



wwPDB EM Validation Summary Report ⓘ

Nov 20, 2022 – 10:27 AM EST

PDB ID : 7MEX
EMDB ID : EMD-23806
Title : Structure of yeast Ubr1 in complex with Ubc2 and N-degron
Authors : Pan, M.; Zheng, Q.; Wang, T.; Liang, L.; Yu, Y.; Liu, L.; Zhao, M.
Deposited on : 2021-04-08
Resolution : 3.35 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

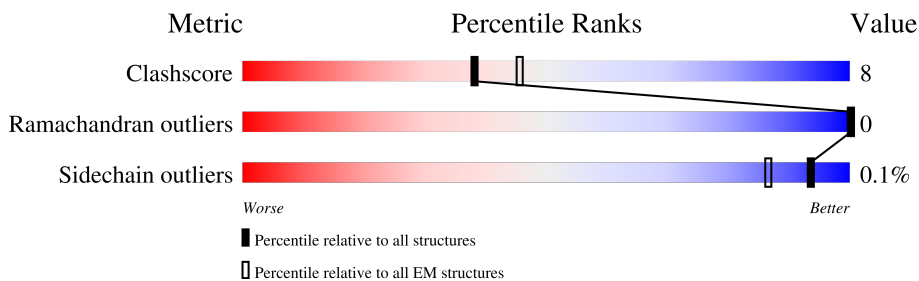
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.35 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	C	76	 79% 21%
2	B	150	 71% 29%
3	D	43	 7% 91%
4	A	1950	 71% 18% 11%

2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 15941 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 Ubiquitin.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	C	76	603	379	105	117	2	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	76	CYS	GLY	engineered mutation	UNP P0CG48

- Molecule 2 is a protein called Ubiquitin-conjugating enzyme E2 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	150	1210	770	204	230	6	0	0

- Molecule 3 is a protein called N-degron.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
3	D	4	34	20	10	4	0	0

- Molecule 4 is a protein called E3 ubiquitin-protein ligase UBR1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	A	1737	14087	9007	2367	2638	75	0	0

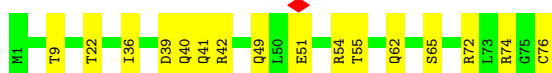
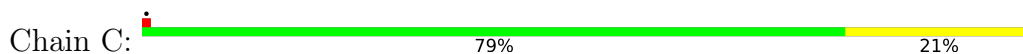
- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
5	A	7	Total	Zn	0
			7	7	

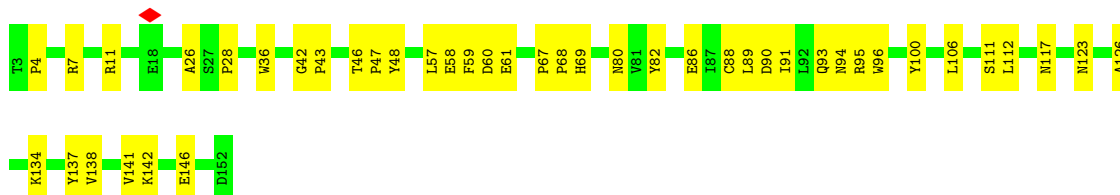
3 Residue-property plots [i](#)

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.

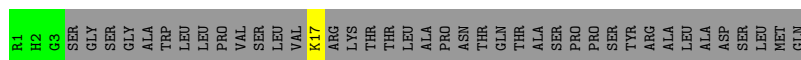
- Molecule 1: Ubiquitin



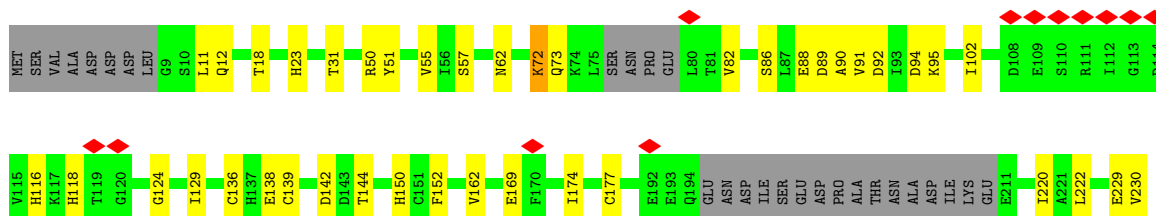
- Molecule 2: Ubiquitin-conjugating enzyme E2 2



