



wwPDB EM Validation Summary Report ⓘ

Mar 4, 2026 – 05:25 PM UTC

PDB ID : 8AG5 / pdb_00008ag5
EMDB ID : EMD-15416
Title : Vaccinia C16 protein bound to Ku70/Ku80
Authors : Rivera-Calzada, A.; Arribas-Bosacoma, R.; Pearl, L.H.; Llorca, O.
Deposited on : 2022-07-19
Resolution : 3.47 Å(reported)
Based on initial model : 1JEY

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:

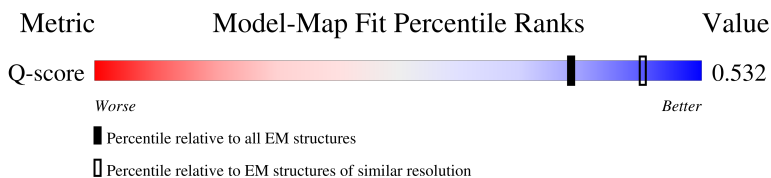
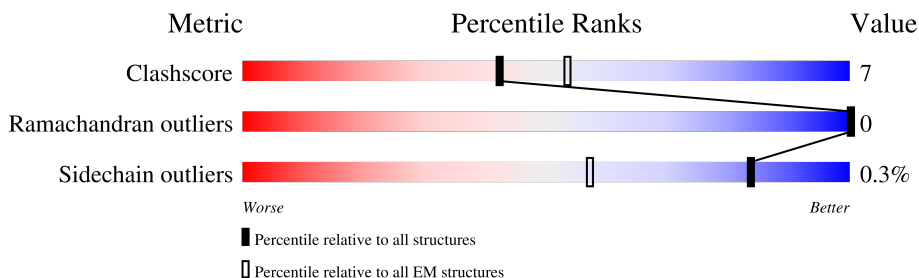
EMDB validation analysis : 0.0.1.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDb archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & 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 3.47 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	13733 (2.97 - 3.97)

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	651	9% 65% 12% 23%
2	B	755	9% 61% 10% 29%
3	C	369	23% 69% 21% 10%
3	D	369	10% 72% 18% 10%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 13762 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 Ku70-Xrcc6.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	502	Total	C	N	O	S	0	0
			4054	2592	687	757	18		

There are 42 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-41	MET	-	initiating methionine	UNP P12956
A	-40	SER	-	expression tag	UNP P12956
A	-39	ALA	-	expression tag	UNP P12956
A	-38	TRP	-	expression tag	UNP P12956
A	-37	SER	-	expression tag	UNP P12956
A	-36	HIS	-	expression tag	UNP P12956
A	-35	PRO	-	expression tag	UNP P12956
A	-34	GLN	-	expression tag	UNP P12956
A	-33	PHE	-	expression tag	UNP P12956
A	-32	GLU	-	expression tag	UNP P12956
A	-31	LYS	-	expression tag	UNP P12956
A	-30	GLY	-	expression tag	UNP P12956
A	-29	SER	-	expression tag	UNP P12956
A	-28	ALA	-	expression tag	UNP P12956
A	-27	GLY	-	expression tag	UNP P12956
A	-26	SER	-	expression tag	UNP P12956
A	-25	ALA	-	expression tag	UNP P12956
A	-24	ALA	-	expression tag	UNP P12956
A	-23	GLY	-	expression tag	UNP P12956
A	-22	SER	-	expression tag	UNP P12956
A	-21	GLY	-	expression tag	UNP P12956
A	-20	ALA	-	expression tag	UNP P12956
A	-19	GLY	-	expression tag	UNP P12956
A	-18	TRP	-	expression tag	UNP P12956
A	-17	SER	-	expression tag	UNP P12956
A	-16	HIS	-	expression tag	UNP P12956
A	-15	PRO	-	expression tag	UNP P12956
A	-14	GLN	-	expression tag	UNP P12956

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-13	PHE	-	expression tag	UNP P12956
A	-12	GLU	-	expression tag	UNP P12956
A	-11	LYS	-	expression tag	UNP P12956
A	-10	LEU	-	expression tag	UNP P12956
A	-9	GLU	-	expression tag	UNP P12956
A	-8	VAL	-	expression tag	UNP P12956
A	-7	LEU	-	expression tag	UNP P12956
A	-6	PHE	-	expression tag	UNP P12956
A	-5	GLN	-	expression tag	UNP P12956
A	-4	GLY	-	expression tag	UNP P12956
A	-3	PRO	-	expression tag	UNP P12956
A	-2	GLY	-	expression tag	UNP P12956
A	-1	GLY	-	expression tag	UNP P12956
A	0	SER	-	expression tag	UNP P12956

- Molecule 2 is a protein called X-ray repair cross-complementing protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	539	Total	C	N	O	S	0	0
			4302	2748	728	802	24		

There are 23 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-22	MET	-	initiating methionine	UNP P13010
B	-21	ALA	-	expression tag	UNP P13010
B	-20	HIS	-	expression tag	UNP P13010
B	-19	HIS	-	expression tag	UNP P13010
B	-18	HIS	-	expression tag	UNP P13010
B	-17	HIS	-	expression tag	UNP P13010
B	-16	HIS	-	expression tag	UNP P13010
B	-15	HIS	-	expression tag	UNP P13010
B	-14	HIS	-	expression tag	UNP P13010
B	-13	HIS	-	expression tag	UNP P13010
B	-12	HIS	-	expression tag	UNP P13010
B	-11	HIS	-	expression tag	UNP P13010
B	-10	GLY	-	expression tag	UNP P13010
B	-9	ALA	-	expression tag	UNP P13010
B	-8	LEU	-	expression tag	UNP P13010
B	-7	GLU	-	expression tag	UNP P13010
B	-6	VAL	-	expression tag	UNP P13010
B	-5	LEU	-	expression tag	UNP P13010

