



## wwPDB EM Validation Summary Report ⓘ

Sep 28, 2024 – 10:33 AM EDT

PDB ID : 6VP7  
EMDB ID : EMD-21250  
Title : Cryo-EM structure of the C-terminal half of the Parkinson's Disease-linked protein Leucine Rich Repeat Kinase 2 (LRRK2)  
Authors : Leschziner, A.; Deniston, C.; Lahiri, I.  
Deposited on : 2020-02-01  
Resolution : 3.50 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.dev113  
Mogul : 2022.3.0, CSD as543be (2022)  
MolProbity : 4.02b-467  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

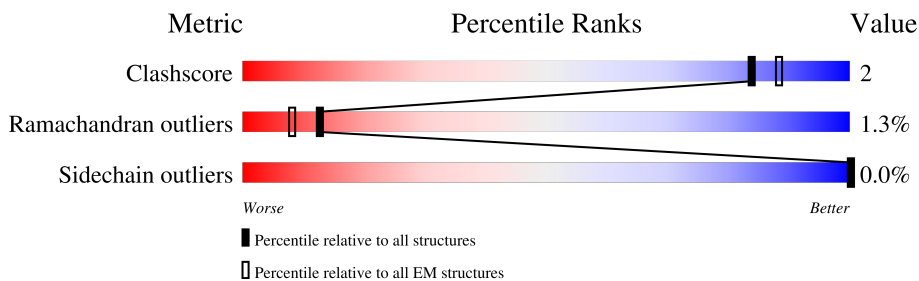
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.50 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	1-A	1201	
1	10-A	1201	
1	2-A	1201	
1	3-A	1201	
1	4-A	1201	
1	5-A	1201	
1	6-A	1201	
1	7-A	1201	
1	8-A	1201	

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Mol	Chain	Length	Quality of chain
1	9-A	1201	 85% 5% • 10%

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 85310 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.

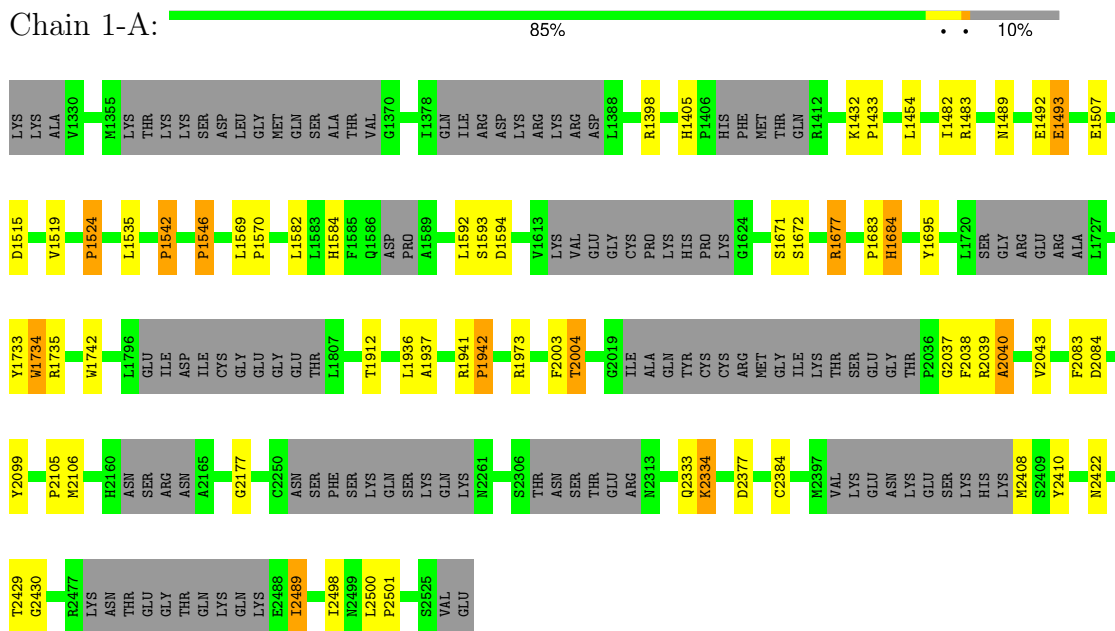
- Molecule 1 is a protein called Leucine-rich repeat serine/threonine-protein kinase 2.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	N	O	P			S
1	1-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	2-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	3-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	4-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	5-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	6-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	7-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	8-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	9-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0
1	10-A	1084	Total 8531	C 5473	N 1455	O 1551	P 1	S 51	0	0

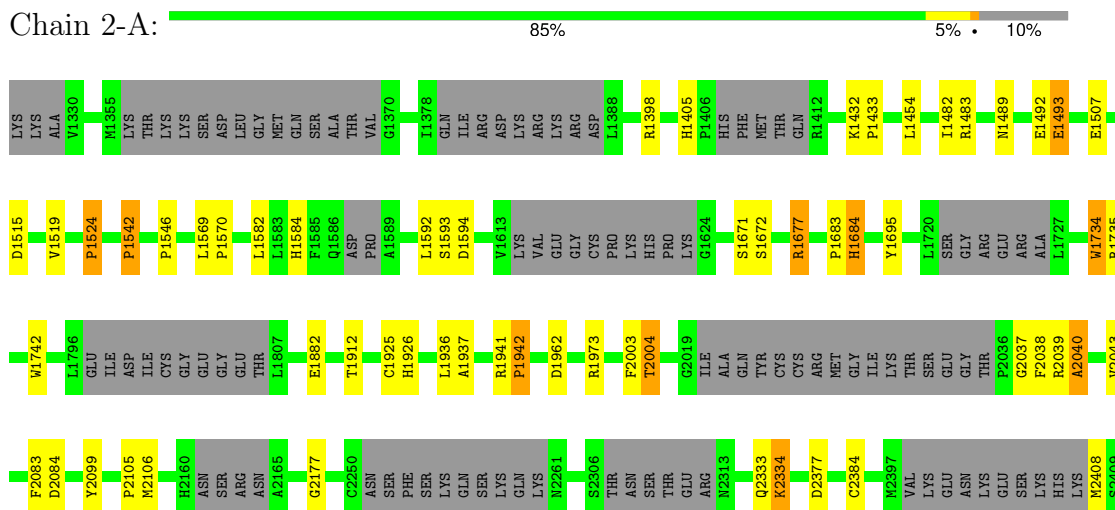
### 3 Residue-property plots

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. 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. 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: Leucine-rich repeat serine/threonine-protein kinase 2



