Full wwPDB EM Validation Report ⓘ

Nov 16, 2022 – 08:31 AM EST

PDB ID	:	7L1U
EMDB ID	:	EMD-23118
Title	:	Orexin Receptor 2 (OX2R) in Complex with G Protein and Natural Peptide-Agonist Orexin B (OxB)
Authors	:	Hong, C.; Byrne, N.J.; Zamlynny, B.; Tummala, S.; Xiao, L.; Shipman, J.M.; Partridge, A.T.; Minnick, C.; Breslin, M.J.; Rudd, M.T.; Stachel, S.J.; Rada, V.L.; Kern, J.C.; Armacost, K.A.; Hollingsworth, S.A.; O'Brien, J.A.; Hall, D.L.; McDonald, T.P.; Strickland, C.; Brooun, A.; Soisson, S.M.; Hollenstein, K.
Deposited on	:	2020-12-15
Resolution	:	3.20 Å(reported)
Based on initial model	:	7L1V

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:

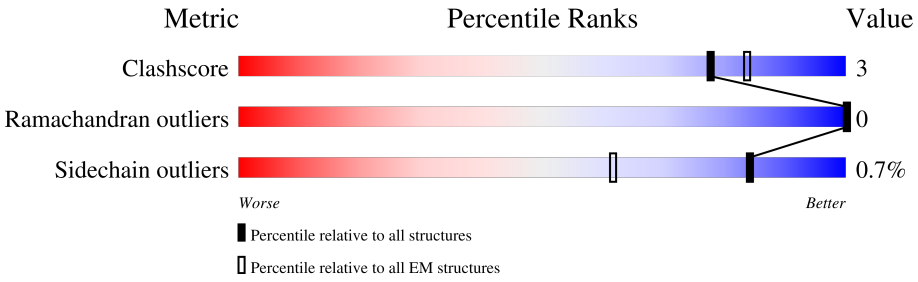
EMDB validation analysis	:	0.0.1.dev43
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

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 3.20 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 <=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	244	87% 7% 7%
2	B	349	88% 9%
3	C	71	6% 79% 18%
4	H	250	86% 7% 7%
5	R	374	70% 5% 25%
6	L	29	24% 10% 66%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8723 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 Engineered Guanine nucleotide-binding protein subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	228	1802	1150	324	320	8	0	0

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	339	2496	1553	437	486	20	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-8	MET	-	initiating methionine	UNP P62873
B	-7	GLY	-	expression tag	UNP P62873
B	-6	HIS	-	expression tag	UNP P62873
B	-5	HIS	-	expression tag	UNP P62873
B	-4	HIS	-	expression tag	UNP P62873
B	-3	HIS	-	expression tag	UNP P62873
B	-2	HIS	-	expression tag	UNP P62873
B	-1	HIS	-	expression tag	UNP P62873
B	0	HIS	-	expression tag	UNP P62873
B	1	HIS	-	expression tag	UNP P62873

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	58	422	267	76	76	3	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	68	SER	CYS	engineered mutation	UNP P59768

- Molecule 4 is a protein called single-chain antibody Fv fragment (svFv16).

Mol	Chain	Residues	Atoms					AltConf	Trace
4	H	233	Total	C	N	O	S	0	0
			1719	1098	287	324	10		

- Molecule 5 is a protein called Hypocretin receptor type 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	R	281	Total	C	N	O	S	0	0
			2220	1479	361	359	21		

There are 49 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	-5	ASP	-	expression tag	UNP Q548Y0
R	-4	TYR	-	expression tag	UNP Q548Y0
R	-3	LYS	-	expression tag	UNP Q548Y0
R	-2	ASP	-	expression tag	UNP Q548Y0
R	-1	ASP	-	expression tag	UNP Q548Y0
R	0	ASP	-	expression tag	UNP Q548Y0
R	1	ALA	-	expression tag	UNP Q548Y0
R	2	MET	-	expression tag	UNP Q548Y0
R	?	-	VAL	deletion	UNP Q548Y0
R	?	-	VAL	deletion	UNP Q548Y0
R	?	-	GLN	deletion	UNP Q548Y0
R	?	-	ARG	deletion	UNP Q548Y0
R	?	-	LYS	deletion	UNP Q548Y0
R	?	-	TRP	deletion	UNP Q548Y0
R	?	-	LYS	deletion	UNP Q548Y0
R	?	-	PRO	deletion	UNP Q548Y0
R	?	-	LEU	deletion	UNP Q548Y0
R	?	-	GLN	deletion	UNP Q548Y0
R	?	-	PRO	deletion	UNP Q548Y0
R	?	-	VAL	deletion	UNP Q548Y0
R	?	-	SER	deletion	UNP Q548Y0
R	?	-	GLN	deletion	UNP Q548Y0
R	?	-	PRO	deletion	UNP Q548Y0
R	?	-	ARG	deletion	UNP Q548Y0
R	?	-	GLY	deletion	UNP Q548Y0
R	?	-	PRO	deletion	UNP Q548Y0

