



wwPDB EM Validation Summary Report ⓘ

Dec 22, 2022 – 04:50 pm GMT

PDB ID : 8A41
EMDB ID : EMD-15134
Title : Nudaurelia capensis omega virus procapsid at pH7.6 (insect cell expressed VLPs)
Authors : Castells-Graells, R.; Hesketh, E.L.; Johnson, J.E.; Ranson, N.A.; Lawson, D.M.; Lomonosoff, G.P.
Deposited on : 2022-06-10
Resolution : 4.88 Å (reported)
Based on initial model : 8A3C

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.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

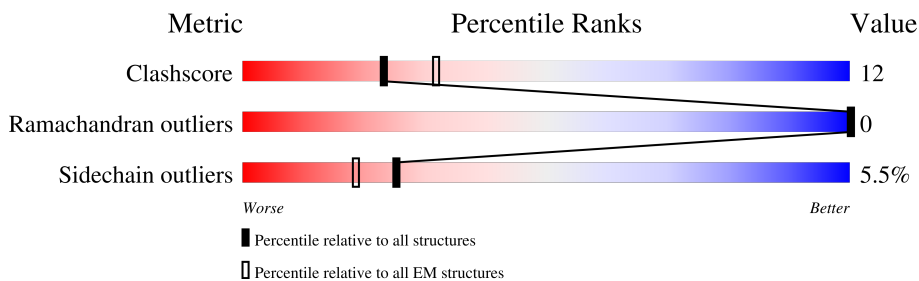
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.88 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 ≥ 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	644	5% 63% 24% 11%
1	B	644	5% 63% 23% 11%
1	C	644	64% 24% 11%
1	D	644	62% 24% 11%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 17464 atoms, of which 0 are hydrogens and 0 are deuteriums.

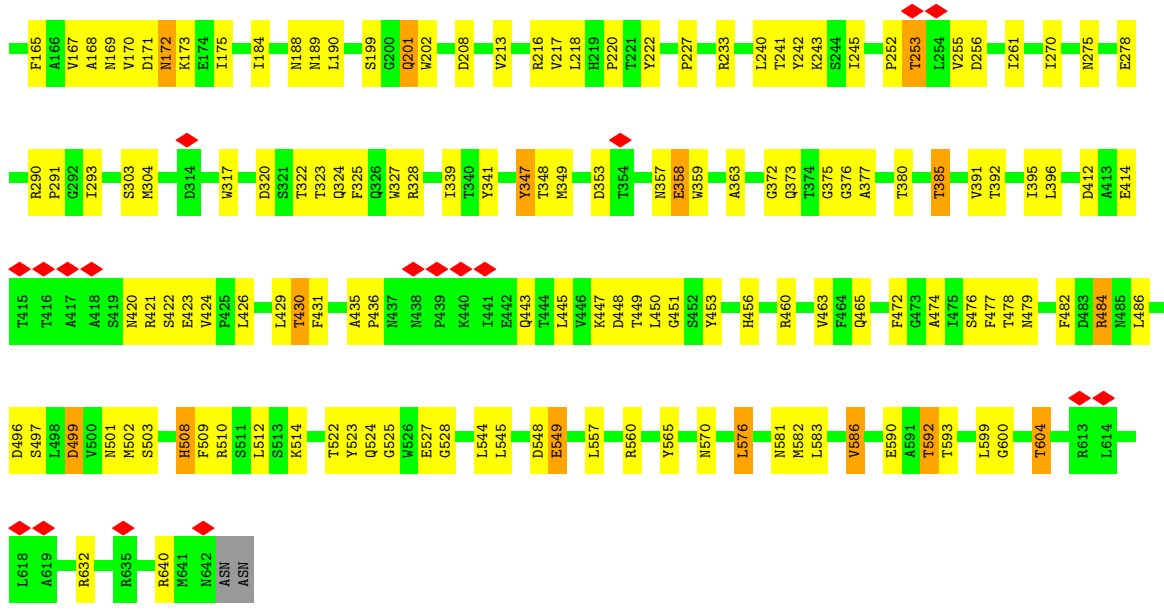
In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called p70.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	570	4366	2765	746	842	13	0	0
1	B	570	4366	2765	746	842	13	0	0
1	C	570	4366	2765	746	842	13	0	0
1	D	570	4366	2765	746	842	13	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	37	ARG	HIS	conflict	UNP Q4TVS9
A	204	THR	ALA	conflict	UNP Q4TVS9
A	576	LEU	SER	conflict	UNP Q4TVS9
B	37	ARG	HIS	conflict	UNP Q4TVS9
B	204	THR	ALA	conflict	UNP Q4TVS9
B	576	LEU	SER	conflict	UNP Q4TVS9
C	37	ARG	HIS	conflict	UNP Q4TVS9
C	204	THR	ALA	conflict	UNP Q4TVS9
C	576	LEU	SER	conflict	UNP Q4TVS9
D	37	ARG	HIS	conflict	UNP Q4TVS9
D	204	THR	ALA	conflict	UNP Q4TVS9
D	576	LEU	SER	conflict	UNP Q4TVS9



• Molecule 1: p70



MET	ASP	SER	ASN	THR	PRO	THR	ALA	GLY	LYS	ARG	ARG	PRO	SER	ASN	ASN	VAL	ILE	ALA	ALA	ASN	VAL	VAL	PRO	GLN	ARG	GLN	ALA	ARG	GLY	ARG	ALA	ARG	SER	ARG	ALA	ASN	ASN	THR	ASP	ASN	VAL	THR	ALA	ALA	GLN	GLU	LEU	GLY	GLN	SER	LEU	ASP	ASN
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VAL	ILE	THR	PHE	PRO	THR	ASN	VAL	ALA	THR	MET	ARG	THR	ASN	ASN	ASN	VAL	VAL	VAL	VAL	PRO	LYS	GLN	ARG	ARG	GLN	GLN	ALA	ALA	ARG	GLY	VAL	THR	THR	ALA	ALA	ALA	ALA	GLN	GLU	LEU	GLY	GLN	SER	LEU	ASP	ASN
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Y157	V167	A168	M169	S419	D171	M172	K173	D178	I184	M189	L190	V196	S199	Q201	T204	F206	D207	D208	P209	T210	W211	R214	I215	R216	P220	D226	P227	T228	E229	C230	L231	L232	R233	T234	V235	S236	D237	T238	R239	L240	T241	T245	P252	T253
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L254	V255	Q274	A276	E278	H284	V288	T289	R290	L293	V297	T322	T323	Q324	T340	Y341	T342	L343	F344	R346	Q346	Y347	T348	Y351	F352	D353	E358	M359	D367	Q373	T374	T380	M381	I384	T385	Y391	T392	A397	S401	F408	D412
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T415	A417	A418	S419	M420	E423	L429	A435	P436	M437	M438	P439	K440	I441	E442	L445	D448	T449	L450	Y453	S457	A469	S470	M479	F482	D483	L486	P487	D499	S503	C507	H508	F509	R510	Y519	Y523	Q524	G525	W526	E527	M528	S529	M531	M583	T584	S585	V586	F590	A591	T592	F593	S594	V595	L599	L606	Q609	R613	L614	L618	A619	S620	I621	P622	G623	K624	L625	R630	R633	W636	E527	S528	V529
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Q538	F539	A540	H541	S542	G543	L544	L545	K546	M547	D548	E549	Y565	G566	A567	F571	L576	M581	M582	L583	T584	S585	V586	F590	A591	T592	F593	S594	V595	L599	L606	Q609	R613	L614	L618	A619	S620	I621	P622	G623	K624	L625	R630	R633	W636	E527	S528	V529
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M642	ASN	ASN	ASN
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• Molecule 1: p70