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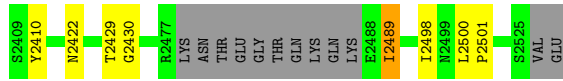




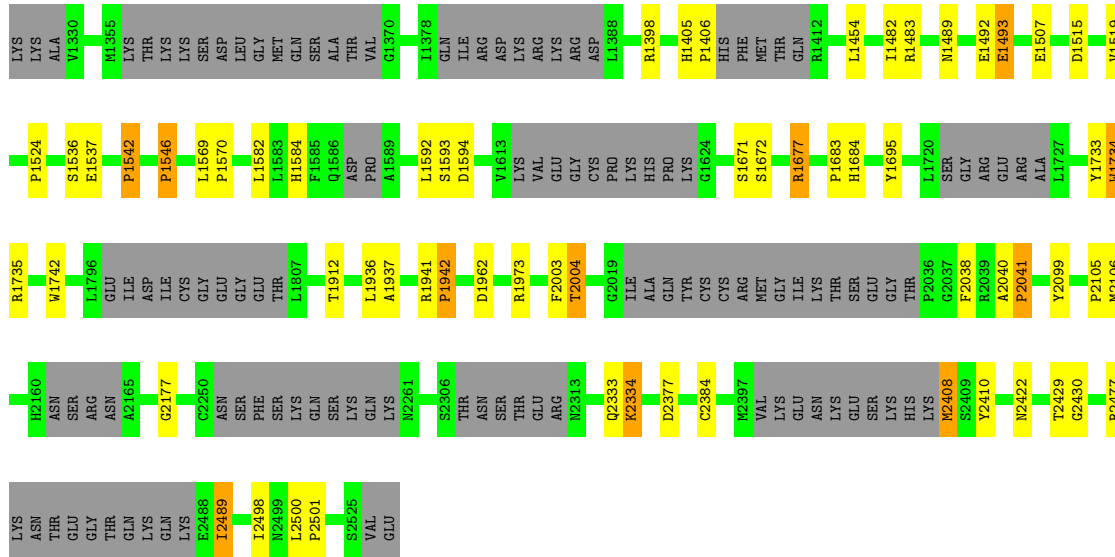
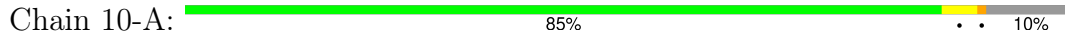








• Molecule 1: Leucine-rich repeat serine/threonine-protein kinase 2



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C3	Depositor
Number of particles used	70953	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Per-particle CTF values	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	6.65	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	130000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.075	Depositor
Minimum map value	-0.032	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.0267	Depositor
Map size (Å)	380.92, 380.92, 380.92	wwPDB
Map dimensions	356, 356, 356	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	Depositor

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: TPO

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	1-A	0.80	1/8682 (0.0%)	0.72	9/11746 (0.1%)
1	2-A	0.80	1/8682 (0.0%)	0.72	7/11746 (0.1%)
1	3-A	0.80	1/8682 (0.0%)	0.72	8/11746 (0.1%)
1	4-A	0.80	1/8682 (0.0%)	0.72	7/11746 (0.1%)
1	5-A	0.80	1/8682 (0.0%)	0.72	8/11746 (0.1%)
1	6-A	0.80	1/8682 (0.0%)	0.72	8/11746 (0.1%)
1	7-A	0.80	1/8682 (0.0%)	0.72	8/11746 (0.1%)
1	8-A	0.80	1/8682 (0.0%)	0.72	9/11746 (0.1%)
1	9-A	0.80	1/8682 (0.0%)	0.72	9/11746 (0.1%)
1	10-A	0.80	2/8682 (0.0%)	0.72	10/11746 (0.1%)
All	All	0.80	11/86820 (0.0%)	0.72	83/117460 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	10-A	0	1

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	1-A	2040	ALA	C-N	5.94	1.45	1.34
1	2-A	2040	ALA	C-N	5.94	1.45	1.34
1	3-A	2040	ALA	C-N	5.94	1.45	1.34
1	4-A	2040	ALA	C-N	5.94	1.45	1.34
1	5-A	2040	ALA	C-N	5.94	1.45	1.34

The worst 5 of 83 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	2-A	1524	PRO	N-CA-CB	7.35	112.12	103.30
1	6-A	1524	PRO	N-CA-CB	7.32	112.08	103.30
1	4-A	1524	PRO	N-CA-CB	7.31	112.07	103.30
1	9-A	1734	TRP	CB-CA-C	-6.58	97.25	110.40
1	4-A	1734	TRP	CB-CA-C	-6.57	97.26	110.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	10-A	2041	PRO	Mainchain

## 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	1-A	8531	0	8567	38	0
1	2-A	8531	0	8567	41	0
1	3-A	8531	0	8567	39	0
1	4-A	8531	0	8567	39	0
1	5-A	8531	0	8567	40	0
1	6-A	8531	0	8567	37	0
1	7-A	8531	0	8567	33	0
1	8-A	8531	0	8567	38	0
1	9-A	8531	0	8567	42	0
1	10-A	8531	0	8567	37	0
All	All	85310	0	85670	384	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 2.

