



Full wwPDB EM Validation Report ⓘ

Mar 9, 2026 – 06:53 PM UTC

PDB ID : 6IIO / pdb_00006iio
EMDB ID : EMD-9675
Title : Cryo-EM structure of CV-A10 native empty particle
Authors : Chen, J.H.; Ye, X.H.; Cong, Y.; Huang, Z.
Deposited on : 2018-10-07
Resolution : 3.12 Å (reported)

This is a Full wwPDB EM Validation 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

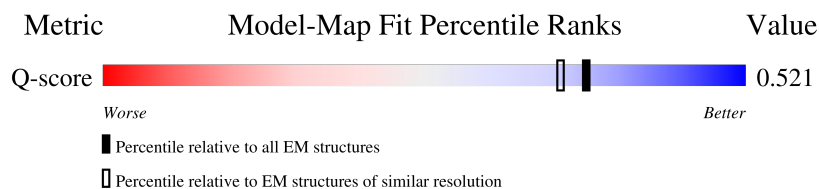
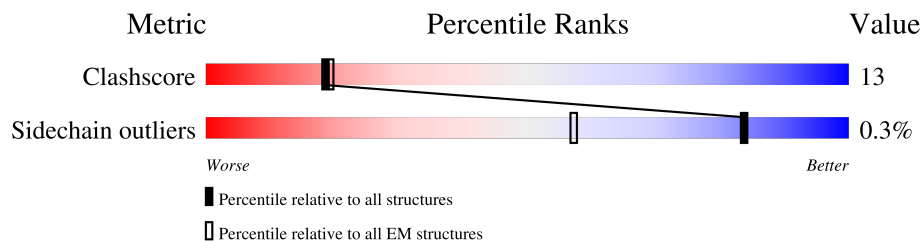
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.12 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	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	14478 (2.62 - 3.62)

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	297	
2	B	324	
3	C	240	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5247 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 VP1.

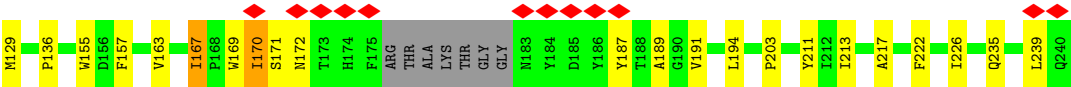
Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	221	Total	C	N	O	S	0	0
			1770	1133	305	321	11		

- Molecule 2 is a protein called VP0.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	216	Total	C	N	O	S	0	0
			1683	1090	282	306	5		

- Molecule 3 is a protein called VP3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	233	Total	C	N	O	S	0	0
			1794	1149	290	345	10		



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	23312	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 ($e^-/\text{\AA}^2$)	8	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	57.127	Depositor
Minimum map value	-38.589	Depositor
Average map value	0.056	Depositor
Map value standard deviation	3.377	Depositor
Recommended contour level	6.5	Depositor
Map size ($\text{\AA}$)	434.16, 434.16, 434.16	wwPDB
Map dimensions	432, 432, 432	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.005, 1.005, 1.005	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	0.44	1/1822 (0.1%)	0.50	0/2477
2	B	0.39	0/1740	0.50	0/2388
3	C	0.40	0/1841	0.51	0/2524
All	All	0.41	1/5403 (0.0%)	0.50	0/7389

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	145	ARG	C-N	-5.64	1.20	1.33

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	1770	0	1726	42	0
2	B	1683	0	1620	55	0
3	C	1794	0	1755	59	0
All	All	5247	0	5101	134	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 13.

