



## Full wwPDB EM Validation Report ⓘ

Dec 20, 2020 – 08:00 PM EST

PDB ID : 6VQH  
EMDB ID : EMD-21350  
Title : Mammalian V-ATPase from rat brain membrane-embedded Vo region rotational state 3 (from focused refinement)  
Authors : Abbas, Y.M.; Rubinstein, J.L.  
Deposited on : 2020-02-05  
Resolution : 4.40 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](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.

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

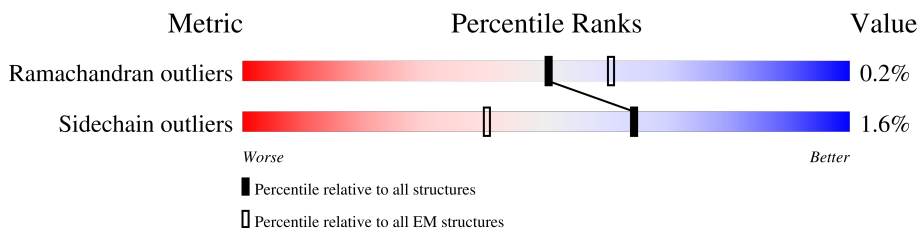
EMDB validation analysis : 0.0.0.dev61  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.16

# 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 4.40 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)
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	H	247	42% 58% 21%
2	L	119	91% 8% 21%
3	a	838	53% 47% 30%
4	b	205	99% 25%
5	c	463	91% 9%
6	d	351	99% 24%
7	e	81	96% 65%
8	f	98	86% 14% 64%
9	g	155	96% 21%

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Mol	Chain	Length	Quality of chain
9	h	155	<p>19% 95%</p>
9	i	155	<p>23% 94%</p>
9	j	155	<p>21% 95%</p>
9	k	155	<p>25% 95%</p>
9	l	155	<p>22% 95%</p>
9	m	155	<p>25% 94%</p>
9	n	155	<p>21% 95%</p>
9	o	155	<p>30% 94%</p>
10	p	350	<p>15% 85%</p>

## 2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 19338 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 ATPase H<sup>+</sup>-transporting V1 subunit D.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	H	104	803	509	138	153	3	0	0

- Molecule 2 is a protein called V-type proton ATPase subunit F.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	L	110	875	553	157	163	2	0	0

- Molecule 3 is a protein called V-type proton ATPase 116 kDa subunit a isoform 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
3	a	441	2173	1291	441	441	0	0

- Molecule 4 is a protein called ATPase, H<sup>+</sup> transporting, V0 subunit B (Predicted), isoform CRA\_a.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	b	203	1503	996	237	259	11	0	0

- Molecule 5 is a protein called V-type proton ATPase subunit S1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	c	41	337	228	51	54	4	0	0

- Molecule 6 is a protein called V-type proton ATPase subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	d	350	2833	1829	460	530	14	0	0

- Molecule 7 is a protein called V-type proton ATPase subunit e 2.

Mol	Chain	Residues	Atoms				AltConf	Trace
7	e	78	Total	C	N	O	0	0
			384	228	78	78		

- Molecule 8 is a protein called Ribonuclease K.

Mol	Chain	Residues	Atoms				AltConf	Trace
8	f	84	Total	C	N	O	0	0
			412	244	84	84		

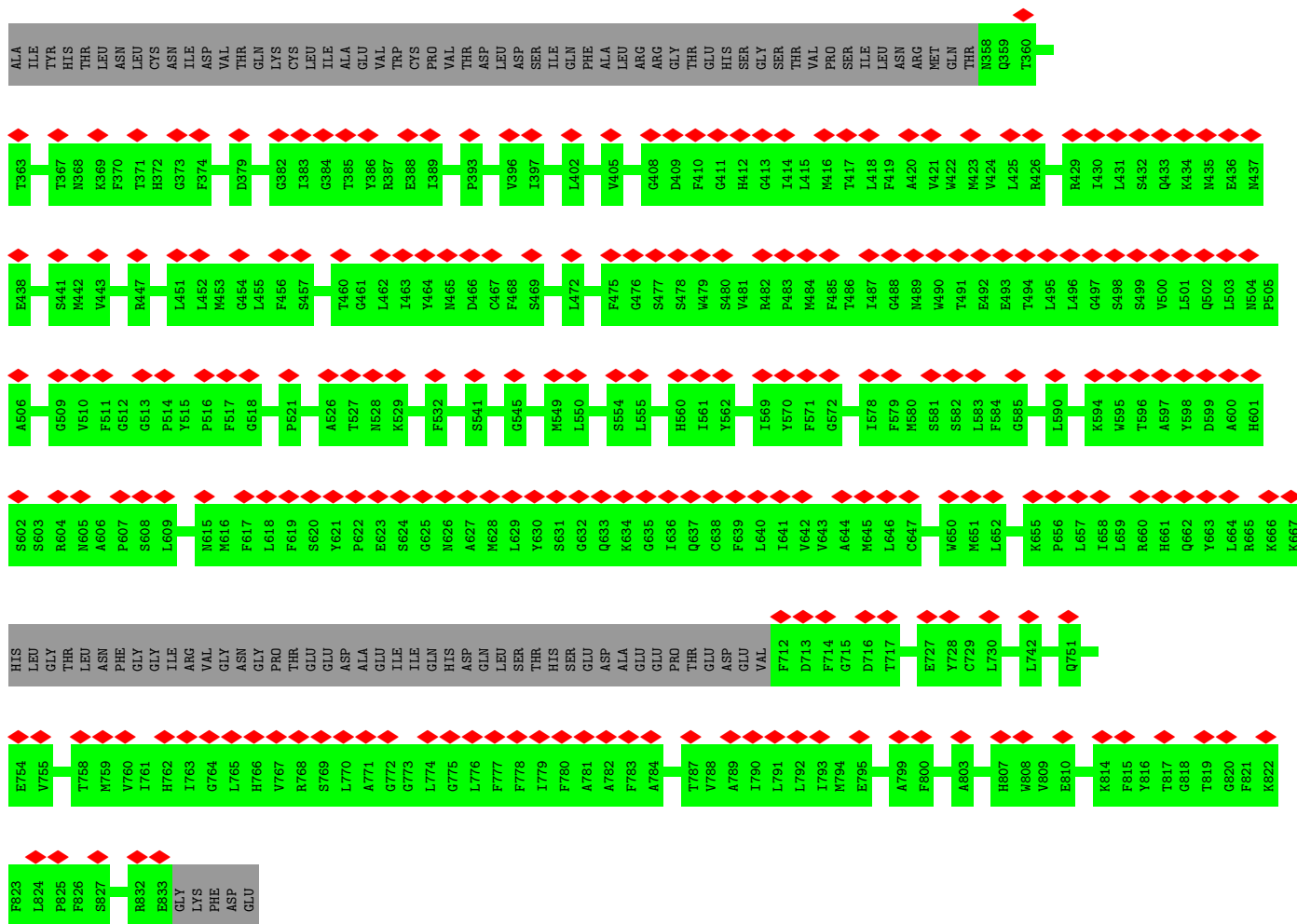
- Molecule 9 is a protein called V-type proton ATPase 16 kDa proteolipid subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	g	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	h	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	i	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	j	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	k	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	l	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	m	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	n	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		
9	o	150	Total	C	N	O	S	0	0
			1068	699	171	190	8		

