



Full wwPDB EM Validation Report ⓘ

Nov 21, 2022 – 11:01 AM EST

PDB ID : 7RFP
EMDB ID : EMD-24444
Title : Mouse GITR (mGITR) with DTA-1 Fab fragment
Authors : Meyerson, J.R.; He, C.
Deposited on : 2021-07-14
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

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.dev43
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

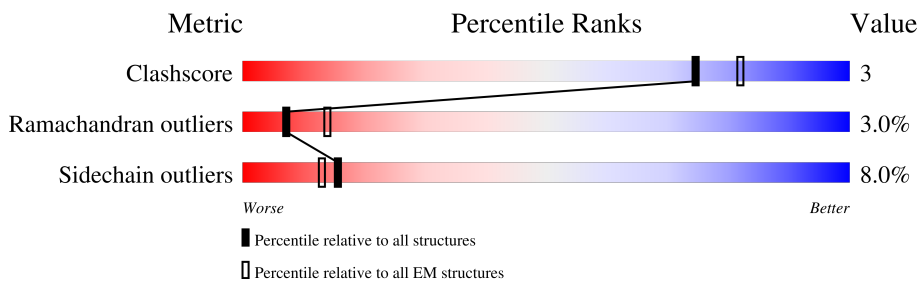
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY





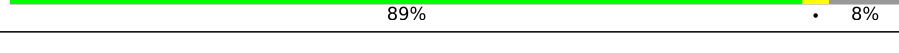

The reported resolution of this entry is 4.40 Å.

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)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 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	490	
1	B	490	
2	H	465	
2	I	465	
3	L	240	
3	M	240	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5532 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 Tumor necrosis factor receptor superfamily member 18, Enhanced green fluorescent protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	118	591	340	118	118	15	0	0
1	B	118	591	340	118	118	15	0	0

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	229	ALA	-	linker	UNP O35714
A	230	GLY	-	linker	UNP O35714
A	231	LEU	-	linker	UNP O35714
A	232	VAL	-	linker	UNP O35714
A	233	PRO	-	linker	UNP O35714
A	234	ARG	-	linker	UNP O35714
A	235	GLY	-	linker	UNP O35714
A	236	SER	-	linker	UNP O35714
A	237	ALA	-	linker	UNP O35714
A	238	ALA	-	linker	UNP O35714
A	239	ALA	-	linker	UNP O35714
A	446	LYS	ALA	conflict	UNP A0A7G8ZY66
A	483	HIS	-	expression tag	UNP A0A7G8ZY66
A	484	HIS	-	expression tag	UNP A0A7G8ZY66
A	485	HIS	-	expression tag	UNP A0A7G8ZY66
A	486	HIS	-	expression tag	UNP A0A7G8ZY66
A	487	HIS	-	expression tag	UNP A0A7G8ZY66
A	488	HIS	-	expression tag	UNP A0A7G8ZY66
A	489	HIS	-	expression tag	UNP A0A7G8ZY66
A	490	HIS	-	expression tag	UNP A0A7G8ZY66
B	229	ALA	-	linker	UNP O35714
B	230	GLY	-	linker	UNP O35714
B	231	LEU	-	linker	UNP O35714
B	232	VAL	-	linker	UNP O35714
B	233	PRO	-	linker	UNP O35714

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Chain	Residue	Modelled	Actual	Comment	Reference
B	234	ARG	-	linker	UNP O35714
B	235	GLY	-	linker	UNP O35714
B	236	SER	-	linker	UNP O35714
B	237	ALA	-	linker	UNP O35714
B	238	ALA	-	linker	UNP O35714
B	239	ALA	-	linker	UNP O35714
B	446	LYS	ALA	conflict	UNP A0A7G8ZY66
B	483	HIS	-	expression tag	UNP A0A7G8ZY66
B	484	HIS	-	expression tag	UNP A0A7G8ZY66
B	485	HIS	-	expression tag	UNP A0A7G8ZY66
B	486	HIS	-	expression tag	UNP A0A7G8ZY66
B	487	HIS	-	expression tag	UNP A0A7G8ZY66
B	488	HIS	-	expression tag	UNP A0A7G8ZY66
B	489	HIS	-	expression tag	UNP A0A7G8ZY66
B	490	HIS	-	expression tag	UNP A0A7G8ZY66

- Molecule 2 is a protein called DTA-1 (heavy chain).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	H	218	1077	636	218	218	5	0	0
2	I	218	1077	636	218	218	5	0	0

- Molecule 3 is a protein called DTA-1 (light chain).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	L	221	1098	650	221	222	5	0	0
3	M	221	1098	650	221	222	5	0	0

Chain M:  88% 8%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	423425	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	55	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.975	Depositor
Minimum map value	-2.056	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.044	Depositor
Recommended contour level	0.34	Depositor
Map size (\AA)	420.86398, 420.86398, 420.86398	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.096, 1.096, 1.096	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	0.70	1/590 (0.2%)	1.05	2/810 (0.2%)
1	B	0.71	1/590 (0.2%)	1.09	2/810 (0.2%)
2	H	0.73	0/1076	0.98	0/1492
2	I	0.73	0/1076	0.97	0/1492
3	L	0.67	0/1097	0.94	0/1523
3	M	0.68	0/1097	0.97	1/1523 (0.1%)
All	All	0.70	2/5526 (0.0%)	0.99	5/7650 (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	1
1	B	0	1
All	All	0	2