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of particles used	33881	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 ($e^-/\text{\AA}^2$)	88.5	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	75000	Depositor
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.095	Depositor
Minimum map value	-0.030	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.010	Depositor
Recommended contour level	0.022	Depositor
Map size (Å)	639.0, 639.0, 639.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.5975, 1.5975, 1.5975	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	0.24	0/4476	0.49	0/6122
1	B	0.24	0/4476	0.48	0/6122
1	C	0.24	0/4476	0.48	0/6122
1	D	0.25	0/4476	0.48	0/6122
All	All	0.24	0/17904	0.48	0/24488

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	4366	0	4244	107	0
1	B	4366	0	4244	106	0
1	C	4366	0	4244	106	0
1	D	4366	0	4244	122	0
All	All	17464	0	16976	424	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 12.

The worst 5 of 424 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:B:184:ILE:HD11	1:B:426:LEU:HD11	1.55	0.88
1:B:151:SER:OG	1:B:172:ASN:ND2	2.08	0.85
1:C:171:ASP:OD1	1:C:210:THR:OG1	1.95	0.84
1:A:113:LYS:NZ	1:A:124:ASP:OD1	2.13	0.81
1:A:149:GLN:O	1:A:514:LYS:NZ	2.12	0.80

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	568/644 (88%)	534 (94%)	34 (6%)	0	100	100
1	B	568/644 (88%)	539 (95%)	29 (5%)	0	100	100
1	C	568/644 (88%)	533 (94%)	35 (6%)	0	100	100
1	D	568/644 (88%)	543 (96%)	25 (4%)	0	100	100
All	All	2272/2576 (88%)	2149 (95%)	123 (5%)	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	468/527 (89%)	441 (94%)	27 (6%)	20	47
1	B	468/527 (89%)	442 (94%)	26 (6%)	21	48

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	468/527 (89%)	441 (94%)	27 (6%)	20	47
1	D	468/527 (89%)	445 (95%)	23 (5%)	25	51
All	All	1872/2108 (89%)	1769 (94%)	103 (6%)	25	49

5 of 103 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	172	ASN
1	C	423	GLU
1	D	586	VAL
1	C	189	ASN
1	C	347	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	538	GLN
1	D	602	GLN
1	A	570	ASN
1	C	149	GLN
1	C	219	HIS

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](#)

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.

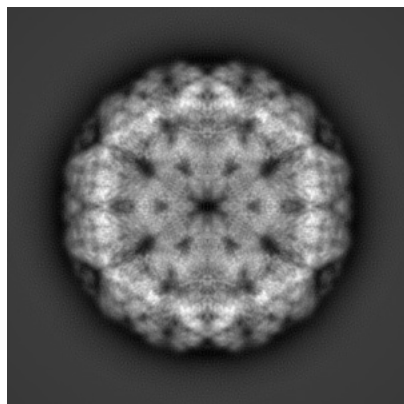
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-15134. These allow visual inspection of the internal detail of the map and identification of artifacts.

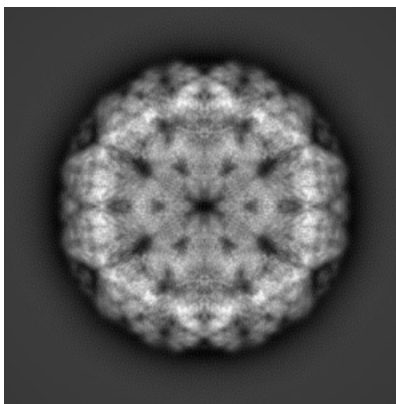
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

