



wwPDB EM Validation Summary Report ⓘ

Oct 29, 2022 – 09:25 am BST

PDB ID : 8A7E
EMDB ID : EMD-15221
Title : PAPP-A dimer in complex with its inhibitor STC2
Authors : Kobbero, S.D.; Gajhede, M.; Mirza, O.A.; Boesen, T.; Oxvig, C.
Deposited on : 2022-06-20
Resolution : 5.02 Å (reported)

This is a wwPDB EM Validation Summary 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

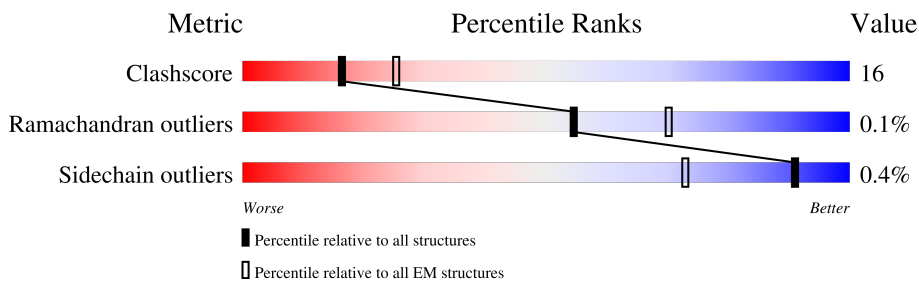
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 5.02 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	168	
1	P	168	
2	C	1536	
2	Q	1536	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 26442 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 Stanniocalcin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	P	168	Total	C	N	O	S	0	0
			1315	822	237	239	17		
1	A	168	Total	C	N	O	S	0	0
			1315	822	237	239	17		

- Molecule 2 is a protein called Pappalysin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	1524	Total	C	N	O	S	0	0
			11897	7436	2062	2294	105		
2	Q	1524	Total	C	N	O	S	0	0
			11897	7436	2062	2294	105		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	563	GLN	GLU	engineered mutation	UNP Q13219
Q	563	GLN	GLU	engineered mutation	UNP Q13219

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
3	C	1	Total	Zn	0
			1	1	
3	Q	1	Total	Zn	0
			1	1	

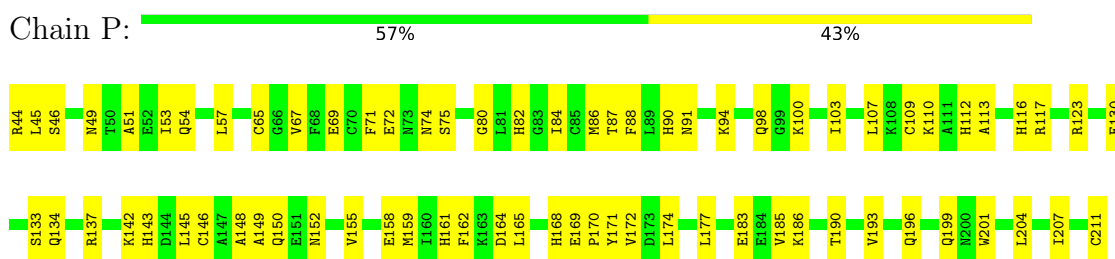
- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
4	C	8	Total 8	Ca 8	0
4	Q	8	Total 8	Ca 8	0

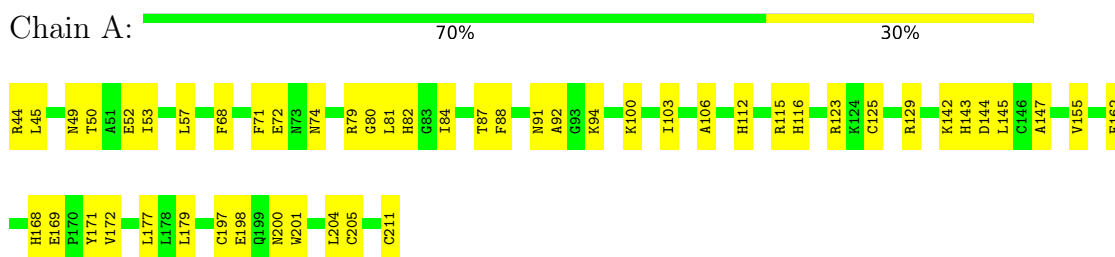
3 Residue-property plots [i](#)

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.

