



## wwPDB EM Validation Summary Report ⓘ

Mar 25, 2024 – 04:47 PM JST

PDB ID : 7YUU  
EMDB ID : EMD-34111  
Title : MtaLon-ADP for the spiral oligomers of trimer  
Authors : Li, S.; Hsieh, K.; Kuo, C.; Lee, S.; Ho, M.; Wang, C.; Zhang, K.; Chang, C.I.  
Deposited on : 2022-08-17  
Resolution : 5.80 Å (reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

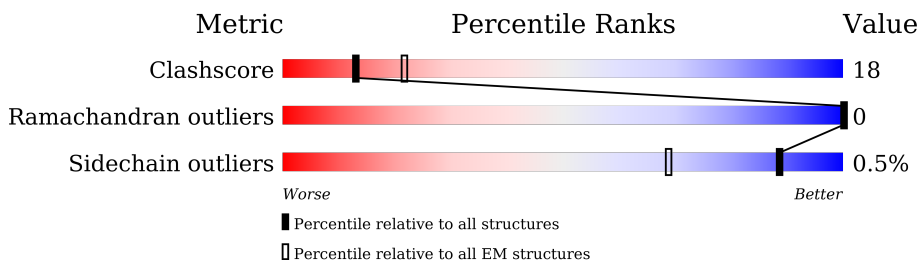
EMDB validation analysis : 0.0.1.dev70  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 5.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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

Mol	Chain	Length	Quality of chain
1	A	793	<div style="display: flex; align-items: center;"> <div style="width: 10%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 38%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 28%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 33%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="font-size: small; margin-top: 5px;">10% 38% 28% 33%</p>
1	B	793	<div style="display: flex; align-items: center;"> <div style="width: 5%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 38%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 28%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 33%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="font-size: small; margin-top: 5px;">5% 38% 28% 33%</p>
1	C	793	<div style="display: flex; align-items: center;"> <div style="width: 8%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 38%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 28%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 33%; height: 10px; background-color: grey; margin-right: 5px;"></div> </div> <p style="font-size: small; margin-top: 5px;">8% 38% 28% 33%</p>

## 2 Entry composition

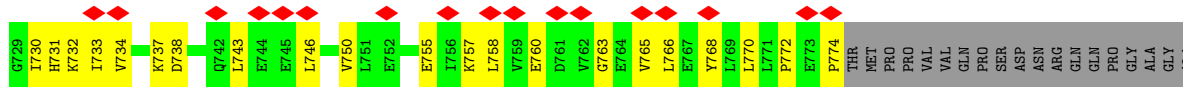
There is only 1 type of molecule in this entry. The entry contains 12432 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Lon protease.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	532	Total 4144	C 2620	N 726	O 783	S 15	0	0
1	B	532	Total 4144	C 2620	N 726	O 783	S 15	0	0
1	C	532	Total 4144	C 2620	N 726	O 783	S 15	0	0





• Molecule 1: Lon protease



MET ARG LEU THR TRP PRO VAL ILE PRO LEU ASN THR VAL ILE LEU PRO HIS THR V750 I751 E752 E755 I756 K757 L758 V759 E760 D761 V762 E764 V765 L766 E767 Y768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA

ASP LEU THR TRP PRO VAL ILE PRO LEU ASN THR VAL ILE LEU PRO HIS THR V750 I751 E752 E755 I756 K757 L758 V759 E760 D761 V762 E764 V765 L766 E767 Y768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA

VAL ARG VAL LEU TRP PRO VAL ILE PRO LEU ASN THR VAL ILE LEU PRO HIS THR V750 I751 E752 E755 I756 K757 L758 V759 E760 D761 V762 E764 V765 L766 E767 Y768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA

GLU LEU THR ASP LEU ALA ARG LEU LYS VAL PHE LEU TYR VAL LEU SER ALA ASN HIS THR V750 I751 E752 E755 I756 K757 L758 V759 E760 D761 V762 E764 V765 L766 E767 Y768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA

ASP GLY L243 R250 E285 R258 V262 K265 A266 L267 K268 E269 L270 L271 D272 R272 L273 E274 R275 Q278 Q279 S280 A283 T284 V285 K286 R287 T288 Y289 L290 D291 V292 L293 T294 P297 W298 S299 K300 A301 D302 Y305 I308 R312 L315 D318 H319 L322

K326 L330 L333 R336 Q337 L338 L339 Q340 L342 L343 V344 R345 P349 I350 L351 V352 L353 V354 G355 P356 P357 G358 K361 T362 S363 R364 G365 R366 S367 L368 A369 R370 S371 R372 K375 L381 G382 G383 V384 R385 D386 E387 A388 E389 I390 R391 R392 R393 R394 I398

G399 A400 L405 I406 H407 P417 V418 L421 D422 E423 I424 A425 K426 M427 D430 H431 R432 L440 S441 V442 L443 D444 N448 M449 T450 F451 T452 D453 L456 P459 Y460 D461 L462 S463 R464 F466 F467 L468 T469 T470 A471 N472 T473 L474 R479 R484 M485

E486 V487 I488 E489 I490 P491 G492 M496 F497 K498 T501 A502 R503 P505 L506 K509 O510 V511 R512 E513 G518 R519 S521 V522 I531 S532 E533 Y534 T535 R536 G539 V540 R541 G542 L543 E544 R545 E546 L547 G548 K549 T550 M550 K553 F557 W558 G561 A562 L564 G565

L566 R567 T568 I569 D573 I574 P575 T576 Y577 L578 R582 Y583 R584 P585 D586 K587 T590 P591 P592 Q593 Q598 G599 L600 P604 G607 T608 L609 L610 T611 V614 A615 V617 G621 K622 L623 S624 L625 T626 L629 M633 K634 A637 A640 T641 T642 L644

R645 A646 H647 D650 V651 G652 D656 N659 D662 L663 H664 V665 H666 P667 P668 D669 G670 A671 T672 P673 K674 P677 S678 A679 A684 I687 S692 R693 R694 P695 A696 R697 M698 I700 T703 G704 S707 L708 R709 G710 K711 I715 V718 K719 E720 Y643 K721 L722

L723 A724 A725 I730 H731 K732 I733 V734 L735 K737 M739 Q742 E755 I756 K757 E760 V765 V768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA

• Molecule 1: Lon protease



MET ARG LEU THR TRP PRO VAL ILE PRO LEU ASN THR VAL ILE LEU PRO HIS THR V750 I751 E752 E755 I756 K757 L758 V759 E760 D761 V762 E764 V765 L766 E767 Y768 L769 L770 L771 P772 E773 P774 THR MET PRO PRO VAL VAL VAL PRO PRO SER ASP ASN ARG GLN PRO PRO GLY ALA



