



wwPDB EM Validation Summary Report ⓘ

Mar 29, 2026 – 02:02 AM UTC

PDB ID : 7U0J / pdb_00007u0j
EMDB ID : EMD-26261
Title : Structure of 162bp LIN28b nucleosome
Authors : Lian, T.; Guan, R.; Bai, Y.
Deposited on : 2022-02-18
Resolution : 2.70 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

EMDB validation analysis : 0.0.1.dev132
MolProbity : 4-5-2 with Phenix2.0
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

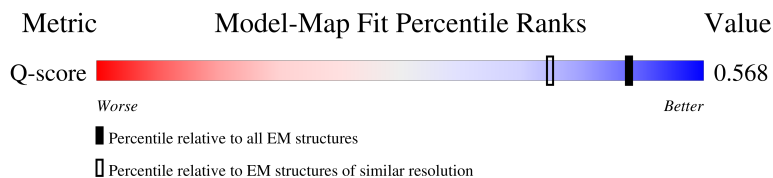
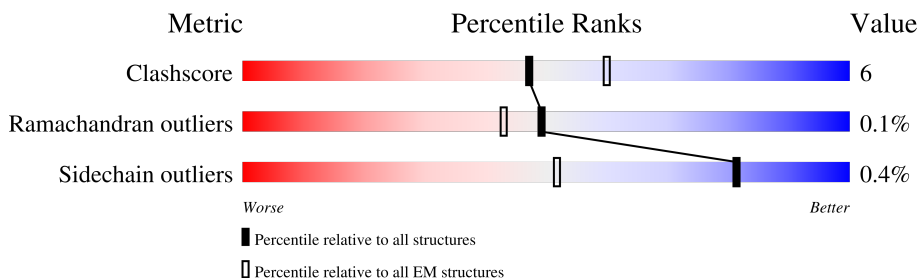
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.70 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.



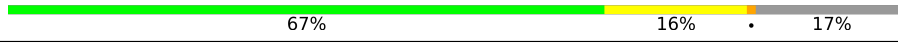
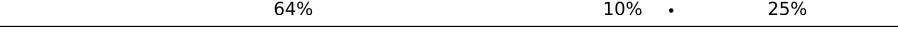
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	10327 (2.20 - 3.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	136	 65% 5% 29%
1	E	136	 64% 6% 29%
2	B	103	 70% 7% 23%
2	F	103	 70% 10% 20%

Continued on next page...

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Mol	Chain	Length	Quality of chain
3	C	129	
3	G	129	
4	D	126	
4	H	126	
5	I	162	
6	J	162	
7	K	265	
7	N	265	

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 15622 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 Histone H3.1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	96	Total	C	N	O	S	0	0
			790	499	151	136	4		
1	E	97	Total	C	N	O	S	0	0
			801	505	155	137	4		

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	79	Total	C	N	O	S	0	0
			633	399	124	109	1		
2	F	82	Total	C	N	O	S	0	0
			653	412	127	113	1		

- Molecule 3 is a protein called Histone H2A type 2-C.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	107	Total	C	N	O	S	0	0
			820	518	159	142	1		
3	G	107	Total	C	N	O	S	0	0
			816	515	158	142	1		

- Molecule 4 is a protein called Histone H2B type 2-E.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	95	Total	C	N	O	S	0	0
			736	462	132	140	2		
4	H	95	Total	C	N	O	S	0	0
			736	462	132	140	2		

- Molecule 5 is a DNA chain called DNA (162-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
5	I	149	Total	C	N	O	P	0	0
			3084	1466	592	877	149		

- Molecule 6 is a DNA chain called DNA (162-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	J	149	Total	C	N	O	P	0	0
			3025	1452	513	911	149		

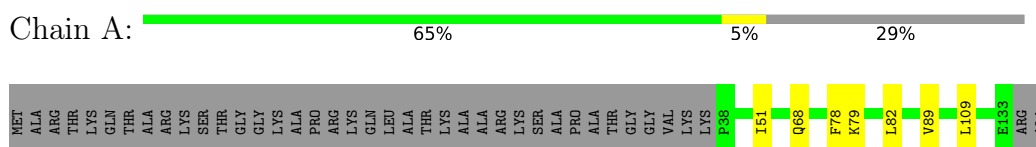
- Molecule 7 is a protein called Single-chain variable fragment.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	K	226	Total	C	N	O	S	0	0
			1759	1109	285	357	8		
7	N	226	Total	C	N	O	S	0	0
			1769	1115	289	357	8		

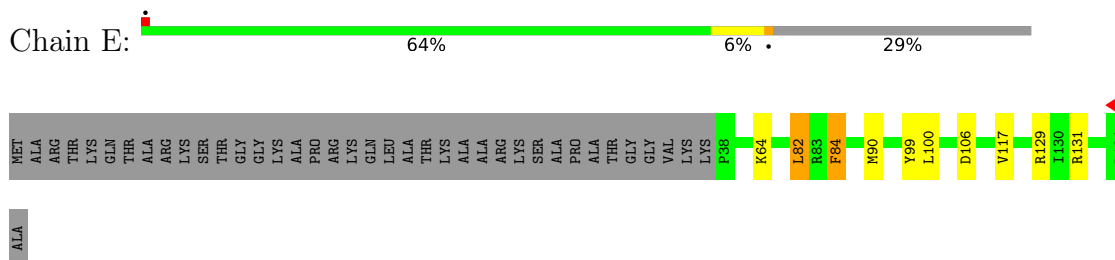
3 Residue-property plots

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.