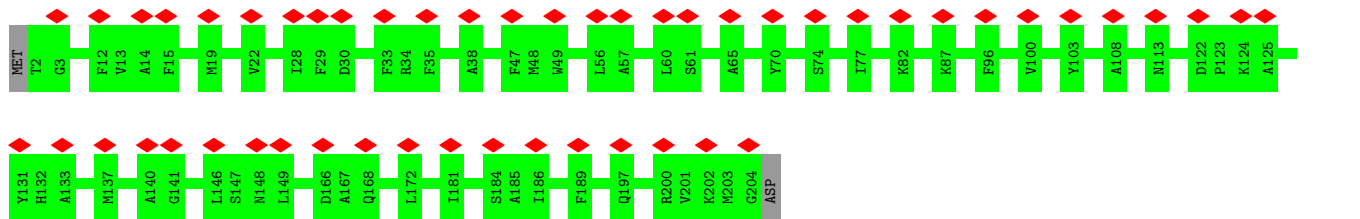
- Molecule 10 is a protein called Renin receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	p	52	Total	C	N	O	S	0	0
			406	269	61	73	3		

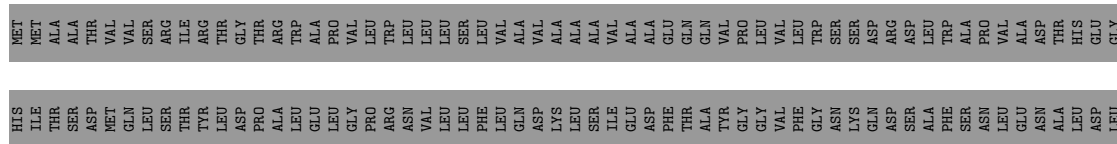




• Molecule 4: ATPase, H+ transporting, V0 subunit B (Predicted), isoform CRA\_a

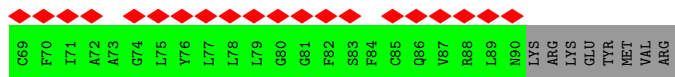


• Molecule 5: V-type proton ATPase subunit S1

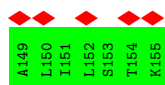
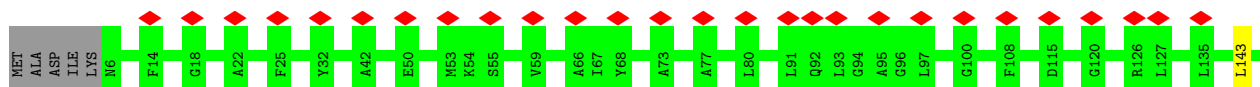




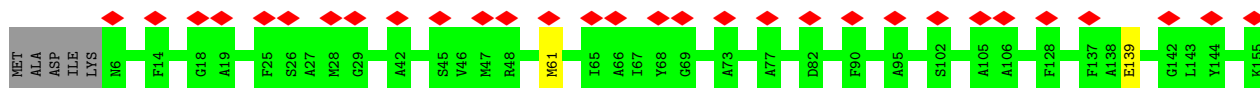




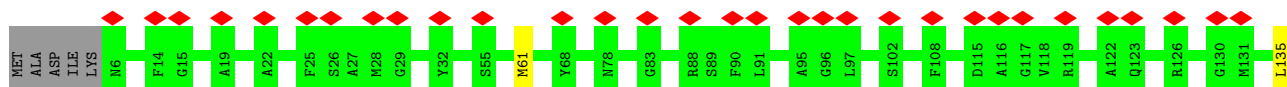
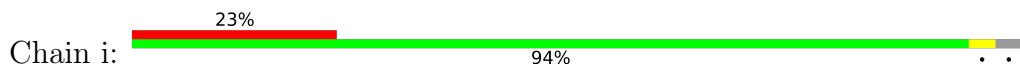
- Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit



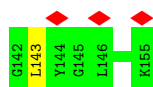
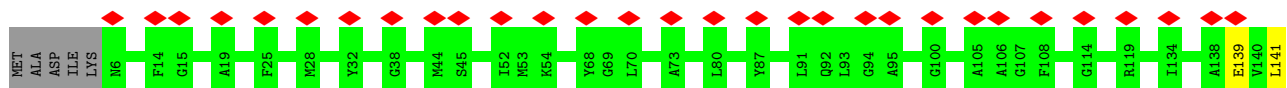
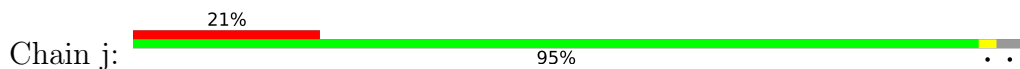
- Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit



- Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit

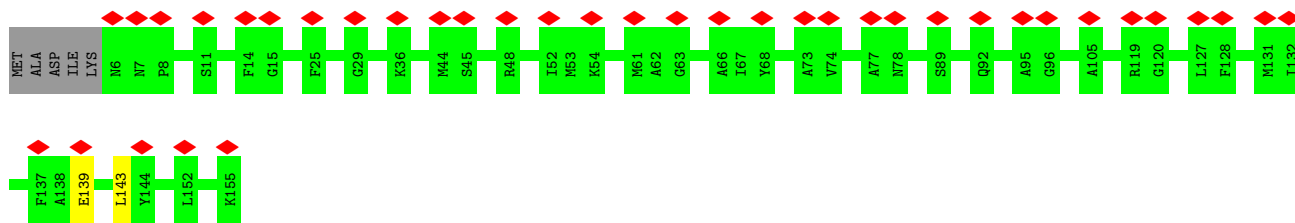


- Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit

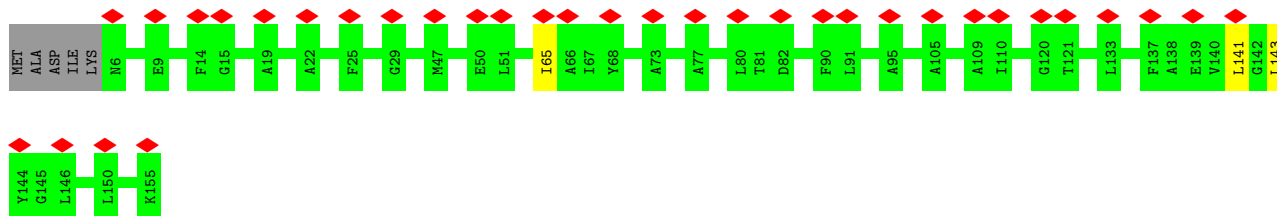


- Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit

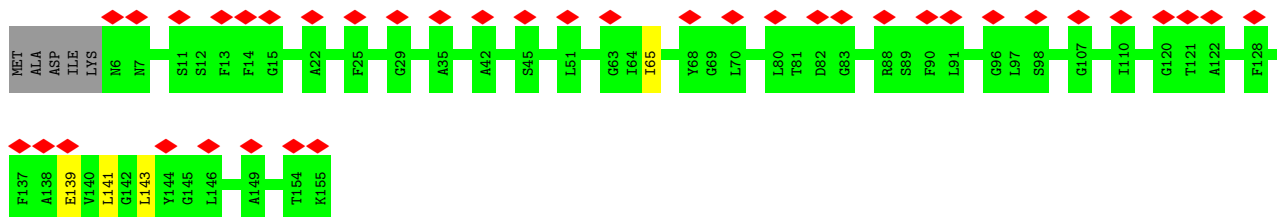




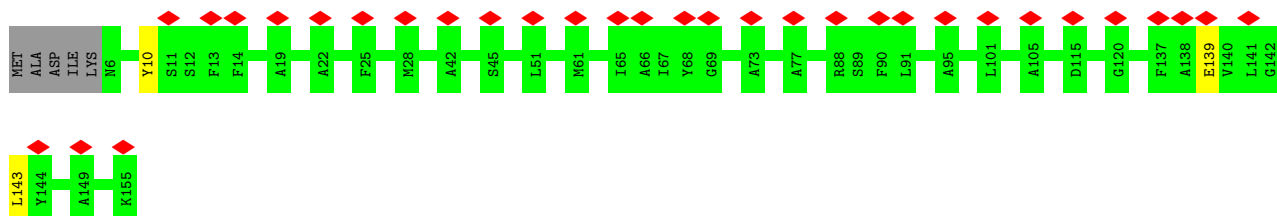
• Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit



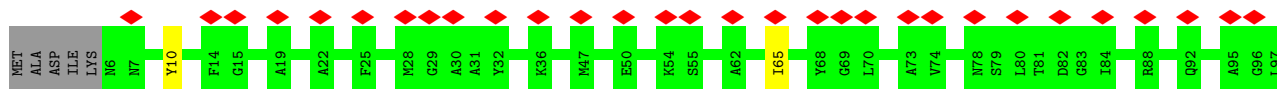
• Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit



• Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit



• Molecule 9: V-type proton ATPase 16 kDa proteolipid subunit





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	79654	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 ( $e^-/\text{\AA}^2$ )	43	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	2.081	Depositor
Minimum map value	-0.649	Depositor
Average map value	-0.002	Depositor
Map value standard deviation	0.056	Depositor
Recommended contour level	0.5	Depositor
Map size (Å)	360.4, 360.4, 360.4	wwPDB
Map dimensions	340, 340, 340	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.06, 1.06, 1.06	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	H	0.83	0/812	0.63	0/1091
2	L	0.81	0/889	0.75	0/1199
3	a	0.30	0/2170	0.46	0/3014
4	b	0.52	0/1537	0.51	0/2088
5	c	0.53	0/347	0.56	0/466
6	d	0.73	0/2899	0.54	0/3927
7	e	0.28	0/383	0.45	0/531
8	f	0.35	0/410	0.48	0/566
9	g	0.50	0/1083	0.54	0/1466
9	h	0.49	0/1083	0.52	0/1466
9	i	0.49	0/1083	0.51	0/1466
9	j	0.47	0/1083	0.50	0/1466
9	k	0.49	0/1083	0.52	0/1466
9	l	0.48	0/1083	0.51	0/1466
9	m	0.51	0/1083	0.57	0/1466
9	n	0.47	0/1083	0.50	0/1466
9	o	0.49	0/1083	0.51	0/1466
10	p	0.50	0/416	0.57	0/571
All	All	0.55	0/19610	0.53	0/26647