The worst 5 of 384 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:A:2037:GLY:O	1:A:2083:PHE:CE2	2.40	0.74
1:A:2037:GLY:O	1:A:2083:PHE:CE2	2.41	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2037:GLY:O	1:A:2083:PHE:CE2	2.42	0.72
1:A:2037:GLY:O	1:A:2083:PHE:CE2	2.43	0.71
1:A:2037:GLY:O	1:A:2083:PHE:HE2	1.74	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	1-A	1055/1201 (88%)	977 (93%)	64 (6%)	14 (1%)	10	41
1	2-A	1055/1201 (88%)	974 (92%)	67 (6%)	14 (1%)	10	41
1	3-A	1055/1201 (88%)	973 (92%)	68 (6%)	14 (1%)	10	41
1	4-A	1055/1201 (88%)	975 (92%)	66 (6%)	14 (1%)	10	41
1	5-A	1055/1201 (88%)	975 (92%)	66 (6%)	14 (1%)	10	41
1	6-A	1055/1201 (88%)	972 (92%)	71 (7%)	12 (1%)	12	45
1	7-A	1055/1201 (88%)	972 (92%)	70 (7%)	13 (1%)	11	43
1	8-A	1055/1201 (88%)	977 (93%)	66 (6%)	12 (1%)	12	45
1	9-A	1055/1201 (88%)	973 (92%)	69 (6%)	13 (1%)	11	43
1	10-A	1055/1201 (88%)	972 (92%)	71 (7%)	12 (1%)	12	45
All	All	10550/12010 (88%)	9740 (92%)	678 (6%)	132 (1%)	13	41

5 of 132 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1-A	1493	GLU
1	1-A	2004	THR
1	2-A	1493	GLU
1	2-A	2004	THR

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Mol	Chain	Res	Type
1	3-A	1493	GLU

### 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	1-A	926/1073 (86%)	926 (100%)	0	100	100
1	2-A	926/1073 (86%)	926 (100%)	0	100	100
1	3-A	926/1073 (86%)	925 (100%)	1 (0%)	92	97
1	4-A	926/1073 (86%)	925 (100%)	1 (0%)	92	97
1	5-A	926/1073 (86%)	926 (100%)	0	100	100
1	6-A	926/1073 (86%)	926 (100%)	0	100	100
1	7-A	926/1073 (86%)	926 (100%)	0	100	100
1	8-A	926/1073 (86%)	925 (100%)	1 (0%)	92	97
1	9-A	926/1073 (86%)	926 (100%)	0	100	100
1	10-A	926/1073 (86%)	925 (100%)	1 (0%)	92	97
All	All	9260/10730 (86%)	9256 (100%)	4 (0%)	100	100

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

Mol	Chain	Res	Type
1	3-A	2408	MET
1	4-A	2408	MET
1	8-A	2408	MET
1	10-A	2408	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	8-A	1405	HIS
1	8-A	2333	GLN

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Mol	Chain	Res	Type
1	10-A	2333	GLN
1	9-A	2333	GLN
1	4-A	2333	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](#)

10 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
1	TPO	5-A	1343	1	8,10,11	0.92	0	10,14,16	0.78	0
1	TPO	3-A	1343	1	8,10,11	0.93	0	10,14,16	0.80	0
1	TPO	2-A	1343	1	8,10,11	0.91	0	10,14,16	0.76	0
1	TPO	9-A	1343	1	8,10,11	0.93	0	10,14,16	0.78	0
1	TPO	4-A	1343	1	8,10,11	0.92	0	10,14,16	0.77	0
1	TPO	10-A	1343	1	8,10,11	0.91	0	10,14,16	0.77	0
1	TPO	1-A	1343	1	8,10,11	0.93	0	10,14,16	0.76	0
1	TPO	6-A	1343	1	8,10,11	0.97	0	10,14,16	0.76	0
1	TPO	8-A	1343	1	8,10,11	0.90	0	10,14,16	0.78	0
1	TPO	7-A	1343	1	8,10,11	0.94	0	10,14,16	0.77	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	TPO	5-A	1343	1	-	1/9/11/13	-
1	TPO	3-A	1343	1	-	0/9/11/13	-
1	TPO	2-A	1343	1	-	0/9/11/13	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	TPO	9-A	1343	1	-	1/9/11/13	-
1	TPO	4-A	1343	1	-	1/9/11/13	-
1	TPO	10-A	1343	1	-	1/9/11/13	-
1	TPO	1-A	1343	1	-	1/9/11/13	-
1	TPO	6-A	1343	1	-	1/9/11/13	-
1	TPO	8-A	1343	1	-	1/9/11/13	-
1	TPO	7-A	1343	1	-	1/9/11/13	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	10-A	1343	TPO	CB-OG1-P-O3P
1	4-A	1343	TPO	CB-OG1-P-O3P
1	5-A	1343	TPO	CB-OG1-P-O3P
1	6-A	1343	TPO	CB-OG1-P-O3P
1	7-A	1343	TPO	CB-OG1-P-O3P

There are no ring outliers.

No monomer is involved in short contacts.

## 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.



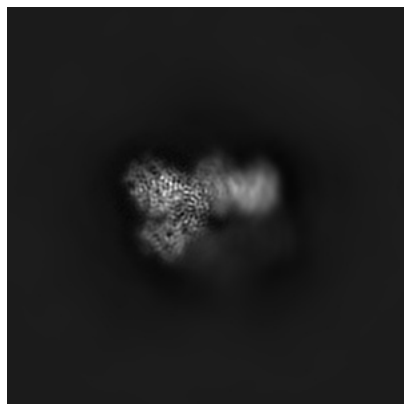
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-21250. These allow visual inspection of the internal detail of the map and identification of artifacts.

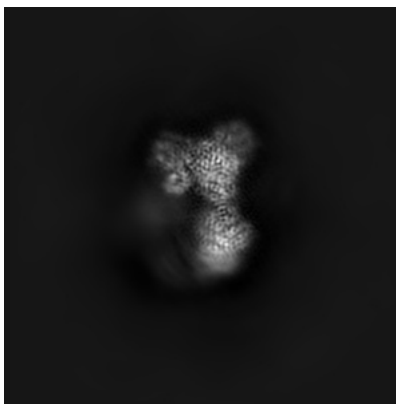
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