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Chain	Residue	Modelled	Actual	Comment	Reference
R	?	-	GLY	deletion	UNP Q548Y0
R	?	-	GLN	deletion	UNP Q548Y0
R	?	-	PRO	deletion	UNP Q548Y0
R	?	-	THR	deletion	UNP Q548Y0
R	?	-	LYS	deletion	UNP Q548Y0
R	?	-	SER	deletion	UNP Q548Y0
R	?	-	ARG	deletion	UNP Q548Y0
R	?	-	MET	deletion	UNP Q548Y0
R	?	-	SER	deletion	UNP Q548Y0
R	?	-	ALA	deletion	UNP Q548Y0
R	?	-	VAL	deletion	UNP Q548Y0
R	?	-	ALA	deletion	UNP Q548Y0
R	?	-	ALA	deletion	UNP Q548Y0
R	390	HIS	-	expression tag	UNP Q548Y0
R	391	HIS	-	expression tag	UNP Q548Y0
R	392	HIS	-	expression tag	UNP Q548Y0
R	393	HIS	-	expression tag	UNP Q548Y0
R	394	HIS	-	expression tag	UNP Q548Y0
R	395	HIS	-	expression tag	UNP Q548Y0
R	396	HIS	-	expression tag	UNP Q548Y0
R	397	HIS	-	expression tag	UNP Q548Y0
R	398	HIS	-	expression tag	UNP Q548Y0
R	399	HIS	-	expression tag	UNP Q548Y0

- Molecule 6 is a protein called Orexin.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	L	10	64	39	13	11	1	0	1

There is a discrepancy between the modelled and reference sequences:

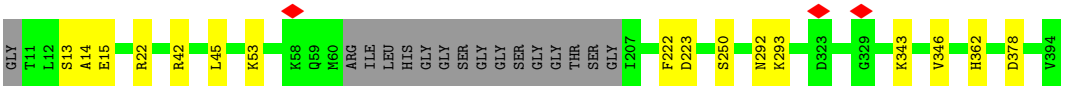
Chain	Residue	Modelled	Actual	Comment	Reference
L	29	NH2	-	amidation	UNP O43612

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.

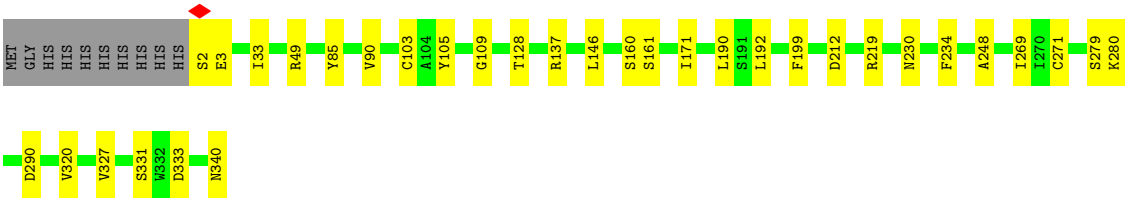
• Molecule 1: Engineered Guanine nucleotide-binding protein subunit alpha

Chain A:



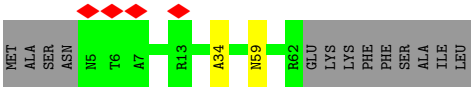
• Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain B:



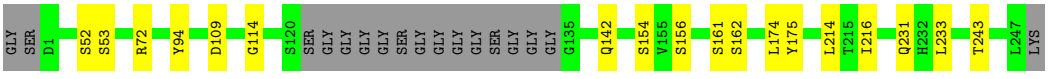
• Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

Chain C:



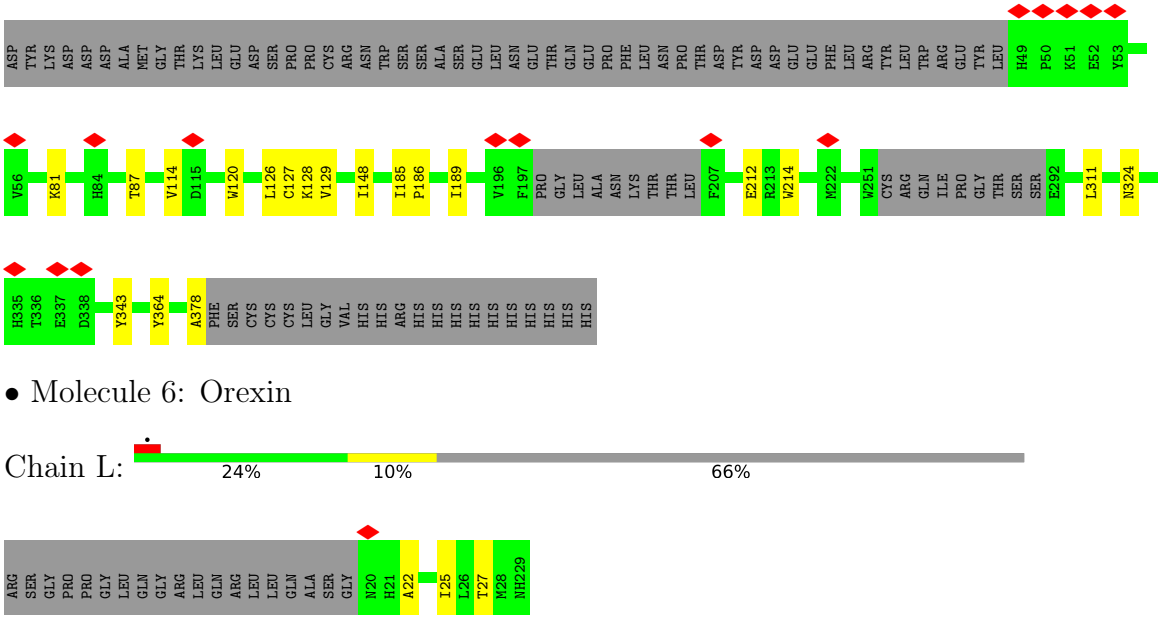
• Molecule 4: single-chain antibody Fv fragment (svFv16)

Chain H:



• Molecule 5: Hypocretin receptor type 2

Chain R:



• Molecule 6: Orexin

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	800000	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 ($e^-/Å^2$)	1.0625	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	59524	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.258	Depositor
Minimum map value	-0.786	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.026	Depositor
Recommended contour level	0.1226	Depositor
Map size (Å)	251.99998, 251.99998, 251.99998	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.84, 0.84, 0.84	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NH2

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	0.48	0/1836	0.54	0/2480
2	B	0.57	1/2542 (0.0%)	0.64	0/3460
3	C	0.35	0/428	0.50	0/581
4	H	0.60	0/1763	0.60	0/2399
5	R	0.42	0/2278	0.57	0/3108
6	L	0.27	0/63	0.44	0/84
All	All	0.51	1/8910 (0.0%)	0.59	0/12112

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	103	CYS	CB-SG	-5.65	1.72	1.81

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1802	0	1765	10	0
2	B	2496	0	2346	19	0
3	C	422	0	422	2	0
4	H	1719	0	1612	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	R	2220	0	2251	10	0
6	L	64	0	63	3	0
All	All	8723	0	8459	49	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 (49) 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)
4:H:94:TYR:O	4:H:114:GLY:HA2	1.71	0.90
1:A:45:LEU:HD23	1:A:223:ASP:HB2	1.79	0.64
1:A:22:ARG:NH1	2:B:90:VAL:O	2.32	0.63
2:B:2:SER:OG	2:B:3:GLU:N	2.33	0.62
4:H:154:SER:HA	4:H:216:ILE:O	2.01	0.61
2:B:146:LEU:HA	2:B:161:SER:HA	1.82	0.61
2:B:340:ASN:ND2	3:C:59:ASN:OD1	2.35	0.60
2:B:160:SER:HB3	2:B:190:LEU:HD23	1.84	0.59
2:B:331:SER:OG	2:B:333:ASP:OD1	2.20	0.59
2:B:212:ASP:OD2	2:B:219:ARG:NH2	2.36	0.58
5:R:126:LEU:HA	5:R:129:VAL:HG12	1.86	0.58
1:A:45:LEU:HD21	1:A:53:LYS:HB2	1.86	0.57
5:R:185:ILE:HG13	5:R:186:PRO:HD3	1.88	0.55
1:A:13:SER:OG	1:A:14:ALA:N	2.39	0.55
2:B:271:CYS:HB2	2:B:290:ASP:HB2	1.90	0.54
2:B:320:VAL:HG22	2:B:327:VAL:HG22	1.88	0.54
4:H:142:GLN:NE2	4:H:243:THR:OG1	2.41	0.54
4:H:52:SER:O	4:H:72:ARG:NH1	2.42	0.53
5:R:128:LYS:NZ	5:R:189:ILE:O	2.40	0.53
2:B:105:TYR:HE2	2:B:109:GLY:HA2	1.76	0.51
2:B:230:ASN:N	2:B:230:ASN:OD1	2.43	0.50
1:A:362:HIS:NE2	1:A:378:ASP:OD2	2.34	0.50
1:A:250:SER:O	1:A:250:SER:OG	2.29	0.49
2:B:279:SER:OG	2:B:280:LYS:N	2.44	0.49
5:R:212:GLU:OE1	5:R:214:TRP:NE1	2.45	0.49
2:B:33:ILE:HD12	3:C:34:ALA:HB3	1.95	0.48
4:H:109:ASP:OD1	4:H:109:ASP:N	2.36	0.48
2:B:49:ARG:NH2	2:B:85:TYR:O	2.47	0.48
5:R:114:VAL:O	5:R:343:TYR:OH	2.31	0.48
5:R:324:ASN:ND2	6:L:27:THR:OG1	2.42	0.48
4:H:156:SER:HA	4:H:214:LEU:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:H:52:SER:OG	4:H:53:SER:N	2.48	0.45
1:A:343:LYS:HA	1:A:346:VAL:HG22	2.00	0.44
4:H:161:SER:OG	4:H:162:SER:N	2.50	0.44
2:B:160:SER:O	2:B:160:SER:OG	2.34	0.43
2:B:248:ALA:HB1	2:B:269:ILE:HG22	2.01	0.43
6:L:22:ALA:HB1	6:L:25:ILE:HD11	2.01	0.43
1:A:15:GLU:OE2	4:H:175:TYR:OH	2.31	0.42
2:B:137:ARG:NE	2:B:171:ILE:O	2.53	0.42
5:R:120:TRP:HE1	5:R:127:CYS:HB2	1.85	0.42
5:R:148:ILE:HG21	5:R:364:TYR:HE2	1.85	0.42
2:B:192:LEU:HD23	2:B:199:PHE:HB3	2.02	0.42
4:H:231:GLN:OE1	4:H:233:LEU:N	2.47	0.41
1:A:292:ASN:OD1	1:A:293:LYS:N	2.53	0.41
1:A:53:LYS:NZ	1:A:223:ASP:OD1	2.42	0.41
5:R:311:LEU:HD23	5:R:311:LEU:HA	1.89	0.41
2:B:333:ASP:OD1	2:B:333:ASP:N	2.49	0.40
5:R:81:LYS:HD2	5:R:378:ALA:HB1	2.02	0.40
6:L:25:ILE:H	6:L:25:ILE:HG12	1.65	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	A	224/244 (92%)	218 (97%)	6 (3%)	0	100	100
2	B	337/349 (97%)	321 (95%)	16 (5%)	0	100	100
3	C	56/71 (79%)	55 (98%)	1 (2%)	0	100	100
4	H	229/250 (92%)	217 (95%)	12 (5%)	0	100	100
5	R	275/374 (74%)	269 (98%)	6 (2%)	0	100	100
6	L	8/29 (28%)	7 (88%)	1 (12%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1129/1317 (86%)	1087 (96%)	42 (4%)	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	185/214 (86%)	183 (99%)	2 (1%)	73 88
2	B	256/291 (88%)	254 (99%)	2 (1%)	81 93
3	C	40/58 (69%)	40 (100%)	0	100 100
4	H	177/202 (88%)	176 (99%)	1 (1%)	86 94
5	R	236/338 (70%)	235 (100%)	1 (0%)	91 95
6	L	6/20 (30%)	6 (100%)	0	100 100
All	All	900/1123 (80%)	894 (99%)	6 (1%)	84 94