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	143	PRO	C-O	-5.31	1.12	1.23
1	A	143	PRO	C-O	-5.11	1.13	1.23

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	143	PRO	O-C-N	-10.45	105.98	122.70
1	B	143	PRO	O-C-N	-9.85	106.94	122.70
3	M	113	TYR	CB-CA-C	-6.89	96.62	110.40
1	B	143	PRO	CA-C-N	-5.65	104.78	117.20
1	A	143	PRO	CA-C-N	-5.42	105.28	117.20

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	143	PRO	Mainchain
1	B	143	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	A	591	0	286	4	0
1	B	591	0	286	5	0
2	H	1077	0	489	5	0
2	I	1077	0	489	5	0
3	L	1098	0	484	3	0
3	M	1098	0	484	6	0
All	All	5532	0	2518	26	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 3.

All (26) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:92:GLY:N	3:M:116:ASP:CB	2.57	0.66
2:I:53:MET:HA	2:I:117:ARG:HA	1.87	0.57
1:B:128:LEU:O	1:B:141:CYS:HB3	2.05	0.56
2:H:53:MET:HA	2:H:117:ARG:HA	1.87	0.56
1:A:45:CYS:HA	1:A:60:CYS:HA	1.87	0.55
3:L:88:SER:C	3:L:90:SER:H	2.12	0.53
2:H:41:CYS:O	2:H:97:SER:HA	2.08	0.53
2:I:41:CYS:O	2:I:97:SER:HA	2.08	0.53
3:M:88:SER:C	3:M:90:SER:H	2.12	0.52
2:H:88:THR:O	2:H:100:LEU:HA	2.12	0.50
2:I:88:THR:O	2:I:100:LEU:HA	2.12	0.49
3:M:113:TYR:C	3:M:115:SER:N	2.67	0.47
3:M:88:SER:C	3:M:90:SER:N	2.69	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:L:88:SER:C	3:L:90:SER:N	2.69	0.46
1:A:55:CYS:SG	1:A:56:PRO:N	2.91	0.44
2:H:121:SER:O	2:H:122:PHE:C	2.57	0.43
1:B:92:GLY:H	3:M:116:ASP:CB	2.31	0.43
2:I:121:SER:O	2:I:122:PHE:C	2.57	0.42
1:B:48:TYR:HA	1:B:58:GLU:H	1.85	0.42
3:L:72:ASP:O	3:L:73:GLN:C	2.58	0.42
1:A:47:LEU:O	1:A:48:TYR:C	2.58	0.42
3:M:72:ASP:O	3:M:73:GLN:C	2.58	0.42
1:A:36:ASN:O	1:A:43:ARG:N	2.53	0.42
2:H:118:HIS:O	2:H:119:ASP:C	2.58	0.41
2:I:118:HIS:O	2:I:119:ASP:C	2.58	0.41
1:B:128:LEU:N	1:B:142:ILE:O	2.49	0.41

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	116/490 (24%)	98 (84%)	13 (11%)	5 (4%)	2	25
1	B	116/490 (24%)	100 (86%)	13 (11%)	3 (3%)	5	35
2	H	216/465 (46%)	191 (88%)	16 (7%)	9 (4%)	3	25
2	I	216/465 (46%)	190 (88%)	17 (8%)	9 (4%)	3	25
3	L	219/240 (91%)	192 (88%)	23 (10%)	4 (2%)	8	42
3	M	219/240 (91%)	193 (88%)	23 (10%)	3 (1%)	11	47
All	All	1102/2390 (46%)	964 (88%)	105 (10%)	33 (3%)	7	31

All (33) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	49	ALA
1	A	50	PRO
1	A	143	PRO
1	B	56	PRO
2	H	80	PRO
2	H	121	SER
3	L	23	LEU
3	L	80	ASP
2	I	121	SER
3	M	80	ASP
1	B	143	PRO
2	H	48	PHE
3	L	92	SER
2	I	48	PHE
2	I	80	PRO
3	M	92	SER
3	M	118	ASP
1	A	48	TYR
2	H	82	SER
2	H	122	PHE
3	L	44	SER
2	I	82	SER
2	I	122	PHE
2	I	166	ASP
2	H	119	ASP
2	H	166	ASP
2	I	119	ASP
1	A	46	SER
2	H	46	PHE
2	I	46	PHE
2	H	45	GLY
2	I	45	GLY
1	B	51	GLY

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	15/419 (4%)	13 (87%)	2 (13%)	4	20
1	B	15/419 (4%)	13 (87%)	2 (13%)	4	20
2	H	5/413 (1%)	5 (100%)	0	100	100
2	I	5/413 (1%)	5 (100%)	0	100	100
3	L	5/213 (2%)	5 (100%)	0	100	100
3	M	5/213 (2%)	5 (100%)	0	100	100
All	All	50/2090 (2%)	46 (92%)	4 (8%)	16	38

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

Mol	Chain	Res	Type
1	A	29	CYS
1	A	44	CYS
1	B	29	CYS
1	B	55	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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

There are no chain breaks in this entry.