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](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 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	H	102/247 (41%)	97 (95%)	5 (5%)	0	100	100
2	L	108/119 (91%)	101 (94%)	5 (5%)	2 (2%)	8	41
3	a	435/838 (52%)	426 (98%)	9 (2%)	0	100	100
4	b	201/205 (98%)	198 (98%)	3 (2%)	0	100	100
5	c	39/463 (8%)	39 (100%)	0	0	100	100
6	d	348/351 (99%)	329 (94%)	18 (5%)	1 (0%)	41	76
7	e	76/81 (94%)	75 (99%)	1 (1%)	0	100	100
8	f	80/98 (82%)	77 (96%)	3 (4%)	0	100	100
9	g	148/155 (96%)	146 (99%)	2 (1%)	0	100	100
9	h	148/155 (96%)	145 (98%)	3 (2%)	0	100	100
9	i	148/155 (96%)	145 (98%)	3 (2%)	0	100	100
9	j	148/155 (96%)	146 (99%)	2 (1%)	0	100	100
9	k	148/155 (96%)	145 (98%)	3 (2%)	0	100	100
9	l	148/155 (96%)	145 (98%)	3 (2%)	0	100	100
9	m	148/155 (96%)	145 (98%)	3 (2%)	0	100	100
9	n	148/155 (96%)	145 (98%)	2 (1%)	1 (1%)	22	62
9	o	148/155 (96%)	143 (97%)	4 (3%)	1 (1%)	22	62
10	p	50/350 (14%)	46 (92%)	3 (6%)	1 (2%)	7	40
All	All	2771/4147 (67%)	2693 (97%)	72 (3%)	6 (0%)	50	81

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
10	p	300	ASN
9	n	10	TYR
9	o	10	TYR
2	L	100	ALA

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Mol	Chain	Res	Type
6	d	119	GLN
2	L	61	ILE

### 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	H	84/212 (40%)	84 (100%)	0	100	100
2	L	94/100 (94%)	94 (100%)	0	100	100
4	b	156/158 (99%)	156 (100%)	0	100	100
5	c	36/395 (9%)	35 (97%)	1 (3%)	43	65
6	d	305/306 (100%)	305 (100%)	0	100	100
9	g	109/113 (96%)	108 (99%)	1 (1%)	78	88
9	h	109/113 (96%)	107 (98%)	2 (2%)	59	77
9	i	109/113 (96%)	104 (95%)	5 (5%)	27	53
9	j	109/113 (96%)	106 (97%)	3 (3%)	43	65
9	k	109/113 (96%)	107 (98%)	2 (2%)	59	77
9	l	109/113 (96%)	106 (97%)	3 (3%)	43	65
9	m	109/113 (96%)	105 (96%)	4 (4%)	34	59
9	n	109/113 (96%)	107 (98%)	2 (2%)	59	77
9	o	109/113 (96%)	105 (96%)	4 (4%)	34	59
10	p	41/313 (13%)	41 (100%)	0	100	100
All	All	1697/2501 (68%)	1670 (98%)	27 (2%)	64	79

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	c	448	ARG
9	g	143	LEU
9	h	61	MET
9	h	139	GLU

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Mol	Chain	Res	Type
9	i	61	MET
9	i	135	LEU
9	i	139	GLU
9	i	141	LEU
9	i	143	LEU
9	j	139	GLU
9	j	141	LEU
9	j	143	LEU
9	k	139	GLU
9	k	143	LEU
9	l	65	ILE
9	l	141	LEU
9	l	143	LEU
9	m	65	ILE
9	m	139	GLU
9	m	141	LEU
9	m	143	LEU
9	n	139	GLU
9	n	143	LEU
9	o	65	ILE
9	o	139	GLU
9	o	141	LEU
9	o	143	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	137	ASN
6	d	297	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.

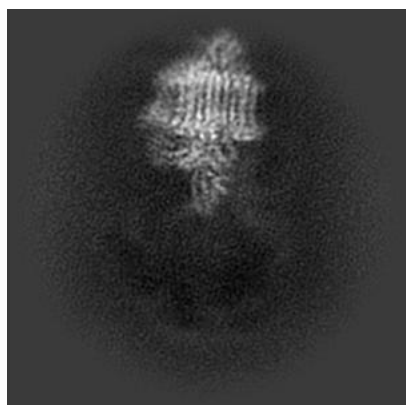
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-21350. These allow visual inspection of the internal detail of the map and identification of artifacts.

