



wwPDB EM Validation Summary Report ⓘ

Sep 22, 2025 – 02:16 PM EDT

PDB ID : 9ELD / pdb_00009eld
EMDB ID : EMD-48145
Title : Full-length and internally HIS-tagged yeast E3 ubiquitin ligase Tom1p in an open-conformation
Authors : Madrigal, J.M.
Deposited on : 2024-12-04
Resolution : 7.10 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.dev129
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDb archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.46

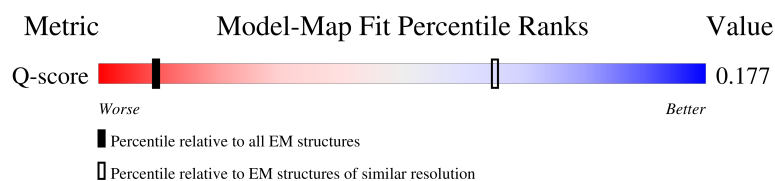
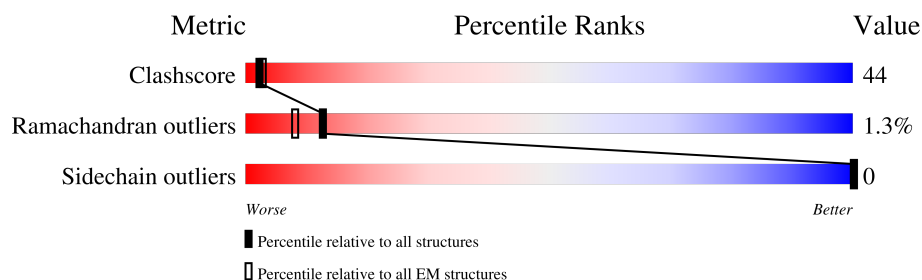
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 7.10 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	464 (6.60 - 7.60)

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	3289	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 43025 atoms, of which 21527 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 E3 ubiquitin-protein ligase TOM1.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	A	2680	43025	13817	21527	3550	4035	96	0	0

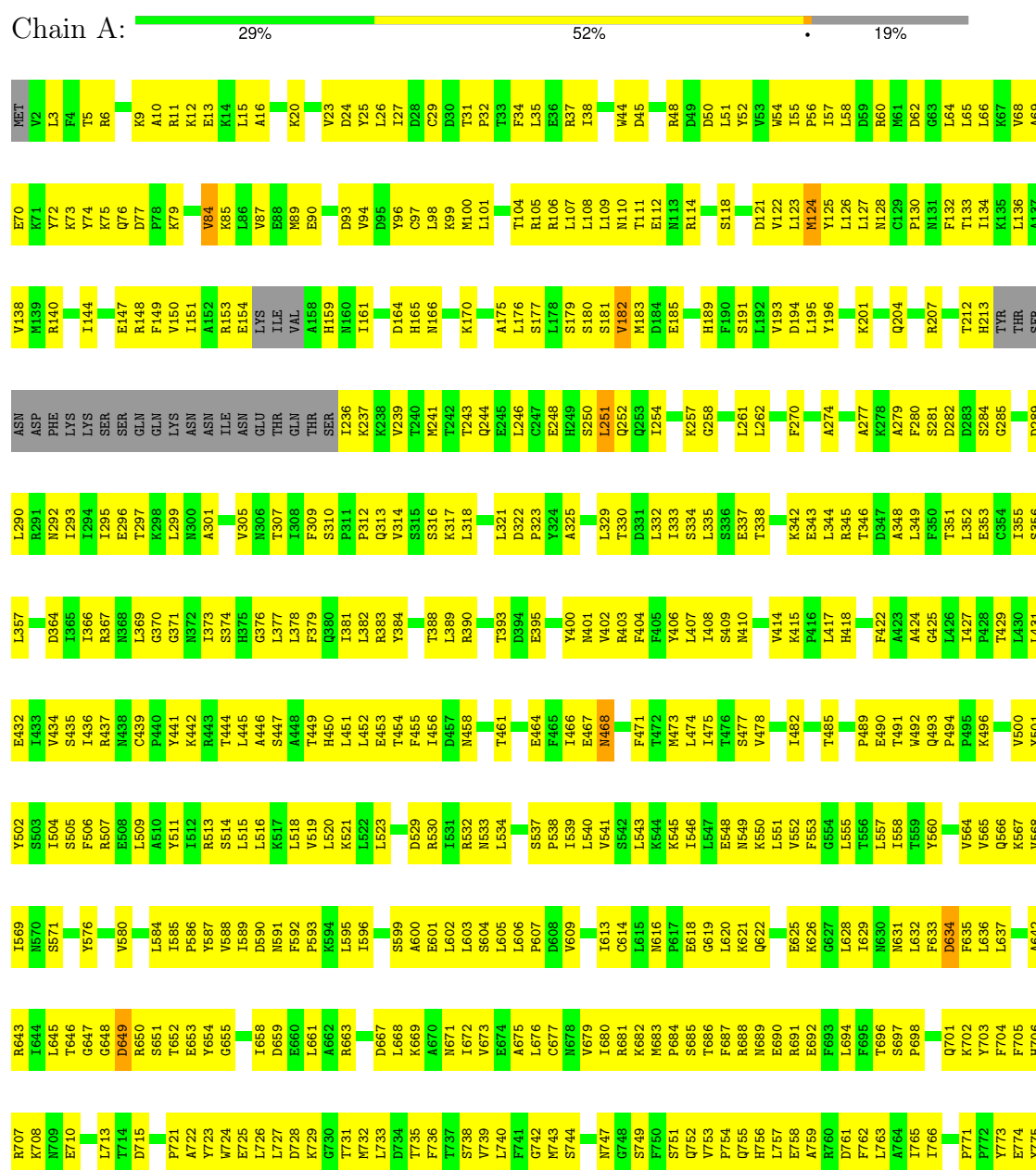
There are 21 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1073B	SER	-	insertion	UNP Q03280
A	1073C	GLY	-	insertion	UNP Q03280
A	1073D	GLY	-	insertion	UNP Q03280
A	1073E	GLY	-	insertion	UNP Q03280
A	1073F	GLY	-	insertion	UNP Q03280
A	1073G	GLY	-	insertion	UNP Q03280
A	1073H	GLY	-	insertion	UNP Q03280
A	1073I	SER	-	insertion	UNP Q03280
A	1073J	ARG	-	insertion	UNP Q03280
A	1073K	HIS	-	insertion	UNP Q03280
A	1073L	HIS	-	insertion	UNP Q03280
A	1073M	HIS	-	insertion	UNP Q03280
A	1073N	HIS	-	insertion	UNP Q03280
A	1073O	HIS	-	insertion	UNP Q03280
A	1073P	HIS	-	insertion	UNP Q03280
A	1073Q	HIS	-	insertion	UNP Q03280
A	1073R	HIS	-	insertion	UNP Q03280
A	1073S	HIS	-	insertion	UNP Q03280
A	1073T	HIS	-	insertion	UNP Q03280
A	1073U	HIS	-	insertion	UNP Q03280
A	1073V	HIS	-	insertion	UNP Q03280

