



Full wwPDB EM Validation Report ⓘ

Oct 28, 2025 – 06:12 pm GMT

PDB ID : 9HX4 / pdb_00009hx4
EMDB ID : EMD-52457
Title : Amyloid fibril of apolipoprotein A-IV
Authors : Aibara, S.; Kassner, A.; Wong, E.; Klingel, K.; Papworth, M.; Althage, M.;
Wang, Q.D.; Correia, C.; Milting, H.; Oliveira, T.M.
Deposited on : 2025-01-06
Resolution : 3.30 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

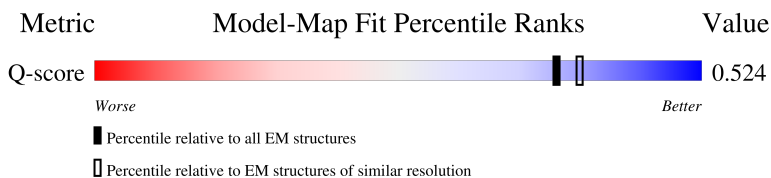
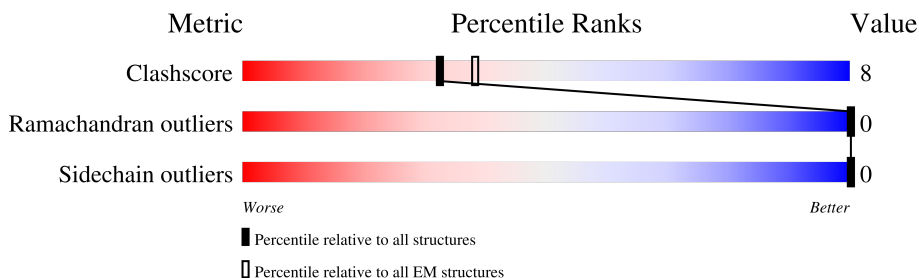
EMDB validation analysis : 0.0.1.dev129
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.46

1 Overall quality at a glance

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

The reported resolution of this entry is 3.30 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	15087 (2.80 - 3.80)

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

Mol	Chain	Length	Quality of chain
1	A	396	
1	B	396	
1	C	396	
1	D	396	

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Mol	Chain	Length	Quality of chain
1	E	396	13% 85%
1	F	396	12% 85%
1	G	396	12% 85%
1	H	396	12% 85%
1	I	396	13% 85%
1	J	396	13% 85%

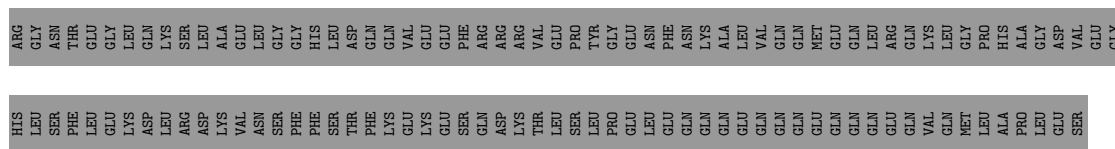
2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4840 atoms, of which 0 are hydrogens and 0 are deuteriums.

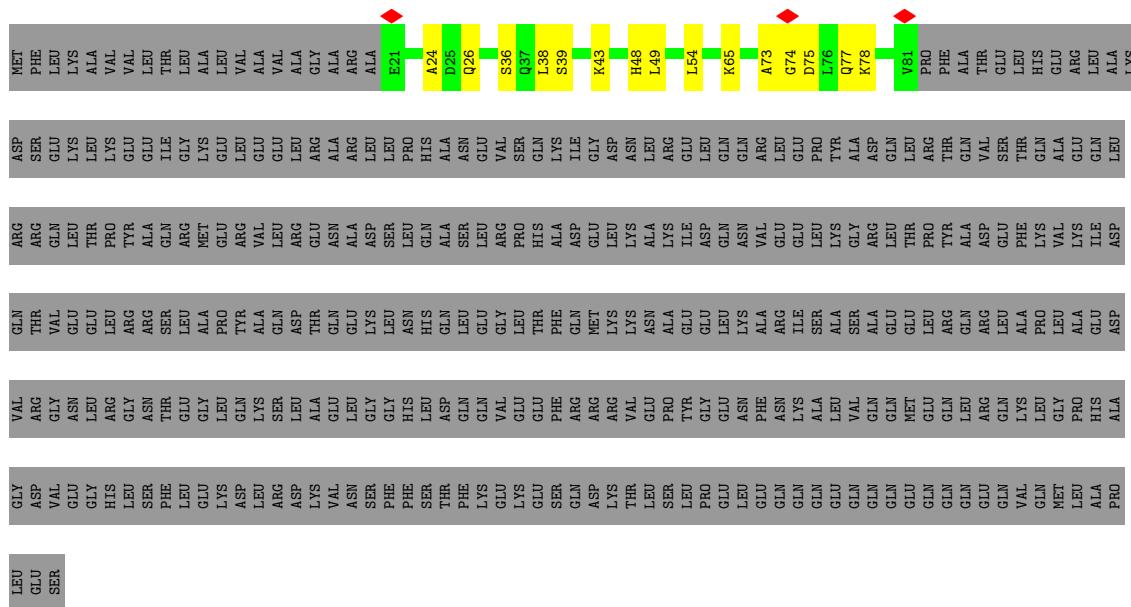
In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Apolipoprotein A-IV.

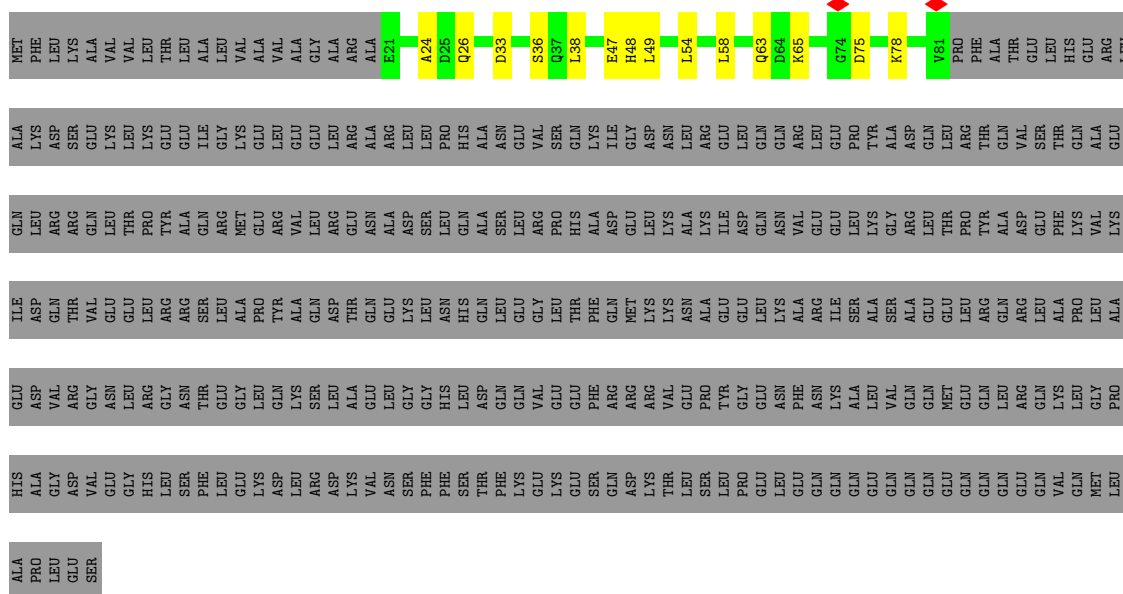
Mol	Chain	Residues	Atoms					AltConf	Trace
1	F	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	E	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	B	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	A	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	C	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	D	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	G	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	H	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	I	61	Total 484	C 304	N 80	O 99	S 1	0	0
1	J	61	Total 484	C 304	N 80	O 99	S 1	0	0



- Molecule 1: Apolipoprotein A-IV



- Molecule 1: Apolipoprotein A-IV



- Molecule 1: Apolipoprotein A-IV

[illegible]