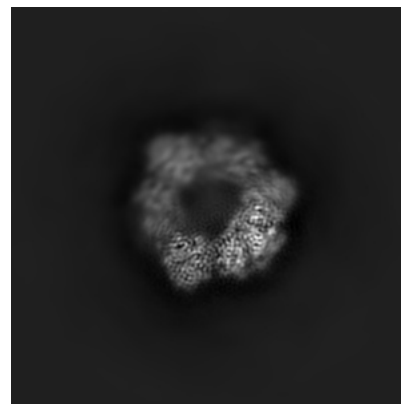
#### 6.1.1 Primary map



X

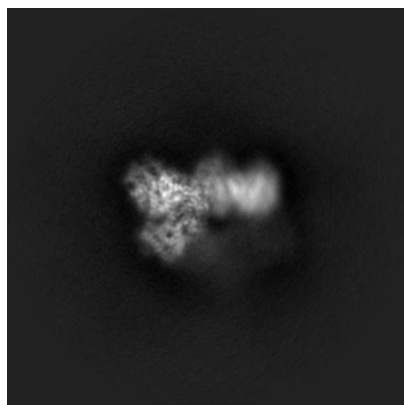


Y

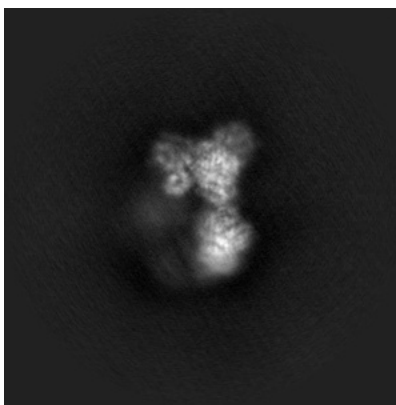


Z

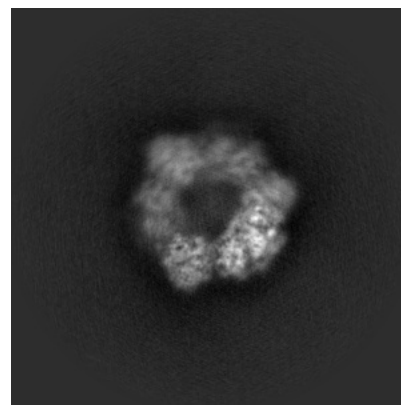
#### 6.1.2 Raw map



X



Y

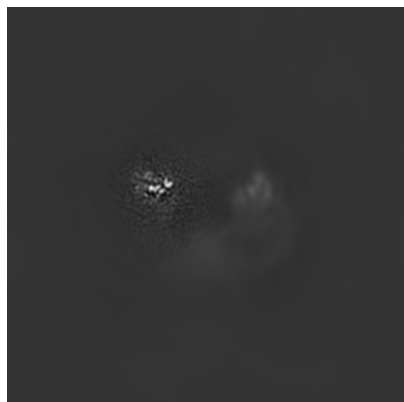


Z

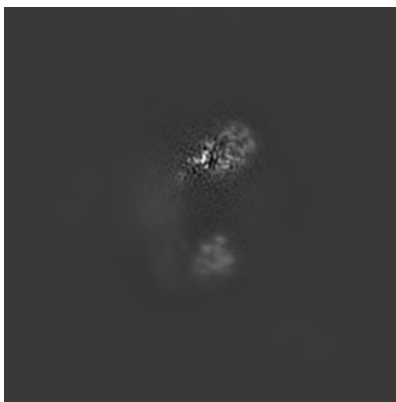
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

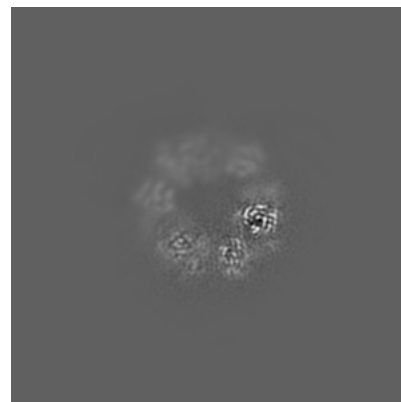
### 6.2.1 Primary map



X Index: 178

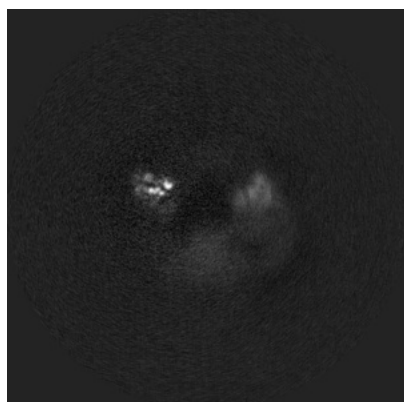


Y Index: 178

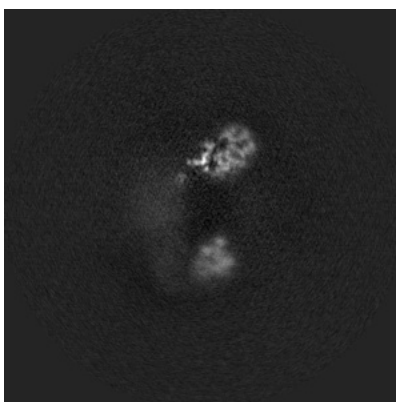


Z Index: 178

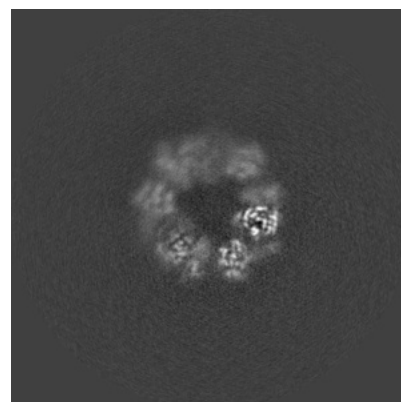
### 6.2.2 Raw map



X Index: 178



Y Index: 178

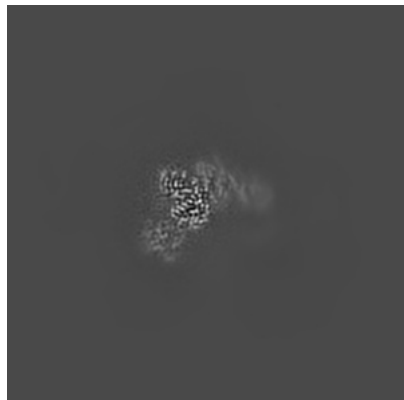


Z Index: 178

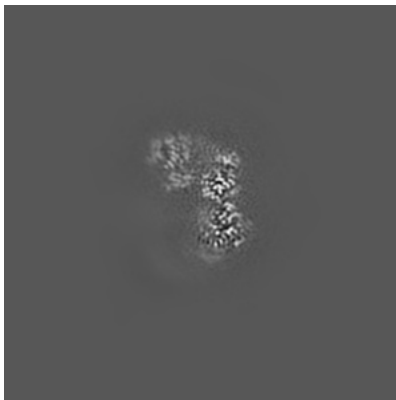
The images above show central slices of the map in three orthogonal directions.

