Full wwPDB EM Validation Report

Dec 25, 2021 – 06:08 am GMT

PDB ID	:	7OTI
EMDB ID	:	EMD-13060
Title	:	Structure of ABCB1/P-glycoprotein in apo state
Authors	:	Ford, R.C.; Barbieri, A.; Thonghin, N.; Shafi, T.; Prince, S.M.; Collins, R.F.
Deposited on	:	2021-06-10
Resolution	:	4.20 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

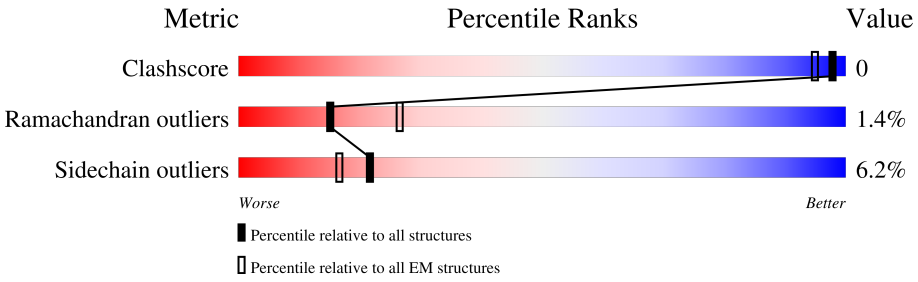
EMDB validation analysis	:	0.0.0.dev97
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.24

1 Overall quality at a glance (i)

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

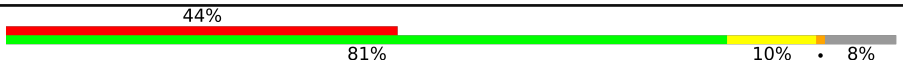
The reported resolution of this entry is 4.20 Å.

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	1284	

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 9171 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 Multidrug resistance protein 1A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1182	9171	5895	1552	1686	38	0	0

There are 8 discrepancies between the modelled and reference sequences:

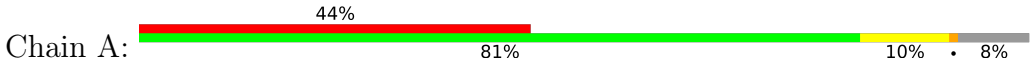
Chain	Residue	Modelled	Actual	Comment	Reference
A	1277	LEU	-	expression tag	UNP P21447
A	1278	GLU	-	expression tag	UNP P21447
A	1279	HIS	-	expression tag	UNP P21447
A	1280	HIS	-	expression tag	UNP P21447
A	1281	HIS	-	expression tag	UNP P21447
A	1282	HIS	-	expression tag	UNP P21447
A	1283	HIS	-	expression tag	UNP P21447
A	1284	HIS	-	expression tag	UNP P21447

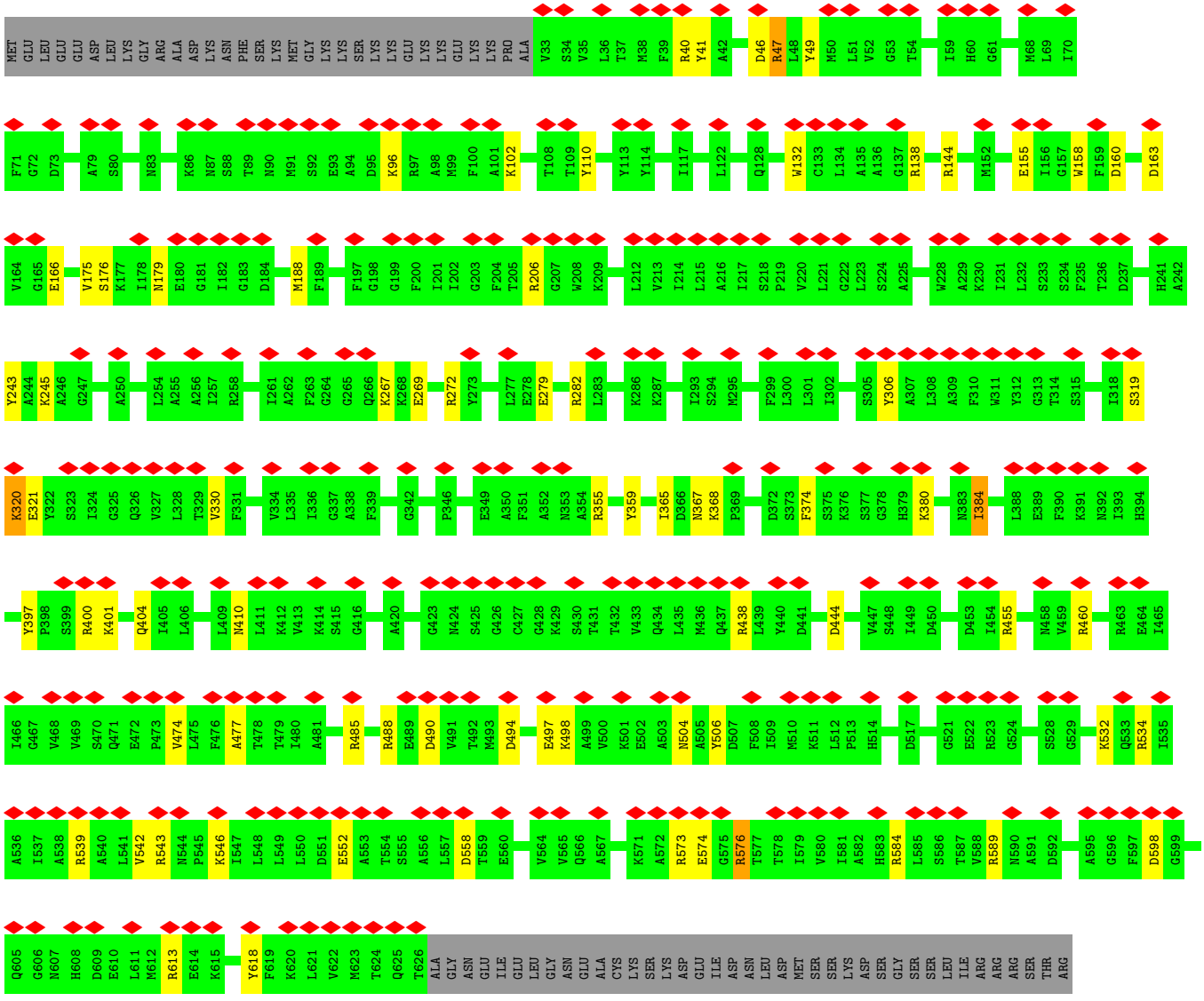
3 Residue-property plots (i)