Chain D: 12% 85%

SEN	VAL	GLY	VAL	GLN	GLU	MET
	GLU	ASN	GLU	GLN	LYS	PHE
	GLY	LEU	GLU	THR	LEU	LEU
	HIS	ARG	LEU	PRO	LYS	LYS
	LEU	GLY	ARG	TYR	GLU	ALA
	SER	ASN	ARG	ALA	GLU	VAL
	PHE	THR	SER	GLN	ILE	VAL
	LEU	THR	LEU	ARG	GLY	LEU
	GLU	GLY	ALA	MET	LYS	THR
	LYS	LEU	PRO	GLU	GLU	LEU
	ASP	GLN	TYR	ARG	LEU	ALA
	LEU	LYS	ALA	VAL	GLU	LEU
	ARG	SER	GLN	LEU	GLU	VAL
	ASP	LEU	ASP	ARG	LEU	ALA
	LYS	ALA	THR	GLU	ARG	VAL
	VAL	GLU	GLN	ASN	ALA	ALA
	ASN	LEU	GLU	ALA	ARG	ALA
	PHE	GLY	LYS	ASP	LEU	ALA
	PHE	GLY	LEU	SER	LEU	ARG
	PHE	HIS	ASN	LEU	PRO	ALA
	SER	LEU	HIS	GLN	HIS	ALA
	THR	ASP	GLN	ALA	ALA	
	PHE	GLN	LEU	SER	ASN	
	LYS	GLN	GLU	LEU	GLU	
	GLU	VAL	GLY	ARG	VAL	
	LYS	GLU	LEU	PRO	SER	
	GLU	GLU	PHE	ALA	LYS	
	SER	PHE	ARG	ASP	GLY	
	GLN	ARG	MET	GLU	ASP	
	ASP	ARG	LYS	LEU	GLY	
	LYS	VAL	VAL	LYS	ASN	
	THR	GLU	ASN	ALA	LEU	
	LEU	GLU	ALA	LYS	ARG	
	SER	PRO	ALA	ILE	GLU	
	LEU	TYR	GLU	ASP	LEU	
	PRO	GLY	GLU	GLN	GLN	
	GLU	GLU	LEU	GLN	GLN	
	LEU	ASN	LYS	ASN	GLN	
	GLU	PHE	ALA	VAL	ARG	
	GLN	ASN	ARG	GLU	LEU	
	GLN	LYS	ILE	GLU	GLU	
	GLN	ALA	SER	LEU	PRO	
	GLU	LEU	ALA	LYS	TYR	
	GLN	VAL	SER	GLY	ALA	
	GLN	GLN	ALA	ARG	GLN	
	GLN	GLN	GLU	LEU	GLN	
	GLU	MET	GLU	THR	LEU	
	GLN	GLN	LEU	PRO	ARG	
	GLN	GLN	ARG	GLN	THR	
	GLN	ARG	ARG	ASP	VAL	
	GLN	GLN	LEU	SER	GLU	
	VAL	LYS	ALA	PHE	THR	
	GLN	LEU	PRO	LYS	GLN	
	MET	GLY	LEU	VAL	ALA	
	LEU	PRO	ALA	LYS	GLU	
	ALA	HIS	GLU	ILE	GLN	
	PRO	ALA	ASP	ASP	LEU	
	LEU	GLY	VAL	GLN	ARG	
	GLU	ASP	ARG	THR	ARG	

Chain G: 12% . 85%

MET PHE LEU LEU LYS ALA VAL VAL VAL LEU THR LEU LEU ALA LEU VAL VAL VAL VAL GLY GLY ARG ARG ALA E21 D25 A24 Q26 L38 E47 H48 L49 L54 Q63 D64 K65 G74 D75 K78 V81 PRO PHE ALA THR GLU LEU HIS GLU ARG LEU ALA LYS ASP SER GLU

[illegible]

- Molecule 1: Apolipoprotein A-IV

Chain H: 12% 85%

GLU	SER	ASP	ARG	THR	ARG	SER	MET
VAL	GLU	GLY	VAL	GLN	GLN	GLU	PHE
GLU	ASN	ASN	GLU	GLU	THR	LYS	LYS
GLY	LEU	ARG	GLU	LEU	THR	LEU	LYS
HIS	GLY	GLY	ARG	THR	PRO	GLU	ALA
LEU	GLY	ASN	ARG	GLN	TYR	GLU	VAL
SER	THR	THR	ASN	GLN	ALA	GLU	VAL
PHE	LEU	THR	SER	GLN	ALA	ILE	THR
GLU	GLU	GLY	ALA	THR	GLU	GLY	LEU
LYS	ALA	GLY	THR	GLN	ARG	GLU	ALA
ASP	VAL	ASN	GLN	VAL	ASP	LEU	ALA
LEU	ASN	LEU	GLY	GLU	ALA	LEU	VAL
ARG	SER	GLY	LYS	LEU	SER	GLU	ALA
ASP	PHE	GLY	ASN	GLN	THR	ASP	ALA
ASP	THR	LEU	HIS	GLN	ALA	GLU	VAL
LYS	PHE	GLN	GLN	LEU	SER	ARG	GLY
VAL	GLY	GLN	GLY	GLU	LEU	VAL	ALA
GLU	GLY	VAL	GLU	GLY	ARG	GLU	ALA
LYS	LYS	GLU	GLU	GLY	PRO	SER	PRO
LYS	GLU	GLU	THR	LEU	HIS	GLN	GLU
SER	SER	PHE	PHE	THR	ALA	LYS	PHE
GLN	GLN	ARG	ARG	GLN	ASP	ILE	THR
ASP	ASP	ARG	MET	GLU	GLY	GLY	GLU
LYS	LYS	ARG	LYS	LYS	LEU	ASP	ASP
THR	LEU	VAL	LYS	LYS	LYS	ASN	ASN
LEU	GLU	GLU	ASN	ASN	ALA	LEU	LEU
SER	SER	PRO	ALA	LYS	LYS	ARG	GLU
LEU	LEU	TYR	GLU	ILE	ILE	GLU	LYS
PRO	GLY	GLY	GLU	GLU	ASP	PRO	GLY
GLU	GLU	GLU	LEU	LYS	GLN	GLN	GLN
LEU	LEU	ASN	LYS	ASN	ASN	ARG	GLN
GLU	GLU	PHE	ALA	ALA	VAL	GLN	GLN
GLN	GLN	ASN	ARG	GLN	GLN	LEU	GLN
GLN	GLN	LYS	ILE	GLU	GLU	PRO	GLY
GLY	GLN	ALA	SER	LEU	LYS	TYR	ALA
GLN	GLN	VAL	SER	SER	GLY	ALA	ASP
GLN	GLN	GLN	ALA	GLU	LEU	GLN	ASP
GLN	GLU	MET	GLU	GLU	THR	LEU	GLN
GLN	GLN	GLN	GLN	LEU	PRO	ARG	ARG
GLN	GLN	GLN	ARG	THR	ALA	THR	ALA
GLU	GLU	ARG	GLN	ASP	GLN	GLU	THR
VAL	VAL	LYS	PHE	GLU	THR	SER	GLU
GLN	GLN	LEU	PRO	LYS	GLN	LEU	LYS
MET	MET	GLY	LEU	VAL	ALA	GLU	GLU
LEU	LEU	PRO	ALA	GLU	LYS	ARG	ARG
ALA	ALA	HIS	GLU	ILE	ILE	GLN	LEU
PRO	PRO	GLY	ASP	VAL	GLN	LEU	ALA
LEU	LEU	GLY	ASP	GLN	ARG	LYS	LYS
							ASP

- Molecule 1: Apolipoprotein A-IV

Chain I: 13% . 85%

[illegible]

PHE	LEU	GLU	LYS	ASP	LEU	ARG	ASP	LYS	VAL	ASN	ASN	PHE	PHE	SER	THR	PHE	LYS	GLU	LYS	GLU	SER	SER	GLN	ASP	LYS	LYS	THR	LEU	LEU	SER	PRO	GLU	LEU	GLU	GLN	GLN	GLN	GLN	GLU	GLN	GLN	GLN	GLN	GLN	VAL	MET	LEU	ALA	PRO	LEU	GLI	SER
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- Molecule 1: Apolipoprotein A-IV



GLU	ILE	GLY	LYS	GLU	LEU	GLU	GLU	GLU	ARG	LEU	ALA	ARG	LEU	LEU	PRO	HIS	ALA	ASN	GLU	VAL	SER	GLN	LYS	ILE	GLY	ASP	ASN	LEU	ARG	GLU	LEU	GLN	GLN	ARG	LEU	GLU	PRO	TYR	ALA	ALA	GLU	GLN	GLN	VAL	SER	THR	GLN	LEU	ARG	ARG	GLN	LEU	THR	PRO	LYS
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ALA	GLN	ARG	MET	GLU	ARG	VAL	LEU	LEU	ARG	GLU	ASN	ALA	ALA	ASP	SER	LEU	GLN	LEU	PRO	HIS	ASP	ALA	GLU	LEU	LYS	LYS	ILE	ASP	GLN	ASN	VAL	VAL	GLU	GLU	LEU	LYS	GLY	ARG	LEU	THR	PRO	TYR	ALA	ALA	ASP	GLU	PHE	LYS	VAL	LYS	ILE	ILE	ASP	GLN	THR	VAL	GLU	GLU	LEU	ARG
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ARG	SER	LEU	PRO	ALA	TYR	GLN	GLN	ASP	GLN	THR	THR	GLN	GLY	GLY	LEU	LEU	ASN	ASN	HIS	GLN	GLN	LEU	LEU	GLY	GLY	GLY	LEU	LEU	THR	THR	THR	GLN	PHE	GLN	MET	LYS	LYS	LYS	ASN	ASN	ALA	ALA	GLU	GLU	GLU	LEU	LEU	LEU	LYS	ALA	ALA	ARG	ILE	LEU	SER	SER	SER	ALA	ALA	GLU	GLU	GLU	LEU	LEU	ARG	ARG	GLN	GLN	ARG	LEU	ALA	ALA	PRO	GLY	ARG	ASN	ASN	LEU	LEU	GLY	ASP	VAL	VAL	ARG	ARG	GLY	GLY
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ASN	THR	GLU	LEU	GLN	LYS	SER	ALA	GLU	LEU	GLY	HIS	LEU	ASP	GLN	GLN	VAL	GLU	PHE	ARG	ARG	ARG	VAL	GLU	PRO	TYR	GLY	GLY	ASN	ASN	LYS	ALA	LEU	VAL	GLN	GLN	MET	GLU	GLN	LEU	ARG	ARG	GLN	LYS	GLY	PRO	HIS	ALA	GLY	ASP	VAL	GLU	GLY	GLY	LEU	HIS	LEU	ASN	THR
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SER	PHE	LEU	GLY	LYS	ASP	LEU	ARG	ASP	LYS	VAL	ASN	SER	PHE	PHE	SER	THR	PHE	LYS	GLU	LYS	GLU	SER	GLN	ASP	LYS	THR	LEU	SER	PRO	LEU	GLU	GLN	GLN	GLN	GLN	GLN	GLN	VAL	GLN	GLN	GLN	GLN	MET	LEU	ALA	PRO	PRO	LEU	GLU	SER
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4 Experimental information

