



## wwPDB EM Validation Summary Report ⓘ

Oct 13, 2024 – 05:37 pm BST

PDB ID : 7NIE  
EMDB ID : EMD-12357  
Title : putative glycerol kinase-like proteins anchored on an array of voltage dependent anion channels in the outer mitochondrial membrane of pig sperm mitochondria  
Authors : Leung, M.R.; Zeev-Ben-Mordehai, T.  
Deposited on : 2021-02-12  
Resolution : 35.00 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  
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

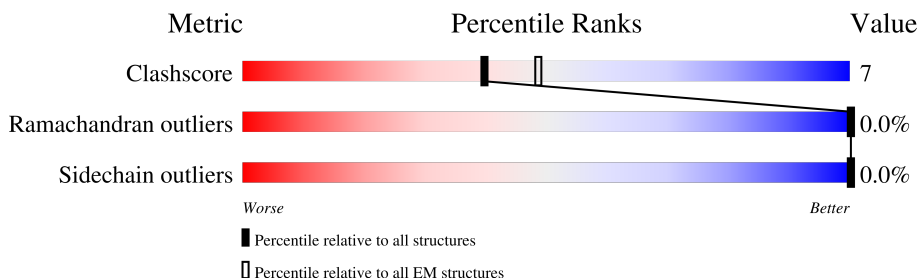
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 35.00 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  $\leq 5\%$ . 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	487	<div> <div>8%</div> <div>94%</div> <div>6%</div> </div>
1	B	487	<div> <div>10%</div> <div>93%</div> <div>6%</div> </div>
1	O	487	<div> <div>9%</div> <div>94%</div> <div>6%</div> </div>
1	P	487	<div> <div>10%</div> <div>93%</div> <div>6%</div> </div>
2	C	294	<div> <div>43%</div> <div>93%</div> <div>7%</div> </div>
2	D	294	<div> <div>47%</div> <div>93%</div> <div>6%</div> </div>
2	E	294	<div> <div>42%</div> <div>91%</div> <div>9%</div> </div>
2	F	294	<div> <div>58%</div> <div>92%</div> <div>7%</div> </div>

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Mol	Chain	Length	Quality of chain
2	G	294	<div><div>46%</div><div>96%</div><div>.</div></div>
2	H	294	<div><div>41%</div><div>94%</div><div>6%</div></div>
2	I	294	<div><div>38%</div><div>96%</div><div>.</div></div>
2	J	294	<div><div>45%</div><div>97%</div><div>.</div></div>
2	K	294	<div><div>35%</div><div>91%</div><div>9%</div></div>
2	L	294	<div><div>60%</div><div>93%</div><div>7%</div></div>
2	M	294	<div><div>27%</div><div>97%</div><div>.</div></div>
2	N	294	<div><div>21%</div><div>96%</div><div>.</div></div>

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 56808 atoms, of which 15136 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 Glycerol kinase.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	487	Total	C	H	N	O	S	0	0
			7539	2392	3784	634	703	26		
1	B	487	Total	C	H	N	O	S	0	0
			7539	2392	3784	634	703	26		
1	O	487	Total	C	H	N	O	S	0	0
			7539	2392	3784	634	703	26		
1	P	487	Total	C	H	N	O	S	0	0
			7539	2392	3784	634	703	26		

- Molecule 2 is a protein called Voltage-dependent anion-selective channel protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	D	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	E	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	F	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	G	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	H	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	I	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	J	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	K	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	L	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		
2	M	294	Total	C	N	O	S	0	0
			2221	1397	371	441	12		

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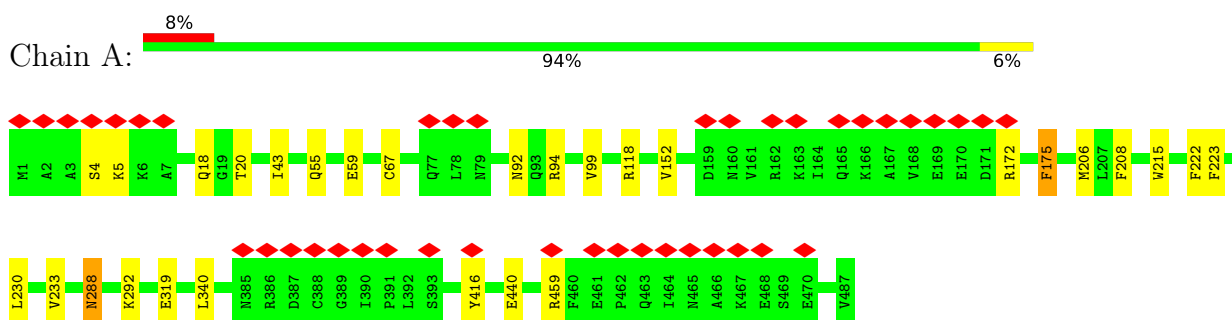
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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	N	294	2221	1397	371	441	12	0	0

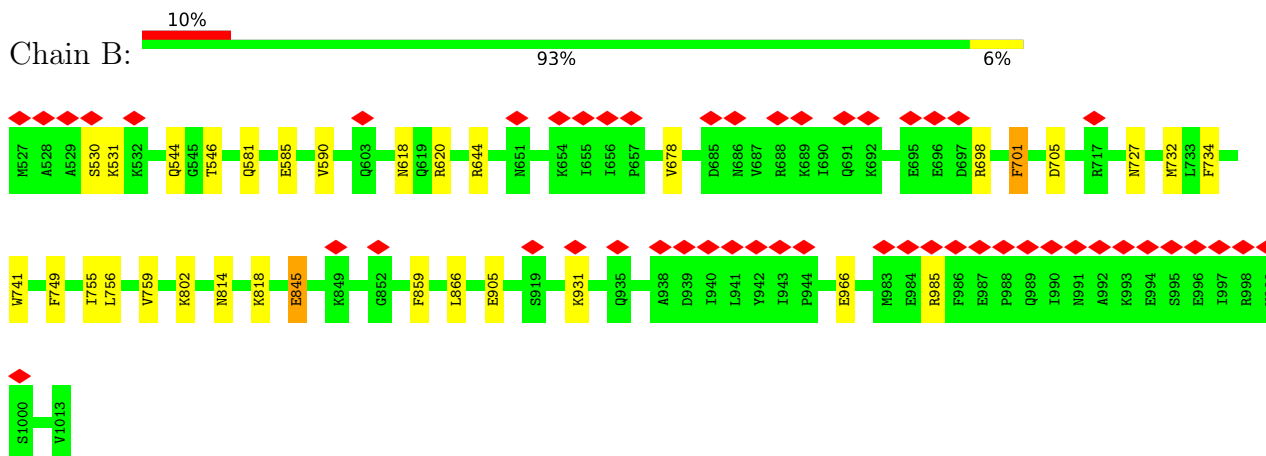
### 3 Residue-property plots [i](#)

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 and atom inclusion in map density. 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. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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.