3 Residue-property plots

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: E3 ubiquitin-protein ligase TOM1







P3230	N3156	E3085	I3008	F2929	N2864
S3231	K3157	K3088	I3009	F2930	Q2865
H3232	N3158	D3089	G3010	K2931	N2866
T3233	N3159	I3090	K3011	E2935	I2867
C3234	T3160	I3091	A3012	I2936	R2868
C3235	T3161	I3092	I3013	K2937	S2869
F3236	V3162	T3093	R3014	N2938	N2870
N3237	V3163	N3096	D3015	S2939	N2874
Q3238	N3164	K3097	Q3016	K2940	S2875
L3239	T3165	Y3100	F3017	L2941	G2876
N3240	T3166	V3101	F3018	E2942	P2877
L3241	A3167	V3102	L3019	I2943	F2878
F3242	T3168	K3103	C3021	T2944	A2879
Y3244	E3171	K3104	H3022		L2880
	V3172	F3023	F3023	V2951	L2881
	S3173	V3104	S3024	G2955	V2882
		V3105	R3025	G2956	K2883
L3255	V3176	E3106	E3026		N2884
L3256	R3177	V3107	V3027	E2959	P2885
A3257	A3178	K3108	N3030	W2960	K2886
I3258	V3179	L3109	V3036	V2963	L2887
		Q3110	S3037	L2964	L2888
G3261	D3183	T3111	V3048		F2889
H3262	A3184	S3112	L3044		F2890
E3263	E3185	V3113			D2891
G3264	E3186	Q3116	K3039	M2968	N2892
F3265	R3187	M3117	D3040	F2969	K2893
	A3188	D3118	N3041	N2970	R2894
	K3189	N3119	E3042		Y2895
		F3120	S3043	Y2973	F2896
Q3192	Q3192	L3121	L3044	A2974	F2897
F3193	V3194	V3122	Y3048	F2976	N2898
V3194	T3195	G3123			K2900
G3196	G3196			V2979	L2901
T3197	S3198	L3127	L3052	P2980	K2902
S3198	K3199	I3128		S2981	S2903
V3200	V3200	D3131	I3055	D2982	ASP
		L3132	L3056	K2983	ASN
		I3133	E3057	T2984	GLN
N3203	N3203	T3134	N3058	T2985	E2907
G3204	G3204	F3135	D3059	F2986	
F3205	F3205	F3136	I3060	H2987	L2911
K3206	K3206	D3137		P2988	F2912
E3207	E3207	E3138	T3067	N2989	T2913
L3208	L3208	Q3139	F3068	R2990	T2914
S3209	S3209	E3140	S3069	T2991	V2915
G3210	G3210	L3141	V3070	S2992	R2916
V3211	V3211	E3142	E3071	G2993	R2917
N3212	N3212	L3143	T3072	I2994	E2918
G3213	G3213	L3144	D3073	N2995	Q2919
V3214	V3214	I3145	D3074		V2920
C3215	C3215	S3146		L2999	F2921
K3216	K3216	D3152	E3077		L2922
F3217	F3217	V3153	H3078	F3002	D2923
S3218	S3218	D3154	K3079		S2924
I3219	I3219	D3155	V3080	I3005	A2927
H3220	H3220		I3084	G3006	L2928
				M3007	

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	16098	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	47	Depositor
Minimum defocus (nm)	-800	Depositor
Maximum defocus (nm)	-2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.656	Depositor
Minimum map value	-0.166	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.025	Depositor
Recommended contour level	0.1	Depositor
Map size ($\text{\AA}$)	387.2, 387.2, 387.2	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.5125, 1.5125, 1.5125	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.21	0/21920	0.43	6/29669 (0.0%)

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	1

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	468	ASN	CA-C-N	9.15	141.11	124.82
1	A	468	ASN	C-N-CA	9.15	141.11	124.82
1	A	1321	THR	OG1-CB-CG2	5.63	120.56	109.30
1	A	3128	ILE	CG1-CB-CG2	5.35	126.75	110.70
1	A	2943	ILE	CG1-CB-CG2	5.29	126.58	110.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	124	MET	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	21498	21527	21652	1912	0
All	All	21498	21527	21652	1912	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 44.

The worst 5 of 1912 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:1589:LEU:HD12	1:A:1592:LYS:HD2	1.41	0.98
1:A:74:TYR:OH	1:A:87:VAL:O	1.82	0.98
1:A:970:ARG:NE	1:A:1030:THR:O	1.98	0.96
1:A:2710:LEU:HD22	1:A:2785:VAL:HG11	1.44	0.95
1:A:1403:GLU:OE2	1:A:2239:TYR:OH	1.85	0.94

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	2660/3289 (81%)	2092 (79%)	533 (20%)	35 (1%)	10	43

5 of 35 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	84	VAL
1	A	182	VAL
1	A	634	ASP
1	A	799	ALA
1	A	1035	SER

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	2416/3002 (80%)	2416 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2475	GLN
1	A	2680	ASN
1	A	3212	ASN
1	A	2555	GLN
1	A	2795	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

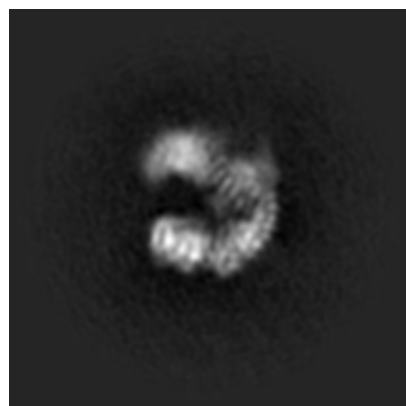
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-48145. These allow visual inspection of the internal detail of the map and identification of artifacts.

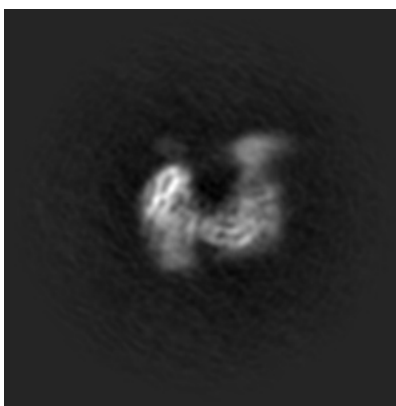
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