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	42	ARG
1	A	222	PHE
2	B	128	THR
2	B	234	PHE
4	H	174	LEU
5	R	87	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	GLN
1	A	385	GLN
2	B	62	HIS

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Mol	Chain	Res	Type
2	B	88	ASN
4	H	13	GLN
4	H	142	GLN
4	H	171	ASN
5	R	324	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.

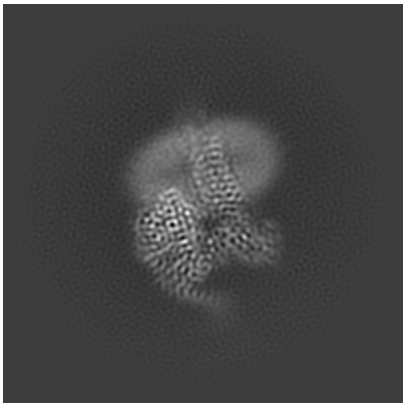
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-23118. These allow visual inspection of the internal detail of the map and identification of artifacts.

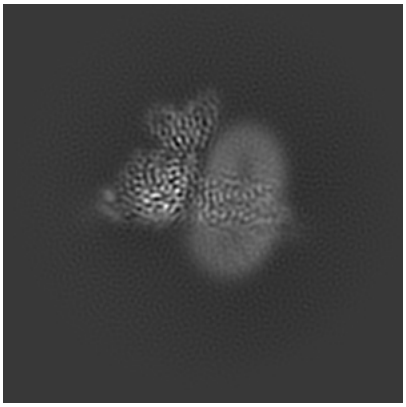
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

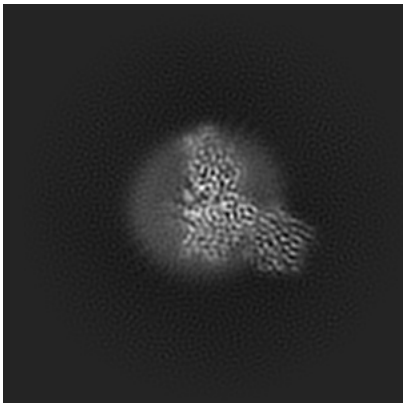
6.1.1 Primary map



X



Y

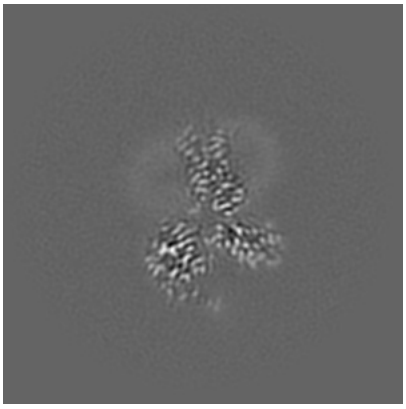


Z

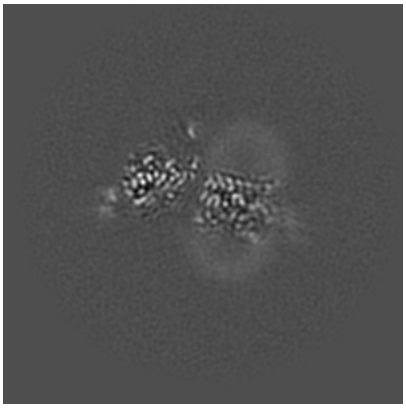
The images above show the map projected in three orthogonal directions.

6.2 Central slices

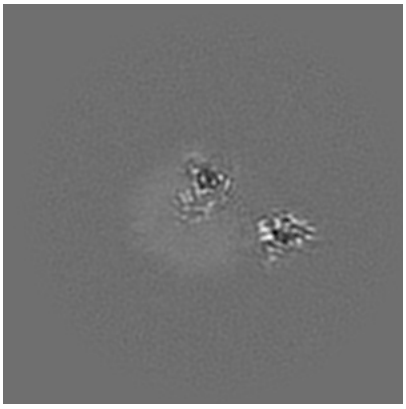
6.2.1 Primary map



X Index: 150



Y Index: 150

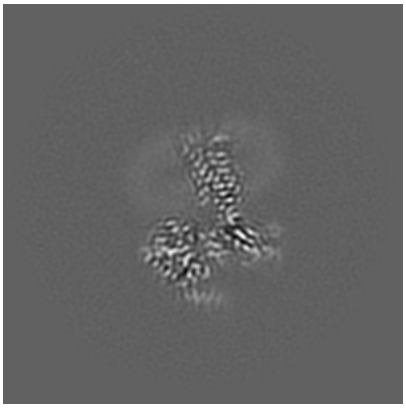


Z Index: 150

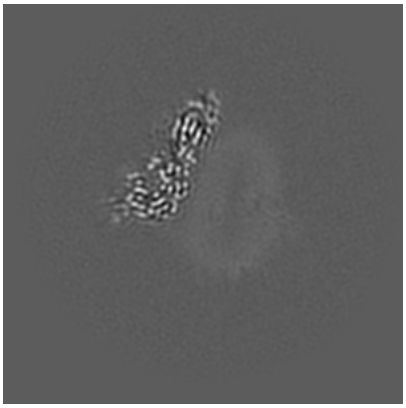
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