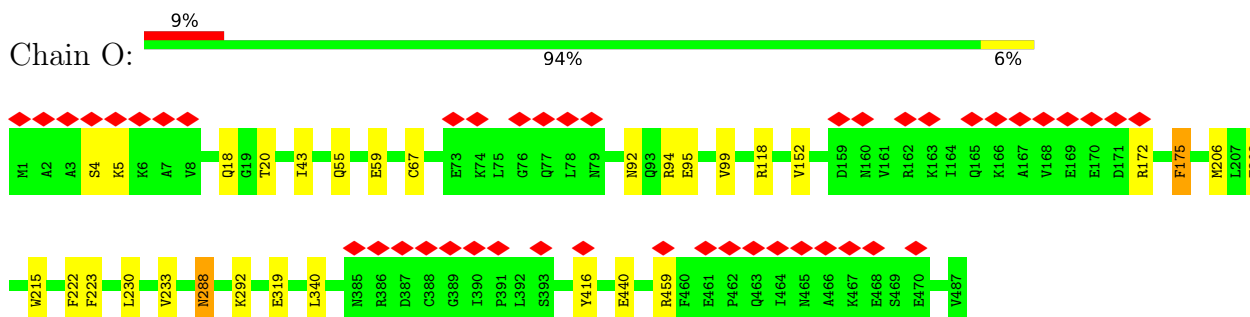
- Molecule 1: Glycerol kinase



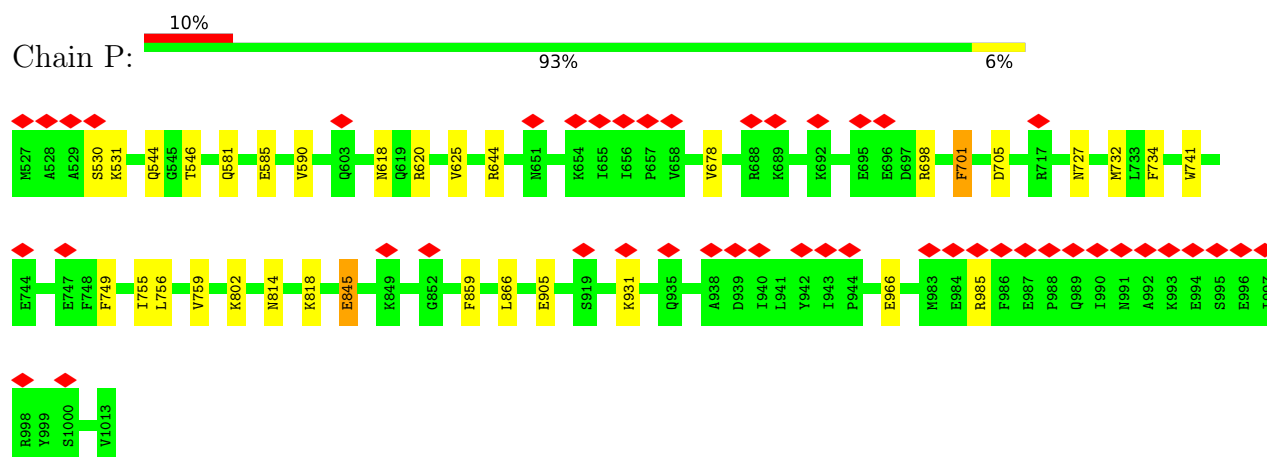
- Molecule 1: Glycerol kinase



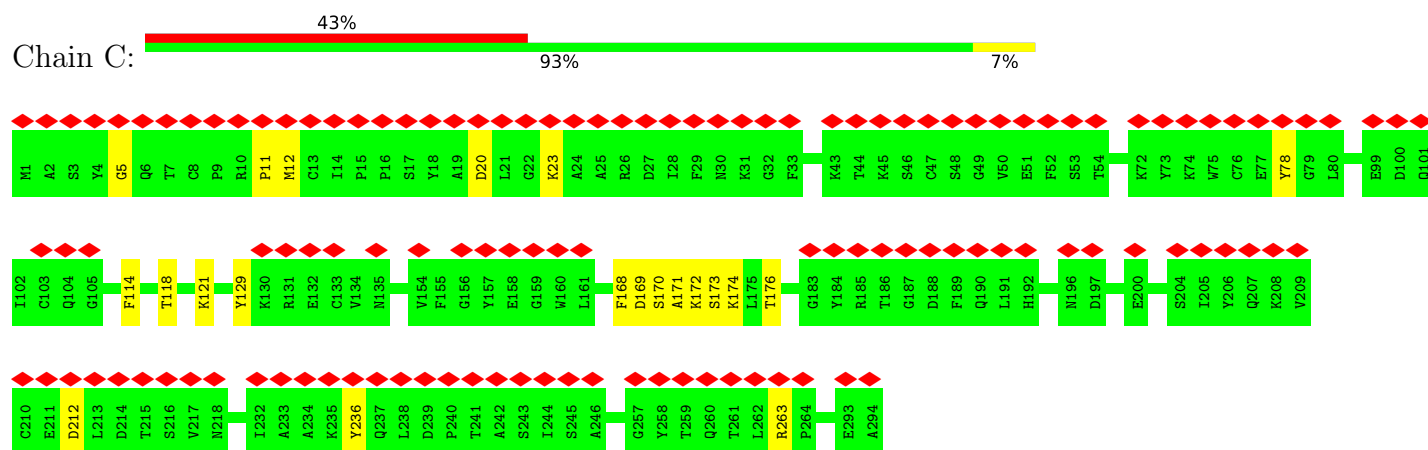
- Molecule 1: Glycerol kinase



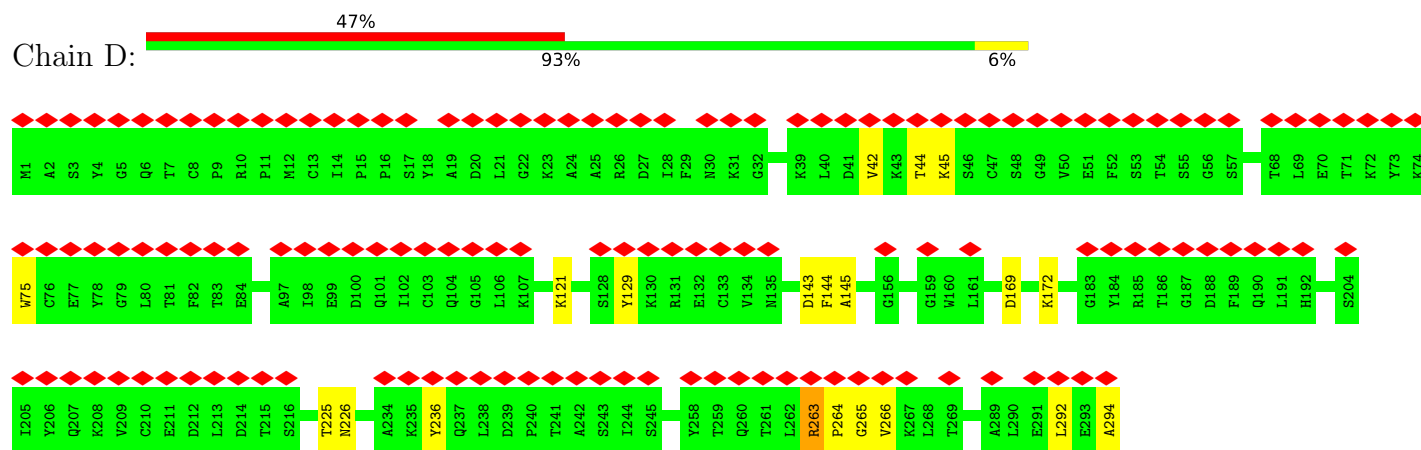
- Molecule 1: Glycerol kinase



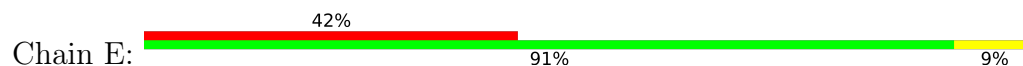
- Molecule 2: Voltage-dependent anion-selective channel protein 2