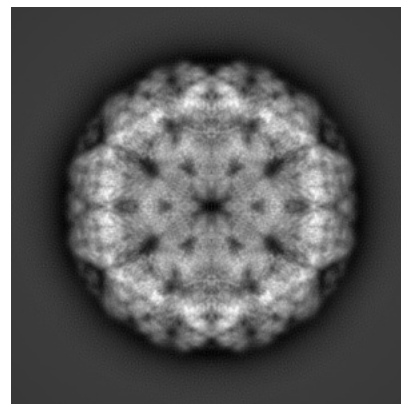
6.1.1 Primary map



X

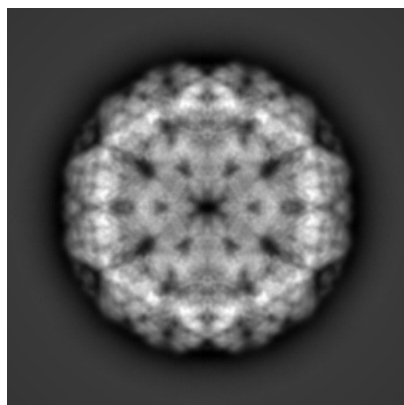


Y

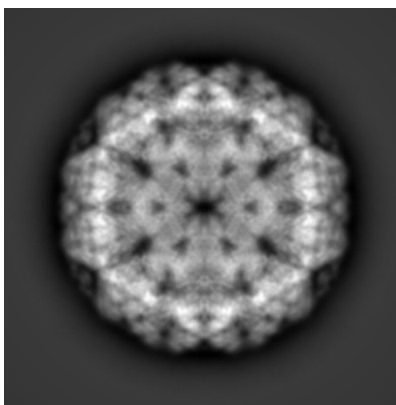


Z

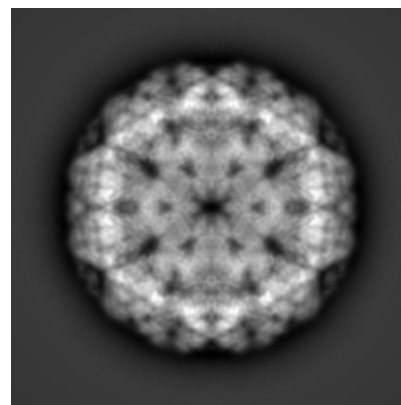
6.1.2 Raw map



X



Y

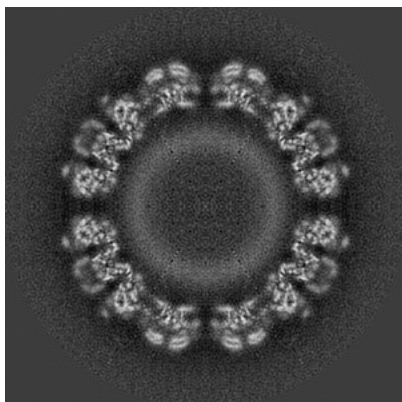


Z

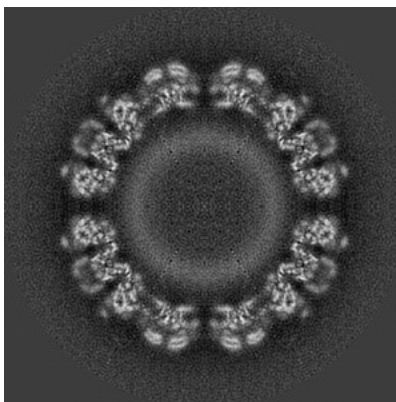
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

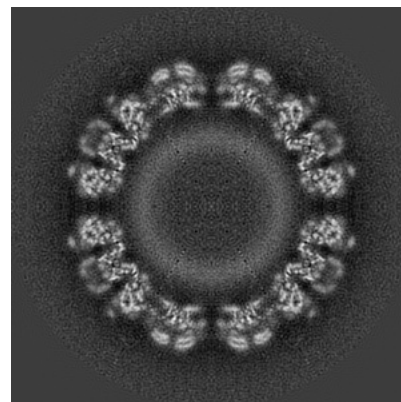
6.2.1 Primary map



X Index: 200

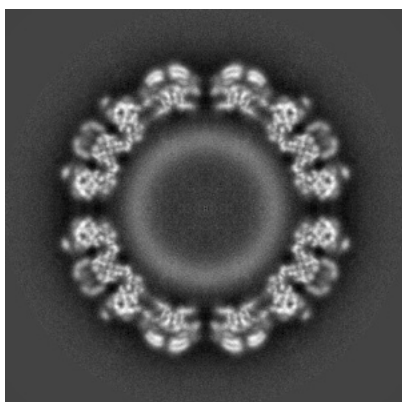


Y Index: 200

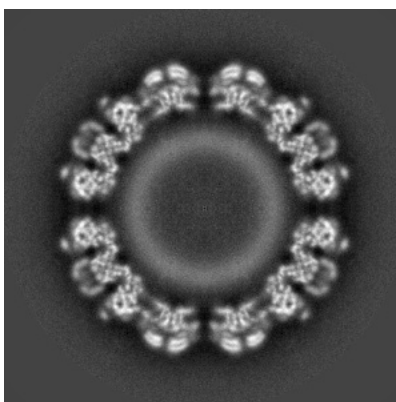


Z Index: 200

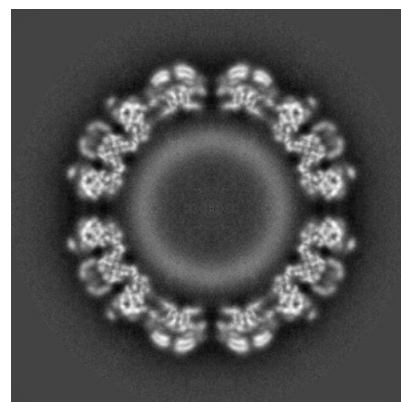
6.2.2 Raw map



X Index: 200



Y Index: 200

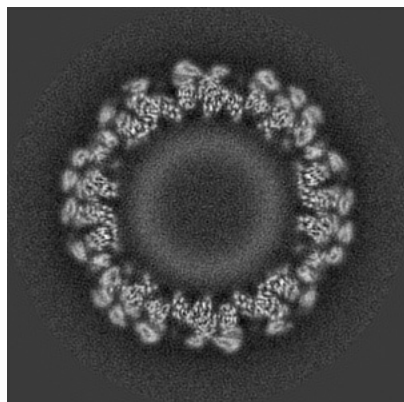


Z Index: 200

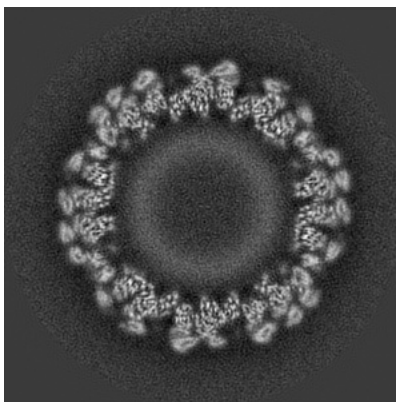
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