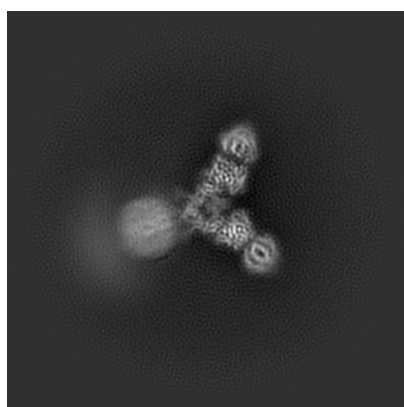
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-24444. These allow visual inspection of the internal detail of the map and identification of artifacts.

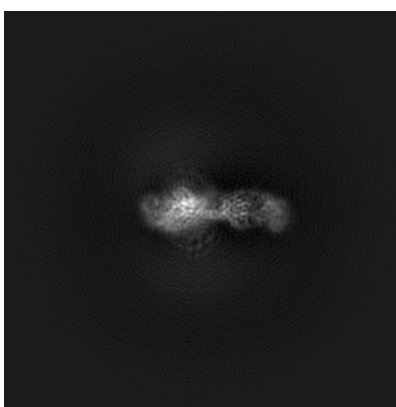
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

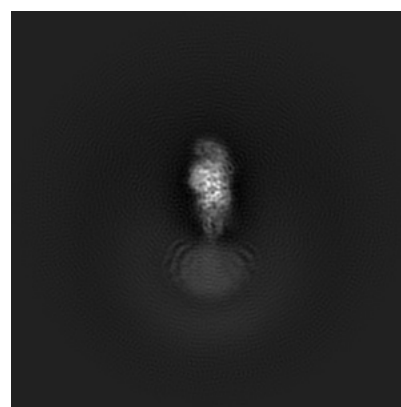
6.1.1 Primary map



X



Y

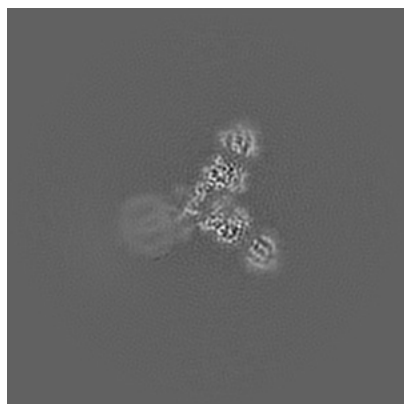


Z

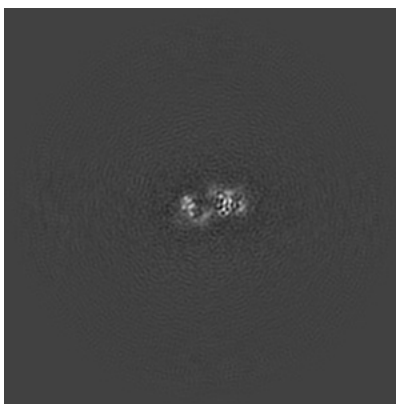
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

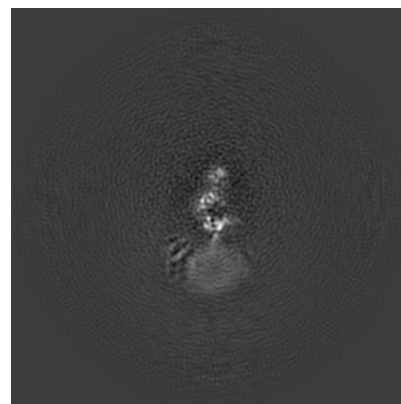
6.2.1 Primary map



X Index: 192



Y Index: 192

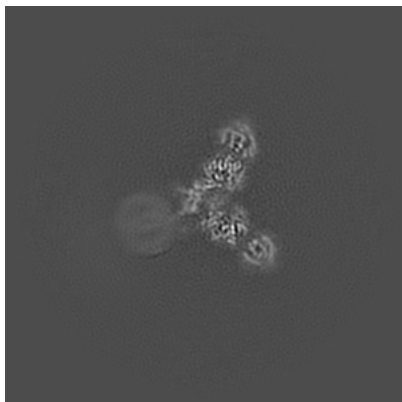


Z Index: 192

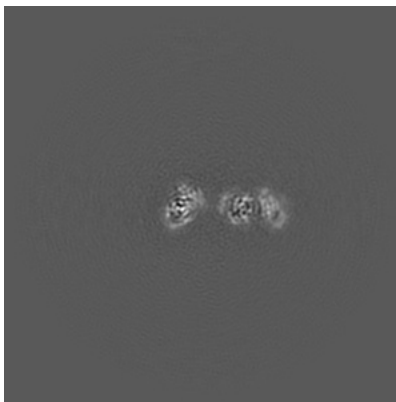
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