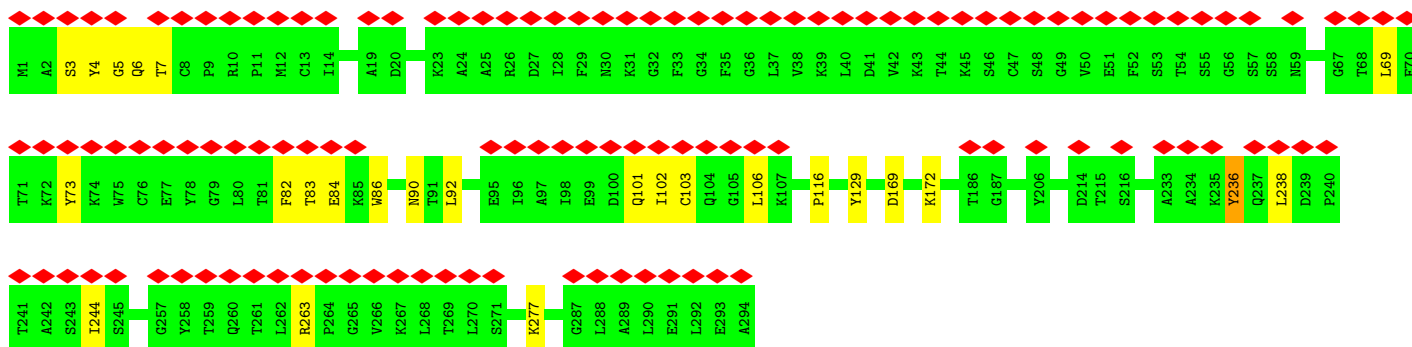


- Molecule 2: Voltage-dependent anion-selective channel protein 2

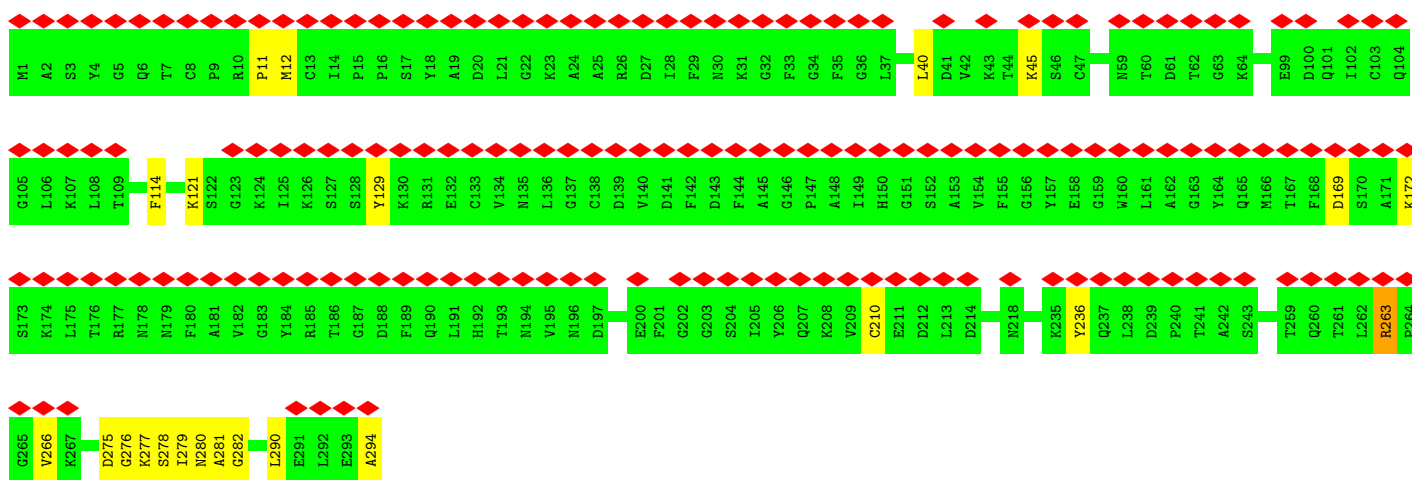


- Molecule 2: Voltage-dependent anion-selective channel protein 2

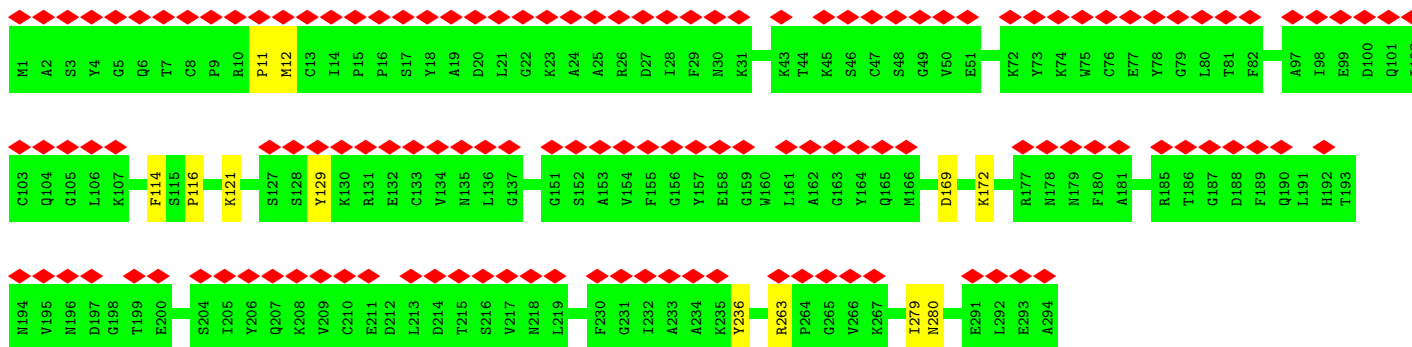




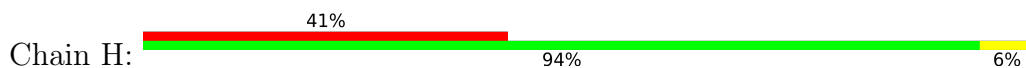
• Molecule 2: Voltage-dependent anion-selective channel protein 2

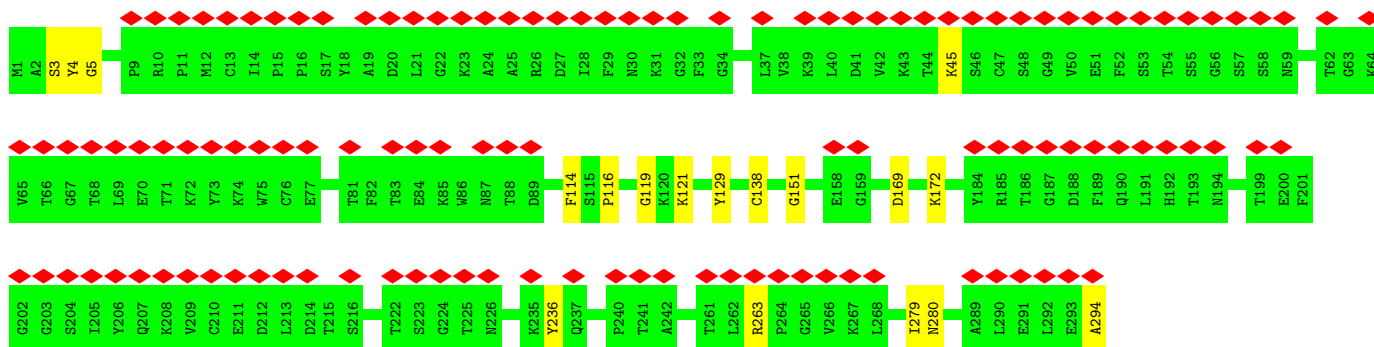


• Molecule 2: Voltage-dependent anion-selective channel protein 2



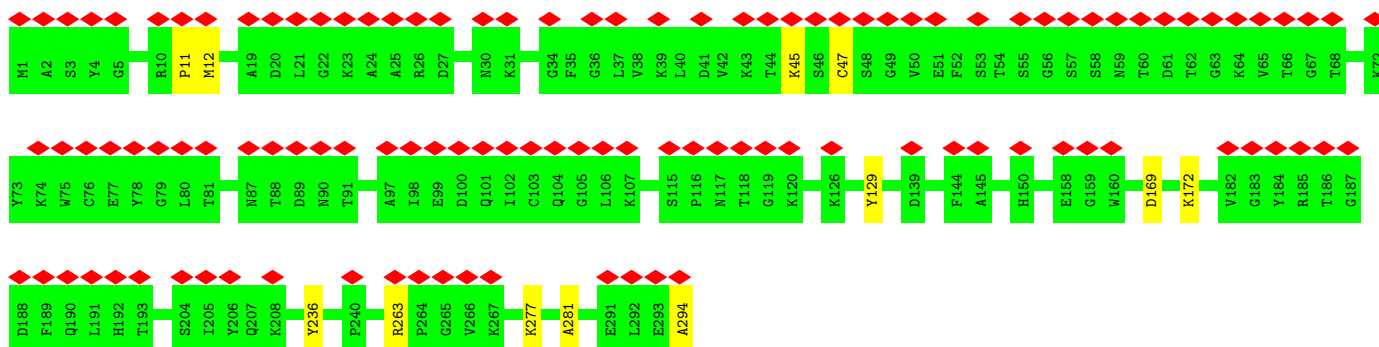
• Molecule 2: Voltage-dependent anion-selective channel protein 2