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	PHE	-	expression tag	UNP P13010
B	-3	GLN	-	expression tag	UNP P13010
B	-2	GLY	-	expression tag	UNP P13010
B	-1	PRO	-	expression tag	UNP P13010
B	0	HIS	-	expression tag	UNP P13010

- Molecule 3 is a protein called Protein C10.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	331	Total	C	N	O	S	0	0
			2703	1715	439	532	17		
3	D	331	Total	C	N	O	S	0	0
			2703	1715	439	532	17		

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	332	GLY	-	expression tag	UNP P03296
C	333	GLY	-	expression tag	UNP P03296
C	334	GLU	-	expression tag	UNP P03296
C	335	ASN	-	expression tag	UNP P03296
C	336	LEU	-	expression tag	UNP P03296
C	337	TYR	-	expression tag	UNP P03296
C	338	PHE	-	expression tag	UNP P03296
C	339	GLN	-	expression tag	UNP P03296
C	340	GLY	-	expression tag	UNP P03296
C	341	TRP	-	expression tag	UNP P03296
C	342	SER	-	expression tag	UNP P03296
C	343	HIS	-	expression tag	UNP P03296
C	344	PRO	-	expression tag	UNP P03296
C	345	GLN	-	expression tag	UNP P03296
C	346	PHE	-	expression tag	UNP P03296
C	347	GLU	-	expression tag	UNP P03296
C	348	LYS	-	expression tag	UNP P03296
C	349	GLY	-	expression tag	UNP P03296
C	350	GLY	-	expression tag	UNP P03296
C	351	GLY	-	expression tag	UNP P03296
C	352	SER	-	expression tag	UNP P03296
C	353	GLY	-	expression tag	UNP P03296
C	354	GLY	-	expression tag	UNP P03296
C	355	GLY	-	expression tag	UNP P03296
C	356	SER	-	expression tag	UNP P03296

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Chain	Residue	Modelled	Actual	Comment	Reference
C	357	GLY	-	expression tag	UNP P03296
C	358	GLY	-	expression tag	UNP P03296
C	359	SER	-	expression tag	UNP P03296
C	360	SER	-	expression tag	UNP P03296
C	361	ALA	-	expression tag	UNP P03296
C	362	TRP	-	expression tag	UNP P03296
C	363	SER	-	expression tag	UNP P03296
C	364	HIS	-	expression tag	UNP P03296
C	365	PRO	-	expression tag	UNP P03296
C	366	GLN	-	expression tag	UNP P03296
C	367	PHE	-	expression tag	UNP P03296
C	368	GLU	-	expression tag	UNP P03296
C	369	LYS	-	expression tag	UNP P03296
D	332	GLY	-	expression tag	UNP P03296
D	333	GLY	-	expression tag	UNP P03296
D	334	GLU	-	expression tag	UNP P03296
D	335	ASN	-	expression tag	UNP P03296
D	336	LEU	-	expression tag	UNP P03296
D	337	TYR	-	expression tag	UNP P03296
D	338	PHE	-	expression tag	UNP P03296
D	339	GLN	-	expression tag	UNP P03296
D	340	GLY	-	expression tag	UNP P03296
D	341	TRP	-	expression tag	UNP P03296
D	342	SER	-	expression tag	UNP P03296
D	343	HIS	-	expression tag	UNP P03296
D	344	PRO	-	expression tag	UNP P03296
D	345	GLN	-	expression tag	UNP P03296
D	346	PHE	-	expression tag	UNP P03296
D	347	GLU	-	expression tag	UNP P03296
D	348	LYS	-	expression tag	UNP P03296
D	349	GLY	-	expression tag	UNP P03296
D	350	GLY	-	expression tag	UNP P03296
D	351	GLY	-	expression tag	UNP P03296
D	352	SER	-	expression tag	UNP P03296
D	353	GLY	-	expression tag	UNP P03296
D	354	GLY	-	expression tag	UNP P03296
D	355	GLY	-	expression tag	UNP P03296
D	356	SER	-	expression tag	UNP P03296
D	357	GLY	-	expression tag	UNP P03296
D	358	GLY	-	expression tag	UNP P03296
D	359	SER	-	expression tag	UNP P03296
D	360	SER	-	expression tag	UNP P03296

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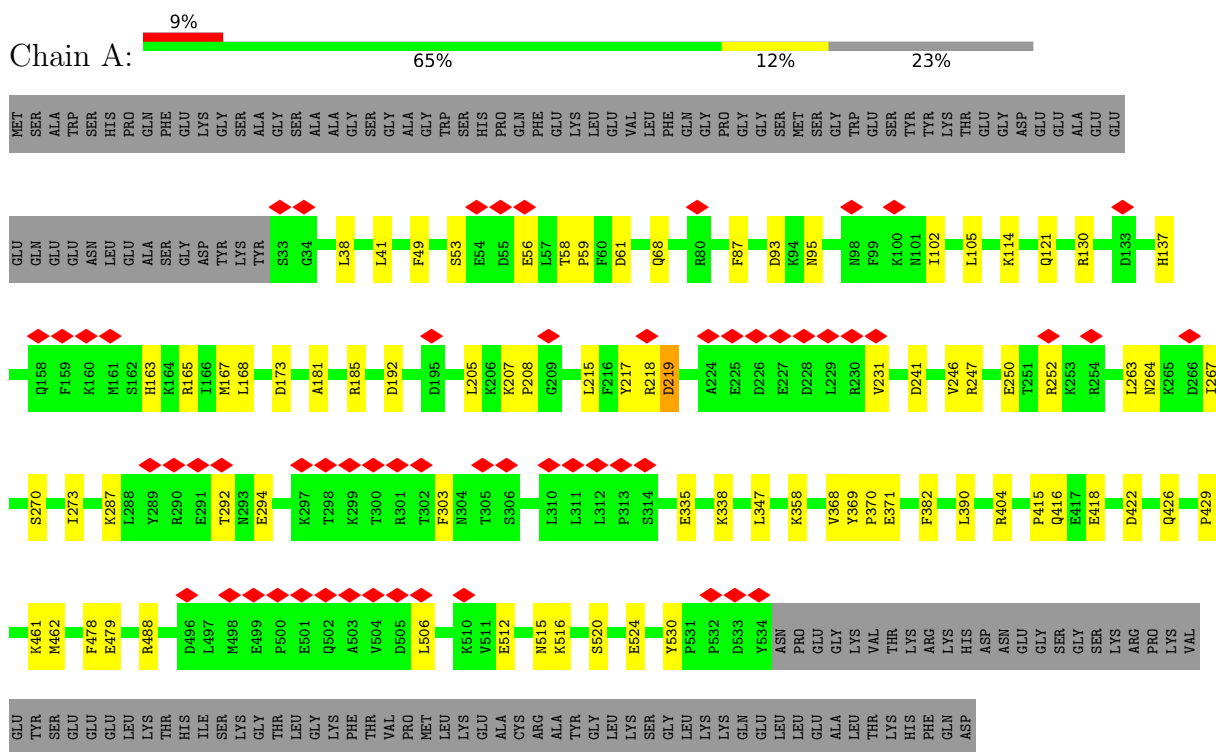
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Chain	Residue	Modelled	Actual	Comment	Reference
D	361	ALA	-	expression tag	UNP P03296
D	362	TRP	-	expression tag	UNP P03296
D	363	SER	-	expression tag	UNP P03296
D	364	HIS	-	expression tag	UNP P03296
D	365	PRO	-	expression tag	UNP P03296
D	366	GLN	-	expression tag	UNP P03296
D	367	PHE	-	expression tag	UNP P03296
D	368	GLU	-	expression tag	UNP P03296
D	369	LYS	-	expression tag	UNP P03296