Property	Value	Source
EM reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=-1.04°, rise=4.76 Å, axial sym=C1	Depositor
Number of segments used	36124	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1400	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.053	Depositor
Minimum map value	-0.028	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.01	Depositor
Map size (Å)	230.4, 230.4, 230.4	wwPDB
Map dimensions	180, 180, 180	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.28, 1.28, 1.28	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	0.10	0/490	0.30	0/662
1	B	0.11	0/490	0.33	0/662
1	C	0.10	0/490	0.30	0/662
1	D	0.11	0/490	0.33	0/662
1	E	0.10	0/490	0.30	0/662
1	F	0.11	0/490	0.33	0/662
1	G	0.10	0/490	0.30	0/662
1	H	0.11	0/490	0.33	0/662
1	I	0.10	0/490	0.30	0/662
1	J	0.11	0/490	0.33	0/662
All	All	0.10	0/4900	0.31	0/6620

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](#)

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	484	0	471	12	0
1	B	484	0	471	13	0
1	C	484	0	471	16	0
1	D	484	0	471	15	0
1	E	484	0	471	11	0
1	F	484	0	471	11	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	484	0	471	14	0
1	H	484	0	471	12	0
1	I	484	0	471	11	0
1	J	484	0	471	8	0
All	All	4840	0	4710	79	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 8.

All (79) 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:E:33:ASP:OD2	1:I:65:LYS:NZ	2.23	0.71
1:E:65:LYS:NZ	1:A:33:ASP:OD2	2.25	0.68
1:H:38:LEU:HD13	1:J:38:LEU:HD23	1.76	0.67
1:A:38:LEU:HD23	1:C:38:LEU:HD13	1.77	0.66
1:A:54:LEU:HD12	1:C:54:LEU:HD22	1.78	0.66
1:C:33:ASP:OD2	1:G:65:LYS:NZ	2.28	0.65
1:F:38:LEU:HD23	1:D:38:LEU:HD13	1.80	0.64
1:F:38:LEU:HD13	1:H:38:LEU:HD23	1.81	0.63
1:G:38:LEU:HD23	1:I:38:LEU:HD13	1.80	0.63
1:G:54:LEU:HD12	1:I:54:LEU:HD22	1.80	0.63
1:B:38:LEU:HD13	1:D:38:LEU:HD23	1.83	0.61
1:E:38:LEU:HD13	1:C:38:LEU:HD23	1.82	0.60
1:D:36:SER:HG	1:D:39:SER:HG	1.47	0.60
1:E:54:LEU:HD12	1:G:54:LEU:HD22	1.83	0.60
1:E:38:LEU:HD23	1:G:38:LEU:HD13	1.84	0.59
1:E:54:LEU:HD22	1:C:54:LEU:HD12	1.85	0.59
1:F:36:SER:OG	1:F:39:SER:OG	2.21	0.54
1:H:36:SER:OG	1:H:39:SER:OG	2.21	0.53
1:J:36:SER:OG	1:J:39:SER:OG	2.21	0.52
1:A:63:GLN:HB2	1:C:63:GLN:HG2	1.95	0.48
1:D:36:SER:OG	1:D:39:SER:OG	2.21	0.47
1:C:48:HIS:C	1:C:49:LEU:HD12	2.39	0.47
1:E:48:HIS:C	1:E:49:LEU:HD12	2.39	0.47
1:A:48:HIS:C	1:A:49:LEU:HD12	2.39	0.47
1:G:48:HIS:C	1:G:49:LEU:HD12	2.39	0.47
1:I:48:HIS:C	1:I:49:LEU:HD12	2.39	0.47
1:H:75:ASP:OD1	1:J:75:ASP:HB3	2.15	0.47
1:B:48:HIS:C	1:B:49:LEU:HD12	2.41	0.46
1:D:48:HIS:C	1:D:49:LEU:HD12	2.41	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:75:ASP:HB3	1:C:75:ASP:OD1	2.16	0.46
1:D:26:GLN:NE2	1:D:78:LYS:O	2.49	0.45
1:B:26:GLN:NE2	1:B:78:LYS:O	2.49	0.45
1:B:75:ASP:OD1	1:D:75:ASP:HB3	2.16	0.45
1:F:48:HIS:C	1:F:49:LEU:HD12	2.41	0.45
1:B:24:ALA:HA	1:D:24:ALA:O	2.16	0.45
1:G:75:ASP:HB3	1:I:75:ASP:OD1	2.17	0.45
1:A:65:LYS:O	1:C:65:LYS:HA	2.16	0.45
1:G:65:LYS:O	1:I:65:LYS:HA	2.16	0.45
1:H:48:HIS:C	1:H:49:LEU:HD12	2.41	0.45
1:A:58:LEU:HA	1:C:58:LEU:O	2.17	0.45
1:J:48:HIS:C	1:J:49:LEU:HD12	2.41	0.45
1:G:74:GLY:O	1:I:74:GLY:HA3	2.17	0.44
1:B:54:LEU:HD22	1:D:54:LEU:HD12	1.99	0.44
1:A:24:ALA:O	1:C:24:ALA:HA	2.18	0.44
1:G:24:ALA:O	1:I:24:ALA:HA	2.18	0.44
1:F:75:ASP:HB3	1:D:75:ASP:OD1	2.19	0.43
1:B:73:ALA:HA	1:D:73:ALA:O	2.19	0.43
1:J:26:GLN:NE2	1:J:78:LYS:O	2.49	0.43
1:B:65:LYS:HA	1:D:65:LYS:O	2.17	0.43
1:F:54:LEU:HD22	1:H:54:LEU:HD12	2.00	0.43
1:G:63:GLN:HB2	1:I:63:GLN:HG2	2.02	0.42
1:B:36:SER:OG	1:B:39:SER:OG	2.21	0.42
1:H:26:GLN:NE2	1:H:78:LYS:O	2.49	0.42
1:F:65:LYS:HA	1:H:65:LYS:O	2.19	0.42
1:E:63:GLN:HG2	1:C:63:GLN:HB2	2.02	0.42
1:B:74:GLY:HA3	1:D:74:GLY:O	2.19	0.42
1:I:38:LEU:HD11	1:I:47:GLU:CD	2.45	0.42
1:B:43:LYS:NZ	1:D:25:ASP:OD2	2.47	0.42
1:G:38:LEU:HD11	1:G:47:GLU:CD	2.45	0.41
1:F:26:GLN:NE2	1:F:78:LYS:O	2.49	0.41
1:E:38:LEU:HD11	1:E:47:GLU:CD	2.45	0.41
1:B:26:GLN:O	1:B:77:GLN:NE2	2.53	0.41
1:A:38:LEU:HD11	1:A:47:GLU:CD	2.45	0.41
1:C:38:LEU:HD11	1:C:47:GLU:CD	2.45	0.41
1:D:26:GLN:O	1:D:77:GLN:NE2	2.53	0.41
1:F:33:ASP:OD2	1:B:65:LYS:NZ	2.37	0.41
1:A:26:GLN:NE2	1:A:78:LYS:O	2.51	0.41
1:F:26:GLN:O	1:F:77:GLN:NE2	2.53	0.41
1:J:26:GLN:O	1:J:77:GLN:NE2	2.53	0.41
1:E:65:LYS:HA	1:C:65:LYS:O	2.20	0.41

Continued on next page...