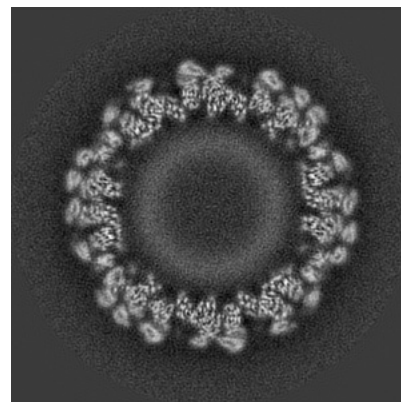
6.3.1 Primary map



X Index: 175

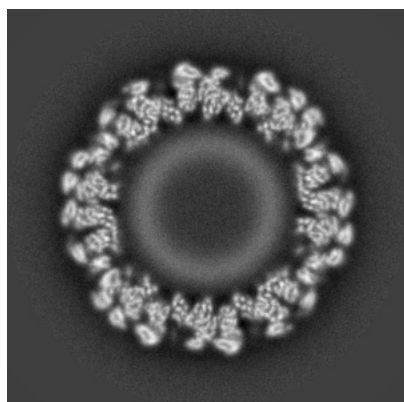


Y Index: 225

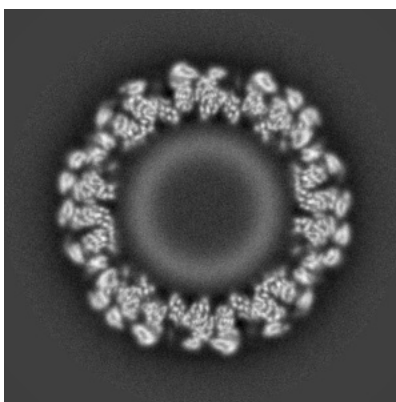


Z Index: 175

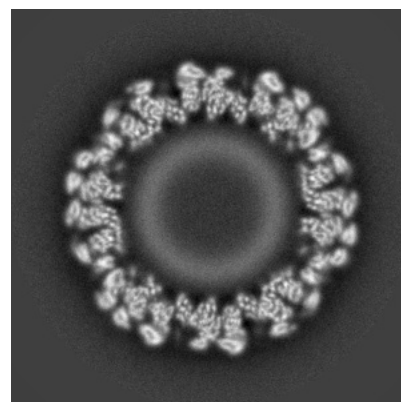
6.3.2 Raw map



X Index: 175



Y Index: 175

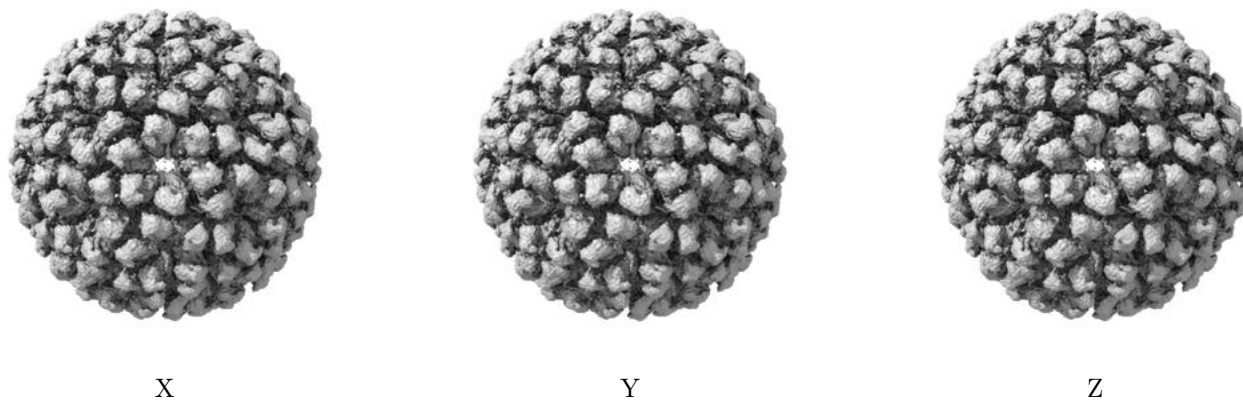


Z Index: 175

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

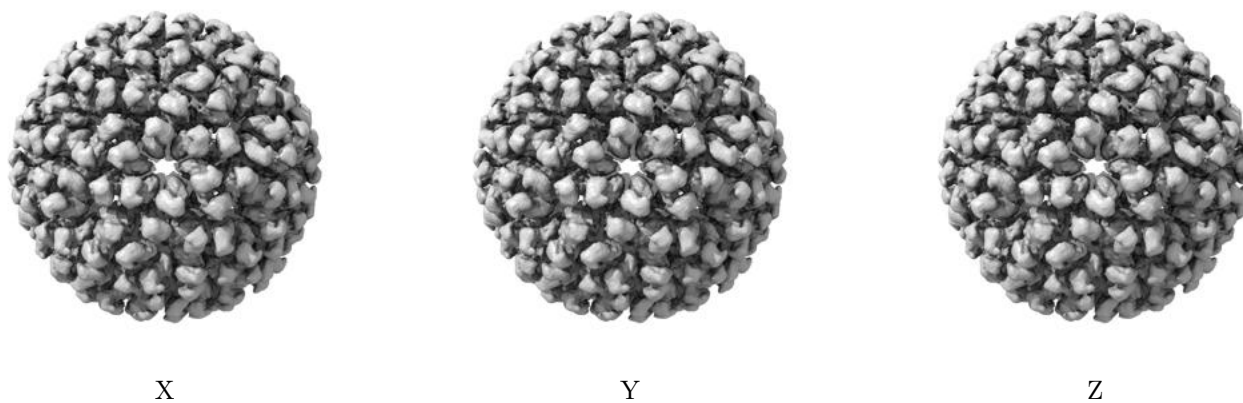
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.022. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.4.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

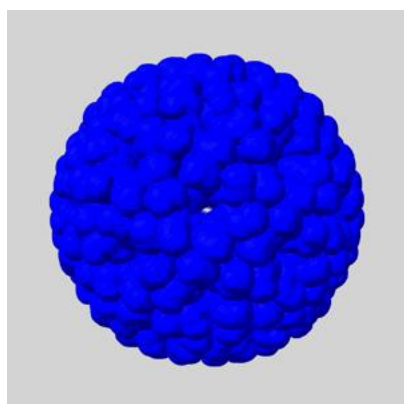
6.5 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

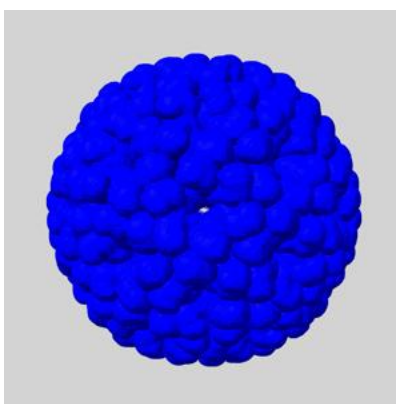
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

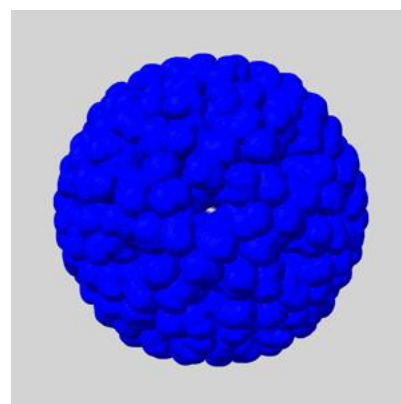
6.5.1 emd_15134_msk_1.map [i](#)