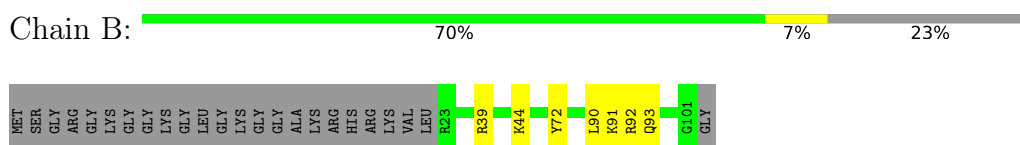
• Molecule 1: Histone H3.1



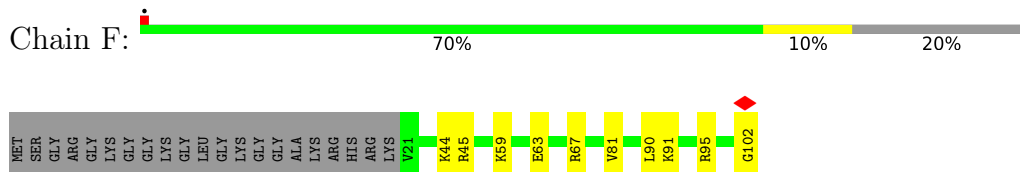
• Molecule 1: Histone H3.1



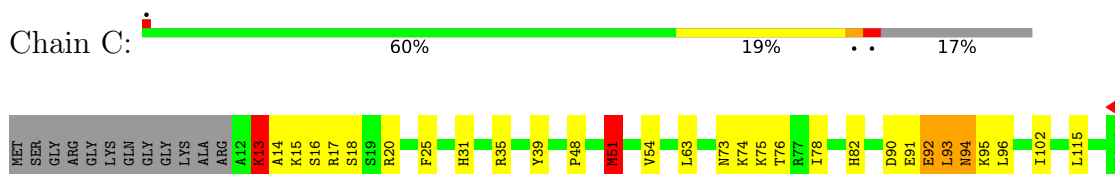
• Molecule 2: Histone H4



• Molecule 2: Histone H4



• Molecule 3: Histone H2A type 2-C



LYS
THR
GLU
SER
ARG
HIS
LYS
ALA
LYS
SER
LYS

• Molecule 3: Histone H2A type 2-C

Chain G:  67% 16% 17%

MET SER GLY ARG PRO GLY LYS GLN GLY LYS ALA ARG A12 S16 R17 R29 V30 H31 L34 P48 H51 V54 T62 L63 I78 H82 I87 R88 R89 D90 E91 E92 L93 N94 I102 L115 K118 LYS THR GLU SER HIS LYS ALA LYS SER LYS

• Molecule 4: Histone H2B type 2-E

Chain D:  64% 10% 25%

MET PRO GLU PRO PRO LYS SER ALA PRO PRO LYS GLY LYS LYS LYS VAL THR LYS LYS ALA GLN LYS LYS ASP GLY LYS ARG K31 R32 R40 Y41 L45 I62 N68 E72 E77 A78 S79 H87 S88 T89 V99 E106 K117 S125 LYS

• Molecule 4: Histone H2B type 2-E

Chain H:  65% 10% 25%

MET PRO GLU PRO PRO LYS SER ALA PRO PRO LYS GLY LYS LYS LYS VAL THR LYS LYS ALA GLN LYS LYS ASP GLY LYS ARG K32 S33 R34 K35 E36 S37 V42 L46 K47 H50 T53 I62 F71 V99 P104 K126

• Molecule 5: DNA (162-MER)

Chain I:  83% 9% 8%

DA DG DT DG DG DT DA DT DT DA A11 C18 T23 G24 G27 A41 A52 C53 A106 G107 C112 T114 T115 A116 G121 T139 G140 G159 DA DC DA

• Molecule 6: DNA (162-MER)

Chain J:  81% 11% 8%

DT DG DT C4 C13 A14 C21 A22 A36 T43 G46 T47 T50 G51 C56 T57 C75 C86 T87 C136 A137 G145 T152 DT DA DA DA DC DC DC DT

• Molecule 7: Single-chain variable fragment

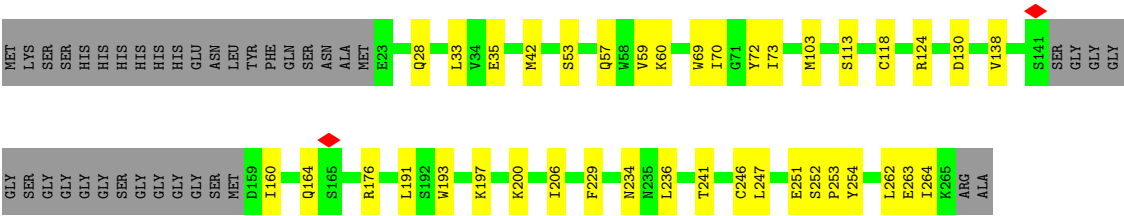
Chain K:  64% 22% 15%

MET LYS SER HIS HIS HIS HIS HIS ASN LEU TYR PHE GLY GLN SER ASN MET E23 Q27 E32 L33 S39 M42 P43 C44 T56 K60 G61 T62 I70 D95 V101 Y102 M103 E104 L105 S110 E111 D112 S113 A114 V115 Y116 K121 R124

L125 L129 Q134 G135 V138 T139 V140 S141 SER GLY GLY GLY GLY GLY GLY MET D159 I160 Q164 S165 V177 T178 I179 Q185 L191 S192 W193 Y194 L205 L206 V216 R219 S223 F229 S230 L231 T232 I233