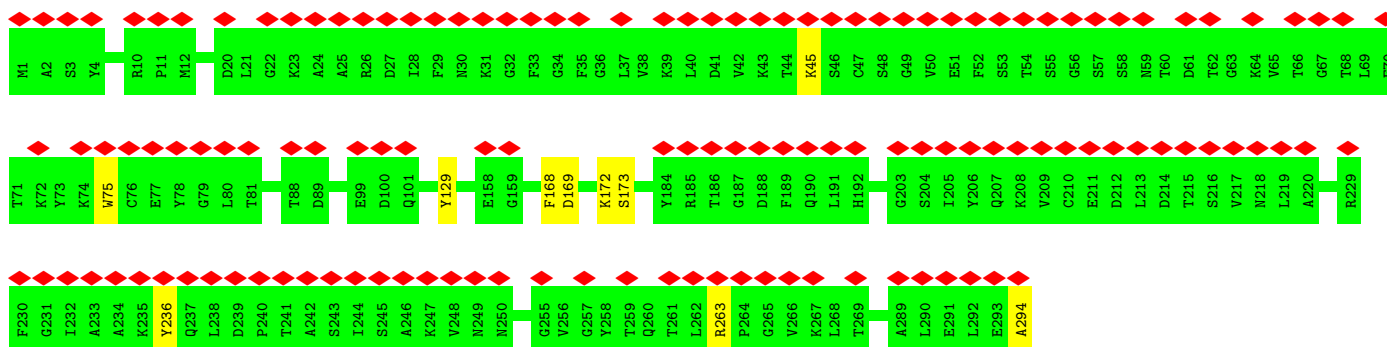
• Molecule 2: Voltage-dependent anion-selective channel protein 2

Chain I: 38% 96%



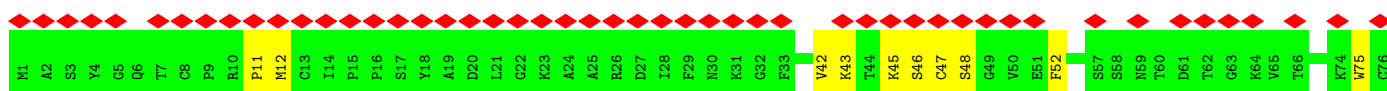
• Molecule 2: Voltage-dependent anion-selective channel protein 2

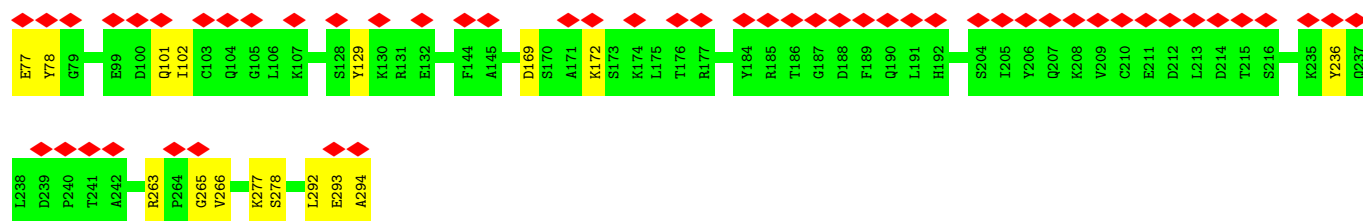
Chain J: 45% 97%



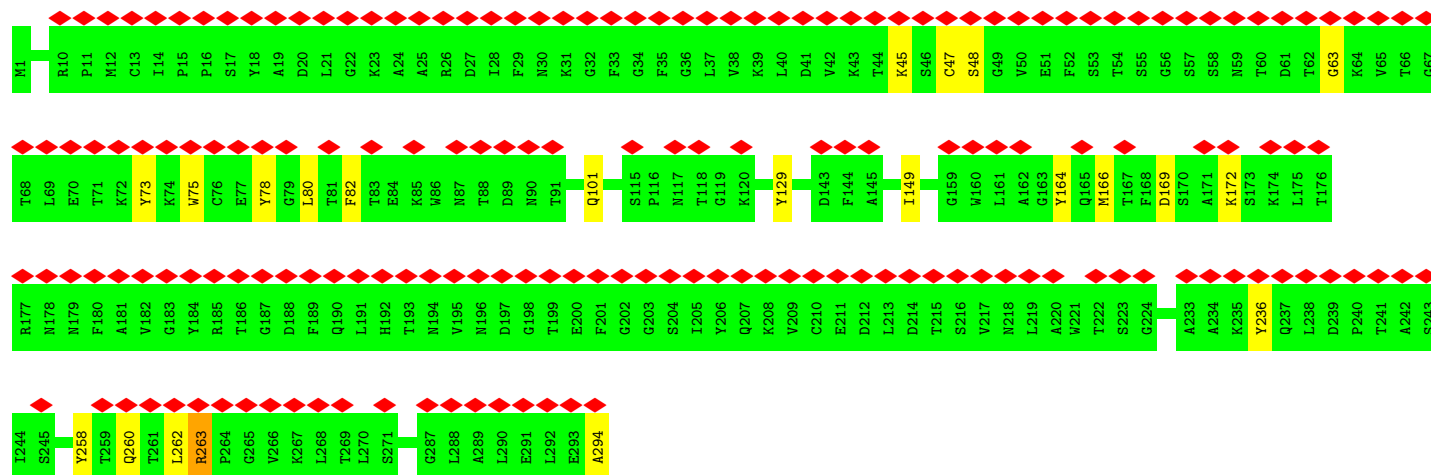
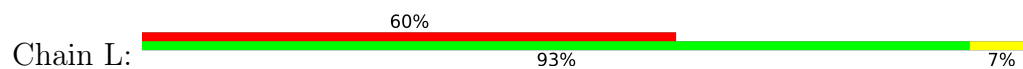
• Molecule 2: Voltage-dependent anion-selective channel protein 2

