



wwPDB EM Validation Summary Report ⓘ

May 28, 2026 – 04:26 PM EDT

PDB ID : 10BE / pdb_000010be
EMDB ID : EMD-75039
Title : Human AGO2 bound to a miR-20a guide and a position 10-11 mismatched target
Authors : Savidge, A.; Nakanishi, K.
Deposited on : 2026-01-09
Resolution : 3.02 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.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
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) : 2.49

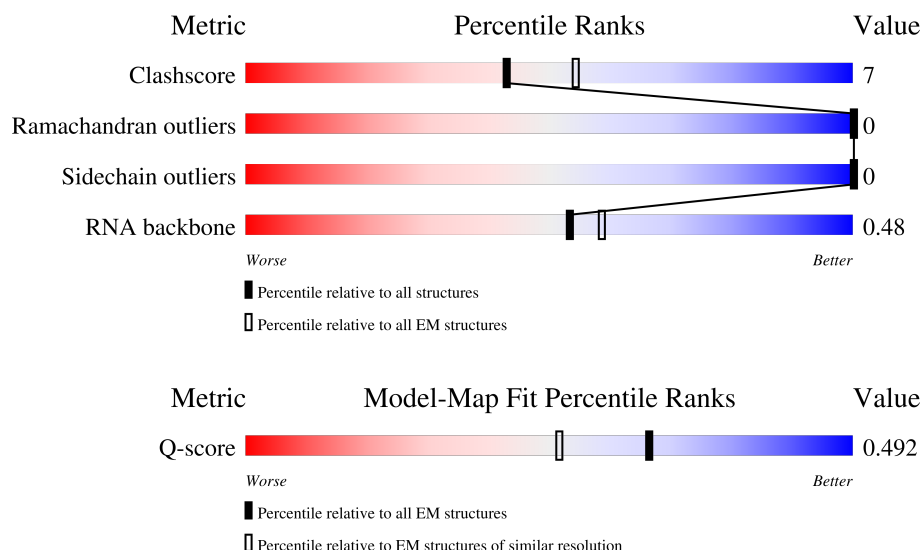
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.02 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	13913 (2.52 - 3.52)

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	B	23	
2	C	18	
3	A	873	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6757 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 RNA chain called Guide RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	10	Total	C	N	O	P	0	0
			213	95	36	72	10		

- Molecule 2 is a RNA chain called Target RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	9	Total	C	N	O	P	0	0
			189	85	32	63	9		

- Molecule 3 is a protein called Protein argonaute-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	A	792	Total	C	N	O	S	0	0
			6355	4050	1146	1119	40		

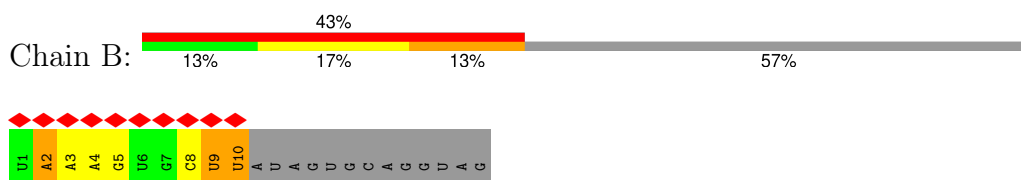
There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-13	GLY	-	expression tag	UNP Q9UKV8
A	-12	ALA	-	expression tag	UNP Q9UKV8
A	-11	MET	-	expression tag	UNP Q9UKV8
A	-10	GLY	-	expression tag	UNP Q9UKV8
A	-9	SER	-	expression tag	UNP Q9UKV8
A	-8	MET	-	expression tag	UNP Q9UKV8
A	-7	ASP	-	expression tag	UNP Q9UKV8
A	-6	TYR	-	expression tag	UNP Q9UKV8
A	-5	LYS	-	expression tag	UNP Q9UKV8
A	-4	ASP	-	expression tag	UNP Q9UKV8
A	-3	ASP	-	expression tag	UNP Q9UKV8
A	-2	ASP	-	expression tag	UNP Q9UKV8
A	-1	ASP	-	expression tag	UNP Q9UKV8
A	0	LYS	-	expression tag	UNP Q9UKV8

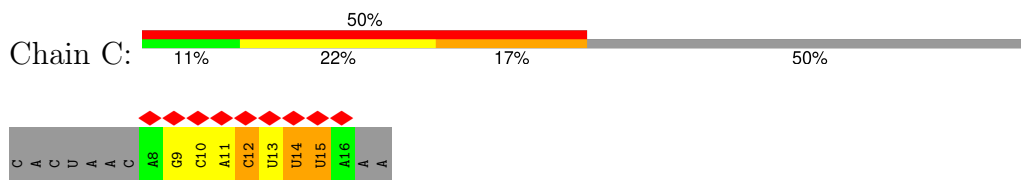
3 Residue-property plots

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.