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	17690	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 ( $e^-/\text{\AA}^2$ )	48	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.826	Depositor
Minimum map value	-0.405	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.031	Depositor
Recommended contour level	0.203	Depositor
Map size ( $\text{\AA}$ )	275.52, 275.52, 275.52	wwPDB
Map dimensions	336, 336, 336	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	0.82, 0.82, 0.82	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	0.41	0/4221	0.65	1/5721 (0.0%)
1	B	0.45	0/4221	0.66	0/5721
1	C	0.44	0/4221	0.66	1/5721 (0.0%)
All	All	0.44	0/12663	0.66	2/17163 (0.0%)

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
1	A	0	3
1	B	0	5
1	C	0	1
All	All	0	9

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	C	318	ASP	CB-CG-OD1	8.84	126.26	118.30
1	A	482	LEU	CA-CB-CG	5.66	128.32	115.30

There are no chirality outliers.

5 of 9 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	350	ILE	Peptide
1	A	454	HIS	Peptide
1	A	591	GLU	Peptide
1	B	322	LEU	Peptide
1	B	422	ASP	Peptide



## 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	4144	0	4226	157	0
1	B	4144	0	4226	151	0
1	C	4144	0	4226	157	0
All	All	12432	0	12678	461	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 18.

The worst 5 of 461 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:599:GLY:O	1:B:609:LEU:HA	1.80	0.81
1:A:500:ALA:O	1:A:504:GLN:HB2	1.84	0.78
1:C:265:LYS:HE3	1:C:457:ASP:HB2	1.69	0.74
1:A:246:LEU:O	1:A:250:ARG:HB2	1.89	0.72
1:C:737:LYS:HB3	1:C:760:GLU:HB2	1.71	0.71

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	530/793 (67%)	479 (90%)	51 (10%)	0	100 100
1	B	530/793 (67%)	483 (91%)	47 (9%)	0	100 100
1	C	530/793 (67%)	485 (92%)	45 (8%)	0	100 100

*Continued on next page...*

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	1590/2379 (67%)	1447 (91%)	143 (9%)	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	443/665 (67%)	439 (99%)	4 (1%)	78	87
1	B	443/665 (67%)	442 (100%)	1 (0%)	93	96
1	C	443/665 (67%)	441 (100%)	2 (0%)	88	93
All	All	1329/1995 (67%)	1322 (100%)	7 (0%)	89	93

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	698	MET
1	B	584	ARG
1	C	702	MET
1	C	385	ARG
1	A	484	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	373	ASN
1	B	647	HIS
1	C	340	GLN
1	C	510	GLN
1	C	742	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

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.

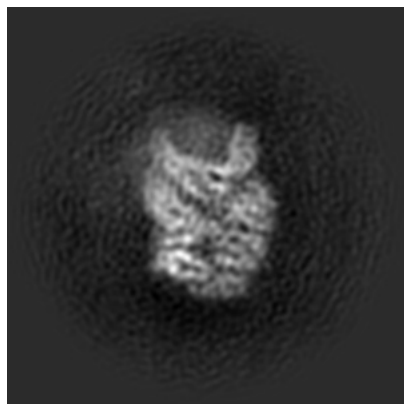
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-34111. These allow visual inspection of the internal detail of the map and identification of artifacts.

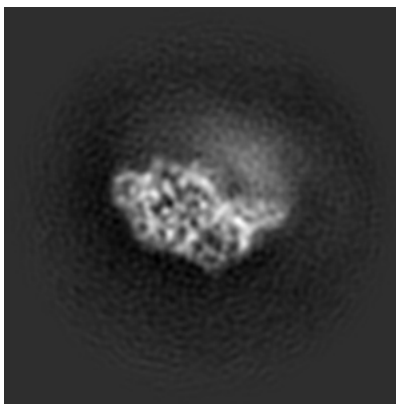
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

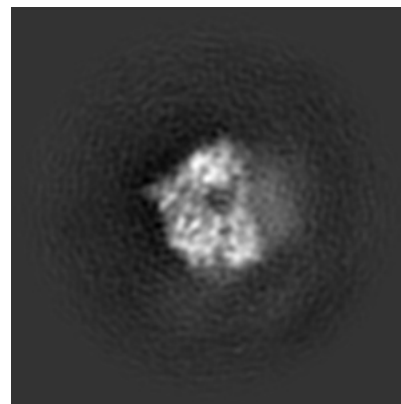
#### 6.1.1 Primary map



X

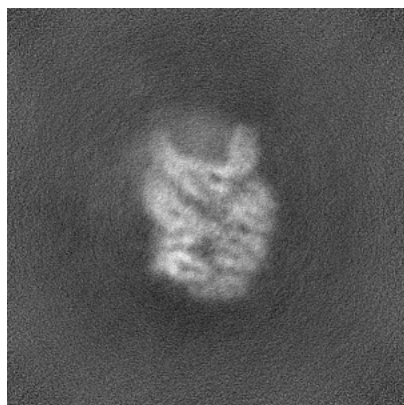


Y

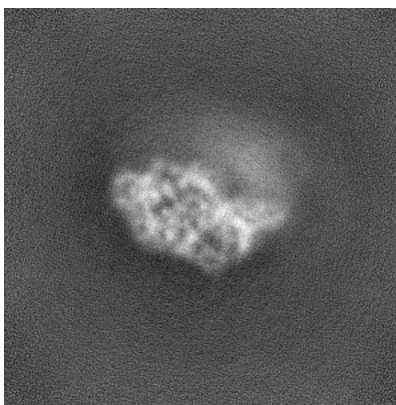


Z

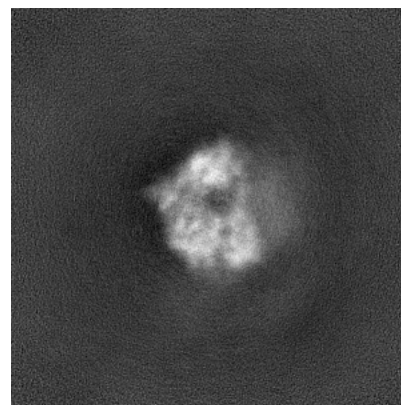
#### 6.1.2 Raw map



X



Y

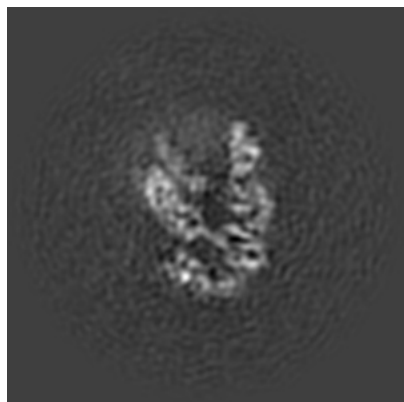


Z

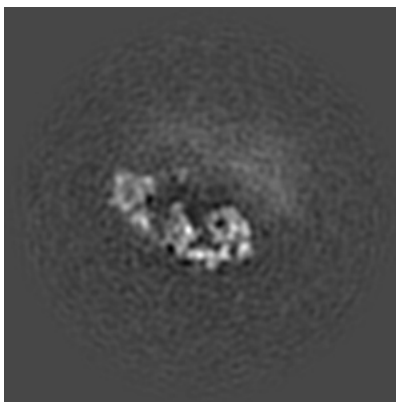
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