Chain K: 35% 91% 9%

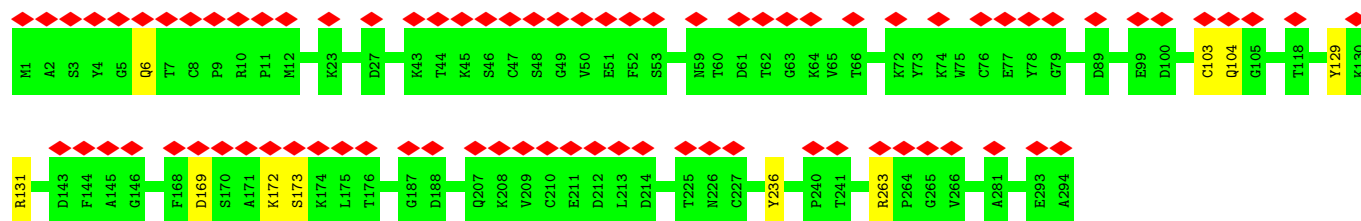




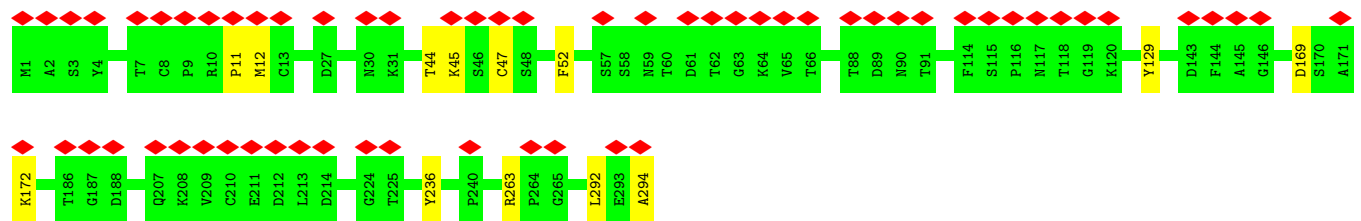
• Molecule 2: Voltage-dependent anion-selective channel protein 2



• Molecule 2: Voltage-dependent anion-selective channel protein 2



• Molecule 2: Voltage-dependent anion-selective channel protein 2



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SUBTOMOGRAM AVERAGING	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of subtomograms used	536	Depositor
Resolution determination method	FSC 0.5 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	1.3	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	0.848	Depositor
Minimum map value	-0.625	Depositor
Average map value	-0.116	Depositor
Map value standard deviation	0.152	Depositor
Recommended contour level	0.01	Depositor
Map size ( $\text{\AA}$ )	347.2, 173.6, 173.6	wwPDB
Map dimensions	80, 40, 40	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	4.34, 4.34, 4.34	Depositor

## 5 Model quality

### 5.1 Standard geometry

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	1.02	12/3831 (0.3%)	0.92	11/5193 (0.2%)
1	B	0.98	11/3831 (0.3%)	0.92	10/5193 (0.2%)
1	O	1.02	13/3831 (0.3%)	0.92	11/5193 (0.2%)
1	P	0.98	11/3831 (0.3%)	0.92	10/5193 (0.2%)
2	C	0.80	0/2265	0.85	3/3061 (0.1%)
2	D	0.80	0/2265	0.85	3/3061 (0.1%)
2	E	0.79	0/2265	0.85	3/3061 (0.1%)
2	F	0.80	0/2265	0.85	3/3061 (0.1%)
2	G	0.80	0/2265	0.85	3/3061 (0.1%)
2	H	0.79	0/2265	0.85	3/3061 (0.1%)
2	I	0.80	0/2265	0.85	3/3061 (0.1%)
2	J	0.80	0/2265	0.85	3/3061 (0.1%)
2	K	0.80	0/2265	0.85	3/3061 (0.1%)
2	L	0.80	0/2265	0.85	3/3061 (0.1%)
2	M	0.79	0/2265	0.85	3/3061 (0.1%)
2	N	0.80	0/2265	0.85	3/3061 (0.1%)
All	All	0.87	47/42504 (0.1%)	0.87	78/57504 (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	A	0	3
1	B	0	1
1	O	0	3
1	P	0	1
All	All	0	8

The worst 5 of 47 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	208	PHE	CB-CG	-9.40	1.35	1.51
1	O	208	PHE	CB-CG	-9.39	1.35	1.51
1	B	734	PHE	CB-CG	-9.15	1.35	1.51
1	P	734	PHE	CB-CG	-9.13	1.35	1.51
1	B	678	VAL	CB-CG1	-6.57	1.39	1.52

The worst 5 of 78 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	P	814	ASN	C-N-CA	11.47	150.38	121.70
1	B	814	ASN	C-N-CA	11.44	150.29	121.70
1	A	172	ARG	NE-CZ-NH2	-8.36	116.12	120.30
1	B	698	ARG	NE-CZ-NH2	-8.31	116.14	120.30
1	P	698	ARG	NE-CZ-NH2	-8.26	116.17	120.30

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	288	ASN	Mainchain,Peptide
1	A	292	LYS	Mainchain
1	B	818	LYS	Mainchain
1	O	288	ASN	Mainchain,Peptide
1	O	292	LYS	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	A	3755	3784	3784	5	0
1	B	3755	3784	3780	7	0
1	O	3755	3784	3784	5	0
1	P	3755	3784	3780	8	0
2	C	2221	0	2169	87	0
2	D	2221	0	2172	101	0
2	E	2221	0	2166	184	0
2	F	2221	0	2166	144	0
2	G	2221	0	2172	37	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	H	2221	0	2170	64	0
2	I	2221	0	2172	38	0
2	J	2221	0	2172	9	0
2	K	2221	0	2168	158	0
2	L	2221	0	2169	183	0
2	M	2221	0	2171	29	0
2	N	2221	0	2170	34	0
All	All	41672	15136	41165	574	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 7.

The worst 5 of 574 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)
2:K:42:VAL:HG12	2:L:75:TRP:CZ2	1.16	1.65
2:E:69:LEU:CD1	2:F:294:ALA:HB2	1.24	1.65
2:E:236:TYR:HE2	2:H:3:SER:CA	1.12	1.61
2:E:236:TYR:CE2	2:H:3:SER:HA	1.22	1.61
2:D:263:ARG:HB3	2:E:4:TYR:CB	1.15	1.60

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	485/487 (100%)	475 (98%)	9 (2%)	1 (0%)	44	78
1	B	485/487 (100%)	476 (98%)	9 (2%)	0	100	100
1	O	485/487 (100%)	475 (98%)	9 (2%)	1 (0%)	44	78
1	P	485/487 (100%)	476 (98%)	9 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	C	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	D	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	E	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	F	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	G	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	H	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	I	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	J	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	K	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	L	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	M	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
2	N	292/294 (99%)	287 (98%)	5 (2%)	0	100	100
All	All	5444/5476 (99%)	5346 (98%)	96 (2%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	288	ASN
1	O	288	ASN

### 5.3.2 Protein sidechains ⓘ

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	408/408 (100%)	408 (100%)	0	100	100
1	B	408/408 (100%)	407 (100%)	1 (0%)	92	94
1	O	408/408 (100%)	408 (100%)	0	100	100
1	P	408/408 (100%)	407 (100%)	1 (0%)	92	94
2	C	240/240 (100%)	240 (100%)	0	100	100
2	D	240/240 (100%)	240 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	E	240/240 (100%)	240 (100%)	0	100	100
2	F	240/240 (100%)	240 (100%)	0	100	100
2	G	240/240 (100%)	240 (100%)	0	100	100
2	H	240/240 (100%)	240 (100%)	0	100	100
2	I	240/240 (100%)	240 (100%)	0	100	100
2	J	240/240 (100%)	240 (100%)	0	100	100
2	K	240/240 (100%)	240 (100%)	0	100	100
2	L	240/240 (100%)	240 (100%)	0	100	100
2	M	240/240 (100%)	240 (100%)	0	100	100
2	N	240/240 (100%)	240 (100%)	0	100	100
All	All	4512/4512 (100%)	4510 (100%)	2 (0%)	100	100

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

Mol	Chain	Res	Type
1	B	802	LYS
1	P	802	LYS

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

Mol	Chain	Res	Type
2	E	90	ASN
2	L	101	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

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.

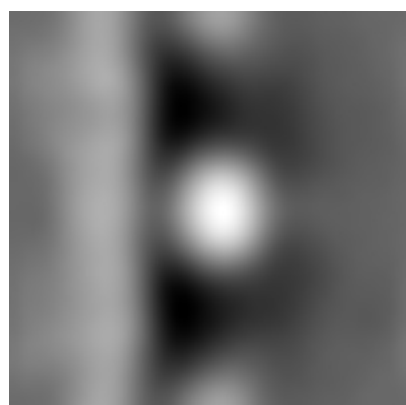
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12357. These allow visual inspection of the internal detail of the map and identification of artifacts.