X



Y

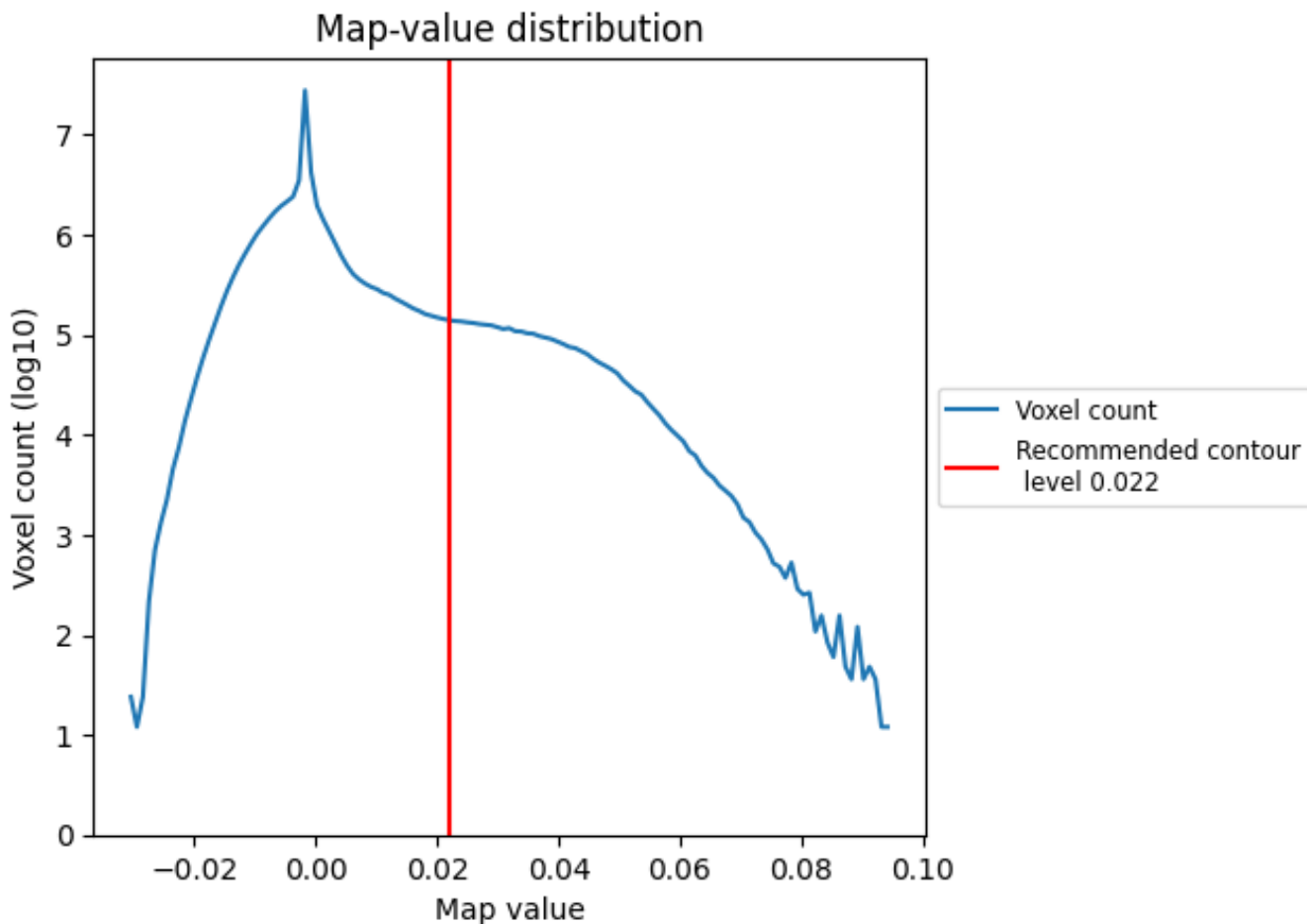


Z

7 Map analysis [i](#)

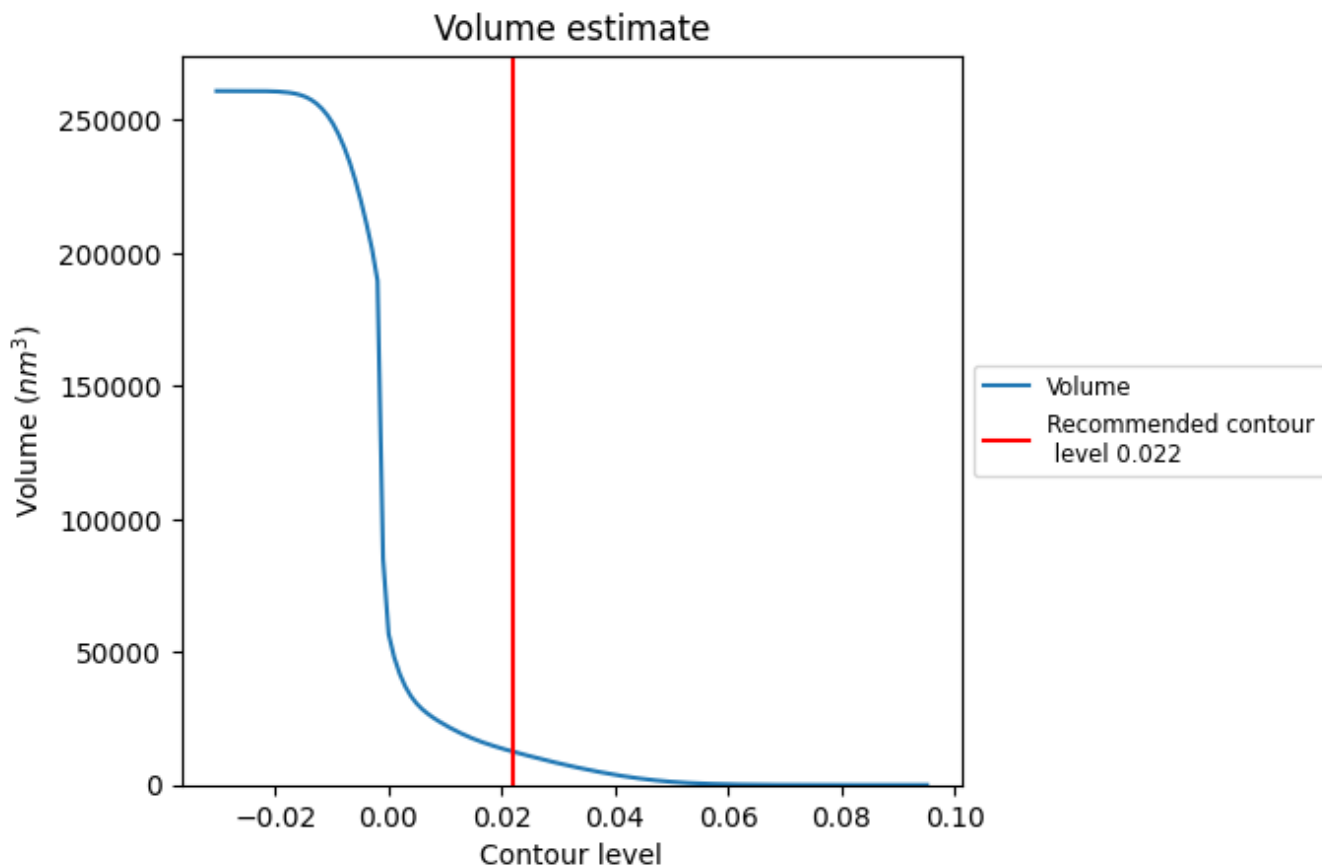
This section contains the results of statistical analysis of the map.

