



## wwPDB EM Validation Summary Report ⓘ

Nov 20, 2022 – 06:48 PM JST

PDB ID : 7CHW  
EMDB ID : EMD-30376  
Title : Cryo-EM structure of an Escherichia coli RNAP-promoter open complex (RPo)  
Authors : Lin, W.; Feng, Y.  
Deposited on : 2020-07-06  
Resolution : 3.58 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) : 2.31.3

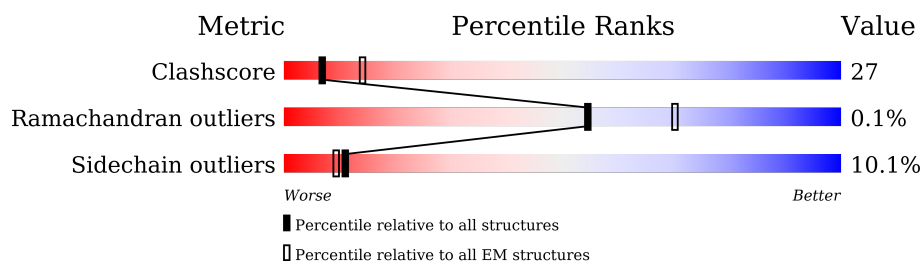
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.58 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  $\geq 3$ , 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	H	63	
2	A	329	
2	B	329	
2	K	329	
3	C	1342	
4	D	1407	
5	E	91	
6	F	613	

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Mol	Chain	Length	Quality of chain
7	G	63	 A horizontal bar chart showing the quality of chain G. The bar is divided into four segments: a green segment (17%), a red segment (30%), a yellow segment (60%), and a grey segment (22%). The percentages are labeled below the bar. The red segment is positioned above the yellow segment.

## 2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 32282 atoms, of which 529 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 DNA chain called DNA (63-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
1	H	63	Total	C	N	O	P	0	0
			1312	623	256	370	63		

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit alpha.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	K	67	Total	C	H	N	O	S	0	0
			1046	328	529	88	99	2		
2	A	230	Total	C	N	O	S		0	0
			1787	1112	317	352	6			
2	B	228	Total	C	N	O	S		0	0
			1767	1100	312	349	6			

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	1339	Total	C	N	O	S	0	0
			10561	6626	1840	2052	43		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	516	VAL	ASP	engineered mutation	UNP P0A8V2

- Molecule 4 is a protein called DNA-directed RNA polymerase subunit beta'.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	1343	Total	C	N	O	S	0	0
			10363	6509	1846	1958	50		

- Molecule 5 is a protein called DNA-directed RNA polymerase subunit omega.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	76	Total	C	N	O	S	0	0
			606	367	115	123	1		

- Molecule 6 is a protein called RNA polymerase sigma factor RpoD.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	472	Total	C	N	O	S	0	0
			3845	2408	685	729	23		

- Molecule 7 is a DNA chain called DNA (63-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	49	Total	C	N	O	P	0	0
			992	478	164	301	49		

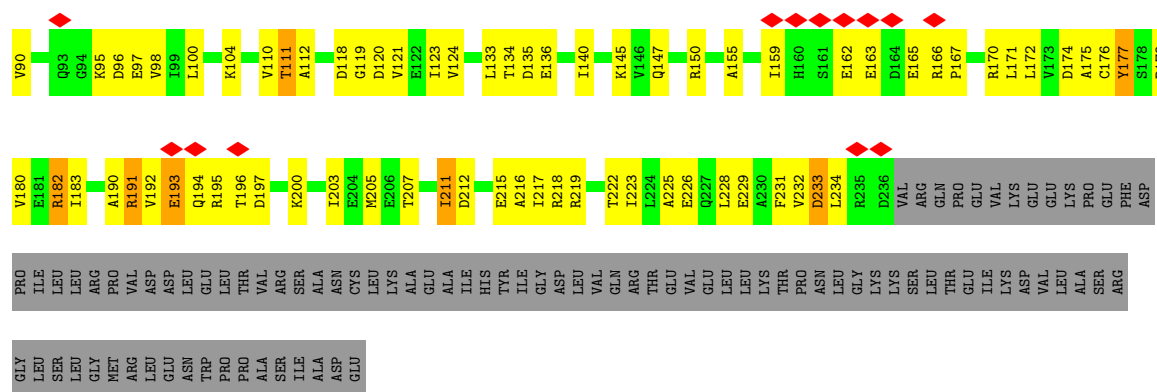
- Molecule 8 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
8	D	1	Total	Mg	0
			1	1	

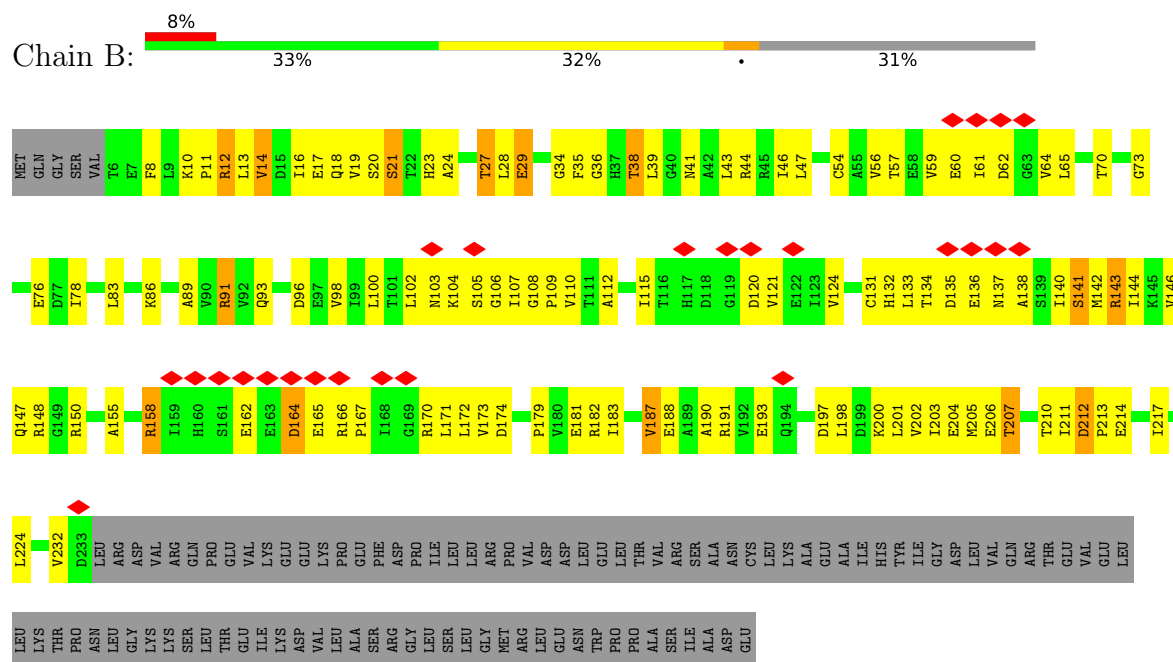
- Molecule 9 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
9	D	2	Total	Zn	0
			2	2	