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

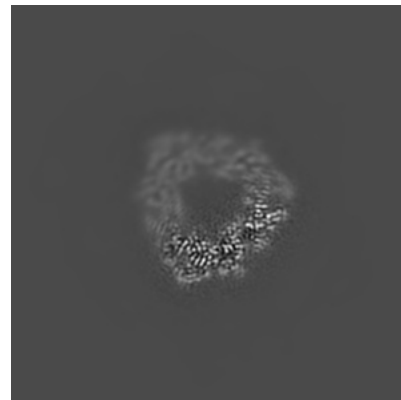
### 6.3.1 Primary map



X Index: 218

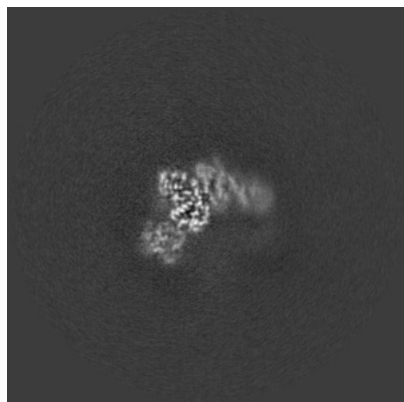


Y Index: 141

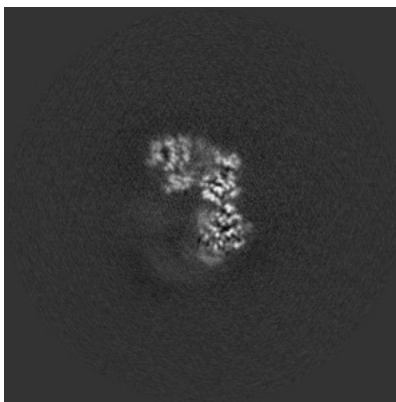


Z Index: 191

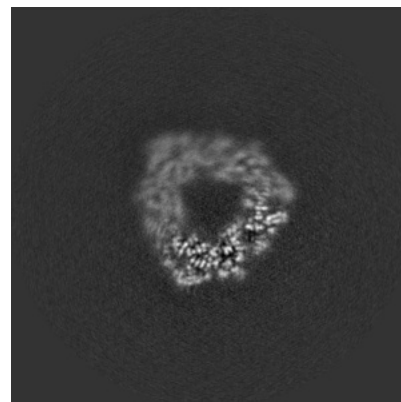
### 6.3.2 Raw map



X Index: 218



Y Index: 141

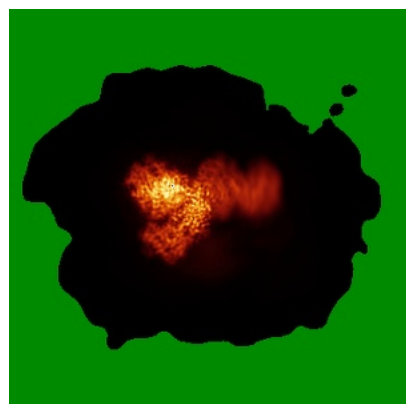


Z Index: 191

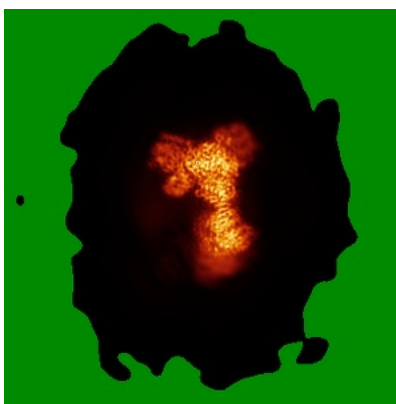
The images above show the largest variance slices of the map in three orthogonal directions.