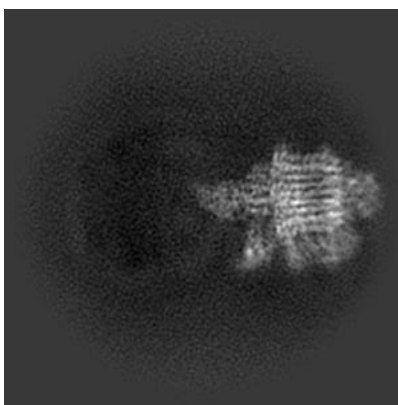
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

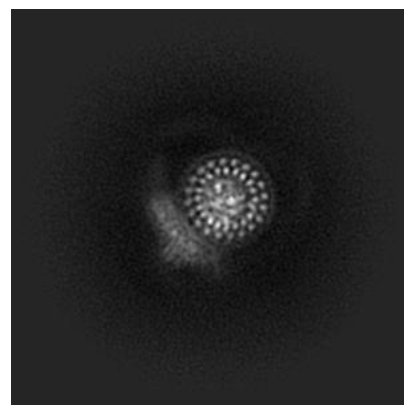
#### 6.1.1 Primary map



X



Y

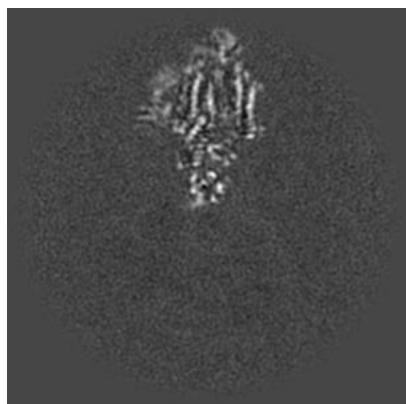


Z

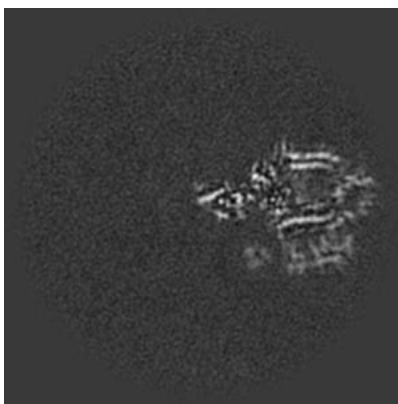
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

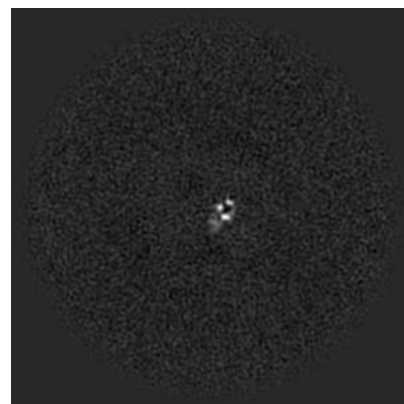
#### 6.2.1 Primary map



X Index: 170



Y Index: 170

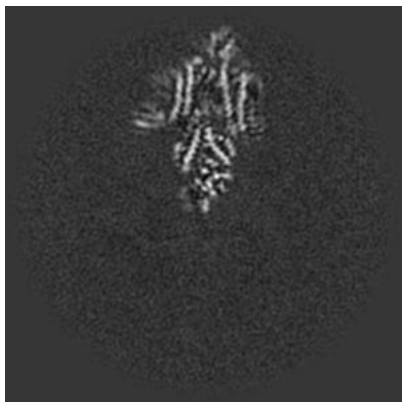


Z Index: 170

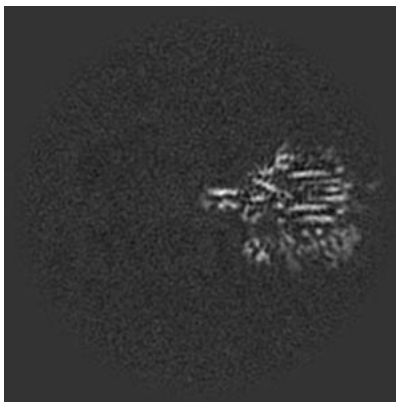
The images above show central slices of the map in three orthogonal directions.

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

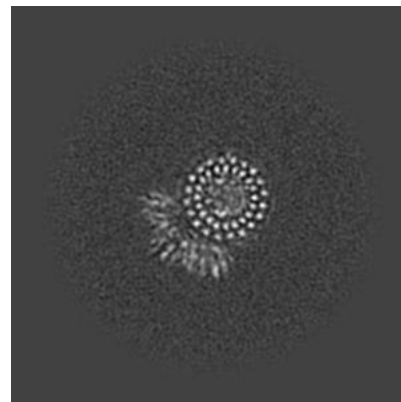
### 6.3.1 Primary map



X Index: 176



Y Index: 158

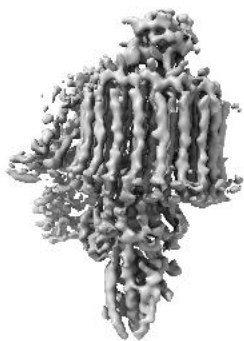


Z Index: 248

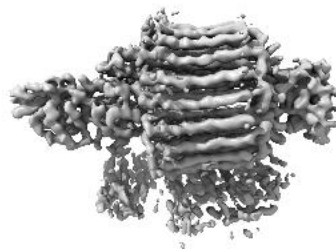
The images above show the largest variance slices of the map in three orthogonal directions.

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

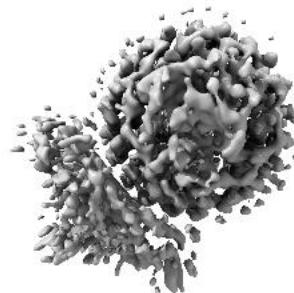
### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.5. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