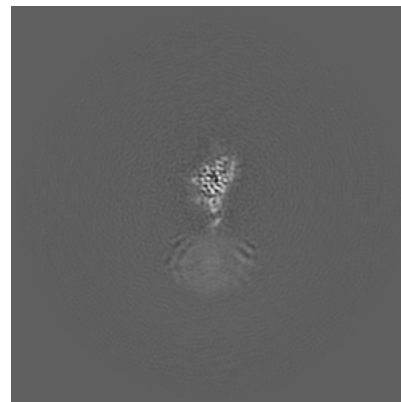
6.3.1 Primary map



X Index: 189



Y Index: 218

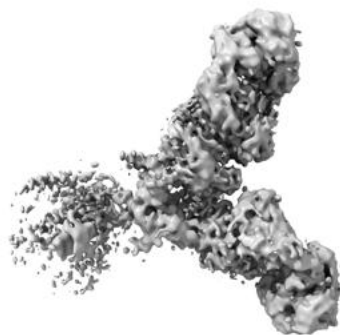


Z Index: 172

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

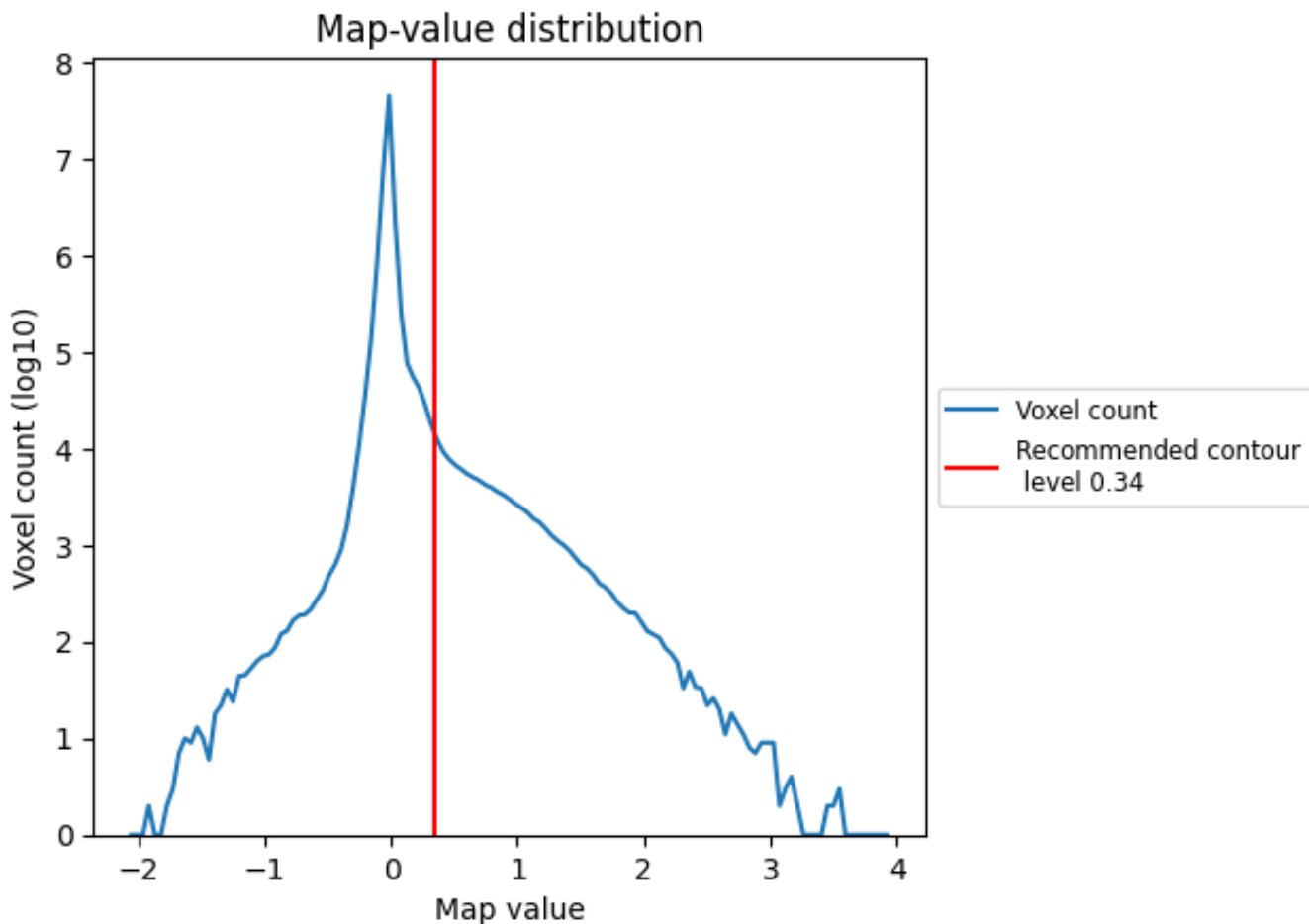
6.5 Mask visualisation

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

7 Map analysis [i](#)