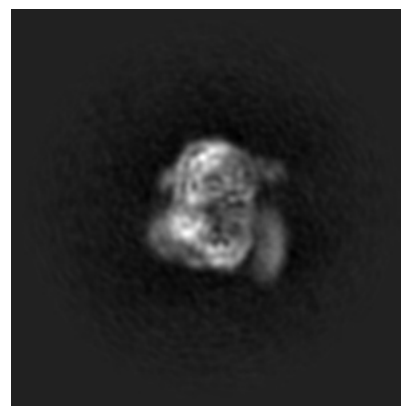
6.1.1 Primary map



X

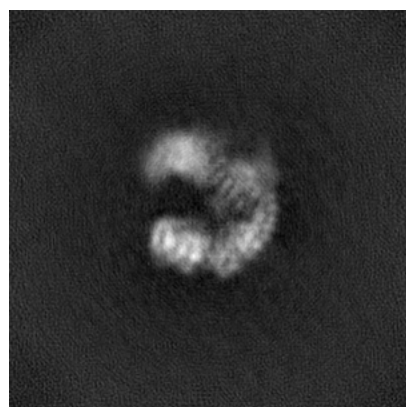


Y

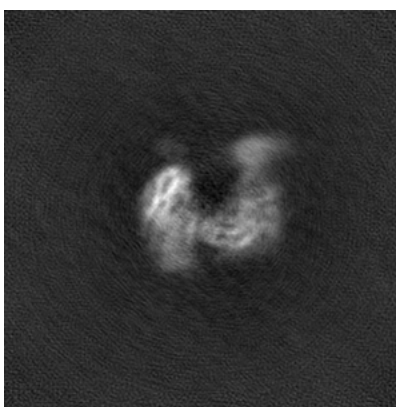


Z

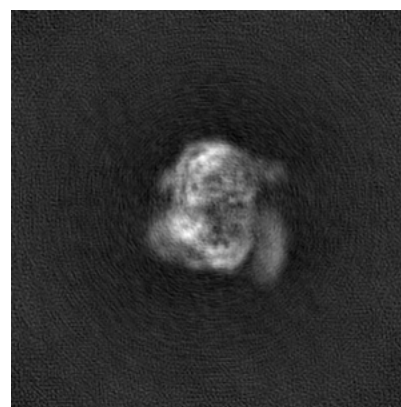
6.1.2 Raw map



X



Y

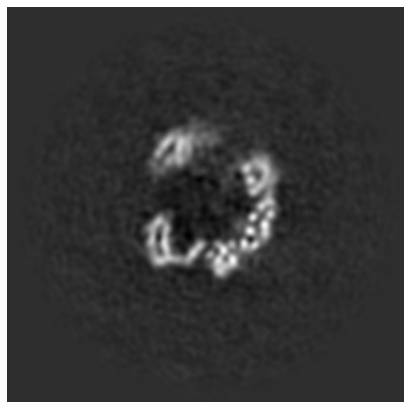


Z

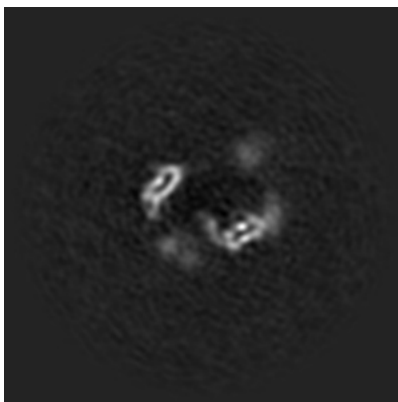
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