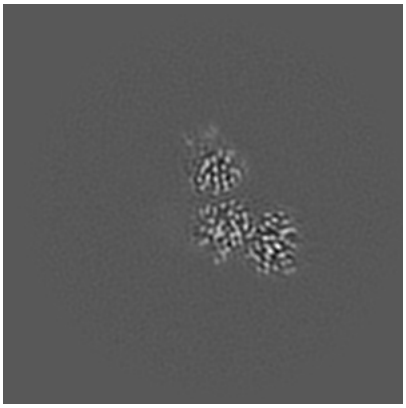
6.3.1 Primary map



X Index: 156



Y Index: 128

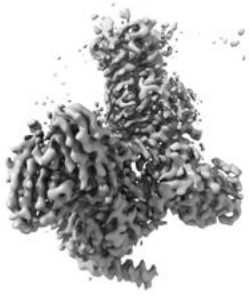


Z Index: 131

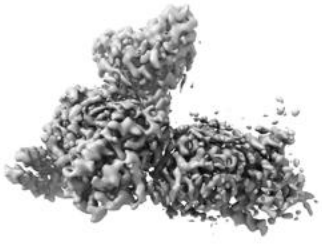
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views (i)

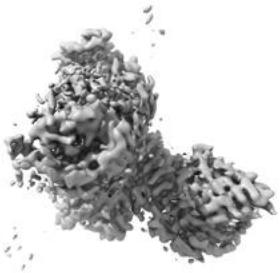
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.1226. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

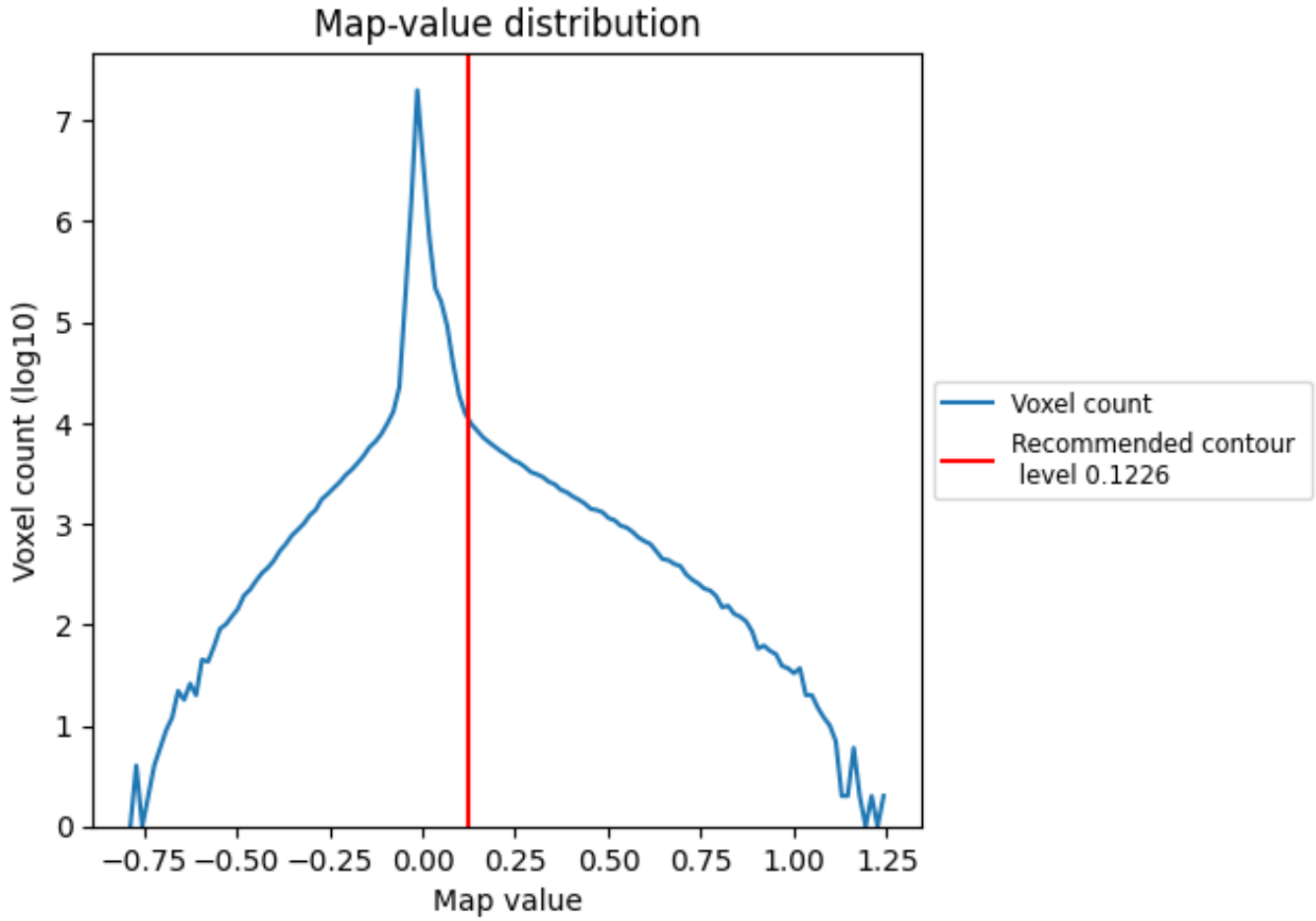
6.5 Mask visualisation (i)