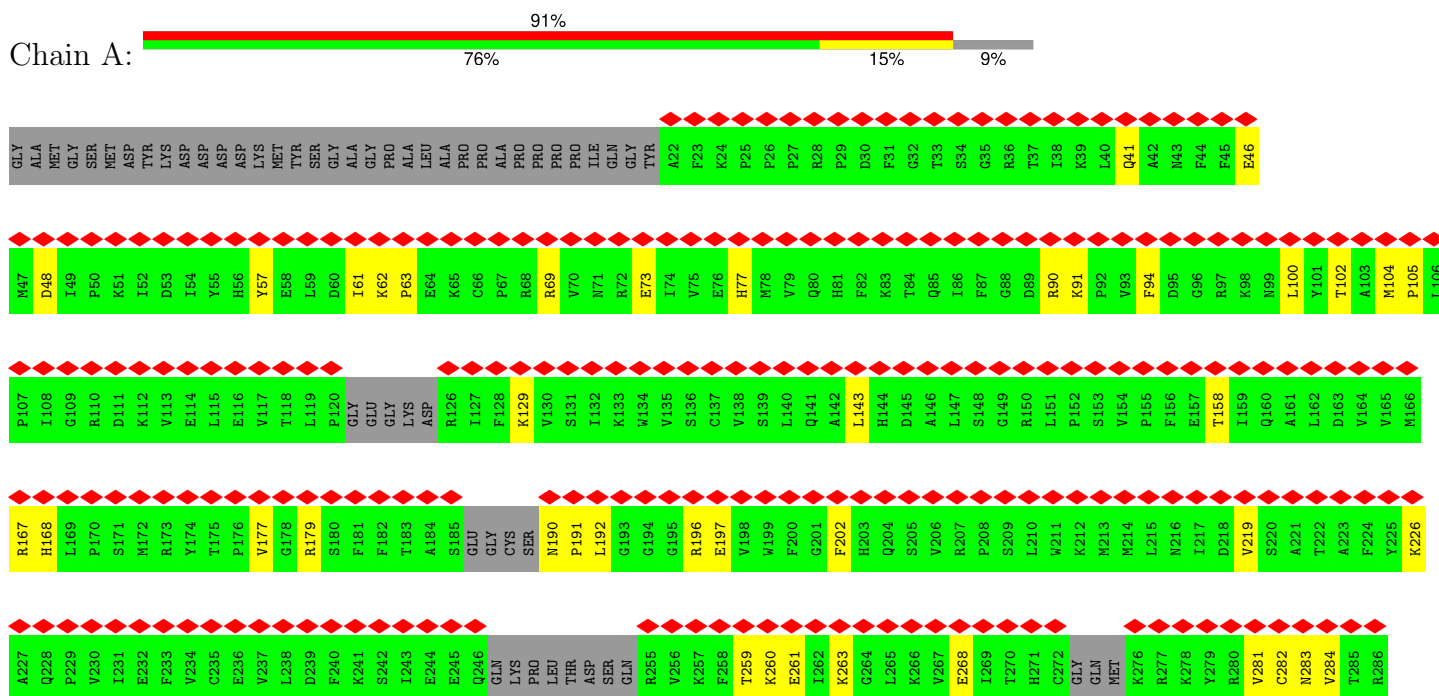
• Molecule 1: Guide RNA



• Molecule 2: Target RNA



• Molecule 3: Protein argonaute-2



GLY	R287	V947	D407	L467	P527	F587	R647	V707	V767	GLY
SER	P288	A948	V408	K468	V528	Q588	E648	Q708	L768	SER
THR	A289	G949	T409	S469	Y529	Q589	L649	K709	W769	HIS
GLY	S290	Q950	G410	F470	A530	P590	L650	R710	D770	THR
GLN	H291	R951	R411	E471	E531	V591	I651	H711	D771	SER
SER	Q292	C952	V412	E472	V532	I592	Q652	H712	N772	GLN
ASN	T293	L953	L413	Q473	K533	F593	F653	T713	K773	ASN
GLY	F294	K954	Q414	L474	R534	L594	V654	R714	F774	GLY
ARG	P295	L955	P415	R475	V535	G595	K655	L715	S775	ARG
	LEU	K956	P416	R476	G536	A596	S656	F716	S776	D838
	GLN	T957	S417	I477	D537	D597	T657	C717	D777	H839
	GLN	D958	I418	S478	T538	V598	R658	T718	E778	Q840
	GLU	N959	L419	R479	V539	T599	F659	D719	L779	A841
	SER	Q960	Y420	D480	L540	H600	K660	K720	Q780	L842
	GLY	T961	G421	A481	G541	P601	P661	N721	I781	A843
	GLN	S962	G422	A482	M542	P602	T662	E722	L782	X844
		T963	R423	M483	A543	A603	R663	R723	T783	A845
		M964	N424	P484	T544	G604	L664	V724	Y784	Y846
		I965	K425	I485	Q545	D605	I665	G725	Q785	Q847
		R966	A426	Q486	C546	G606	F666	K726	L786	Y848
		T967	I427	V547	V547	K607	Y667	S727	C787	H849
		A968	A428	Q488	Q548	K608	R668	G728	H788	Q850
		A969	T429	P489	M549	P609	D669	N729	T789	D851
		R970	P430	C490	K550	S610	G670	I730	Y790	T852
		S971	V431	F491	N551	I611	V671	P731	V791	L853
		A972	Q432	C492	V552	A612	S672	A732	R792	R854
		P973	G433	K493	Q553	A613	E673	G733	C793	T855
		D974	V434	Y494	R554	V614	G674	T734	T794	Y856
		R975	W435	A495	T555	V615	Q675	T735	R795	Y857
		Q976	D436	Q496	T556	G616	F676	V736	S796	F858
		E977	M437	Q497	P557	S617	Q677	D737	V797	A859
		E978	R438	A498	Q558	M618	Q678	T738	S798	
		I979	D499	D499	T559	D619	V679	K739	I799	
		S980	K440	S500	L560	A620	L680	I740	P800	
		K981	Q441	V501	S561	H621	H681	T741	A801	
		L982	F442	E502	N562	P622	H682	H742	P802	
		M983	H443	P503	L563	N623	E683	P743	A803	
		T984	T444	M504	C564	R624	L684	T744	E804	
		S985	G445	F505	L565	Y625	L685	E745	Y805	
		A986	I446	R506	K566	Q626	A686	F746	A806	
		S987	E447	H507	I567	A627	I687	D747	H807	
		F988	I448	L508	N568	T628	R688	F748	L808	
		N989	K449	K509	V569	V629	E689	Y749	V809	
		T990	V450	N510	K570	R630	A690	L750	A810	
		D991	W451	T511	L571	V631	C691	C751	F811	
		P992	A452	Y512	G572	Q632	L692	S752	R812	
		Y993	I453	A513	G573	Q633	K693	H753	A813	
		V994	A454	G514	V574	H634	L694	A754	R814	
		R995	C455	L515	N575	R635	E695	G755	Y815	
		F996	F456	Q516	N576	Q636	K696	I756	H816	
		F997	A457	L517	I577	E637	D697	Q757	L817	
		G998	P458	V518	L578	I638	Y698	G758	V818	
		I999	Q459	V519	L579	T639	Q699	T759	D819	
		M400	R460	V520	P580	Q640	P700	S760	GLU	
		V401	Q461	I521	Q581	D641	G701	R761	HIS	
		K402	C462	L522	G582	L642	T702	P762	ASP	
		D403	T463	F523	R583	A643	T703	S763	SER	
		E404	E464	G524	P584	A644	F704	H764	ALA	
		M405	V465	K525	P585	M645	I705	Y765	GLU	
		T406	H466	T526	V586	V646	V706	H766		

