



Full wwPDB EM Validation Report ⓘ

Feb 21, 2022 – 04:47 pm GMT

PDB ID : 7OWG
EMDB ID : EMD-13097
Title : human DEPTOR in a complex with mutant human mTORC1 A1459P
Authors : Heimhalt, M.; Berndt, A.; Wagstaff, J.; Anandapadamanaban, M.; Perisic, O.; Maslen, S.; McLaughlin, S.; Yu, W.-H.; Masson, G.R.; Boland, A.; Ni, X.; Yamashita, K.; Murshudov, G.N.; Skehel, M.; Freund, S.M.; Williams, R.L.
Deposited on : 2021-06-18
Resolution : 4.70 Å (reported)
Based on initial model : 6BCX

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

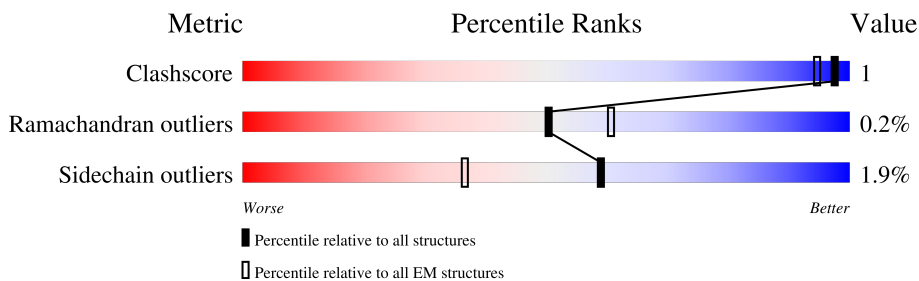
EMDB validation analysis : 0.0.0.dev97
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.26

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 4.70 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	B	2549	
2	E	326	
3	O	409	
4	Y	1335	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 57277 atoms, of which 28740 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 Serine/threonine-protein kinase mTOR.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	B	2152	34569	10958	17422	3002	3077	110	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	60	UNK	SER	conflict	UNP P42345
B	1459	PRO	ALA	engineered mutation	UNP P42345

- Molecule 2 is a protein called Target of rapamycin complex subunit LST8.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
2	E	317	4809	1526	2353	436	476	18	0	0

- Molecule 3 is a protein called DEP domain-containing mTOR-interacting protein.

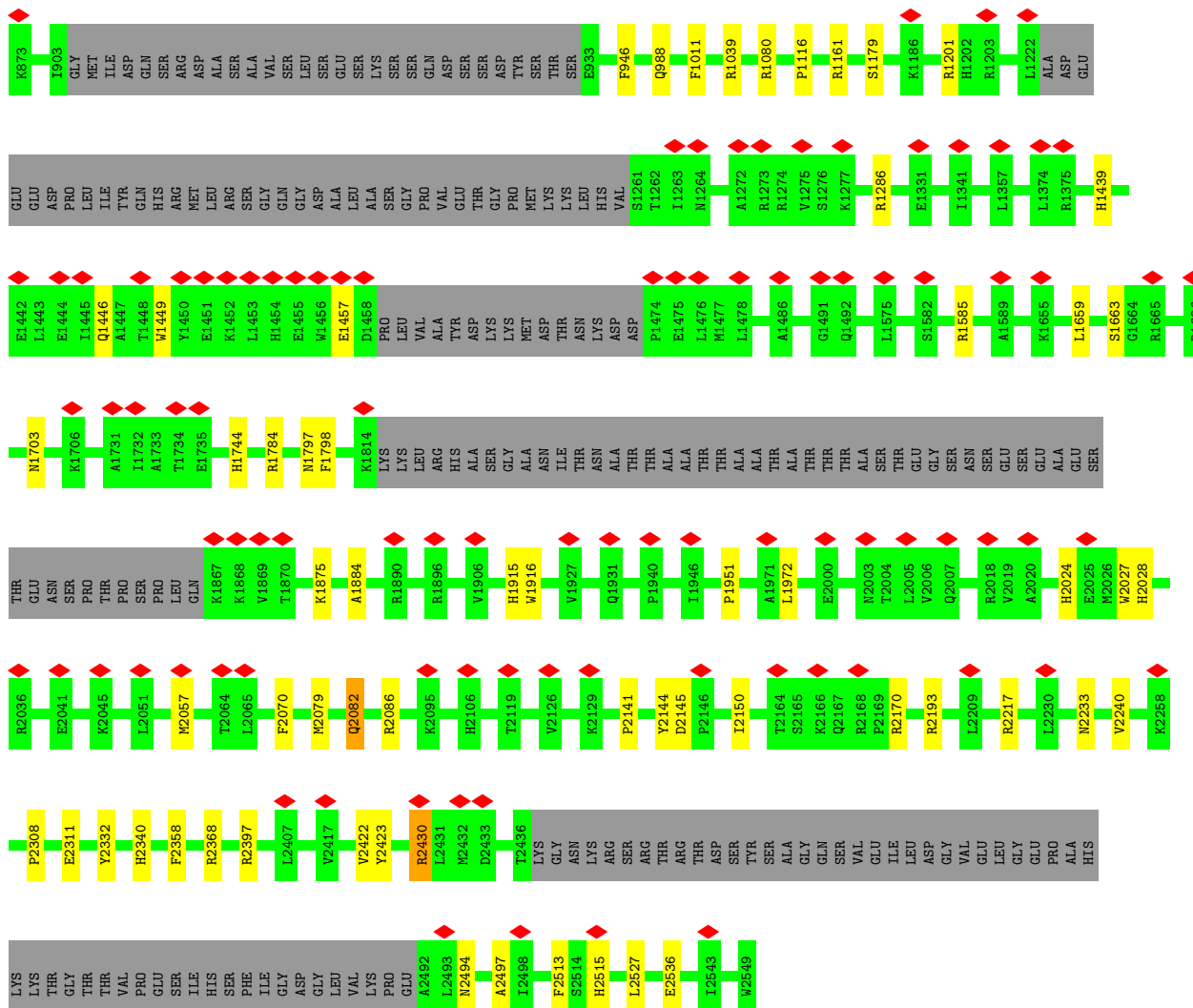
Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
3	O	81	1229	388	620	107	109	5	0	0

There are 2 discrepancies between the modelled and reference sequences:

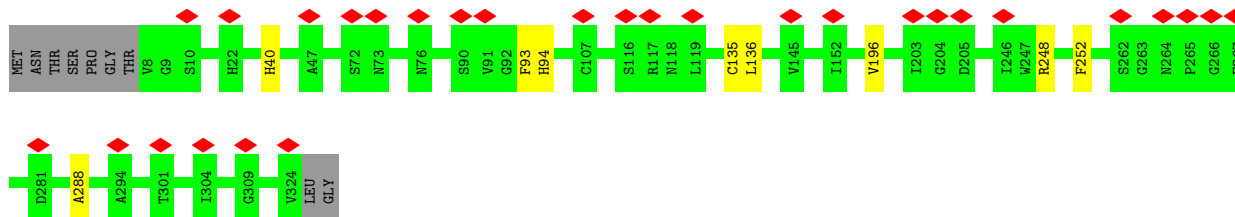
Chain	Residue	Modelled	Actual	Comment	Reference
O	204	SER	ASN	variant	UNP Q8TB45
O	389	ASN	SER	variant	UNP Q8TB45

- Molecule 4 is a protein called Regulatory-associated protein of mTOR.