- Molecule 3: N-degron



- Molecule 4: E3 ubiquitin-protein ligase UBR1



	F234	V237	Q240	I248	I252	M279	M282	F283	D284	GLY	THR	THR	THR	ALA	LYS	THR	SER	SER	ASN	SER	PRG	SER	ALA	K305	I306	D307	P308	I315	Y320	H321	Q325	T328	R331	Q332	P335	D336	H337	F338	H339	I340	D341																																										
	L342	L343	R346	G351	L355	K356	V364	V371	N374	A378	M383	T391	C392	I395	I396	I399	T413	M435	T436	P437	F443	L475	S479	S484	P485	M488	M500	L503	Q504	H505	K515	R518	Q522	I526	P527	K536	P537	I538	F539	V544	I550	S553	V564	M571	D588	R589	E590	P591	T599	A565	C569	L573	S588	M594	S595	A757	I596	L621	V636	P646	L650	K653	K663	N666	K670	I671	L680	H681	T693	Q701	K705	K711	D712	S713									
	I714	D715	S716	K717	L718	F719	L720	N721	R724	S728	F729	N732	L735	K738	L739	I740	Y741	D742	K748	R755	V756	A757	F758	M759	M760	P761	L762	Q763	T764	M765	F768	K772	F788	L789	K790	I791	S792	D793	L801	I805	D806	V817	K825	N826	N827	L830	Y833	I837	L845	M846	E847	R848	D849	I854	D860	L864	L865	Y879	F880	D881	I886	I887	Q888	I894	Y895	R901	R914	I918	I923	Y927	Y933	P941	L944	T949	E950	F951	D952	L979	D984	P985	N990	E992	N993
	L830	Y833	I837	L845	M846	E847	R848	D849	I854	D860	L864	L865	Y879	F880	D881	I886	I887	Q888	I894	Y895	R901	R914	I918	I923	Y927	Y933	P941	L944	T949	E950	F951	D952	L979	D984	P985	N990	E992	N993	S1004	A1007	K1008	L1013	A1014	K1015	L1018	L1024	L1027	A1031	L1032	F1043	L1055	L1063	M1064	E1065	L1066	L1067	D1076	D1077	E1078	L1079	M1081	D1084	P1087	Y1090	I1095	C1096	L1100	S1101	I1102	L1114	K1117	M1125	K1128	L1133	L1137								
	H1138	A1139	S1140	G1142	N1143	Q1144	M1147	D1148	Y1149	K1150	D1151	K1152	L1153	L1154	R1155	GLN	VAL	ASN	LEU	GLN	T1163	E1164	R1167	K1174	L1178	Q1187	E1197	PHE	ASP	GLU	GLN	ASP	ASP	ASP	VAL	MET	VAL	GLY	LYS	TYR	SER	GLU	GLU	ASP	F1218	L1222	C1223																																				
	Q1224	D1225	S1226	M1251	P1252	M1253	F1254	M1256	W1259	D1266	R1289	K1290	L1291	F1292	V1293	M1296	H1300	C1303	R1306	K1310	C1323	Q1324	T1325	C1334	Q1335	S1337	K1338	F1348	L1349	L1353	S1354	L1355	L1358	L1361	L1373	I1376	Q1385	V1402	M1416	L1417	E1418	S1421	K1425	P1426	I1429	K1438	Y1439	K1440	T1441	I1445	L1446	V1447	M1450	L1451	F1452	V1455	I1456	Q1469	T1472	Q1476	L1479	R1485	S1486	A1487	P1491	L1494	L1502	T1503	T1504	F1505	L1517	Y1527	A1530	S1531	K1532	V1539	M1543						
	L1547	D1552	I1563	L1573	K1574	S1575	L1576	L1577	P1578	R1581	R1582	F1586	V1589	V1594	K1595	D1596	T1604	H1607	E1610	E1611	E1612	A1619	V1622	A1625	L1626	I1629	T1630	E1631	K1632	L1638	V1646	Y1650	L1651	E1657	T1661	T1662	K1663	L1664	I1665	D1666																																											
	L1671	T1676	R1684	E1685	E1686	R1687	S1688	Q1689	H1690	G1707	V1708	H1711	L1712	R1713	A1714	H1717	E1718	M1726	F1734	P1737	C1743	S1751	P1758	Y1759	L1760	S1762	T1777	Y1784	M1794	R1802	V1803	M1804	R1809	L1812	LEU	SER	ASN	ASP	ALA	GLY	ILE	ILE	ARG	ASN	LEU	ASP	GLU	ILE	ASP	ALA	ASP	ASP	GLY	PHE	PHE	ALA																											
	PHE	ASN	ARG	GLU	PRO	ARG	PRO	ARG	ARG	ILE	PRO	ASN	ARG	PRO	THR	THR	ASP	GLU	ASP	ASP	ASP	GLY	GLU	ALA	GLU	ASP	GLY	THR	GLY	ALA	ALA	ALA	VAL	VAL	GLY	GLY	GLY	GLY	ILE	ILE	ARG	ASN	LEU	ASP	GLU	ILE	ASP	ALA	ASP	GLY	PHE	PHE	ALA																														
	ASN	ASP	SER	GLU	ARG	GLU	ILE	TRP																																																																											

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	232915	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	48	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.064	Depositor
Minimum map value	-0.019	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.015	Depositor
Map size (\AA)	255.12, 255.12, 255.12	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.063, 1.063, 1.063	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:
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	C	0.24	0/609	0.50	0/819
2	B	0.26	0/1245	0.50	0/1697
3	D	0.19	0/33	0.62	0/39
4	A	0.26	0/14392	0.45	0/19471
All	All	0.26	0/16279	0.46	0/22026

There are no bond length outliers.

There are no bond angle outliers.

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	C	603	0	631	19	0
2	B	1210	0	1171	34	0
3	D	34	0	36	1	0
4	A	14087	0	13925	212	0
5	A	7	0	0	0	0
All	All	15941	0	15763	252	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 8.

The worst 5 of 252 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:C:76:CYS:CB	2:B:88:CYS:HB3	1.68	1.23
1:C:76:CYS:HB3	2:B:88:CYS:CB	1.72	1.17
2:B:36:TRP:HB2	2:B:57:LEU:HB2	1.67	0.75
4:A:1429:ILE:HD11	4:A:1610:GLU:HA	1.68	0.74
4:A:1353:LEU:HD13	4:A:1494:LEU:HB2	1.71	0.73

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	C	74/76 (97%)	74 (100%)	0	0	100	100
2	B	148/150 (99%)	143 (97%)	5 (3%)	0	100	100
3	D	1/43 (2%)	1 (100%)	0	0	100	100
4	A	1725/1950 (88%)	1688 (98%)	37 (2%)	0	100	100
All	All	1948/2219 (88%)	1906 (98%)	42 (2%)	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	C	69/69 (100%)	69 (100%)	0	100	100
2	B	135/135 (100%)	135 (100%)	0	100	100
3	D	3/35 (9%)	3 (100%)	0	100	100
4	A	1589/1792 (89%)	1588 (100%)	1 (0%)	93	98
All	All	1796/2031 (88%)	1795 (100%)	1 (0%)	93	98

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	A	72	LYS

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

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 7 ligands modelled in this entry, 7 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.

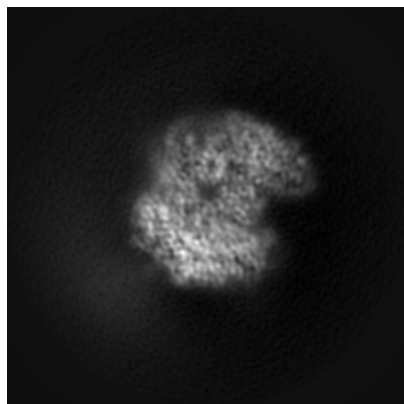
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-23806. These allow visual inspection of the internal detail of the map and identification of artifacts.

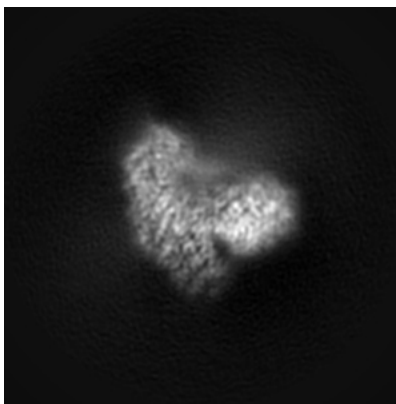
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