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	200460	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.166	Depositor
Minimum map value	-0.109	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.15	Depositor
Map size (Å)	178.0224, 178.0224, 178.0224	wwPDB
Map dimensions	488, 488, 488	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.3648, 0.3648, 0.3648	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	B	0.10	0/237	0.27	0/365
2	C	0.11	0/210	0.29	0/324
3	A	0.10	0/6504	0.24	0/8799
All	All	0.10	0/6951	0.24	0/9488

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	B	213	0	107	6	0
2	C	189	0	97	6	0
3	A	6355	0	6423	80	0
All	All	6757	0	6627	88	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 7.

The worst 5 of 88 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)
3:A:90:ARG:HH12	3:A:104:MET:HB2	1.53	0.74

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:259:THR:HG22	3:A:284:VAL:HB	1.70	0.73
3:A:192:LEU:HD21	3:A:360:GLN:HG3	1.74	0.70
3:A:742:HIS:CD2	3:A:743:PRO:HD2	2.31	0.65
3:A:636:GLN:HG2	3:A:638:ILE:HG22	1.78	0.65

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	
3	A	776/873 (89%)	756 (97%)	20 (3%)	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	
3	A	701/763 (92%)	701 (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 13 such sidechains are listed below:

Mol	Chain	Res	Type
3	A	589	GLN
3	A	636	GLN
3	A	847	GLN
3	A	788	HIS
3	A	839	HIS

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	B	9/23 (39%)	2 (22%)	1 (11%)
2	C	8/18 (44%)	3 (37%)	0
All	All	17/41 (41%)	5 (29%)	1 (5%)

All (5) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	B	2	A
1	B	10	U
2	C	12	C
2	C	14	U
2	C	15	U

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	B	9	U

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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.

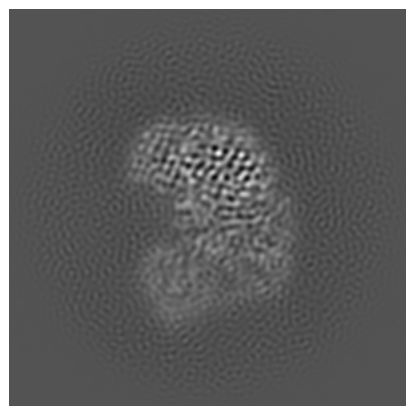
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-75039. These allow visual inspection of the internal detail of the map and identification of artifacts.

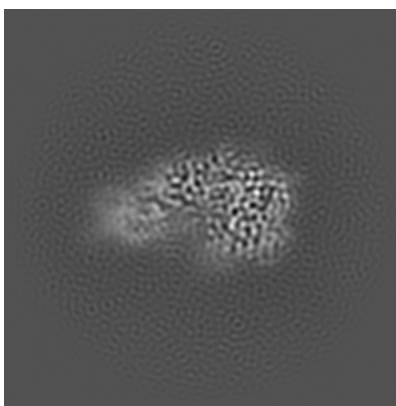
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