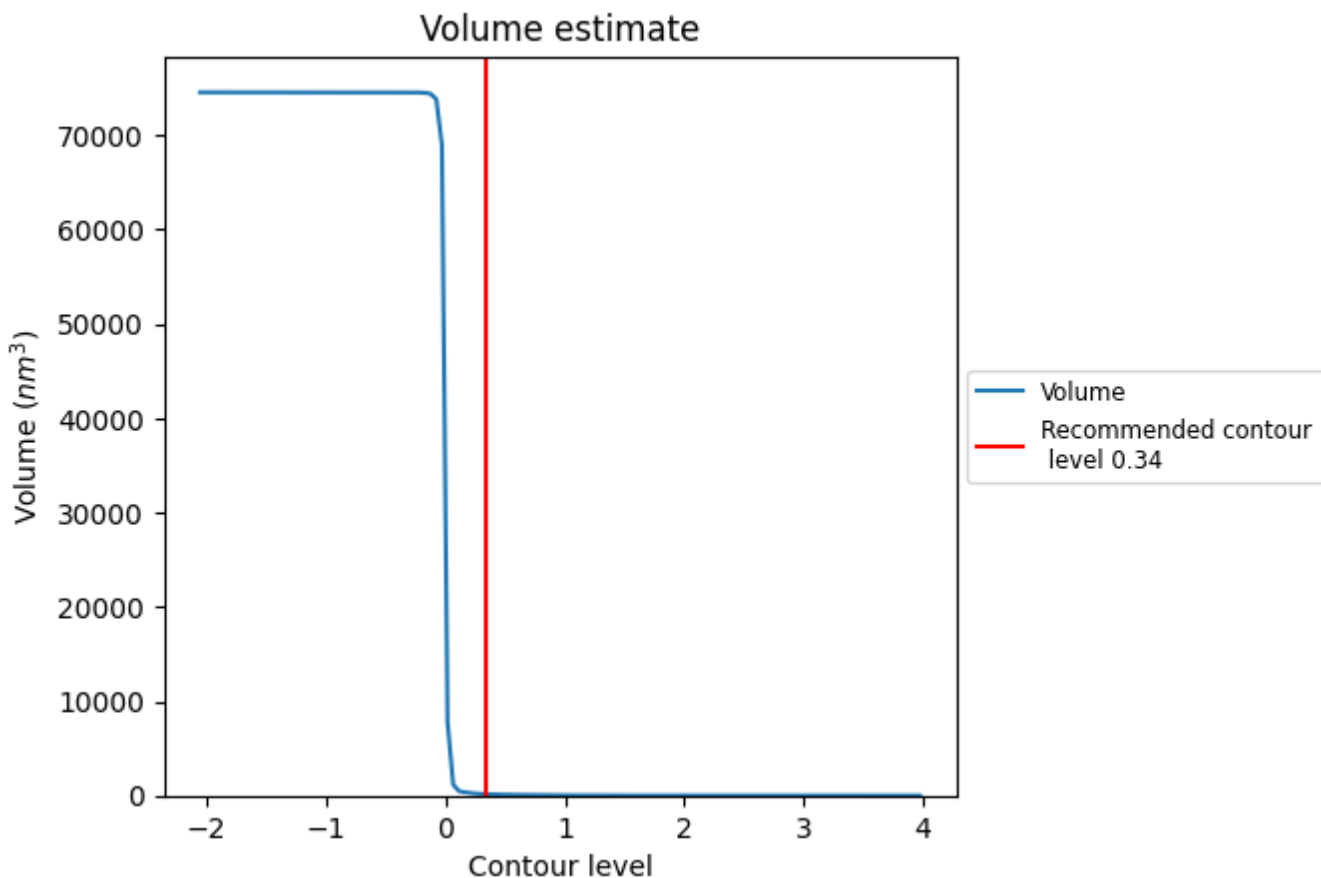
This section contains the results of statistical analysis of the map.

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.

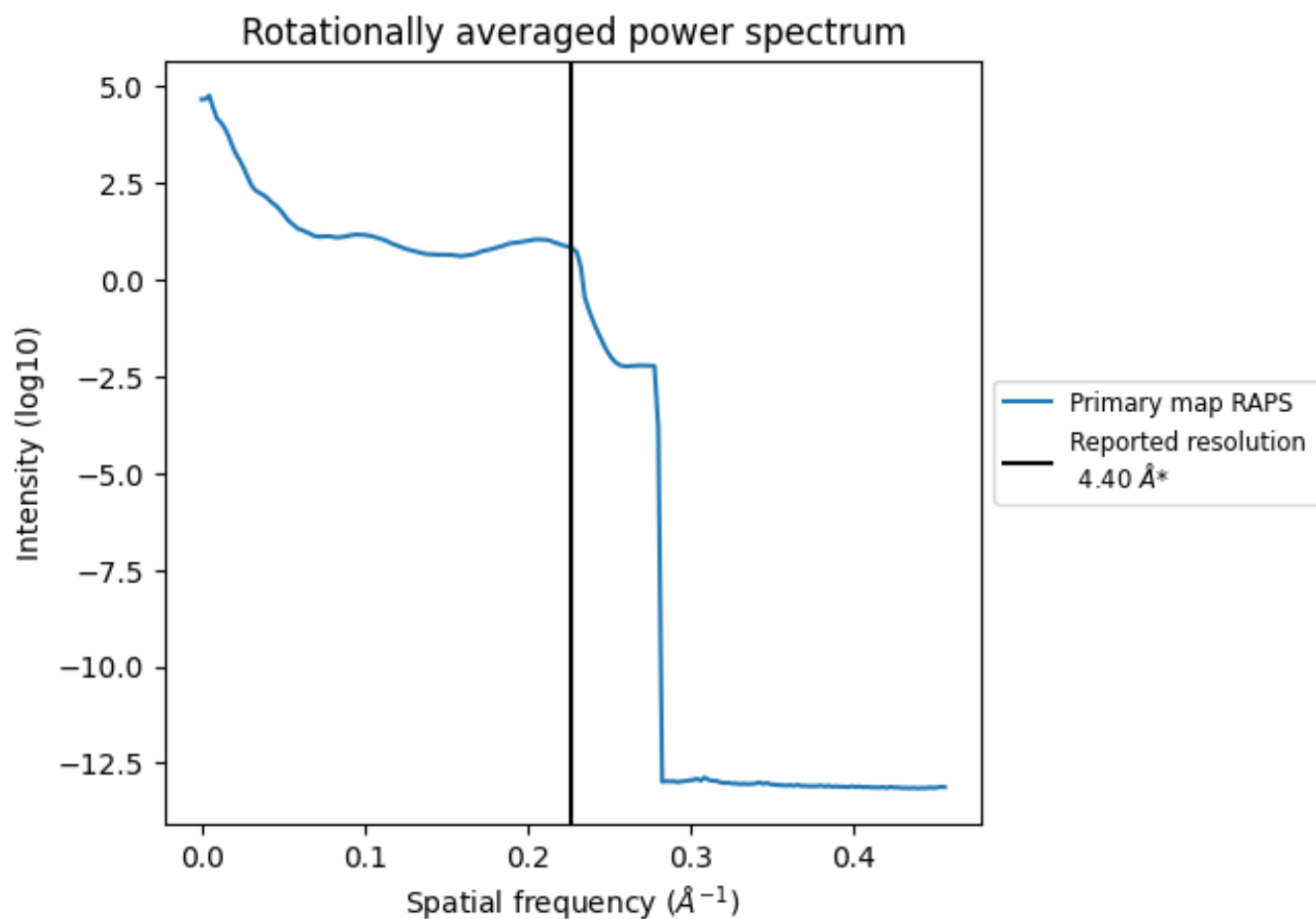
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 141 nm³; this corresponds to an approximate mass of 127 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