- Molecule 7: Single-chain variable fragment



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	359203	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 ($e^-/\text{\AA}^2$)	53.8	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.699	Depositor
Minimum map value	-1.544	Depositor
Average map value	0.005	Depositor
Map value standard deviation	0.103	Depositor
Recommended contour level	0.35	Depositor
Map size ($\text{\AA}$)	253.44, 253.44, 253.44	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.056, 1.056, 1.056	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	A	0.39	1/802 (0.1%)	0.44	0/1076
1	E	0.63	3/813 (0.4%)	0.58	1/1090 (0.1%)
2	B	1.21	9/640 (1.4%)	0.75	1/857 (0.1%)
2	F	0.25	0/660	0.54	0/883
3	C	1.41	14/830 (1.7%)	0.93	6/1118 (0.5%)
3	G	0.46	2/826 (0.2%)	0.50	0/1114
4	D	0.51	2/747 (0.3%)	0.50	0/1005
4	H	0.25	0/747	0.71	2/1005 (0.2%)
5	I	0.21	0/3471	0.46	0/5360
6	J	0.23	0/3381	0.46	0/5211
7	K	0.21	0/1801	0.55	1/2443 (0.0%)
7	N	0.21	0/1811	0.52	1/2454 (0.0%)
All	All	0.49	31/16529 (0.2%)	0.54	12/23616 (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
3	C	0	2

The worst 5 of 31 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	90	LEU	C-O	-15.49	1.05	1.24
3	C	51	MET	C-O	-14.85	1.04	1.24
3	C	93	LEU	C-O	-14.33	1.07	1.24
3	C	94	ASN	C-O	-12.83	1.09	1.24
3	C	51	MET	CA-C	-11.78	1.36	1.52

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	33	SER	N-CA-C	13.07	126.95	110.61
3	C	51	MET	CB-CG-SD	-9.91	82.95	112.70
3	C	13	LYS	N-CA-C	8.42	128.74	110.80
3	C	13	LYS	CA-C-N	6.57	134.09	121.54
3	C	13	LYS	C-N-CA	6.57	134.09	121.54

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	C	51	MET	Mainchain
3	C	92	GLU	Mainchain

5.2 Too-close contacts ⓘ

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	790	0	826	10	0
1	E	801	0	839	15	0
2	B	633	0	673	4	0
2	F	653	0	696	12	0
3	C	820	0	880	35	0
3	G	816	0	869	18	0
4	D	736	0	749	13	0
4	H	736	0	749	12	0
5	I	3084	0	1675	11	0
6	J	3025	0	1692	15	0
7	K	1759	0	1686	36	0
7	N	1769	0	1708	31	0
All	All	15622	0	13042	171	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 171 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)
3:C:13:LYS:HE3	3:C:14:ALA:HB2	1.22	1.16
3:C:13:LYS:CG	3:C:14:ALA:H	1.51	1.16
1:E:117:VAL:HG23	2:F:45:ARG:HD3	1.32	1.11
3:C:13:LYS:HG3	3:C:14:ALA:N	1.44	1.11
4:D:87:ARG:HH21	4:D:89:THR:HG23	1.12	1.09

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	94/136 (69%)	94 (100%)	0	0	100	100
1	E	95/136 (70%)	95 (100%)	0	0	100	100
2	B	77/103 (75%)	73 (95%)	4 (5%)	0	100	100
2	F	80/103 (78%)	77 (96%)	3 (4%)	0	100	100
3	C	105/129 (81%)	96 (91%)	8 (8%)	1 (1%)	12	32
3	G	105/129 (81%)	100 (95%)	5 (5%)	0	100	100
4	D	93/126 (74%)	90 (97%)	3 (3%)	0	100	100
4	H	93/126 (74%)	87 (94%)	6 (6%)	0	100	100
7	K	222/265 (84%)	210 (95%)	12 (5%)	0	100	100
7	N	222/265 (84%)	208 (94%)	14 (6%)	0	100	100
All	All	1186/1518 (78%)	1130 (95%)	55 (5%)	1 (0%)	49	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	13	LYS

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	84/111 (76%)	84 (100%)	0	100	100
1	E	85/111 (77%)	85 (100%)	0	100	100
2	B	65/79 (82%)	65 (100%)	0	100	100
2	F	67/79 (85%)	67 (100%)	0	100	100
3	C	83/99 (84%)	83 (100%)	0	100	100
3	G	82/99 (83%)	82 (100%)	0	100	100
4	D	80/106 (76%)	79 (99%)	1 (1%)	61	83
4	H	80/106 (76%)	80 (100%)	0	100	100
7	K	197/224 (88%)	196 (100%)	1 (0%)	81	92
7	N	199/224 (89%)	197 (99%)	2 (1%)	68	86
All	All	1022/1238 (83%)	1018 (100%)	4 (0%)	81	93

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	106	GLU
7	K	125	LEU
7	N	57	GLN
7	N	59	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	85	GLN
7	N	196	GLN
3	G	31	HIS
7	N	235	ASN
7	K	57	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 oligosaccharides 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.

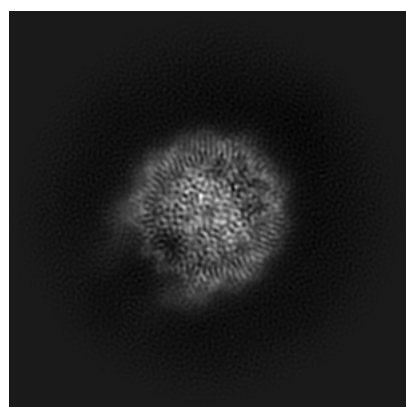
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-26261. These allow visual inspection of the internal detail of the map and identification of artifacts.