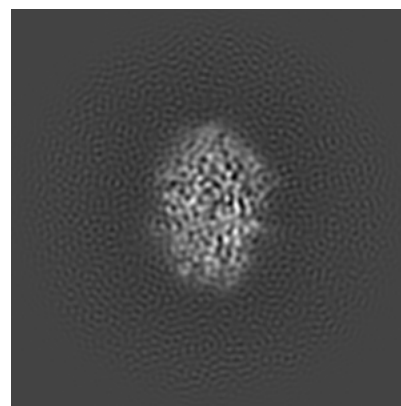
6.1.1 Primary map



X

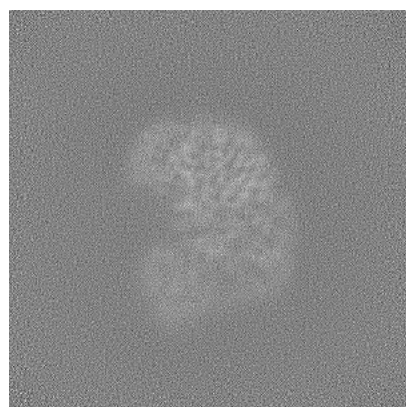


Y

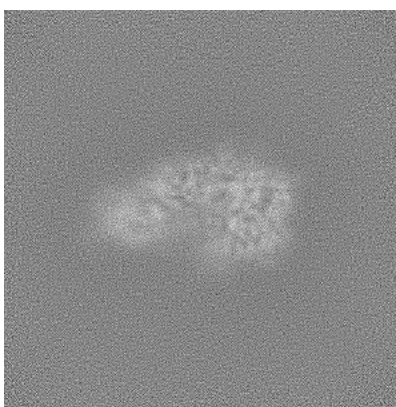


Z

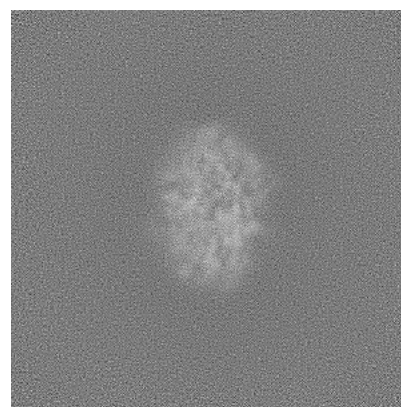
6.1.2 Raw map



X



Y

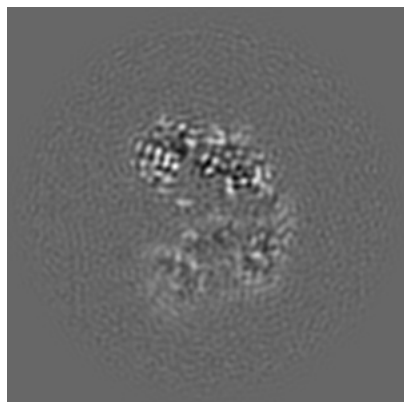


Z

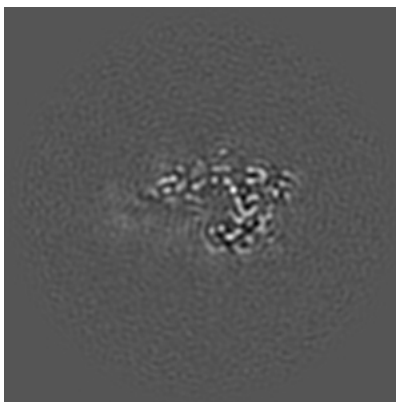
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