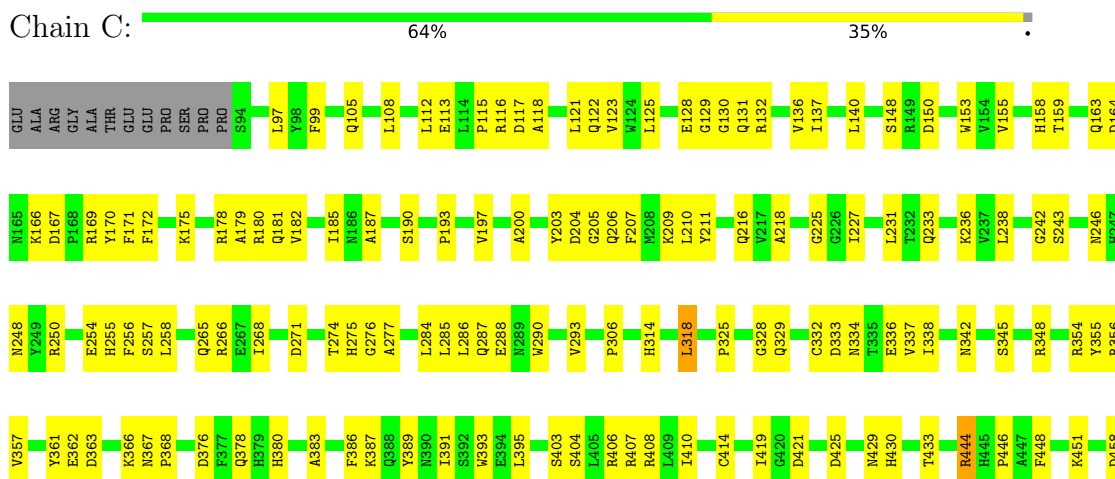
- Molecule 1: Stanniocalcin-2

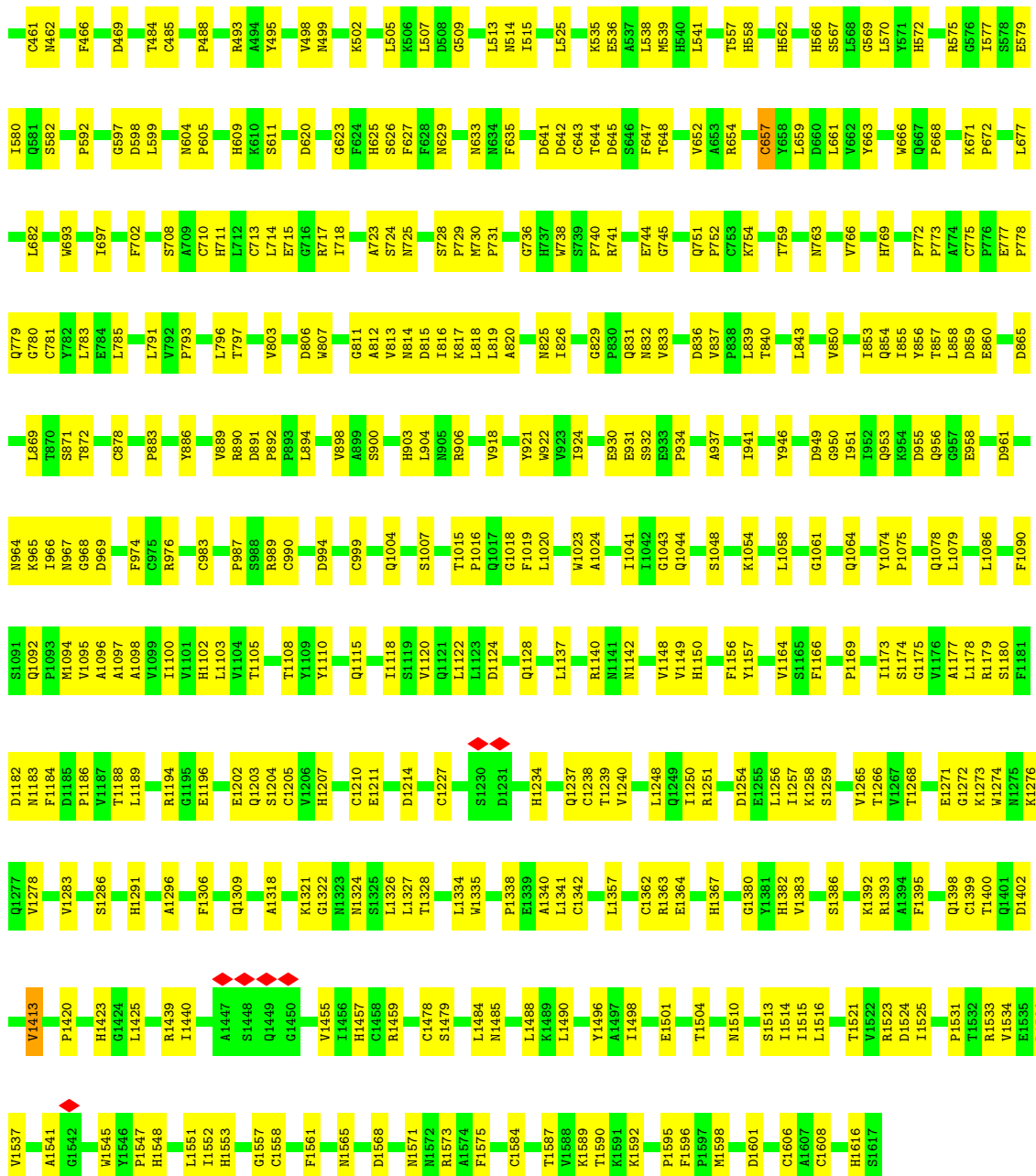


- Molecule 1: Stanniocalcin-2

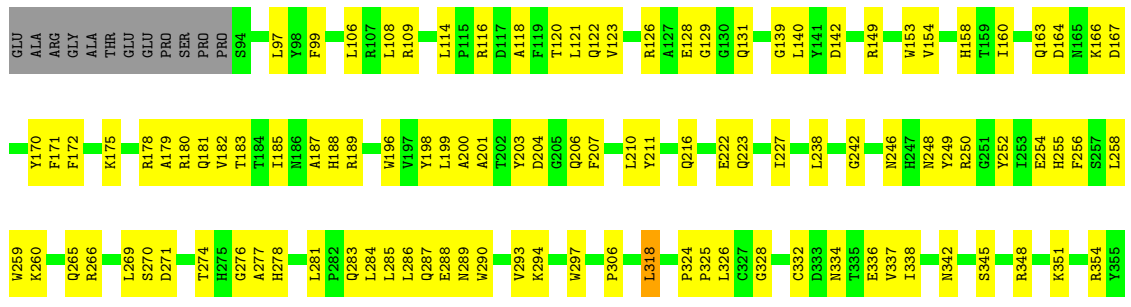


- Molecule 2: Pappalysin-1





• Molecule 2: Pappalysin-1



C1558	E1559	F1560	F1561	M1571	M1572	R1573	A1574	F1575	C1584	T1587	K1591	P1595	F1596	F1597	M1598	L1602	C1608	H1616	S1617																														
R1439	L1440	D1446	A1447	S1448	Q1449	G1450	L1451	G1452	H1457	V1464	N1465	H1469	S1479	E1483	L1484	N1485	S1486	N1487	L1488	K1489	L1507	I1514	I1515	L1516	T1521	D1524	I1525	L1529	R1533	V1534	E1535	R1536	V1537	G1542	H1545	I1546	P1547	H1548	L1551	L1552	H1553	C1554	G1557						
Q1277	C1285	P1288	D1289	S1190	C1192	G1195	E1196	A1201	E1202	Q1203	S1204	C1205	V1206	H1207	C1210	E1211	E1342	L1344	M1345	C1362	R1363	E1364	H1367	C1377	H1382	S1386	C1387	R1388	K1392	R1393	Q1398	C1399	T1400	Q1401	D1402	Q1406	V1413	T1414	C1415	D1416	L1425	F1432							
F1184	D1185	V1186	T1187	L1188	L1189	S1190	C1191	G1195	E1196	A1201	E1202	Q1203	S1204	C1205	V1206	H1207	C1210	E1211	E1342	L1344	M1345	C1362	R1363	E1364	H1367	C1377	H1382	S1386	C1387	R1388	K1392	R1393	Q1398	C1399	T1400	Q1401	D1402	Q1406	V1413	T1414	C1415	D1416	L1425	F1432					
W1085	L1086	G970	G971	F974	F981	R982	C983	S871	I984	T872	D873	E876	L791	V792	C878	L879	K882	P883	R890	D891	P892	P893	L894	V898	A899	S900	H903	N814	D815	I816	K817	L818	L819	V918	Y921	W922	E930	E931	S932	A937	I941	C947	Q953	K954	D955	Q956	N964		
Y856	D859	E860	H861	L862	L869	T870	C878	L879	K882	P883	R890	D891	P892	P893	L894	V898	A899	S900	H903	N814	D815	I816	K817	L818	L819	V918	Y921	W922	E930	E931	S932	A937	I941	C947	Q953	K954	D955	Q956	N964										
A774	C775	F776	E777	Q779	C780	C781	L783	E786	L791	V792	C878	L879	K882	P883	R890	D891	P892	P893	L894	V898	A899	S900	H903	N814	D815	I816	K817	L818	L819	V918	Y921	W922	E930	E931	S932	A937	I941	C947	Q953	K954	D955	Q956	N964						