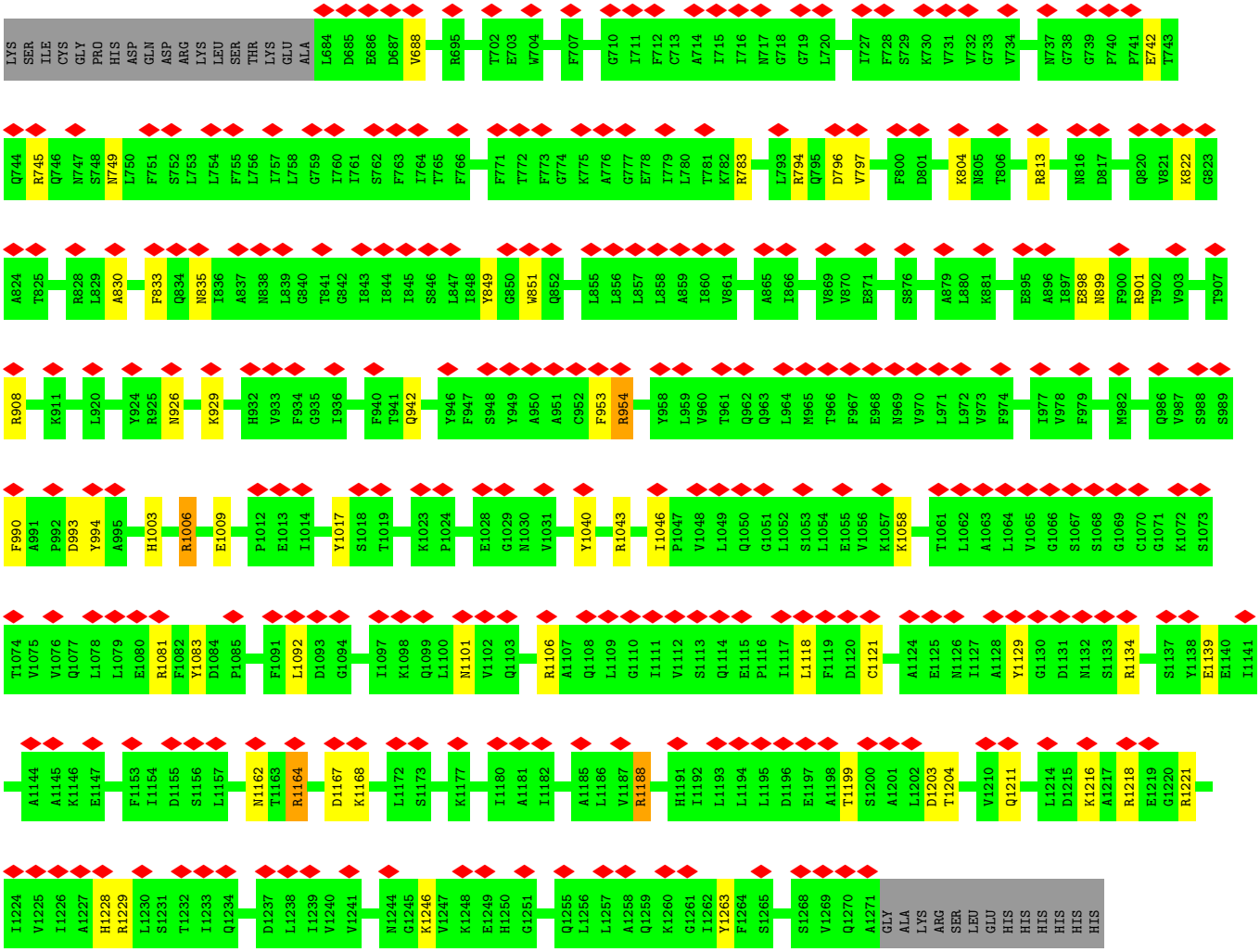
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Multidrug resistance protein 1A

Chain A:






LYS SER ILE CYS GLY PRO HIS ASP GLN ASP ARG LYS LEU SER THR LYS GLU ALA L684 D685 E686 D687 V688 R695 T702 E703 W704 F707 G710 I711 F712 C713 A714 I715 I716 N717 G718 G719 L720 I727 F728 S729 K730 V731 V732 G733 V734 N737 G738 G739 P740 P741 E742 T743
Q744 R745 Q746 N747 S748 N749 L750 F751 S752 L753 L754 F755 L756 I757 L758 G759 I760 I761 S762 F763 I764 T765 F766 F771 T772 F773 G774 K775 A776 G777 E778 I779 L780 T781 K782 R783 L793 R794 Q795 D796 V797 F800 D801 K804 N805 T806 R813 N816 D817 Q820 V821 K822 G823
A824 T825 R828 L829 A830 F833 Q834 N835 I836 A837 N838 L839 G840 T841 G842 I843 I844 I845 S846 L847 I848 Y849 G850 W851 Q852 L855 L856 L857 L858 A859 I860 V861 A865 I866 V869 V870 E871 S876 A879 L880 K881 E895 A896 I897 E898 N899 F900 R901 T902 V903 T907
R908 K911 L920 Y924 R925 N926 K929 H932 V933 F934 G935 I936 F940 T941 Q942 Y946 F947 S948 Y949 A950 A951 C952 F953 R954 Y958 L959 V960 T961 Q962 Q963 L964 M965 T966 F967 E968 N969 V970 L971 L972 V973 F974 I977 V978 F979 M982 Q986 V987 S988 S989
F990 A991 P992 D993 Y994 A995 H1003 R1006 E1009 P1012 E1013 I1014 Y1017 S1018 T1019 K1023 P1024 E1028 G1029 N1030 V1031 Y1040 R1043 I1046 P1047 V1048 L1049 Q1050 G1051 L1052 S1053 L1054 E1055 V1056 K1057 K1058 T1061 L1062 A1063 L1064 V1065 G1066 S1067 S1068 G1069 C1070 G1071 K1072 S1073
T1074 V1075 V1076 Q1077 L1078 L1079 E1080 R1081 F1082 Y1083 D1084 P1085 F1091 L1092 D1093 G1094 I1097 K1098 Q1099 L1100 N1101 V1102 Q1103 R1106 A1107 Q1108 L1109 G1110 I1111 V1112 S1113 Q1114 E1115 P1116 I1117 L1118 F1119 D1120 C1121 A1124 E1125 N1126 I1127 A1128 Y1129 G1130 D1131 N1132 S1133 R1134 S1137 Y1138 E1139 E1140 I1141
A1144 A1145 K1146 E1147 F1153 I1154 D1155 S1156 L1157 N1162 T1163 R1164 D1167 K1168 L1172 S1173 K1177 T1180 A1181 I1182 A1185 L1186 V1187 R1188 H1191 I1192 L1193 L1194 L1195 D1196 E1197 A1198 T1199 S1200 A1201 L1202 D1203 T1204 V1210 Q1211 L1214 D1215 K1216 A1217 R1218 E1219 G1220 R1221
I1224 V1225 I1226 A1227 H1228 R1229 L1230 S1231 T1232 I1233 Q1234 D1237 L1238 I1239 V1240 V1241 N1244 G1245 K1246 V1247 K1248 E1249 H1250 G1251 Q1255 L1256 L1257 A1258 Q1259 K1260 G1261 I1262 Y1263 F1264 S1265 S1268 V1269 Q1270 A1271 GLY ALA LYS ARG SER LEU GLU HIS HIS HIS HIS HIS HIS

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	104000	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 ($e^-/Å^2$)	64	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	4.732	Depositor
Minimum map value	-2.225	Depositor
Average map value	0.007	Depositor
Map value standard deviation	0.210	Depositor
Recommended contour level	1.05	Depositor
Map size (Å)	229.45999, 229.45999, 229.45999	wwPDB
Map dimensions	220, 220, 220	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.043, 1.043, 1.043	Depositor

5 Model quality

5.1 Standard geometry

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|>5$	RMSZ	#$\|Z\|>5$
1	A	0.72	0/9339	1.08	47/12626 (0.4%)

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	13

There are no bond length outliers.

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1218	ARG	NE-CZ-NH1	10.59	125.60	120.30
1	A	1229	ARG	NE-CZ-NH1	9.34	124.97	120.30
1	A	543	ARG	NE-CZ-NH1	9.28	124.94	120.30
1	A	794	ARG	NE-CZ-NH1	8.83	124.72	120.30
1	A	144	ARG	NE-CZ-NH1	8.78	124.69	120.30
1	A	488	ARG	NE-CZ-NH1	8.18	124.39	120.30
1	A	573	ARG	NE-CZ-NH1	7.90	124.25	120.30
1	A	613	ARG	NE-CZ-NH1	7.32	123.96	120.30
1	A	400	ARG	NE-CZ-NH1	7.20	123.90	120.30
1	A	455	ARG	NE-CZ-NH1	7.05	123.82	120.30
1	A	954	ARG	NE-CZ-NH1	7.03	123.81	120.30
1	A	272	ARG	NE-CZ-NH1	7.00	123.80	120.30
1	A	1134	ARG	NE-CZ-NH1	6.83	123.71	120.30
1	A	1221	ARG	NE-CZ-NH1	6.75	123.68	120.30
1	A	206	ARG	NE-CZ-NH1	6.70	123.65	120.30
1	A	584	ARG	NE-CZ-NH1	6.58	123.59	120.30
1	A	47	ARG	NE-CZ-NH1	6.52	123.56	120.30
1	A	783	ARG	NE-CZ-NH1	6.45	123.53	120.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	539	ARG	NE-CZ-NH1	6.42	123.51	120.30
1	A	485	ARG	NE-CZ-NH1	6.35	123.48	120.30
1	A	110	TYR	CB-CG-CD2	-6.31	117.21	121.00
1	A	355	ARG	NE-CZ-NH1	6.17	123.39	120.30
1	A	813	ARG	NE-CZ-NH1	6.14	123.37	120.30
1	A	618	TYR	CB-CG-CD2	-6.00	117.40	121.00
1	A	1081	ARG	NE-CZ-NH1	5.97	123.29	120.30
1	A	282	ARG	NE-CZ-NH1	5.83	123.21	120.30
1	A	534	ARG	NE-CZ-NH1	5.80	123.20	120.30
1	A	1164	ARG	NE-CZ-NH1	5.79	123.20	120.30
1	A	272	ARG	NE-CZ-NH2	-5.75	117.42	120.30
1	A	460	ARG	CD-NE-CZ	5.69	131.57	123.60
1	A	1106	ARG	NE-CZ-NH1	5.58	123.09	120.30
1	A	40	ARG	NE-CZ-NH1	5.55	123.08	120.30
1	A	138	ARG	NE-CZ-NH1	5.49	123.05	120.30
1	A	745	ARG	NE-CZ-NH1	5.41	123.00	120.30
1	A	576	ARG	NE-CZ-NH1	5.40	123.00	120.30
1	A	1006	ARG	NE-CZ-NH1	5.37	122.98	120.30
1	A	543	ARG	NE-CZ-NH2	-5.37	117.62	120.30
1	A	908	ARG	NE-CZ-NH2	5.27	122.93	120.30
1	A	355	ARG	CD-NE-CZ	5.27	130.97	123.60
1	A	374	PHE	CB-CG-CD1	-5.26	117.12	120.80
1	A	1188	ARG	NE-CZ-NH1	5.23	122.92	120.30
1	A	306	TYR	CB-CG-CD2	-5.22	117.87	121.00
1	A	901	ARG	NE-CZ-NH2	5.14	122.87	120.30
1	A	438	ARG	NE-CZ-NH1	5.07	122.84	120.30
1	A	849	TYR	CB-CG-CD2	-5.07	117.96	121.00
1	A	455	ARG	NE-CZ-NH2	-5.04	117.78	120.30
1	A	49	TYR	CB-CG-CD2	-5.04	117.98	121.00