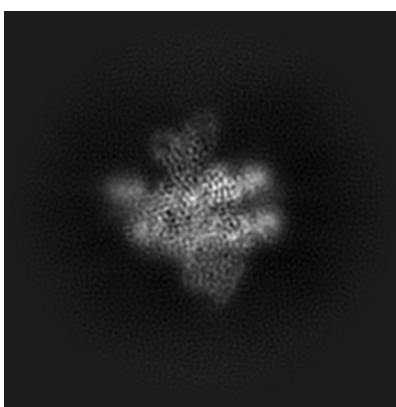
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

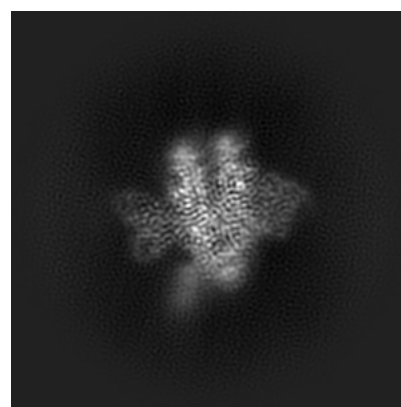
6.1.1 Primary map



X



Y

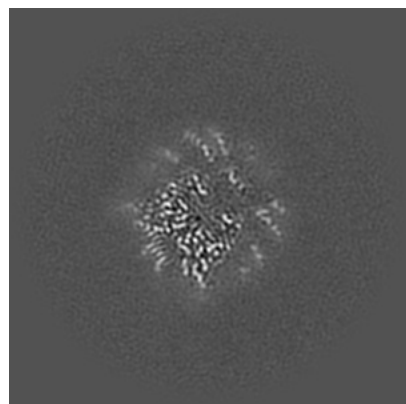


Z

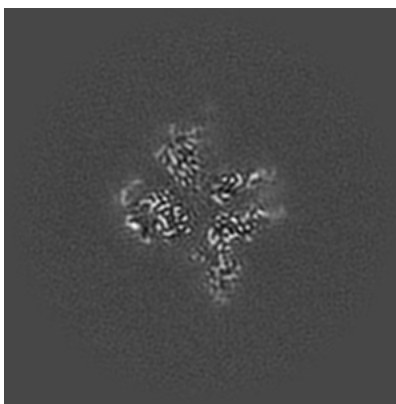
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

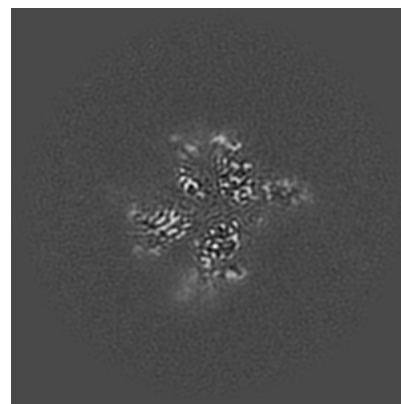
6.2.1 Primary map



X Index: 120



Y Index: 120

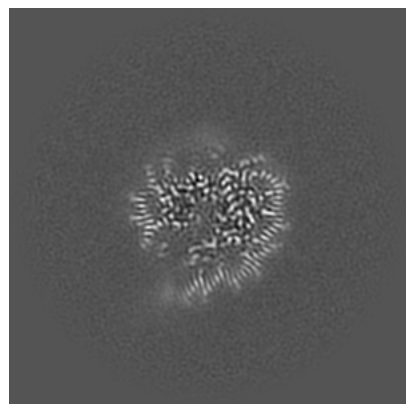


Z Index: 120

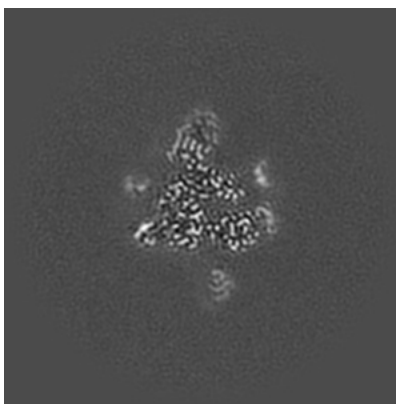
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

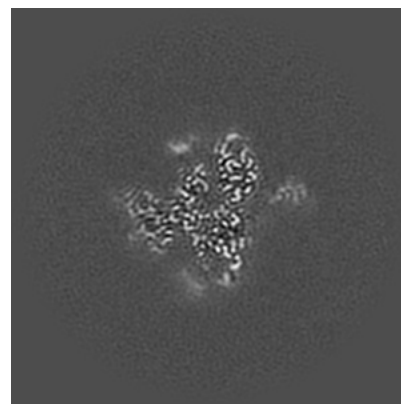
6.3.1 Primary map



X Index: 129



Y Index: 129

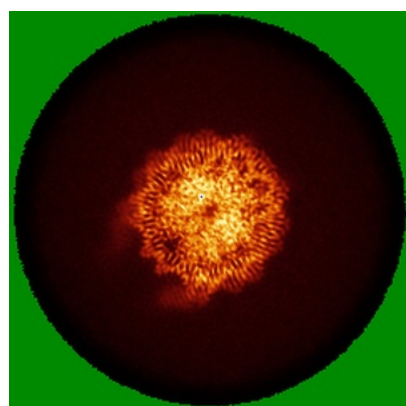


Z Index: 125

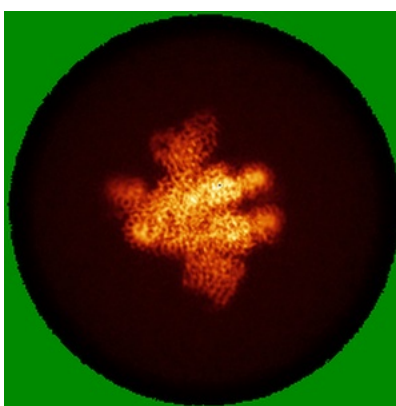
The images above show the largest variance slices of the map in three orthogonal directions.