All (134) 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:110:SER:CB	3:C:171:SER:HB2	1.77	1.13
3:C:110:SER:HB3	3:C:171:SER:HB2	1.41	0.99
2:B:173:SER:OG	2:B:313:SER:HA	1.67	0.93
3:C:110:SER:HB3	3:C:171:SER:CB	2.06	0.84
1:A:279:SER:HB2	2:B:204:ARG:HB2	1.61	0.81
3:C:167:ILE:HD11	3:C:170:ILE:CG2	2.12	0.80
3:C:167:ILE:CD1	3:C:170:ILE:HG21	2.17	0.75
3:C:167:ILE:HD11	3:C:170:ILE:HG21	1.70	0.74
1:A:125:THR:HB	1:A:260:VAL:HG13	1.72	0.72
1:A:264:ILE:HD11	3:C:101:GLN:HB3	1.73	0.69
2:B:179:VAL:HG22	2:B:306:ILE:HG22	1.75	0.69
3:C:110:SER:HB2	3:C:171:SER:HB2	1.68	0.69
3:C:107:THR:HB	3:C:226:ILE:HG23	1.75	0.69
1:A:87:SER:HB2	1:A:252:LYS:HB2	1.74	0.68
2:B:274:ASP:OD2	2:B:279:HIS:ND1	2.21	0.68
1:A:132:GLU:OE2	1:A:187:GLN:NE2	2.27	0.67
3:C:85:MET:HG2	3:C:191:VAL:HG12	1.77	0.66
2:B:139:MET:HG3	2:B:301:ALA:HB1	1.79	0.65
3:C:72:SER:OG	3:C:75:ASN:ND2	2.30	0.65
2:B:191:LEU:HB2	2:B:253:VAL:HG13	1.81	0.63
2:B:254:ASN:HB3	2:B:257:THR:HG22	1.81	0.63
3:C:54:GLU:HG2	3:C:67:LEU:HD23	1.83	0.61
2:B:156:ASN:HD21	2:B:277:ILE:HG22	1.66	0.61
2:B:197:PRO:HB3	2:B:268:ILE:HD11	1.83	0.61
3:C:24:ILE:HG23	3:C:25:LEU:HD13	1.83	0.61
3:C:169:TRP:O	3:C:170:ILE:HG22	2.01	0.61
2:B:269:ASN:OD1	2:B:270:ALA:N	2.33	0.60
1:A:271:LEU:HD23	1:A:273:ASN:H	1.66	0.60
3:C:95:GLN:O	3:C:101:GLN:NE2	2.27	0.59
3:C:110:SER:CB	3:C:171:SER:CB	2.66	0.59
2:B:247:ILE:HD11	3:C:98:LEU:HD11	1.83	0.59
3:C:169:TRP:O	3:C:170:ILE:CG2	2.51	0.59
1:A:159:PRO:HB2	1:A:168:GLN:HE22	1.67	0.59
1:A:209:PHE:HA	2:B:278:ASN:HD21	1.66	0.58
2:B:150:LYS:NZ	2:B:199:PHE:O	2.37	0.58
2:B:173:SER:HG	2:B:313:SER:HA	1.69	0.58
3:C:167:ILE:CD1	3:C:170:ILE:CG2	2.77	0.57
2:B:172:ARG:O	2:B:173:SER:OG	2.17	0.57
3:C:169:TRP:C	3:C:170:ILE:HG23	2.30	0.56
2:B:246:LEU:HD12	3:C:51:THR:HA	1.87	0.56
3:C:47:CYS:SG	3:C:102:ILE:HG21	2.45	0.56
2:B:256:ARG:NH1	3:C:122:SER:O	2.39	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:110:SER:CA	3:C:171:SER:HB2	2.34	0.56
3:C:50:GLU:HA	3:C:217:ALA:HB2	1.88	0.55
3:C:170:ILE:O	3:C:170:ILE:HG13	2.07	0.55
3:C:124:MET:HB3	3:C:203:PRO:HG3	1.87	0.55
2:B:177:LEU:HG	2:B:308:ILE:HG22	1.89	0.55
2:B:196:ILE:HG13	2:B:199:PHE:HB2	1.87	0.55
3:C:169:TRP:C	3:C:170:ILE:CG2	2.79	0.55
1:A:164:ARG:HH12	1:A:240:ALA:HA	1.72	0.54
1:A:90:VAL:HG11	1:A:251:MET:HE2	1.88	0.54
3:C:58:THR:O	3:C:60:GLU:N	2.40	0.53
1:A:263:PRO:HG2	2:B:240:VAL:HG21	1.89	0.53
1:A:120:LYS:O	1:A:123:MET:HG2	2.09	0.53
2:B:192:LEU:HB3	2:B:287:VAL:HG12	1.91	0.52
2:B:290:SER:HA	3:C:68:LEU:HD21	1.91	0.52
1:A:115:VAL:HG11	3:C:235:GLN:HB3	1.91	0.52
1:A:161:PRO:HA	1:A:168:GLN:HG3	1.92	0.52
1:A:123:MET:HB3	1:A:264:ILE:HG22	1.92	0.52
2:B:140:TRP:HD1	2:B:144:SER:HB2	1.75	0.52
3:C:129:MET:HG2	3:C:157:PHE:CZ	2.45	0.52
2:B:151:PHE:C	2:B:153:ASP:H	2.17	0.52
2:B:151:PHE:HB3	2:B:152:PRO:HD3	1.92	0.52
2:B:108:PRO:HG2	2:B:311:LEU:HD11	1.91	0.51
3:C:118:MET:HB3	3:C:213:ILE:HG23	1.92	0.51
1:A:151:TYR:HD1	1:A:233:VAL:HG22	1.74	0.51
3:C:110:SER:HA	3:C:170:ILE:O	2.10	0.51
1:A:290:SER:O	3:C:58:THR:HG21	2.10	0.51
1:A:208:THR:O	2:B:278:ASN:ND2	2.44	0.50
2:B:223:PRO:HB3	2:B:228:ALA:HB2	1.93	0.50
3:C:167:ILE:HD13	3:C:170:ILE:HG21	1.90	0.50
3:C:89:GLY:HA3	3:C:109:TRP:CH2	2.46	0.50
1:A:263:PRO:HD2	2:B:248:TYR:OH	2.11	0.50
2:B:274:ASP:OD1	2:B:275:SER:N	2.42	0.50
3:C:51:THR:HG21	3:C:98:LEU:HD13	1.94	0.50
2:B:191:LEU:HB2	2:B:253:VAL:CG1	2.42	0.50
1:A:144:ALA:O	1:A:145:ARG:HG3	2.13	0.48
3:C:110:SER:HB3	3:C:171:SER:OG	2.13	0.48
2:B:240:VAL:HG22	2:B:241:PRO:HD2	1.95	0.48
2:B:102:LEU:HD11	2:B:107:TRP:CE2	2.49	0.48
3:C:10:THR:HG22	3:C:11:ASN:ND2	2.29	0.48
1:A:278:ASP:HA	2:B:206:SER:HB3	1.96	0.48
1:A:212:HIS:CD2	1:A:214:GLU:HB3	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:206:TYR:HE1	1:A:220:TYR:HB2	1.78	0.47
2:B:103:ALA:HB3	2:B:265:VAL:HA	1.96	0.47
2:B:234:TYR:OH	3:C:54:GLU:OE2	2.31	0.47
3:C:68:LEU:HD23	3:C:211:TYR:CD2	2.50	0.47
1:A:154:VAL:HG23	1:A:230:THR:HB	1.96	0.47
2:B:191:LEU:HD23	2:B:288:PRO:HA	1.98	0.46
3:C:107:THR:HB	3:C:226:ILE:CG2	2.43	0.46
1:A:204:ASP:O	2:B:279:HIS:HD2	1.99	0.46
1:A:152:MET:HE1	1:A:169:TRP:HA	1.97	0.46
2:B:196:ILE:HG22	2:B:248:TYR:CG	2.52	0.45
3:C:119:PHE:CZ	3:C:121:GLY:HA3	2.52	0.45
2:B:149:TRP:HB3	2:B:154:VAL:HG21	1.98	0.45
1:A:159:PRO:HB2	1:A:168:GLN:NE2	2.31	0.44
1:A:288:ASP:N	1:A:288:ASP:OD1	2.51	0.44
2:B:173:SER:OG	2:B:313:SER:CA	2.53	0.44
2:B:198:GLU:OE2	2:B:279:HIS:NE2	2.51	0.44
1:A:96:THR:HG23	1:A:244:LYS:HG2	1.98	0.44
1:A:260:VAL:HG23	2:B:104:TYR:OH	2.19	0.43
2:B:294:TYR:OH	2:B:300:THR:HG23	2.18	0.43
2:B:238:SER:HB2	2:B:240:VAL:HG12	1.99	0.43
3:C:81:CYS:HB3	3:C:194:LEU:HD23	2.01	0.43
1:A:113:GLY:HA2	3:C:239:LEU:HD23	2.00	0.43
1:A:262:ARG:HH21	2:B:198:GLU:HB2	1.84	0.43
1:A:272:LYS:HB2	3:C:239:LEU:O	2.19	0.43
2:B:153:ASP:OD2	2:B:222:PHE:HB3	2.18	0.43
3:C:24:ILE:HG23	3:C:25:LEU:CD1	2.49	0.43
1:A:151:TYR:CD1	1:A:233:VAL:HG22	2.54	0.43
3:C:61:ALA:HB1	3:C:65:THR:OG1	2.19	0.42
2:B:138:LYS:HA	2:B:138:LYS:HD3	1.84	0.42
2:B:204:ARG:HE	2:B:231:HIS:CD2	2.37	0.42
2:B:150:LYS:O	2:B:153:ASP:HB3	2.20	0.42
3:C:167:ILE:HD11	3:C:170:ILE:HG22	1.97	0.42
2:B:277:ILE:HG13	2:B:278:ASN:N	2.34	0.42
3:C:111:GLY:HA3	3:C:222:PHE:HA	2.02	0.42
3:C:110:SER:HA	3:C:171:SER:HB2	2.02	0.42
2:B:151:PHE:HE2	2:B:175:PHE:CD1	2.37	0.41
2:B:196:ILE:HD11	2:B:199:PHE:CD1	2.54	0.41
3:C:172:ASN:HA	3:C:187:TYR:HE1	1.85	0.41
1:A:112:MET:HE1	1:A:121:CYS:SG	2.61	0.41
1:A:239:GLU:HG3	1:A:240:ALA:N	2.35	0.41
1:A:293:LYS:HB2	3:C:80:LEU:HD23	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:169:TRP:CE3	1:A:234:ARG:HD2	2.55	0.41
3:C:155:TRP:CD1	3:C:163:VAL:HB	2.56	0.41
1:A:286:ALA:HA	3:C:95:GLN:OE1	2.21	0.41
3:C:136:PRO:HB3	3:C:189:ALA:HA	2.02	0.41
1:A:120:LYS:HA	1:A:123:MET:HE3	2.03	0.41
2:B:196:ILE:HG21	2:B:196:ILE:HD13	1.69	0.41
3:C:87:ASP:OD2	3:C:90:ARG:HD3	2.21	0.40
1:A:239:GLU:HG3	1:A:240:ALA:H	1.87	0.40
2:B:182:ASN:O	2:B:302:ILE:HG23	2.21	0.40
1:A:264:ILE:HD11	3:C:101:GLN:CB	2.49	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