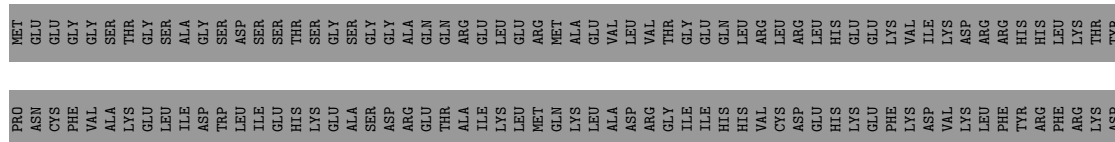
Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
4	Y	1044	16670	5322	8345	1441	1506	56	0	0

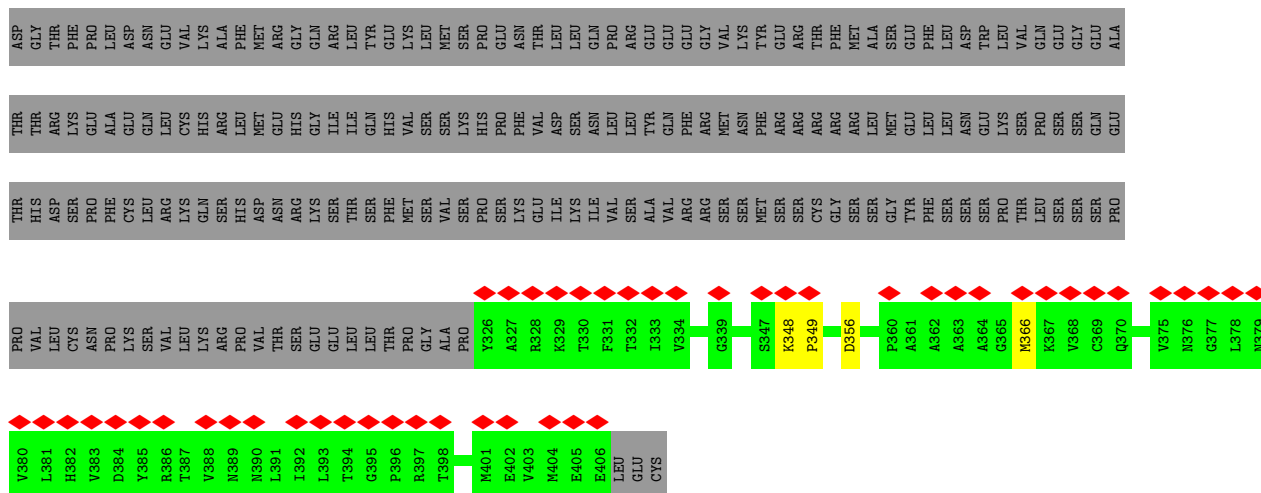


● Molecule 2: Target of rapamycin complex subunit LST8

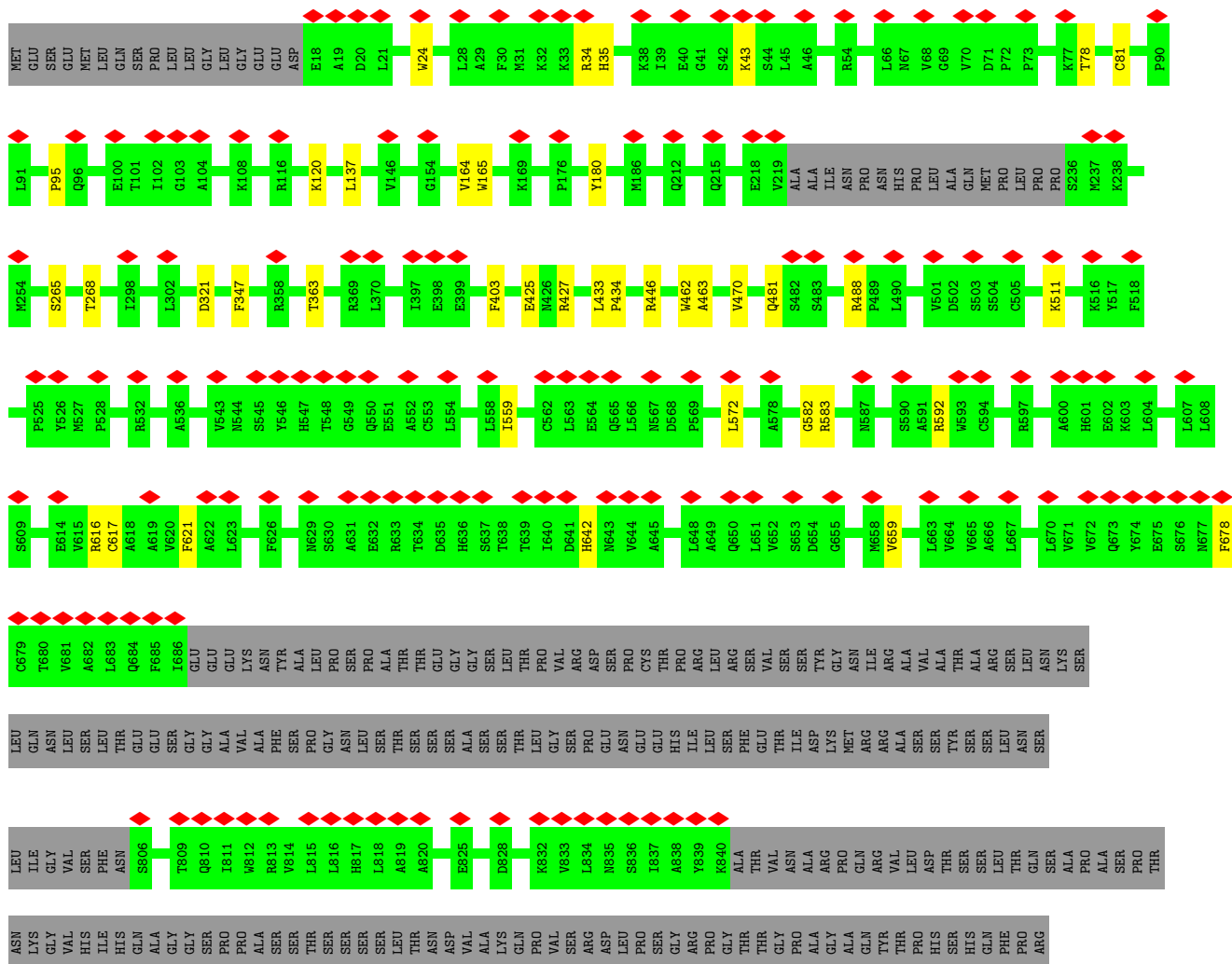
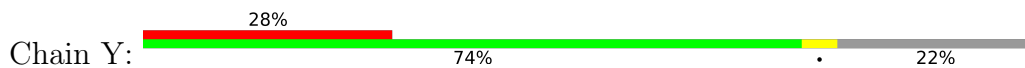


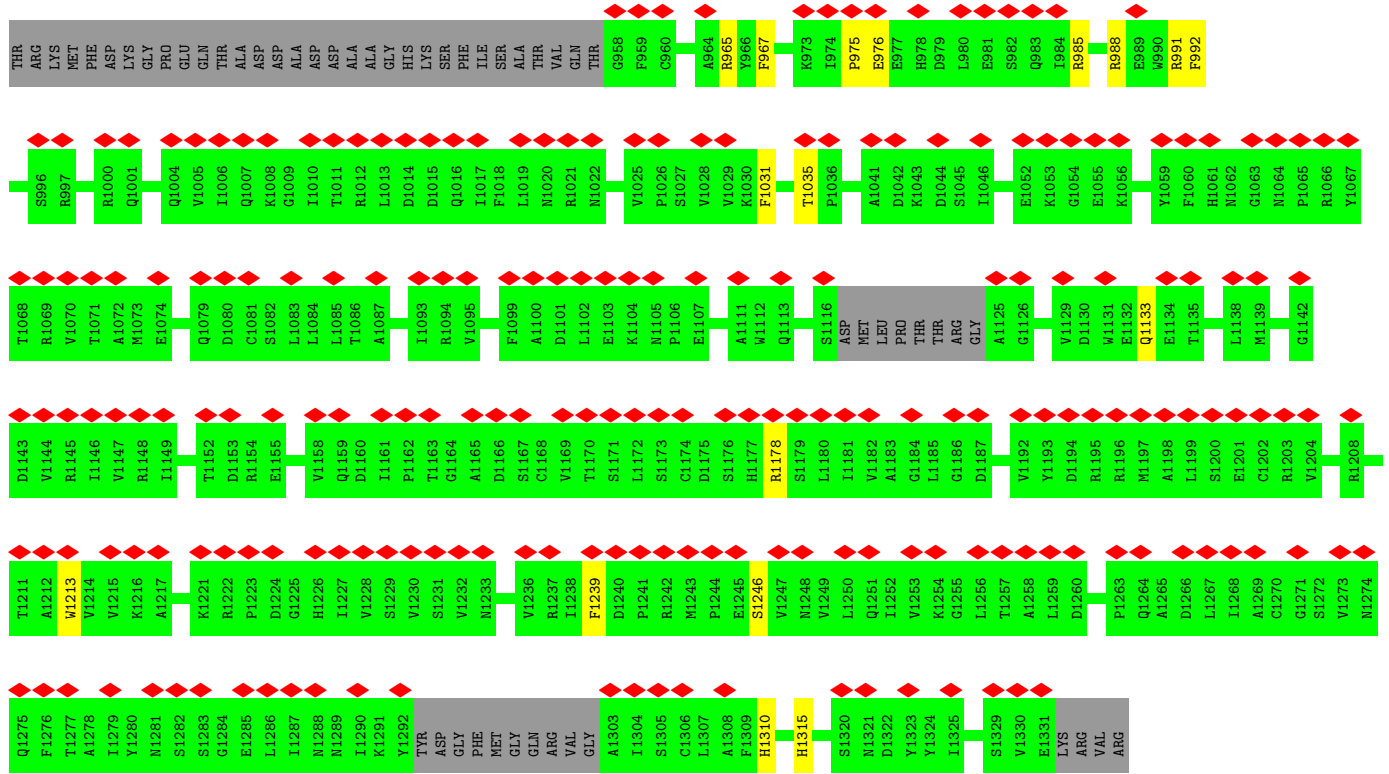
● Molecule 3: DEP domain-containing mTOR-interacting protein