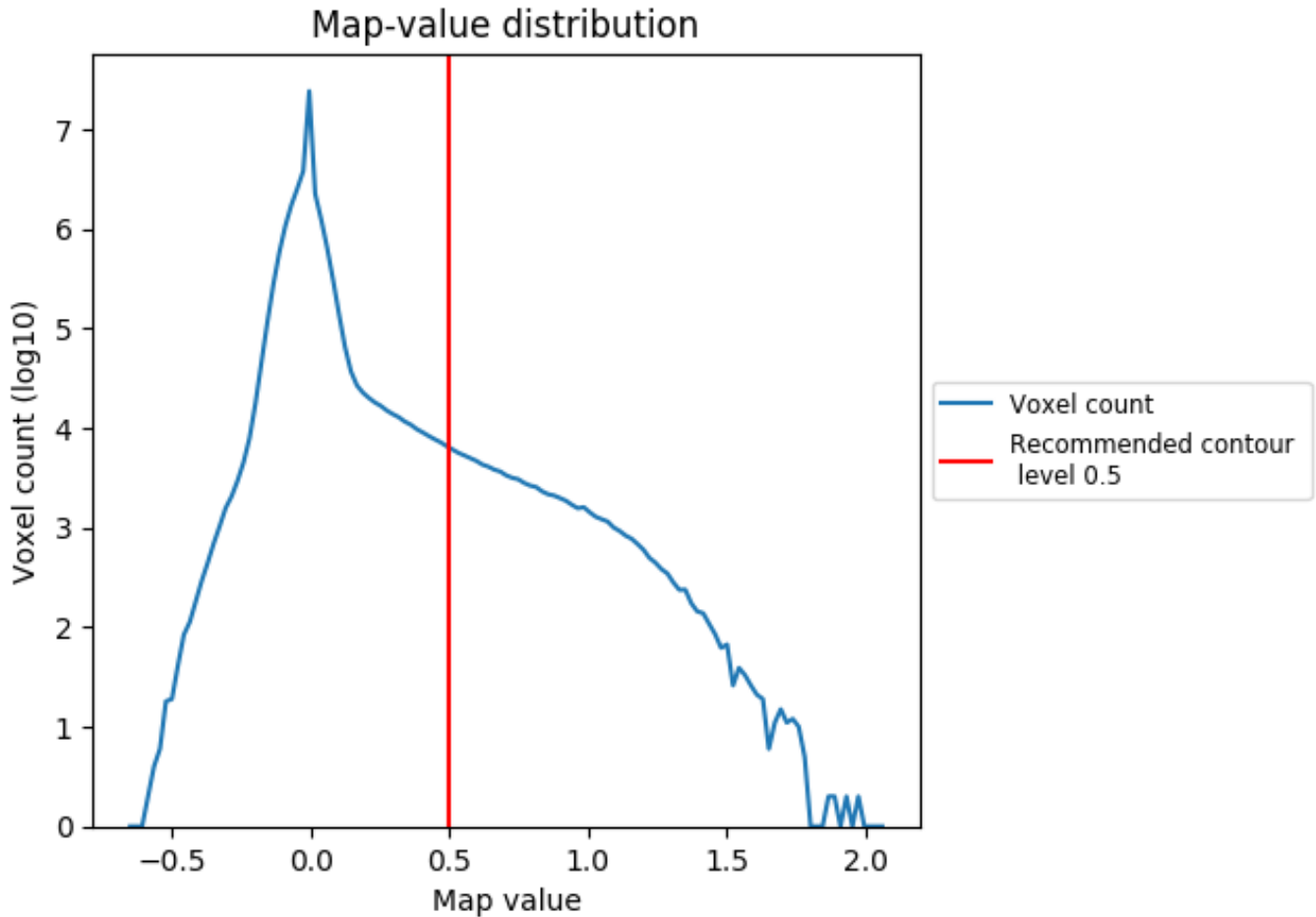
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

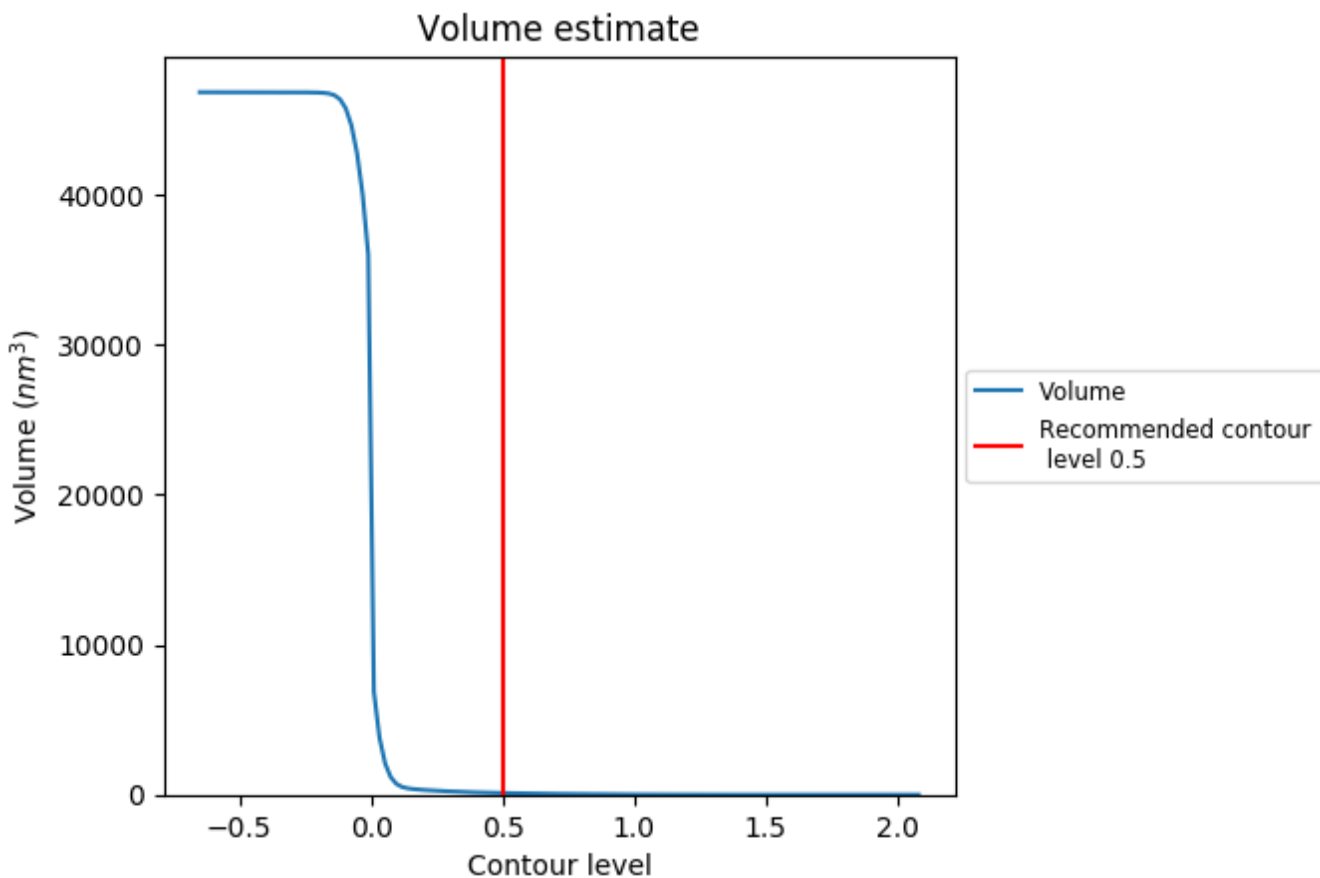
This section contains the results of statistical analysis of the map.