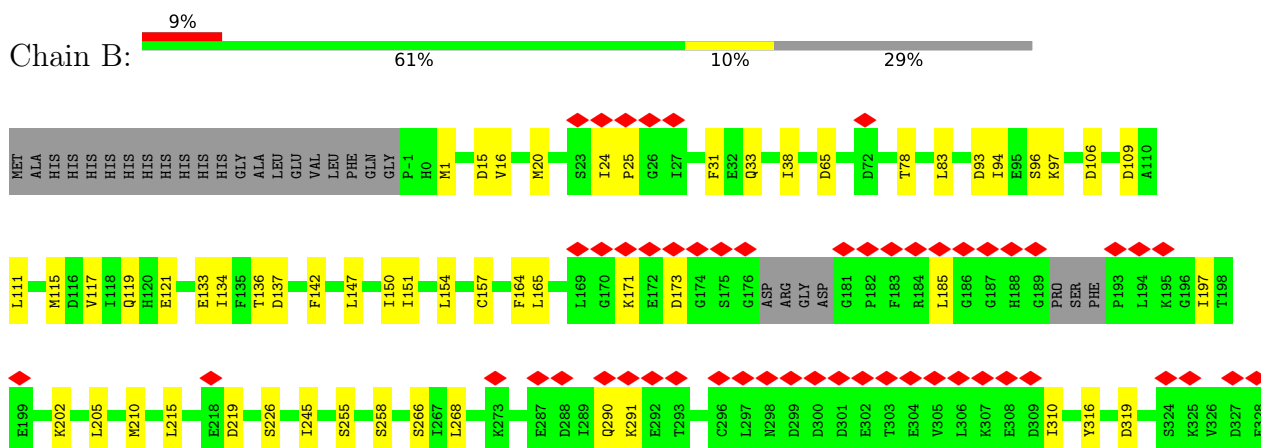
3 Residue-property plots

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.