• Molecule 4: Regulatory-associated protein of mTOR





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	500000	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 ($e^-/\text{\AA}^2$)	56	Depositor
Minimum defocus (nm)	-1400	Depositor
Maximum defocus (nm)	-3000	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.038	Depositor
Minimum map value	-0.014	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.01	Depositor
Map size (\AA)	303.6, 303.6, 303.6	wwPDB
Map dimensions	276, 276, 276	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.1, 1.1, 1.1	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	B	0.71	2/17214 (0.0%)	0.93	24/23297 (0.1%)
2	E	0.75	0/2514	0.93	0/3426
3	O	0.78	0/621	0.90	0/845
4	Y	0.76	0/8524	0.95	13/11596 (0.1%)
All	All	0.73	2/28873 (0.0%)	0.94	37/39164 (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	B	0	4
2	E	0	3
3	O	0	1
4	Y	0	5
All	All	0	13

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	762	SER	CA-CB	-5.99	1.44	1.52
1	B	1179	SER	CA-CB	-5.29	1.45	1.52

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	2193	ARG	NE-CZ-NH2	-10.24	115.18	120.30
1	B	731	ARG	NE-CZ-NH1	8.49	124.55	120.30
1	B	1585	ARG	NE-CZ-NH2	-8.04	116.28	120.30
4	Y	427	ARG	NE-CZ-NH2	-7.88	116.36	120.30
4	Y	446	ARG	NE-CZ-NH2	-7.51	116.54	120.30
1	B	619	ARG	NE-CZ-NH1	7.27	123.93	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1039	ARG	NE-CZ-NH2	-6.99	116.81	120.30
1	B	1585	ARG	NE-CZ-NH1	6.88	123.74	120.30
1	B	1161	ARG	NE-CZ-NH1	6.88	123.74	120.30
1	B	859	ARG	NE-CZ-NH1	6.87	123.74	120.30
4	Y	985	ARG	NE-CZ-NH2	-6.62	116.99	120.30
1	B	2217	ARG	NE-CZ-NH1	6.42	123.51	120.30
1	B	708	ARG	NE-CZ-NH2	-6.08	117.26	120.30
1	B	837	ARG	NE-CZ-NH1	6.06	123.33	120.30
4	Y	488	ARG	NE-CZ-NH2	-6.04	117.28	120.30
1	B	2193	ARG	NE-CZ-NH1	5.92	123.26	120.30
1	B	2397	ARG	NE-CZ-NH1	5.91	123.26	120.30
4	Y	991	ARG	NE-CZ-NH1	5.85	123.22	120.30
4	Y	583	ARG	NE-CZ-NH1	5.74	123.17	120.30
4	Y	1178	ARG	NE-CZ-NH2	-5.74	117.43	120.30
4	Y	616	ARG	NE-CZ-NH2	-5.68	117.46	120.30
1	B	2217	ARG	NE-CZ-NH2	-5.63	117.48	120.30
4	Y	592	ARG	NE-CZ-NH2	5.55	123.08	120.30
1	B	2423	TYR	CB-CG-CD2	-5.54	117.68	121.00
1	B	2430	ARG	NE-CZ-NH2	-5.48	117.56	120.30
1	B	1080	ARG	NE-CZ-NH2	-5.45	117.58	120.30
1	B	1201	ARG	NE-CZ-NH2	-5.44	117.58	120.30
1	B	755	ARG	NE-CZ-NH2	-5.43	117.58	120.30
1	B	2368	ARG	NE-CZ-NH1	5.39	123.00	120.30
1	B	2170	ARG	NE-CZ-NH1	5.38	122.99	120.30
4	Y	34	ARG	NE-CZ-NH2	-5.35	117.63	120.30
1	B	1915	HIS	CA-CB-CG	5.18	122.41	113.60
4	Y	985	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	B	731	ARG	NE-CZ-NH2	-5.12	117.74	120.30
4	Y	1315	HIS	CA-CB-CG	5.10	122.27	113.60
1	B	1161	ARG	NE-CZ-NH2	-5.05	117.78	120.30
4	Y	616	ARG	NE-CZ-NH1	5.02	122.81	120.30

There are no chirality outliers.

All (13) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	1439	HIS	Peptide
1	B	1659	LEU	Peptide
1	B	2233	ASN	Peptide
1	B	853	TYR	Sidechain
2	E	288	ALA	Peptide
2	E	93	PHE	Peptide

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Mol	Chain	Res	Type	Group
2	E	94	HIS	Peptide
3	O	348	LYS	Peptide
4	Y	1035	THR	Peptide
4	Y	35	HIS	Peptide
4	Y	425	GLU	Peptide
4	Y	975	PRO	Peptide
4	Y	976	GLU	Peptide

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	B	17147	17422	17177	14	0
2	E	2456	2353	2341	2	0
3	O	609	620	617	0	0
4	Y	8325	8345	8314	13	0
All	All	28537	28740	28449	29	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 1.

All (29) 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:1798:PHE:CD2	1:B:1884:ALA:HB1	2.29	0.68
4:Y:164:VAL:HG22	4:Y:165:TRP:H	1.70	0.57
1:B:1797:ASN:HB3	1:B:1884:ALA:HB2	1.90	0.54
4:Y:433:LEU:HB3	4:Y:434:PRO:HD3	1.90	0.53
1:B:2311:GLU:H	1:B:2311:GLU:CD	2.12	0.53
2:E:135:CYS:SG	2:E:136:LEU:N	2.81	0.53
1:B:2024:HIS:HA	1:B:2027:TRP:CE2	2.46	0.51
4:Y:988:ARG:HA	4:Y:992:PHE:CD1	2.45	0.50
1:B:2082:GLN:NE2	1:B:2086:ARG:HE	2.13	0.46
4:Y:1031:PHE:CE2	4:Y:1310:HIS:CD2	3.05	0.45
4:Y:582:GLY:HA3	4:Y:621:PHE:CE2	2.52	0.44
1:B:398:ARG:N	1:B:398:ARG:HD3	2.32	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:Y:363:THR:O	4:Y:363:THR:HG23	2.18	0.43
4:Y:1239:PHE:CE2	4:Y:1246:SER:HB3	2.54	0.42
1:B:108:ALA:HB2	1:B:144:TYR:CZ	2.55	0.42
1:B:2536:GLU:H	1:B:2536:GLU:CD	2.22	0.42
4:Y:265:SER:HA	4:Y:268:THR:HG22	2.00	0.42
2:E:196:VAL:HG11	2:E:252:PHE:CE2	2.55	0.42
1:B:988:GLN:H	1:B:988:GLN:CD	2.23	0.41
4:Y:120:LYS:HE3	4:Y:137:LEU:HD21	2.02	0.41
4:Y:470:VAL:O	4:Y:470:VAL:CG1	2.67	0.41
1:B:2311:GLU:CD	1:B:2311:GLU:N	2.74	0.41
1:B:2144:TYR:CE1	1:B:2150:ILE:HA	2.56	0.41
1:B:2513:PHE:CE2	1:B:2527:LEU:HB3	2.55	0.41
4:Y:617:CYS:SG	4:Y:659:VAL:HA	2.61	0.41
1:B:2422:VAL:HG12	1:B:2497:ALA:HB1	2.02	0.40
1:B:1875:LYS:HE2	1:B:1916:TRP:CE3	2.56	0.40
4:Y:462:TRP:CD1	4:Y:463:ALA:N	2.90	0.40
4:Y:559:ILE:H	4:Y:559:ILE:HD12	1.87	0.40