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

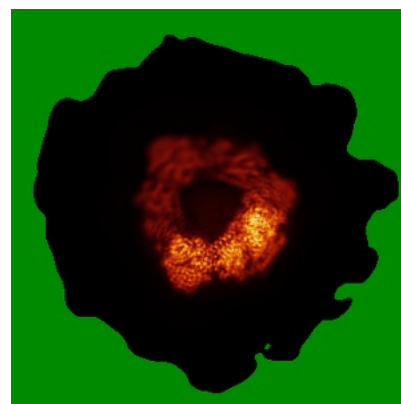
### 6.4.1 Primary map



X

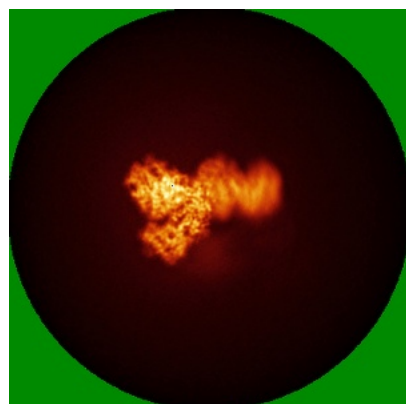


Y

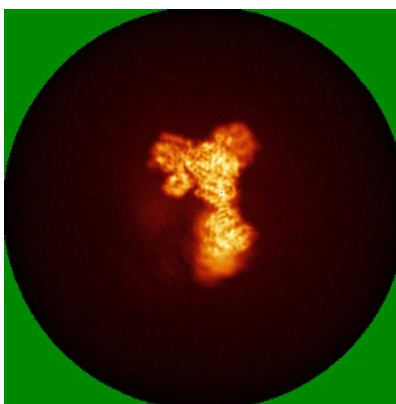


Z

### 6.4.2 Raw map



X



Y

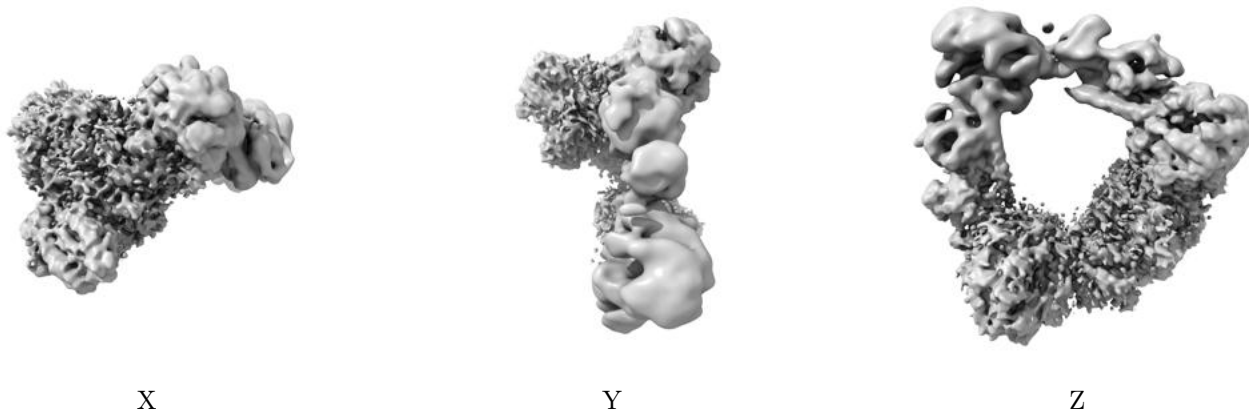


Z

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.

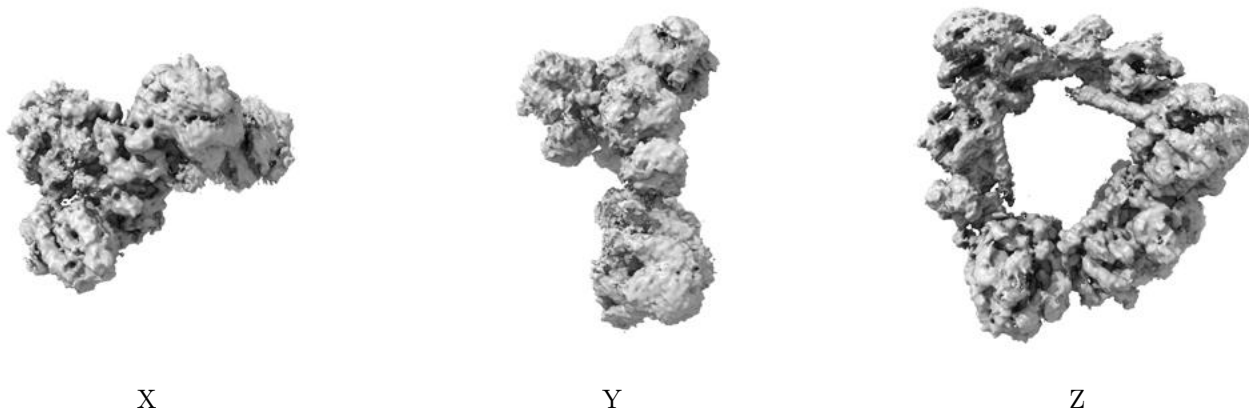
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0267. 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.

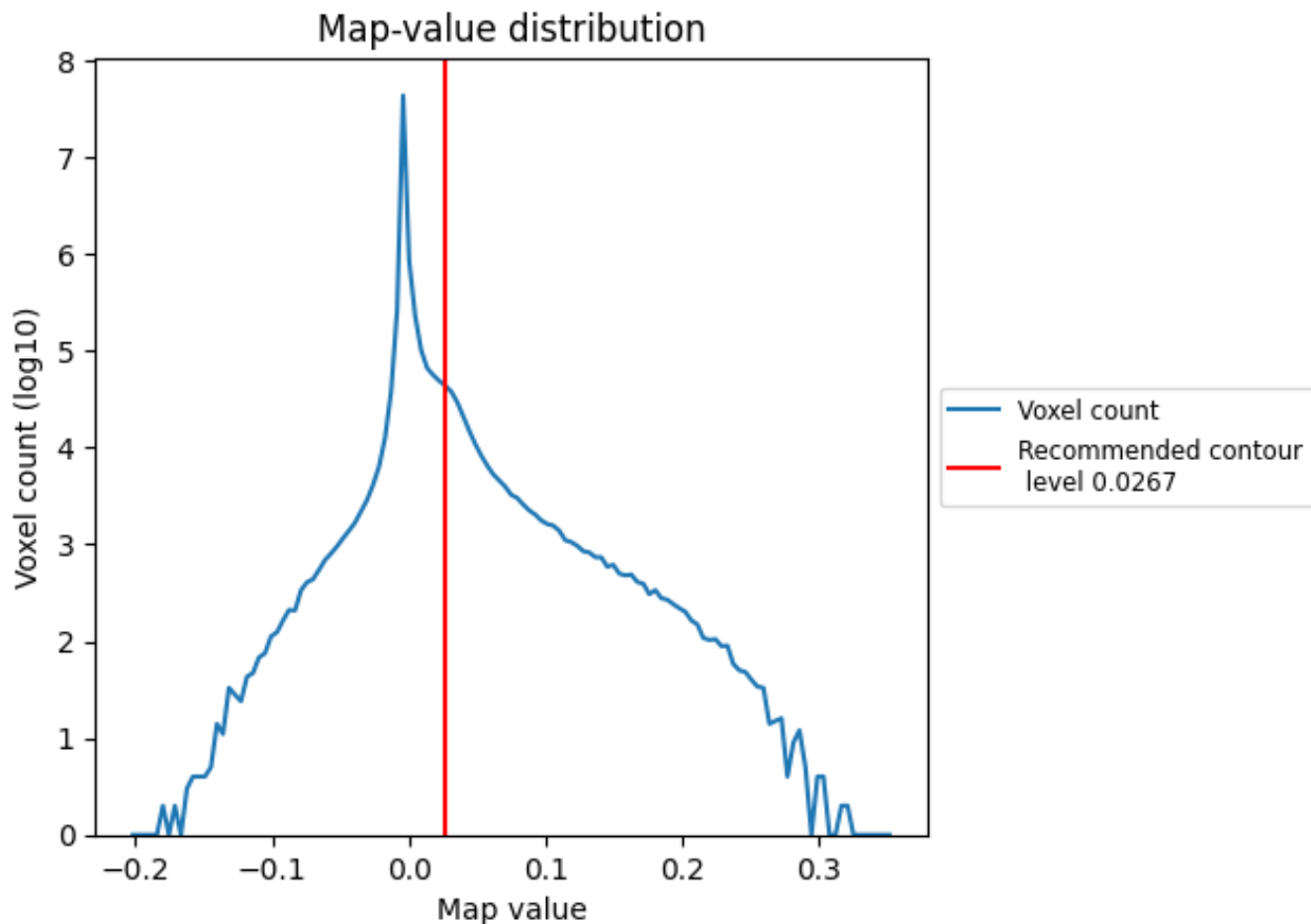
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