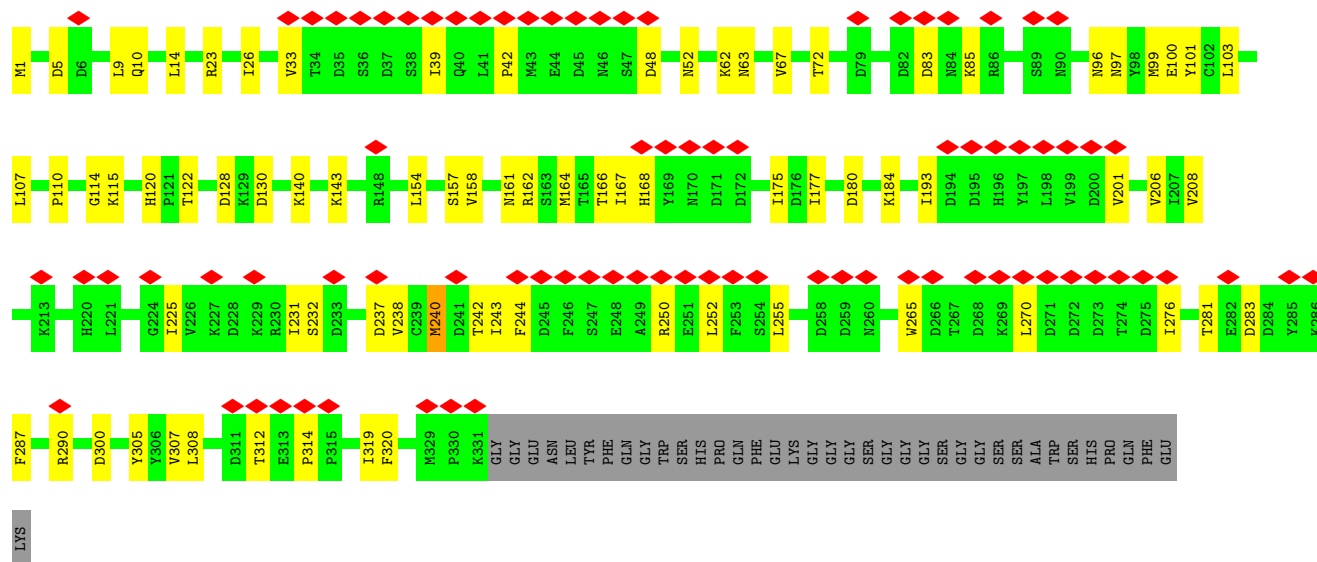
• Molecule 1: Ku70-Xrcc6



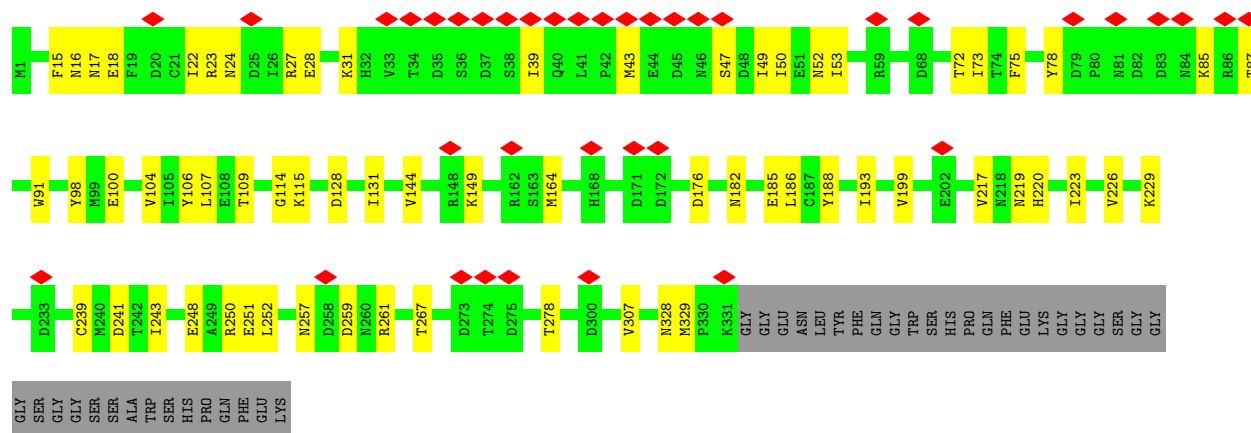
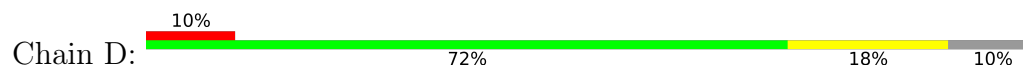
• Molecule 2: X-ray repair cross-complementing protein 5



- Molecule 3: Protein C10



- Molecule 3: Protein C10



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	152123	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 ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	90.367	Depositor
Minimum map value	-3.055	Depositor
Average map value	0.010	Depositor
Map value standard deviation	1.052	Depositor
Recommended contour level	5	Depositor
Map size (Å)	253.84, 253.84, 253.84	wwPDB
Map dimensions	304, 304, 304	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.835, 0.835, 0.835	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.12	0/4133	0.26	0/5568
2	B	0.12	0/4388	0.26	0/5912
3	C	0.11	0/2756	0.27	0/3734
3	D	0.12	0/2756	0.32	0/3734
All	All	0.12	0/14033	0.28	0/18948

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	4054	0	4130	53	0
2	B	4302	0	4350	53	0
3	C	2703	0	2646	51	0
3	D	2703	0	2646	38	0
All	All	13762	0	13772	185	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 7.

The worst 5 of 185 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:D:114:GLY:HA3	3:D:144:VAL:HG12	1.64	0.79
2:B:93:ASP:HA	2:B:97:LYS:HB3	1.69	0.75
3:D:28:GLU:OE1	3:D:31:LYS:NZ	2.24	0.70
3:C:97:ASN:HB3	3:C:162:ARG:HG2	1.74	0.70
2:B:65:ASP:HB3	2:B:78:THR:HG23	1.74	0.69

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	500/651 (77%)	487 (97%)	13 (3%)	0	100	100
2	B	533/755 (71%)	515 (97%)	18 (3%)	0	100	100
3	C	329/369 (89%)	312 (95%)	17 (5%)	0	100	100
3	D	329/369 (89%)	312 (95%)	17 (5%)	0	100	100
All	All	1691/2144 (79%)	1626 (96%)	65 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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	456/577 (79%)	453 (99%)	3 (1%)	76	77
2	B	483/668 (72%)	483 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	C	314/340 (92%)	313 (100%)	1 (0%)	86	83
3	D	314/340 (92%)	314 (100%)	0	100	100
All	All	1567/1925 (81%)	1563 (100%)	4 (0%)	84	83

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

Mol	Chain	Res	Type
1	A	68	GLN
1	A	114	LYS
1	A	219	ASP
3	C	240	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	168	HIS
3	D	260	ASN
3	D	262	ASN
3	C	262	ASN
2	B	104	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.

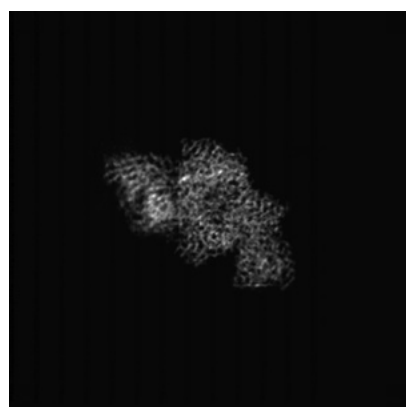
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-15416. These allow visual inspection of the internal detail of the map and identification of artifacts.