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	B	2060/2549 (81%)	1918 (93%)	137 (7%)	5 (0%)	47	81
2	E	315/326 (97%)	284 (90%)	31 (10%)	0	100	100
3	O	79/409 (19%)	71 (90%)	7 (9%)	1 (1%)	12	48
4	Y	1032/1335 (77%)	945 (92%)	86 (8%)	1 (0%)	51	85
All	All	3486/4619 (76%)	3218 (92%)	261 (8%)	7 (0%)	50	81

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	O	349	PRO
1	B	1951	PRO
1	B	2308	PRO
1	B	2141	PRO
1	B	211	ALA
1	B	434	PHE
4	Y	95	PRO

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	B	1840/2171 (85%)	1803 (98%)	37 (2%)	55	73
2	E	269/276 (98%)	267 (99%)	2 (1%)	84	90
3	O	66/364 (18%)	64 (97%)	2 (3%)	41	63
4	Y	921/1163 (79%)	904 (98%)	17 (2%)	59	77
All	All	3096/3974 (78%)	3038 (98%)	58 (2%)	59	75

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	62	ARG
1	B	214	ARG
1	B	274	ILE
1	B	412	TYR
1	B	417	MET
1	B	448	PHE
1	B	451	TYR
1	B	522	TYR
1	B	587	ARG
1	B	647	THR
1	B	748	ARG
1	B	807	GLN
1	B	946	PHE
1	B	1011	PHE
1	B	1116	PRO

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Mol	Chain	Res	Type
1	B	1286	ARG
1	B	1446	GLN
1	B	1449	TRP
1	B	1457	GLU
1	B	1663	SER
1	B	1703	ASN
1	B	1744	HIS
1	B	1784	ARG
1	B	1972	LEU
1	B	2028	HIS
1	B	2057	MET
1	B	2070	PHE
1	B	2079	MET
1	B	2082	GLN
1	B	2145	ASP
1	B	2240	VAL
1	B	2332	TYR
1	B	2340	HIS
1	B	2358	PHE
1	B	2430	ARG
1	B	2494	ASN
1	B	2515	HIS
2	E	40	HIS
2	E	248	ARG
3	O	356	ASP
3	O	366	MET
4	Y	24	TRP
4	Y	43	LYS
4	Y	78	THR
4	Y	81	CYS
4	Y	180	TYR
4	Y	321	ASP
4	Y	347	PHE
4	Y	403	PHE
4	Y	481	GLN
4	Y	511	LYS
4	Y	572	LEU
4	Y	642	HIS
4	Y	678	PHE
4	Y	965	ARG
4	Y	967	PHE
4	Y	1133	GLN

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Mol	Chain	Res	Type
4	Y	1213	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	419	HIS
1	B	1058	GLN
1	B	1196	ASN
1	B	1693	HIS
1	B	1703	ASN
4	Y	35	HIS
4	Y	1289	ASN

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.

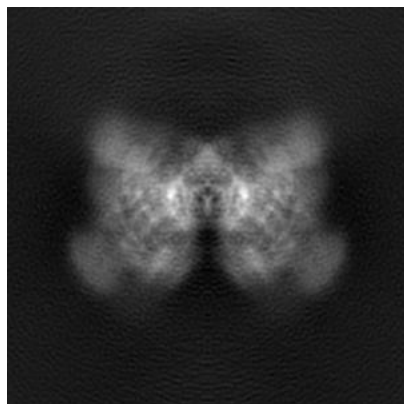
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13097. These allow visual inspection of the internal detail of the map and identification of artifacts.

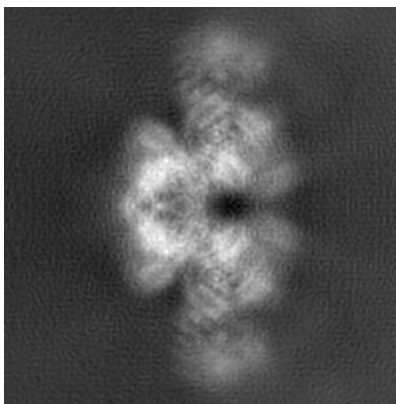
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

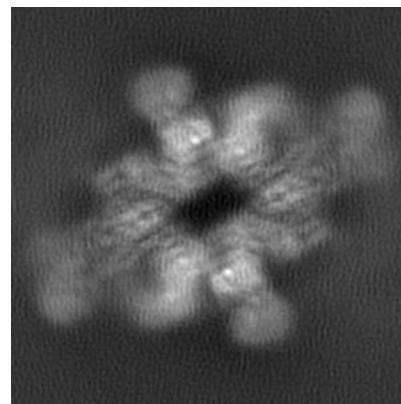
6.1.1 Primary map



X

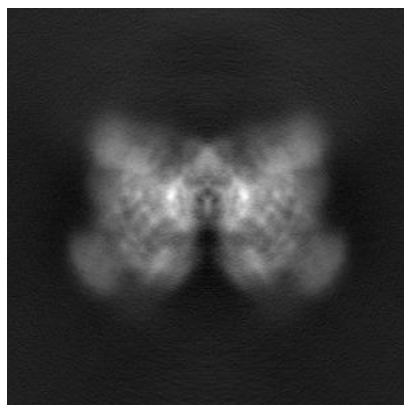


Y

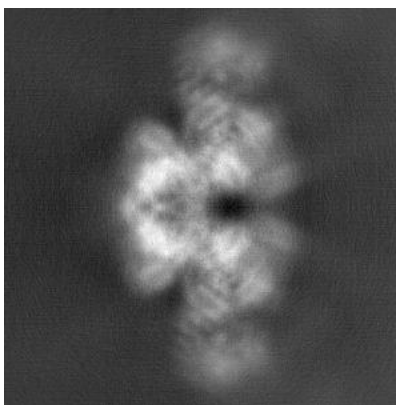


Z

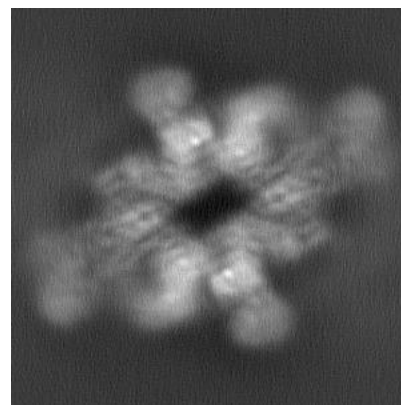
6.1.2 Raw map



X



Y

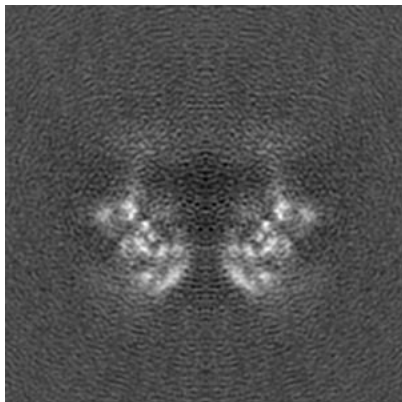


Z

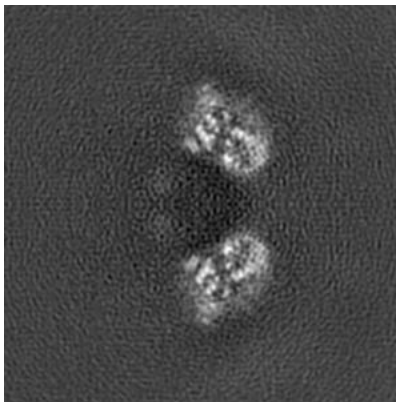
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