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:26:GLN:NE2	1:C:78:LYS:O	2.51	0.41
1:E:26:GLN:NE2	1:E:78:LYS:O	2.51	0.41
1:H:74:GLY:HA3	1:J:74:GLY:O	2.21	0.41
1:F:63:GLN:HG2	1:H:63:GLN:HB2	2.02	0.40
1:A:36:SER:CB	1:C:36:SER:O	2.69	0.40
1:G:26:GLN:NE2	1:G:78:LYS:O	2.51	0.40
1:H:26:GLN:O	1:H:77:GLN:NE2	2.53	0.40
1:G:75:ASP:CB	1:I:75:ASP:OD1	2.70	0.40
1:H:24:ALA:HA	1:J:24:ALA:O	2.20	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	59/396 (15%)	56 (95%)	3 (5%)	0	100	100
1	B	59/396 (15%)	55 (93%)	4 (7%)	0	100	100
1	C	59/396 (15%)	56 (95%)	3 (5%)	0	100	100
1	D	59/396 (15%)	55 (93%)	4 (7%)	0	100	100
1	E	59/396 (15%)	56 (95%)	3 (5%)	0	100	100
1	F	59/396 (15%)	55 (93%)	4 (7%)	0	100	100
1	G	59/396 (15%)	56 (95%)	3 (5%)	0	100	100
1	H	59/396 (15%)	55 (93%)	4 (7%)	0	100	100
1	I	59/396 (15%)	56 (95%)	3 (5%)	0	100	100
1	J	59/396 (15%)	55 (93%)	4 (7%)	0	100	100
All	All	590/3960 (15%)	555 (94%)	35 (6%)	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	53/344 (15%)	53 (100%)	0	100	100
1	B	53/344 (15%)	53 (100%)	0	100	100
1	C	53/344 (15%)	53 (100%)	0	100	100
1	D	53/344 (15%)	53 (100%)	0	100	100
1	E	53/344 (15%)	53 (100%)	0	100	100
1	F	53/344 (15%)	53 (100%)	0	100	100
1	G	53/344 (15%)	53 (100%)	0	100	100
1	H	53/344 (15%)	53 (100%)	0	100	100
1	I	53/344 (15%)	53 (100%)	0	100	100
1	J	53/344 (15%)	53 (100%)	0	100	100
All	All	530/3440 (15%)	530 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	B	63	GLN
1	A	63	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

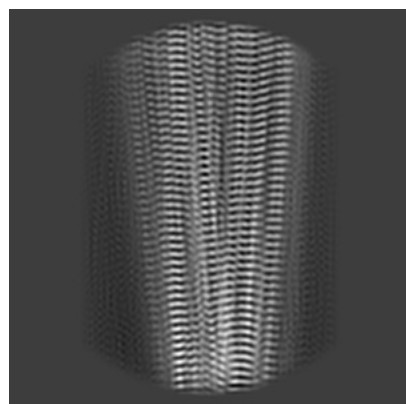
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-52457. These allow visual inspection of the internal detail of the map and identification of artifacts.

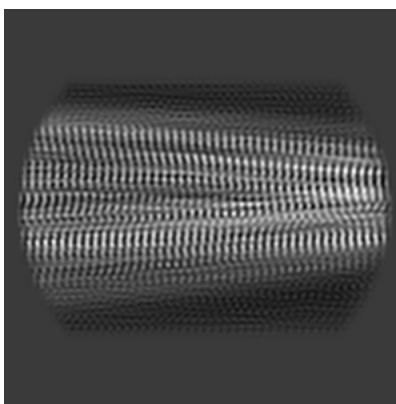
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

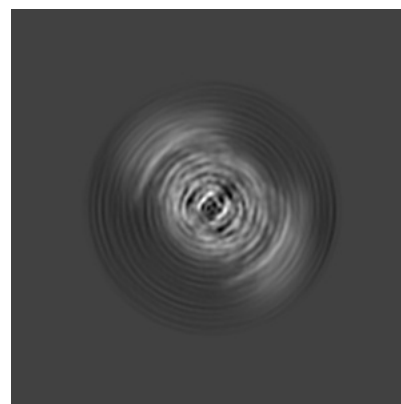
6.1.1 Primary map



X

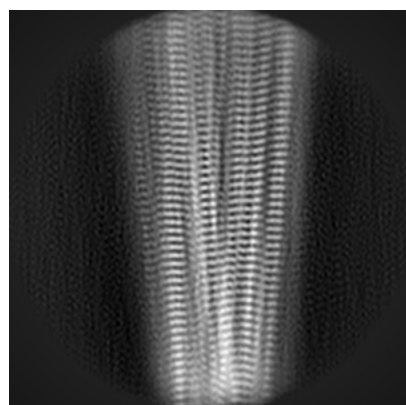


Y

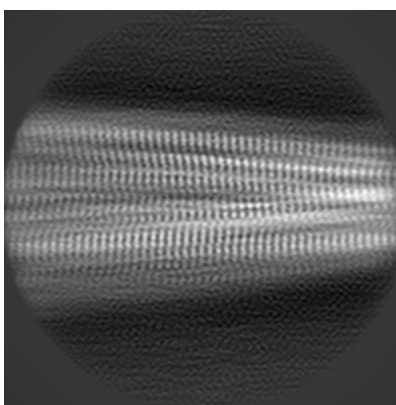


Z

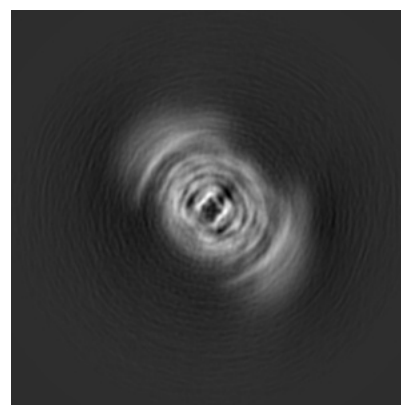
6.1.2 Raw map



X



Y

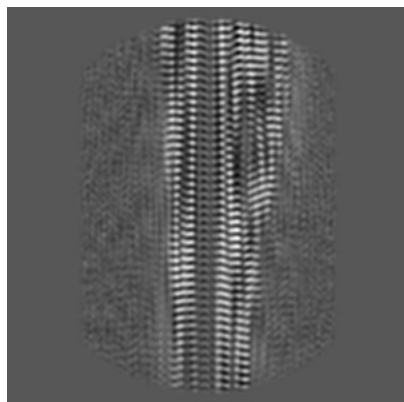


Z

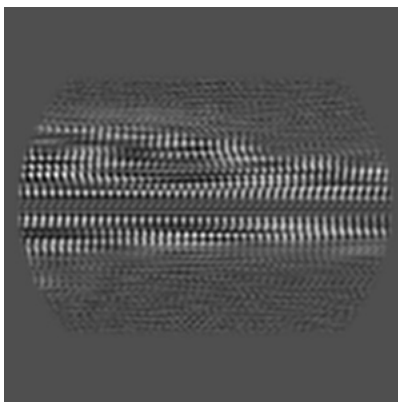
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