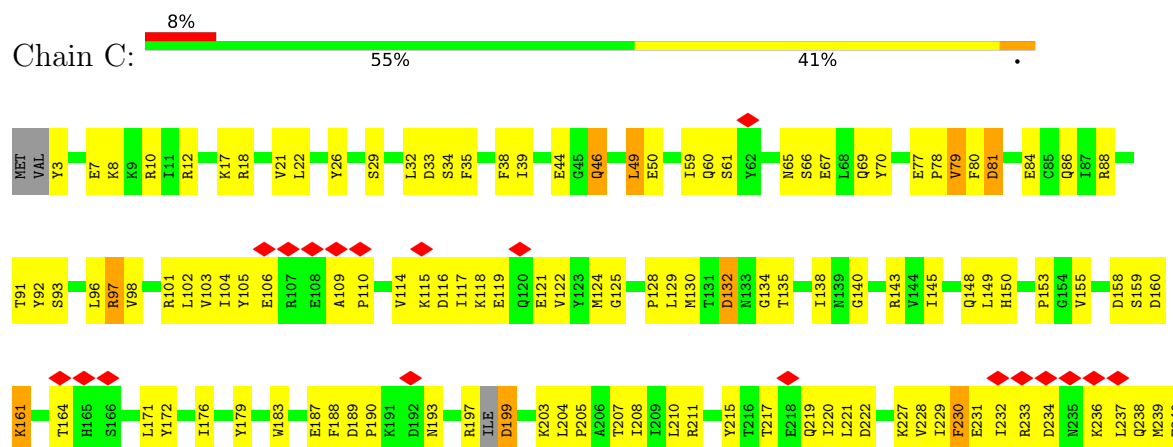


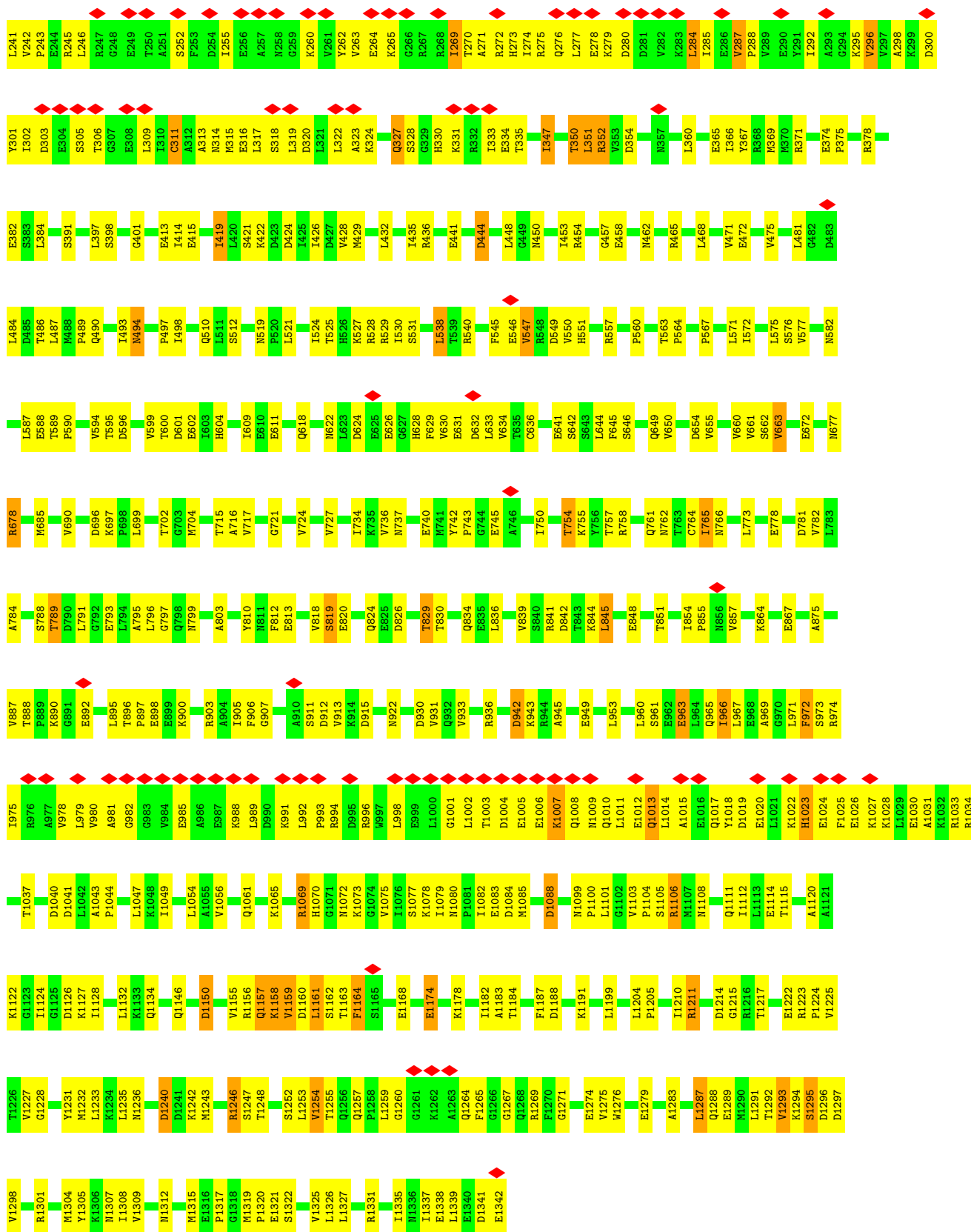


• Molecule 2: DNA-directed RNA polymerase subunit alpha



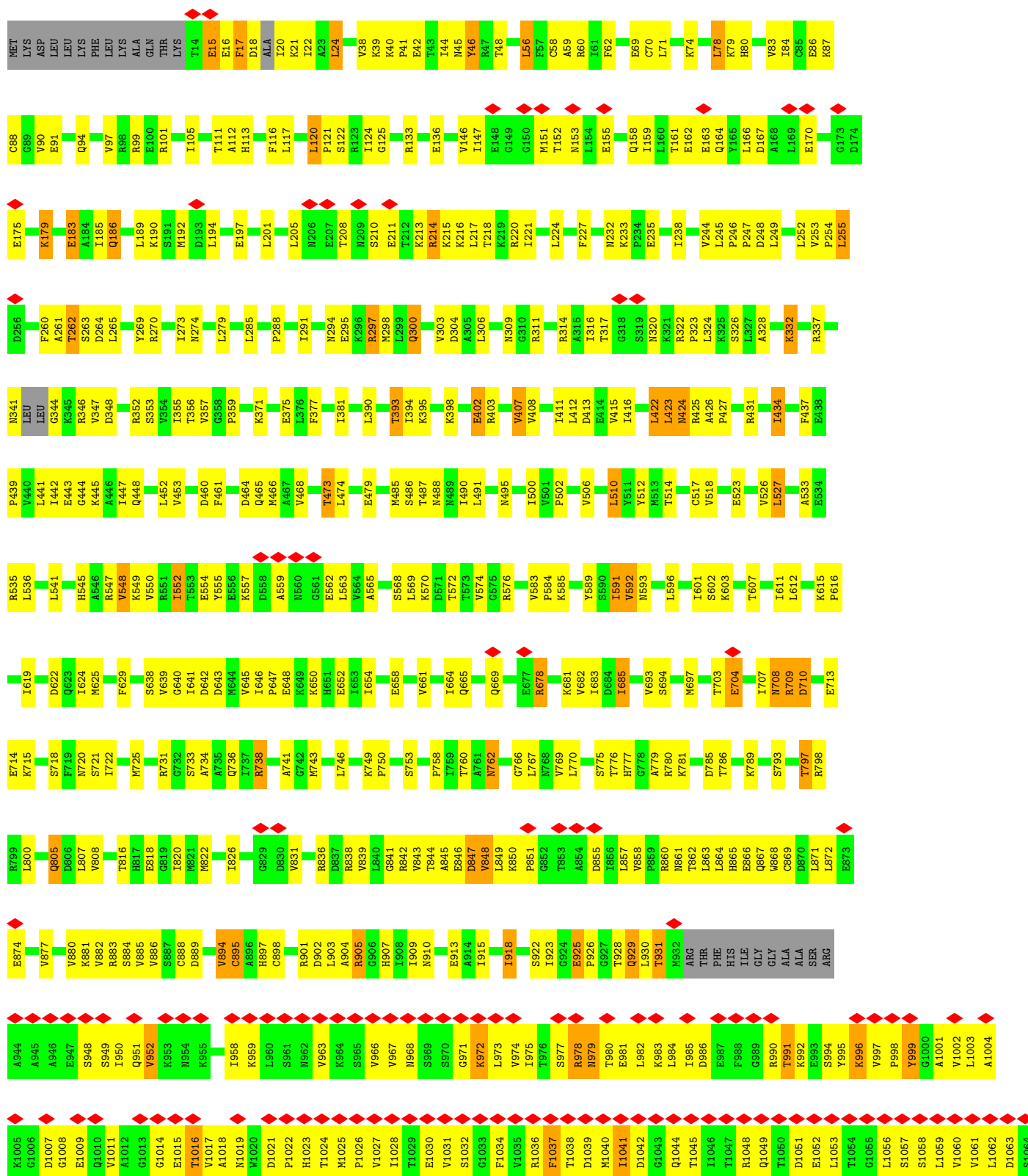