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.

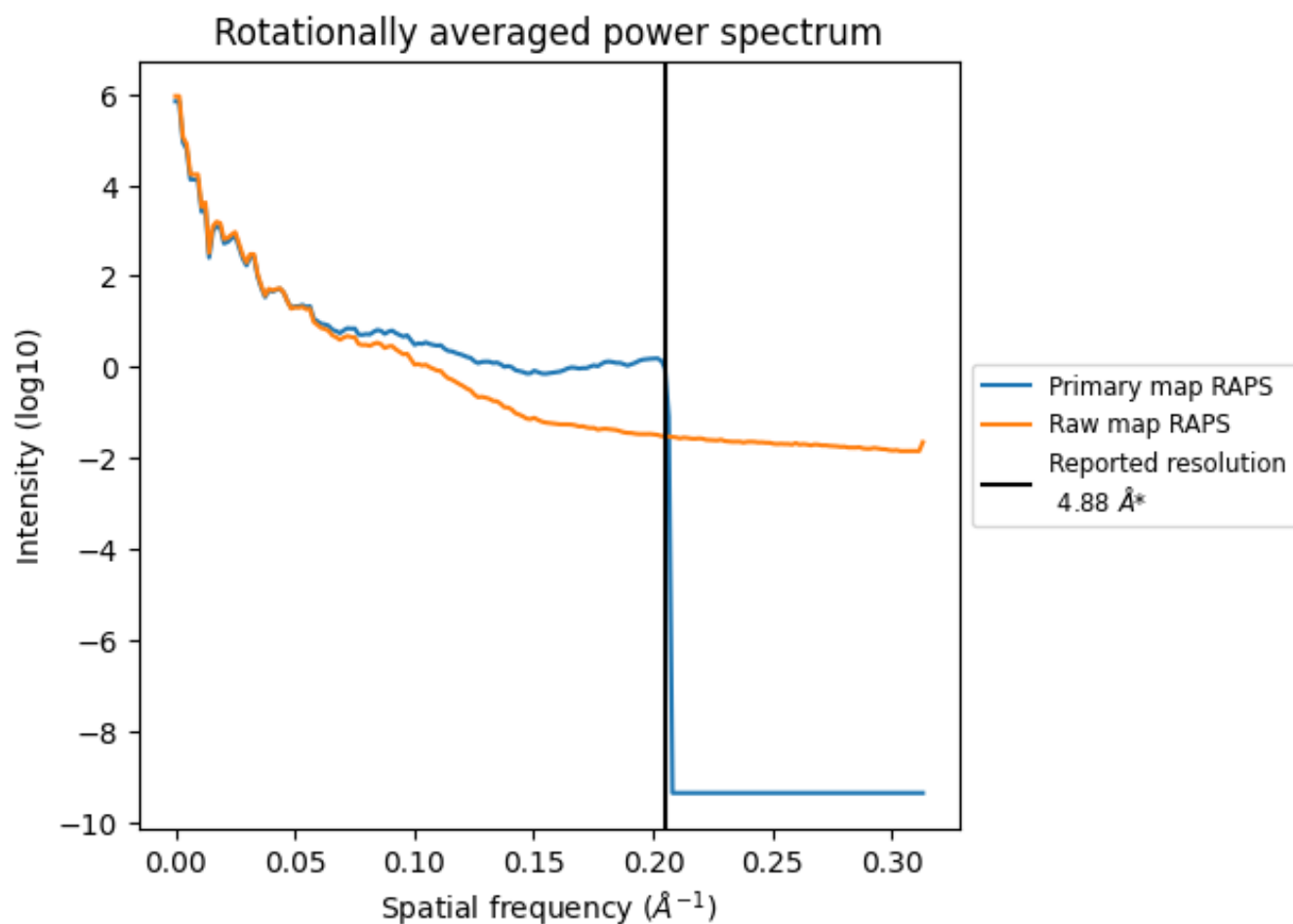
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 12534 nm^3 ; this corresponds to an approximate mass of 11322 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 [i](#)