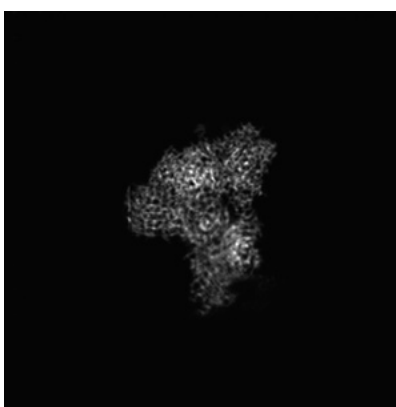
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

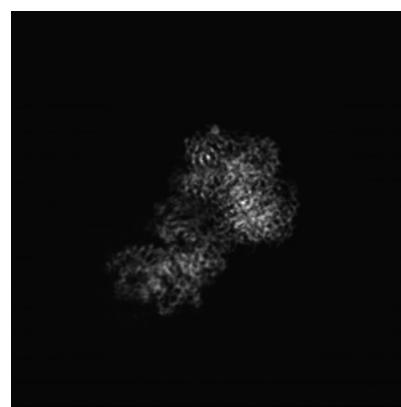
6.1.1 Primary map



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: 152



Y Index: 152



Z Index: 152

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: 176



Y Index: 145

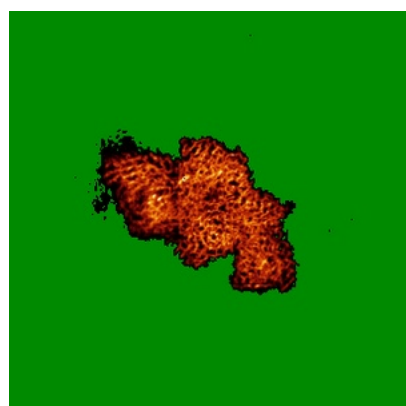


Z Index: 176

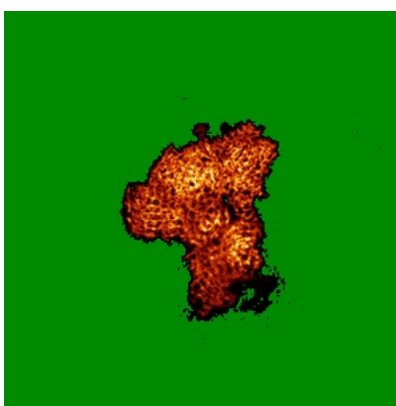
The images above show the largest variance slices of the map in three orthogonal directions.

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

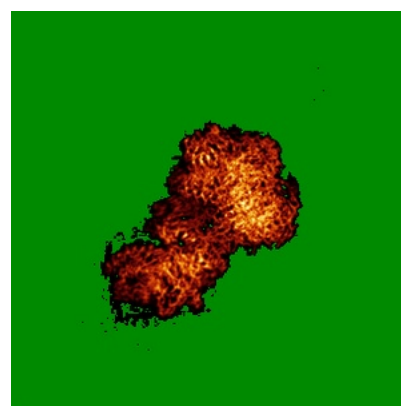
6.4.1 Primary map



X



Y

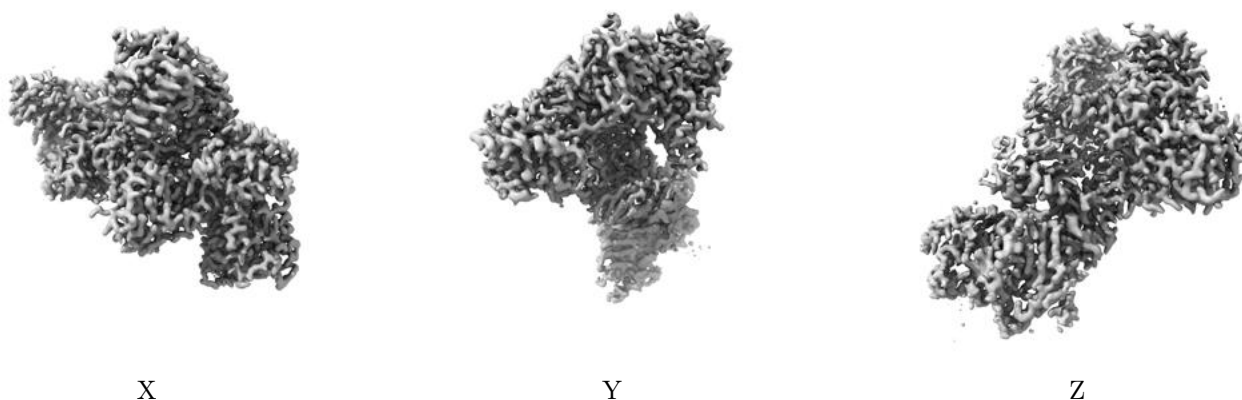


Z

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 5.0. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