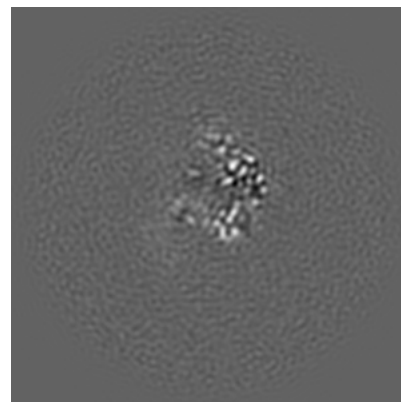
6.2.1 Primary map



X Index: 244

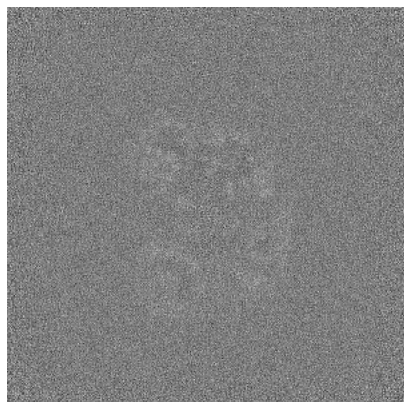


Y Index: 244

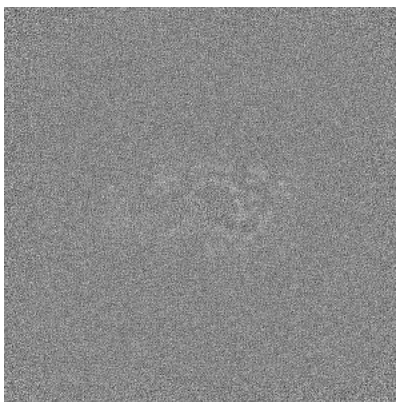


Z Index: 244

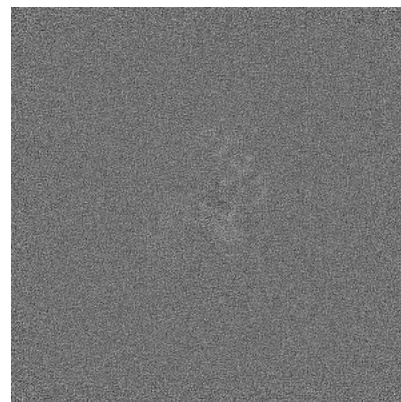
6.2.2 Raw map



X Index: 244



Y Index: 244

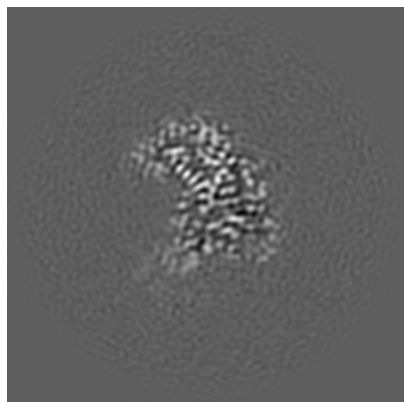


Z Index: 244

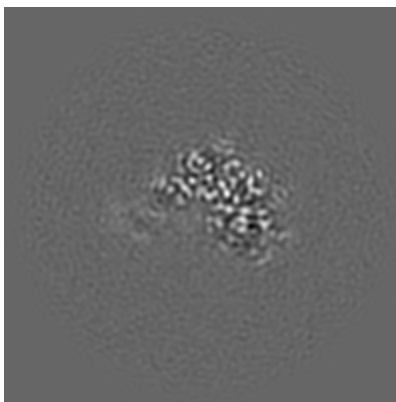
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

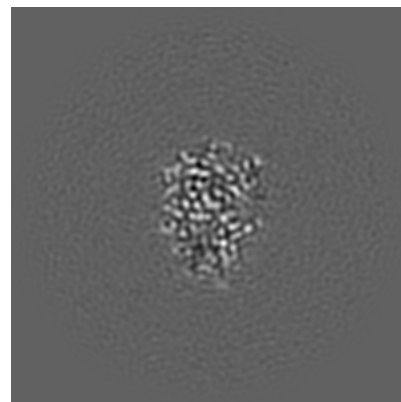
6.3.1 Primary map



X Index: 274

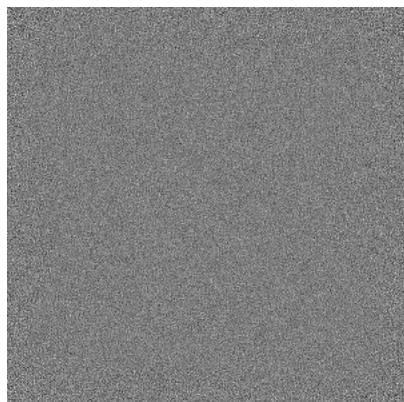


Y Index: 273

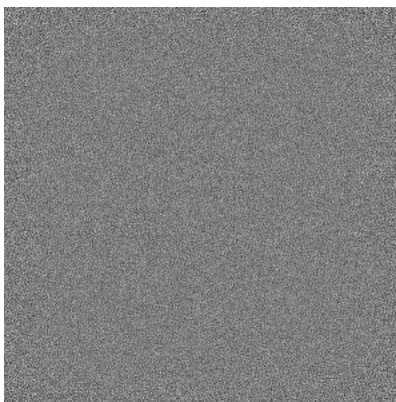


Z Index: 287

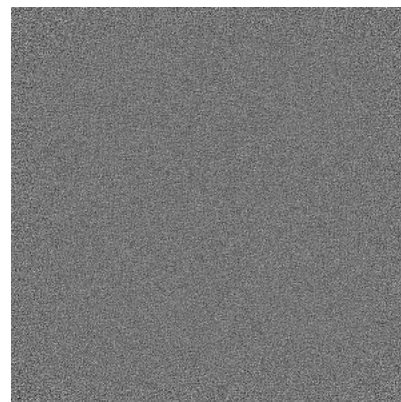
6.3.2 Raw map



X Index: 0



Y Index: 0

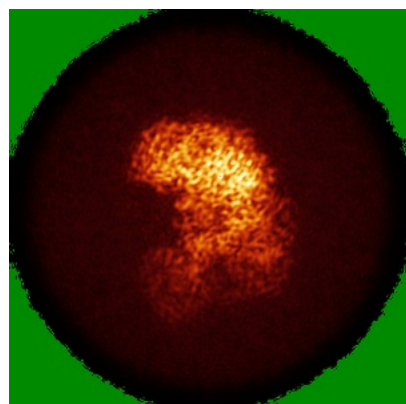


Z Index: 0

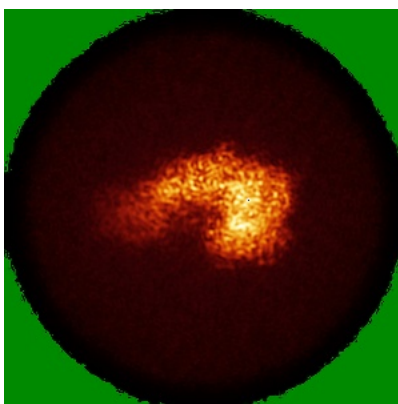
The images above show the largest variance slices of the map in three orthogonal directions.