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

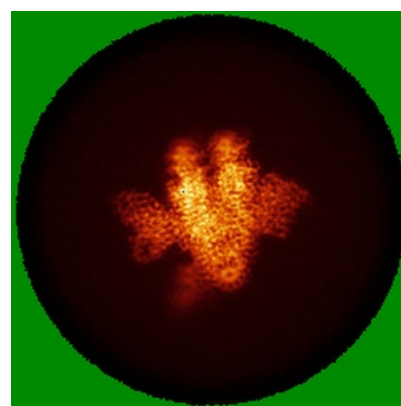
6.4.1 Primary map



X



Y

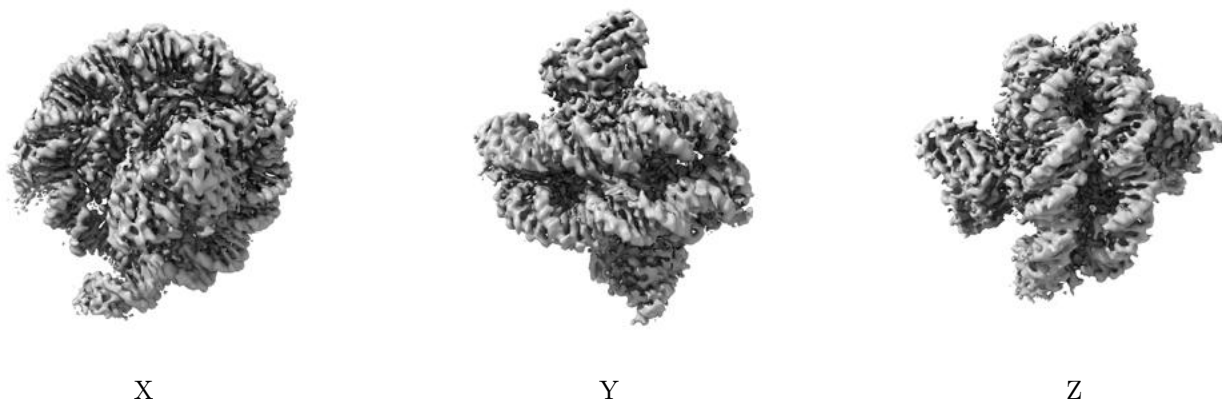


Z

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



The images above show the 3D surface view of the map at the recommended contour level 0.35. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

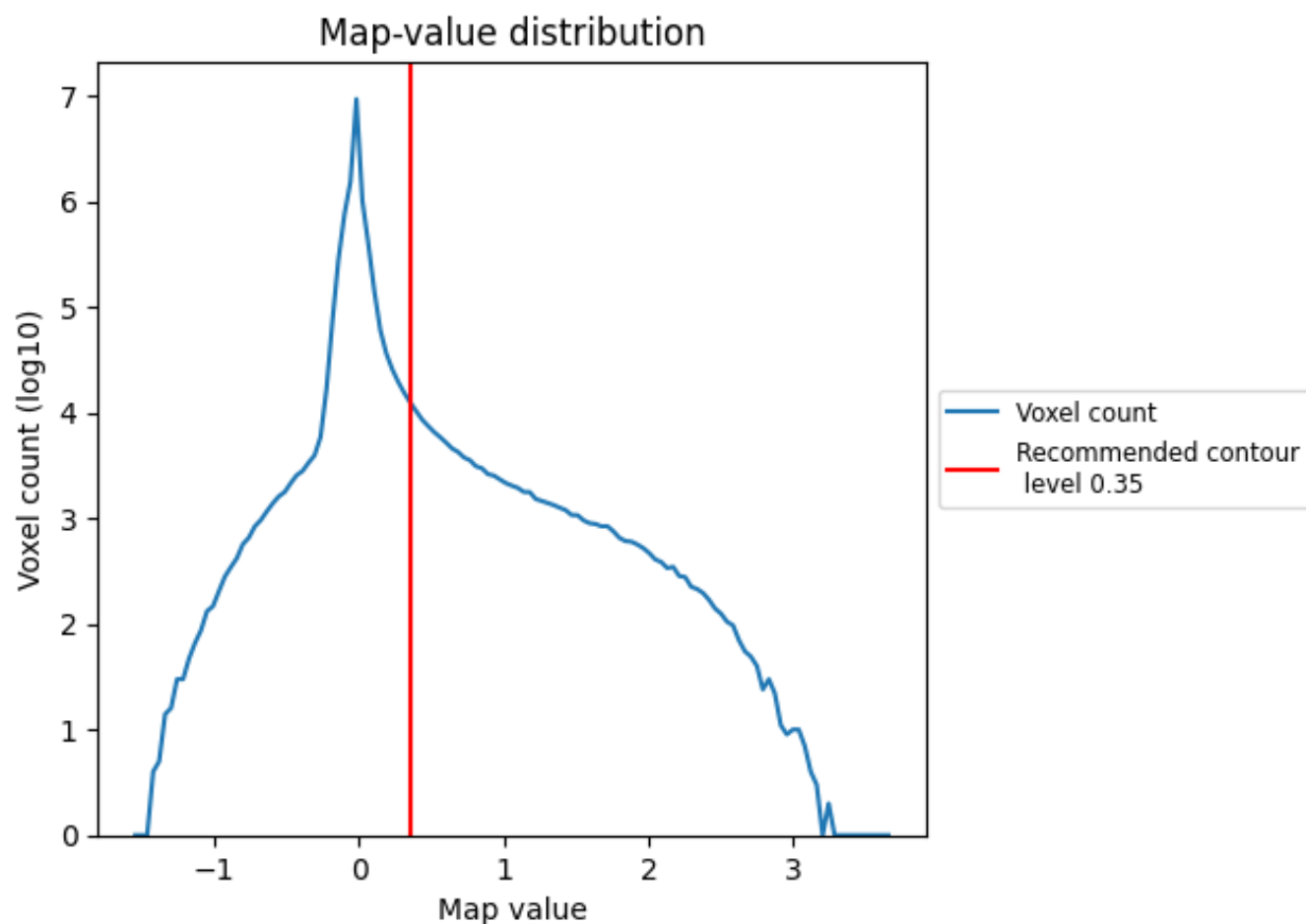
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