P672	P679	L682	D598	L599	M604	P605	R609	H610	S611	P615	D620	G623	F624	H625	I615	F616	F627	F628	M629	T630	P631	Y632	N633	N634	F635	D641	D642	G643	G643	H558	T559	M560	I561	H562	Q563	L564	G565	H566	S567	L568	G569	L570	Y571	H572	D458	C461	M462	F466	D469
C587	P592	G597	P778	L599	M604	P605	R609	H610	S611	P615	D620	G623	F624	H625	I615	F616	F627	F628	M629	T630	P631	Y632	N633	N634	F635	D641	D642	G643	G643	H558	T559	M560	I561	H562	Q563	L564	G565	H566	S567	L568	G569	L570	Y571	H572	D458	C461	M462	F466	D469
C473	N480	T484	C485	P488	R493	A494	Y495	N499	K502	G509	L513	N514	I515	F516	F517	A518	K535	E536	A537	L538	M539	H540	C414	L541	D415	K418	I419	D425	N429	H430	T433	R444	H445	P446	A447	F448	D458	C461	M462	F466	D469								
R356	V357	Y361	E362	D363	K366	N367	P368	D376	F377	Q378	H379	H380	F386	Y389	N390	I391	D396	S403	S404	L405	E536	A537	L538	M539	H540	C414	L541	D415	K418	I419	D425	N429	H430	T433	R444	H445	P446	A447	F448	D458	C461	M462	F466	D469					

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	3	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	58, 59	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k), GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	25.960	Depositor
Minimum map value	-13.178	Depositor
Average map value	-0.002	Depositor
Map value standard deviation	0.939	Depositor
Recommended contour level	1.7	Depositor
Map size (Å)	303.59998, 303.59998, 303.59998	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.1859374, 1.1859374, 1.1859374	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.25	0/1337	0.48	0/1799
1	P	0.28	0/1337	0.51	0/1799
2	C	0.25	0/12217	0.49	1/16633 (0.0%)
2	Q	0.25	0/12217	0.48	1/16633 (0.0%)
All	All	0.25	0/27108	0.49	2/36864 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	Q	318	LEU	CA-CB-CG	6.00	129.09	115.30
2	C	318	LEU	CA-CB-CG	5.16	127.17	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1315	0	1290	34	0
1	P	1315	0	1290	52	0
2	C	11897	0	11211	373	0
2	Q	11897	0	11213	381	0
3	C	1	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	Q	1	0	0	0	0
4	C	8	0	0	0	0
4	Q	8	0	0	0	0
All	All	26442	0	25004	810	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 16.