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

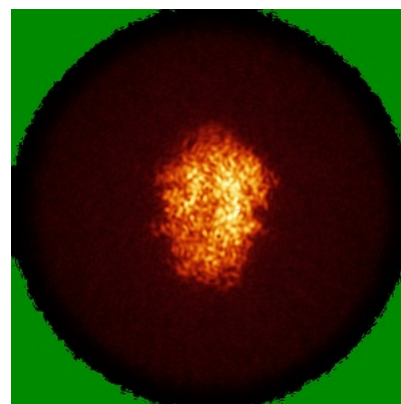
6.4.1 Primary map



X

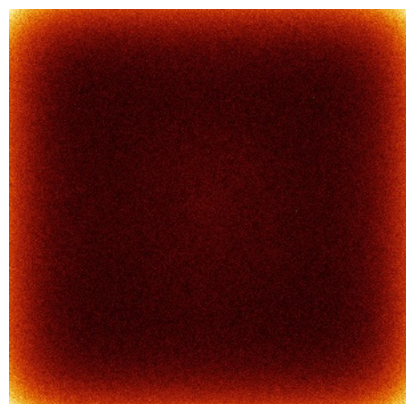


Y

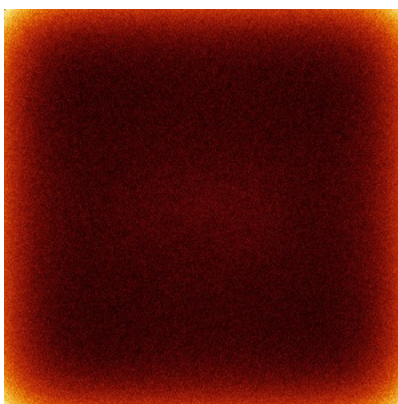


Z

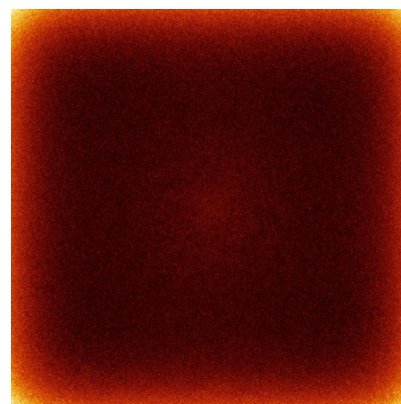
6.4.2 Raw map



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 0.15. 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

X Y Z

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.

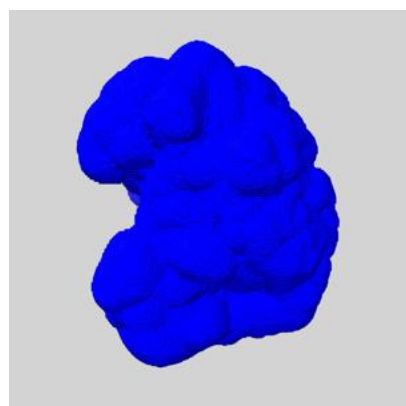
6.6 Mask visualisation [i](#)

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

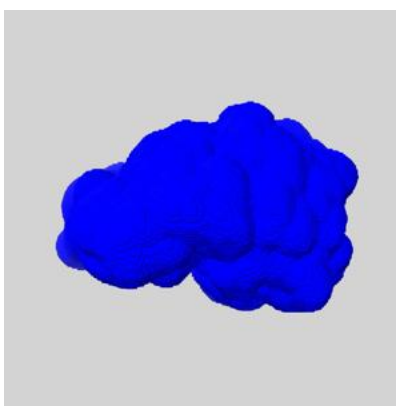
A mask typically either:

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

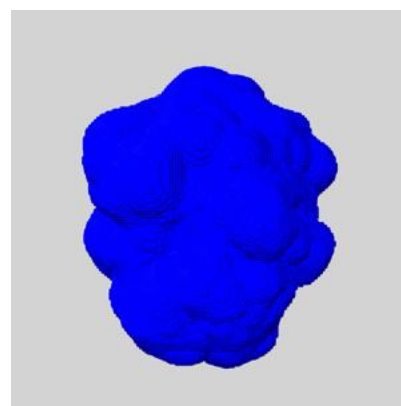
6.6.1 emd_75039_msk_1.map [i](#)