There are no chirality outliers.

All (13) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1017	TYR	Sidechain
1	A	1083	TYR	Sidechain
1	A	1092	LEU	Peptide
1	A	1118	LEU	Peptide
1	A	1263	TYR	Peptide
1	A	243	TYR	Sidechain
1	A	359	TYR	Sidechain
1	A	384	ILE	Peptide

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Group
1	A	41	TYR	Peptide
1	A	474	VAL	Peptide
1	A	506	TYR	Sidechain
1	A	589	ARG	Sidechain
1	A	688	VAL	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	A	9171	0	9344	7	0
All	All	9171	0	9344	7	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 0.

All (7) 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:A:830:ALA:HB1	1:A:990:PHE:CZ	2.52	0.45
1:A:926:ASN:HA	1:A:929:LYS:HE3	1.99	0.44
1:A:320:LYS:HE3	1:A:321:GLU:OE1	2.18	0.43
1:A:1003:HIS:CE1	1:A:1006:ARG:HH21	2.36	0.41
1:A:245:LYS:HZ1	1:A:279:GLU:CD	2.24	0.41
1:A:1139:GLU:CD	1:A:1139:GLU:H	2.25	0.41
1:A:160:ASP:HA	1:A:397:TYR:CZ	2.57	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	1178/1284 (92%)	1035 (88%)	127 (11%)	16 (1%)	11 47

All (16) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	384	ILE
1	A	319	SER
1	A	1203	ASP
1	A	404	GLN
1	A	797	VAL
1	A	804	LYS
1	A	851	TRP
1	A	477	ALA
1	A	504	ASN
1	A	552	GLU
1	A	1121	CYS
1	A	365	ILE
1	A	96	LYS
1	A	1204	THR
1	A	1046	ILE
1	A	175	VAL

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	976/1065 (92%)	915 (94%)	61 (6%)	18 45

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	46	ASP
1	A	47	ARG
1	A	102	LYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	132	TRP
1	A	155	GLU
1	A	158	TRP
1	A	163	ASP
1	A	166	GLU
1	A	176	SER
1	A	179	ASN
1	A	188	MET
1	A	267	LYS
1	A	269	GLU
1	A	320	LYS
1	A	330	VAL
1	A	367	ASN
1	A	368	LYS
1	A	380	LYS
1	A	401	LYS
1	A	410	ASN
1	A	444	ASP
1	A	490	ASP
1	A	494	ASP
1	A	497	GLU
1	A	498	LYS
1	A	532	LYS
1	A	542	VAL
1	A	546	LYS
1	A	558	ASP
1	A	574	GLU
1	A	576	ARG
1	A	598	ASP
1	A	742	GLU
1	A	749	ASN
1	A	796	ASP
1	A	822	LYS
1	A	833	PHE
1	A	835	ASN
1	A	898	GLU
1	A	899	ASN
1	A	942	GLN
1	A	953	PHE
1	A	954	ARG
1	A	993	ASP
1	A	994	TYR

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	1009	GLU
1	A	1040	TYR
1	A	1043	ARG
1	A	1058	LYS
1	A	1101	ASN
1	A	1129	TYR
1	A	1162	ASN
1	A	1164	ARG
1	A	1167	ASP
1	A	1168	LYS
1	A	1188	ARG
1	A	1199	THR
1	A	1211	GLN
1	A	1216	LYS
1	A	1228	HIS
1	A	1246	LYS

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

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

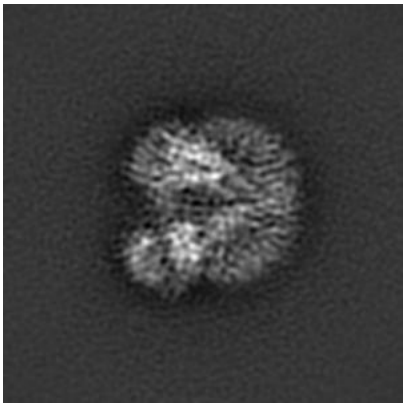
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-13060. These allow visual inspection of the internal detail of the map and identification of artifacts.