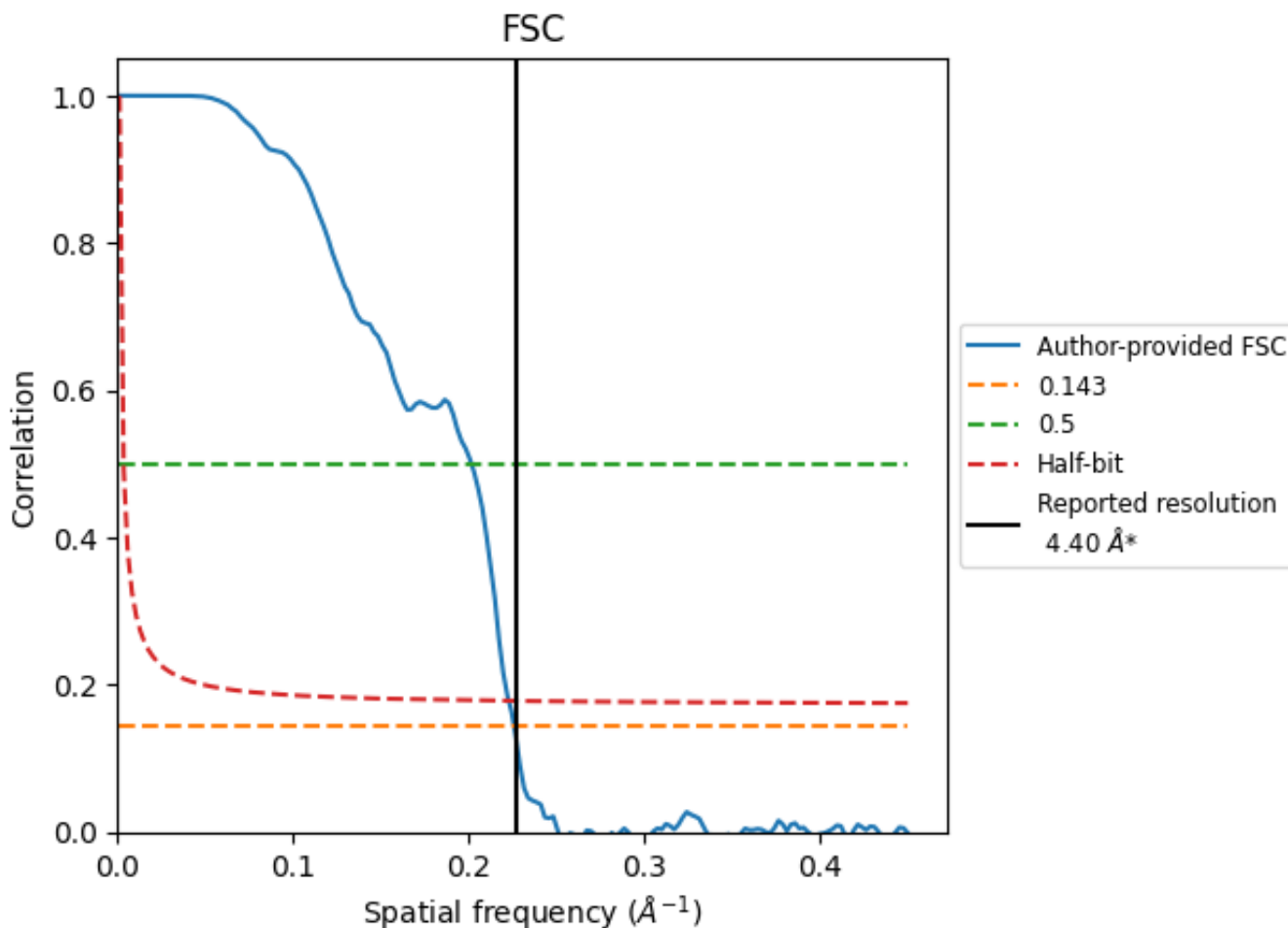


*Reported resolution corresponds to spatial frequency of 0.227 Å⁻¹

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 0.227 Å⁻¹

8.2 Resolution estimates [i](#)

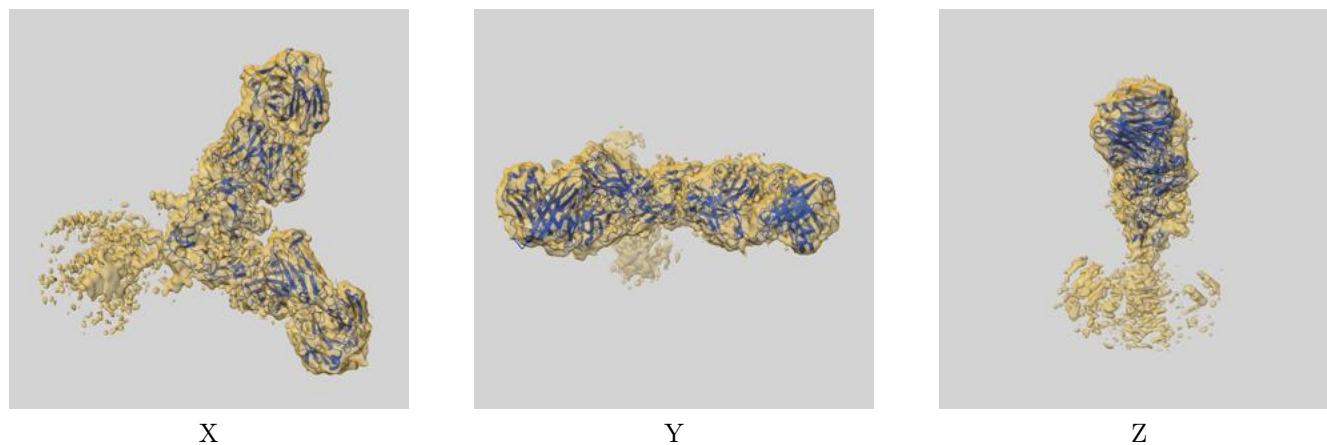
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.40	-	-