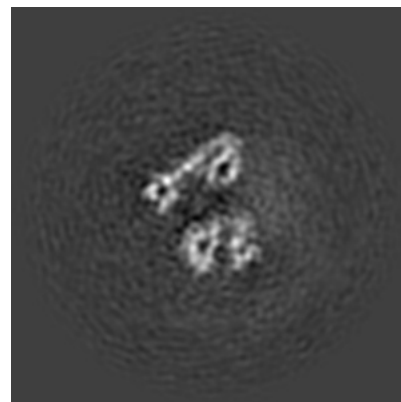
### 6.2.1 Primary map



X Index: 168

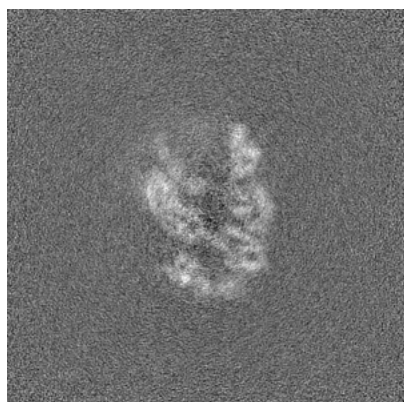


Y Index: 168

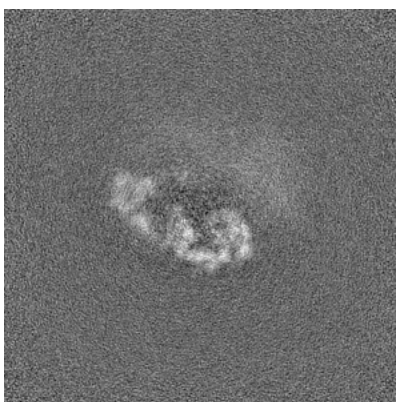


Z Index: 168

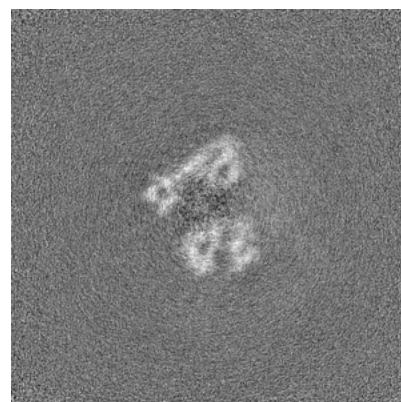
### 6.2.2 Raw map



X Index: 168



Y Index: 168

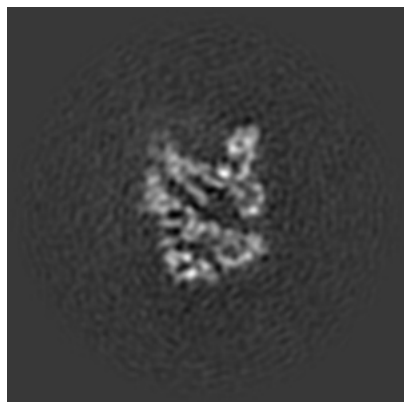


Z Index: 168

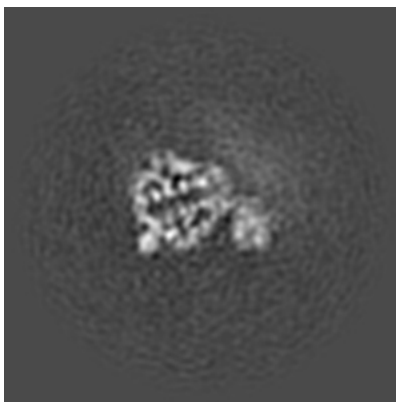
The images above show central slices of the map in three orthogonal directions.