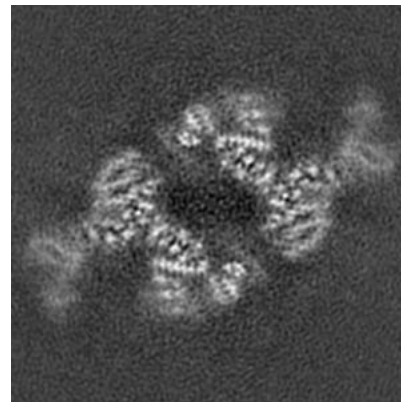
6.2.1 Primary map



X Index: 138

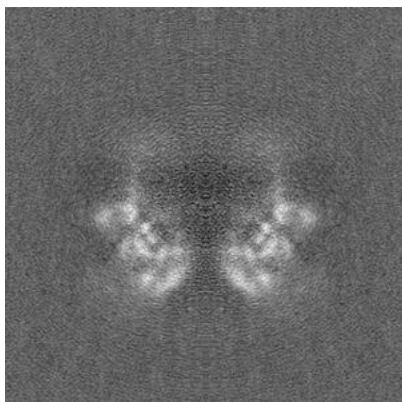


Y Index: 138

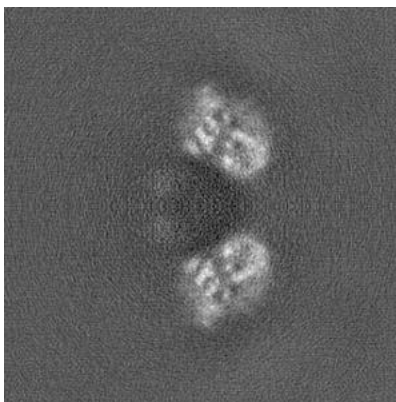


Z Index: 138

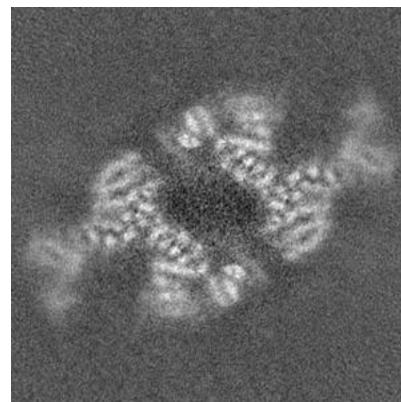
6.2.2 Raw map



X Index: 138



Y Index: 138

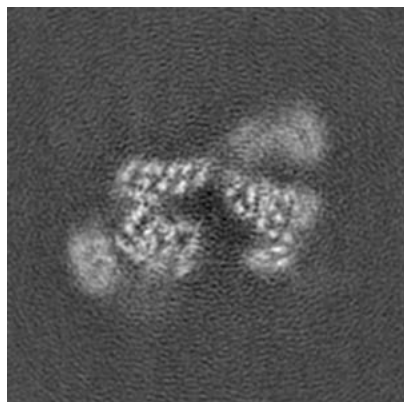


Z Index: 138

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

6.3 Largest variance slices [i](#)

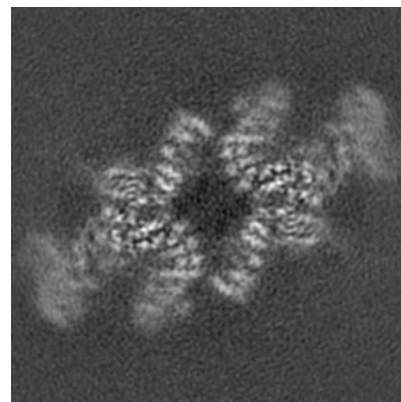
6.3.1 Primary map



X Index: 160

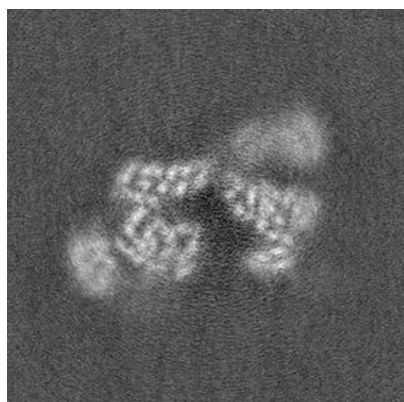


Y Index: 113



Z Index: 148

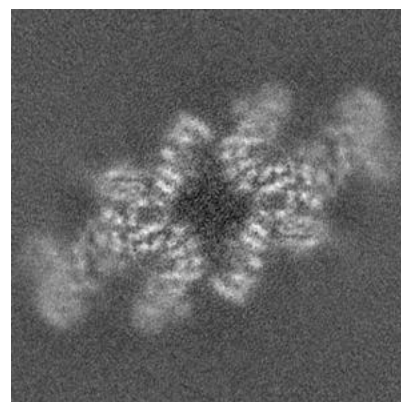
6.3.2 Raw map



X Index: 160



Y Index: 113

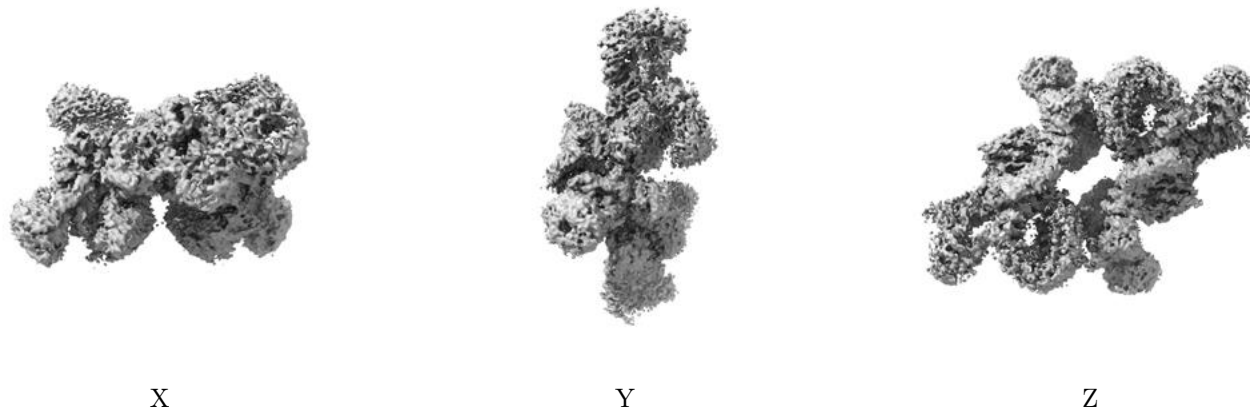


Z Index: 148

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

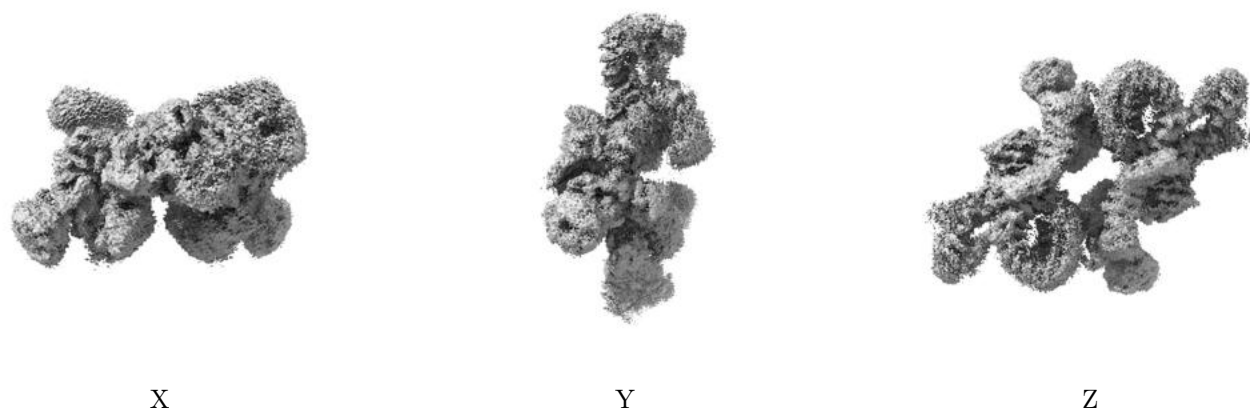
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



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.

6.4.2 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.