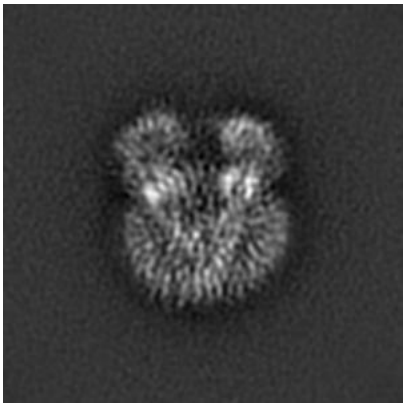
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

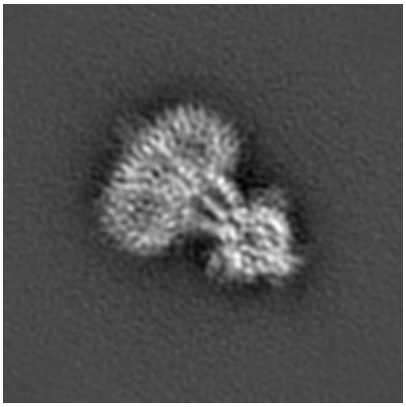
6.1.1 Primary map



X



Y

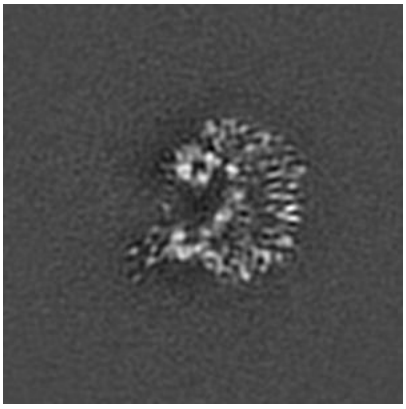


Z

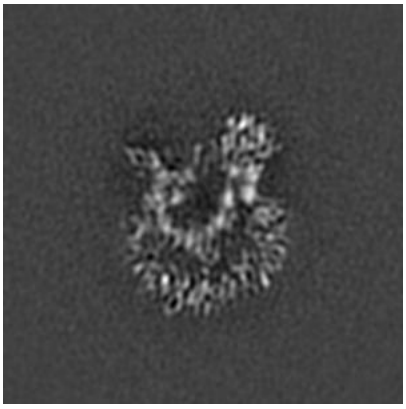
The images above show the map projected in three orthogonal directions.

6.2 Central slices

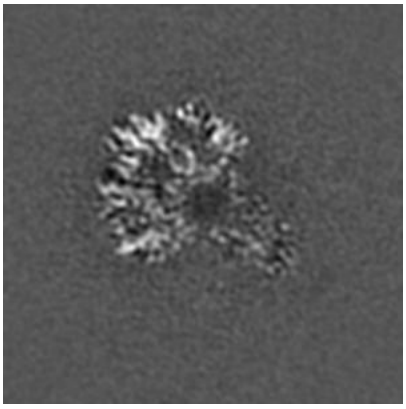
6.2.1 Primary map



X Index: 110



Y Index: 110

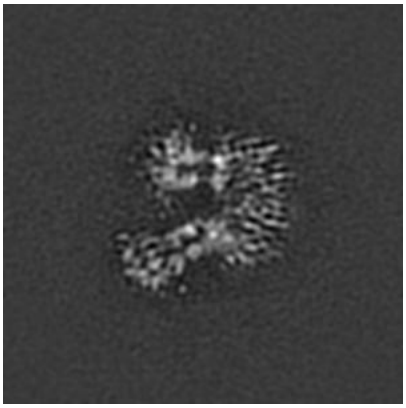


Z Index: 110

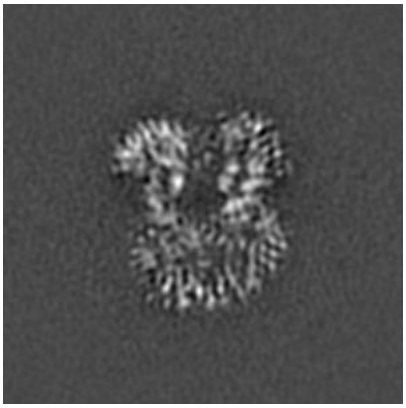
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

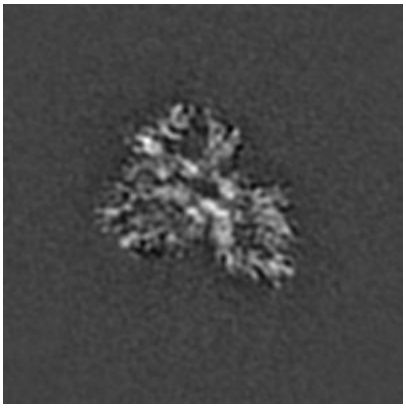
6.3.1 Primary map



X Index: 121



Y Index: 101

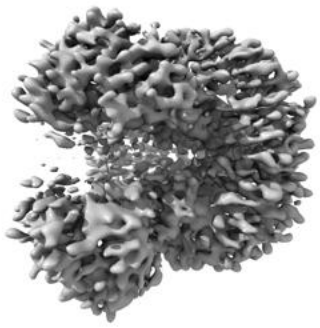


Z Index: 123

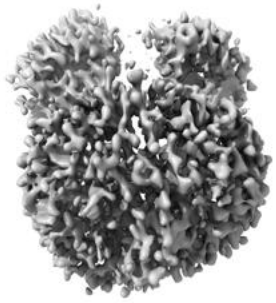
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views (i)

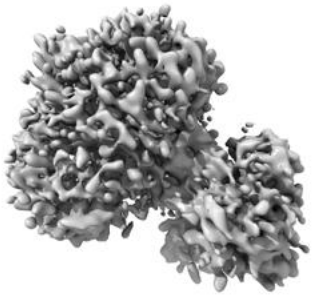
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 1.05. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