• Molecule 3: DNA-directed RNA polymerase subunit beta

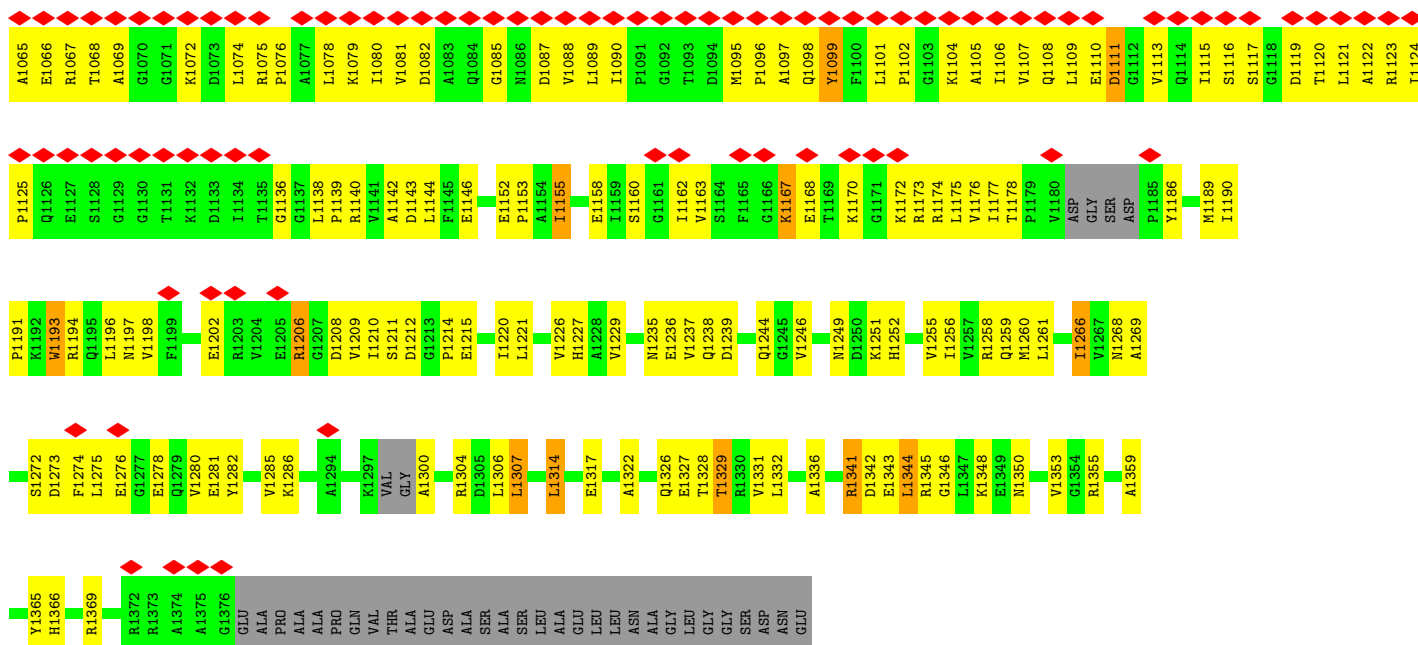




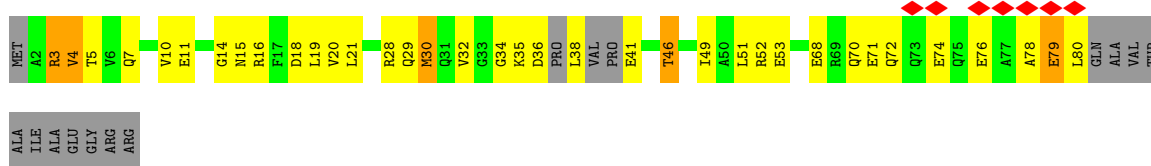
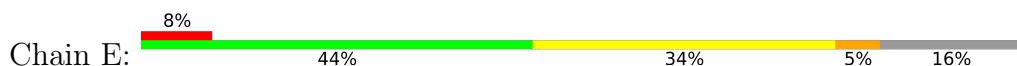
- Molecule 4: DNA-directed RNA polymerase subunit beta'