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	193/253 (76%)	193 (100%)	0	100	100
2	B	183/273 (67%)	183 (100%)	0	100	100
3	C	198/202 (98%)	196 (99%)	2 (1%)	68	77
All	All	574/728 (79%)	572 (100%)	2 (0%)	84	86

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	167	ILE
3	C	170	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	82	HIS
1	A	168	GLN
1	A	212	HIS
1	A	226	ASN
1	A	284	ASN
1	A	296	ASN
2	B	156	ASN
2	B	182	ASN
2	B	278	ASN
3	C	11	ASN
3	C	75	ASN
3	C	140	GLN
3	C	197	GLN
3	C	235	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 ⓘ

There are no chain breaks in this entry.

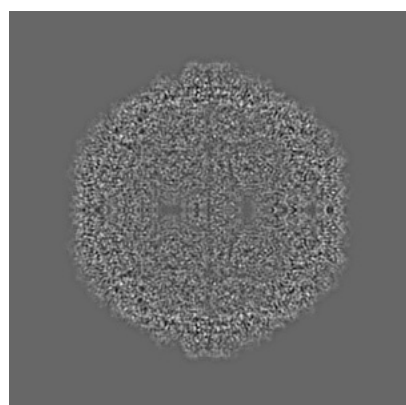
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-9675. These allow visual inspection of the internal detail of the map and identification of artifacts.

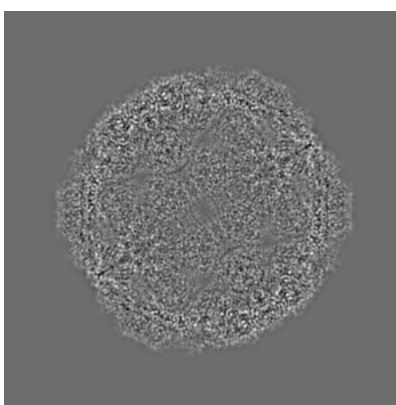
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