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

7 Map analysis

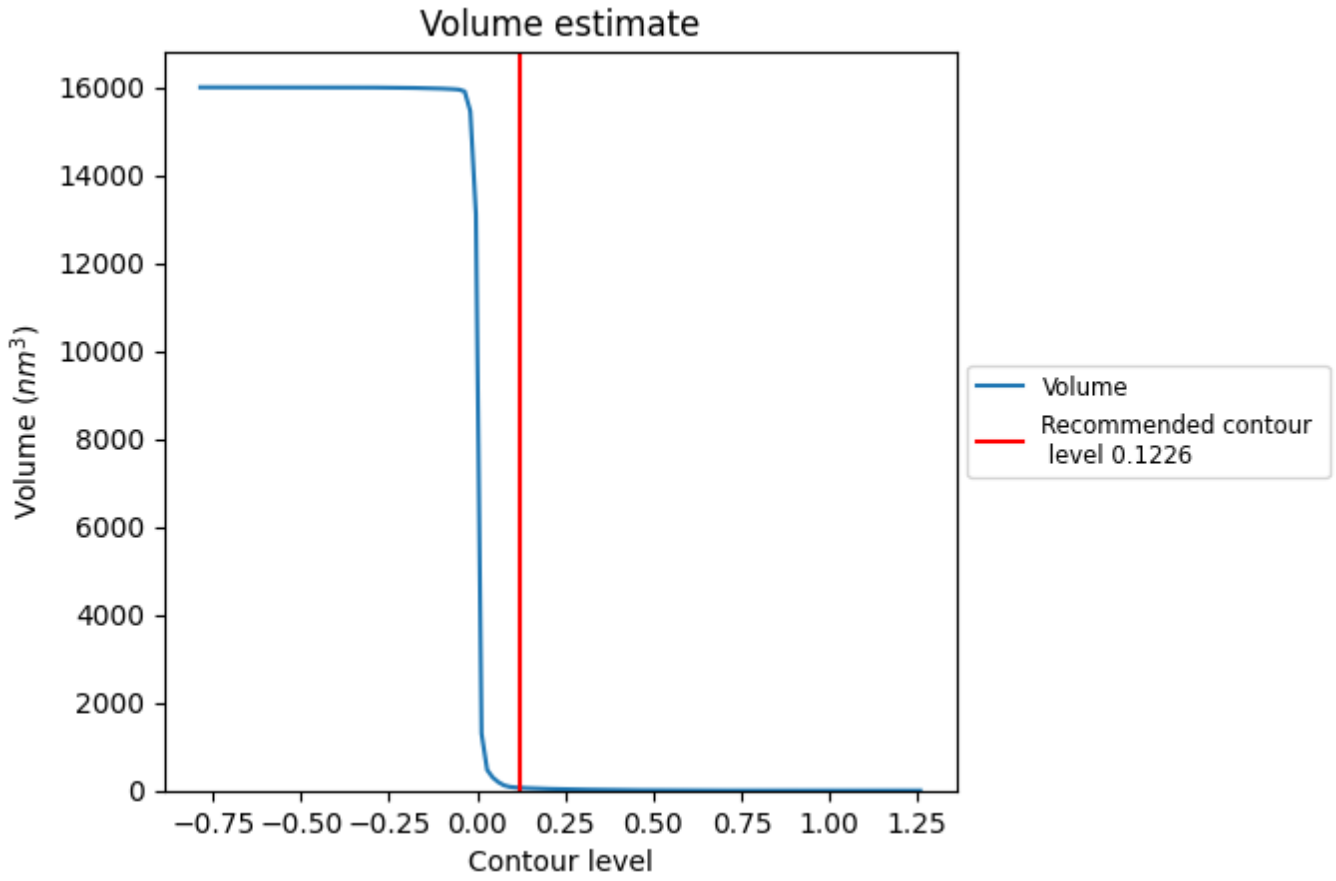
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