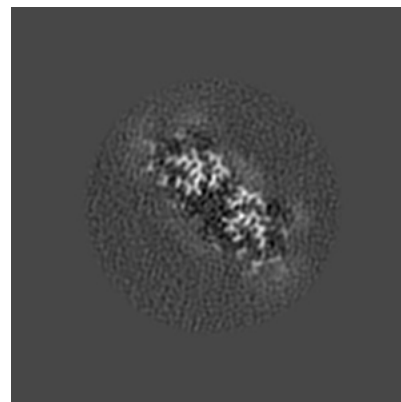
6.2.1 Primary map



X Index: 90

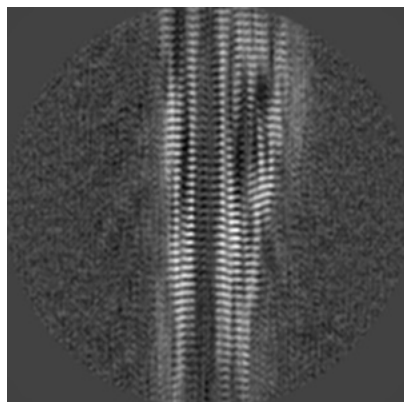


Y Index: 90

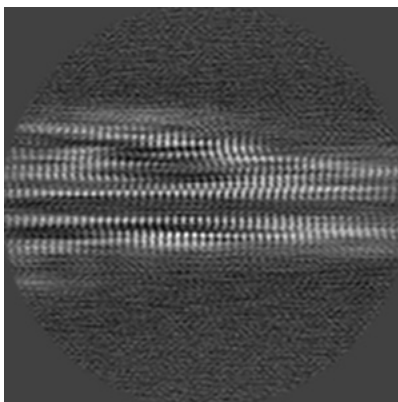


Z Index: 90

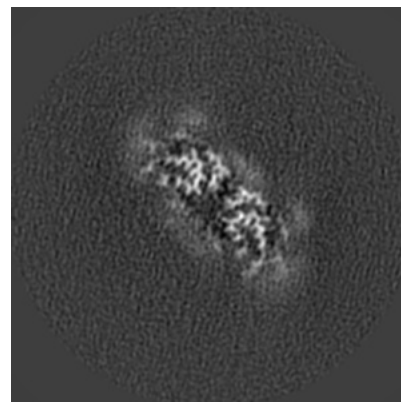
6.2.2 Raw map



X Index: 90



Y Index: 90

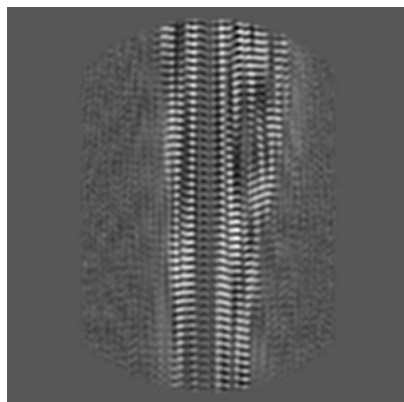


Z Index: 90

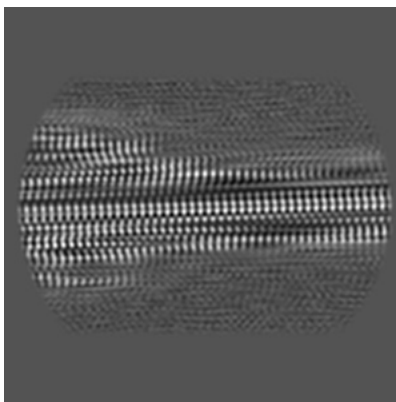
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

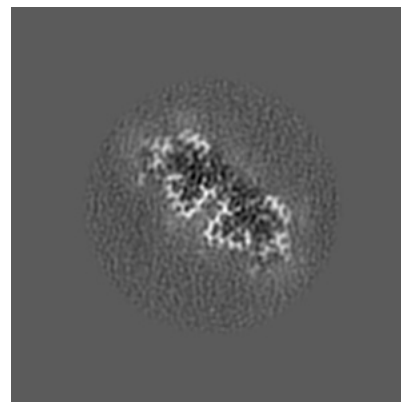
6.3.1 Primary map



X Index: 90

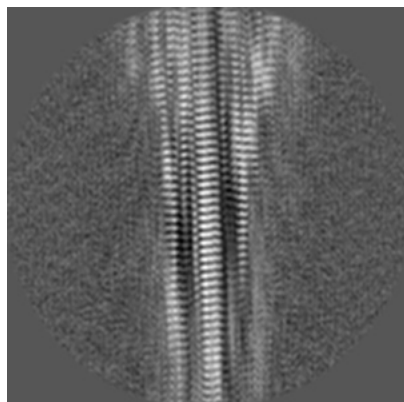


Y Index: 96

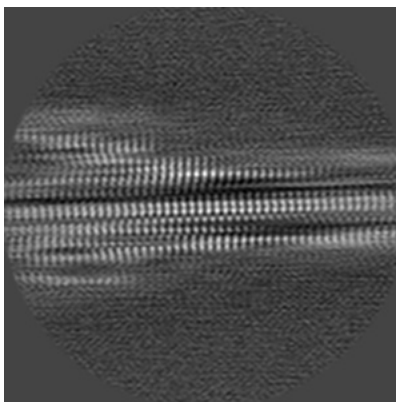


Z Index: 77

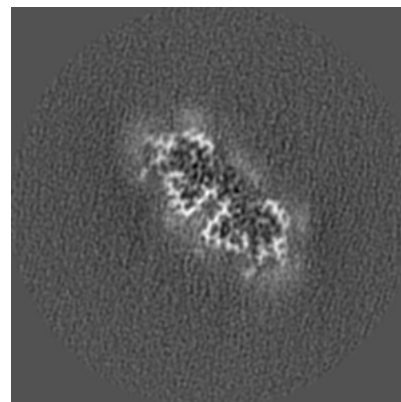
6.3.2 Raw map



X Index: 96



Y Index: 96

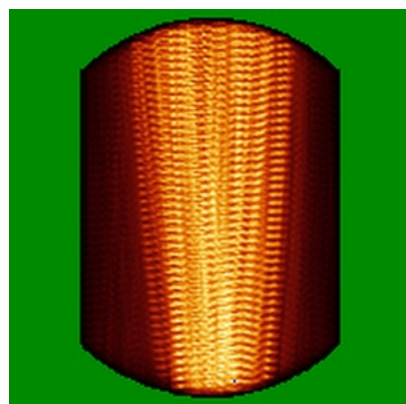


Z Index: 92

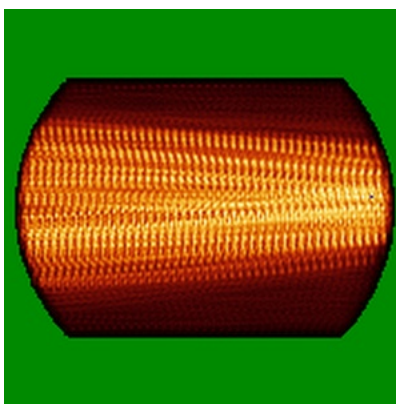
The images above show the largest variance slices of the map in three orthogonal directions.

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

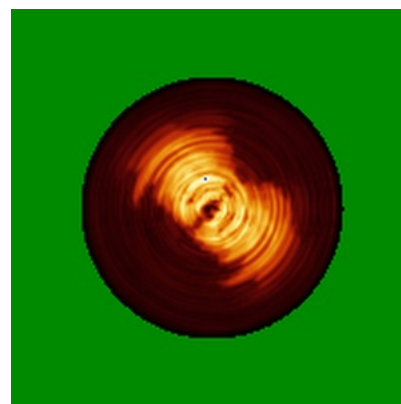
6.4.1 Primary map



X

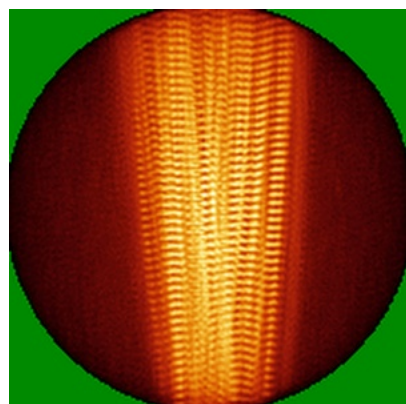


Y

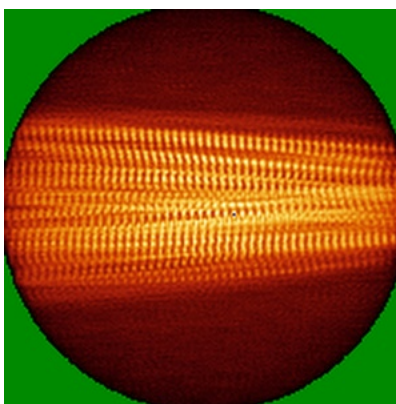


Z

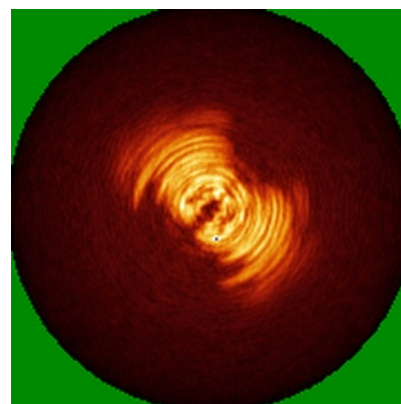
6.4.2 Raw map



X



Y

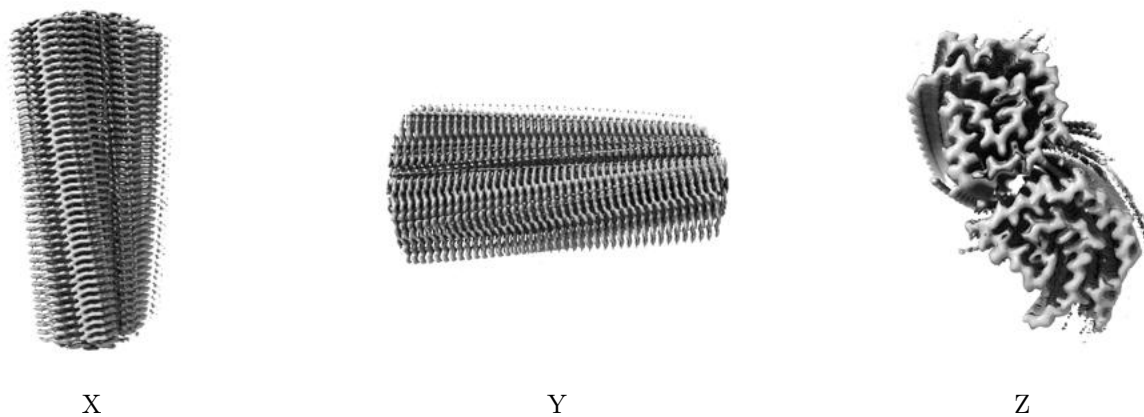


Z

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.