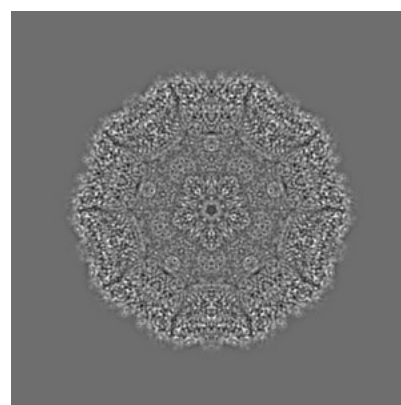
6.1.1 Primary map



X



Y

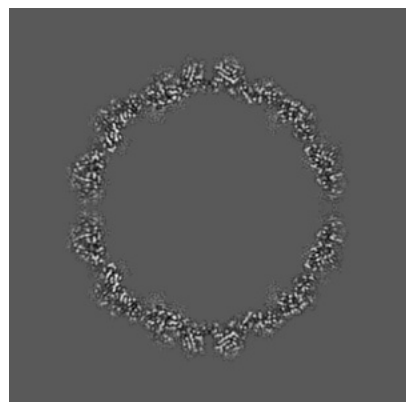


Z

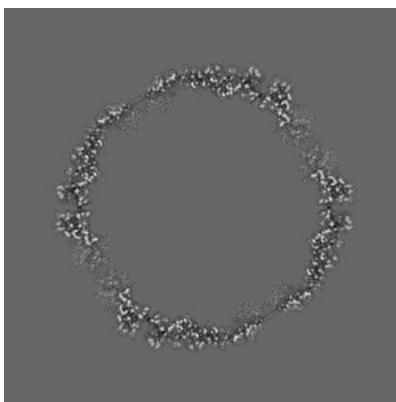
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

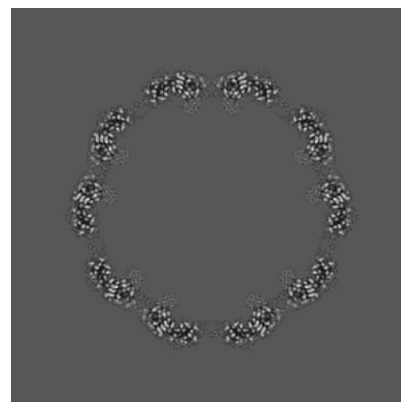
6.2.1 Primary map



X Index: 216



Y Index: 216

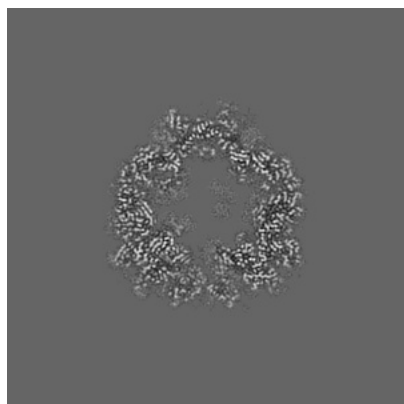


Z Index: 216

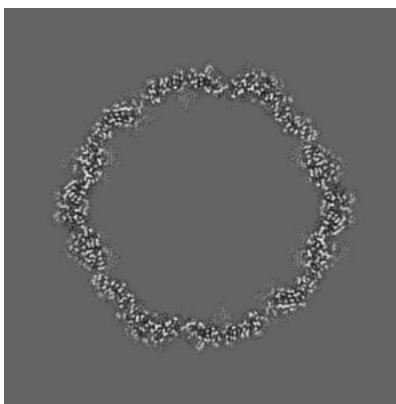
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

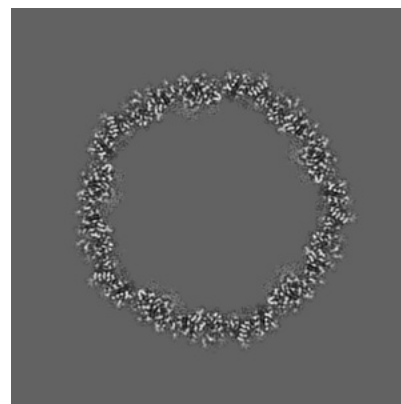
6.3.1 Primary map



X Index: 327



Y Index: 200

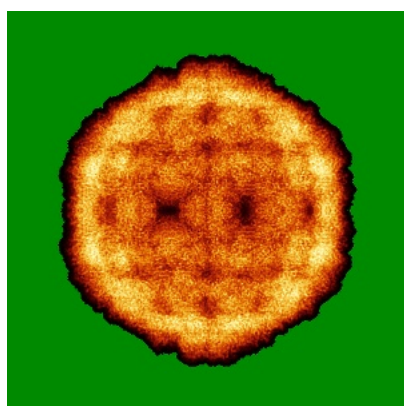


Z Index: 263

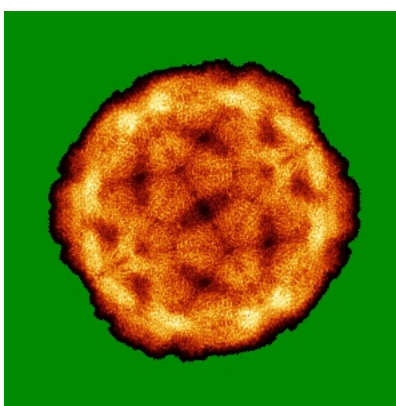
The images above show the largest variance slices of the map in three orthogonal directions.

