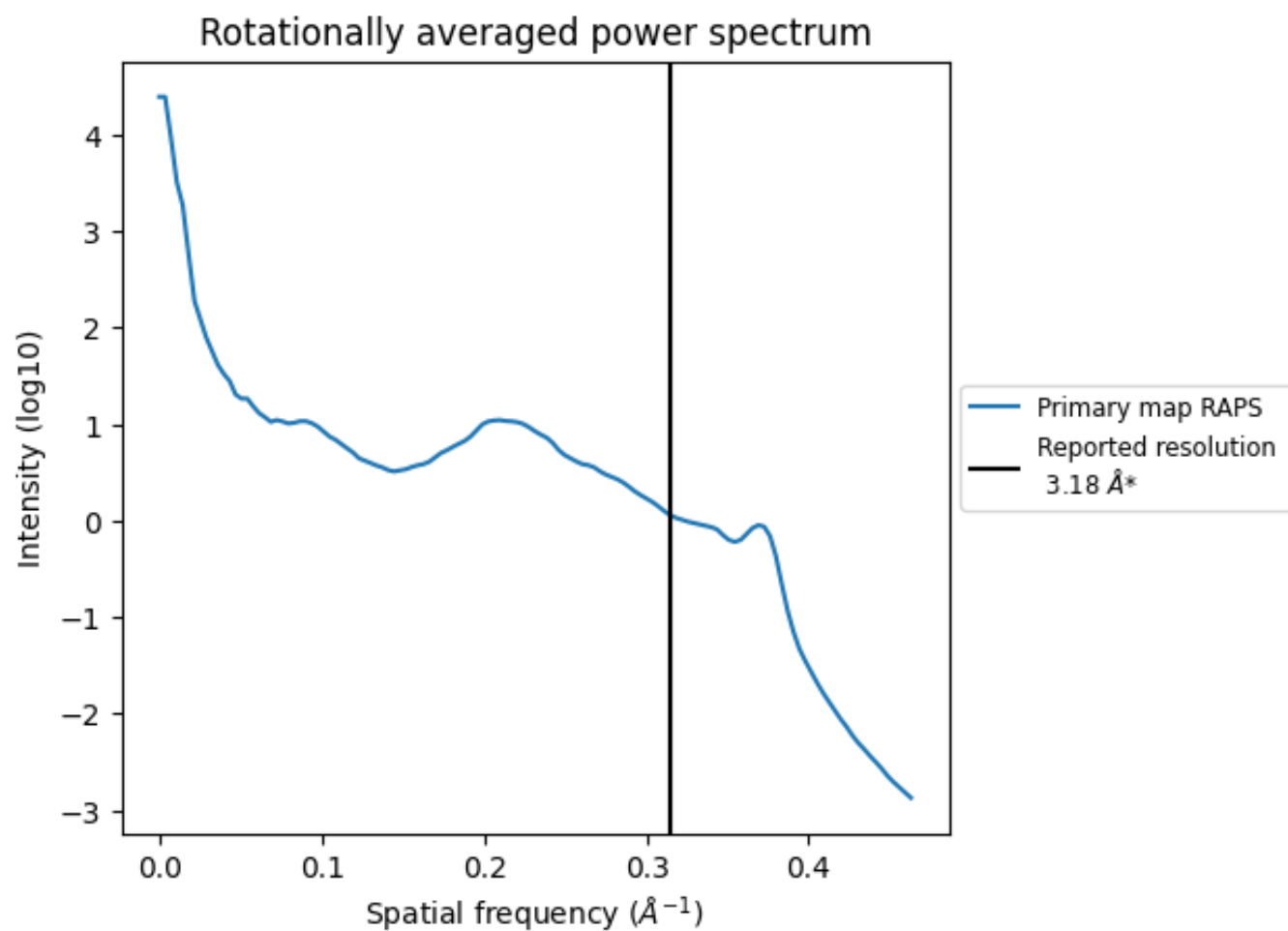
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 481  $\text{nm}^3$ ; this corresponds to an approximate mass of 435 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 0.314  $\text{\AA}^{-1}$