X



Y

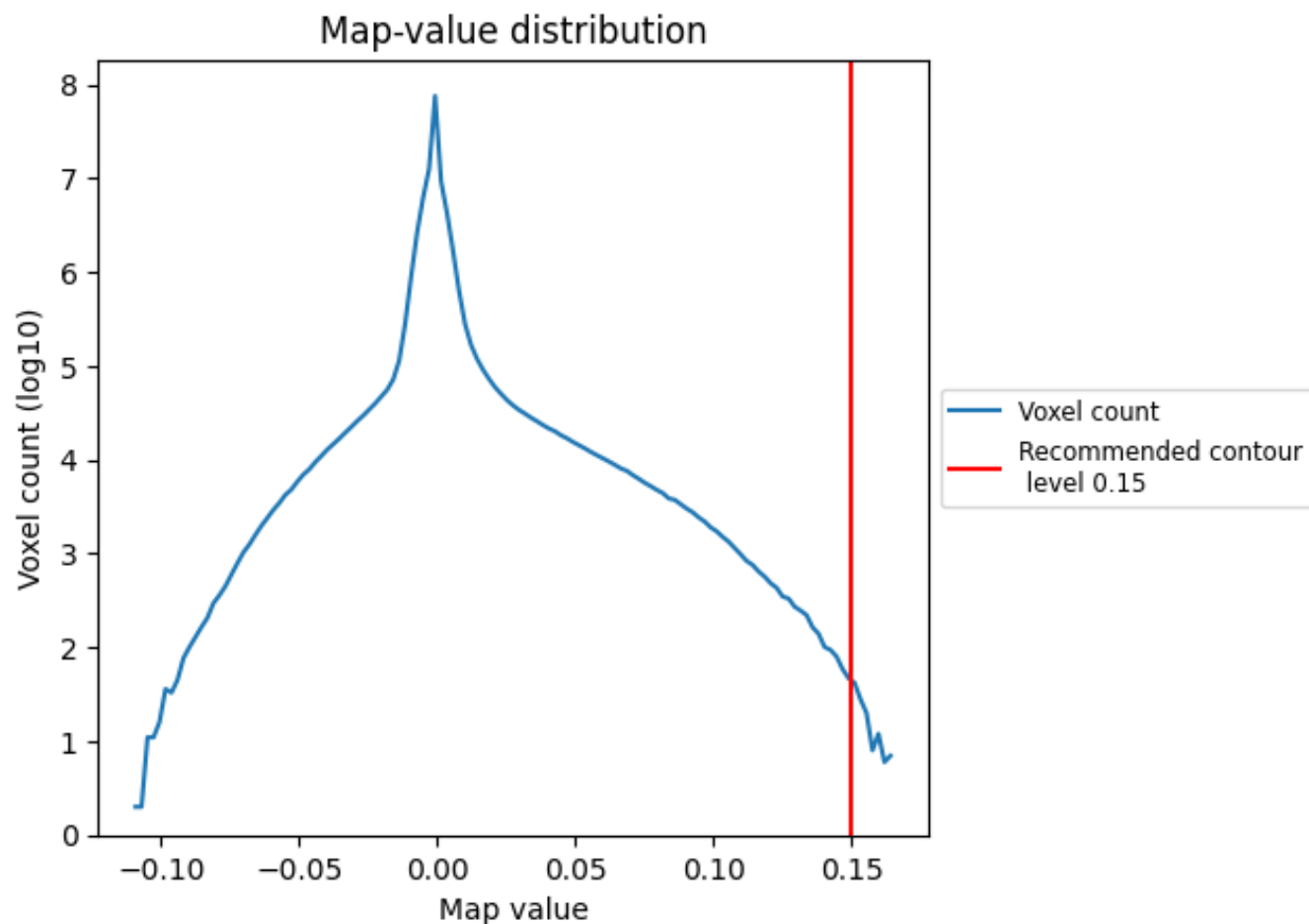


Z

7 Map analysis [i](#)

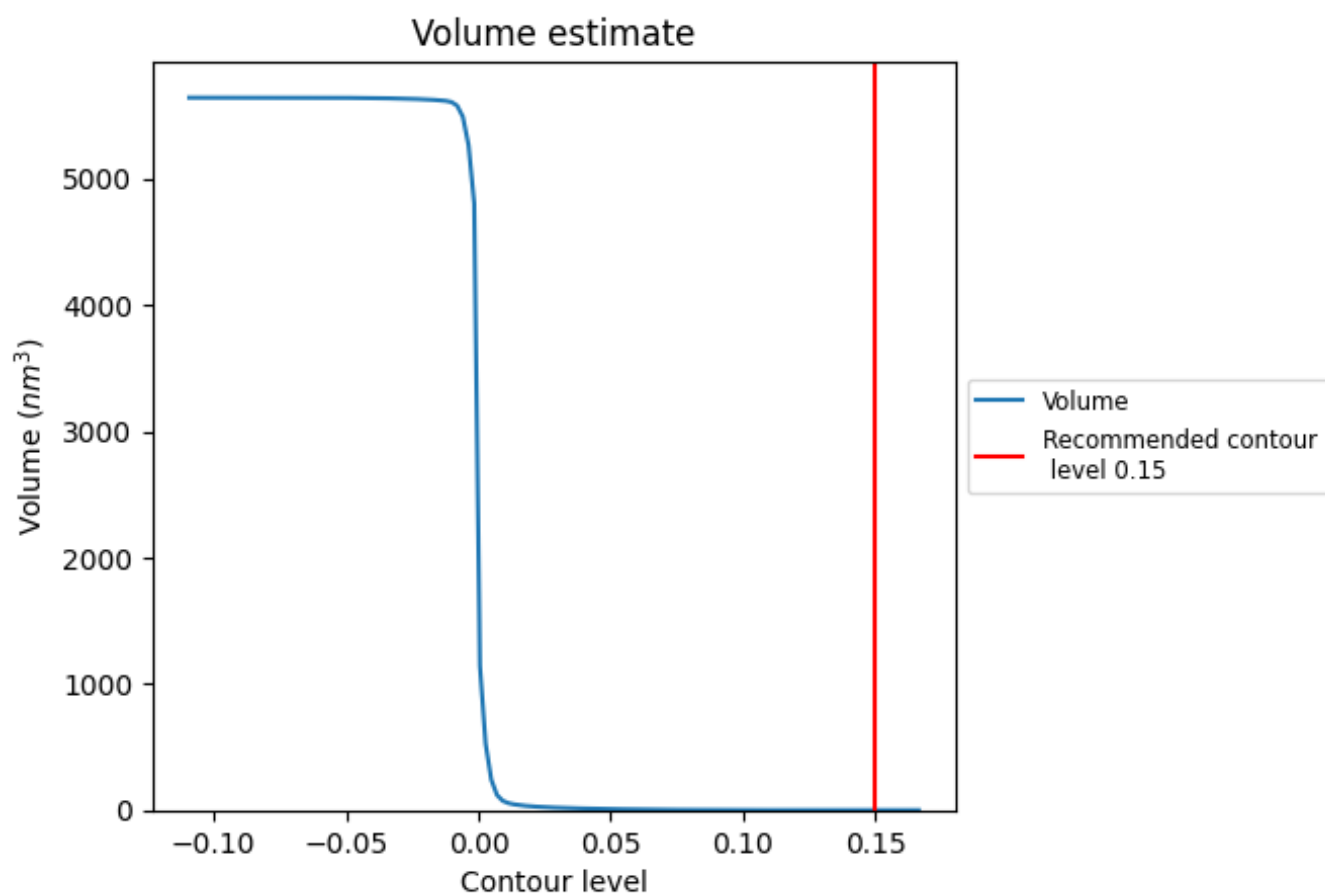
This section contains the results of statistical analysis of the map.