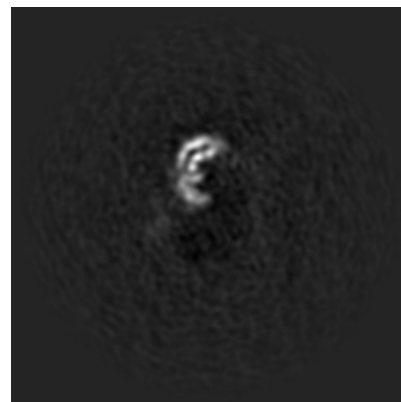
6.2.1 Primary map



X Index: 128

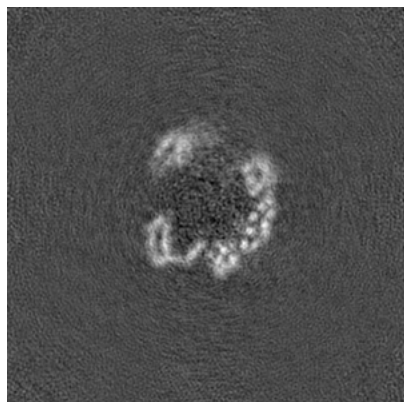


Y Index: 128

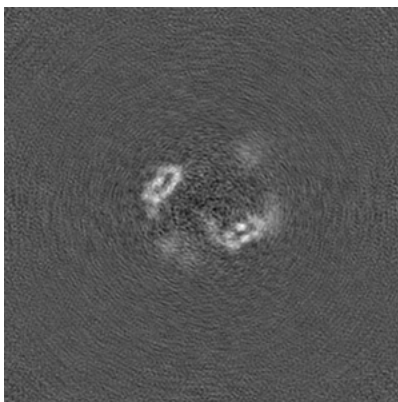


Z Index: 128

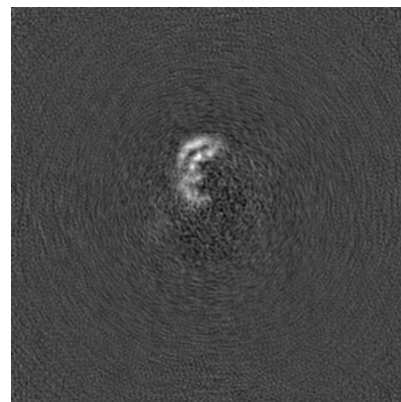
6.2.2 Raw map



X Index: 128



Y Index: 128

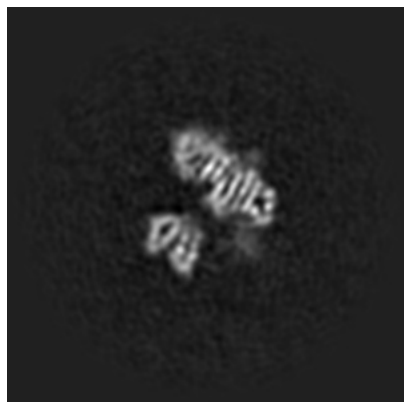


Z Index: 128

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

6.3 Largest variance slices [i](#)

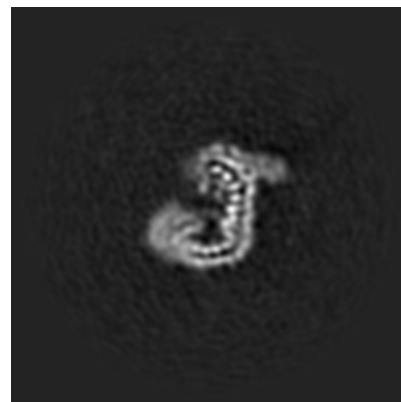
6.3.1 Primary map



X Index: 115

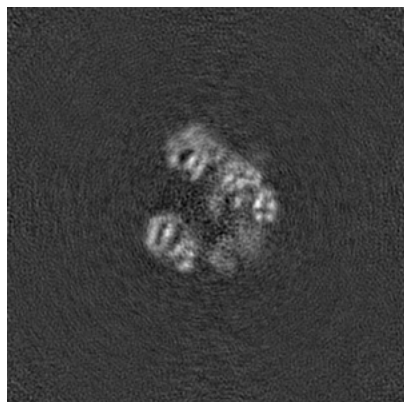


Y Index: 112

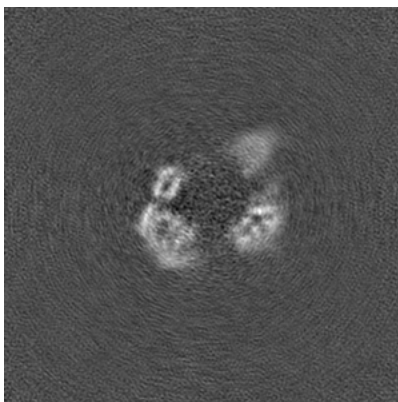


Z Index: 107

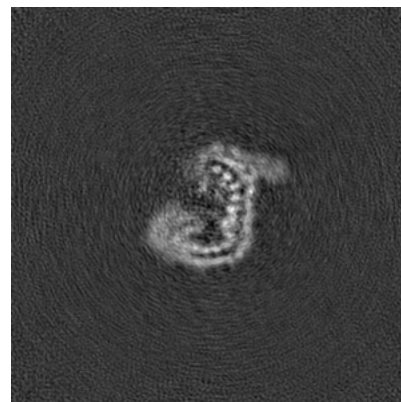
6.3.2 Raw map



X Index: 120



Y Index: 115



Z Index: 107

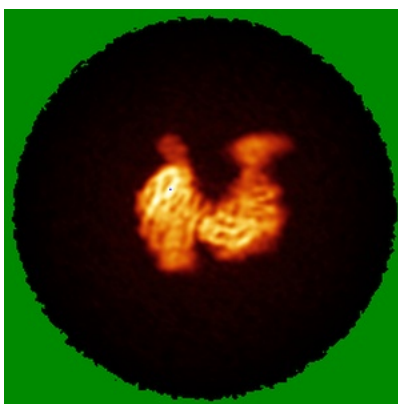
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

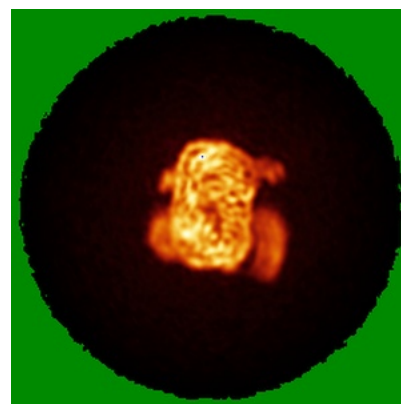
6.4.1 Primary map



X

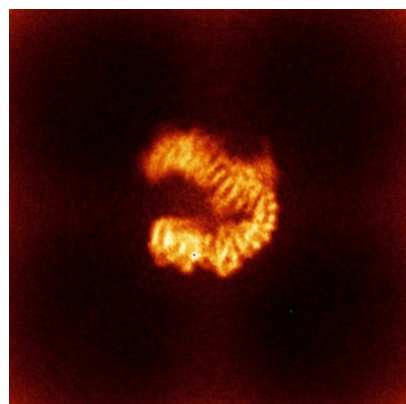


Y



Z

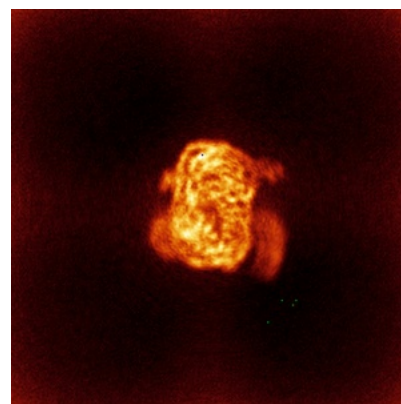
6.4.2 Raw map



X



Y

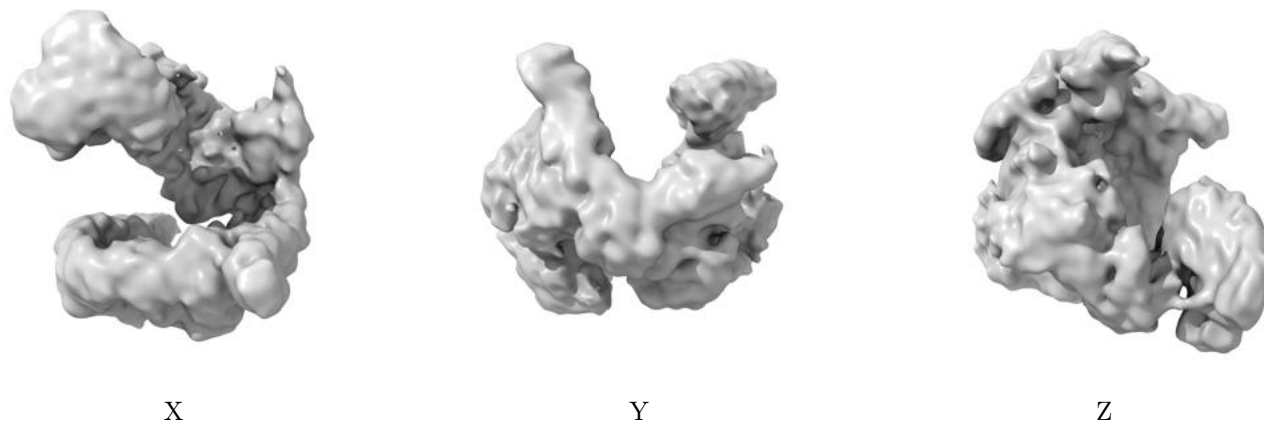


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

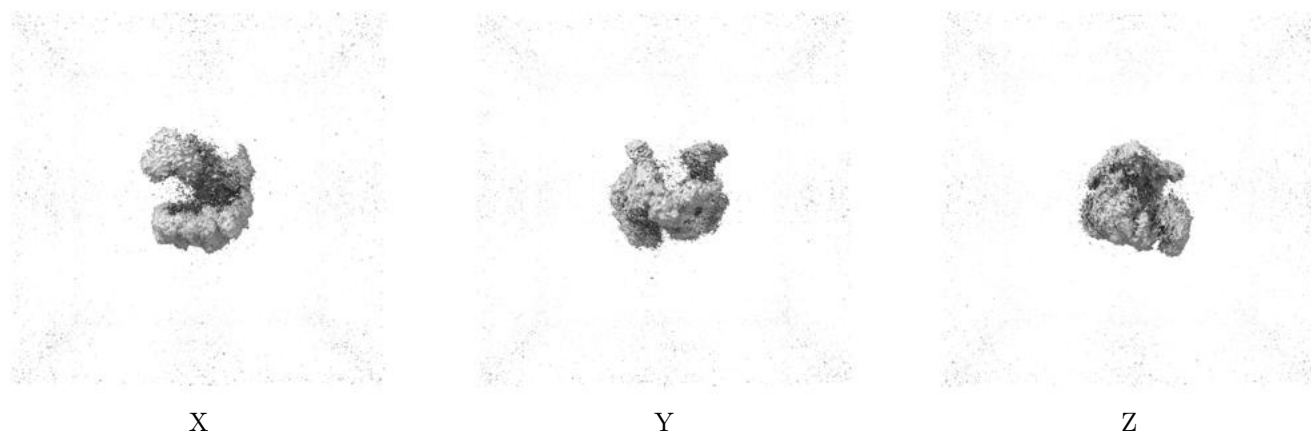
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.1. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 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.