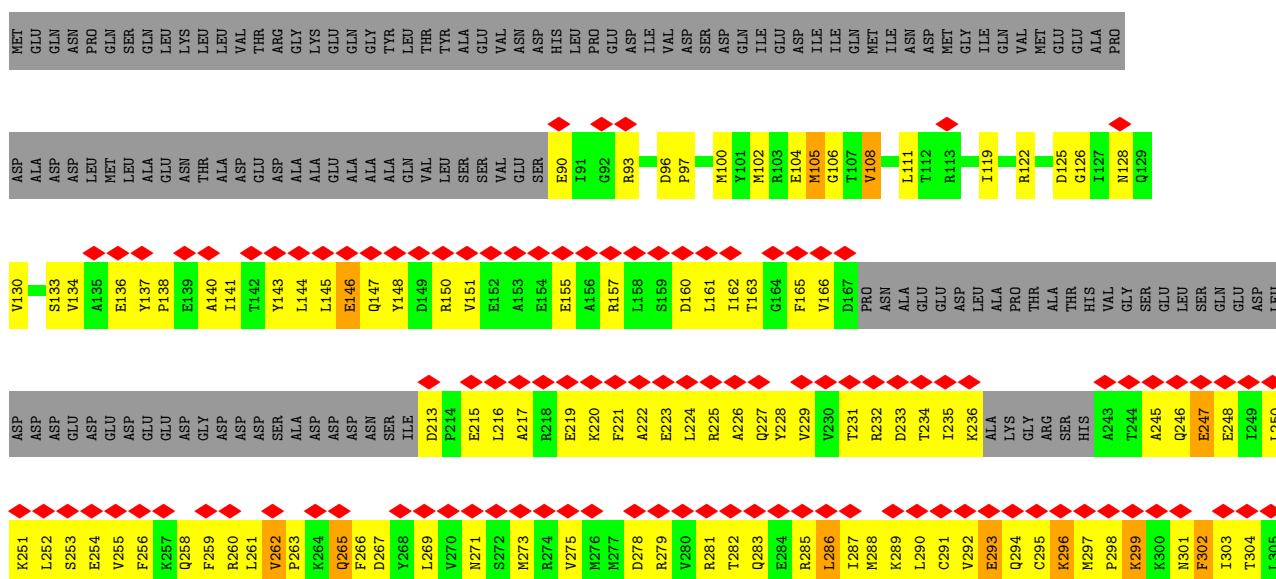


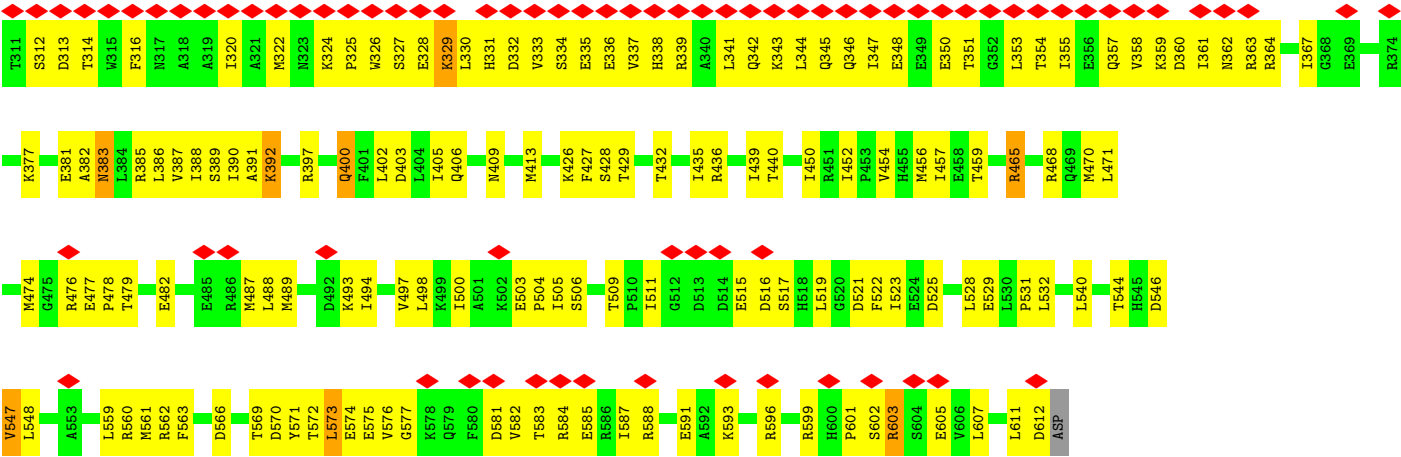


• Molecule 5: DNA-directed RNA polymerase subunit omega

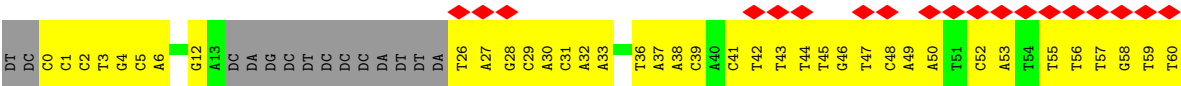
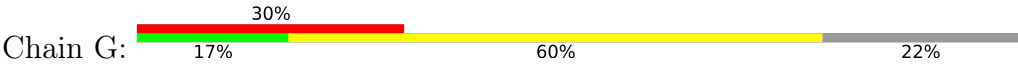


• Molecule 6: RNA polymerase sigma factor RpoD





• Molecule 7: DNA (63-MER)



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	199208	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 ( $e^-/\text{\AA}^2$ )	59	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.219	Depositor
Minimum map value	-0.168	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.008	Depositor
Recommended contour level	0.0259	Depositor
Map size (Å)	261.4, 261.4, 261.4	wwPDB
Map dimensions	200, 200, 200	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.3069999, 1.3069999, 1.3069999	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: MG, ZN

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	H	0.57	0/1478	0.89	0/2283
2	A	0.37	0/1809	0.49	0/2451
2	B	0.33	0/1789	0.48	0/2425
2	K	0.29	0/523	0.65	0/710
3	C	0.41	0/10729	0.49	0/14474
4	D	0.39	0/10515	0.49	0/14198
5	E	0.34	0/604	0.46	0/807
6	F	0.28	0/3896	0.43	0/5236
7	G	0.57	0/1106	1.00	0/1700
All	All	0.40	0/32449	0.54	0/44284

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	H	1312	0	709	61	0
2	A	1787	0	1810	89	0
2	B	1767	0	1789	106	0
2	K	517	529	528	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	10561	0	10575	546	0
4	D	10363	0	10510	632	0
5	E	606	0	609	31	0
6	F	3845	0	3913	311	0
7	G	992	0	560	53	0
8	D	1	0	0	0	0
9	D	2	0	0	0	0
All	All	31753	529	31003	1713	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 27.

The worst 5 of 1713 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:D:17:PHE:CZ	4:D:1353:VAL:HG11	1.59	1.36
4:D:17:PHE:HZ	4:D:1353:VAL:CG1	1.52	1.23
3:C:1342:GLU:HG3	4:D:18:ASP:OD1	1.45	1.15
3:C:1002:LEU:HD23	3:C:1007:LYS:HB2	1.37	1.06
3:C:1146:GLN:OE1	3:C:1160:ASP:HB3	1.57	1.05

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	
2	A	228/329 (69%)	207 (91%)	21 (9%)	0	100	100
2	B	226/329 (69%)	199 (88%)	26 (12%)	1 (0%)	34	71
2	K	63/329 (19%)	56 (89%)	7 (11%)	0	100	100
3	C	1335/1342 (100%)	1165 (87%)	167 (12%)	3 (0%)	47	80

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	D	1331/1407 (95%)	1179 (89%)	152 (11%)	0	100	100
5	E	71/91 (78%)	65 (92%)	6 (8%)	0	100	100
6	F	466/613 (76%)	440 (94%)	26 (6%)	0	100	100
All	All	3720/4440 (84%)	3311 (89%)	405 (11%)	4 (0%)	54	84

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	1164	PHE
2	B	21	SER
3	C	1159	VAL
3	C	1224	PRO