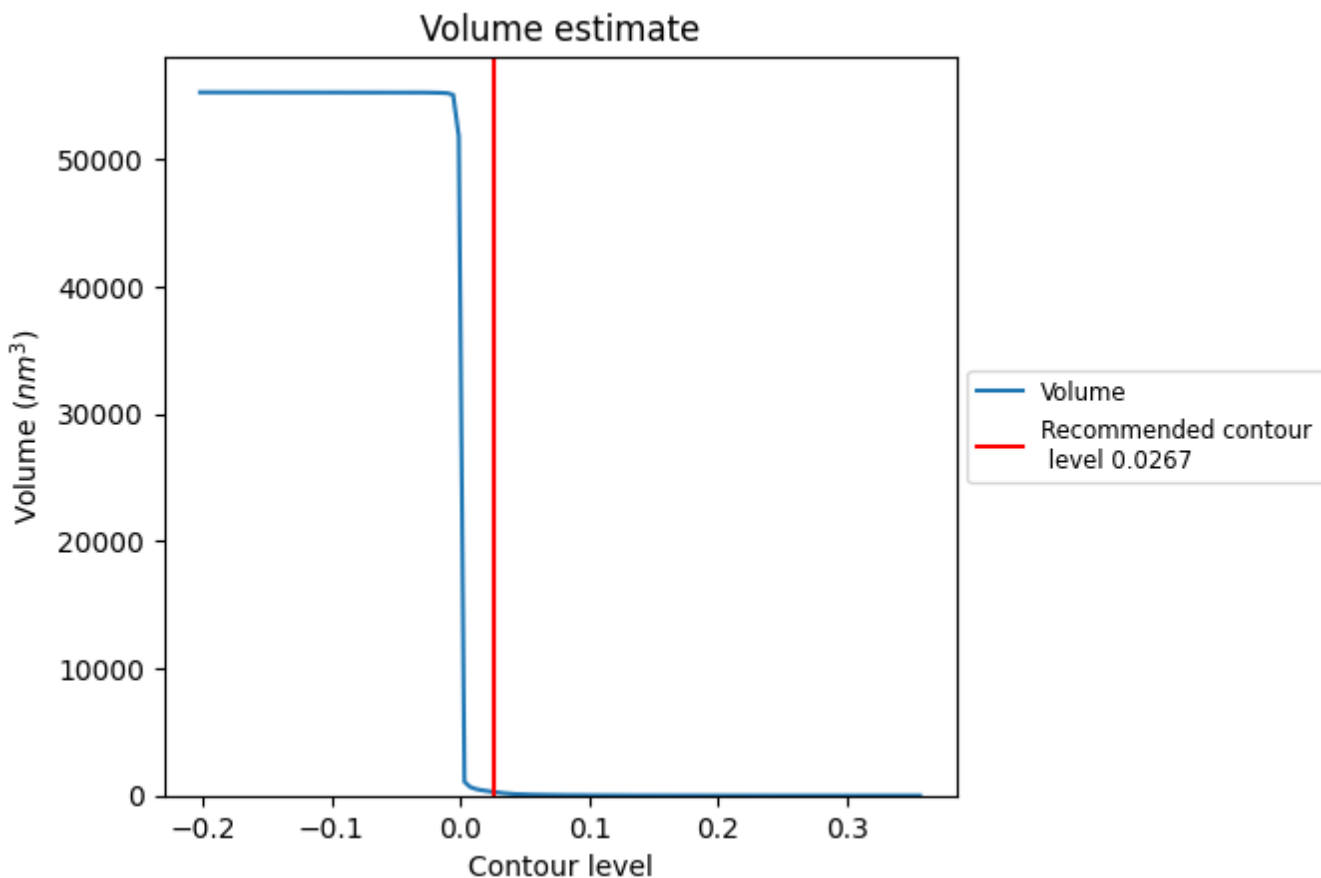
This section contains the results of statistical analysis of the map.