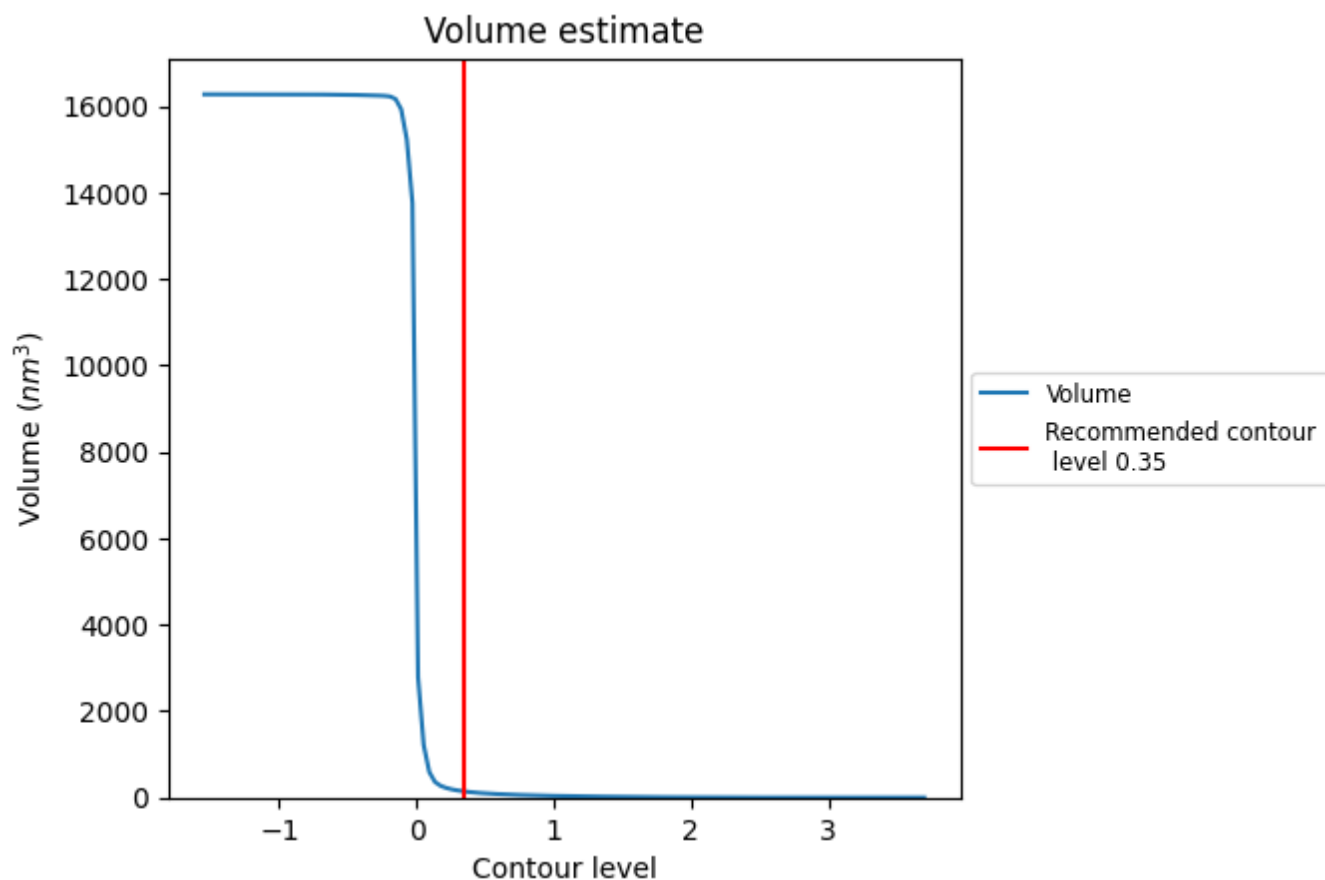
This section contains the results of statistical analysis of the map.

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.

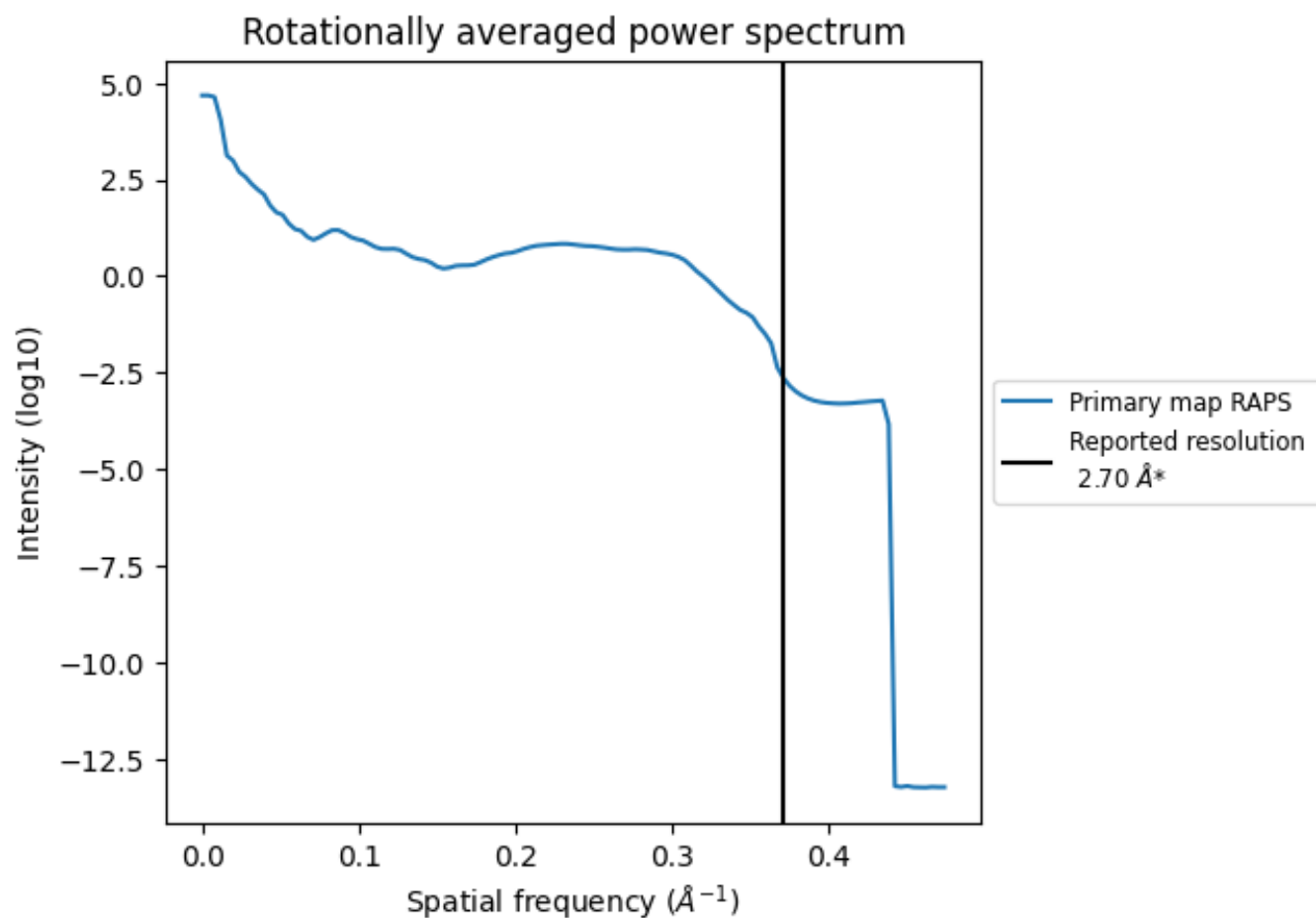
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 142 nm³; this corresponds to an approximate mass of 128 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 0.370 Å⁻¹