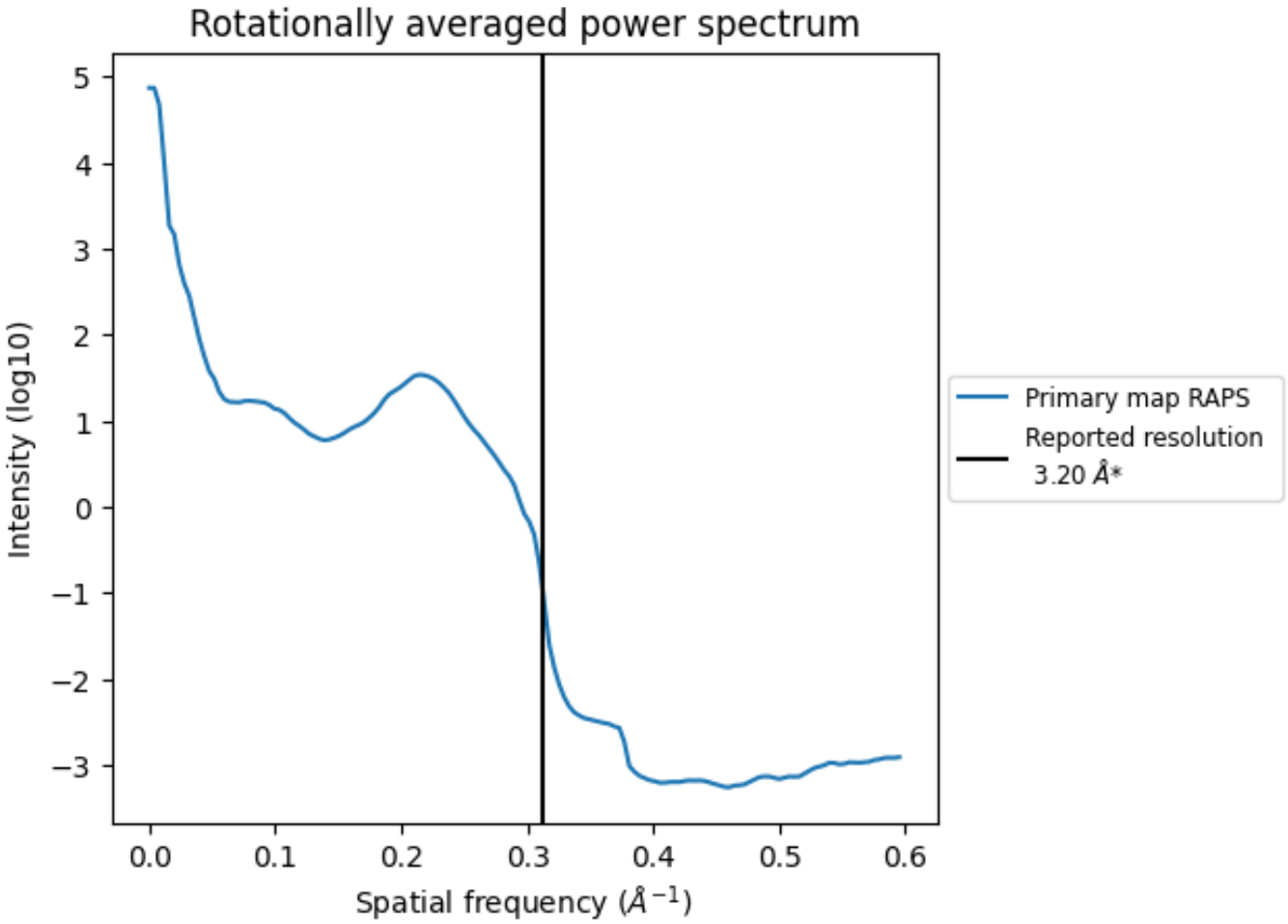
7.2 Volume estimate



The volume at the recommended contour level is 63 nm^3; this corresponds to an approximate mass of 57 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 0.312 Å^{-1}

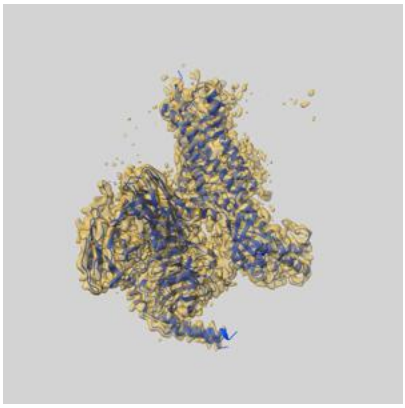
8 Fourier-Shell correlation

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

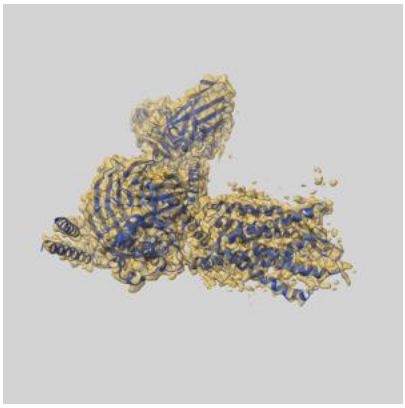
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-23118 and PDB model 7L1U. Per-residue inclusion information can be found in section 3 on page 6.

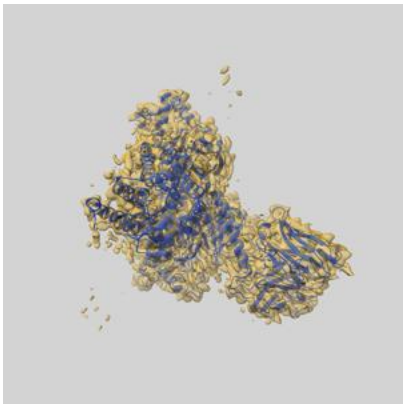
9.1 Map-model overlay



X



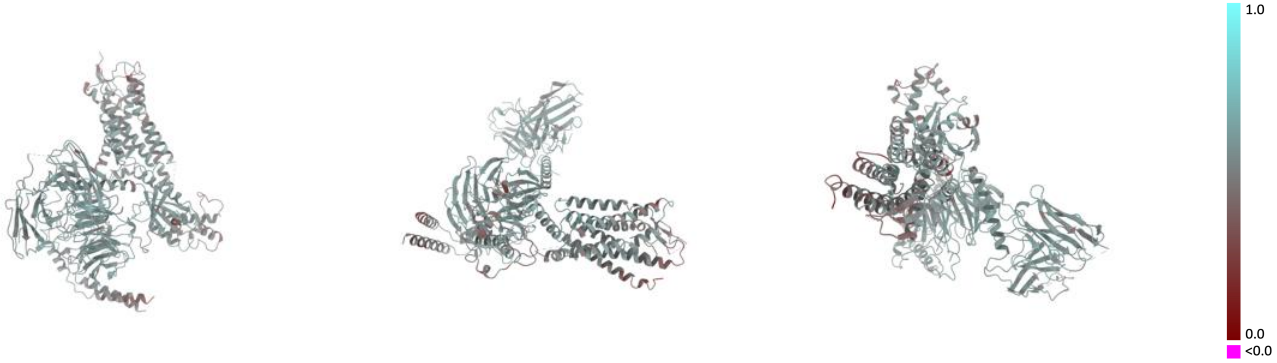
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.1226 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.