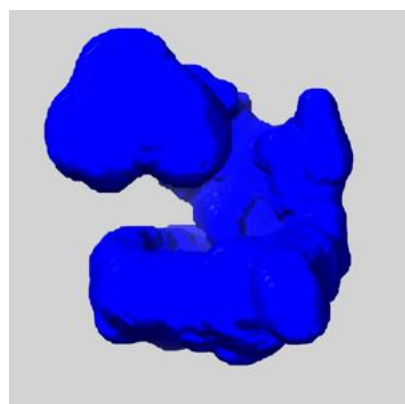
6.6 Mask visualisation [i](#)

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

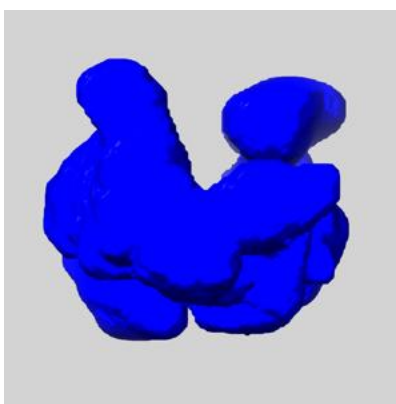
A mask typically either:

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

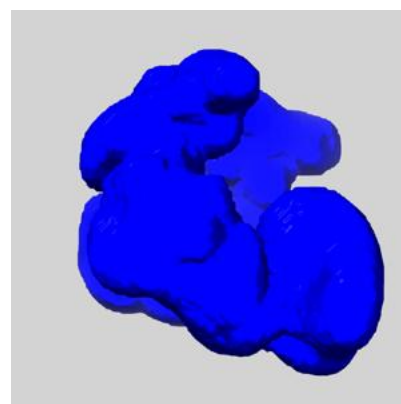
6.6.1 emd_48145_msk_1.map [i](#)