Author-provided FSC curve	4.42	4.96	4.49
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

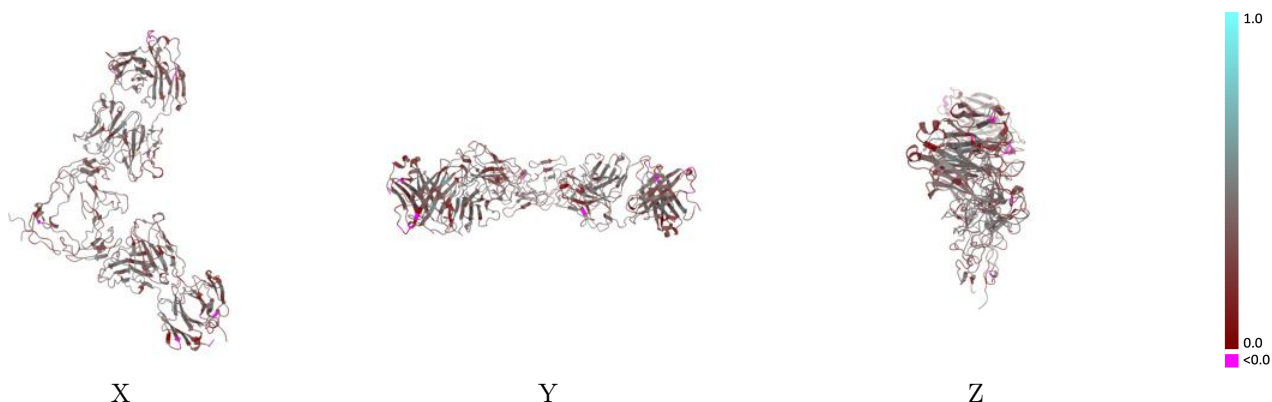
This section contains information regarding the fit between EMDB map EMD-24444 and PDB model 7RFP. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay [i](#)