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

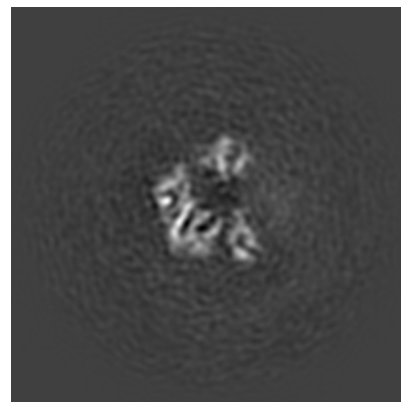
### 6.3.1 Primary map



X Index: 155

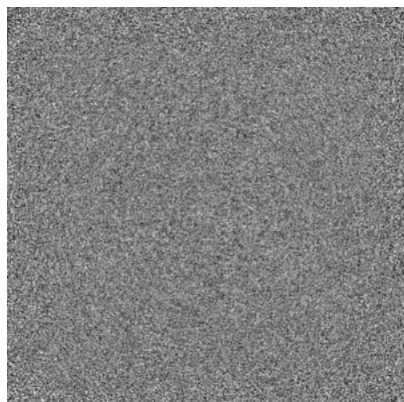


Y Index: 137

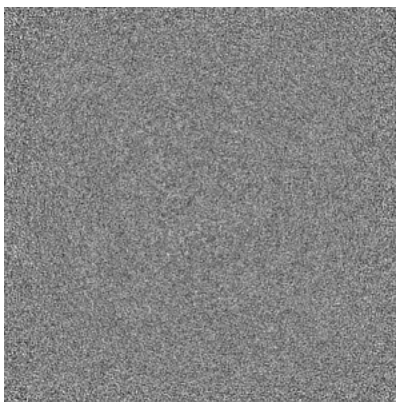


Z Index: 155

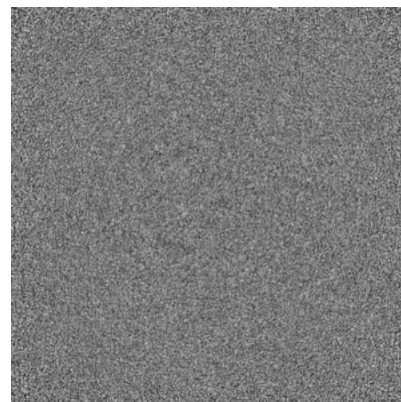
### 6.3.2 Raw map



X Index: 0



Y Index: 0

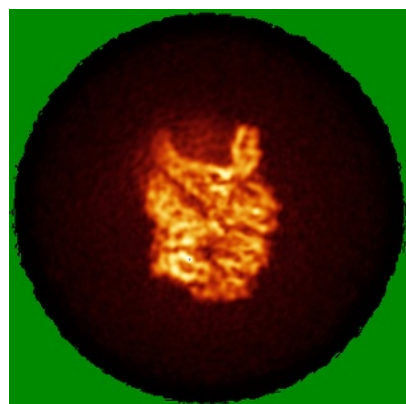


Z Index: 0

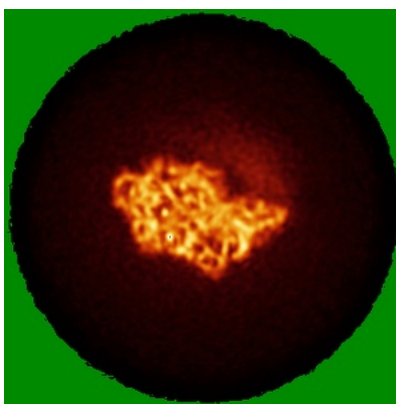
The images above show the largest variance slices of the map in three orthogonal directions.

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

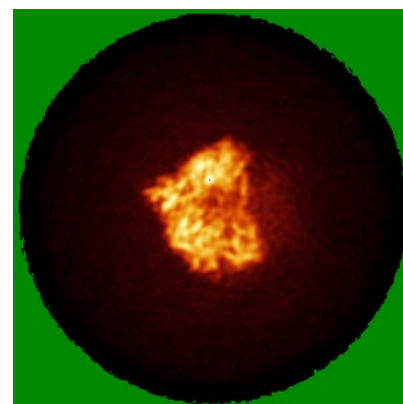
### 6.4.1 Primary map



X

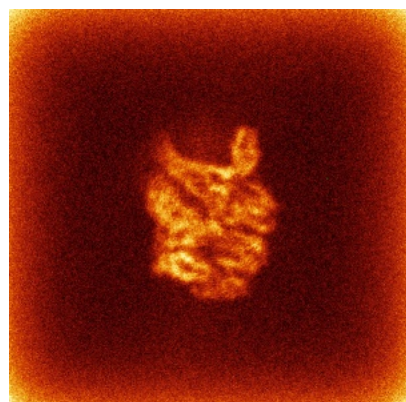


Y

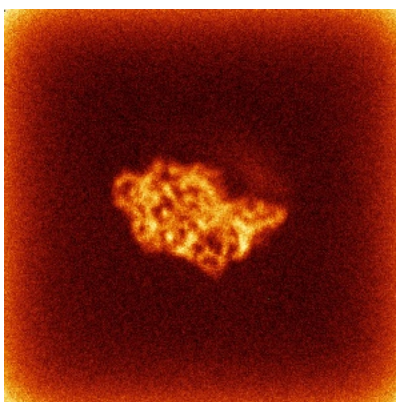


Z

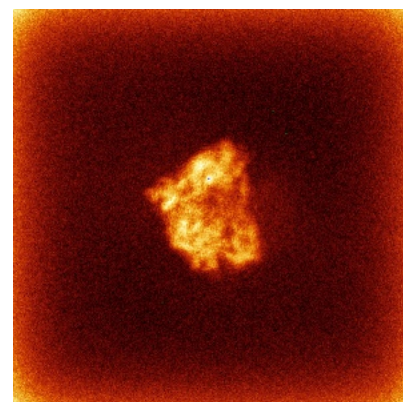
### 6.4.2 Raw map



X



Y

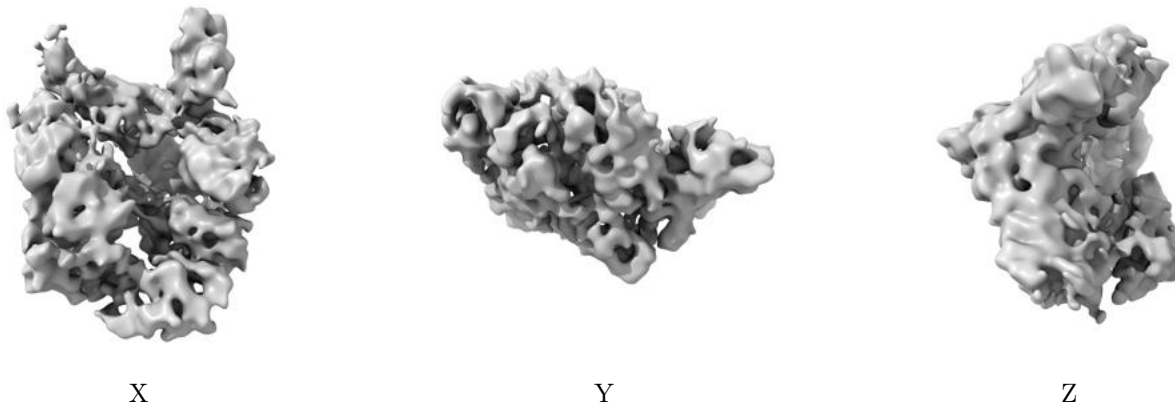


Z

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.

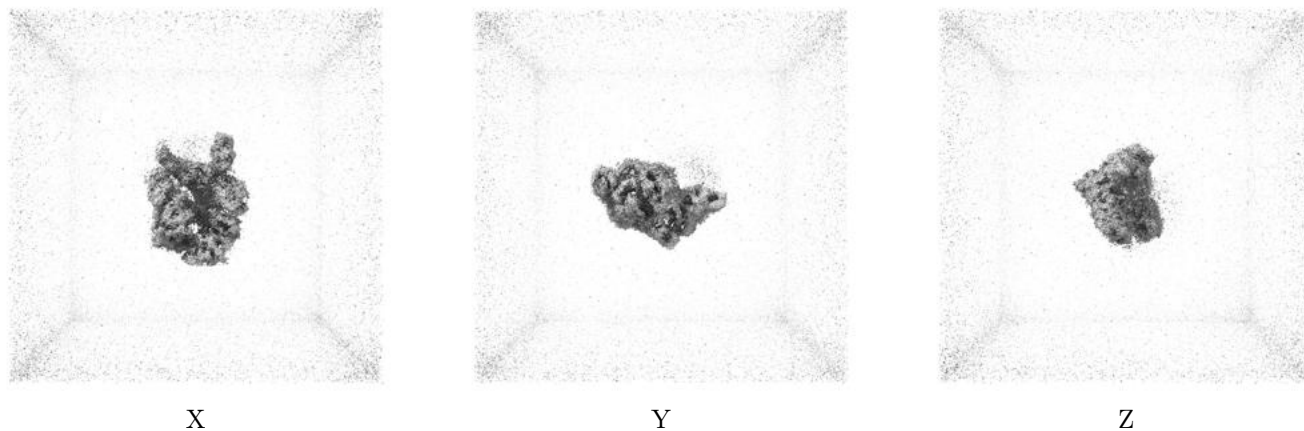
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.203. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2 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.