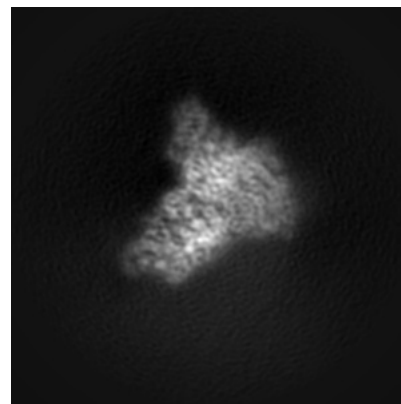
6.1.1 Primary map



X

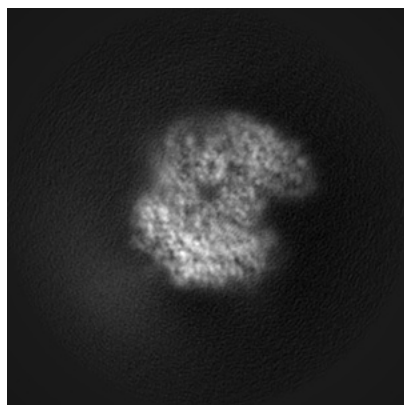


Y

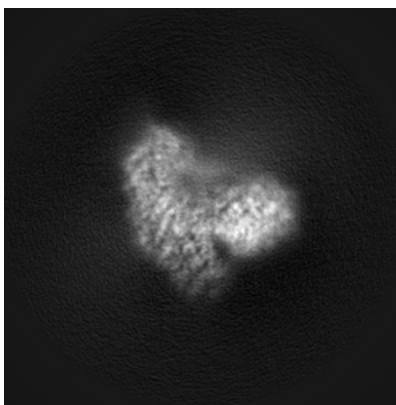


Z

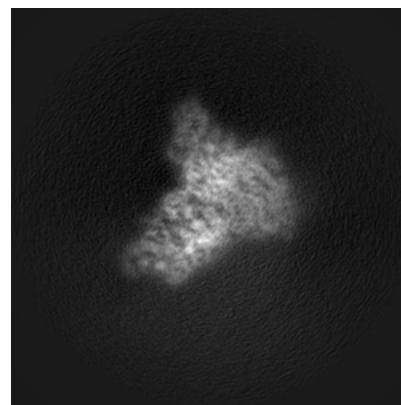
6.1.2 Raw map



X



Y

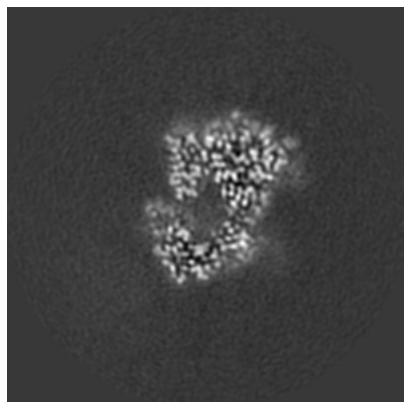


Z

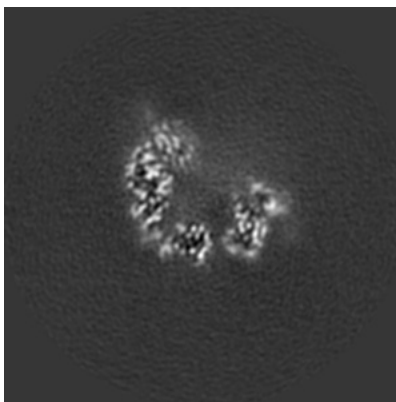
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

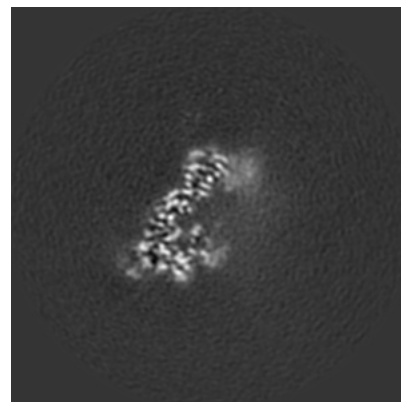
6.2.1 Primary map



X Index: 120

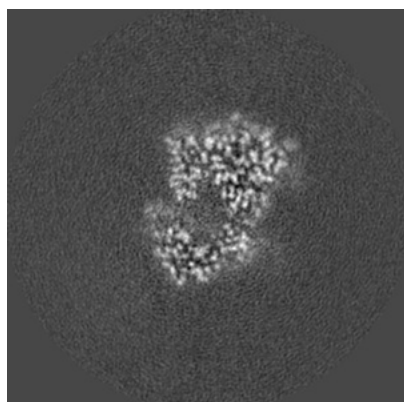


Y Index: 120

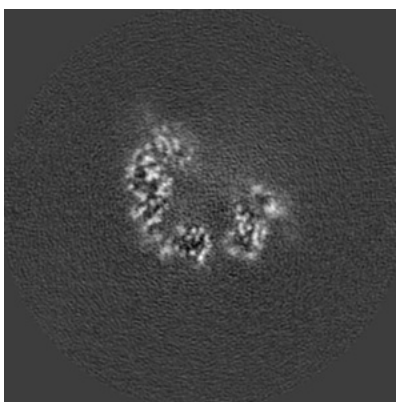


Z Index: 120

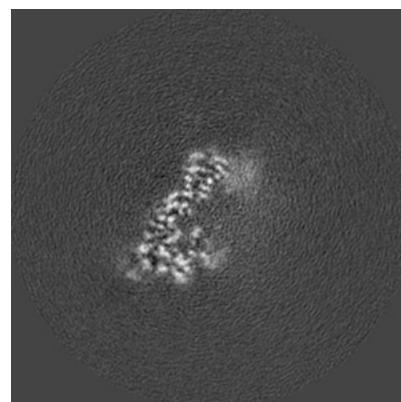
6.2.2 Raw map



X Index: 120



Y Index: 120

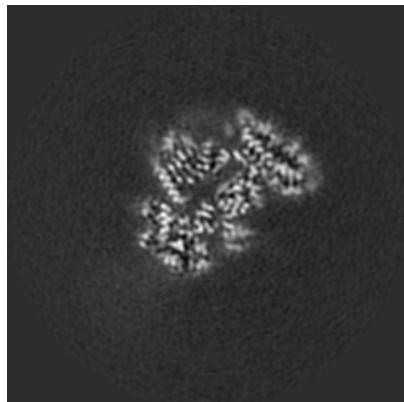


Z Index: 120

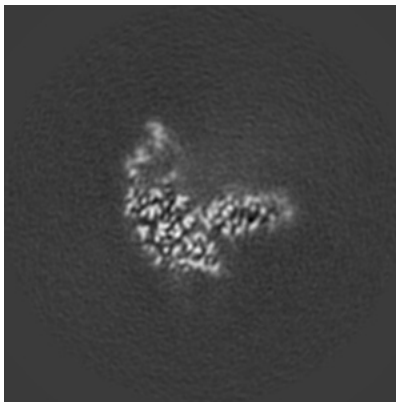
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