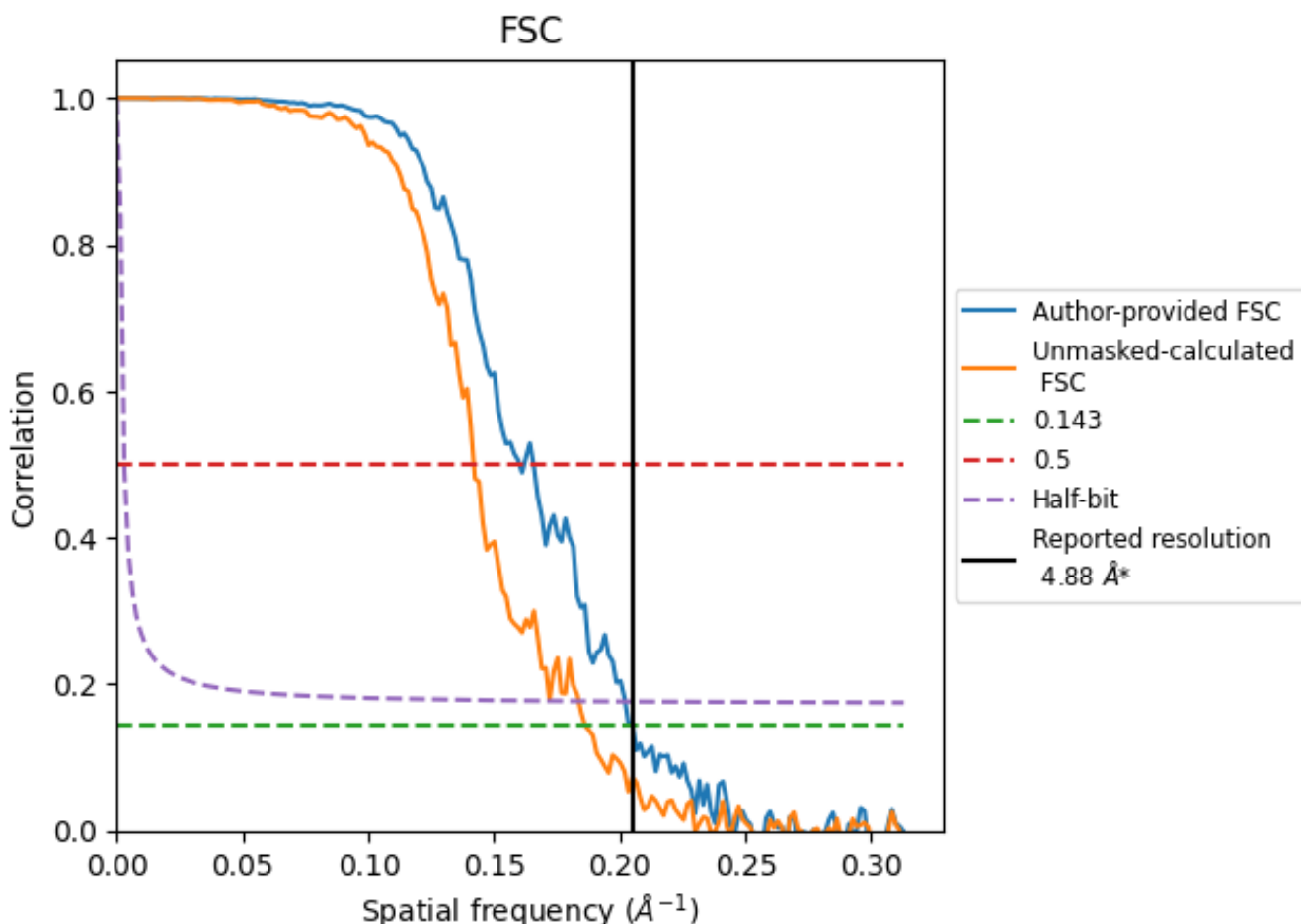


*Reported resolution corresponds to spatial frequency of 0.205 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.205 \AA^{-1}

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.88	-	-
Author-provided FSC curve	4.88	6.25	4.95
Unmasked-calculated*	5.37	7.04	5.44

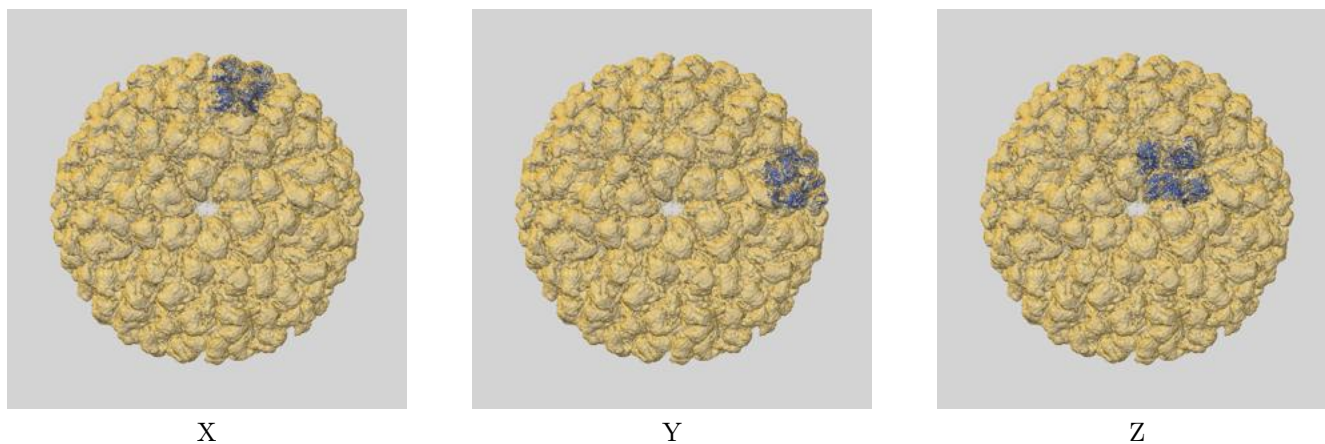
*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 5.37 differs from the reported value 4.88 by more than 10 %

9 Map-model fit [i](#)

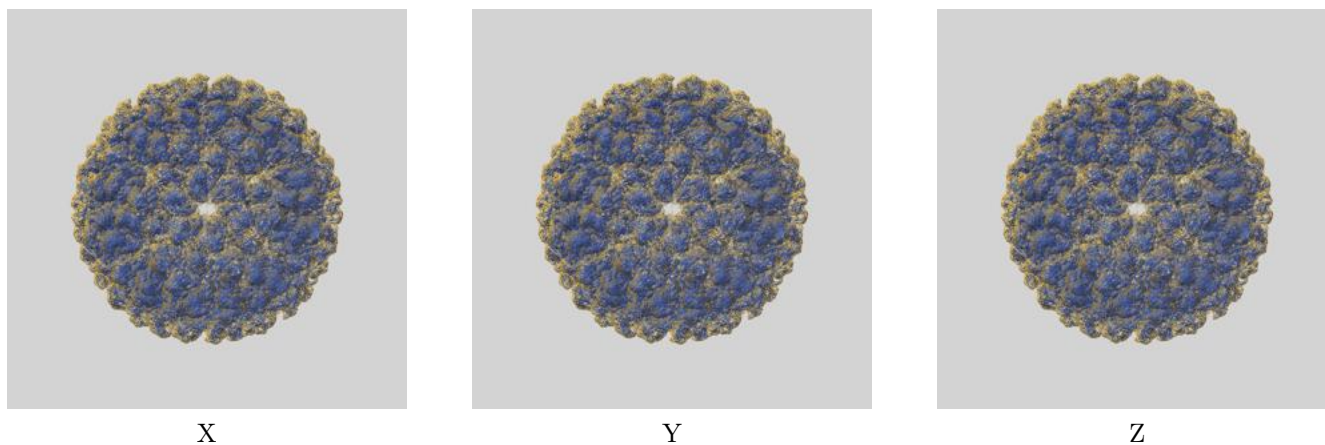
This section contains information regarding the fit between EMDB map EMD-15134 and PDB model 8A41. Per-residue inclusion information can be found in section 3 on page 4.