## 6.6 Mask visualisation [i](#)

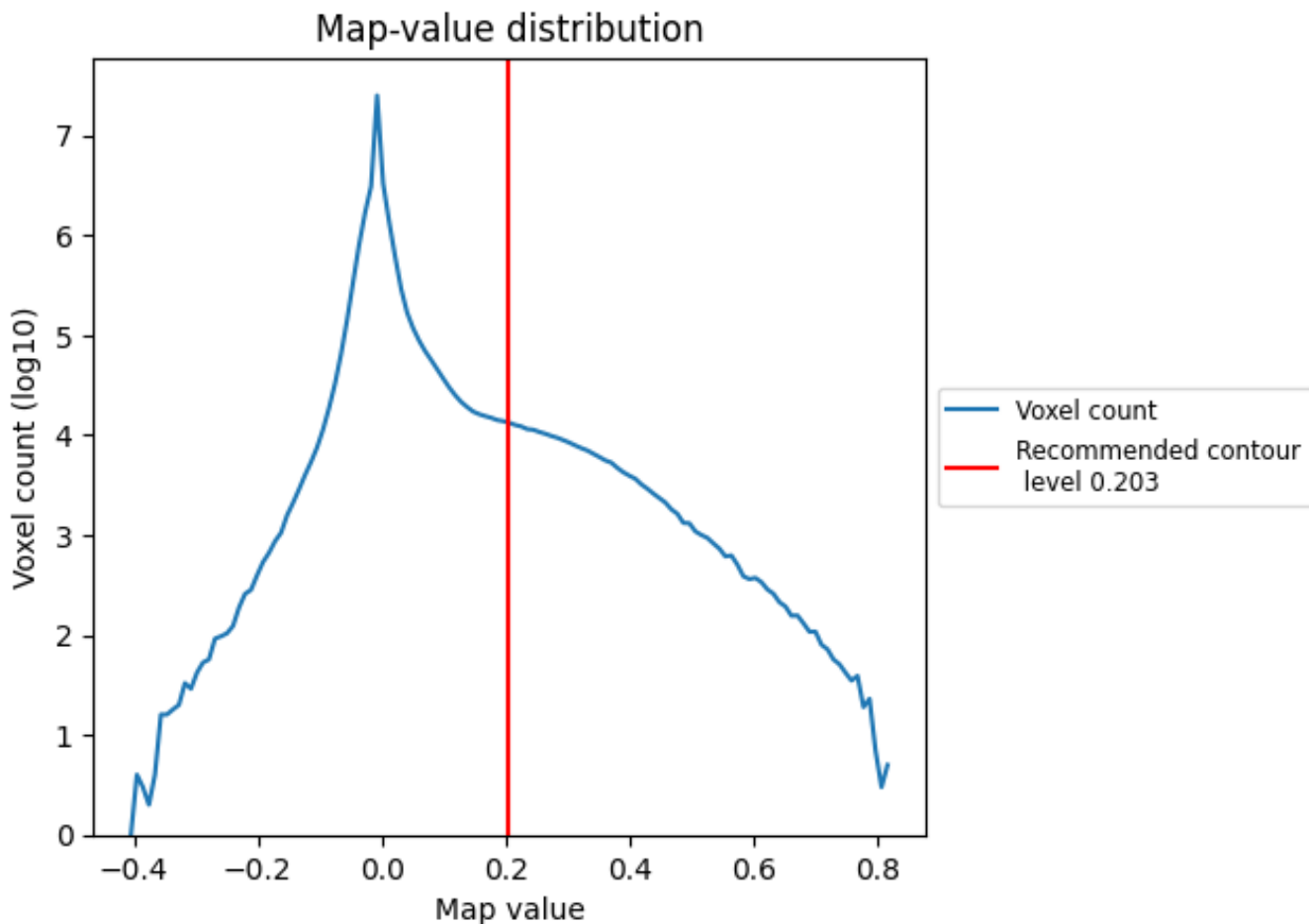
This section was not generated. No masks/segmentation were deposited.