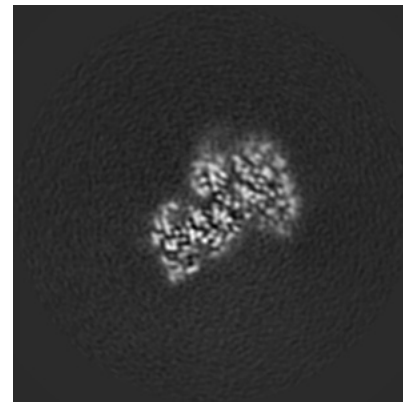
6.3.1 Primary map



X Index: 107

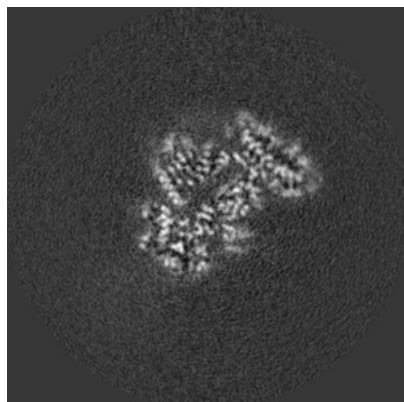


Y Index: 104

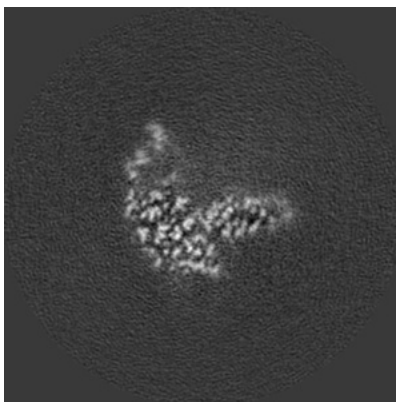


Z Index: 96

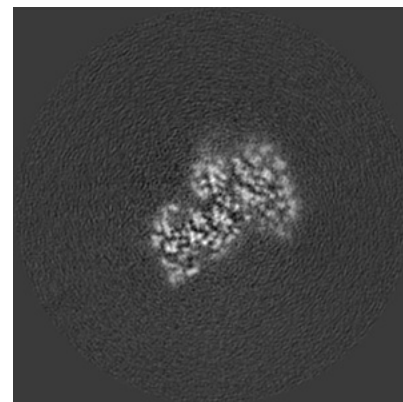
6.3.2 Raw map



X Index: 107



Y Index: 104

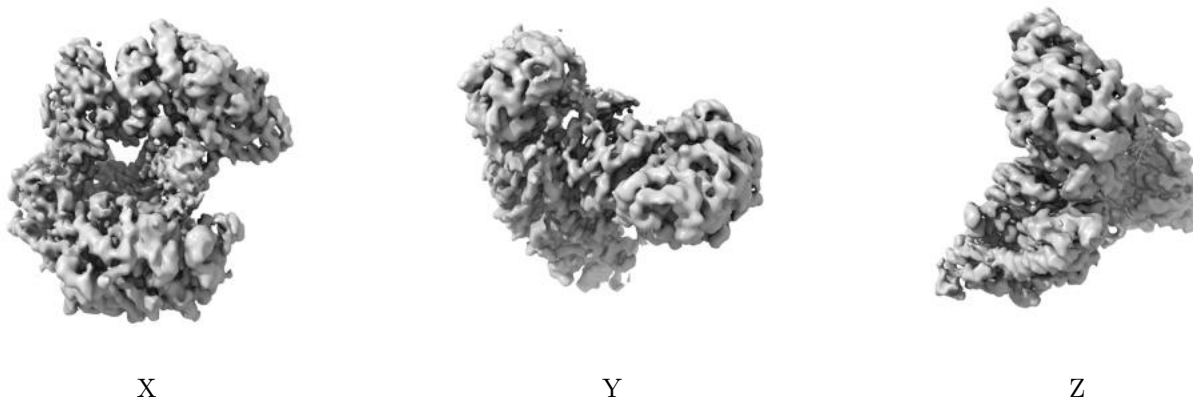


Z Index: 96

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

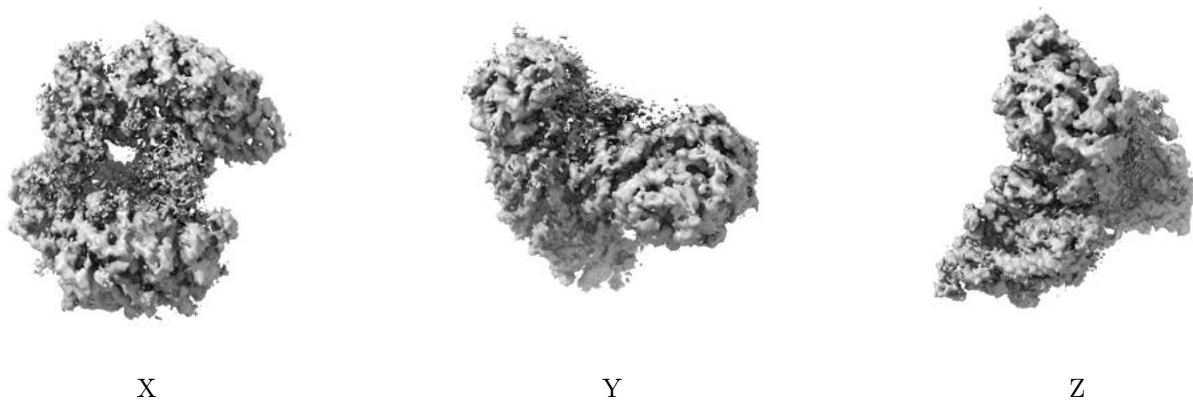
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.015. 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.

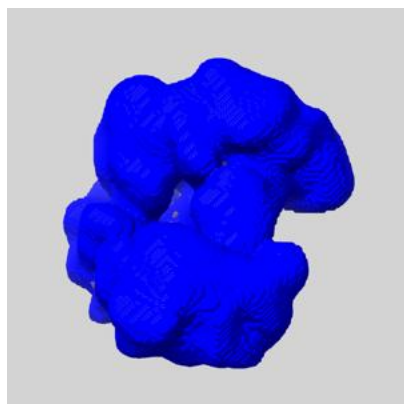
6.5 Mask visualisation [i](#)

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

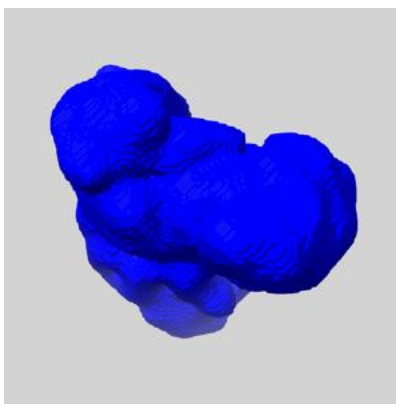
A mask typically either:

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

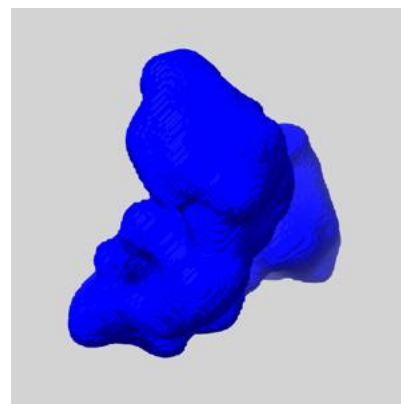
6.5.1 emd_23806_msk_1.map [i](#)



X



Y

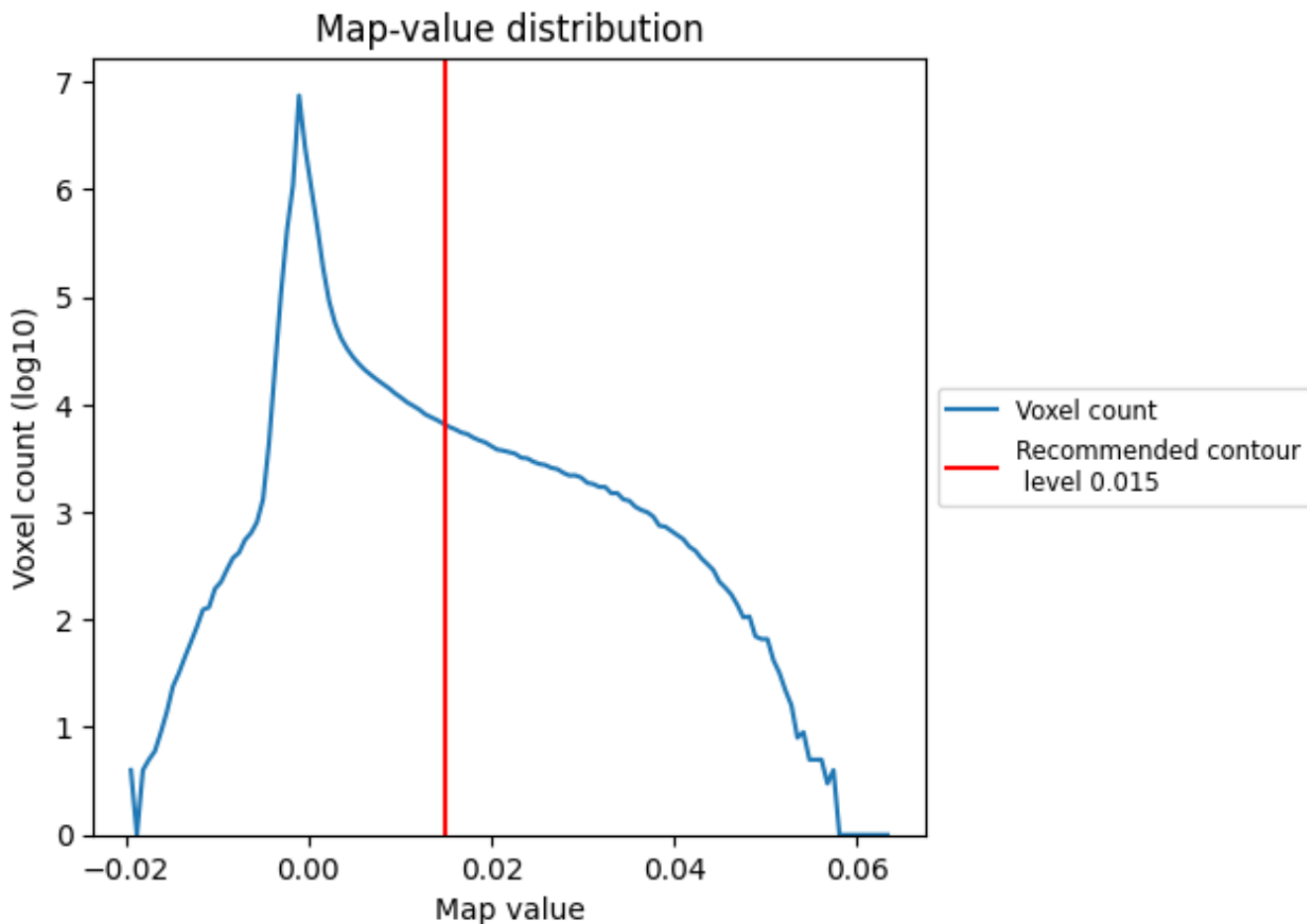


Z

7 Map analysis [i](#)

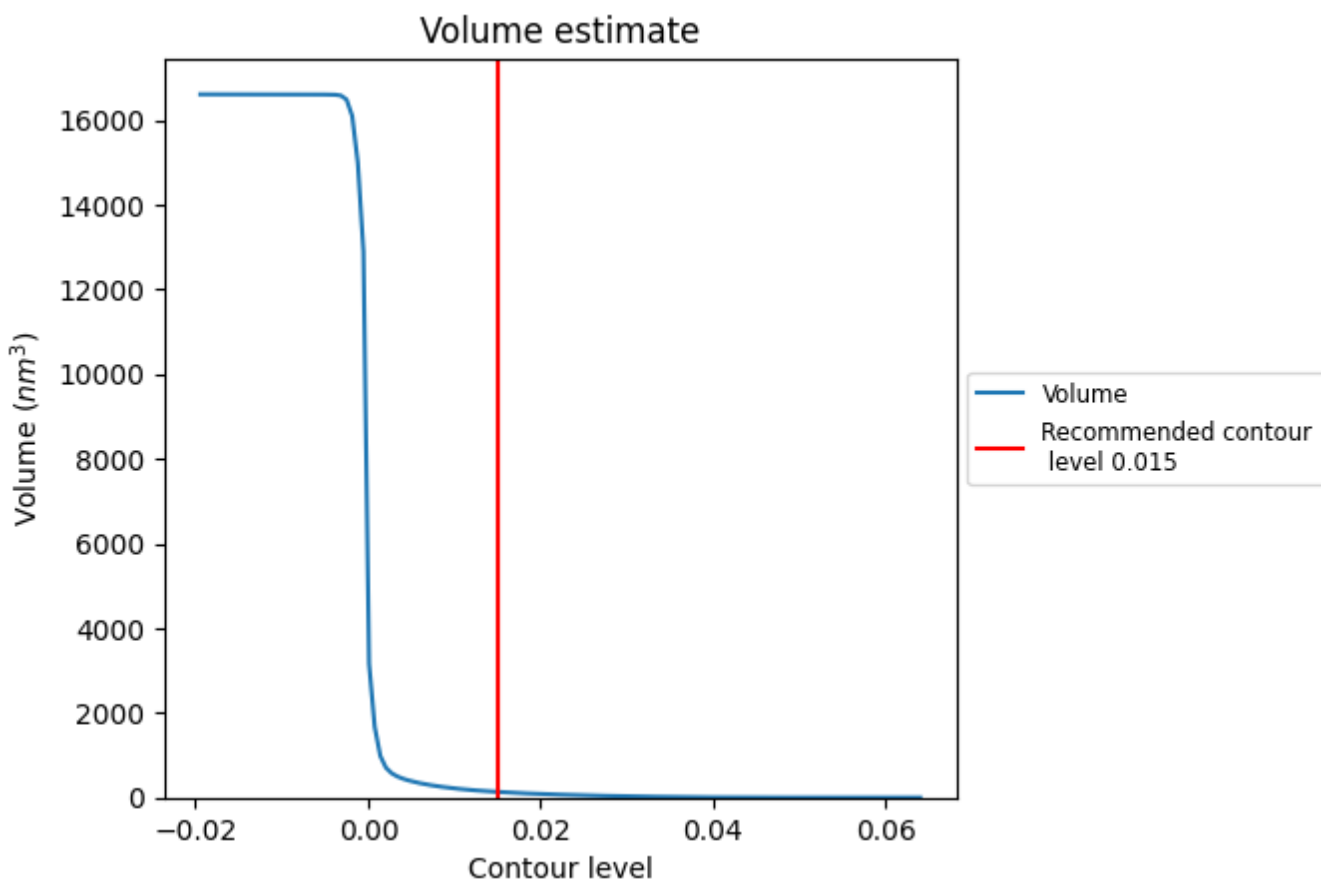
This section contains the results of statistical analysis of the map.