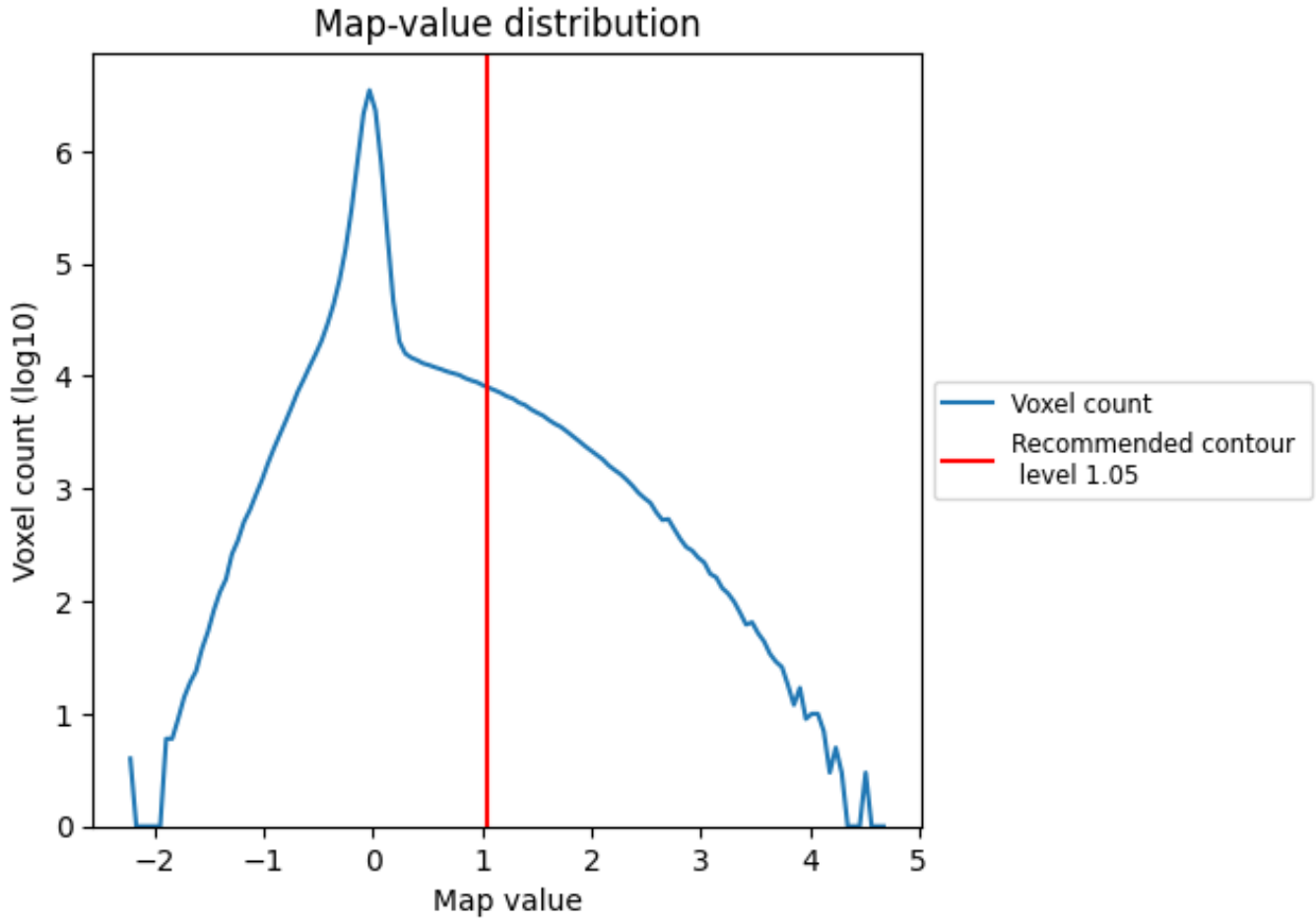
6.5 Mask visualisation (i)

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

7 Map analysis

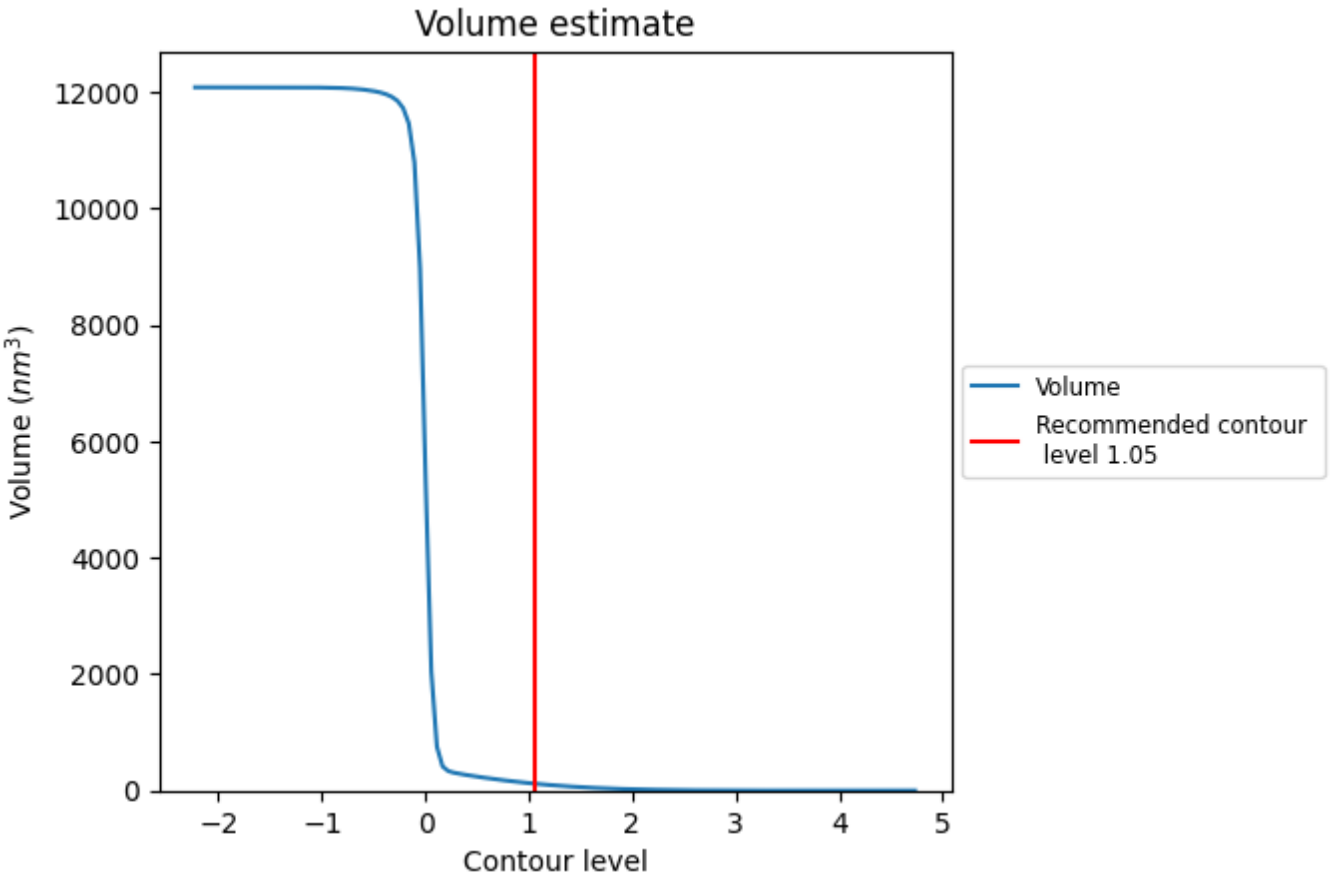
This section contains the results of statistical analysis of the map.