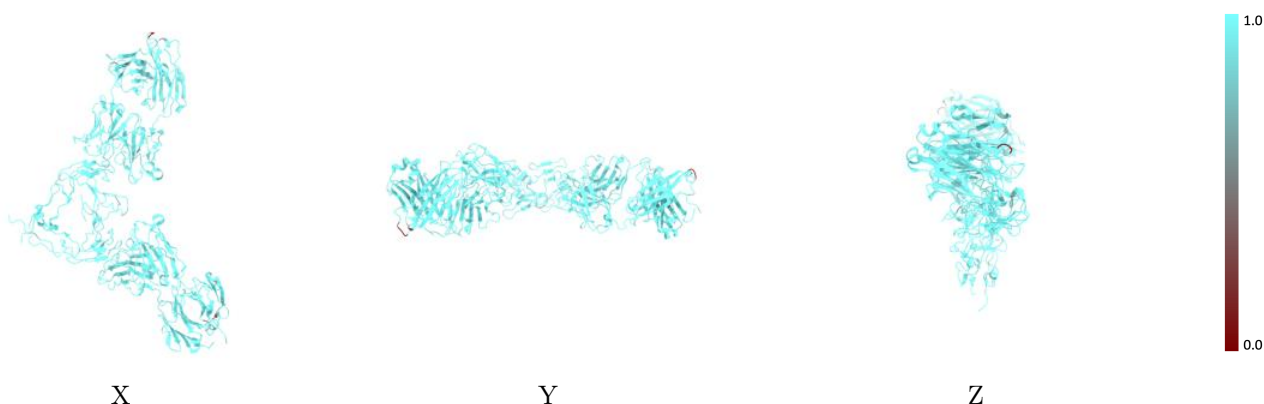
The images above show the 3D surface view of the map at the recommended contour level 0.34 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



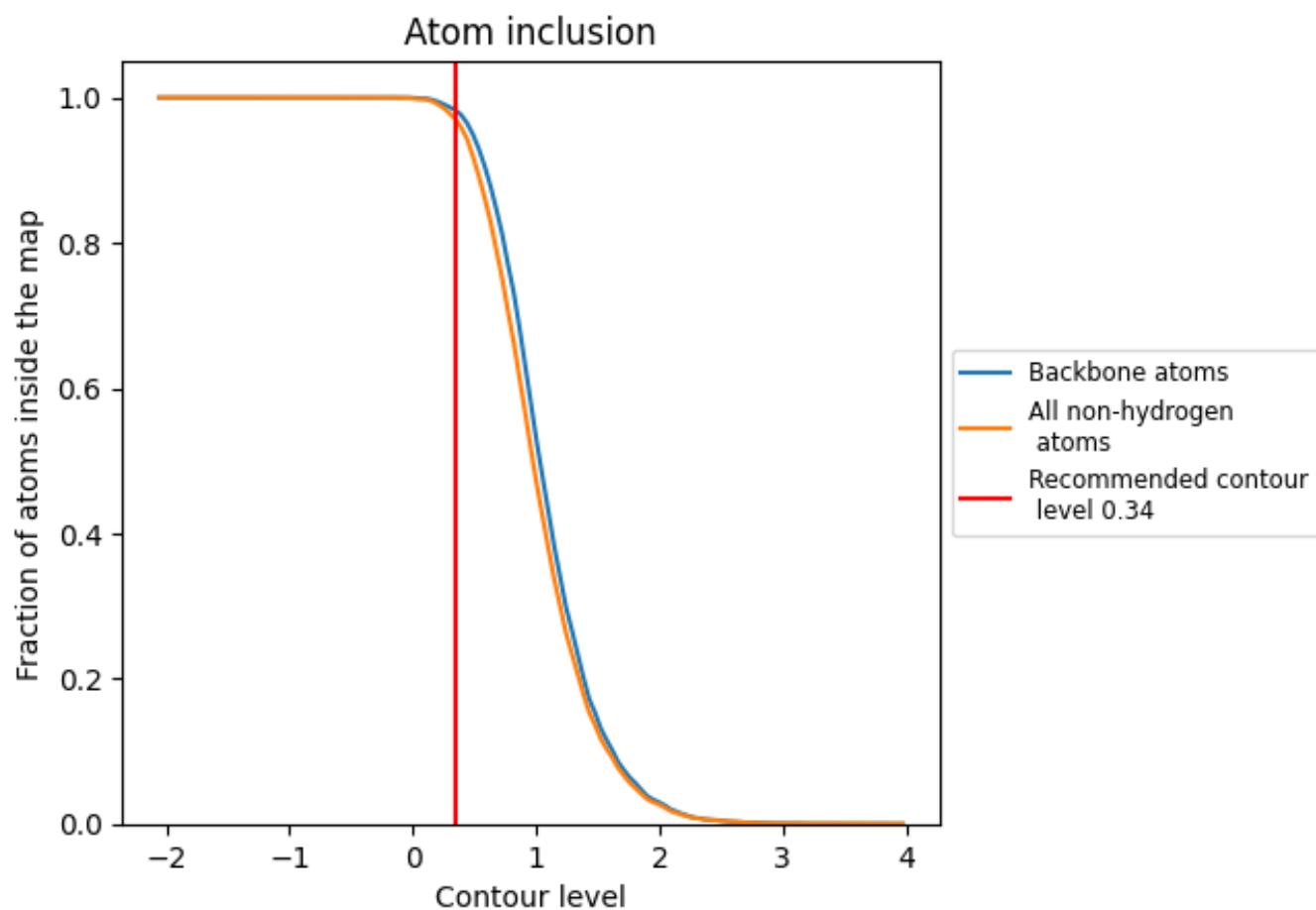
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.34).















9.4 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 97% 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 (0.34) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9716	 0.3560
A	 0.9662	 0.3590
B	 0.9865	 0.3700
H	 0.9629	 0.3420
I	 0.9638	 0.3360
L	 0.9800	 0.3660
M	 0.9745	 0.3710