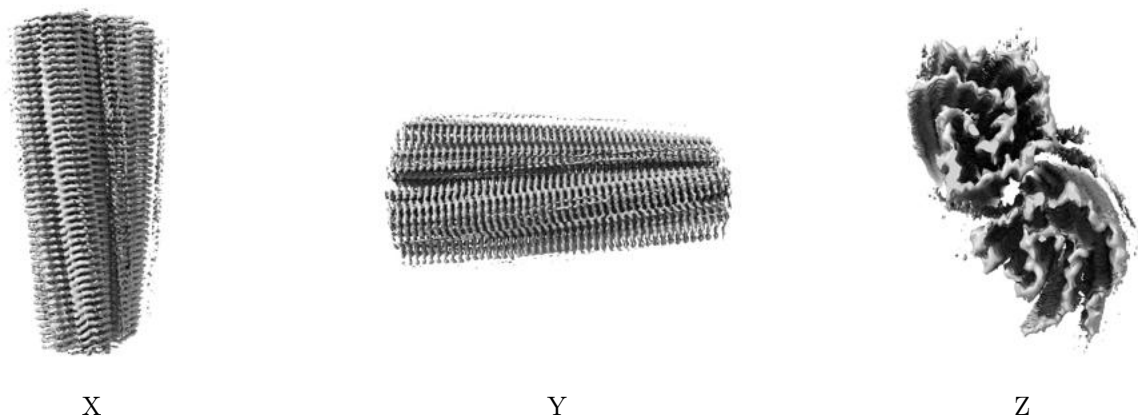
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.01. 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.

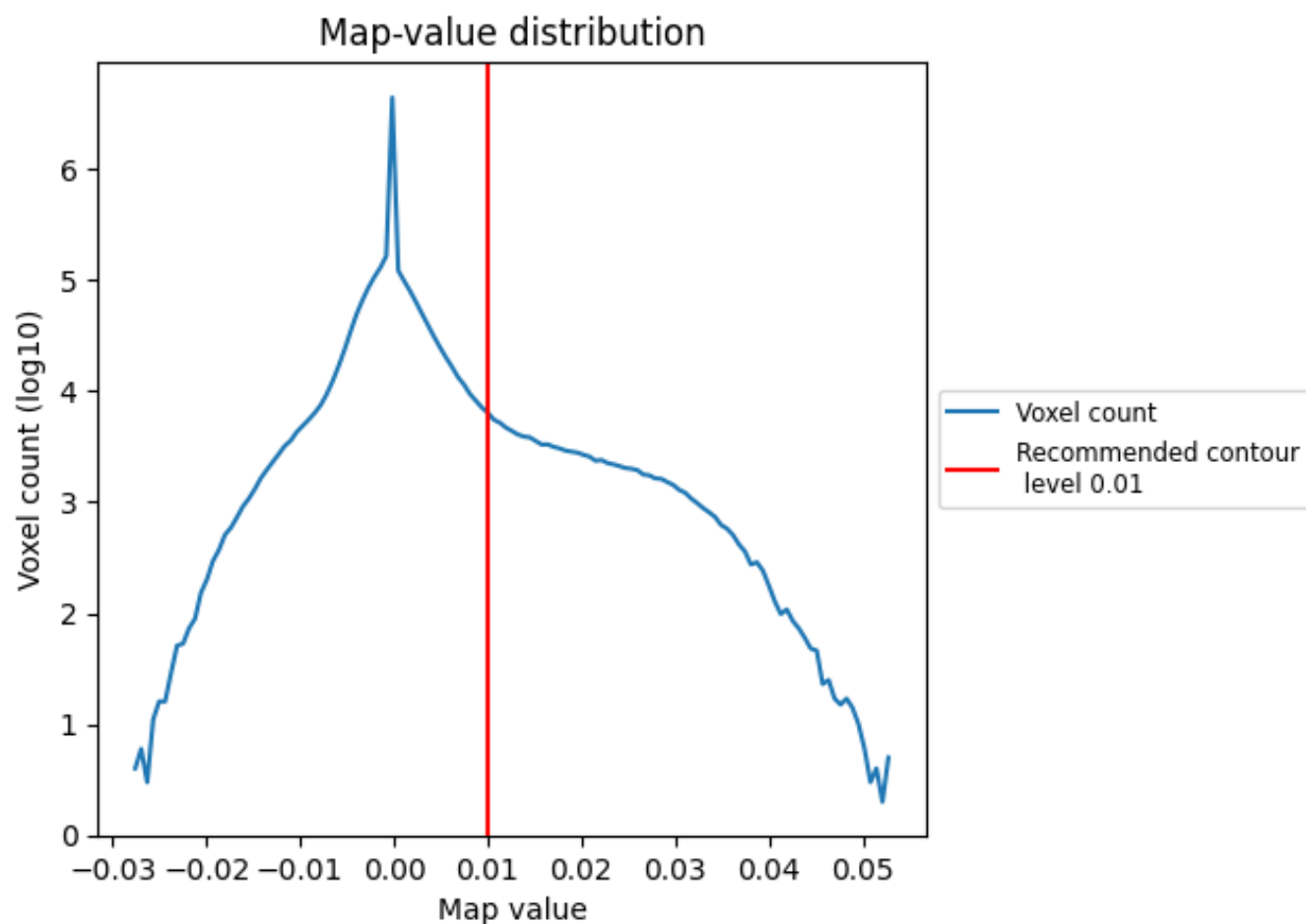
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

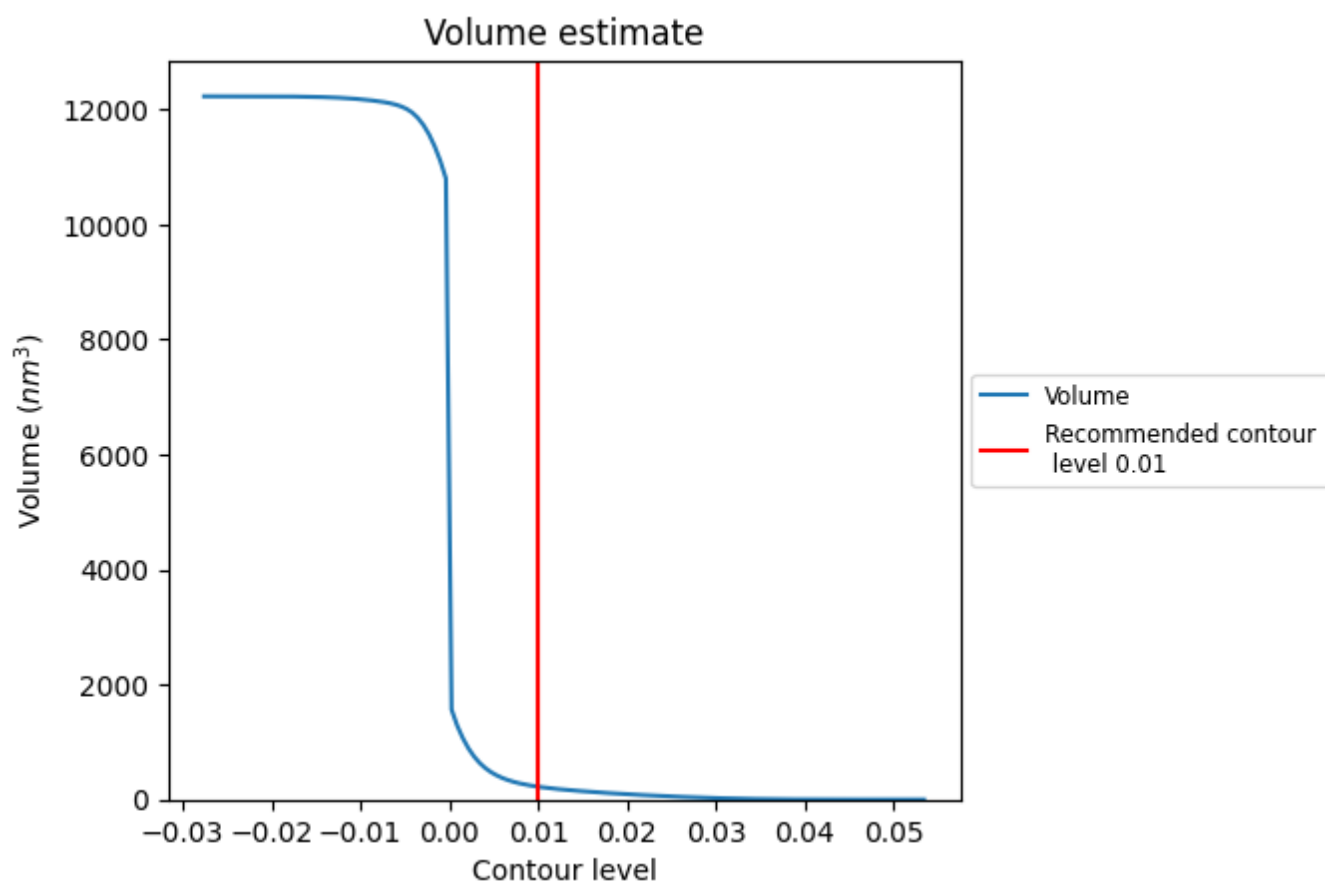
This section contains the results of statistical analysis of the map.