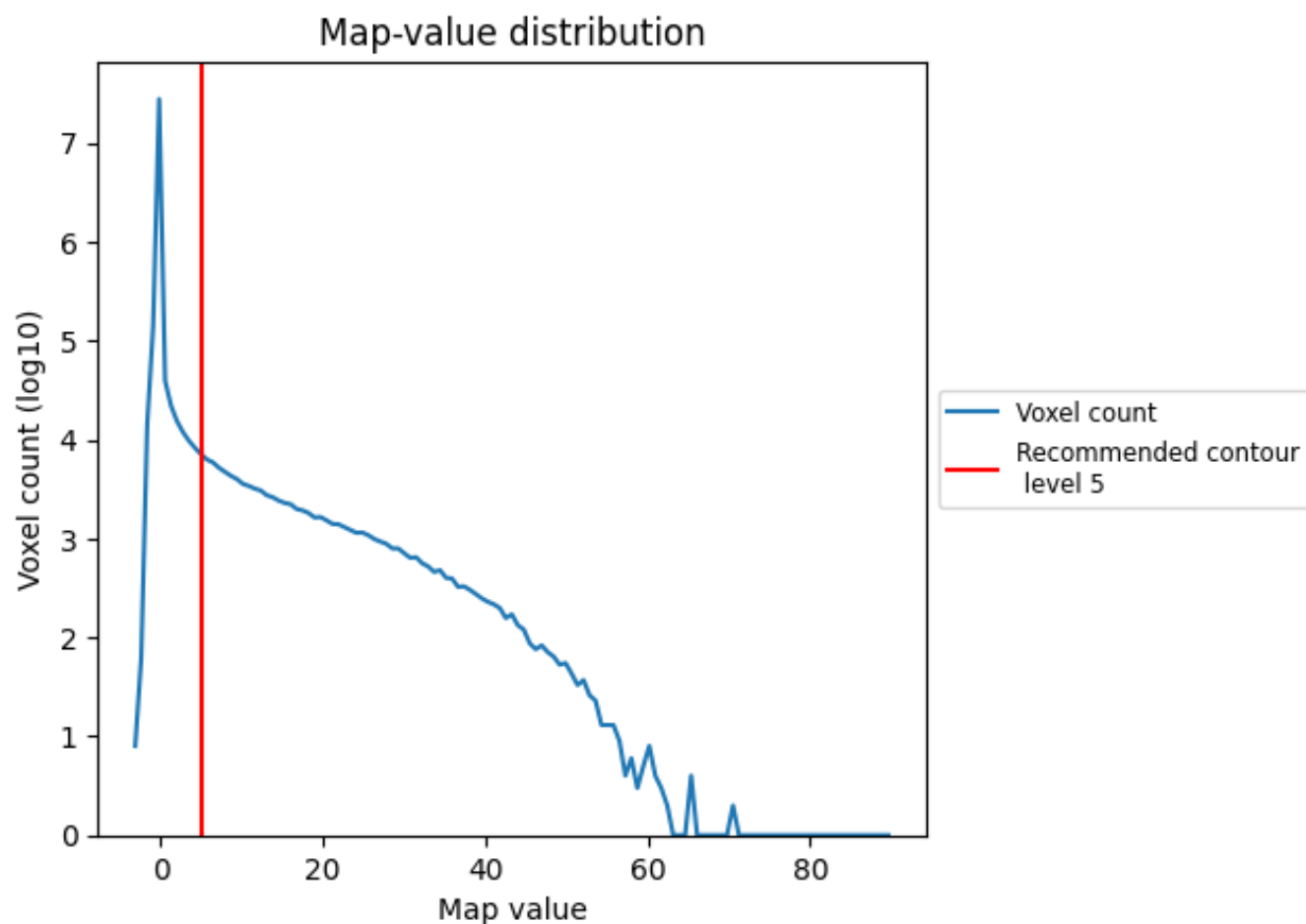
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

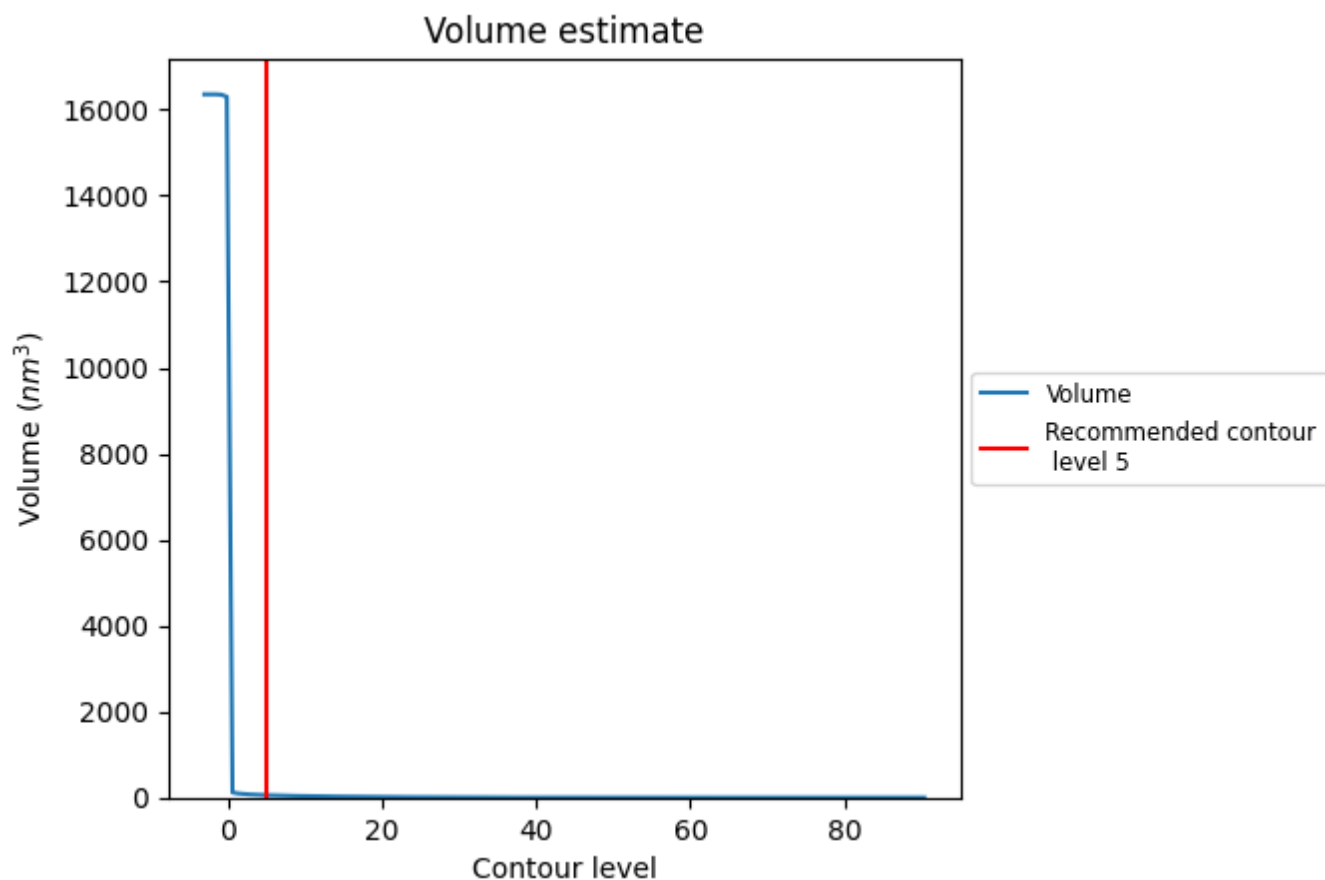
This section contains the results of statistical analysis of the map.