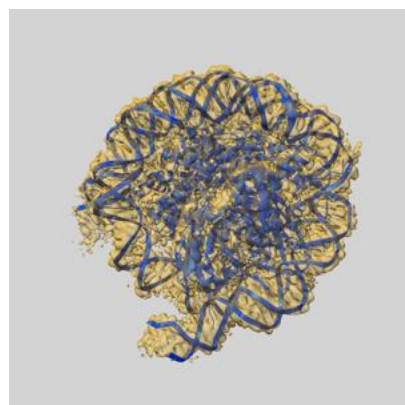
8 Fourier-Shell correlation

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

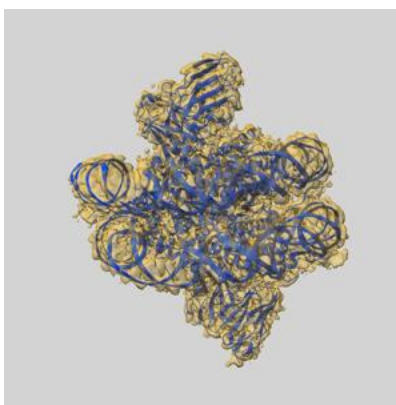
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-26261 and PDB model 7U0J. Per-residue inclusion information can be found in section [3](#) on page [6](#).

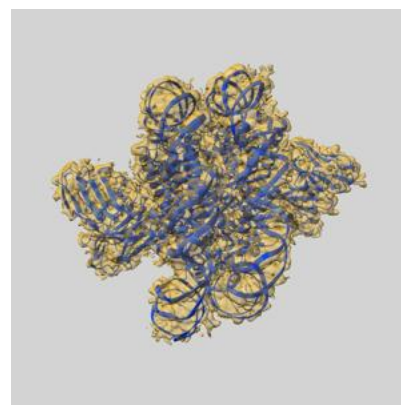
9.1 Map-model overlay [i](#)