### 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.

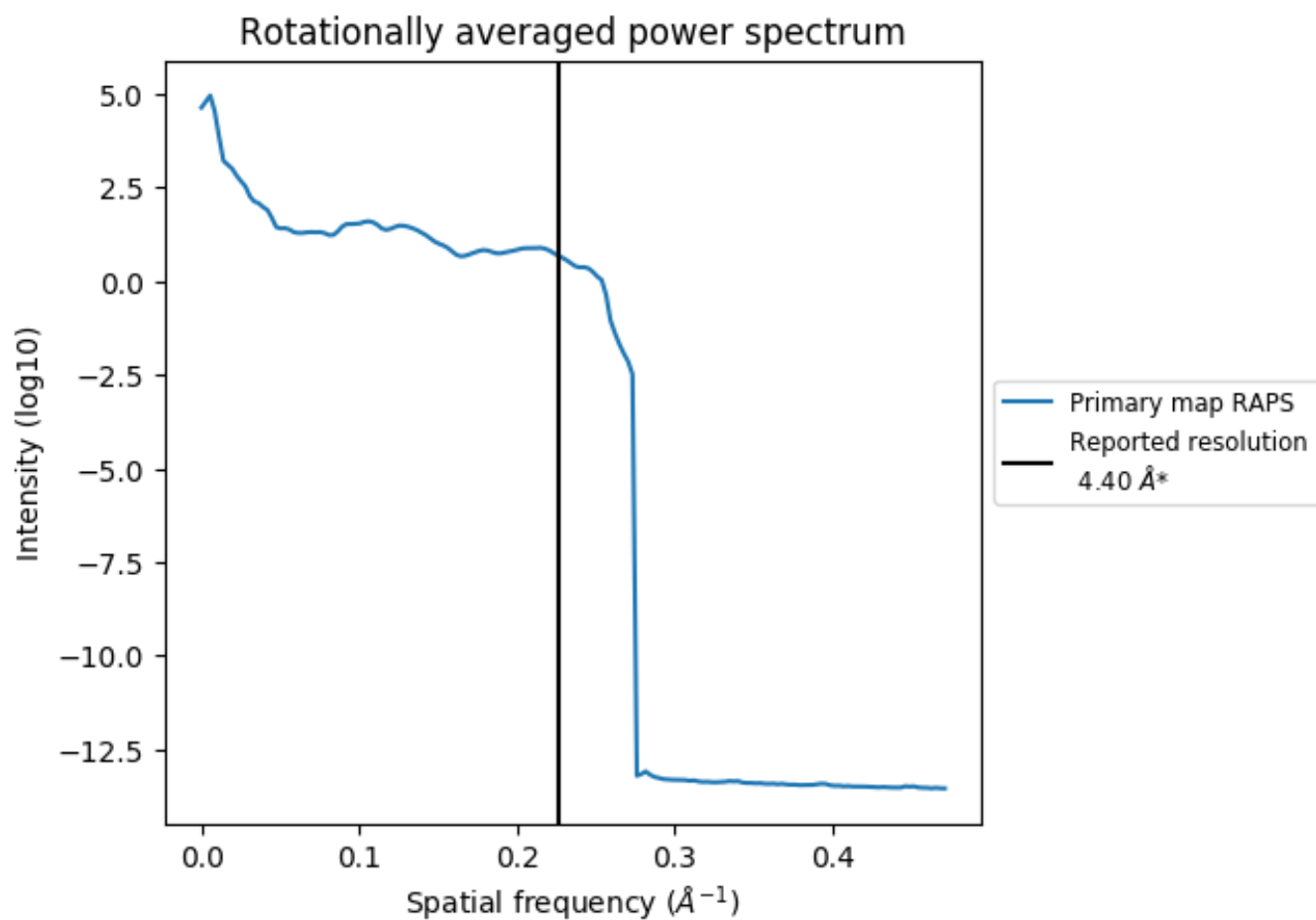
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 110 nm<sup>3</sup>; this corresponds to an approximate mass of 99 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 0.227 Å<sup>-1</sup>