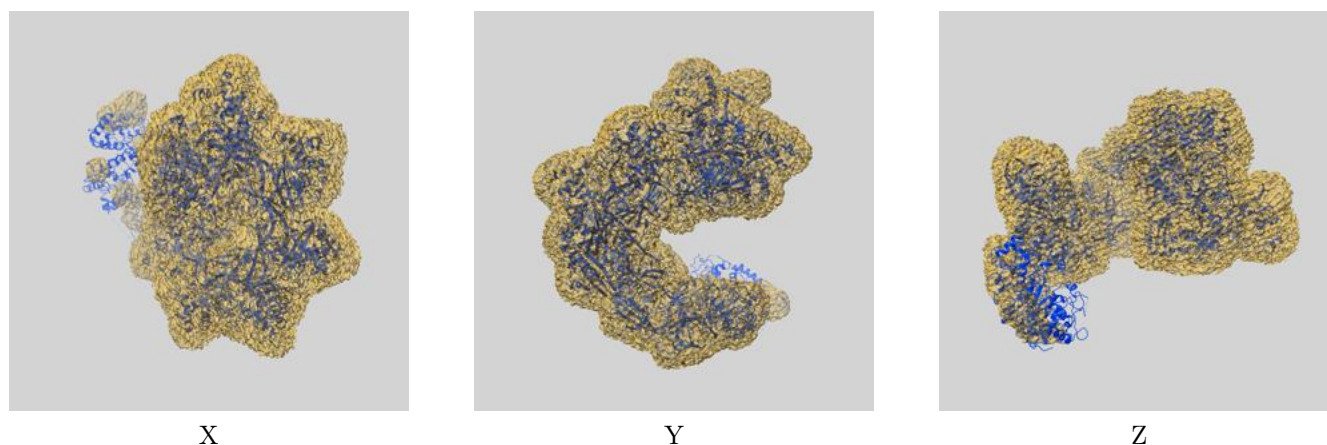
## 8 Fourier-Shell correlation

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

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

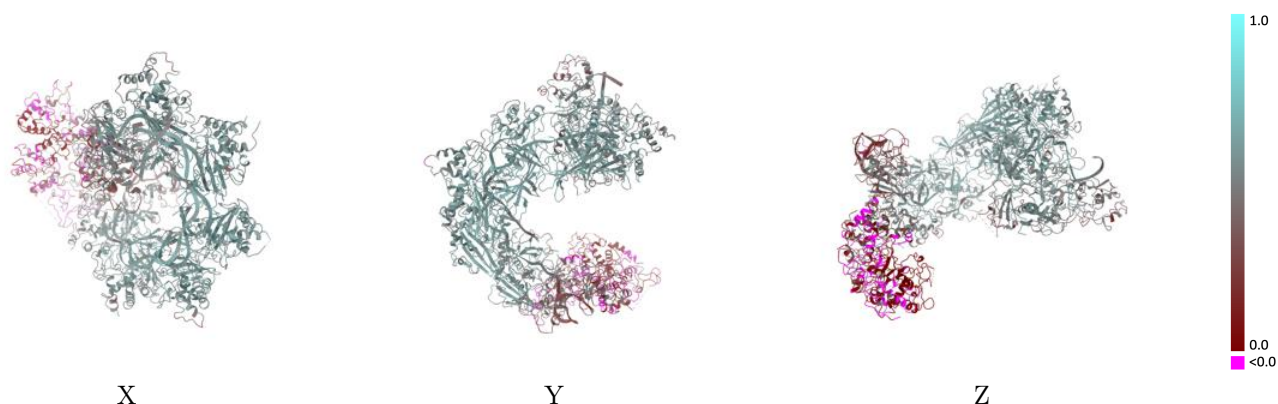
This section contains information regarding the fit between EMDB map EMD-0929 and PDB model 6LNB. Per-residue inclusion information can be found in section 3 on page 6.

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



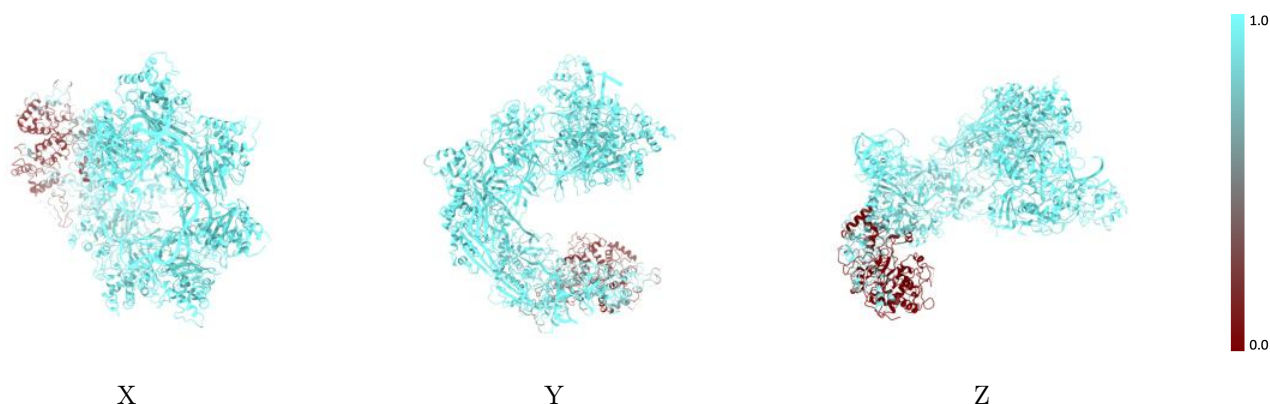
The images above show the 3D surface view of the map at the recommended contour level 0.0015 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 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.