The worst 5 of 810 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)
2:Q:984:ILE:O	2:Q:988:SER:HA	1.69	0.90
1:A:88:PHE:HB3	1:A:103:ILE:HD11	1.54	0.87
2:Q:332:CYS:CB	2:Q:657:CYS:SG	2.64	0.86
2:C:562:HIS:CD2	2:C:566:HIS:NE2	2.45	0.83
2:C:488:PRO:HA	2:C:493:ARG:HD3	1.62	0.81

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	166/168 (99%)	162 (98%)	4 (2%)	0	100	100
1	P	166/168 (99%)	163 (98%)	3 (2%)	0	100	100
2	C	1522/1536 (99%)	1422 (93%)	98 (6%)	2 (0%)	51	86
2	Q	1522/1536 (99%)	1427 (94%)	93 (6%)	2 (0%)	51	86
All	All	3376/3408 (99%)	3174 (94%)	198 (6%)	4 (0%)	54	86

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	1413	VAL
2	Q	1413	VAL
2	C	419	ILE
2	Q	419	ILE

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	146/146 (100%)	146 (100%)	0	100	100
1	P	146/146 (100%)	146 (100%)	0	100	100
2	C	1338/1347 (99%)	1334 (100%)	4 (0%)	92	95
2	Q	1338/1347 (99%)	1331 (100%)	7 (0%)	88	93
All	All	2968/2986 (99%)	2957 (100%)	11 (0%)	91	94

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	Q	657	CYS
2	Q	882	LYS
2	Q	1536	ARG
2	Q	1439	ARG
2	Q	414	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
2	Q	656	HIS
2	Q	1049	GLN
2	Q	1183	ASN
2	Q	1022	GLN
2	C	1004	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 18 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.

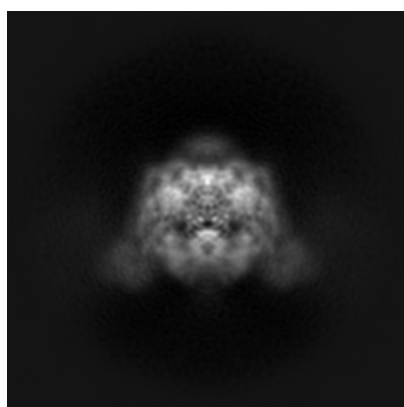
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-15221. These allow visual inspection of the internal detail of the map and identification of artifacts.

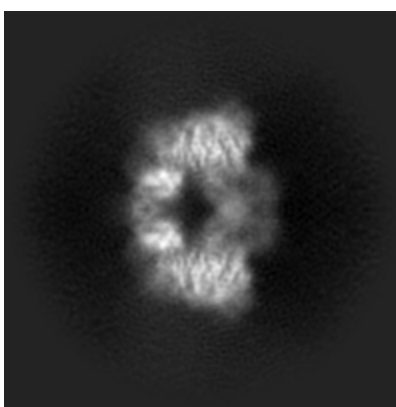
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

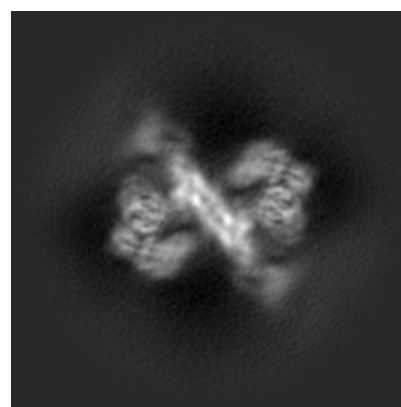
6.1.1 Primary map



X



Y

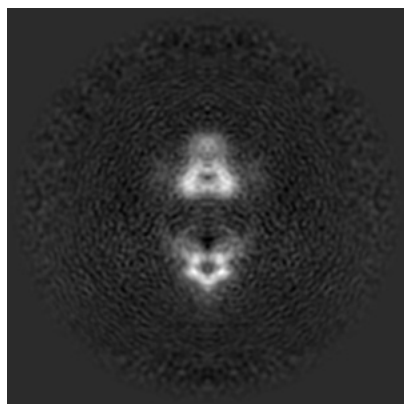


Z

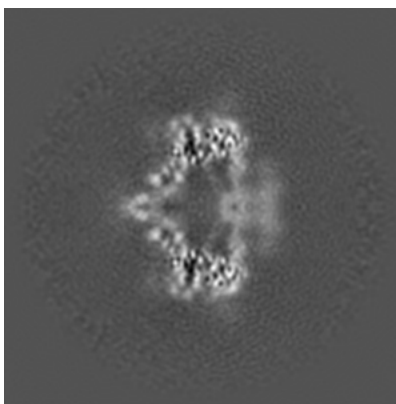
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

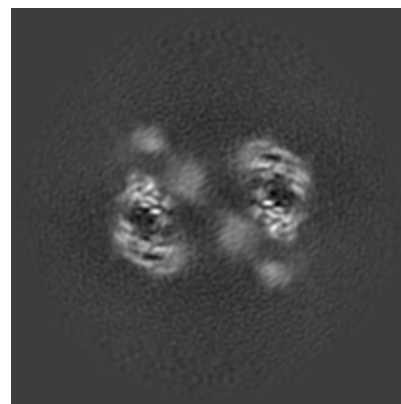
6.2.1 Primary map



X Index: 128



Y Index: 128

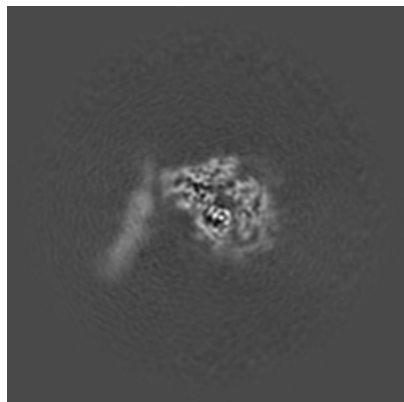


Z Index: 128

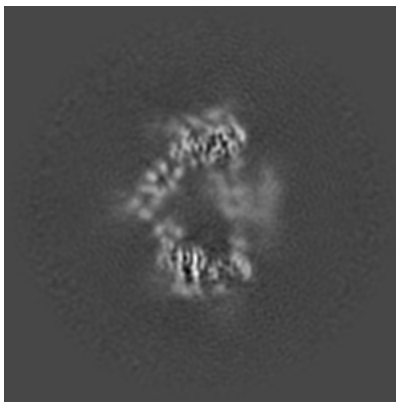
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