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.

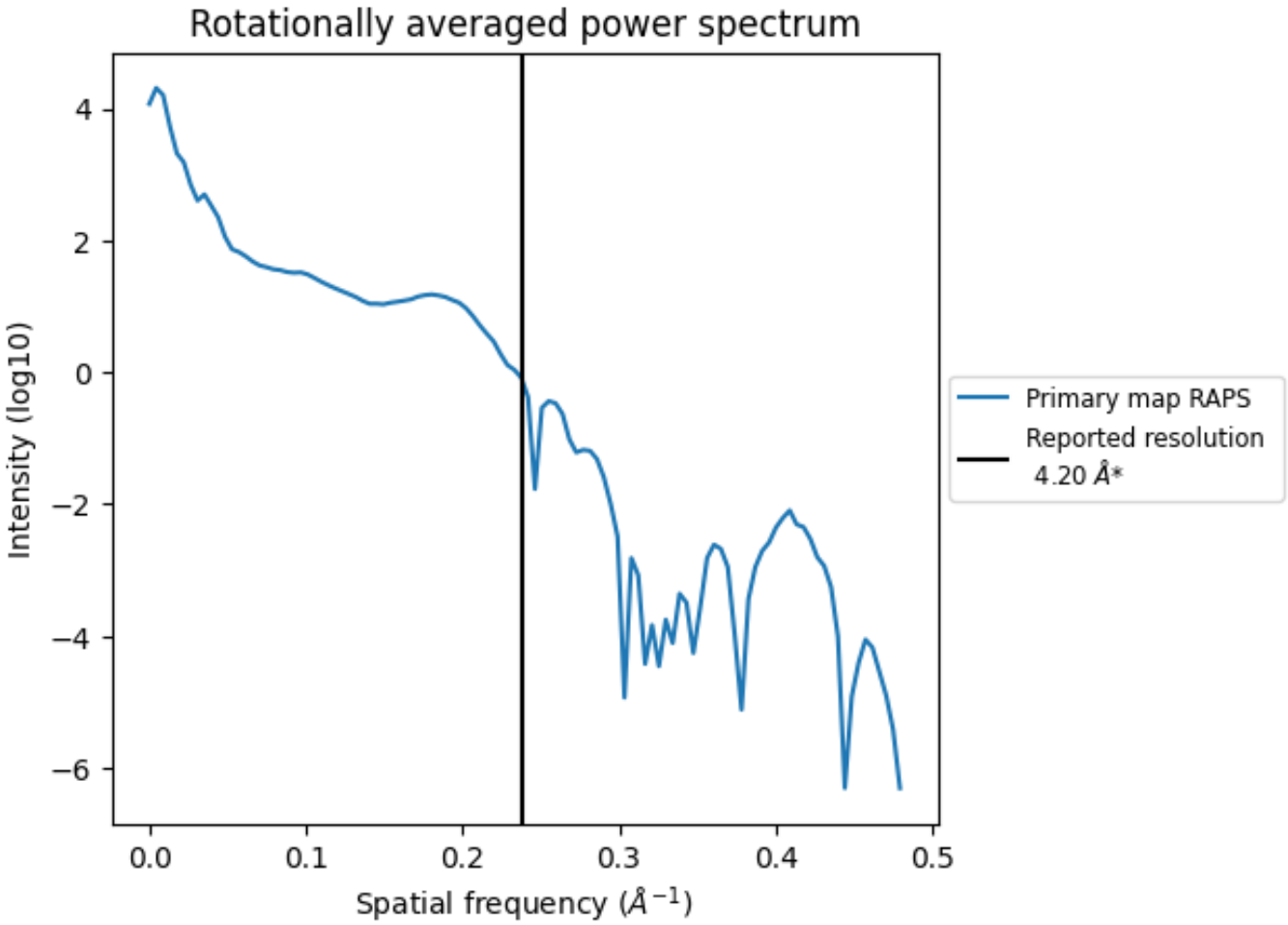
7.2 Volume estimate



The volume at the recommended contour level is 119 nm^3; this corresponds to an approximate mass of 108 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 0.238 Å^{-1}