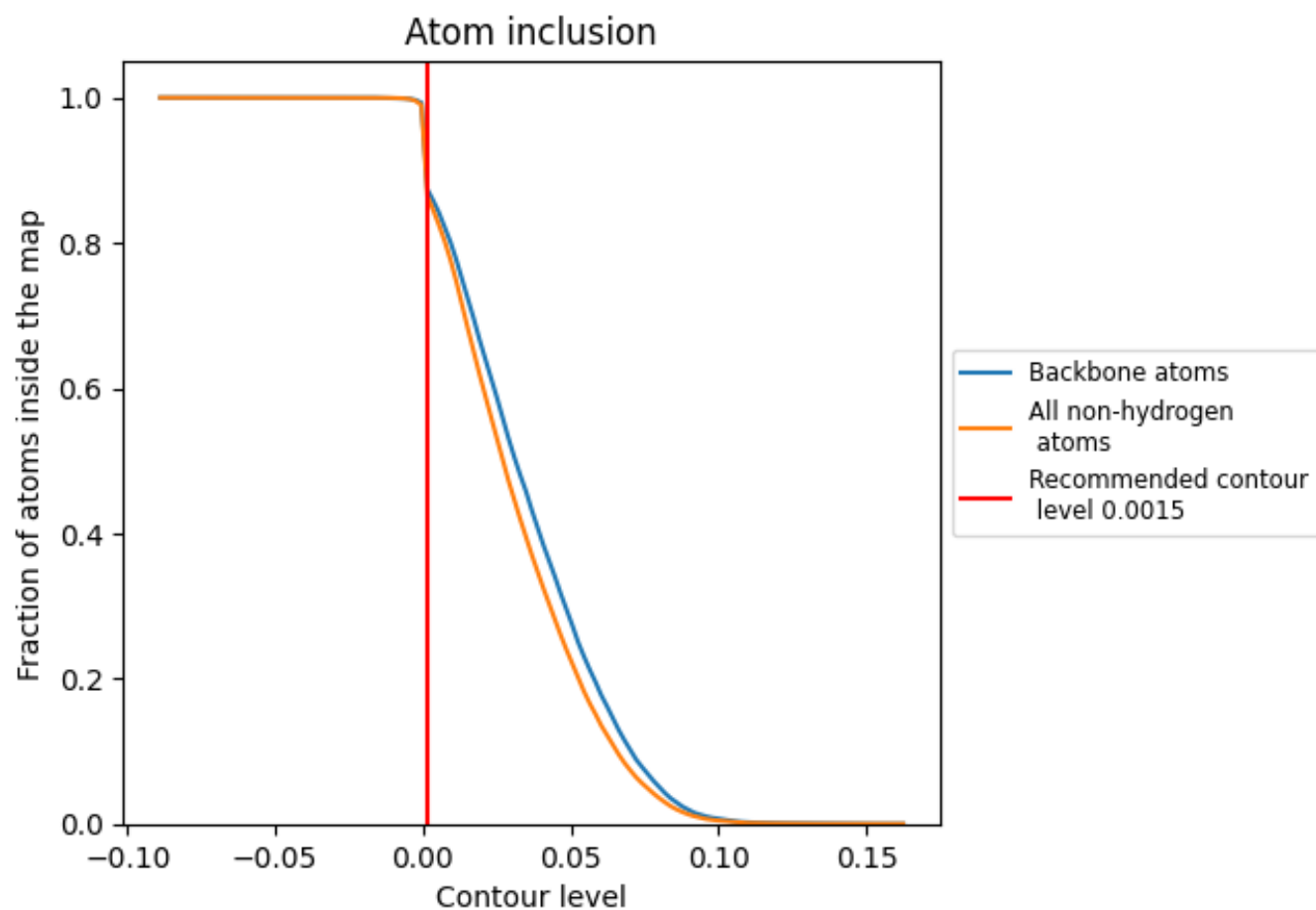
## 9.3 Atom inclusion mapped to coordinate model [i](#)



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 (0.0015).































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 87% of all backbone atoms, 86% 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 (0.0015) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8640	 0.4410
A	 0.9530	 0.3180
B	 0.9875	 0.5330
C	 0.9896	 0.5600
D	 0.9901	 0.5750
E	 0.9905	 0.5790
F	 0.9920	 0.5750
G	 0.9921	 0.5490
H	 0.9835	 0.4770
I	 0.3826	 0.0950
J	 0.3783	 0.1090
M	 0.9922	 0.5040
N	 0.9838	 0.5500
O	 1.0000	 0.4800