## 7 Map analysis [i](#)

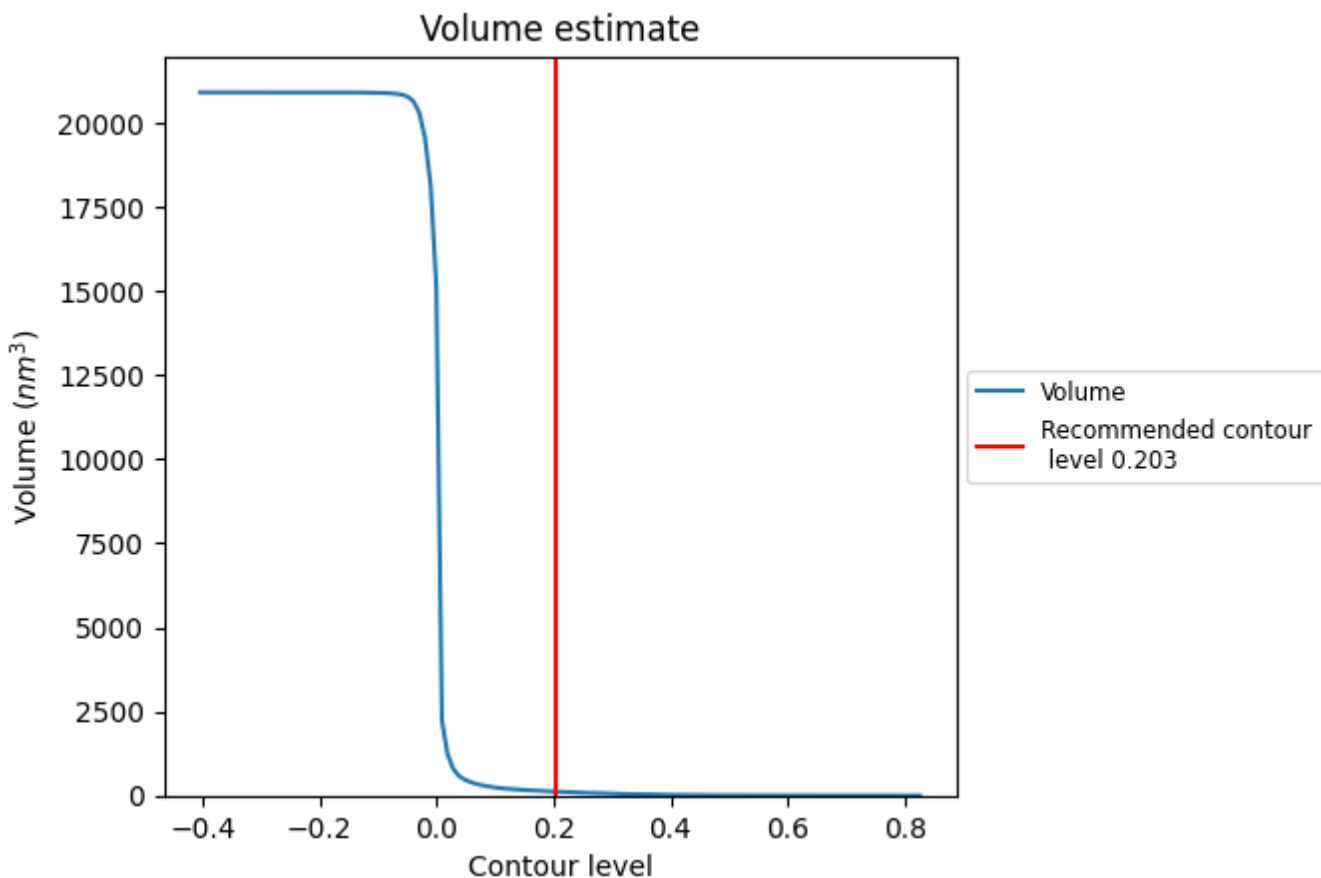
This section contains the results of statistical analysis of the map.

### 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.

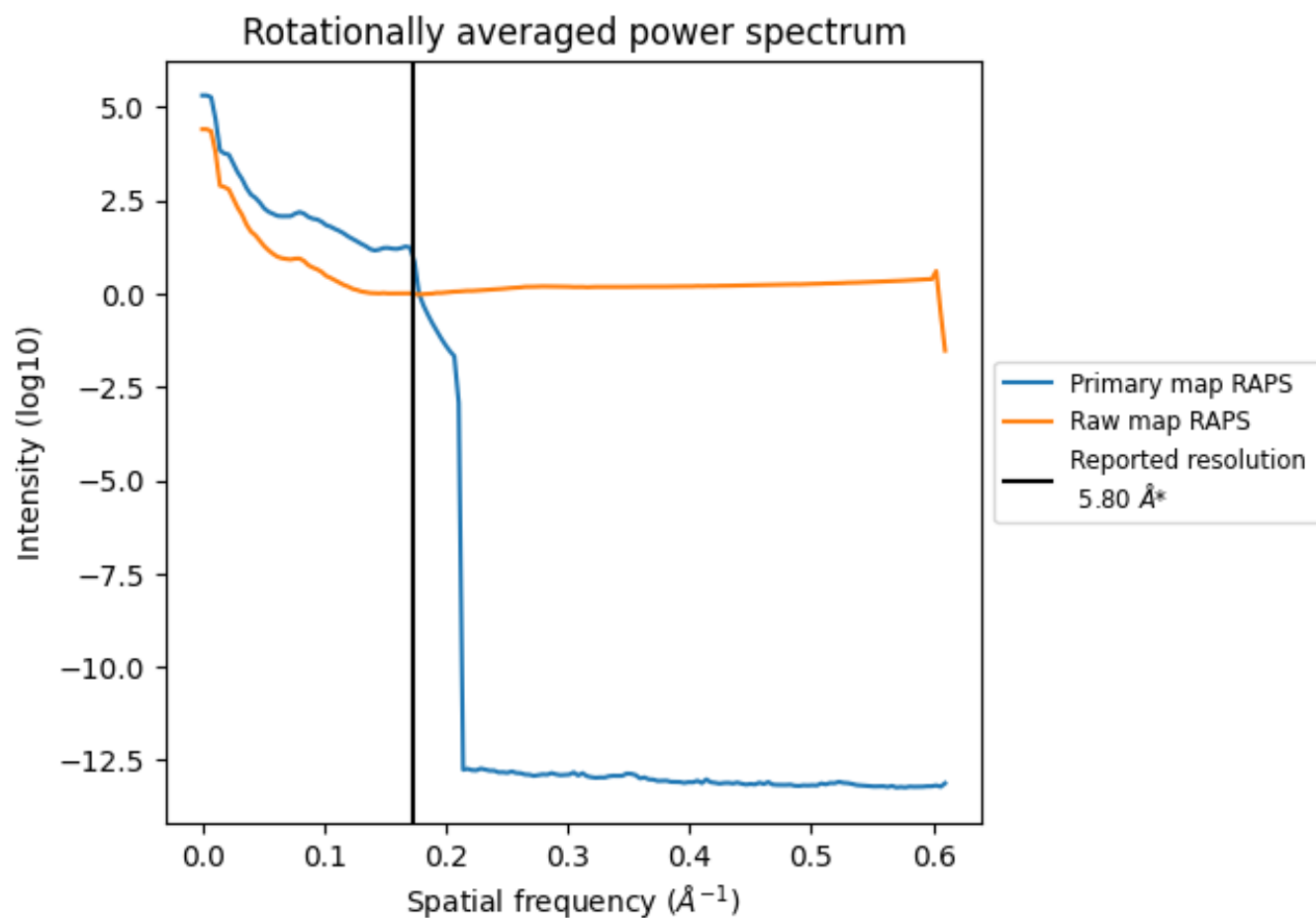
## 7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 118 nm<sup>3</sup>; this corresponds to an approximate mass of 107 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](#)