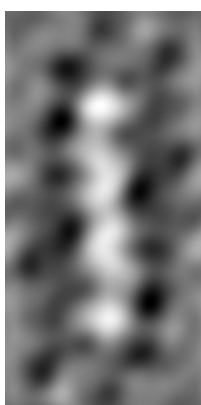
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

#### 6.1.1 Primary map



X



Y

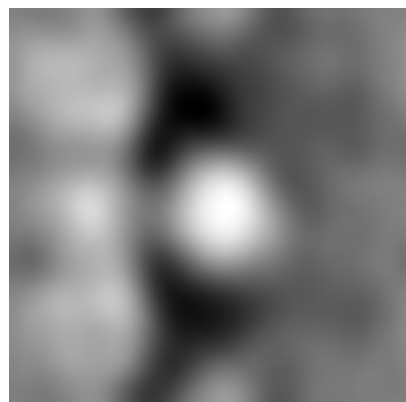


Z

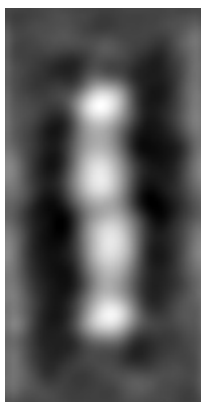
The images above show the map projected in three orthogonal directions.

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

#### 6.2.1 Primary map



X Index: 40



Y Index: 20

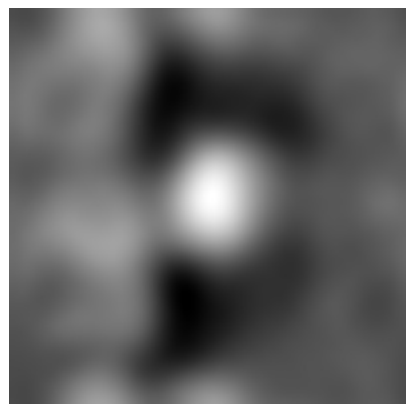


Z Index: 20

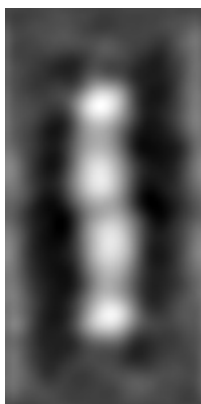
The images above show central slices of the map in three orthogonal directions.

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

### 6.3.1 Primary map



X Index: 31



Y Index: 20

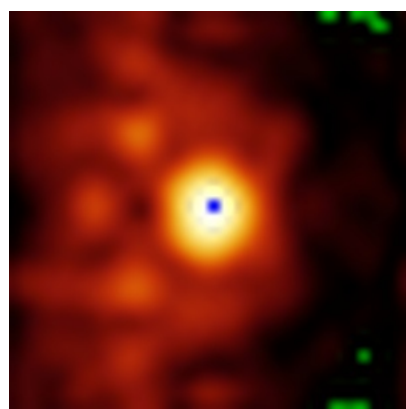


Z Index: 20

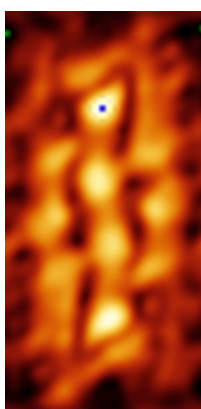
The images above show the largest variance slices of the map in three orthogonal directions.

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

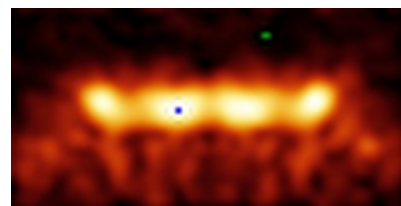
### 6.4.1 Primary map



X



Y

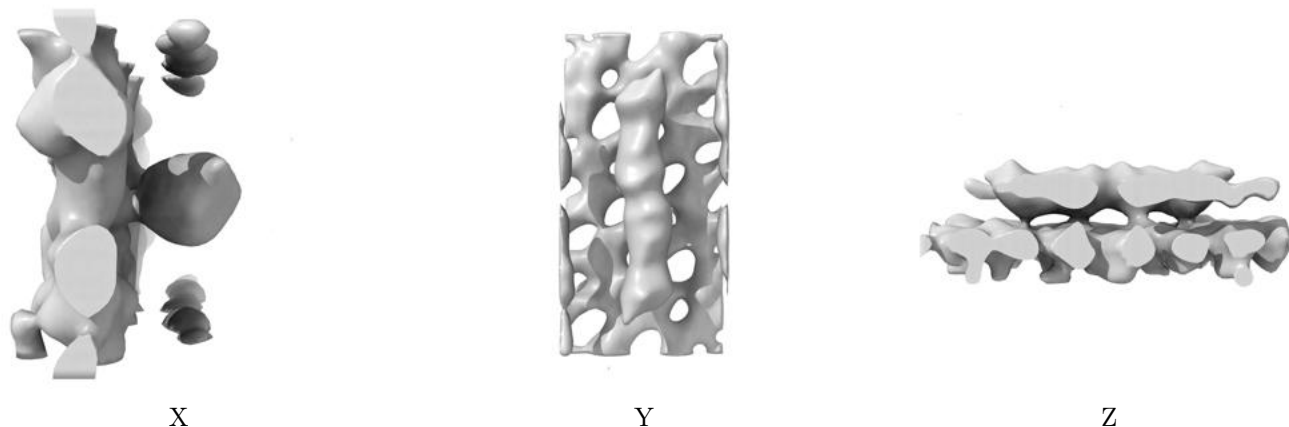


Z

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

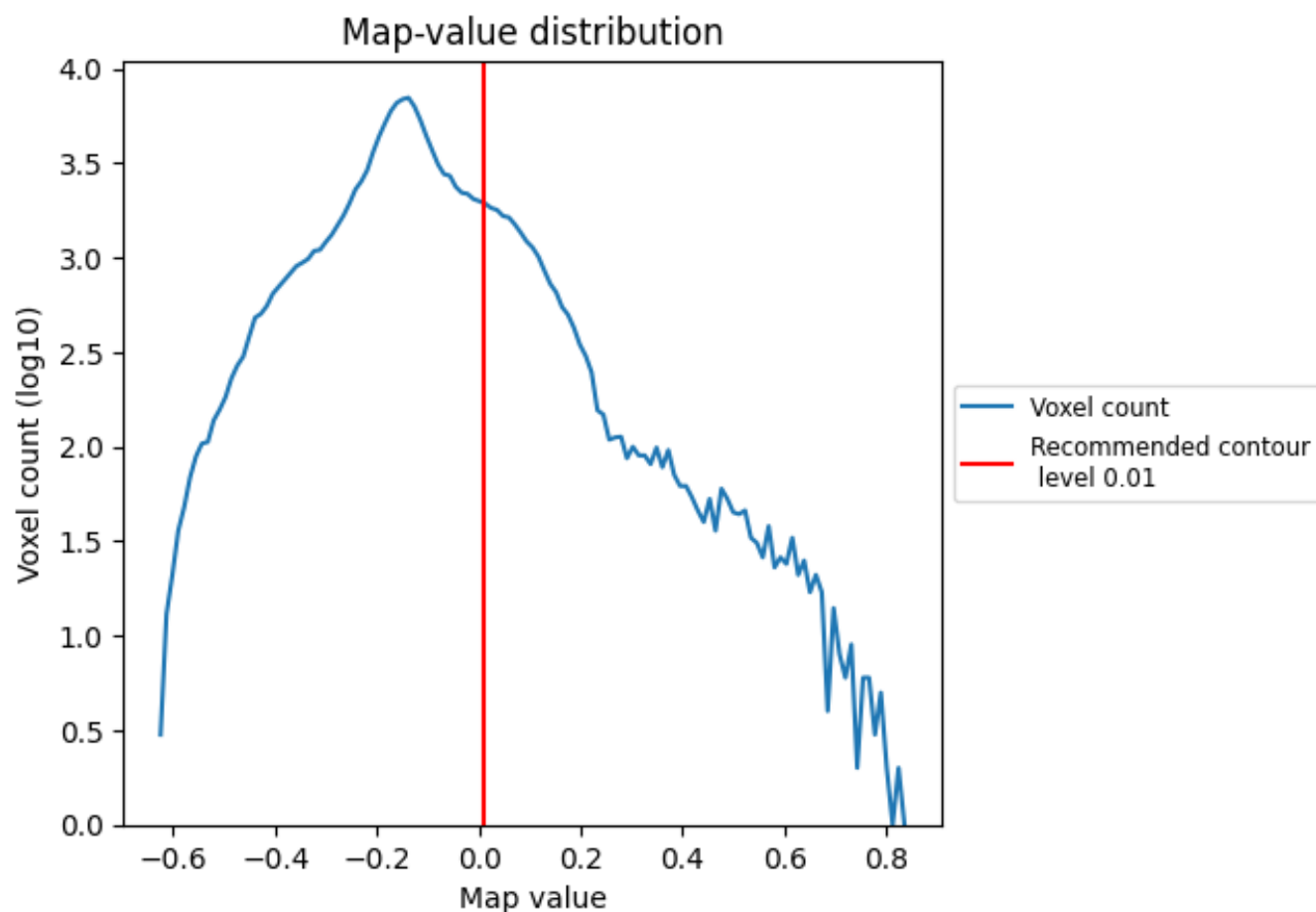
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