9.1 Map-model overlays

9.1.1 Map-model overlay [i](#)

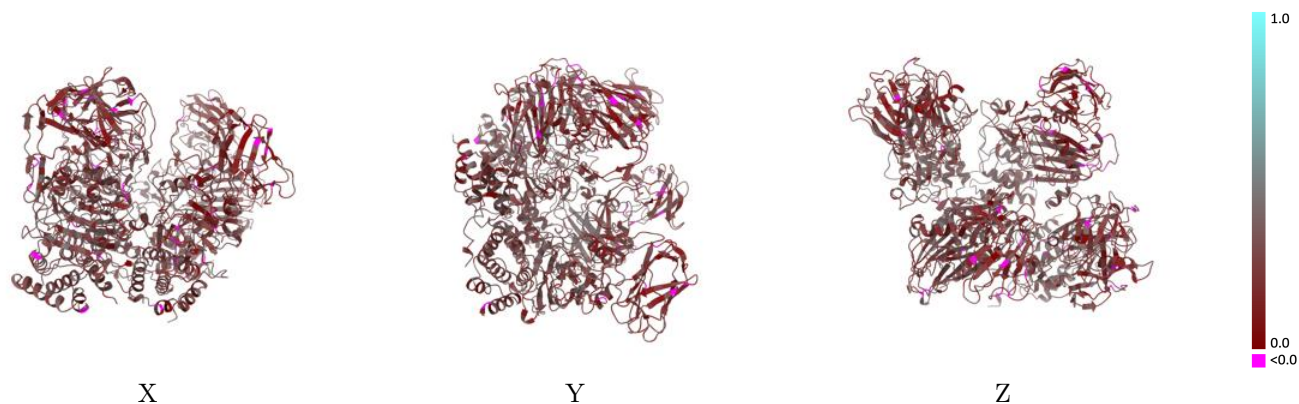


9.1.2 Map-model assembly overlay [i](#)



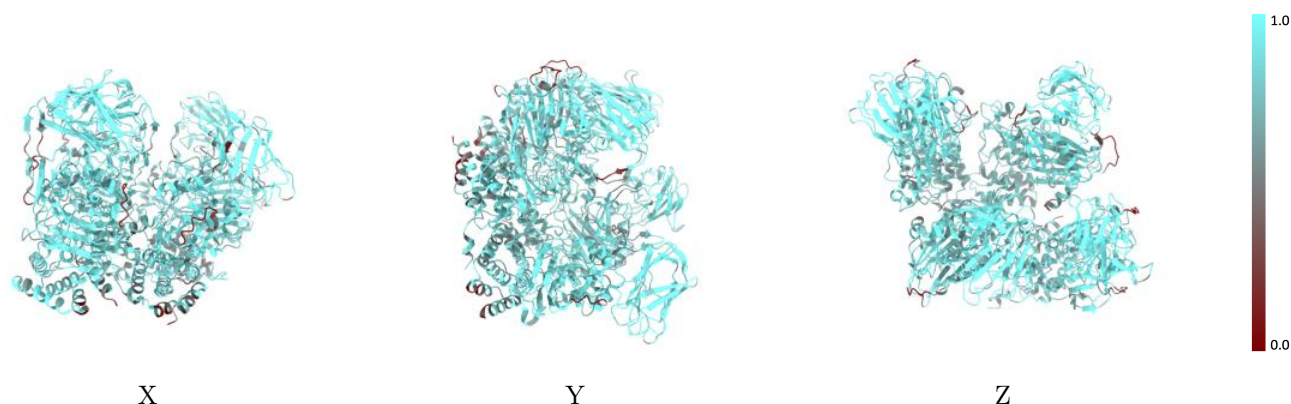
The images above show the 3D surface view of the map at the recommended contour level 0.022 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



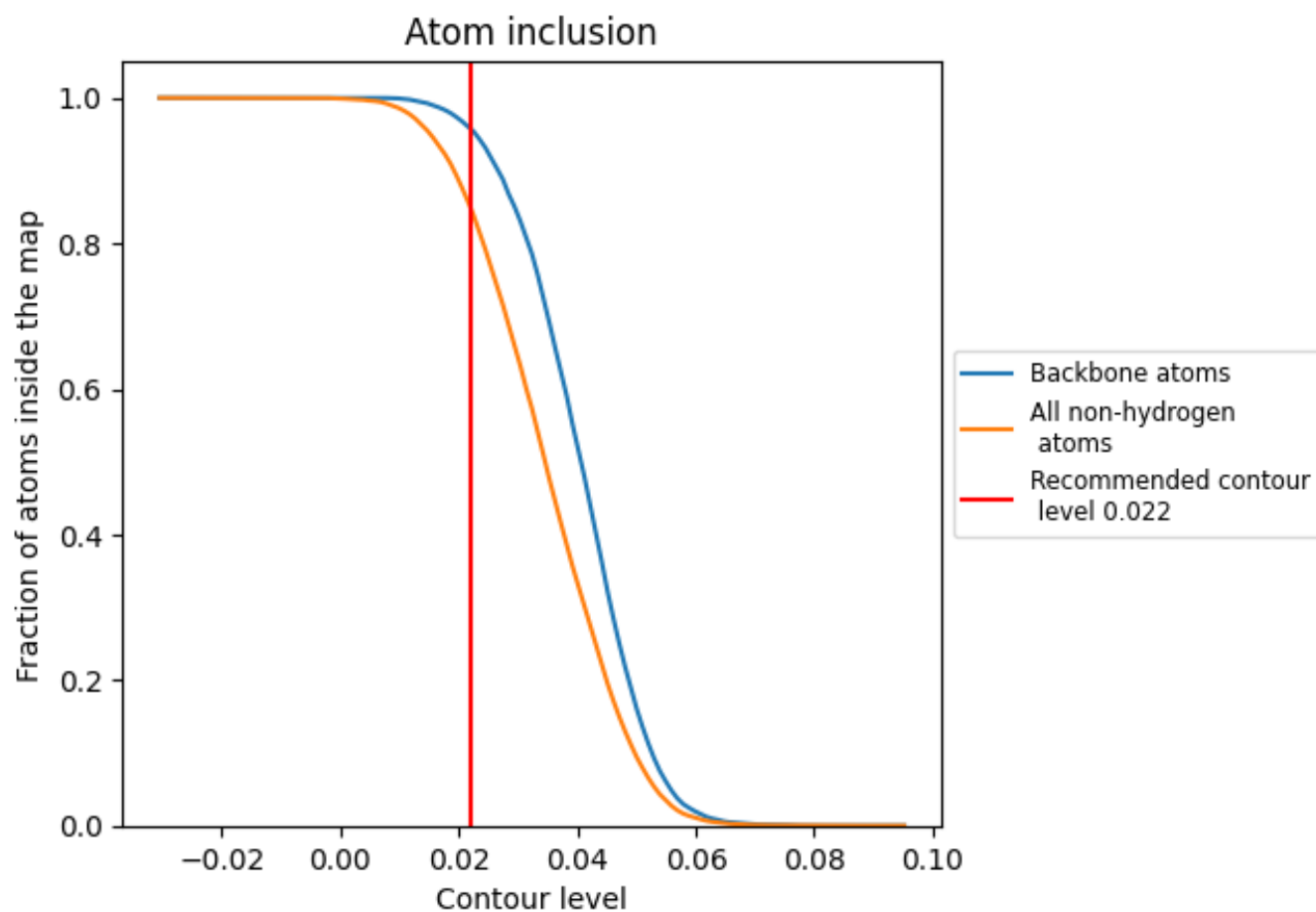
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.022).











9.4 Atom inclusion [i](#)



At the recommended contour level, 96% of all backbone atoms, 85% 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 (0.022) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8497	 0.2590
A	 0.8518	 0.2640
B	 0.8413	 0.2340
C	 0.8521	 0.2670
D	 0.8537	 0.2730