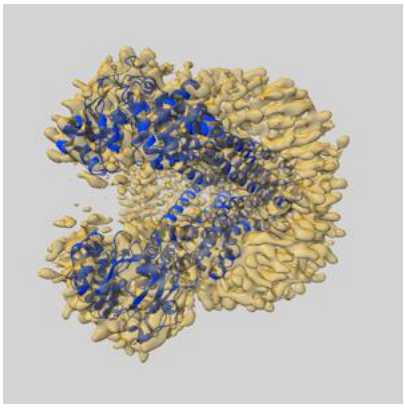
8 Fourier-Shell correlation

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

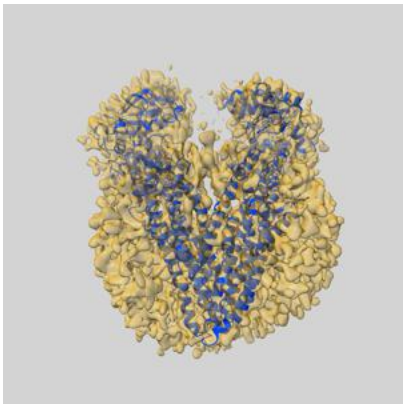
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-13060 and PDB model 7OTI. Per-residue inclusion information can be found in section 3 on page 4.

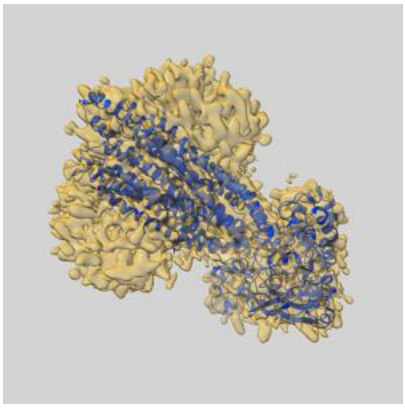
9.1 Map-model overlay



X



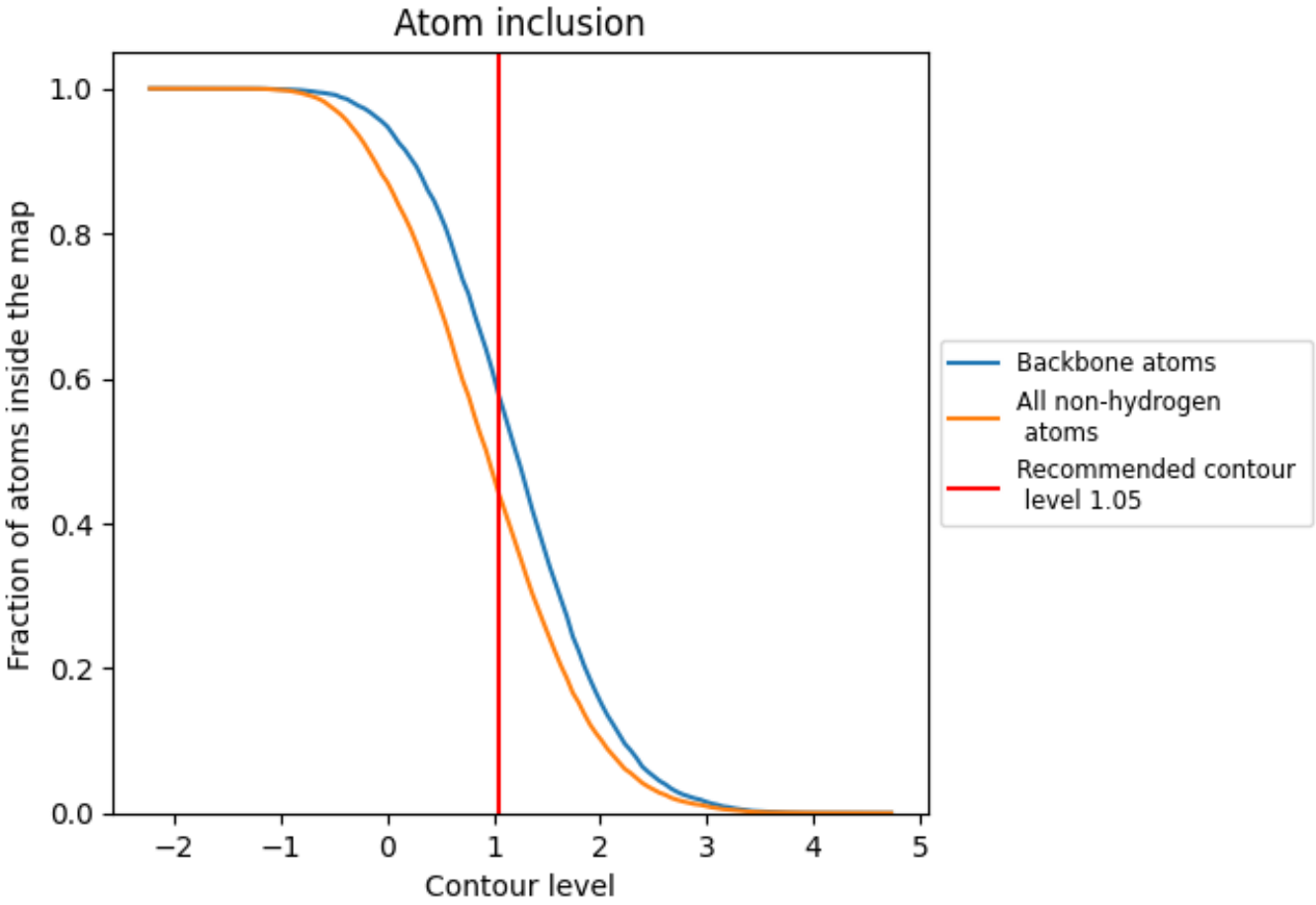
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 1.05 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 Atom inclusion (i)



At the recommended contour level, 58% of all backbone atoms, 44% of all non-hydrogen atoms, are inside the map.