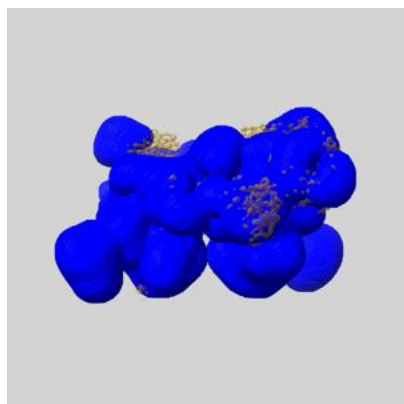
6.5 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

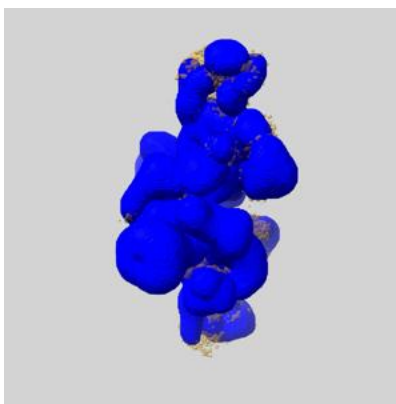
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

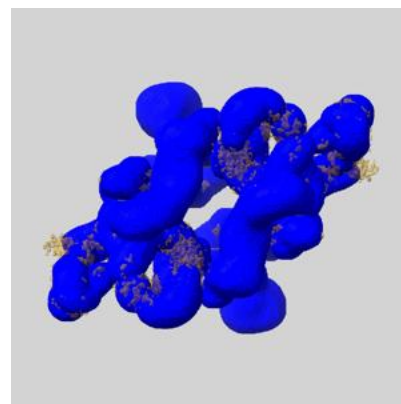
6.5.1 emd_13097_msk_1.map [i](#)



X



Y

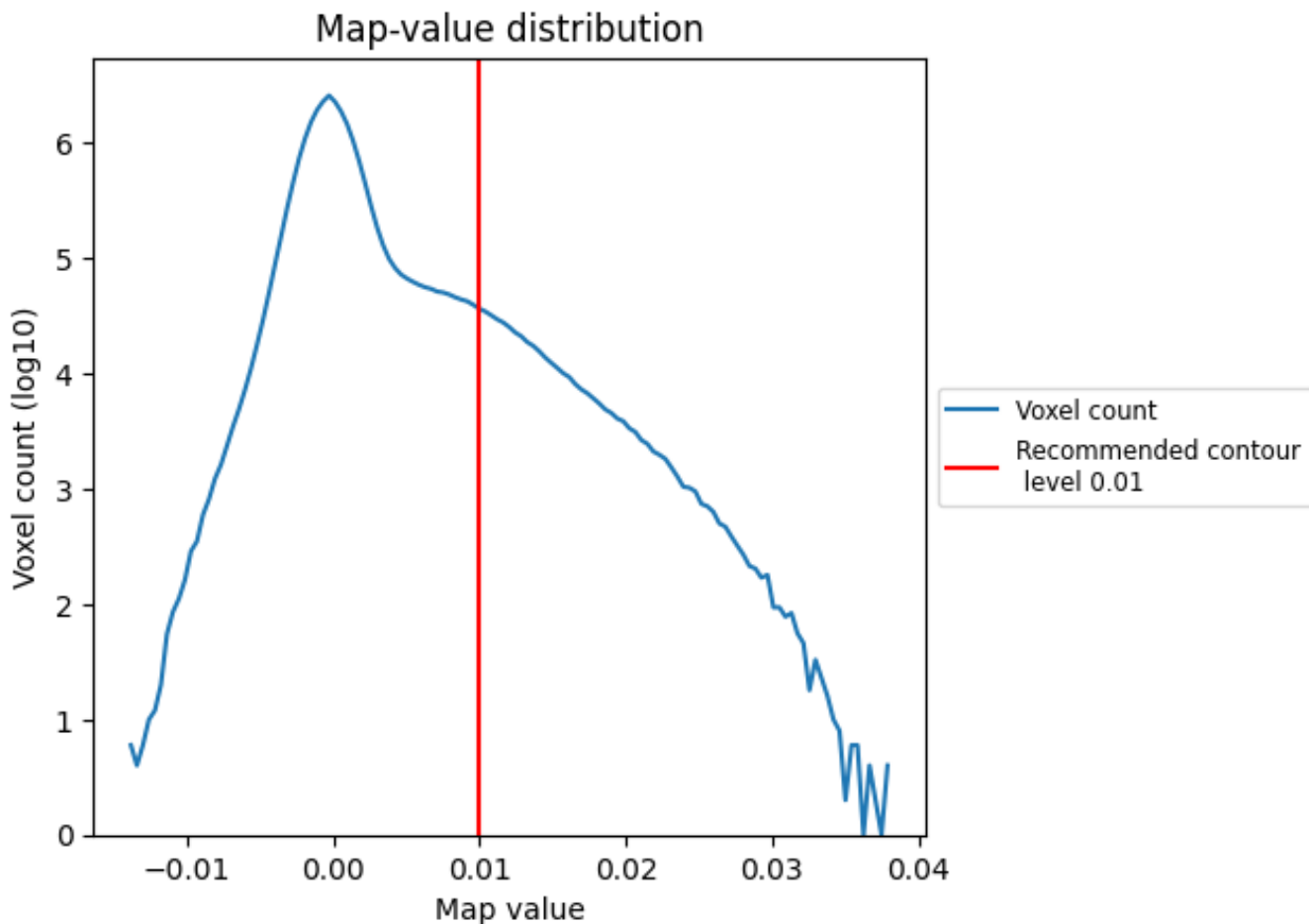


Z

7 Map analysis [i](#)

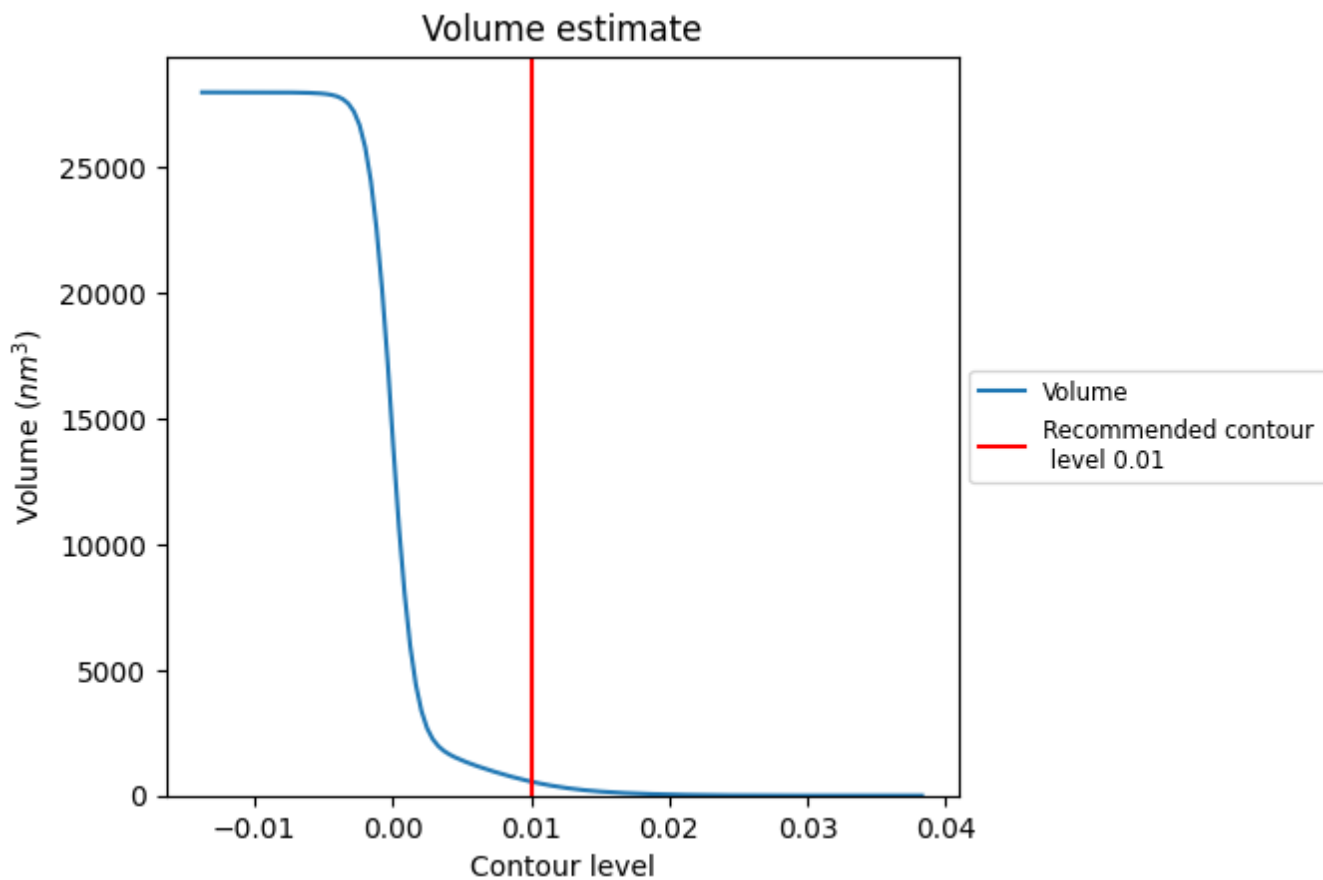
This section contains the results of statistical analysis of the map.