## 8 Fourier-Shell correlation

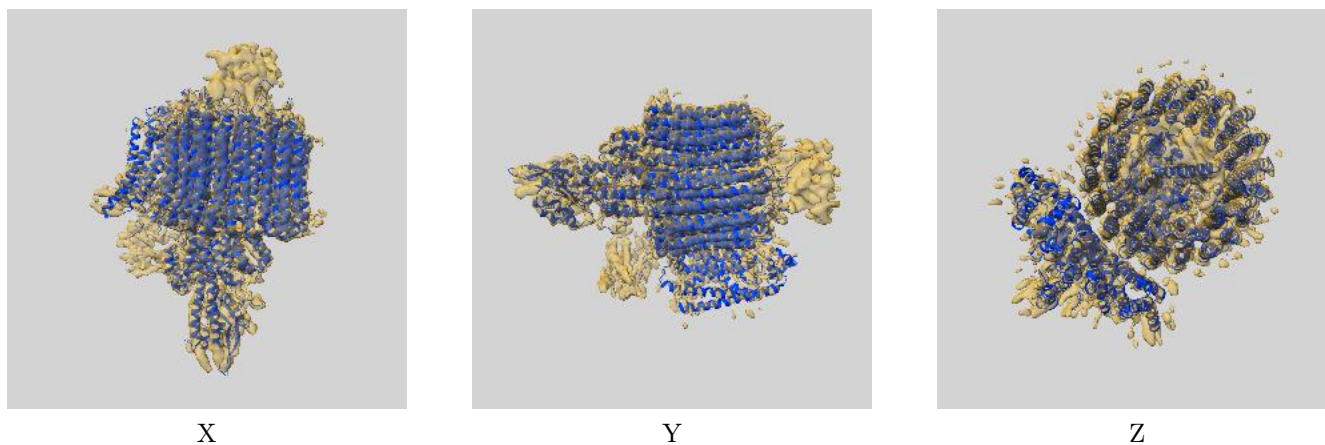
This section was not generated. No FSC curve or half-maps provided.



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

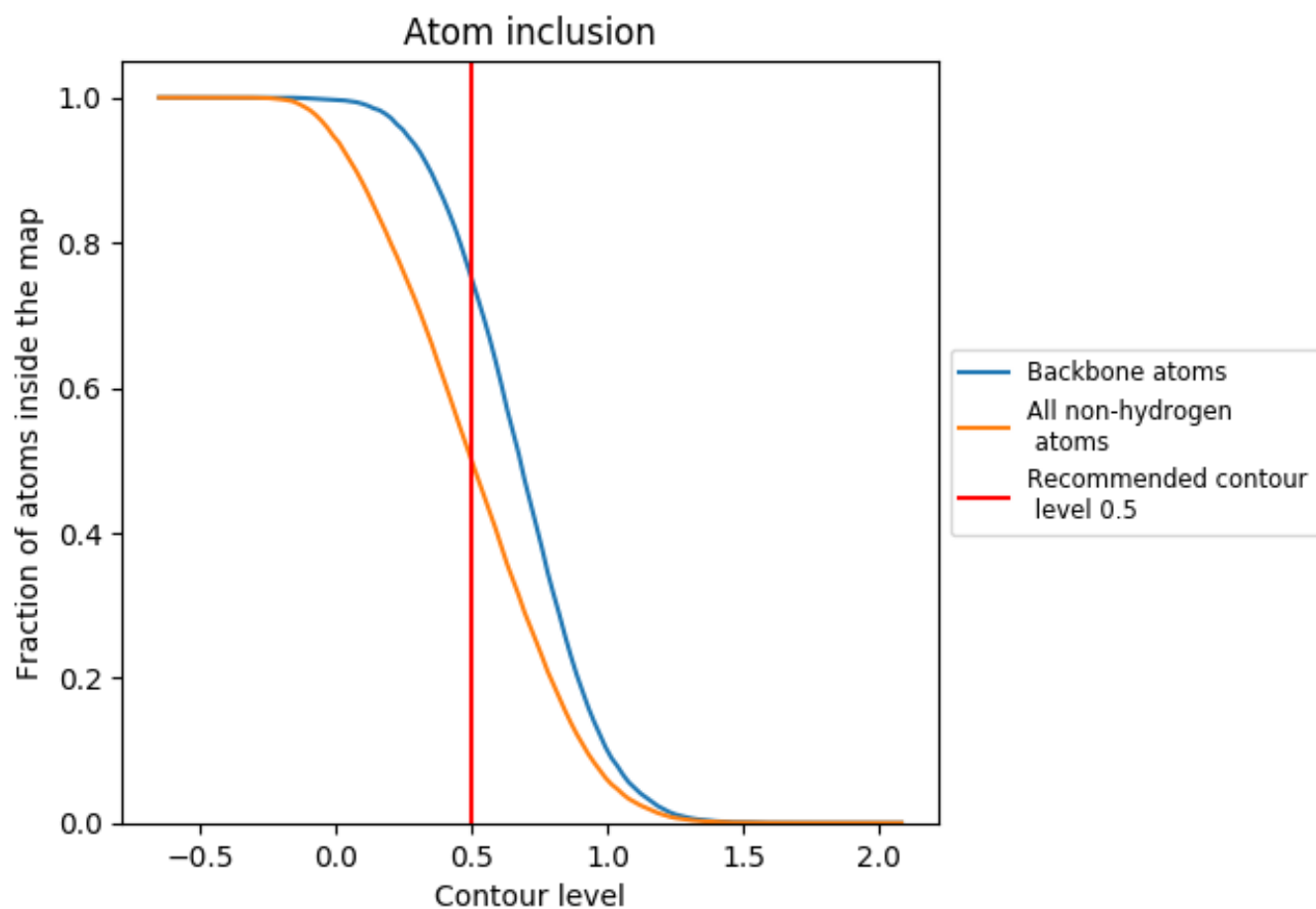
This section contains information regarding the fit between EMDB map EMD-21350 and PDB model 6VQH. Per-residue inclusion information can be found in section 3 on page 6.

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



The images above show the 3D surface view of the map at the recommended contour level 0.5 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 Atom inclusion [i](#)



At the recommended contour level, 75% of all backbone atoms, 50% of all non-hydrogen atoms, are inside the map.