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

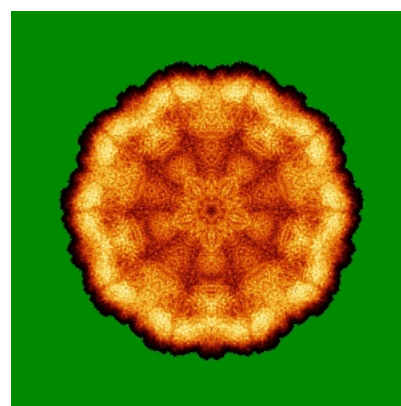
6.4.1 Primary map



X



Y

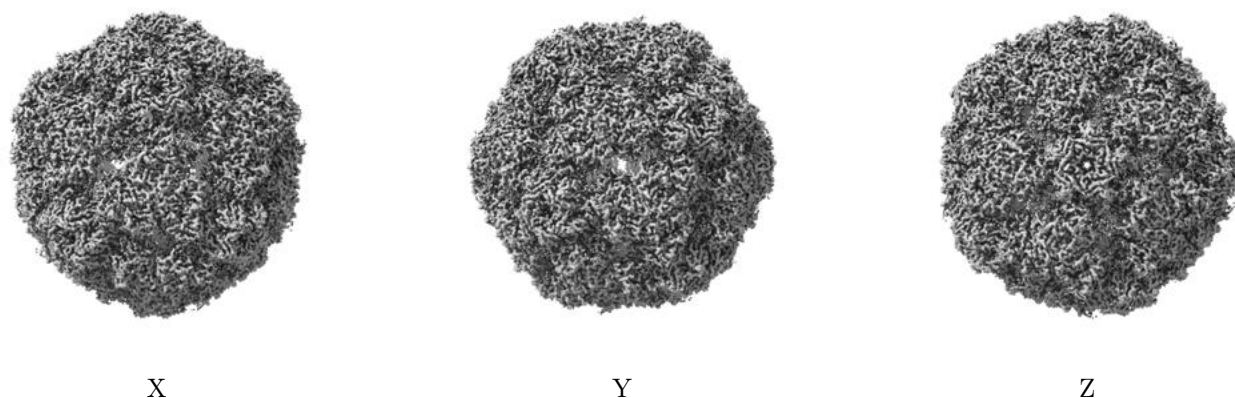


Z

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

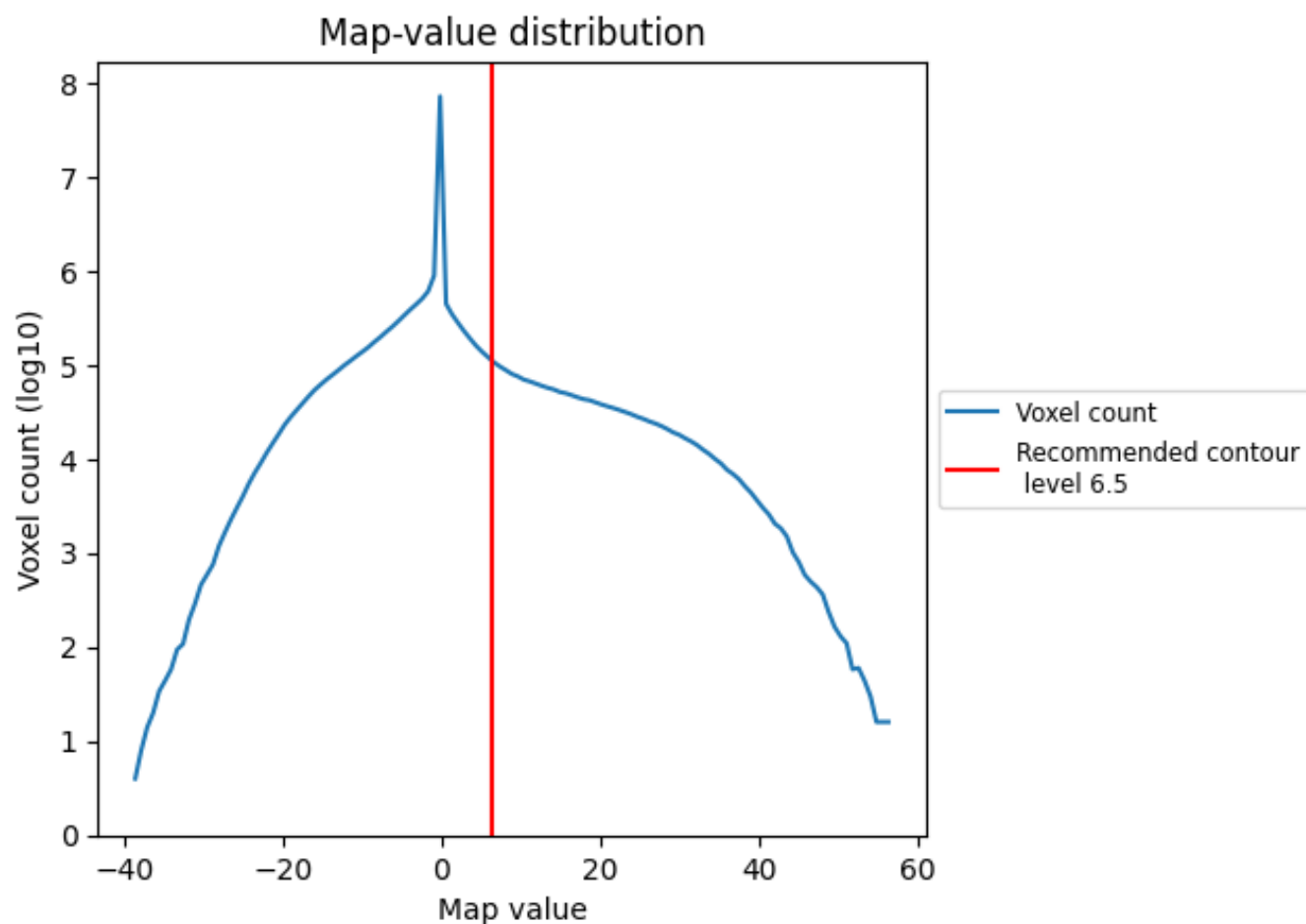
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