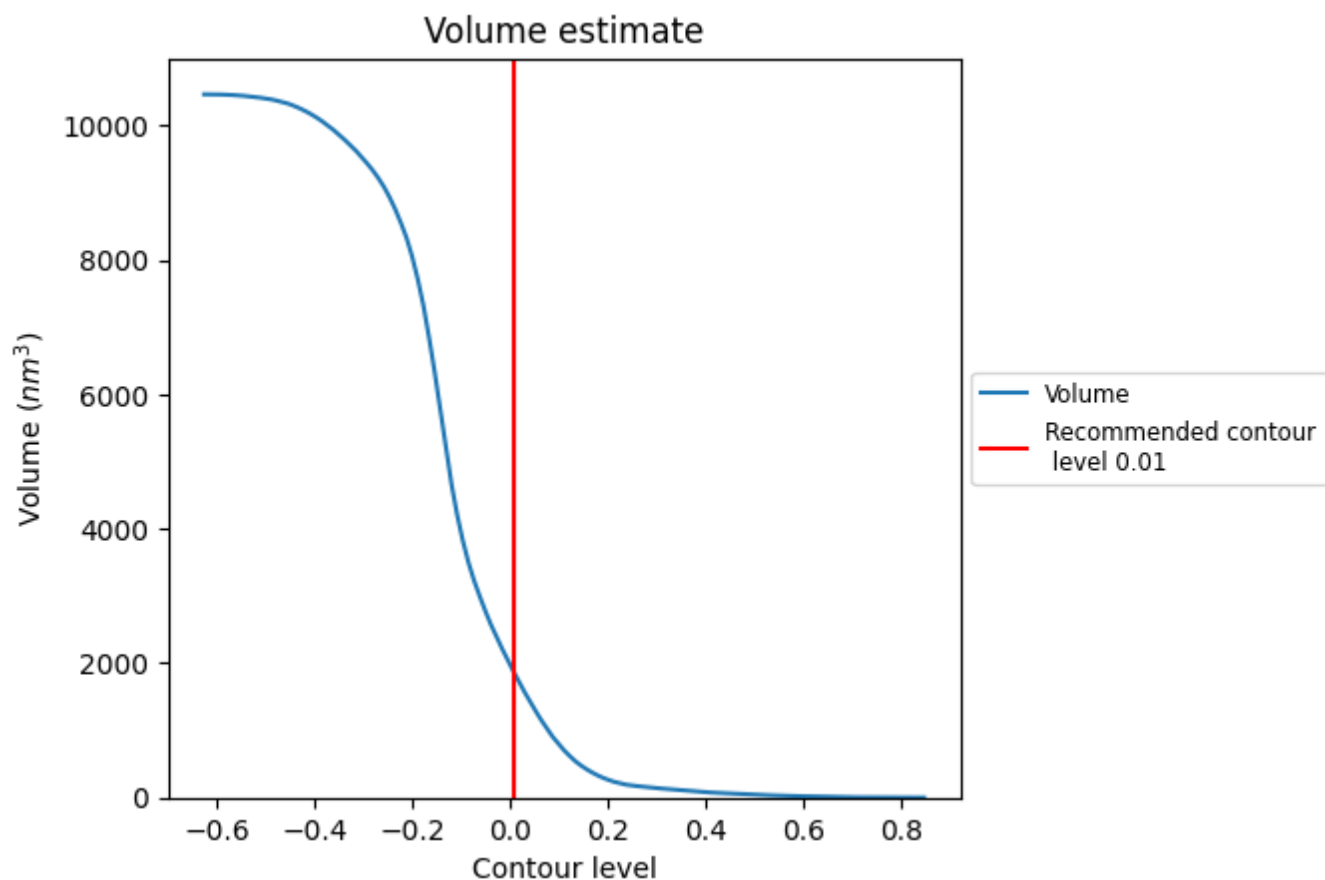
This section contains the results of statistical analysis of the map.

### 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 1847 nm<sup>3</sup>; this corresponds to an approximate mass of 1669 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](#)

This section was not generated. The rotationally averaged power spectrum is only generated for cubic maps.

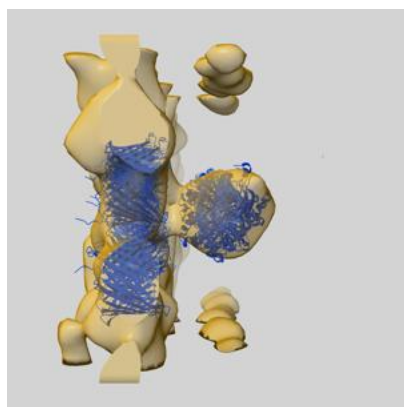
## 8 Fourier-Shell correlation

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

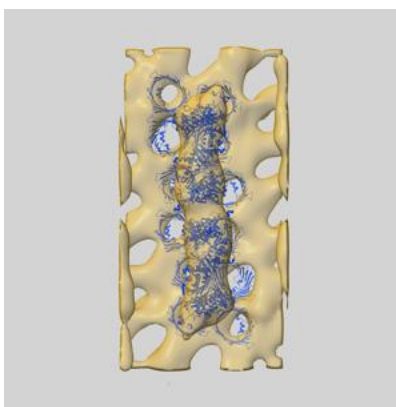
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-12357 and PDB model 7NIE. Per-residue inclusion information can be found in section [3](#) on page [6](#).