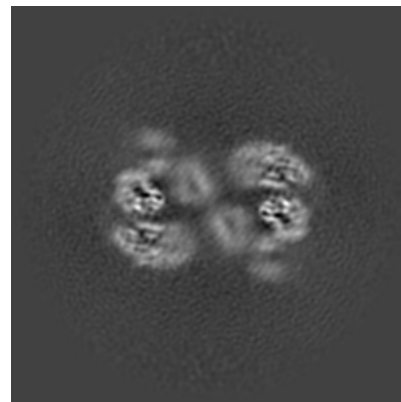
6.3.1 Primary map



X Index: 168



Y Index: 124



Z Index: 136

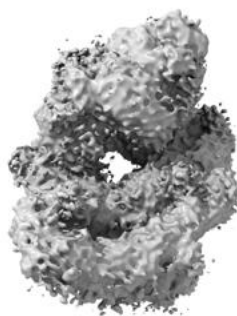
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views [i](#)

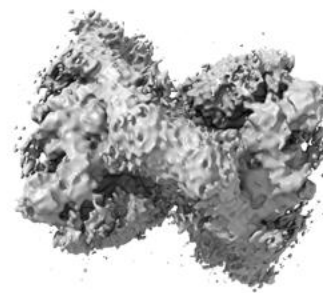
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 1.7. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