### 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	
2	A	198/286 (69%)	182 (92%)	16 (8%)	11	43
2	B	196/286 (68%)	175 (89%)	21 (11%)	6	33
2	K	57/286 (20%)	45 (79%)	12 (21%)	1	7
3	C	1154/1157 (100%)	1043 (90%)	111 (10%)	8	37
4	D	1103/1168 (94%)	982 (89%)	121 (11%)	6	31
5	E	64/75 (85%)	56 (88%)	8 (12%)	4	25
6	F	420/540 (78%)	388 (92%)	32 (8%)	13	45
All	All	3192/3798 (84%)	2871 (90%)	321 (10%)	11	35

5 of 321 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	775	SER
5	E	36	ASP
4	D	849	LEU

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Mol	Chain	Res	Type
4	D	1037	PHE
6	F	299	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 41 such sidechains are listed below:

Mol	Chain	Res	Type
4	D	861	ASN
6	F	294	GLN
4	D	865	HIS
4	D	1249	ASN
6	F	400	GLN

### 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 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.



## 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.

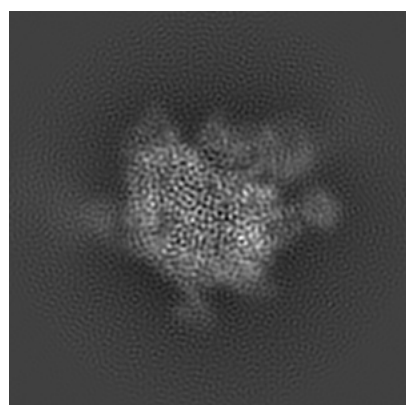
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-30376. These allow visual inspection of the internal detail of the map and identification of artifacts.

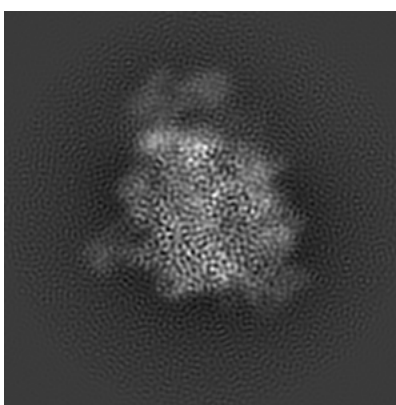
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

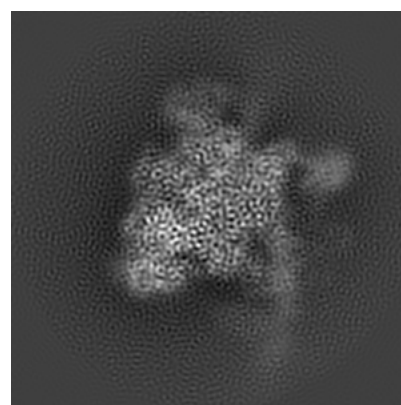
#### 6.1.1 Primary map



X



Y

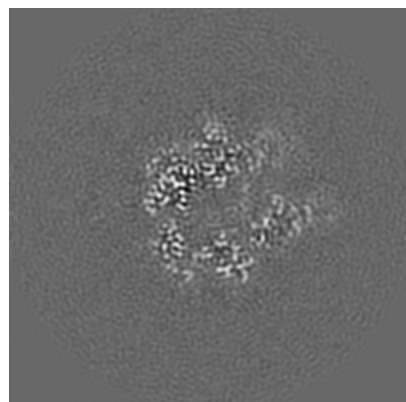


Z

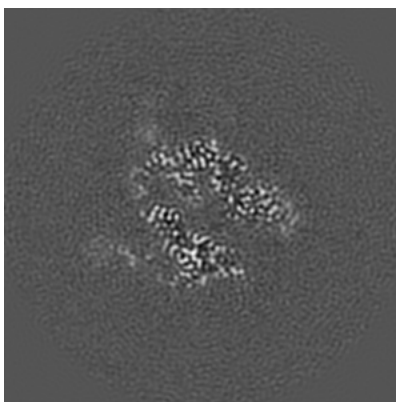
The images above show the map projected in three orthogonal directions.

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

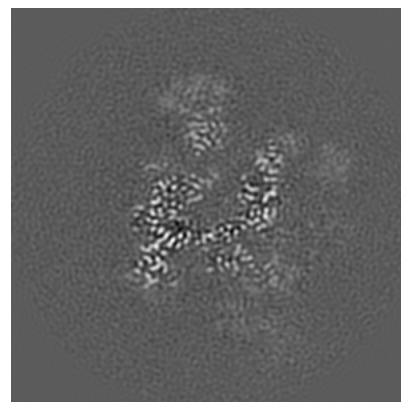
#### 6.2.1 Primary map



X Index: 100



Y Index: 100

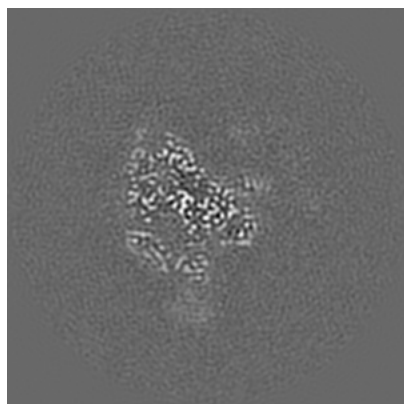


Z Index: 100

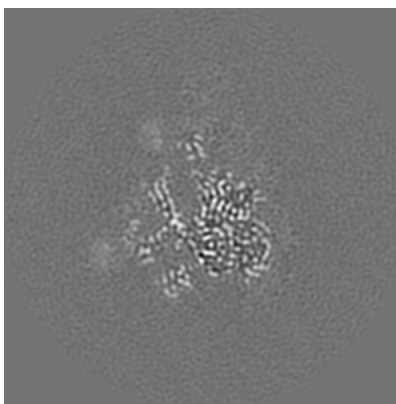
The images above show central slices of the map in three orthogonal directions.

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

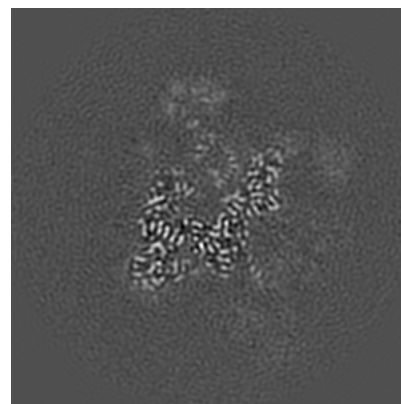
### 6.3.1 Primary map



X Index: 74



Y Index: 86



Z Index: 104

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

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

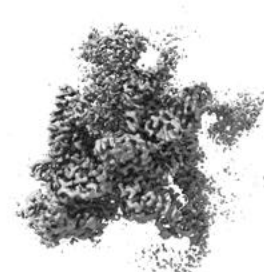
### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0259. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