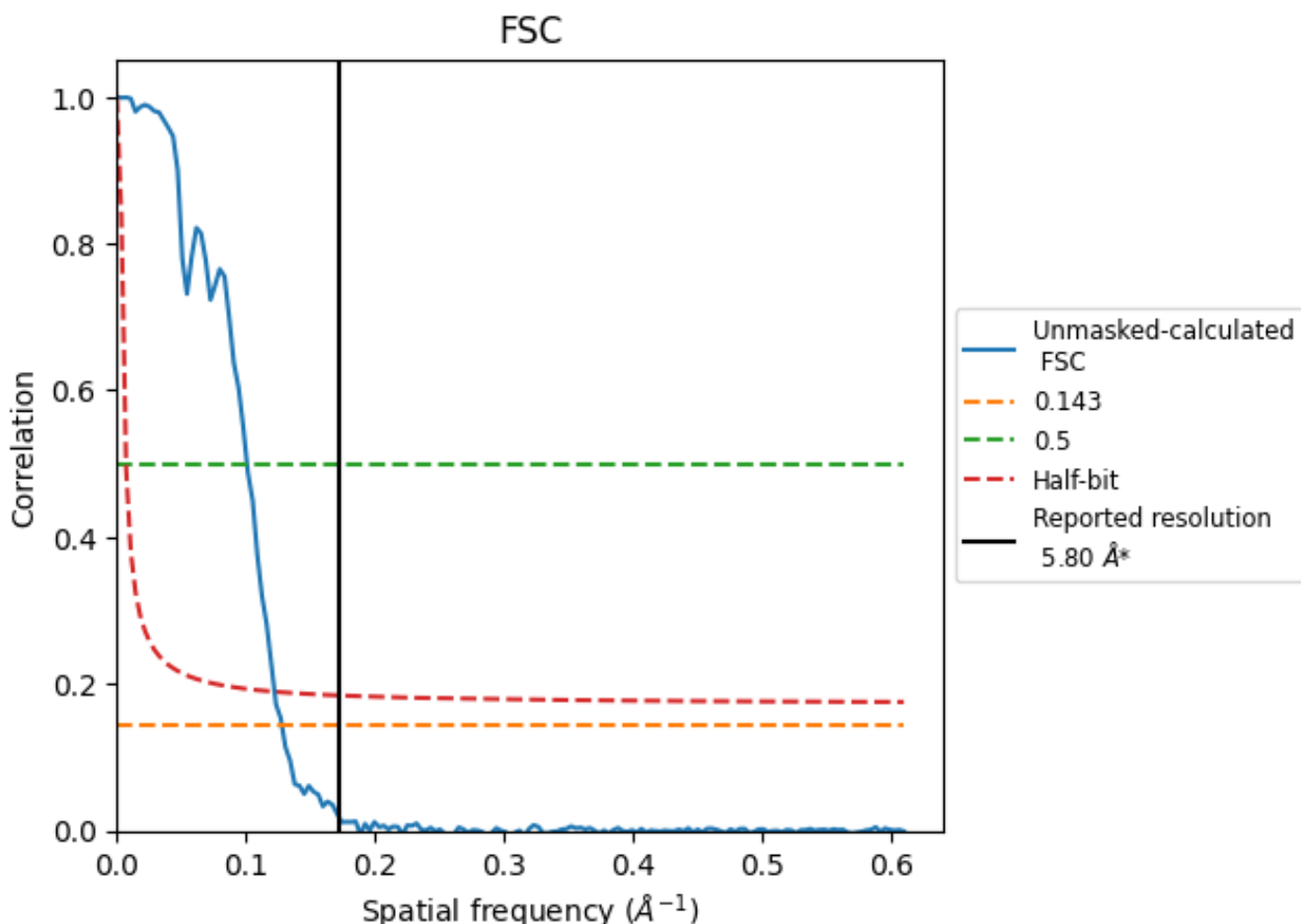


\*Reported resolution corresponds to spatial frequency of 0.172 Å<sup>-1</sup>

## 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 0.172 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

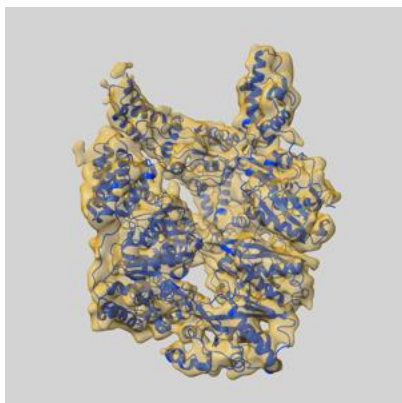
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	5.80	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	7.81	9.91	8.18

\*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 7.81 differs from the reported value 5.8 by more than 10 %

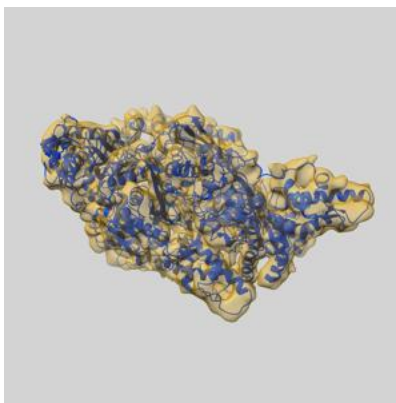
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-34111 and PDB model 7YUU. Per-residue inclusion information can be found in section [3](#) on page [4](#).

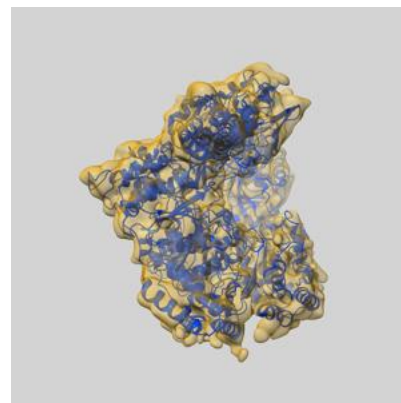
### 9.1 Map-model overlay [i](#)