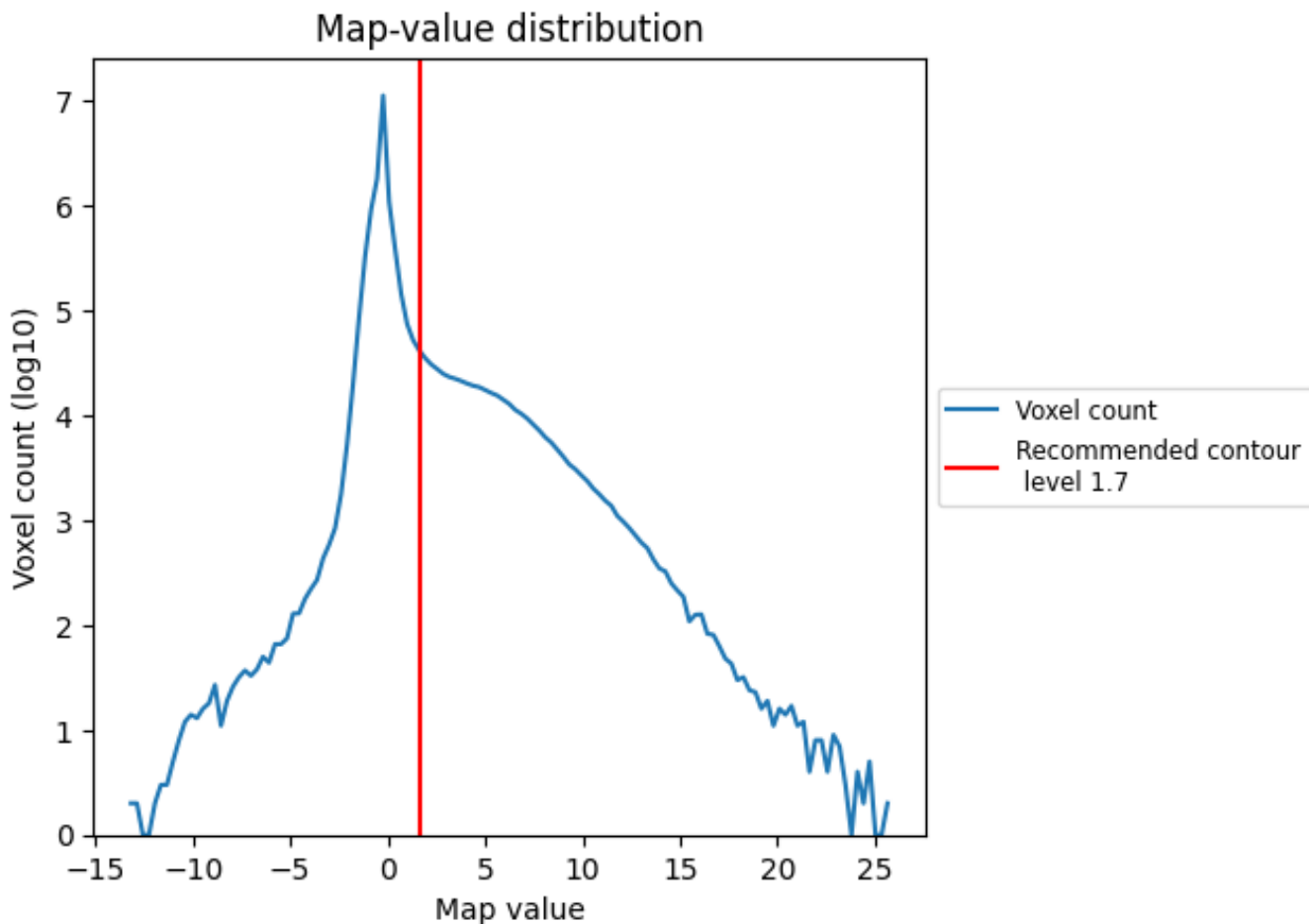
6.5 Mask visualisation

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

7 Map analysis [i](#)

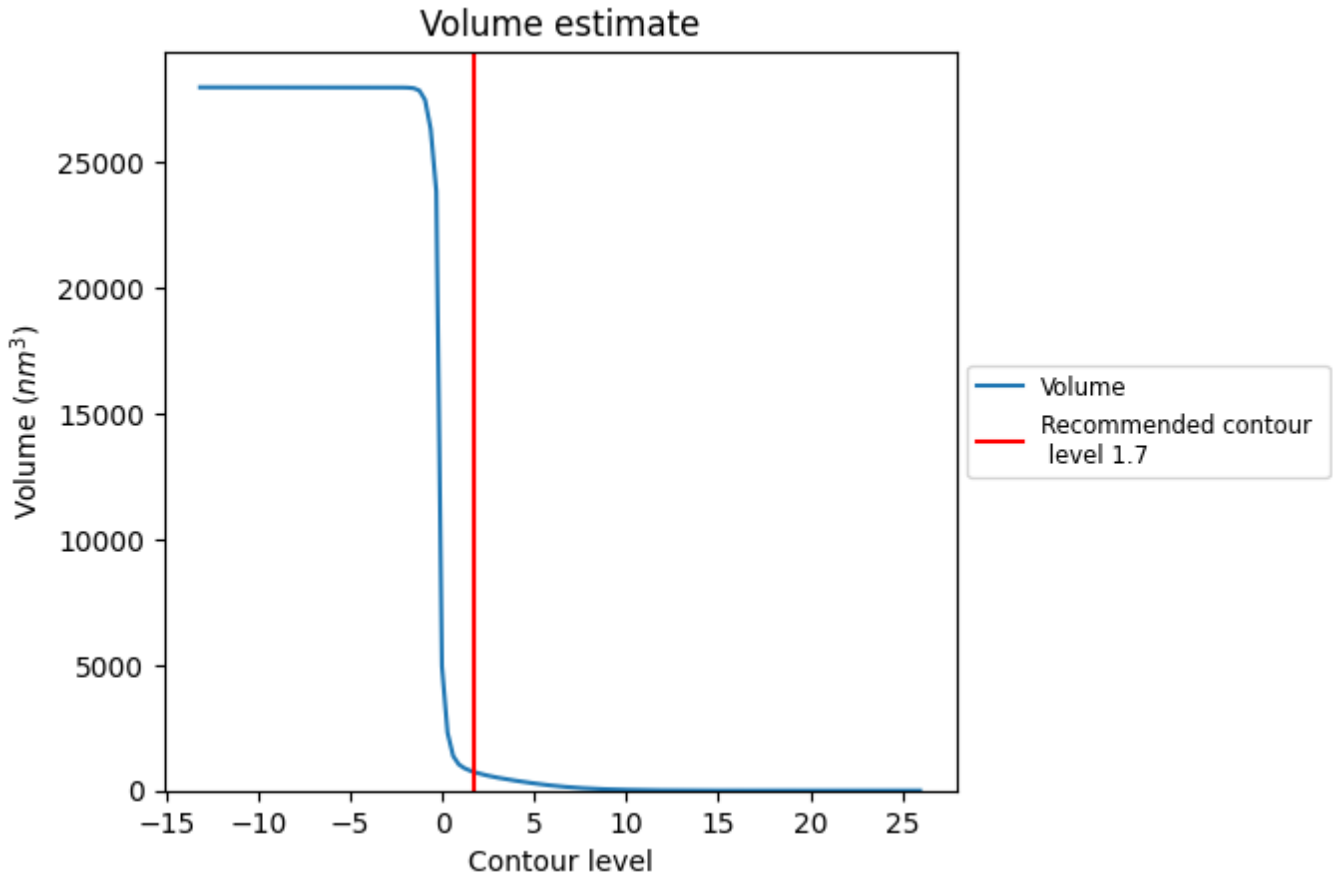
This section contains the results of statistical analysis of the map.

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.

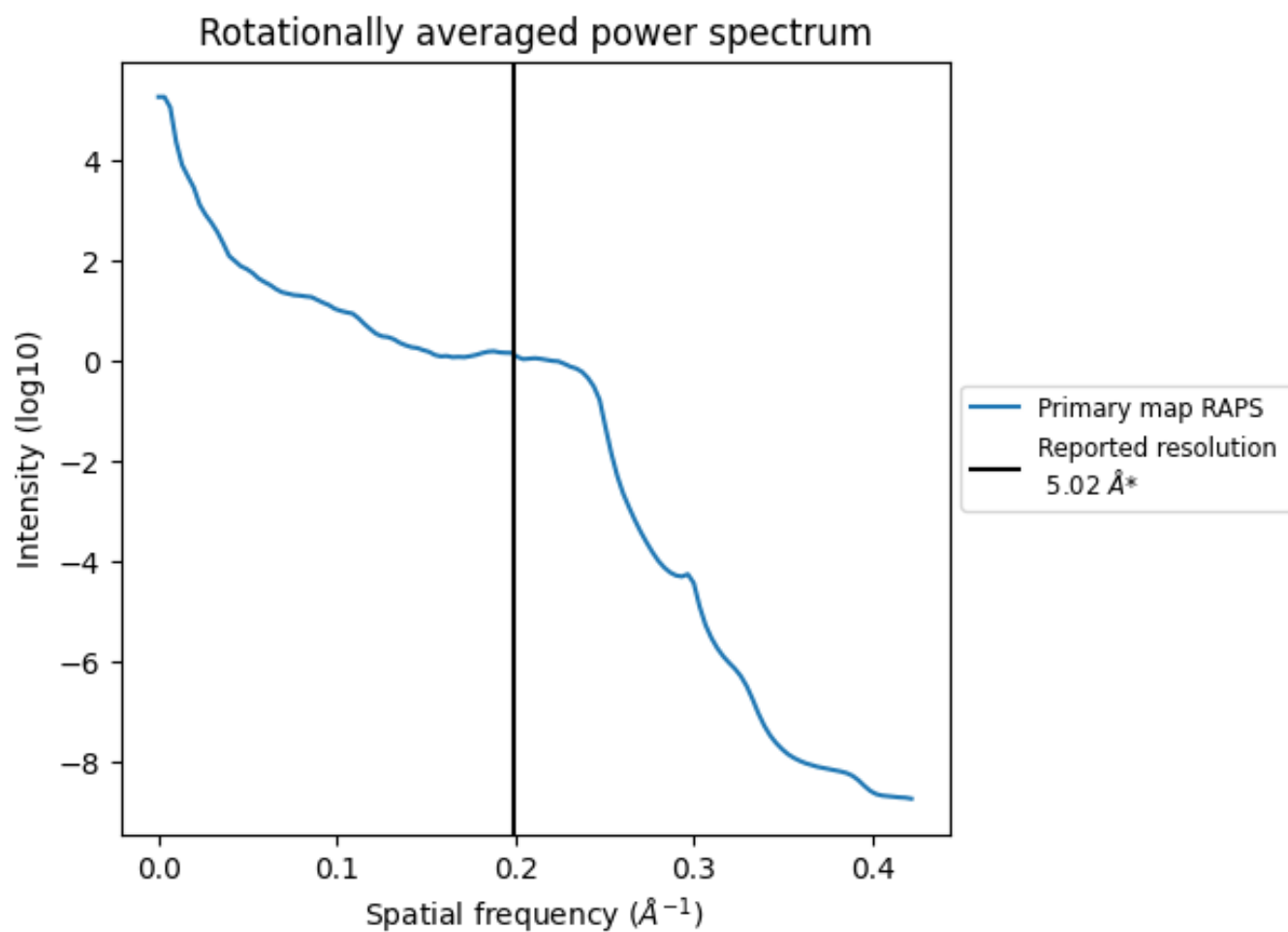
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 743 nm^3 ; this corresponds to an approximate mass of 671 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 0.199\AA^{-1}