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.

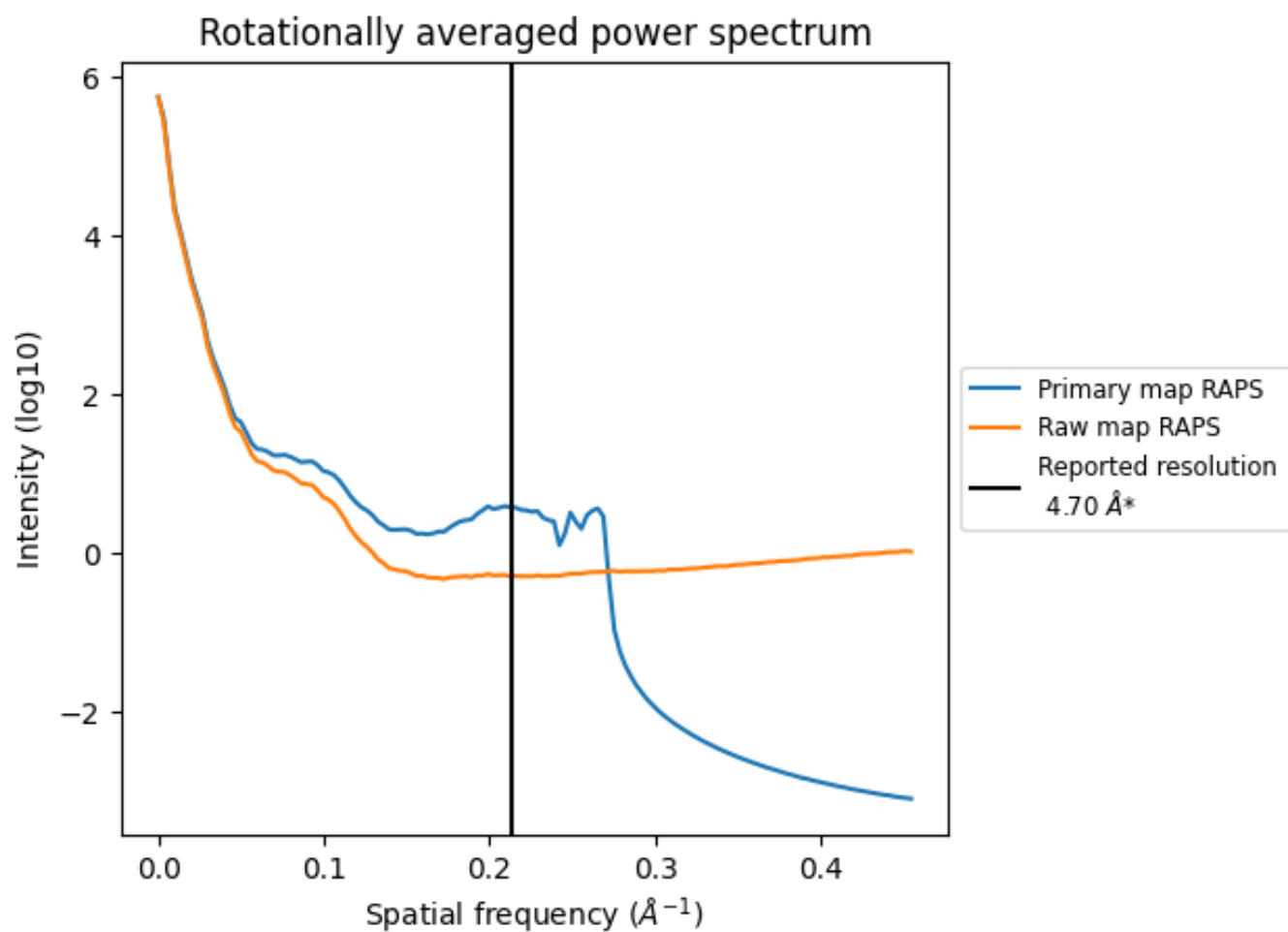
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 557 nm³; this corresponds to an approximate mass of 503 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

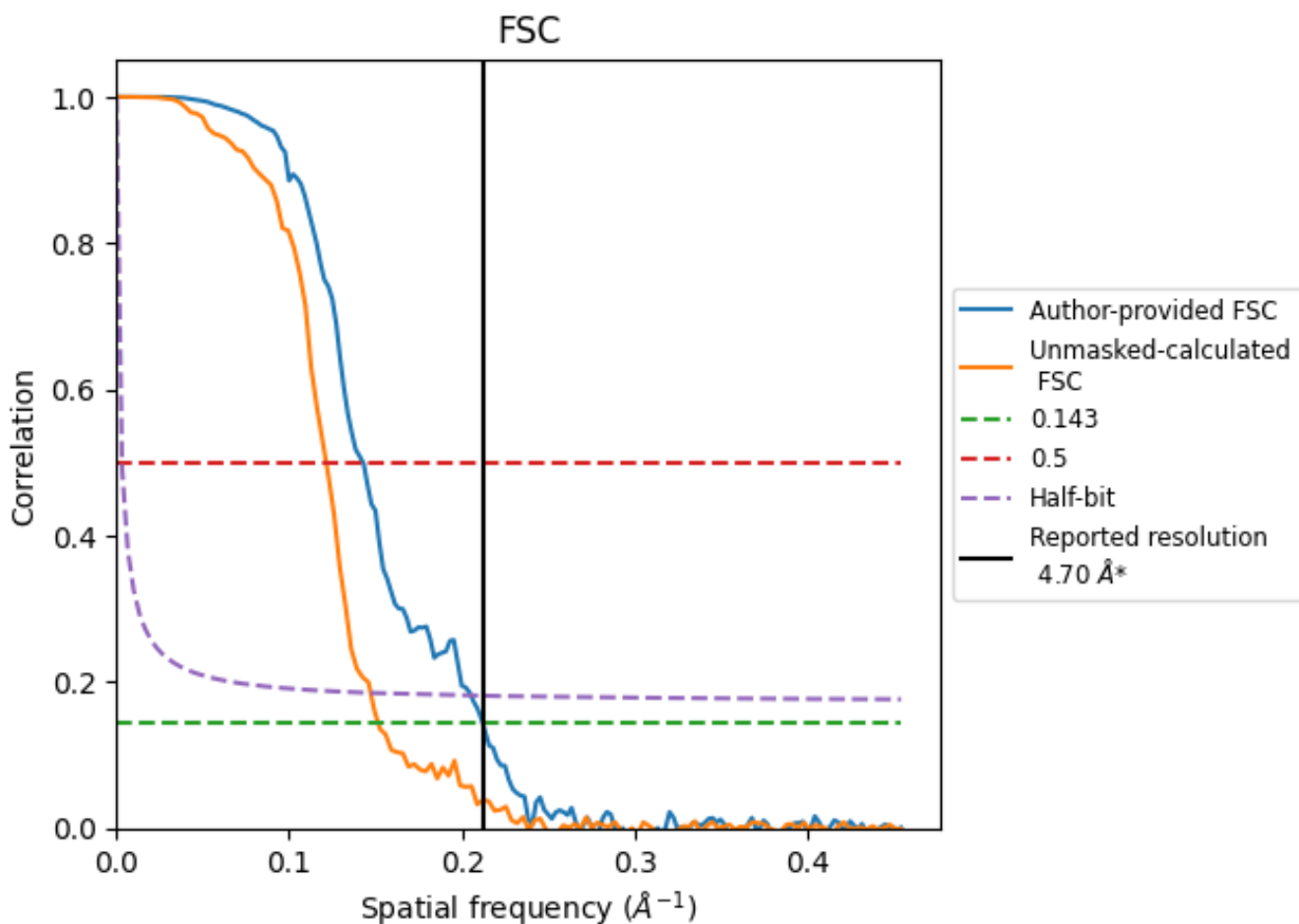


*Reported resolution corresponds to spatial frequency of 0.213 Å⁻¹

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 0.213 Å⁻¹

8.2 Resolution estimates [i](#)

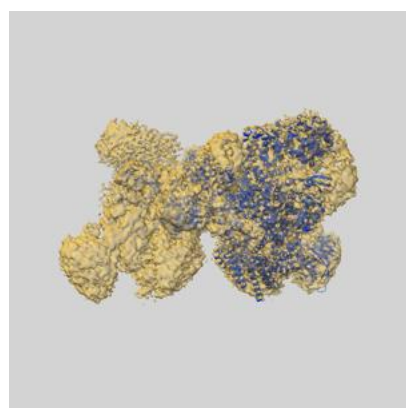
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.70	-	-
Author-provided FSC curve	4.71	7.01	4.86
Unmasked-calculated*	6.60	8.23	6.79