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.

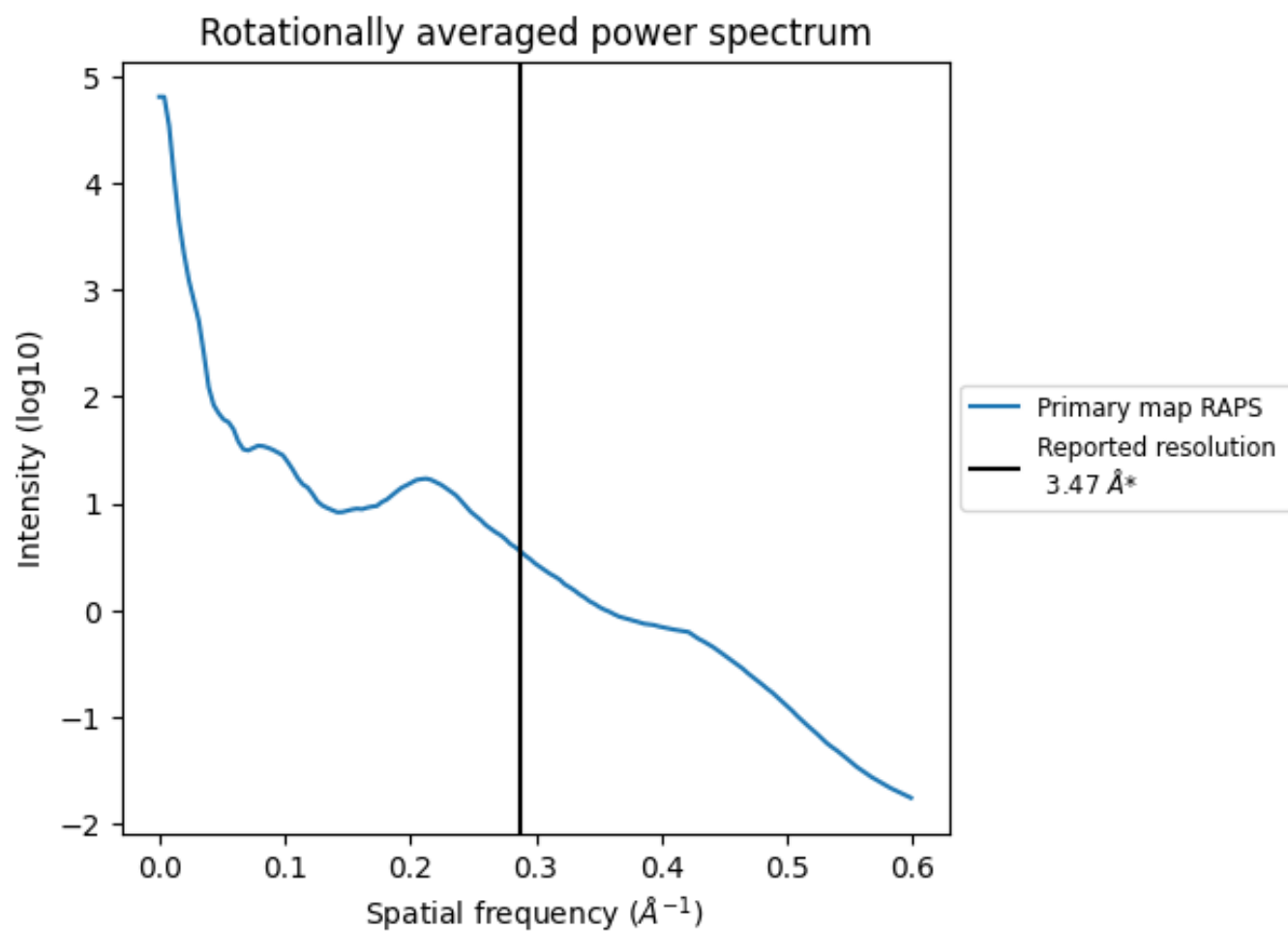
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 55 nm^3 ; this corresponds to an approximate mass of 50 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 0.288 Å⁻¹

8 Fourier-Shell correlation

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

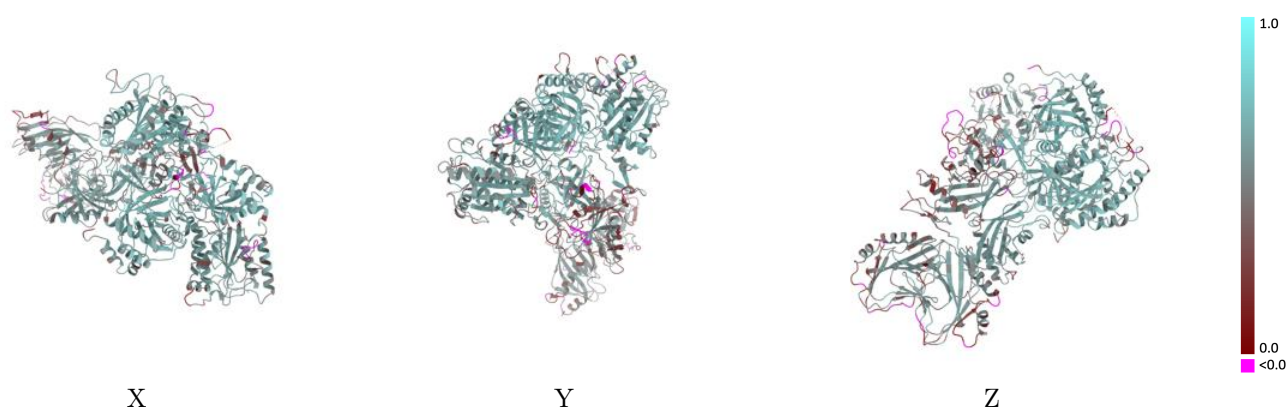
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-15416 and PDB model 8AG5. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay [i](#)