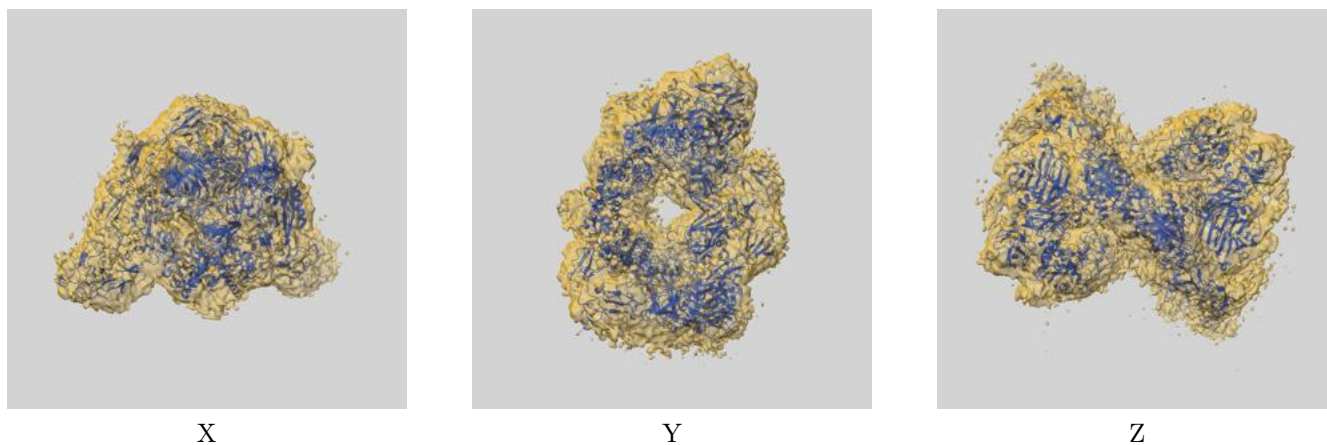
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

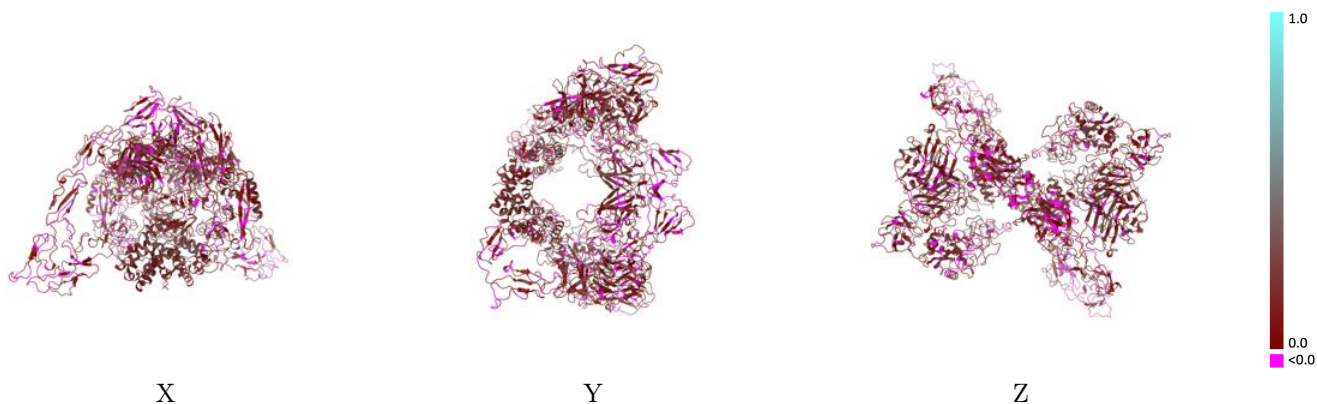
This section contains information regarding the fit between EMDB map EMD-15221 and PDB model 8A7E. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay [i](#)