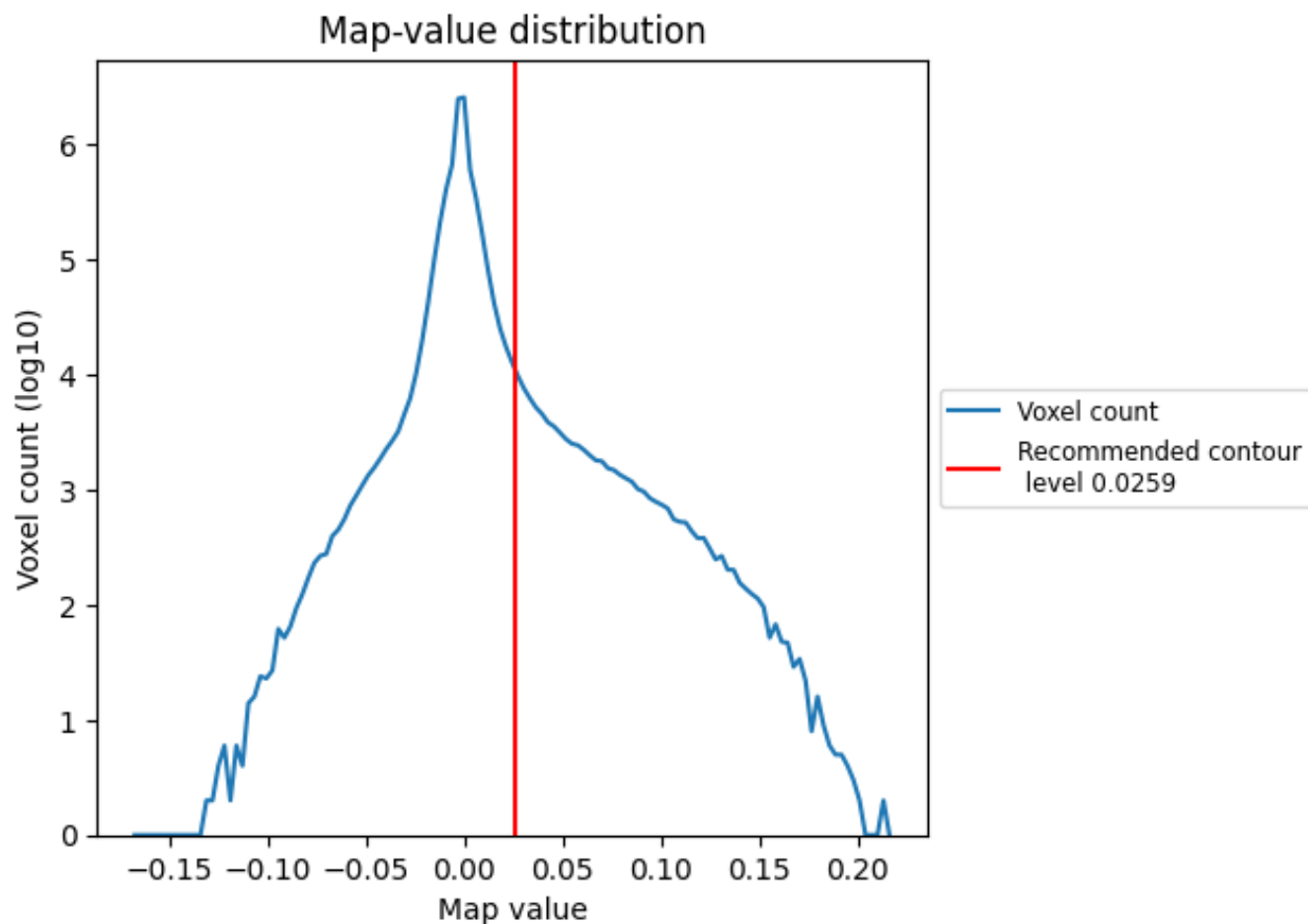
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

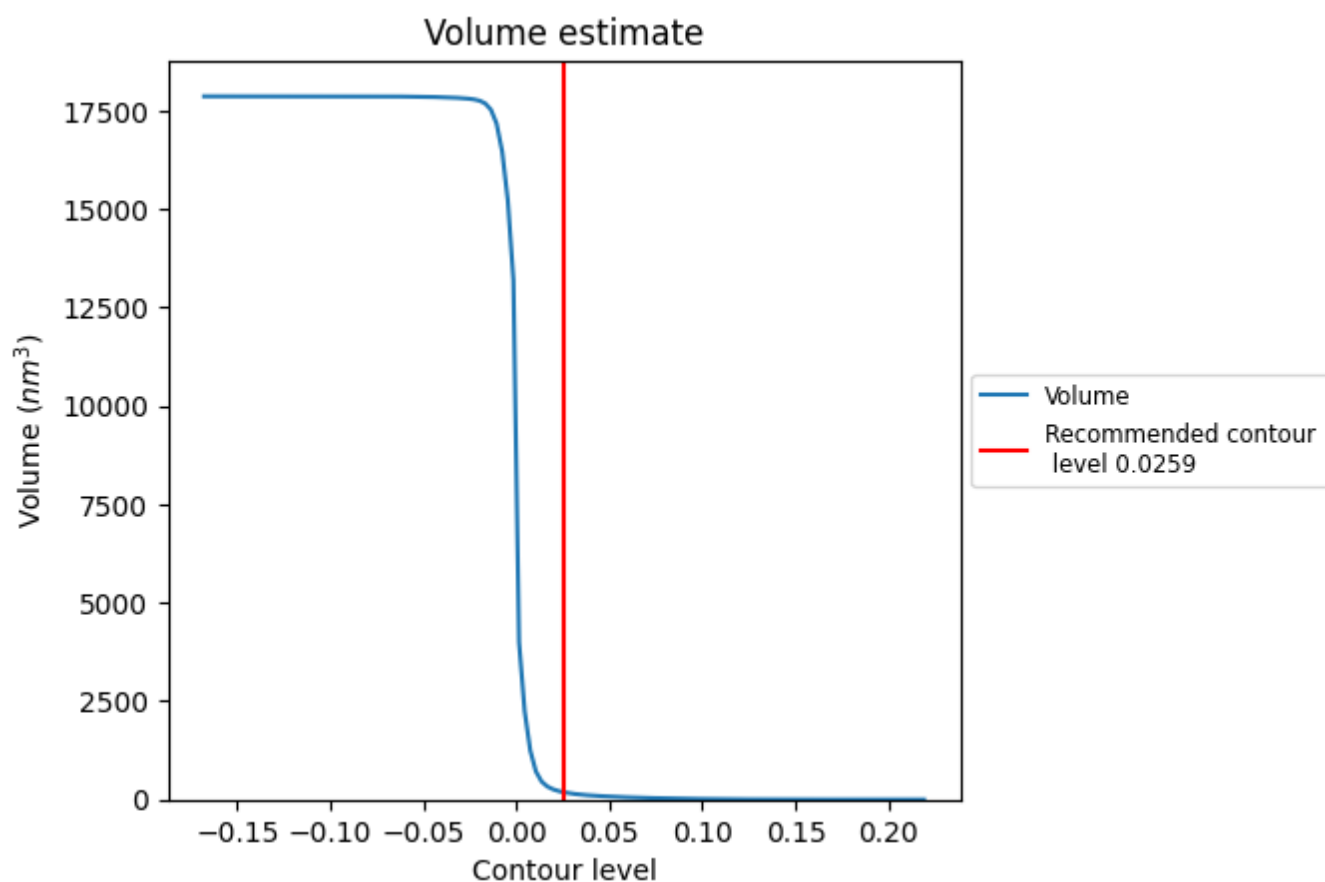
This section contains the results of statistical analysis of the map.