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.

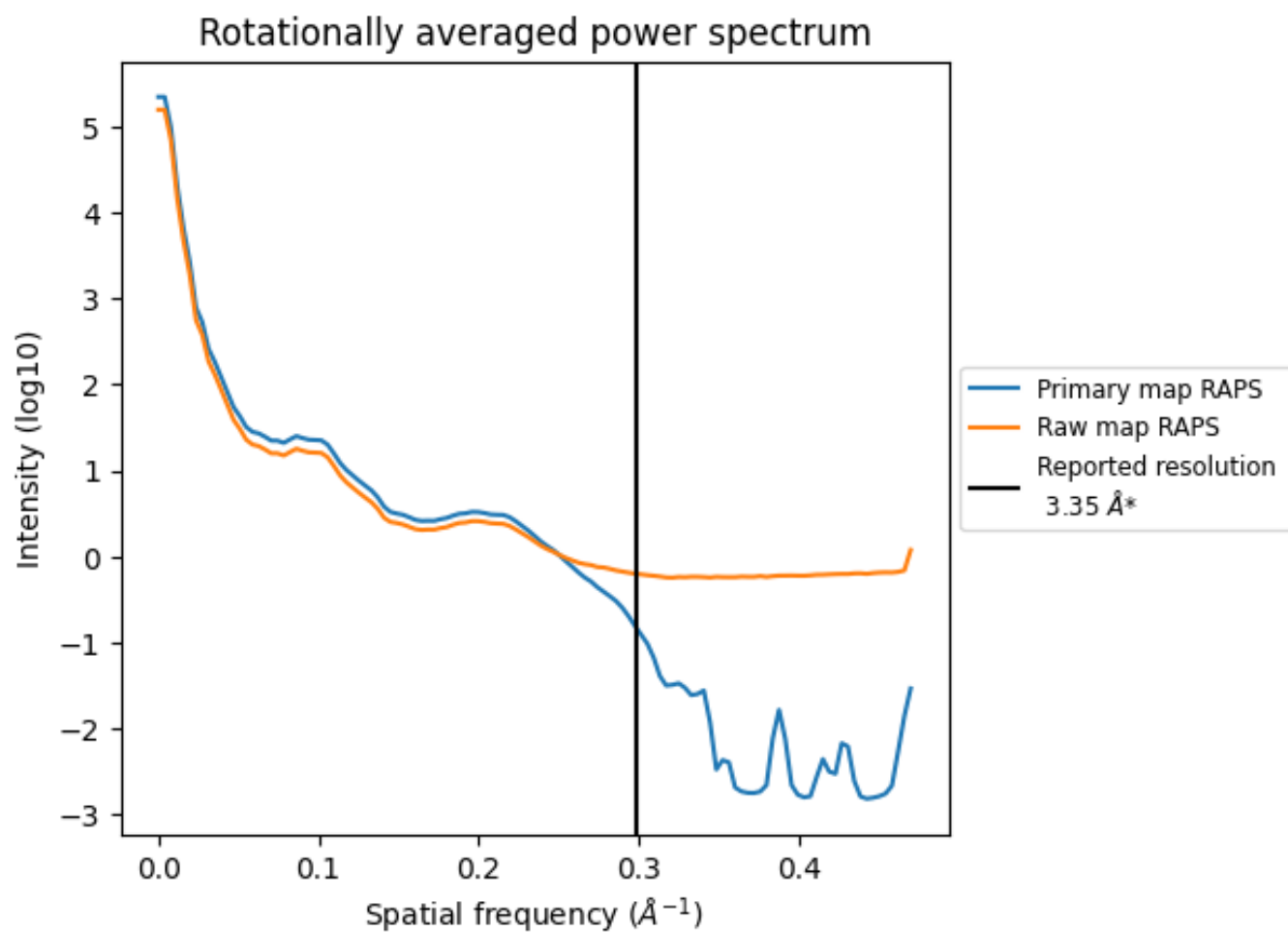
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 134 nm³; this corresponds to an approximate mass of 121 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