X



Y

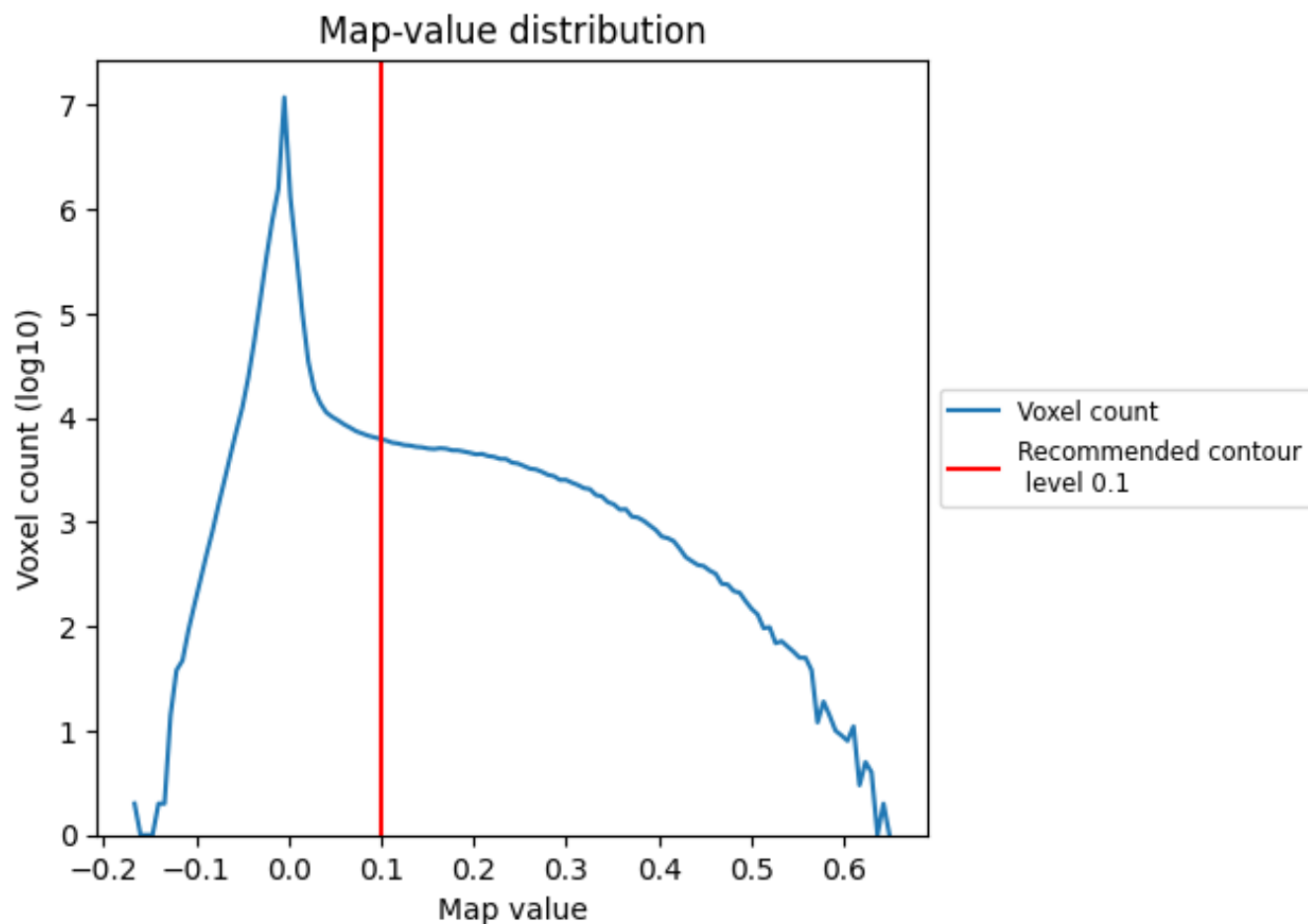


Z

7 Map analysis [i](#)

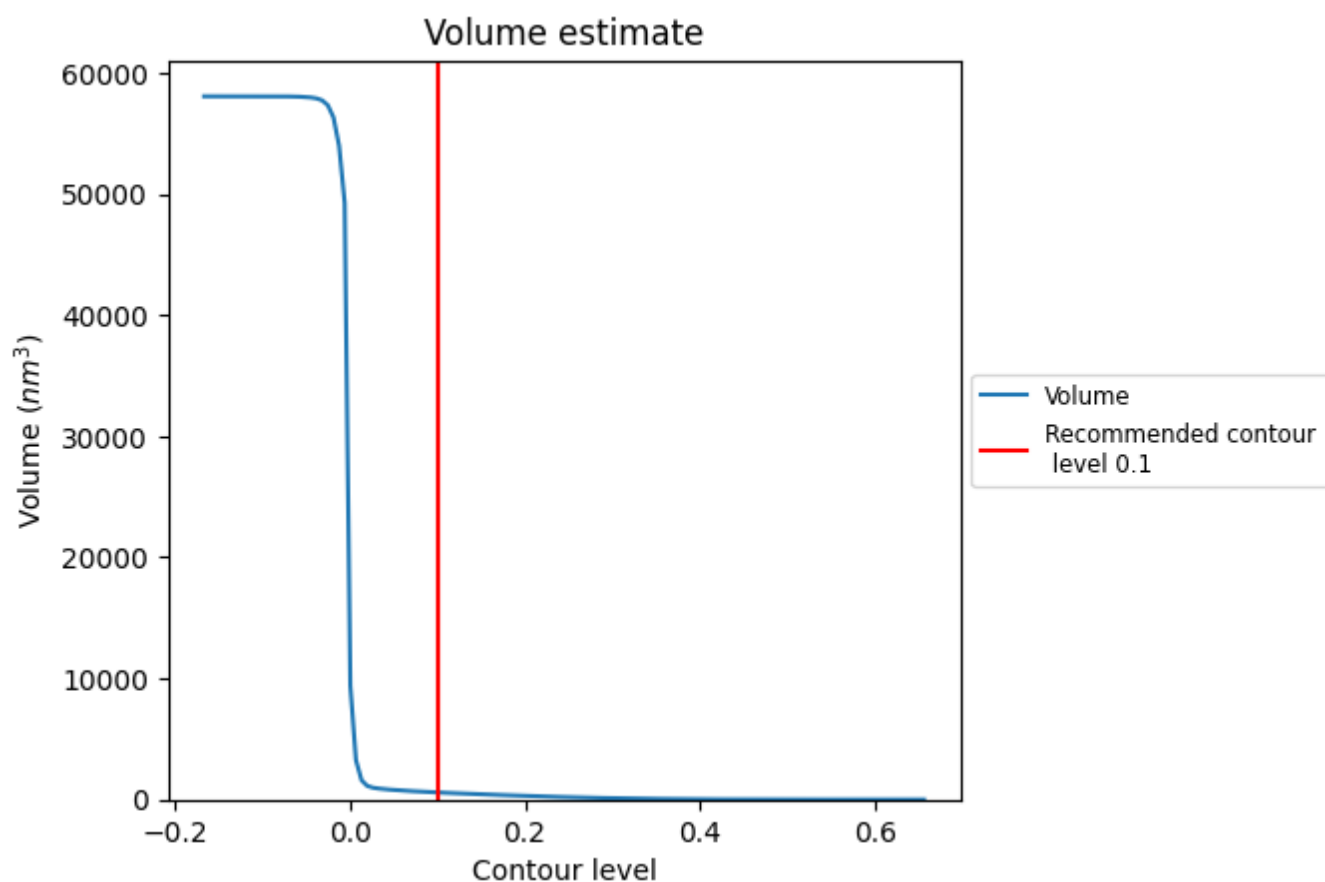
This section contains the results of statistical analysis of the map.

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.

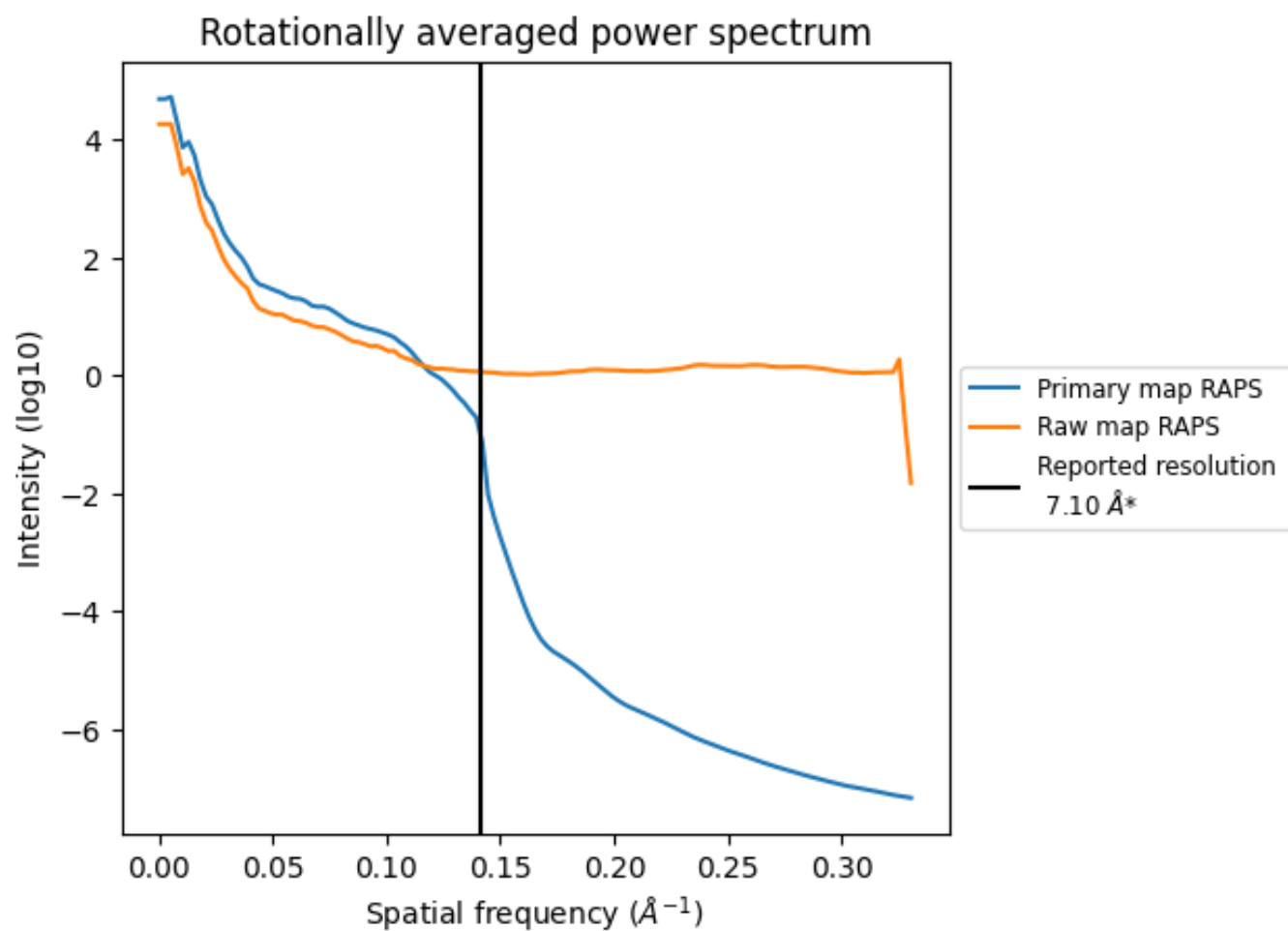
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 588 nm^3 ; this corresponds to an approximate mass of 531 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 ⓘ