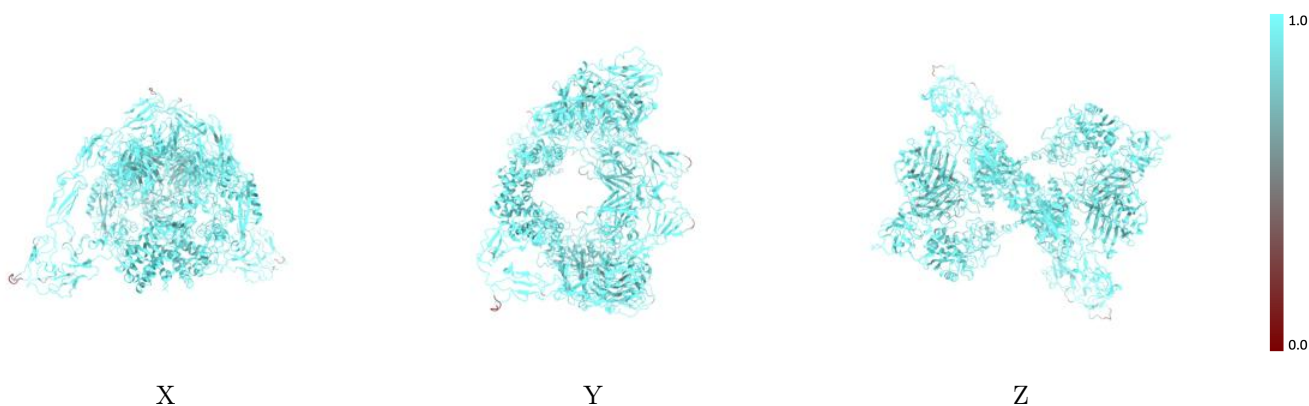
The images above show the 3D surface view of the map at the recommended contour level 1.7 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



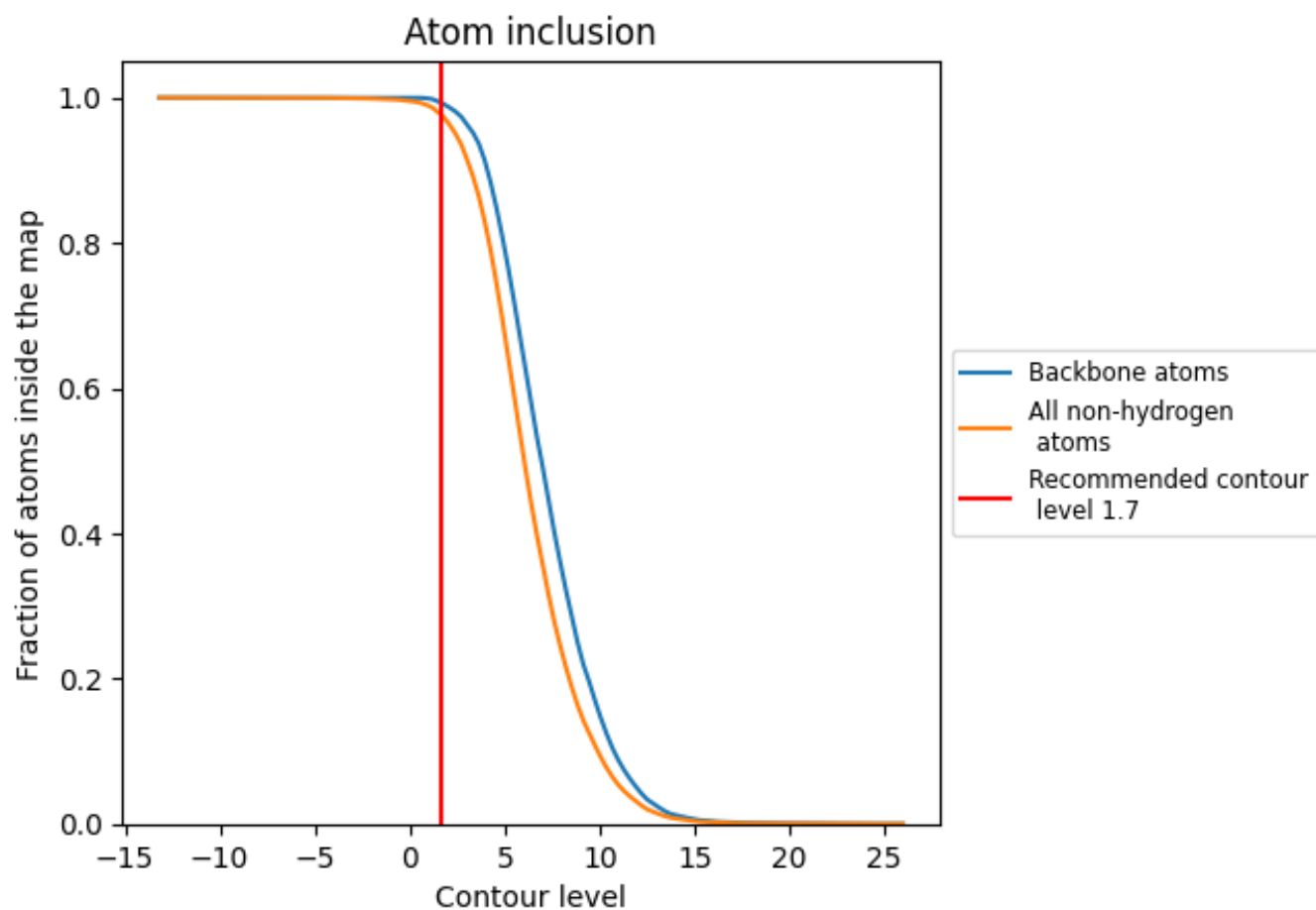
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (1.7).










9.4 Atom inclusion [i](#)



At the recommended contour level, 99% of all backbone atoms, 98% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary [i](#)

The table lists the average atom inclusion at the recommended contour level (1.7) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9754	 0.1470
A	 0.9931	 0.2210
C	 0.9709	 0.1300
P	 0.9961	 0.2160
Q	 0.9757	 0.1480