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.

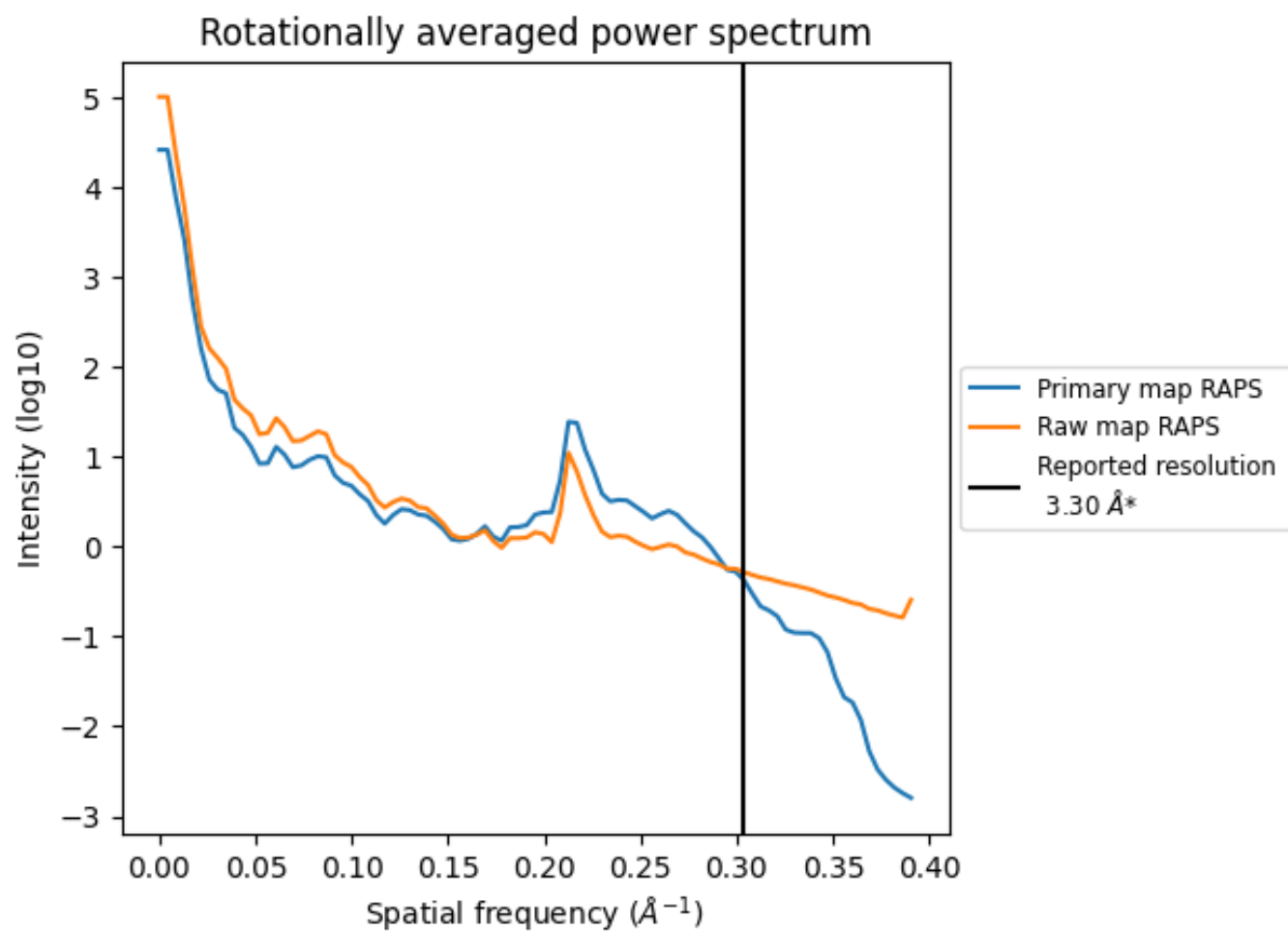
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 223 nm³; this corresponds to an approximate mass of 202 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum ⓘ

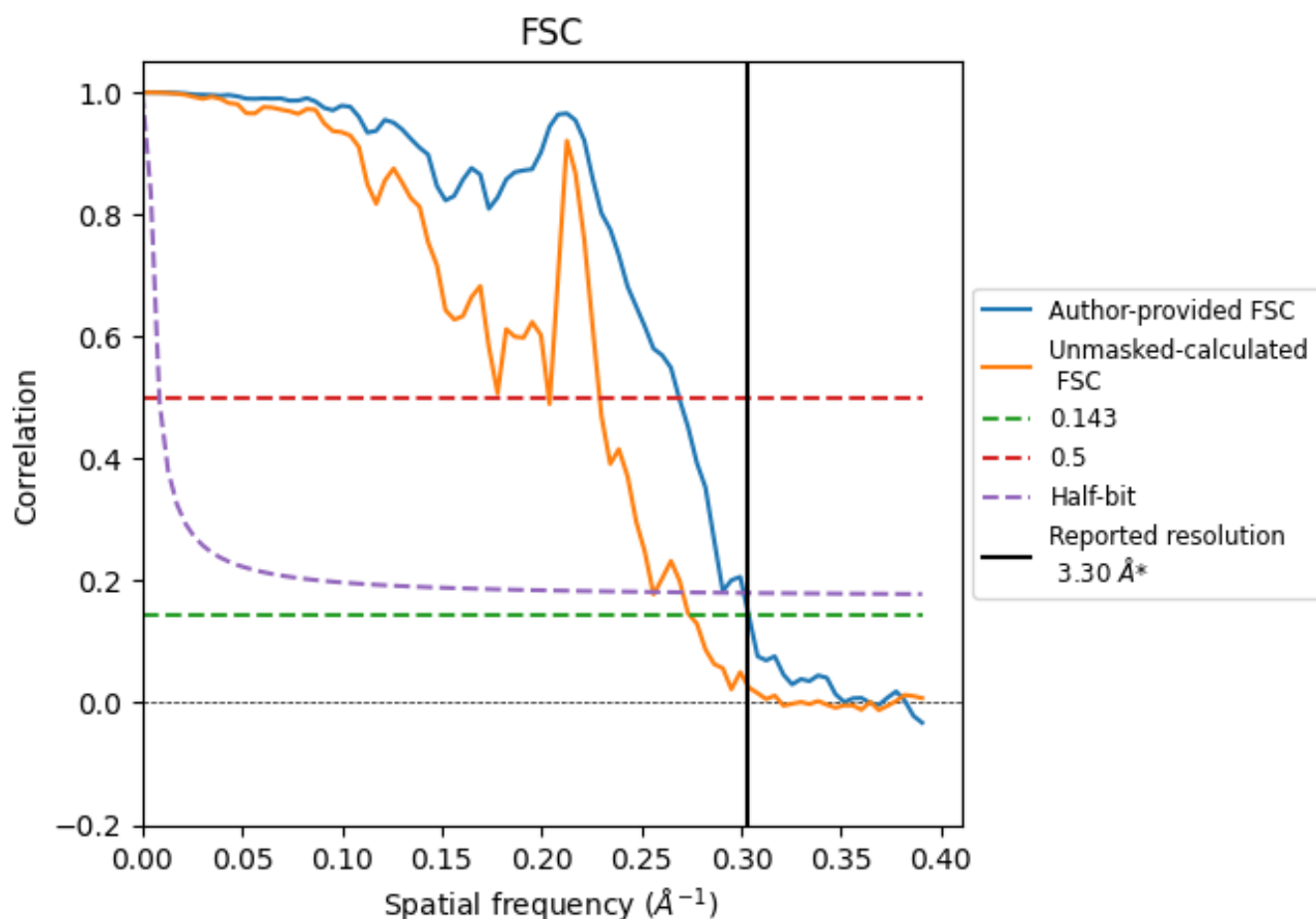


*Reported resolution corresponds to spatial frequency of 0.303 Å⁻¹

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 0.303 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

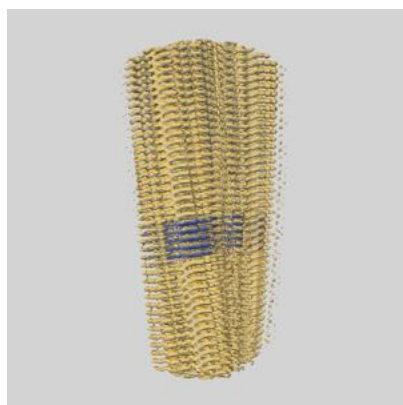
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.30	-	-
Author-provided FSC curve	3.29	3.72	3.32
Unmasked-calculated*	3.65	4.91	3.91

*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 3.65 differs from the reported value 3.3 by more than 10 %

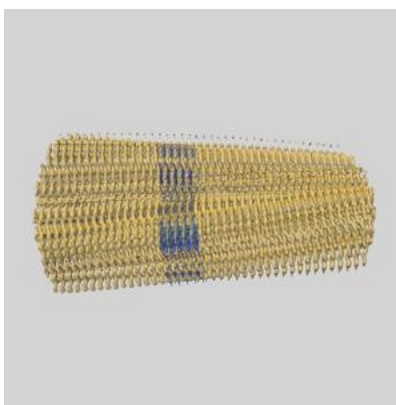
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-52457 and PDB model 9HX4. Per-residue inclusion information can be found in section [3](#) on page [5](#).