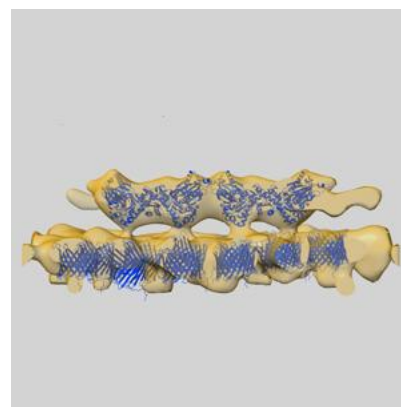
### 9.1 Map-model overlay [i](#)



X



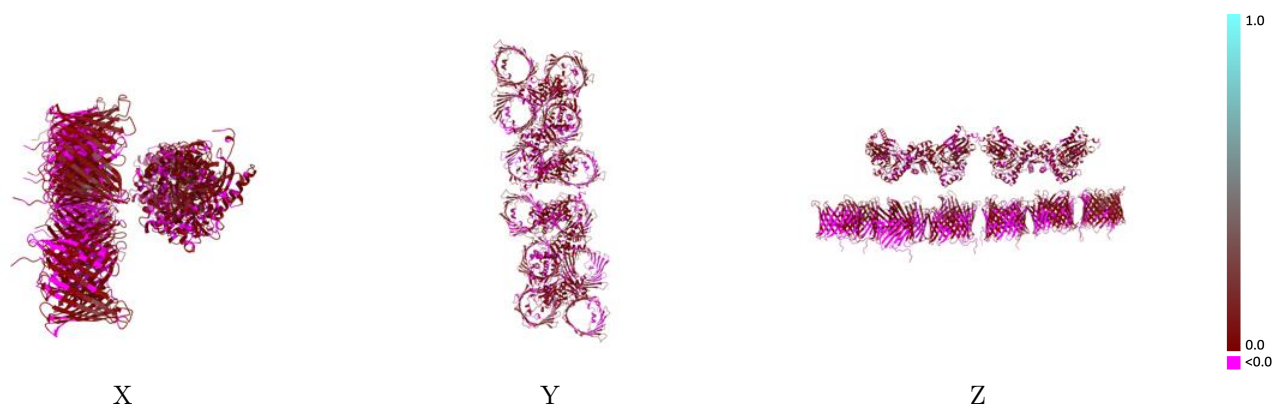
Y



Z

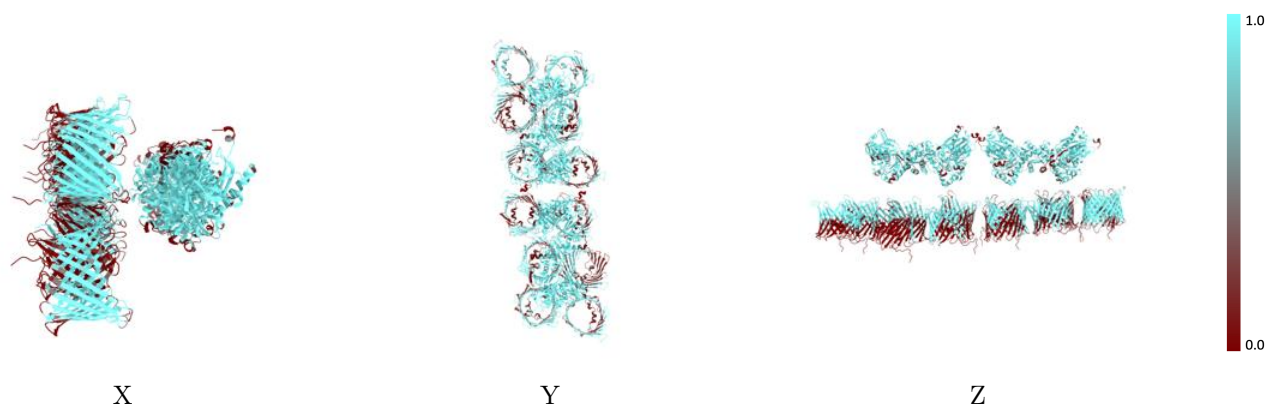
The images above show the 3D surface view of the map at the recommended contour level 0.01 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



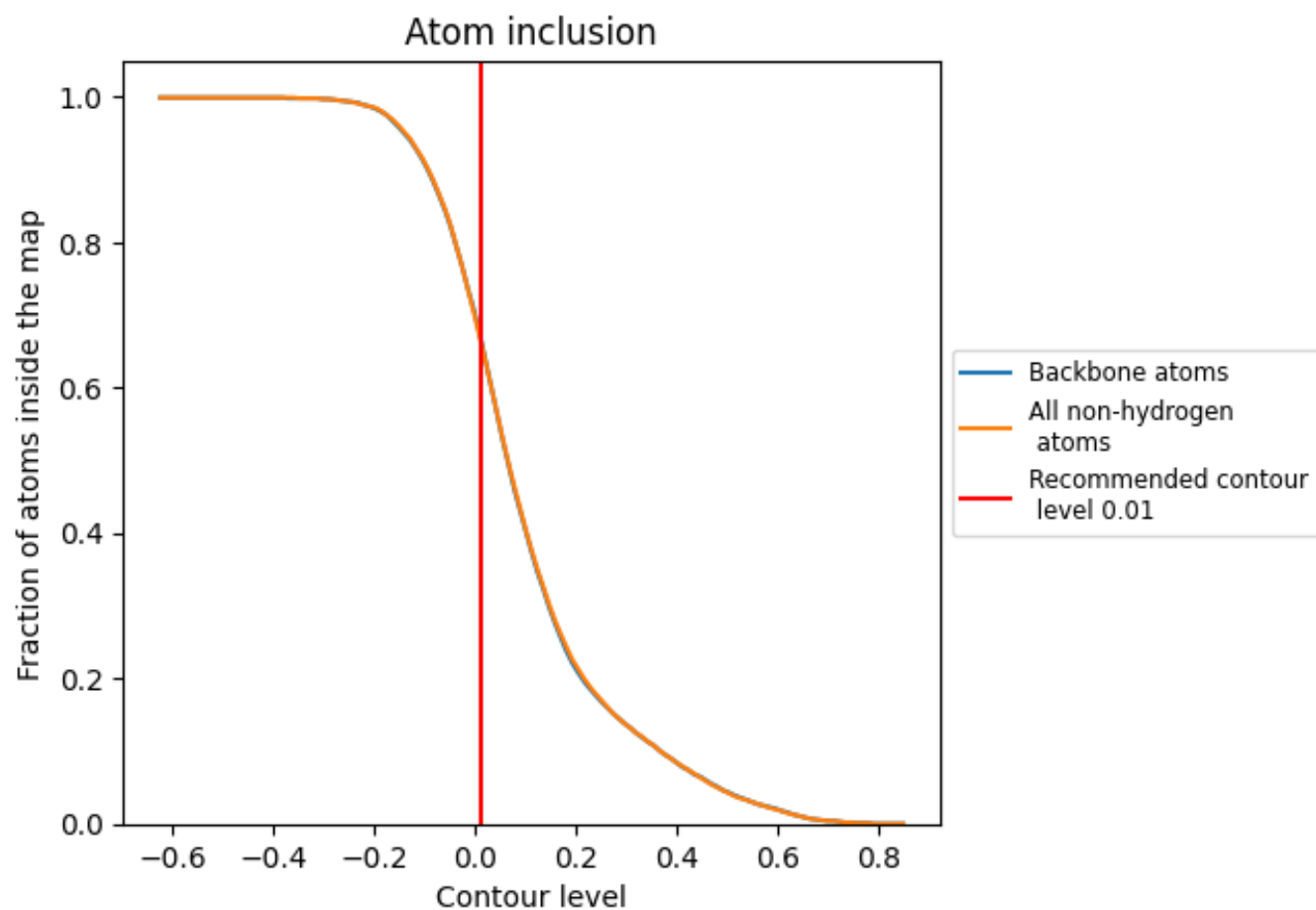
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.01).



































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 67% of all backbone atoms, 66% 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 (0.01) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6650	 0.0320
A	 0.8930	 0.0440
B	 0.8720	 0.0440
C	 0.5430	 0.0200
D	 0.5080	 0.0330
E	 0.5570	 0.0270
F	 0.3870	 0.0090
G	 0.5240	 0.0110
H	 0.5560	 0.0320
I	 0.6100	 0.0150
J	 0.5320	 0.0270
K	 0.6010	 0.0190
L	 0.3780	 0.0160
M	 0.7060	 0.0430
N	 0.7700	 0.0570
O	 0.8850	 0.0460
P	 0.8770	 0.0420