### 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.

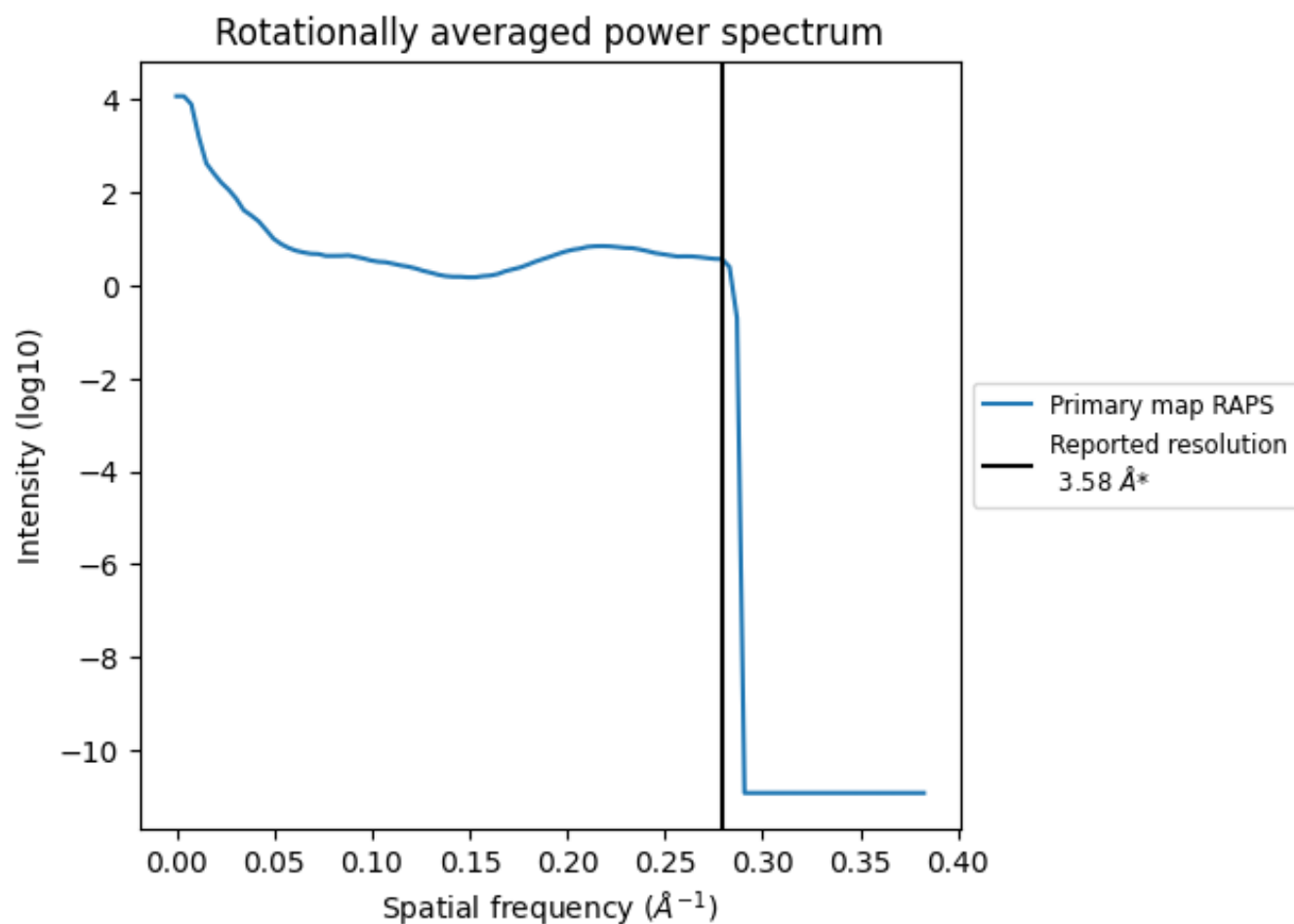
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 182 nm<sup>3</sup>; this corresponds to an approximate mass of 165 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 0.279  $\text{\AA}^{-1}$

## 8 Fourier-Shell correlation

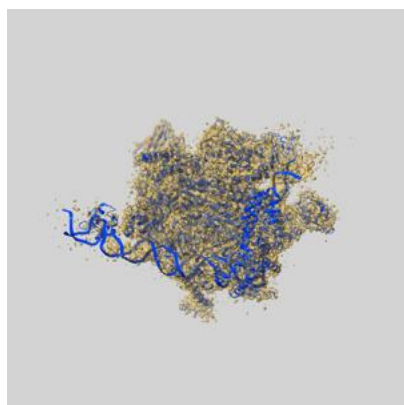
This section was not generated. No FSC curve or half-maps provided.



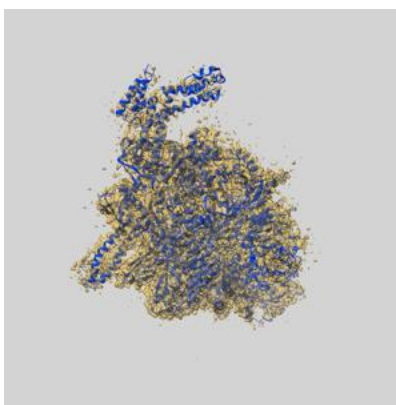
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-30376 and PDB model 7CHW. Per-residue inclusion information can be found in [section 3](#) on [page 6](#).

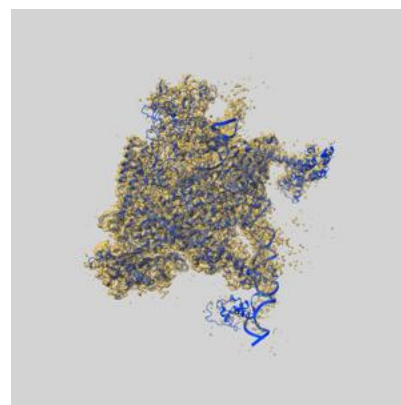
### 9.1 Map-model overlay [i](#)