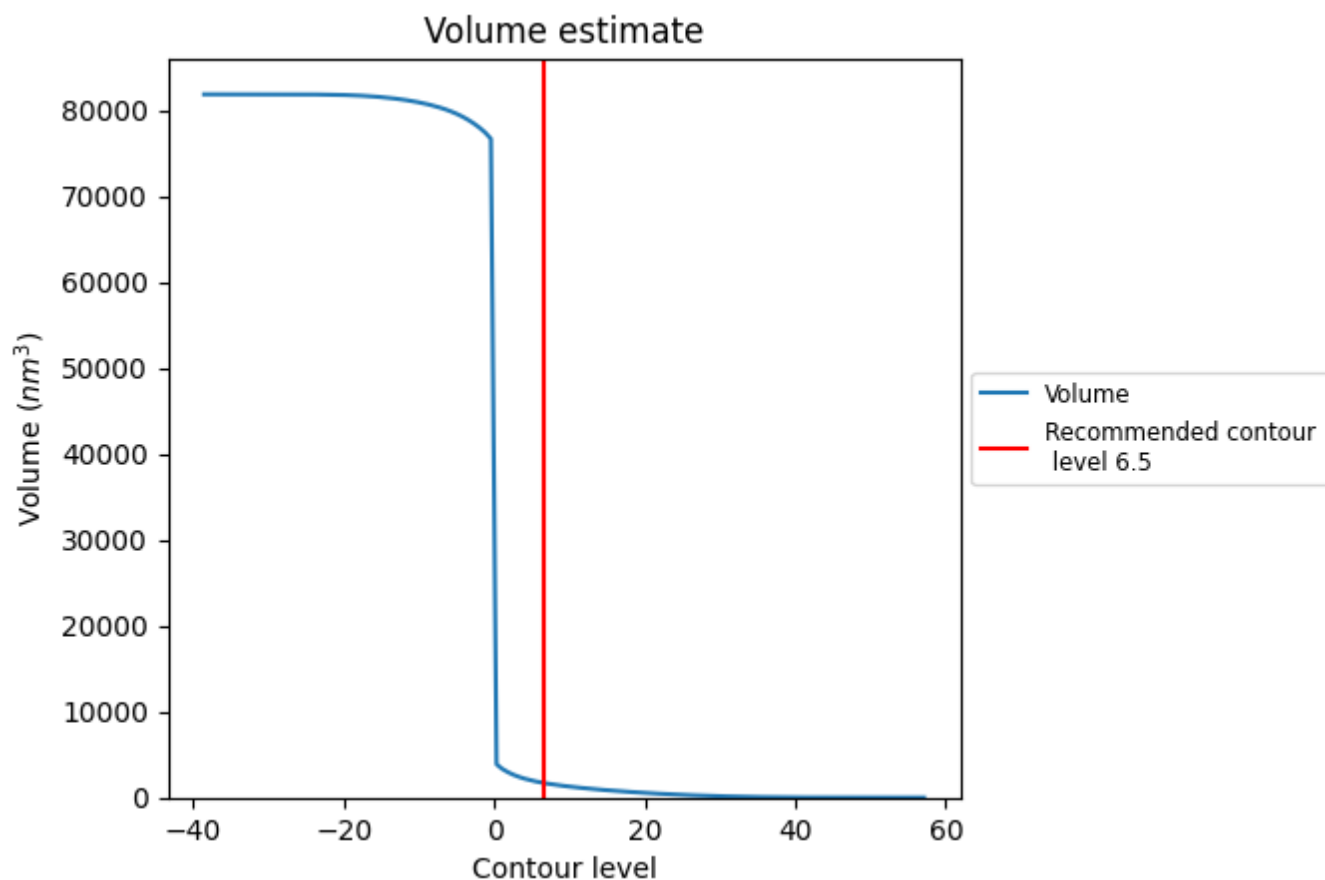
This section contains the results of statistical analysis of the map.

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.

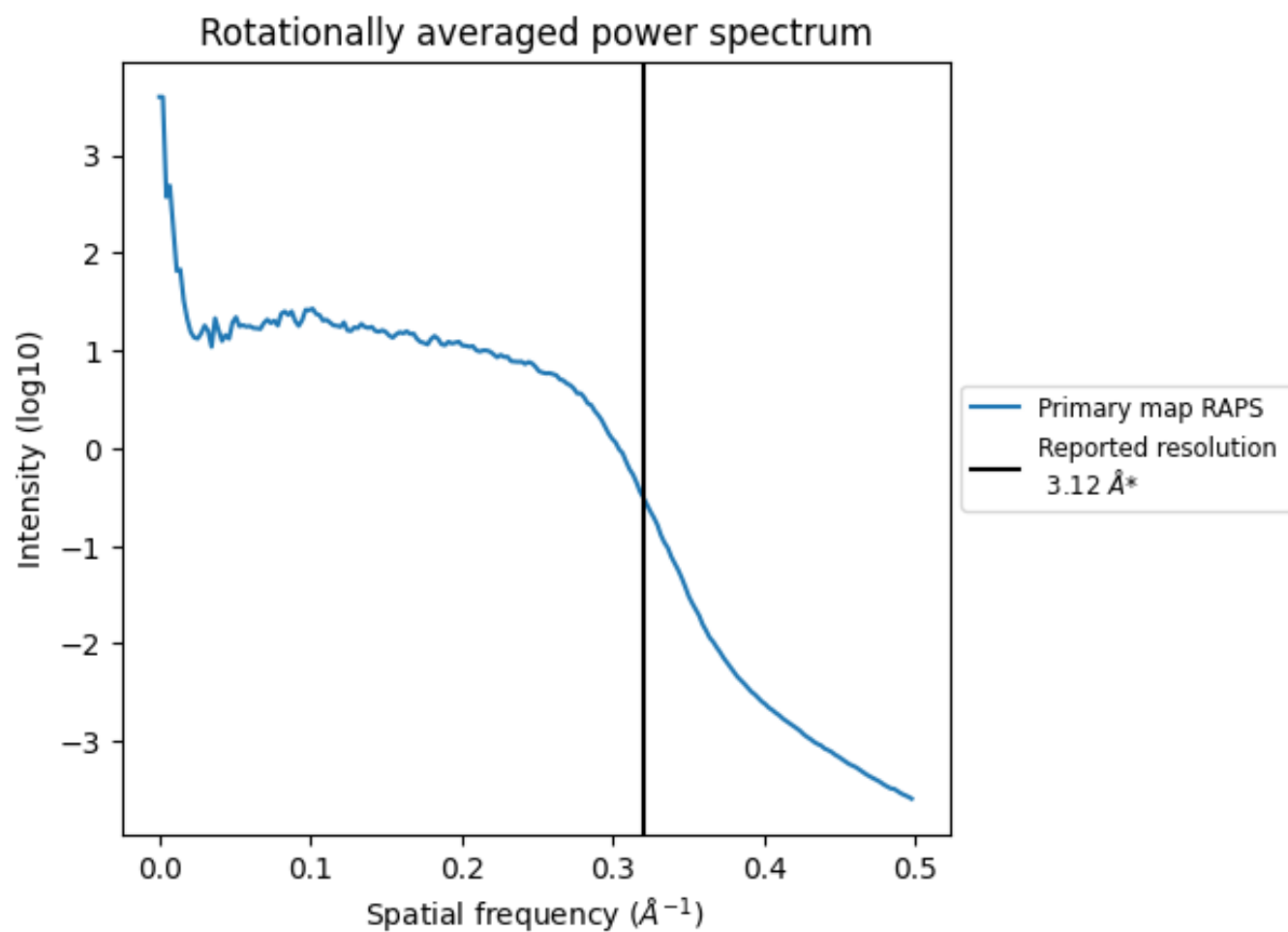
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1709 nm³; this corresponds to an approximate mass of 1544 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 0.321 Å⁻¹