*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 6.60 differs from the reported value 4.7 by more than 10 %

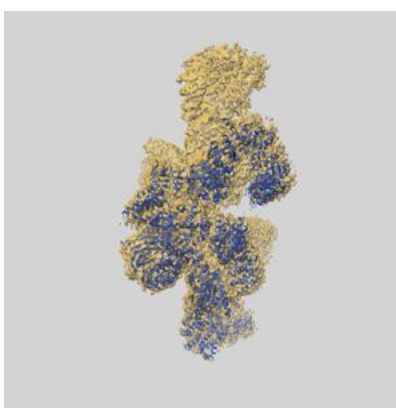
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-13097 and PDB model 7OWG. Per-residue inclusion information can be found in section 3 on page 4.

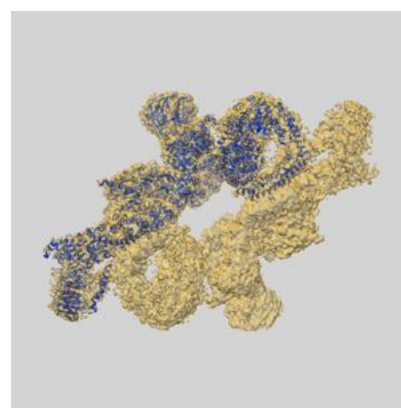
9.0.1 Map-model overlay [i](#)



X

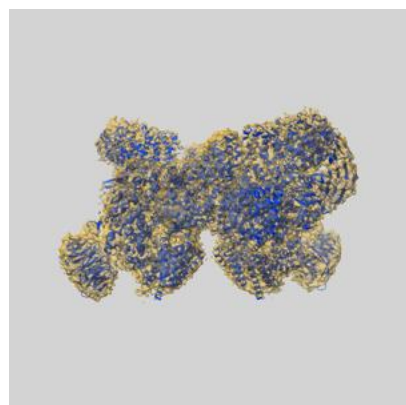


Y

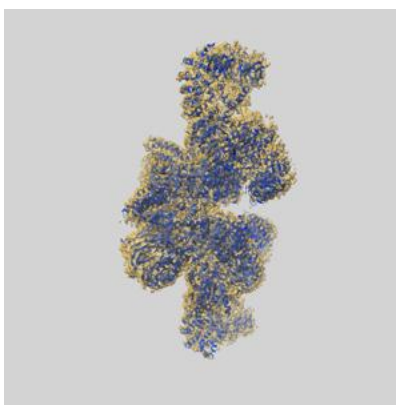


Z

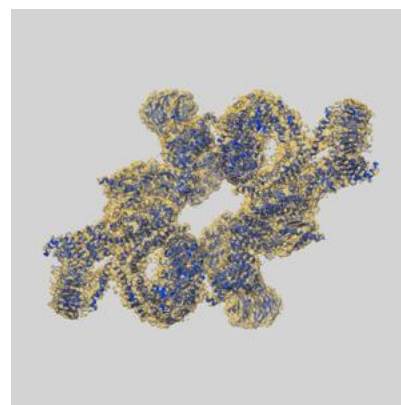
9.0.2 Map-model assembly overlay [i](#)



X



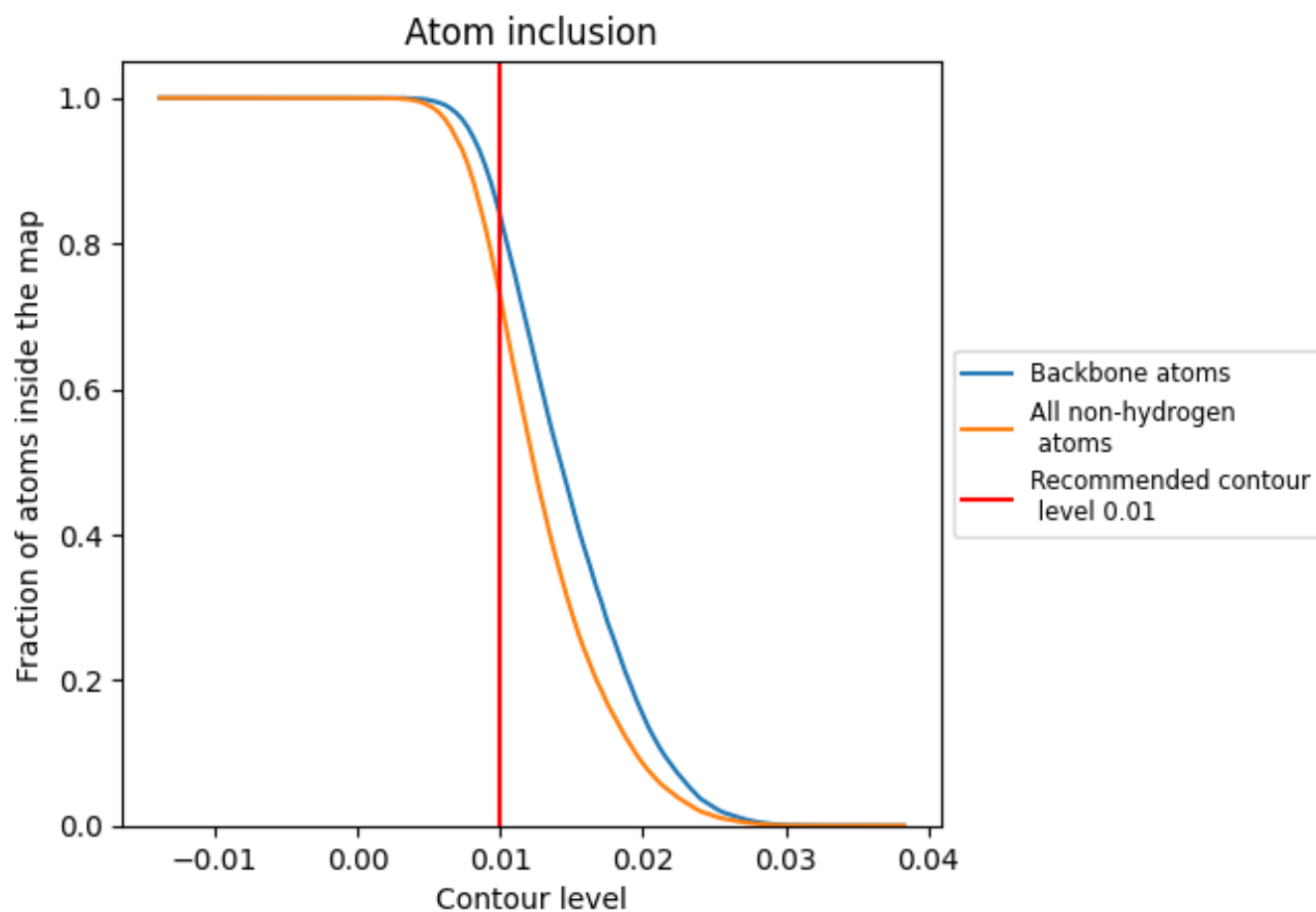
Y



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.

9.1 Atom inclusion [i](#)



At the recommended contour level, 84% of all backbone atoms, 73% of all non-hydrogen atoms, are inside the map.