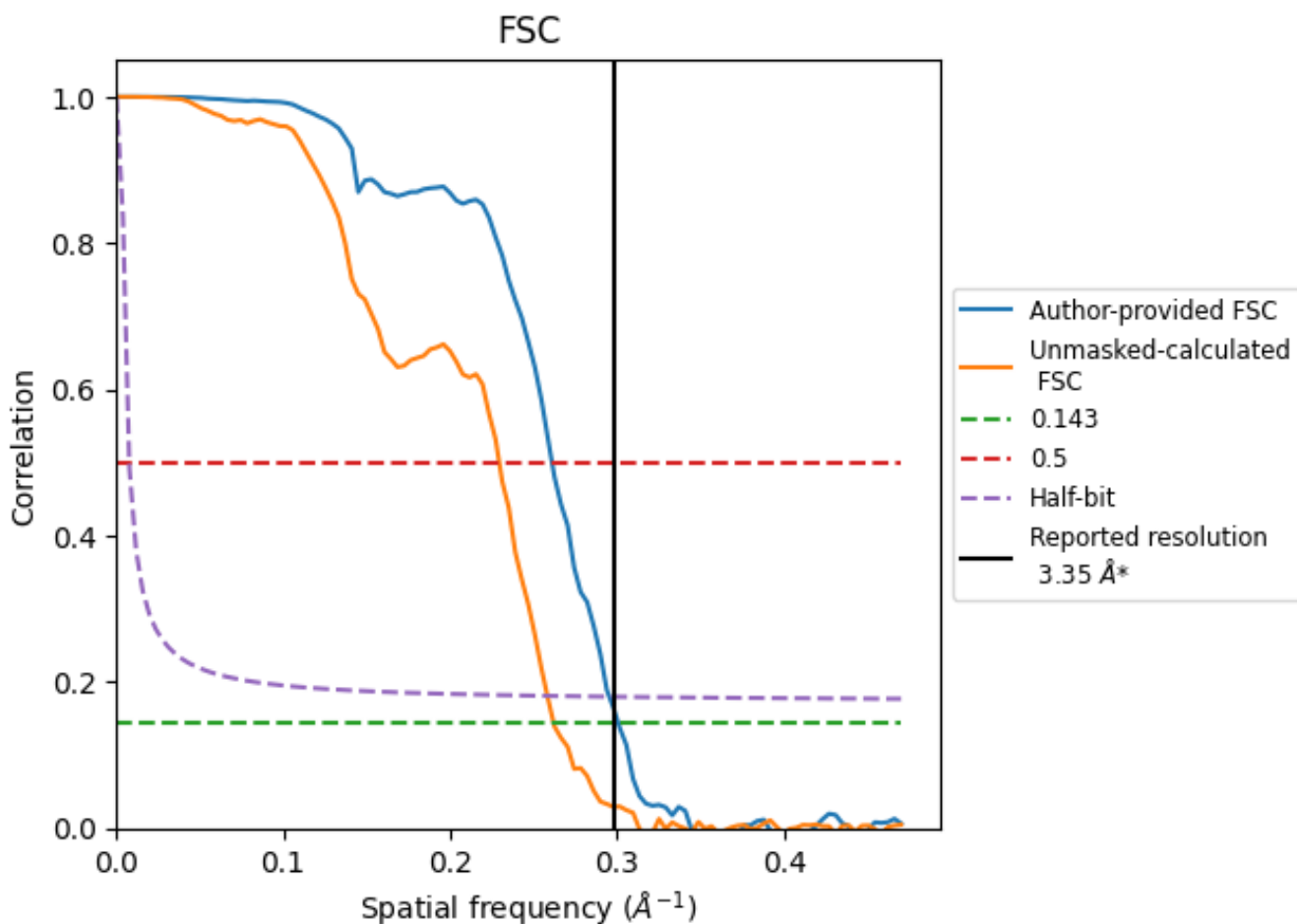


*Reported resolution corresponds to spatial frequency of 0.299 Å⁻¹

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 0.299 Å⁻¹

8.2 Resolution estimates [i](#)

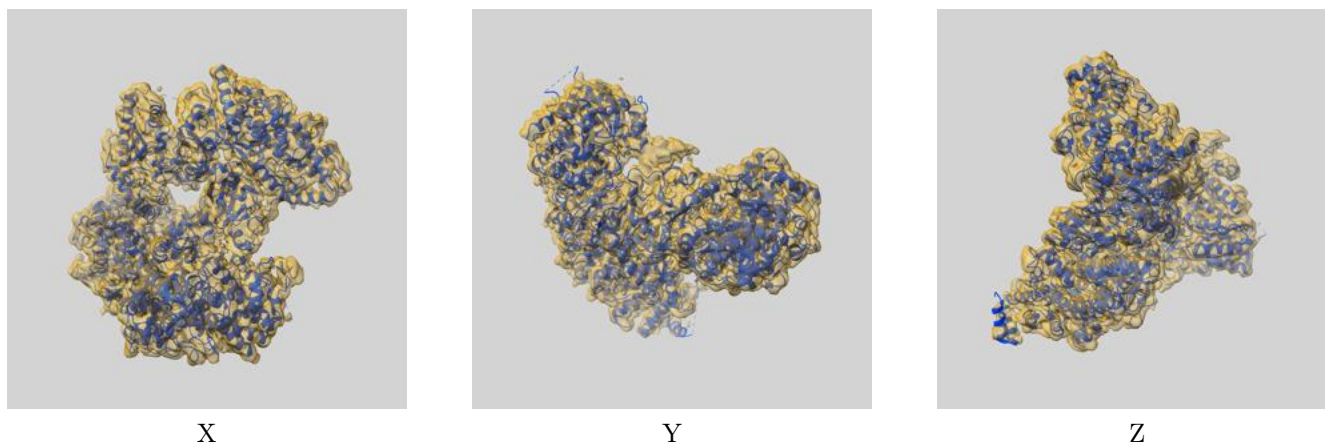
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.35	-	-
Author-provided FSC curve	3.32	3.83	3.38
Unmasked-calculated*	3.81	4.36	3.87

*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 3.81 differs from the reported value 3.35 by more than 10 %

9 Map-model fit [i](#)

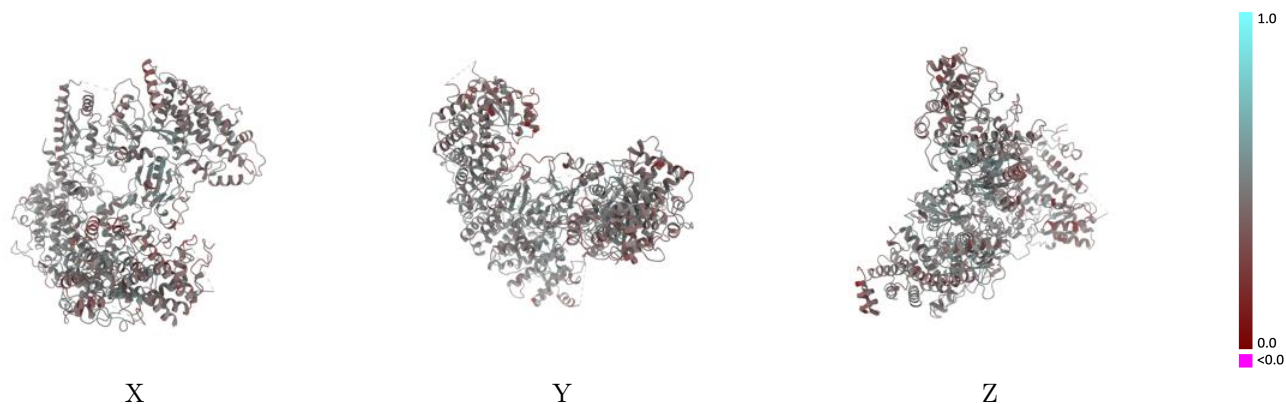
This section contains information regarding the fit between EMDB map EMD-23806 and PDB model 7MEX. Per-residue inclusion information can be found in section [3](#) on page [4](#).