X



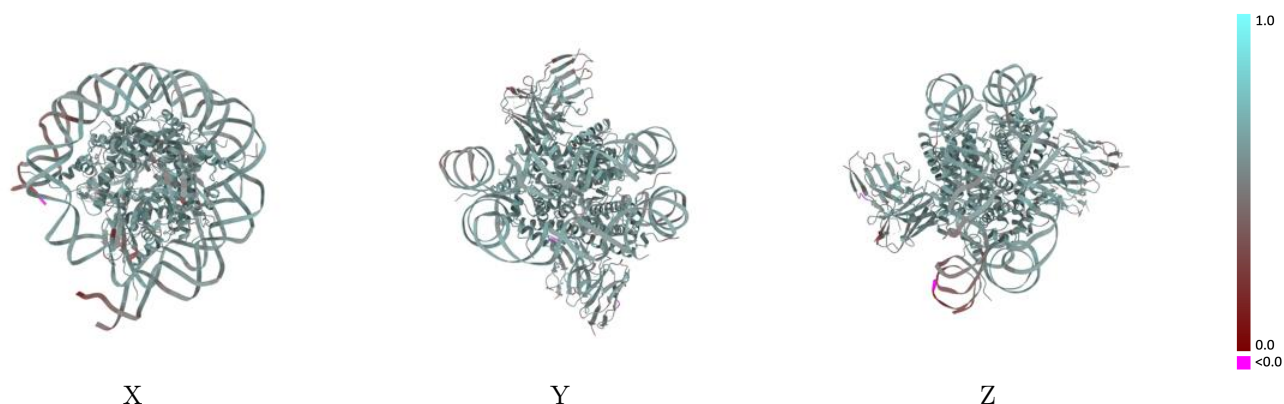
Y



Z

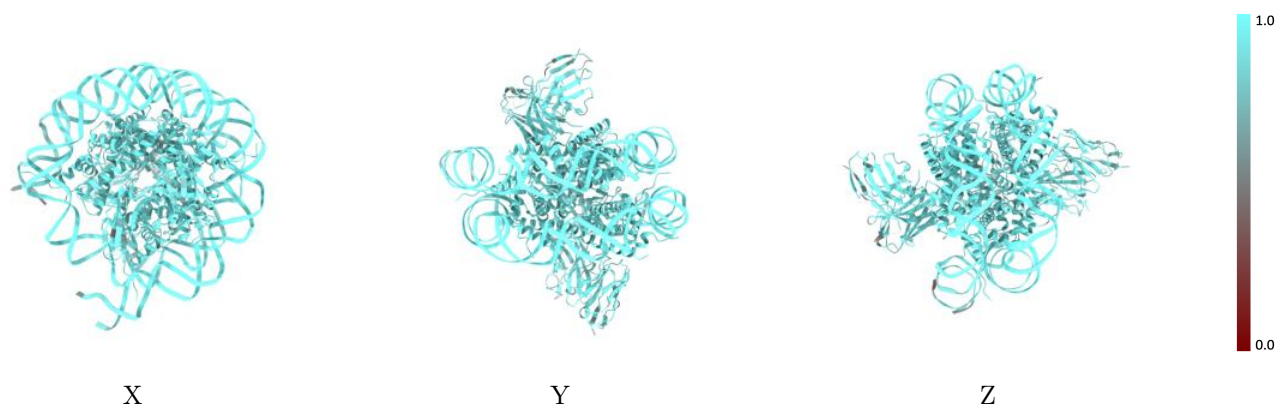
The images above show the 3D surface view of the map at the recommended contour level 0.35 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



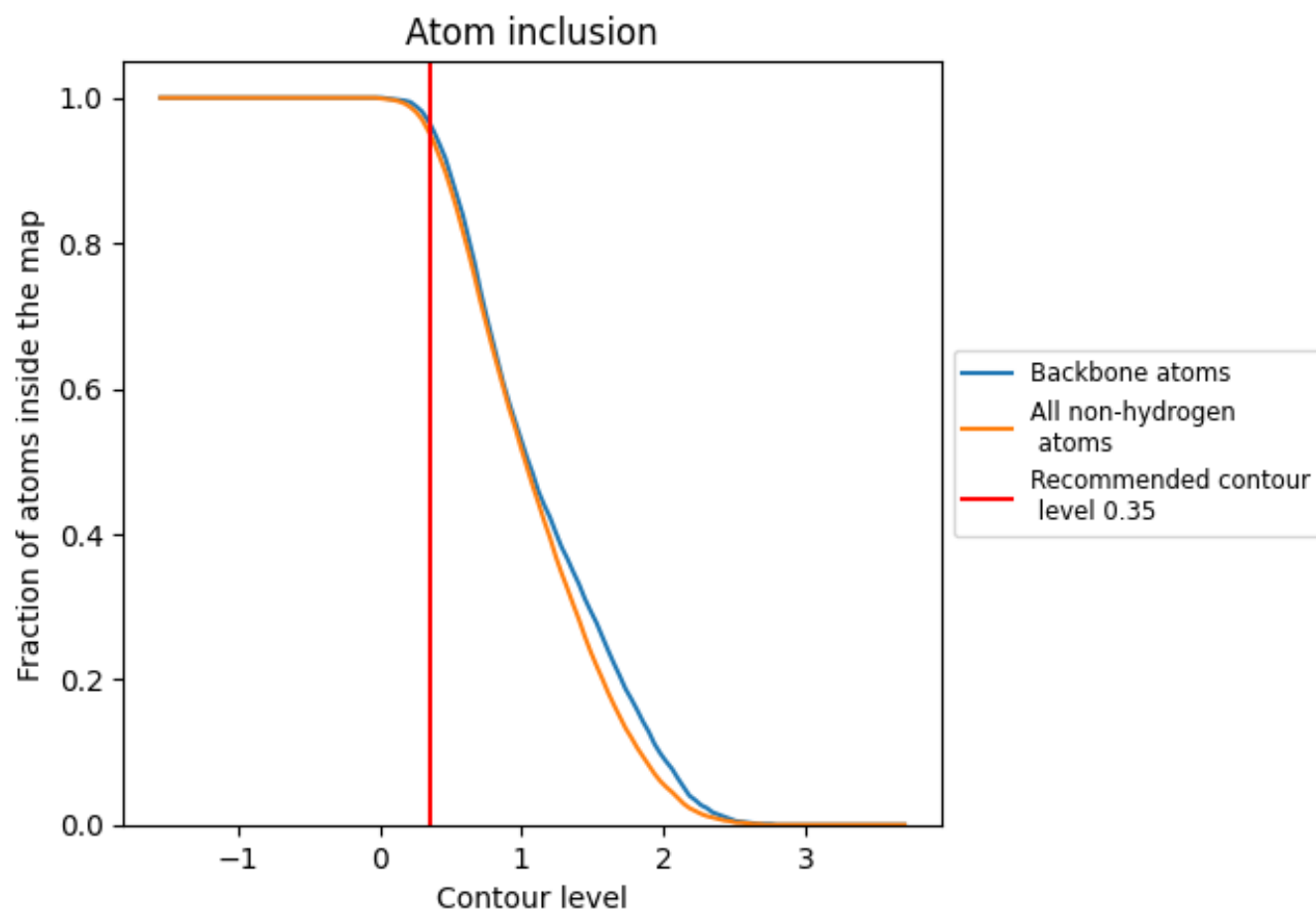
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.35).

9.4 Atom inclusion [i](#)



At the recommended contour level, 97% of all backbone atoms, 95% 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 (0.35) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9520	0.5680
A	0.9660	0.6060
B	0.9750	0.6150
C	0.9610	0.6000
D	0.9650	0.5920
E	0.9690	0.6050
F	0.9630	0.5970
G	0.9670	0.6070
H	0.9720	0.6010
I	0.9630	0.5500
J	0.9650	0.5430
K	0.8960	0.5460
N	0.9160	0.5510

1.0

0.0

<0.0