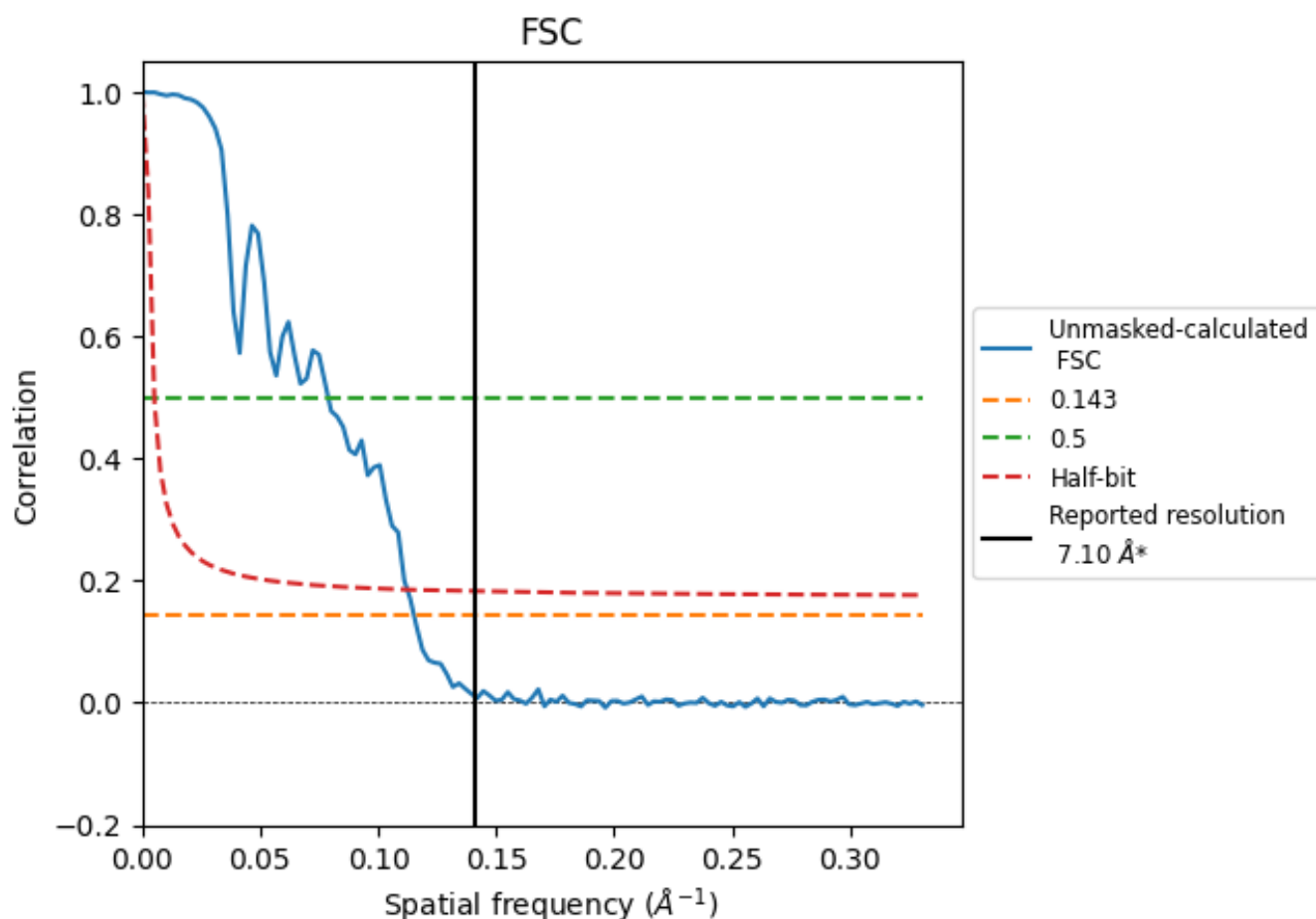


*Reported resolution corresponds to spatial frequency of 0.141 Å⁻¹

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 0.141 Å⁻¹

8.2 Resolution estimates [i](#)

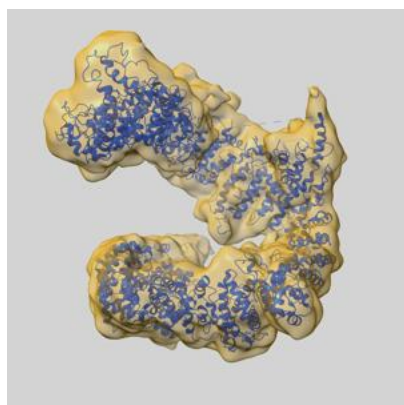
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	7.10	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	8.68	12.69	8.90

*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 8.68 differs from the reported value 7.1 by more than 10 %

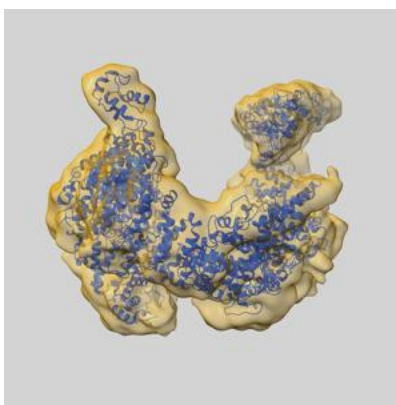
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-48145 and PDB model 9ELD. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

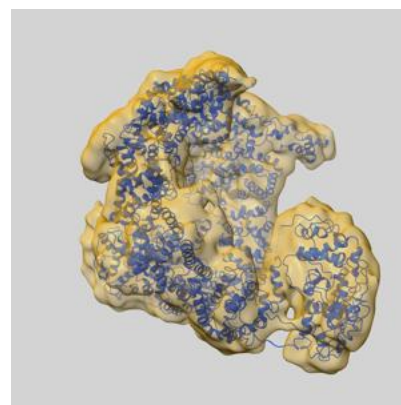
9.1 Map-model overlay [i](#)