### 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.

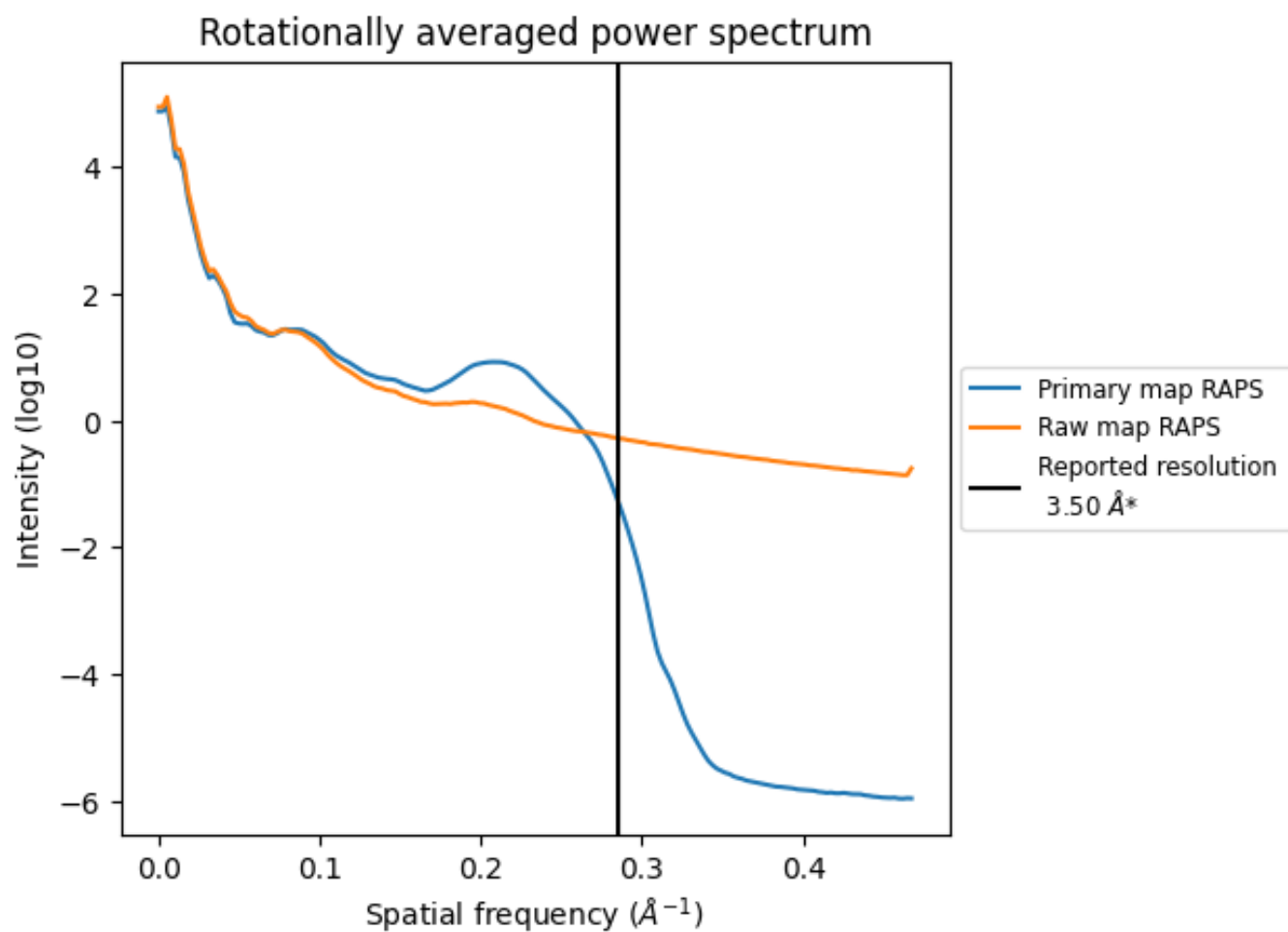
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 270 nm<sup>3</sup>; this corresponds to an approximate mass of 244 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



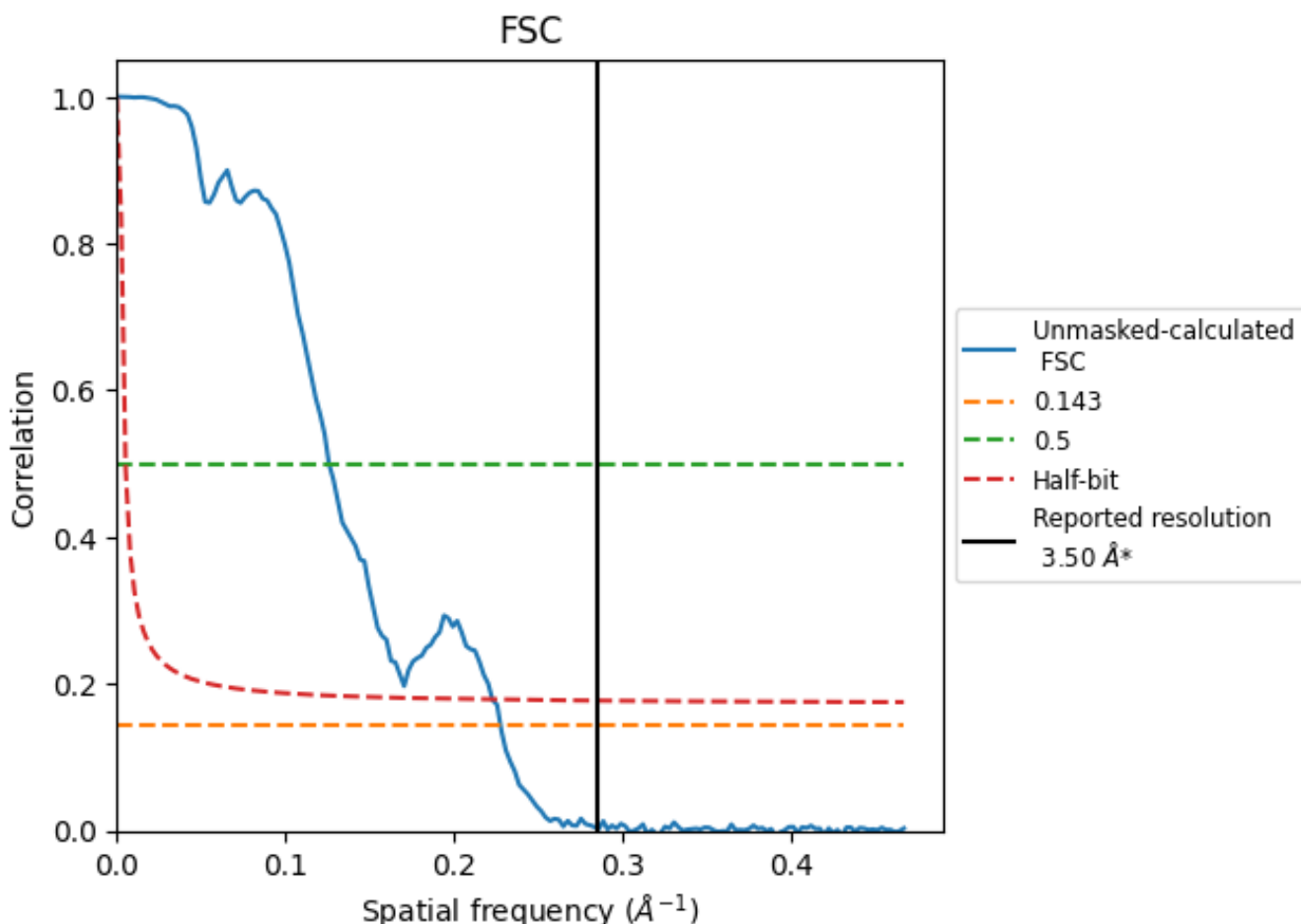
\*Reported resolution corresponds to spatial frequency of 0.286 Å<sup>-1</sup>



## 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  $0.286 \text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.50	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.39	7.94	4.48

\*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 4.39 differs from the reported value 3.5 by more than 10 %

## 9 Map-model fit

This section was not generated.