8 Fourier-Shell correlation ⓘ

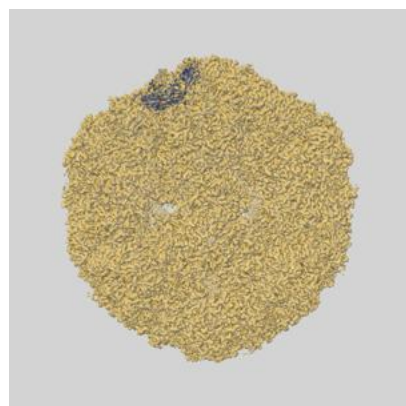
This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-9675 and PDB model 6HIO. Per-residue inclusion information can be found in section 3 on page 4.

9.1 Map-model overlays

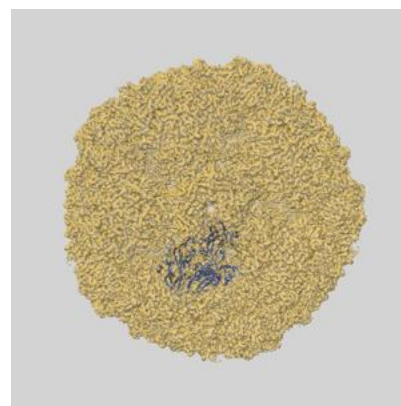
9.1.1 Map-model overlay [i](#)



X

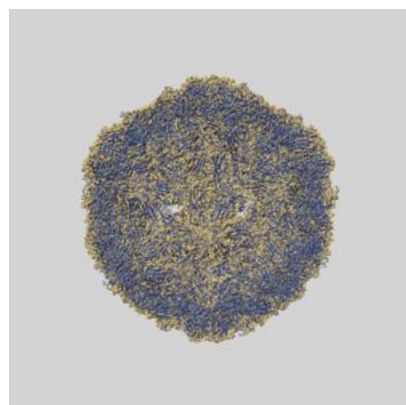


Y

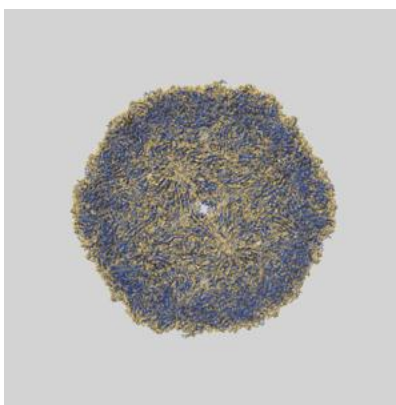


Z

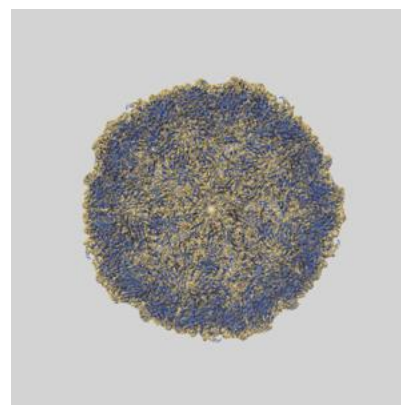
9.1.2 Map-model assembly overlay [i](#)