X



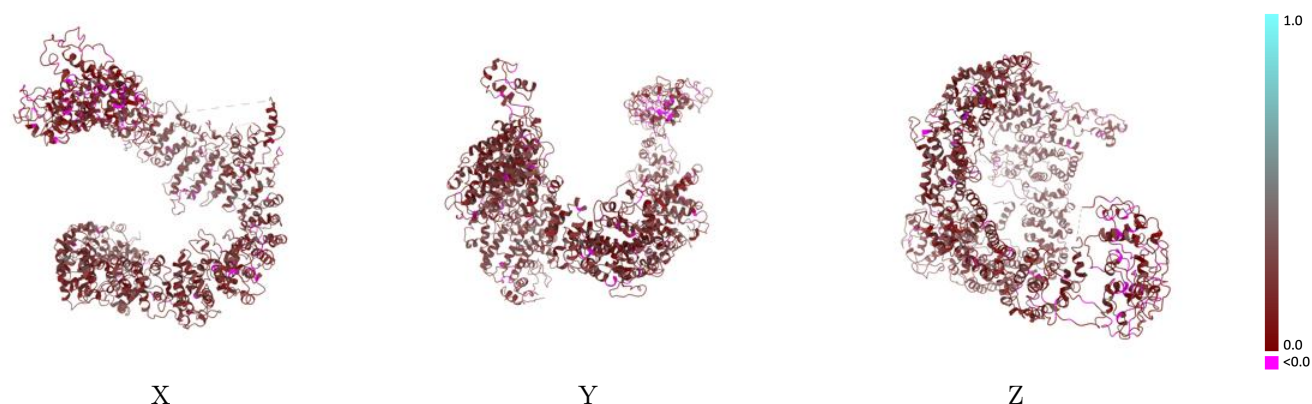
Y



Z

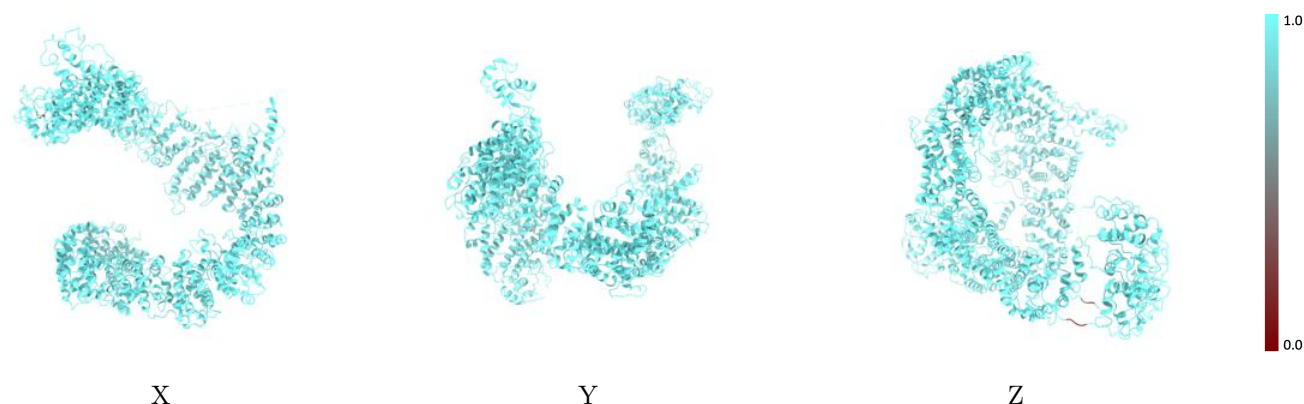
The images above show the 3D surface view of the map at the recommended contour level 0.1 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



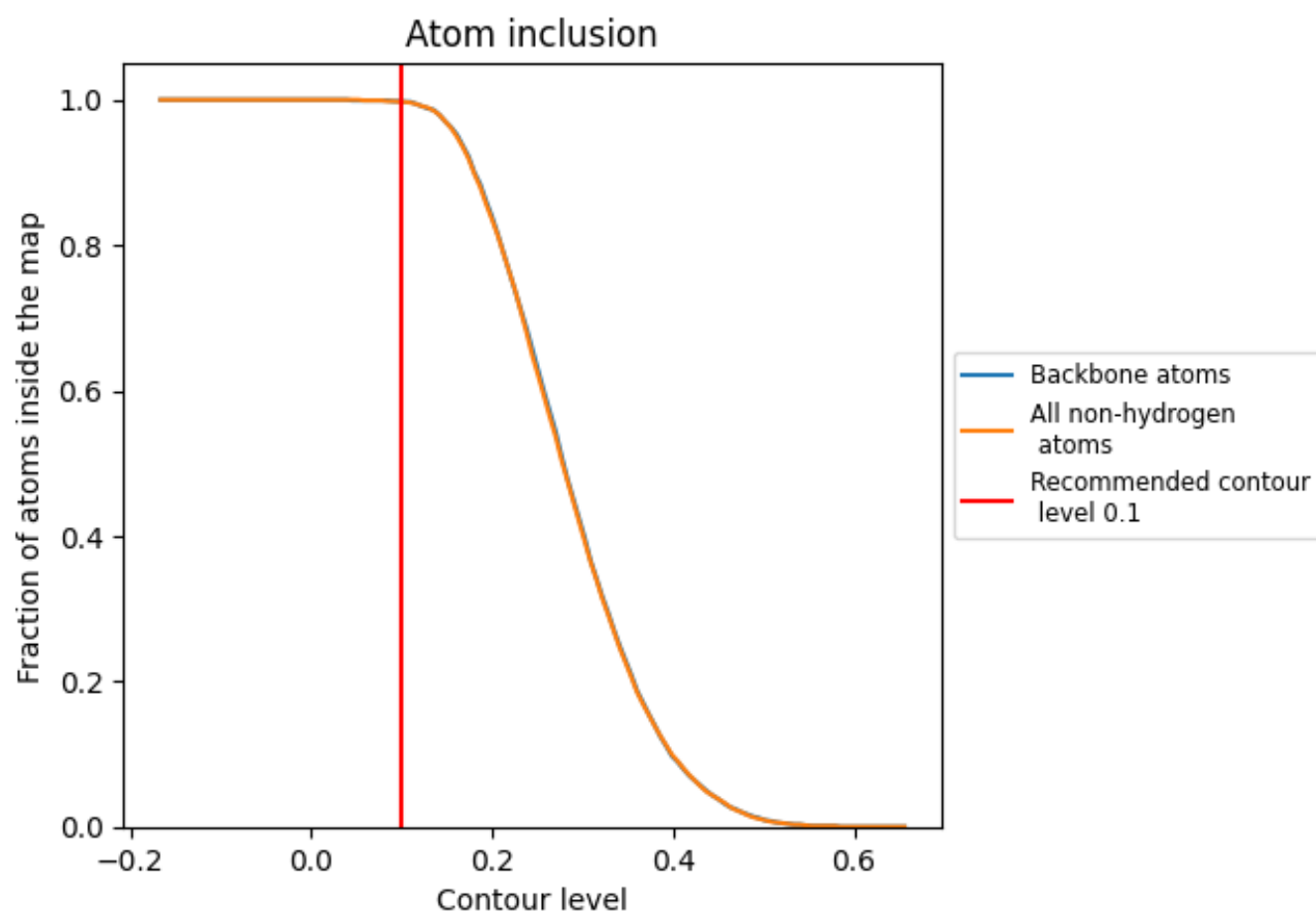
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.1).

9.4 Atom inclusion [i](#)



At the recommended contour level, 100% of all backbone atoms, 100% 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 (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9970	0.1770
A	0.9980	0.1770