X



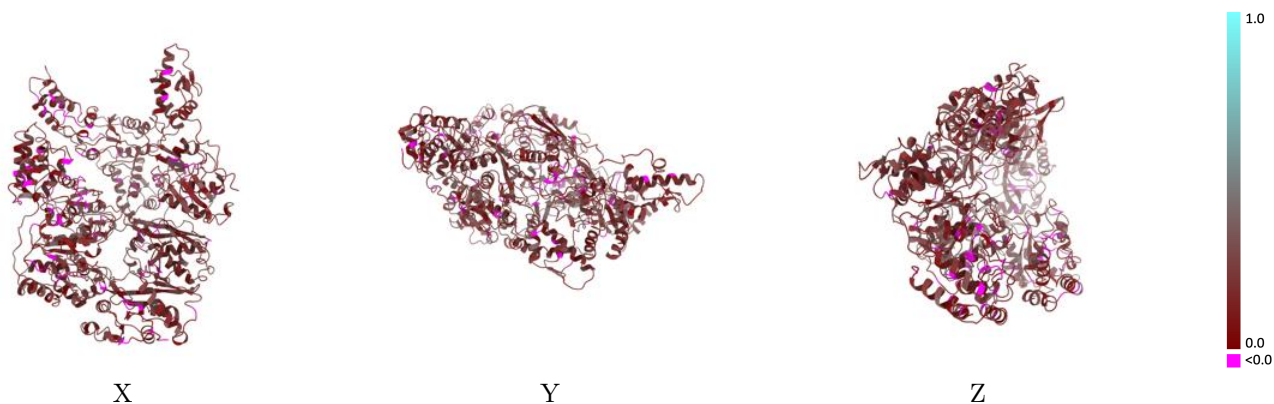
Y



Z

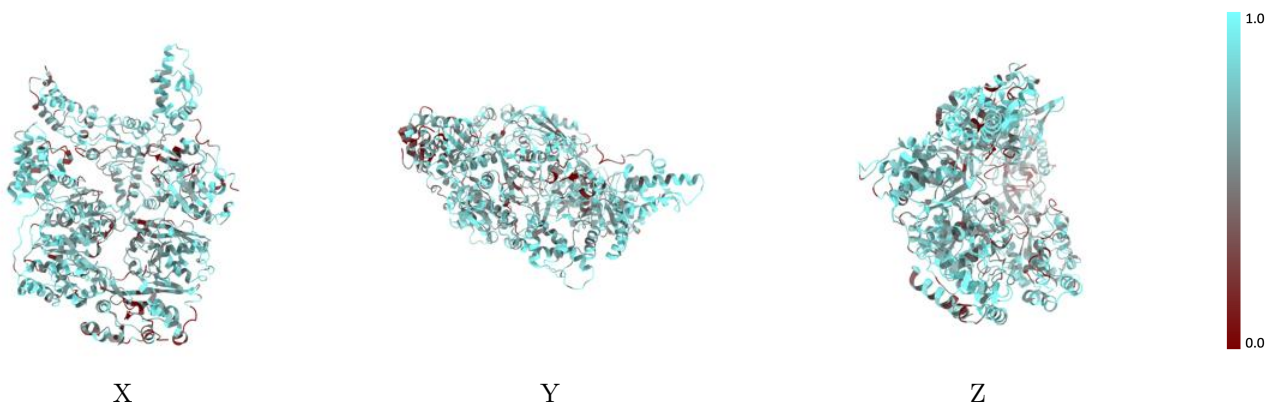
The images above show the 3D surface view of the map at the recommended contour level 0.203 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



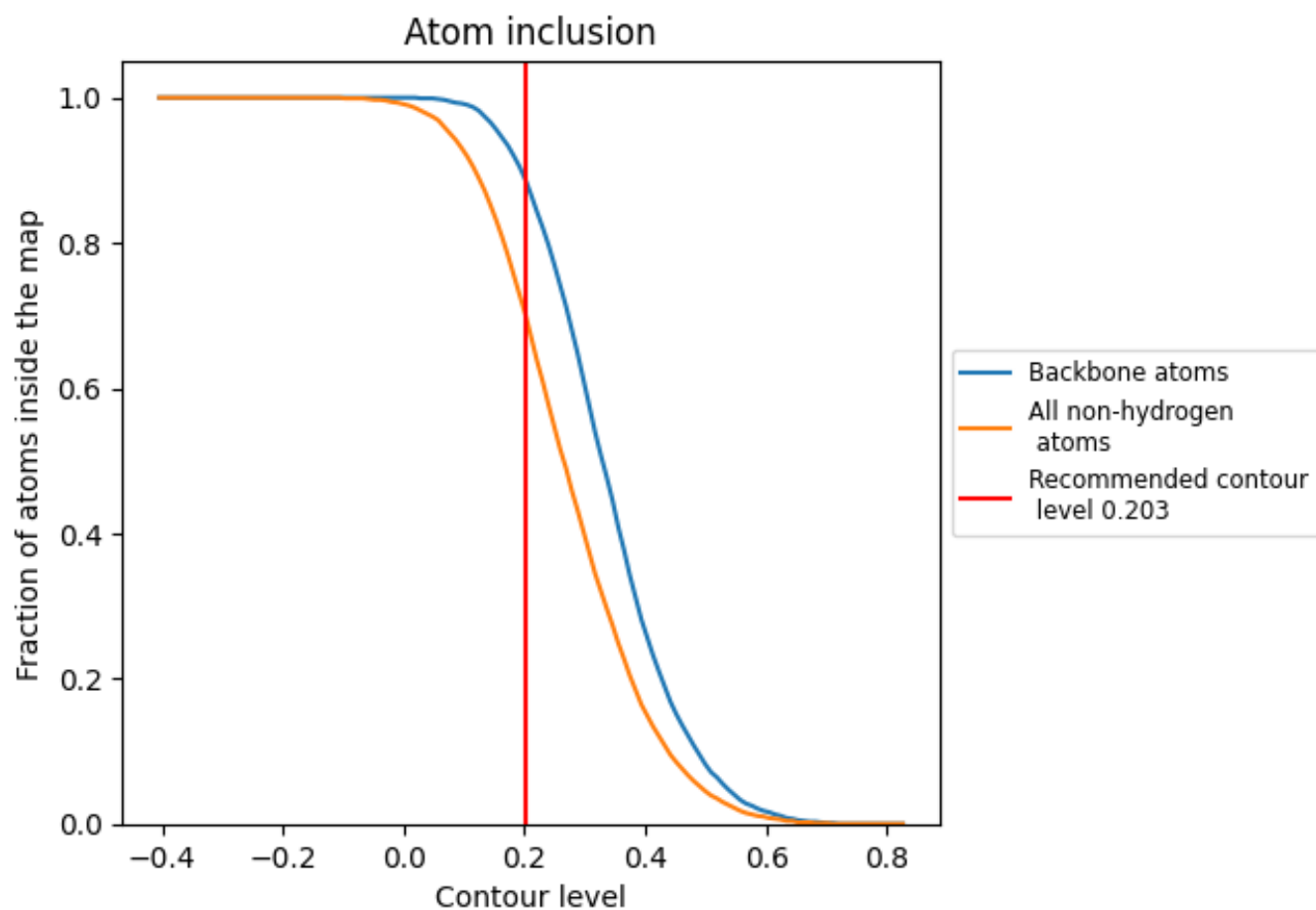
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.203).

## 9.4 Atom inclusion [i](#)











At the recommended contour level, 88% of all backbone atoms, 70% 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 (0.203) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6970	 0.1940
A	 0.6740	 0.1870
B	 0.7180	 0.2060
C	 0.7000	 0.1880