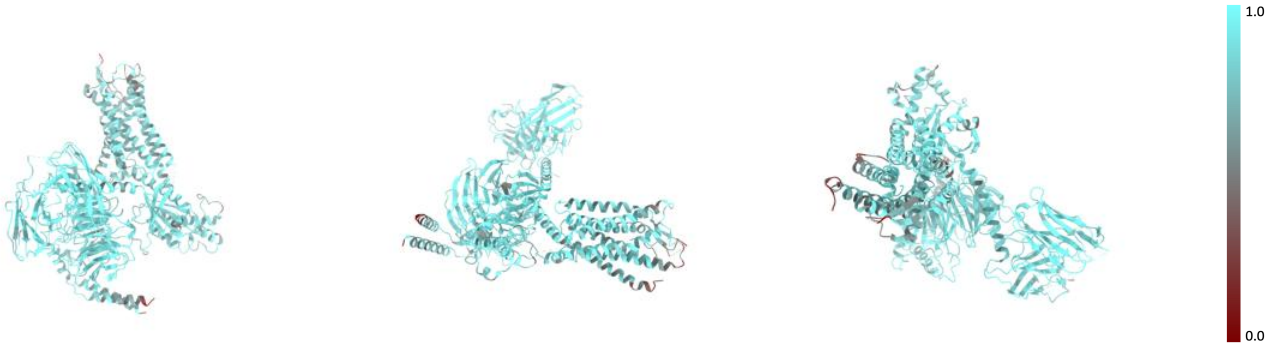
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according 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.

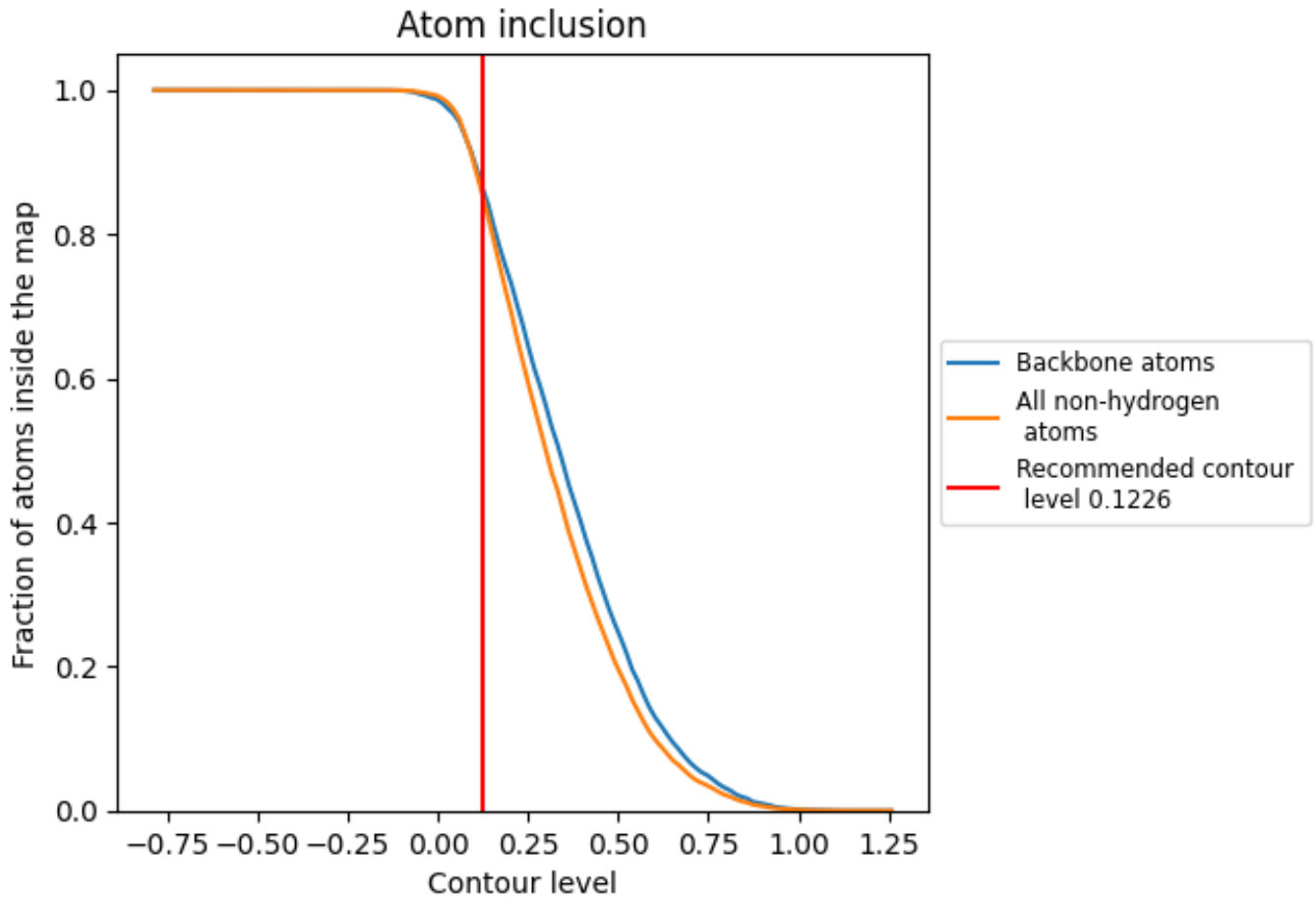
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.1226).

9.4 Atom inclusion (i)



At the recommended contour level, 87% of all backbone atoms, 86% 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 (0.1226) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8577	0.5300
A	0.8601	0.5260
B	0.9057	0.5550
C	0.7807	0.5050
H	0.9102	0.5500
L	0.7031	0.4830
R	0.7802	0.4940