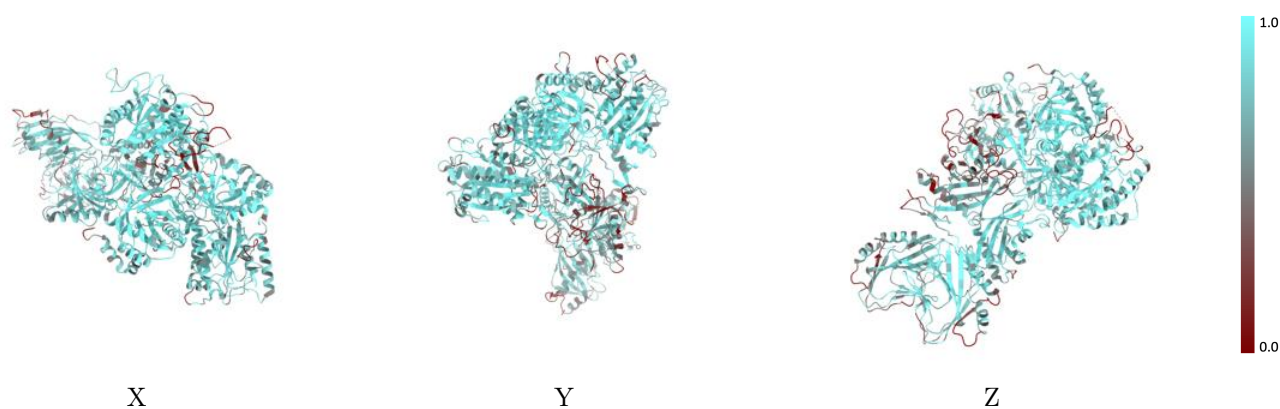
This section was not generated.

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



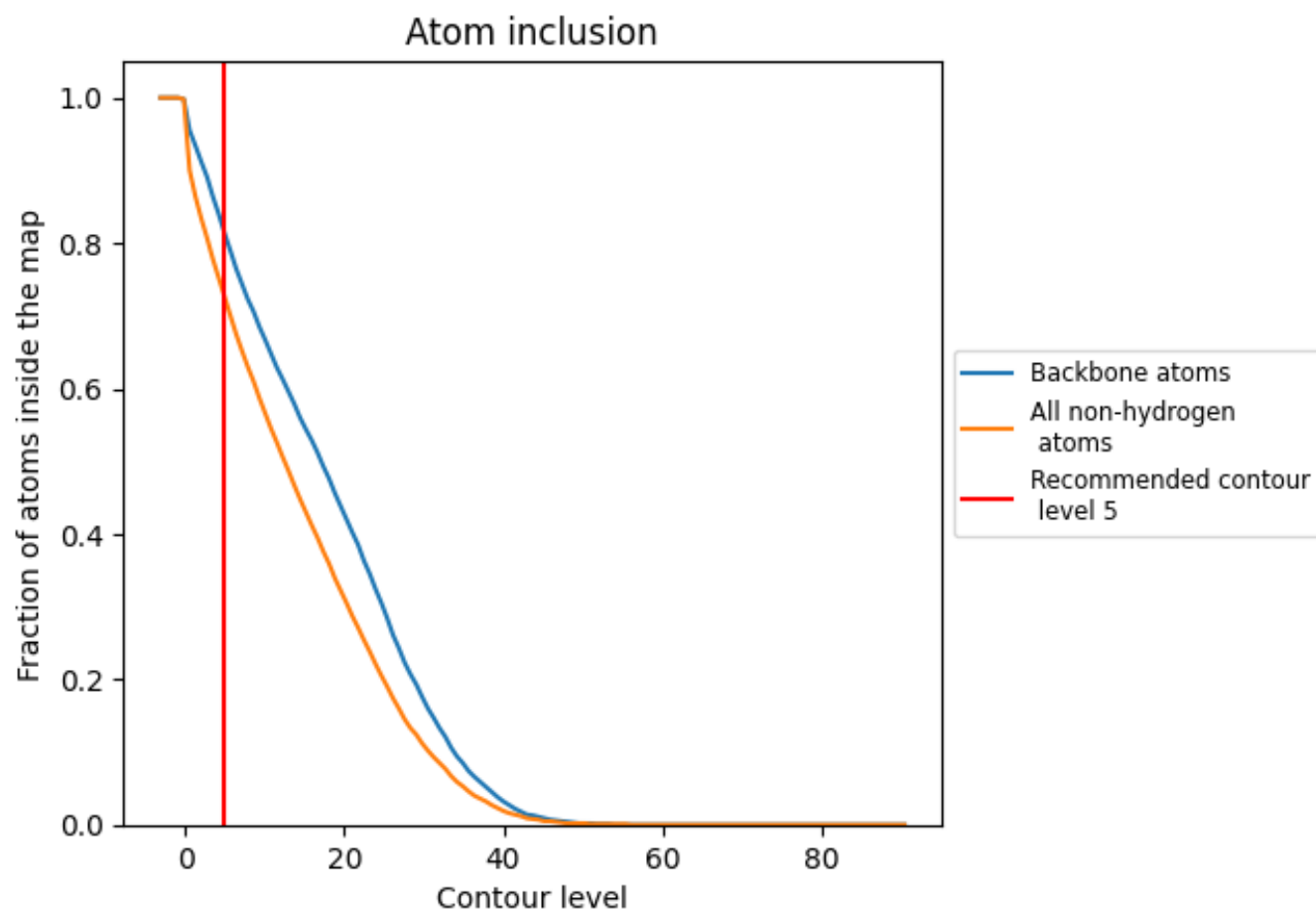
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (5).

9.4 Atom inclusion [i](#)



At the recommended contour level, 81% of all backbone atoms, 72% 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 (5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7240	0.5320
A	0.7520	0.5570
B	0.7730	0.5750
C	0.5970	0.4460
D	0.7280	0.5130