X



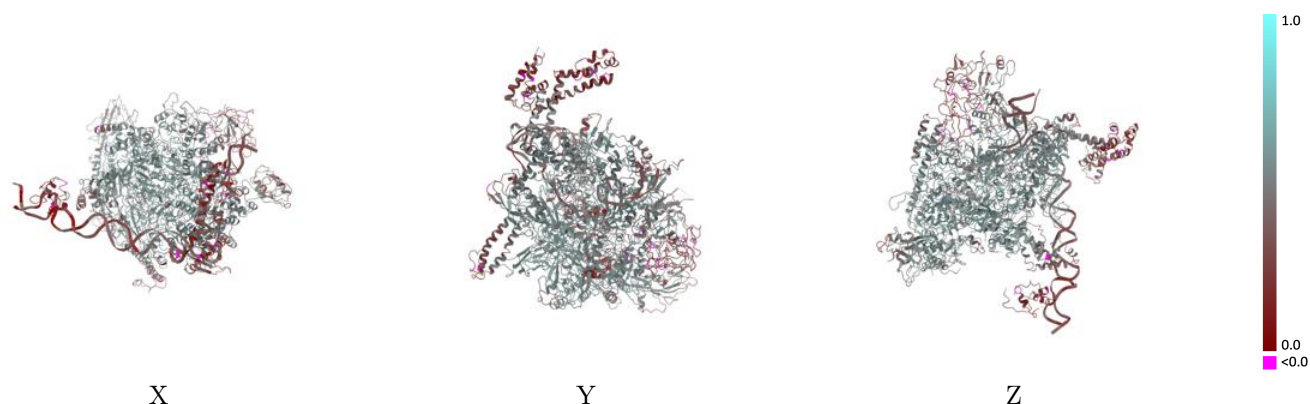
Y



Z

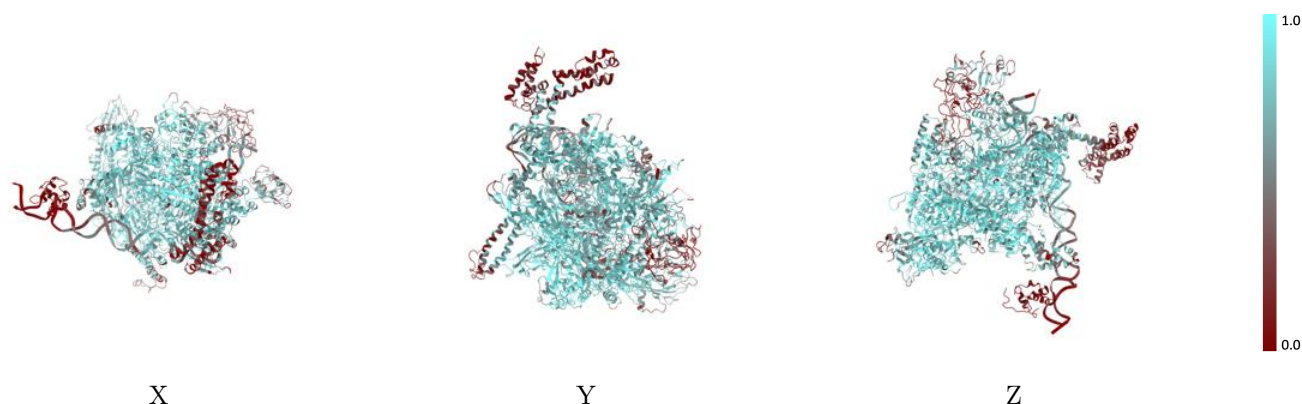
The images above show the 3D surface view of the map at the recommended contour level 0.0259 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



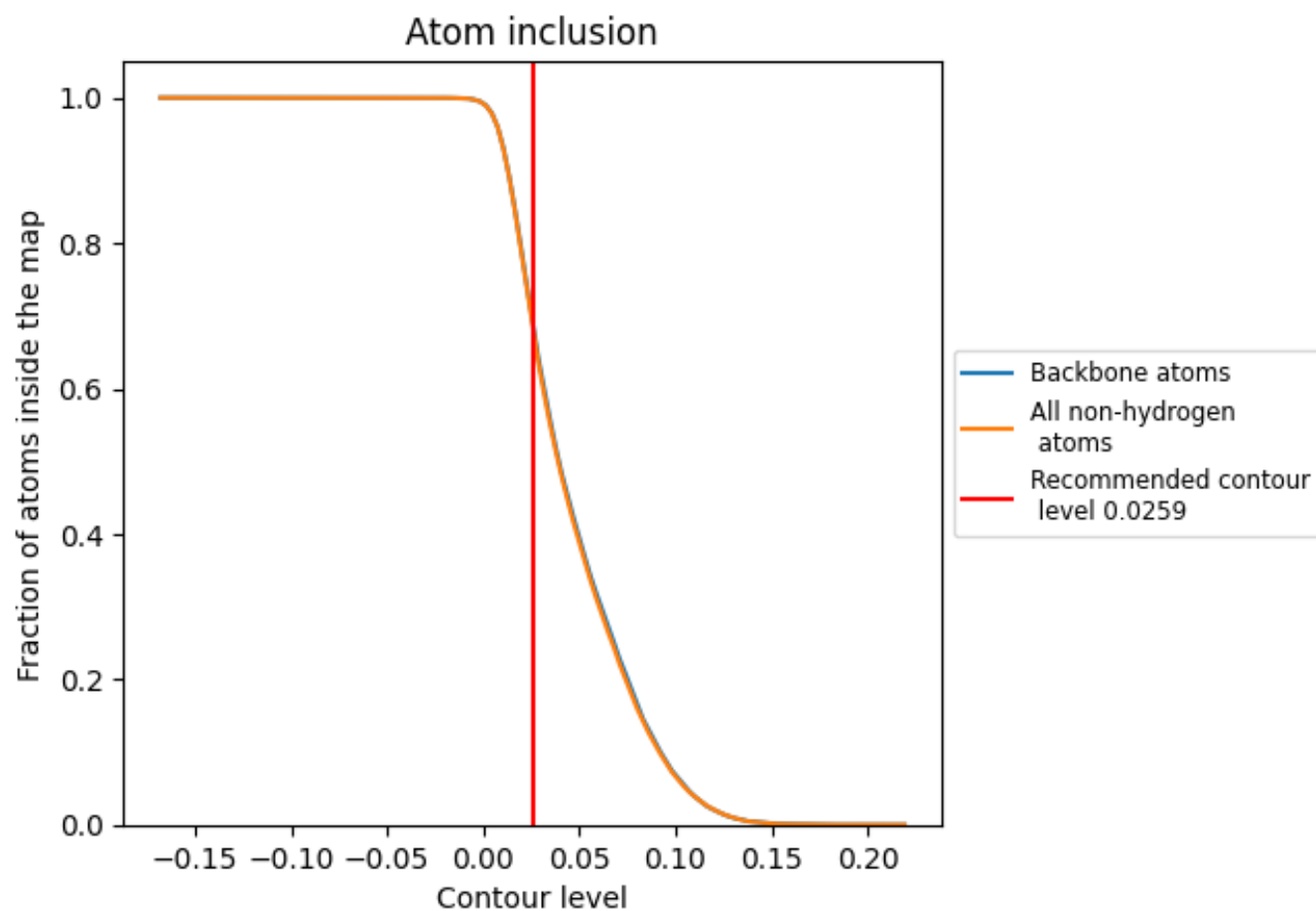
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0259).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 69% of all backbone atoms, 68% 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 (0.0259) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.6833	<div></div> 0.4700
A	<div></div> 0.7953	<div></div> 0.5300
B	<div></div> 0.7042	<div></div> 0.4860
C	<div></div> 0.7764	<div></div> 0.5100
D	<div></div> 0.7166	<div></div> 0.4880
E	<div></div> 0.7661	<div></div> 0.5040
F	<div></div> 0.4971	<div></div> 0.3890
G	<div></div> 0.4567	<div></div> 0.3200
H	<div></div> 0.4588	<div></div> 0.3370
K	<div></div> 0.0237	<div></div> 0.2210

1.0

0.0

<0.0