9.1 Map-model overlay [i](#)



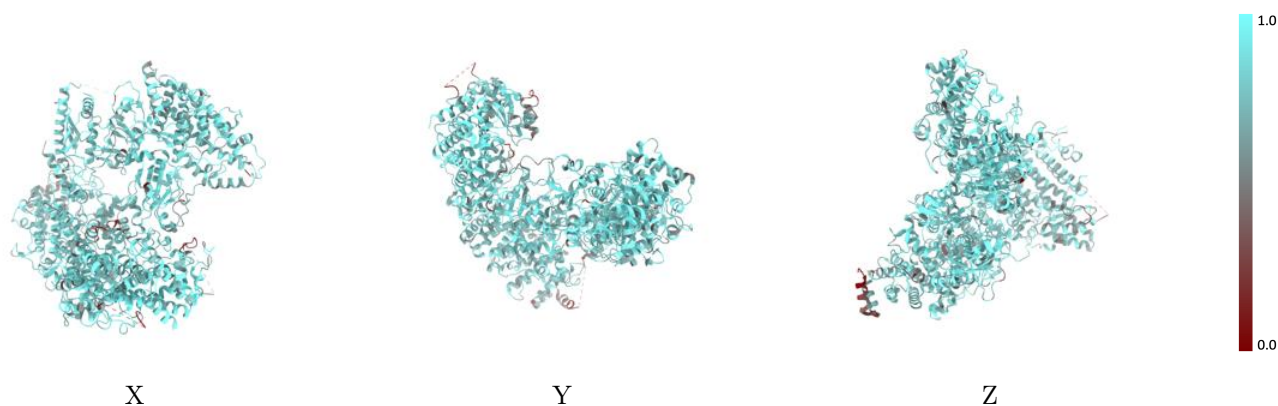
The images above show the 3D surface view of the map at the recommended contour level 0.015 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



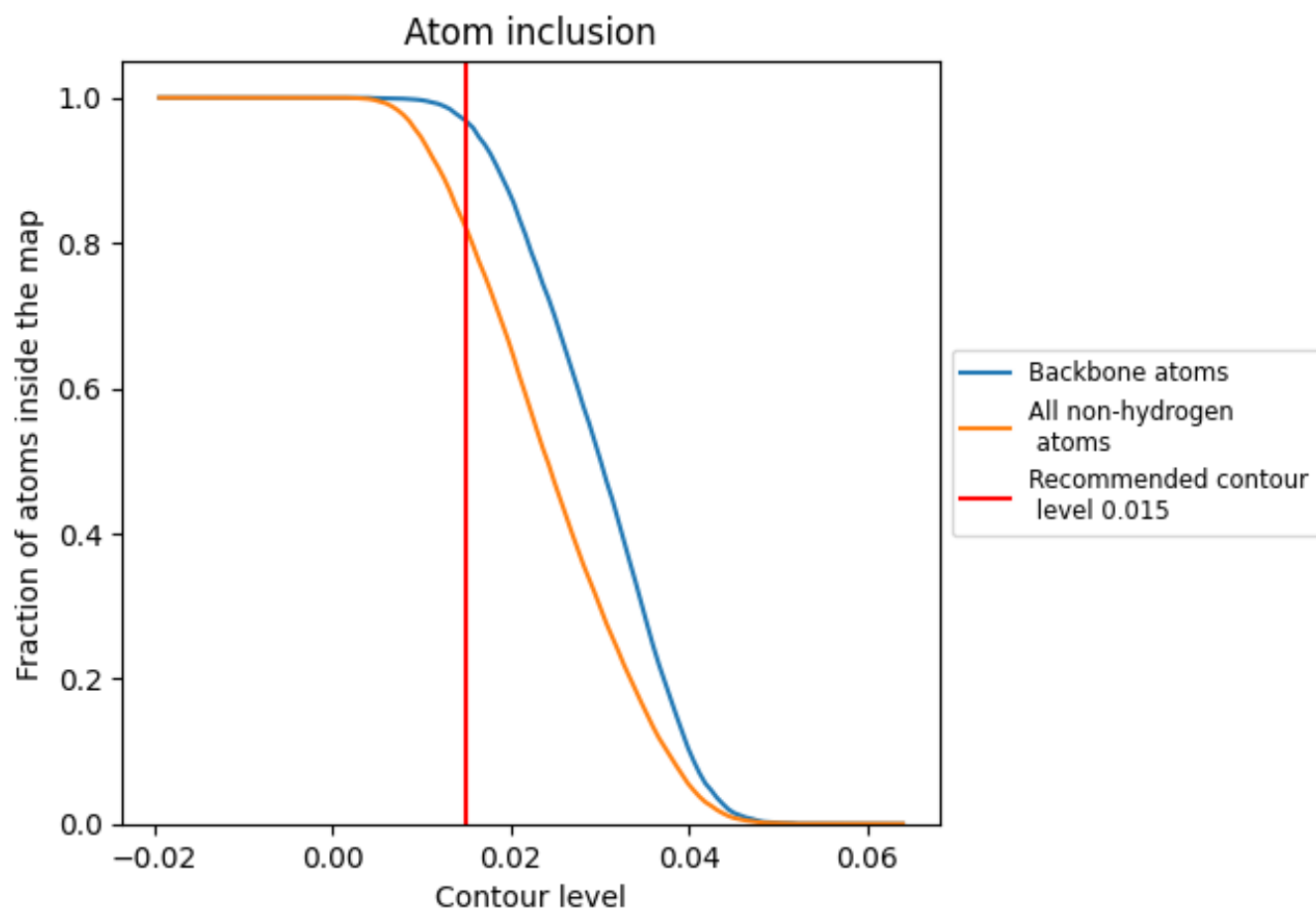
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.015).










9.4 Atom inclusion [i](#)



At the recommended contour level, 97% of all backbone atoms, 82% 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 (0.015) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8191	 0.4500
A	 0.8160	 0.4470
B	 0.8533	 0.4670
C	 0.8131	 0.4800
D	 0.9688	 0.5260