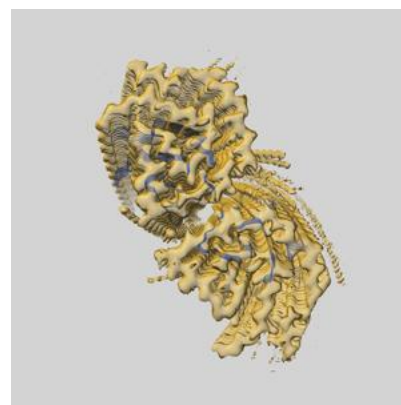
9.1 Map-model overlay [i](#)



X



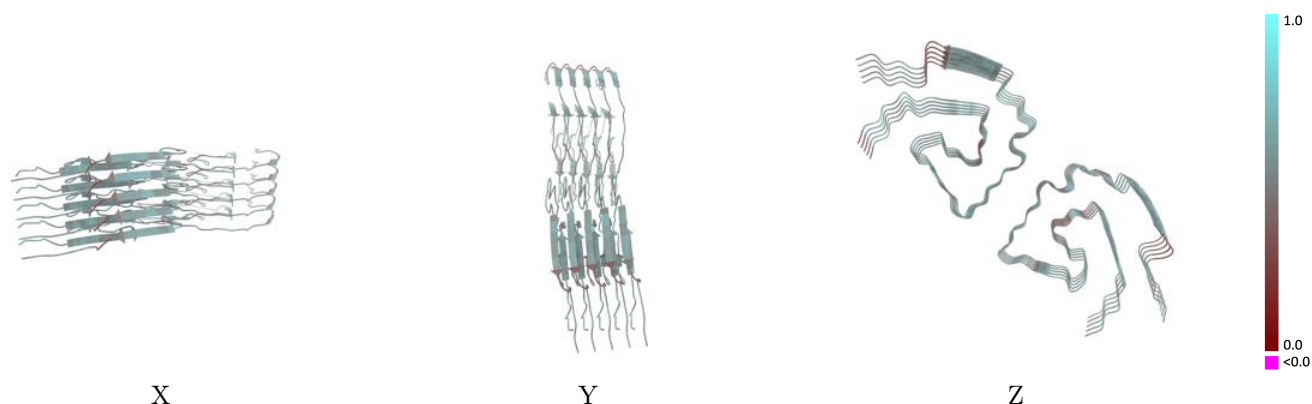
Y



Z

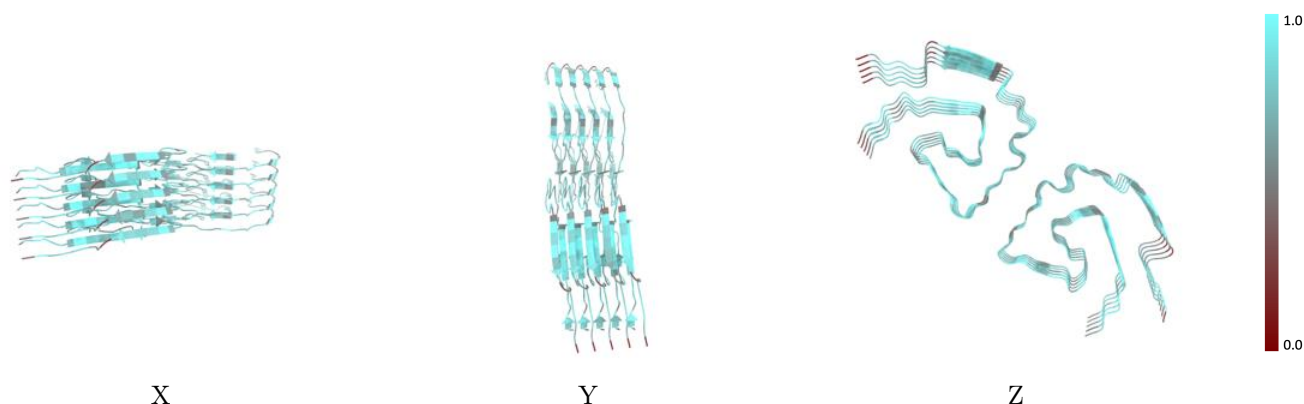
The images above show the 3D surface view of the map at the recommended contour level 0.01 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



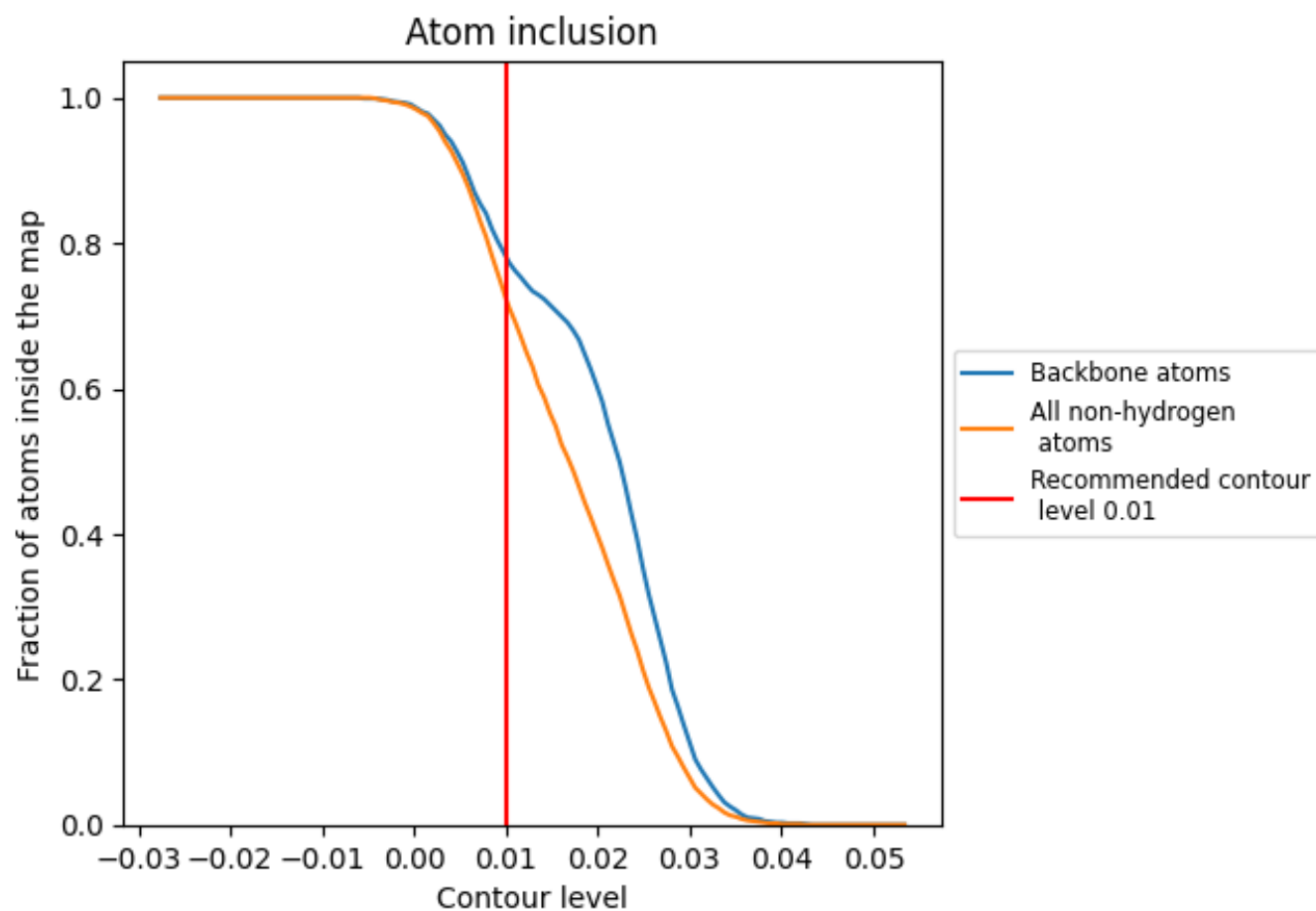
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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, 78% of all backbone atoms, 72% 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	0.7240	0.5240
A	0.7170	0.5200
B	0.7340	0.5270
C	0.7130	0.5230
D	0.7240	0.5260
E	0.7240	0.5240
F	0.7340	0.5230
G	0.7150	0.5250
H	0.7340	0.5260
I	0.7190	0.5250
J	0.7260	0.5200