X



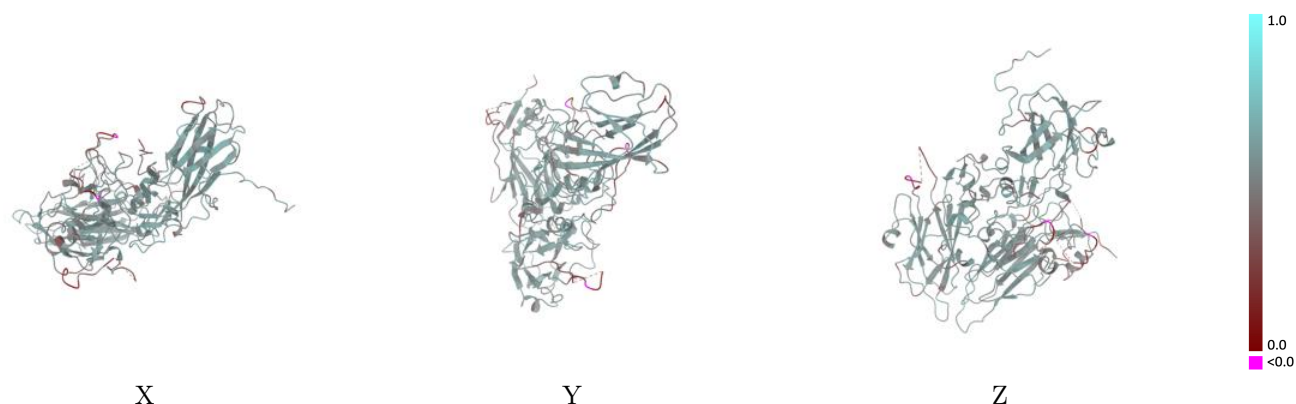
Y



Z

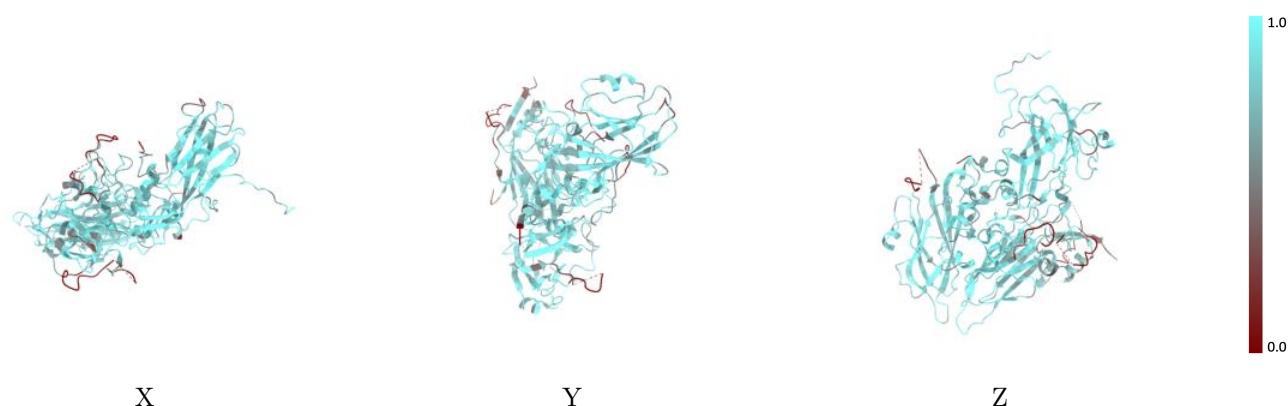
The images above show the 3D surface view of the map at the recommended contour level 6.5 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



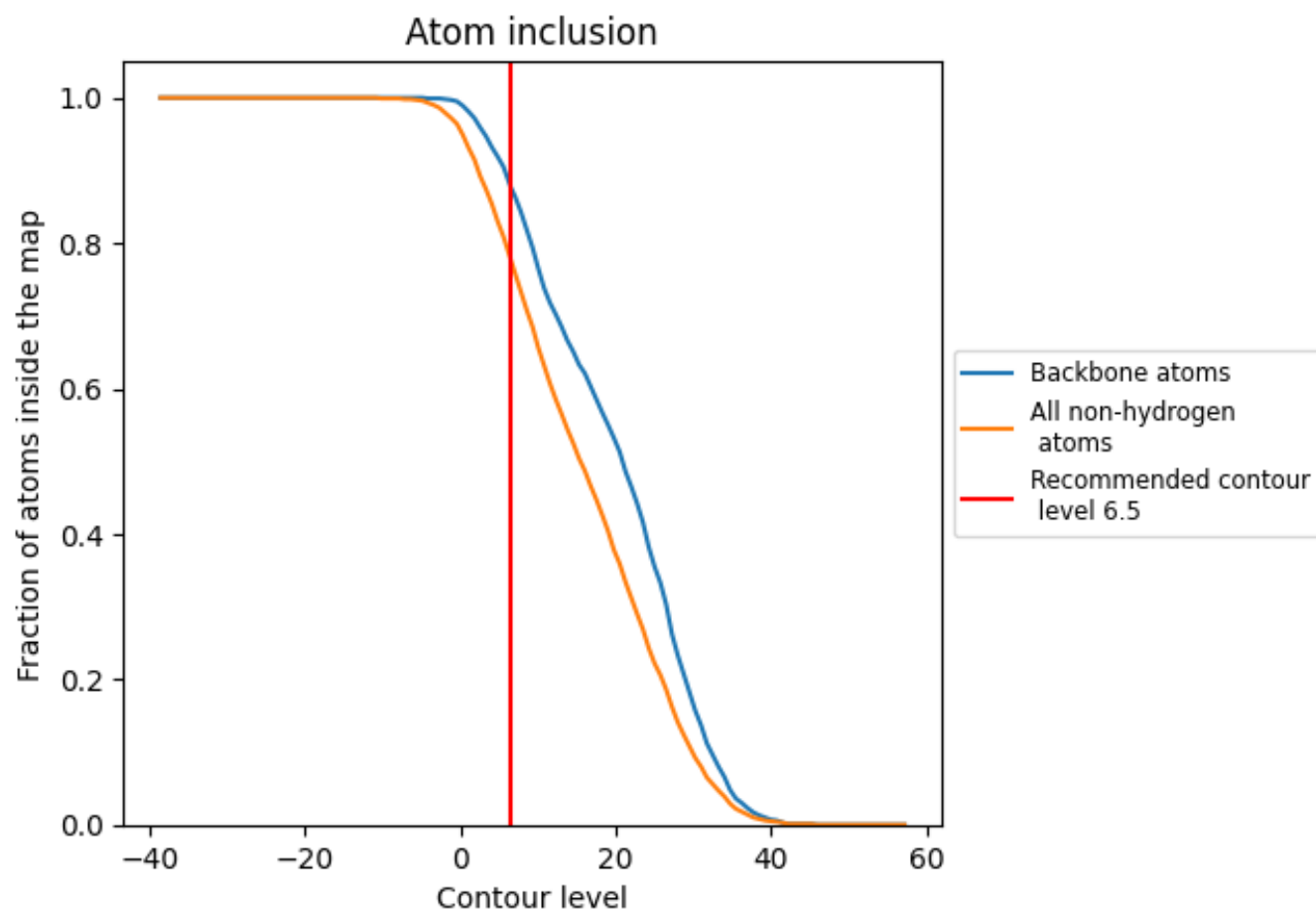
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (6.5).

9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 78% 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 (6.5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7760	0.5210
A	0.8030	0.5330
B	0.7300	0.5090
C	0.7910	0.5190