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.

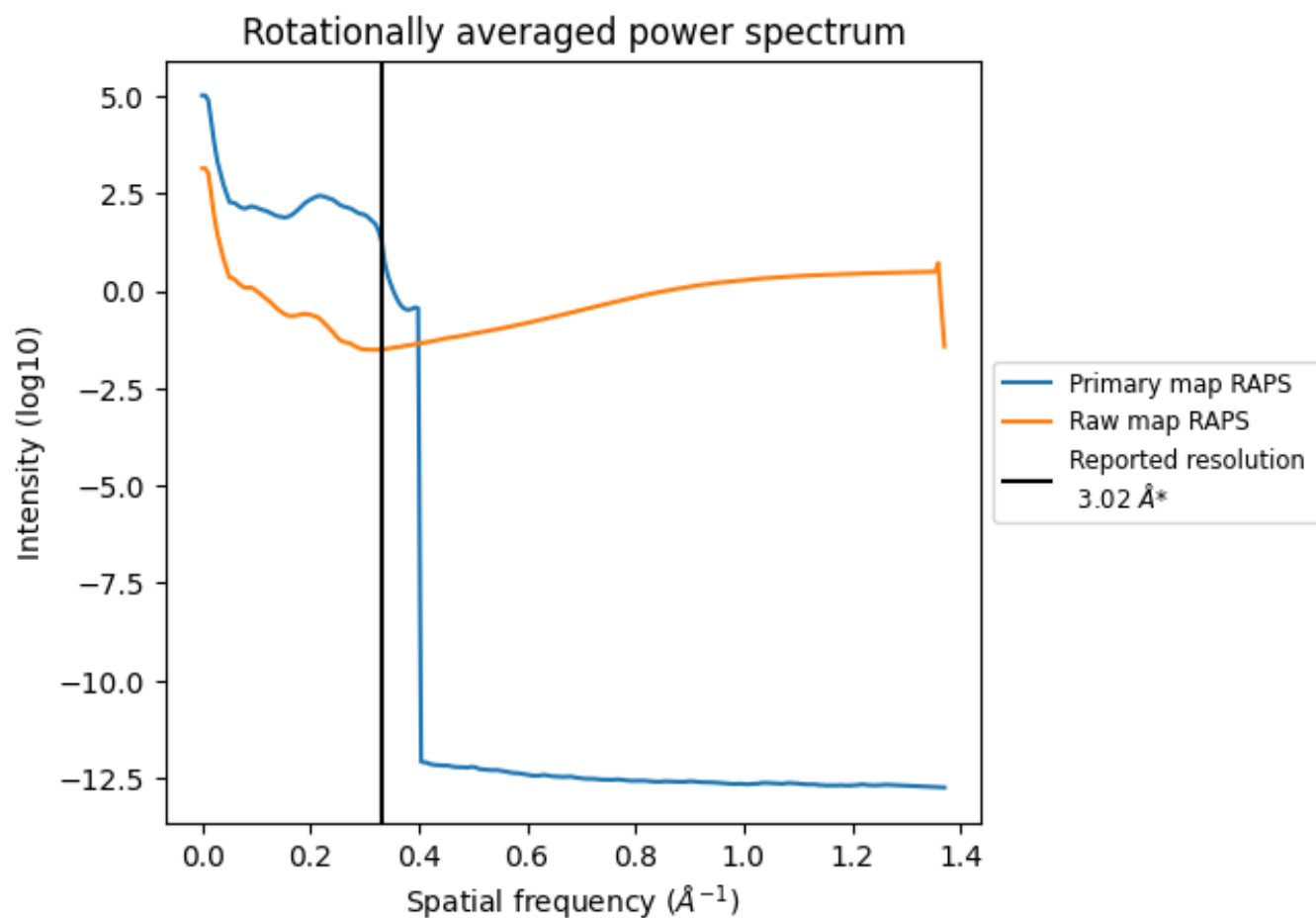
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 0 nm³; this corresponds to an approximate mass of 0 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 ⓘ

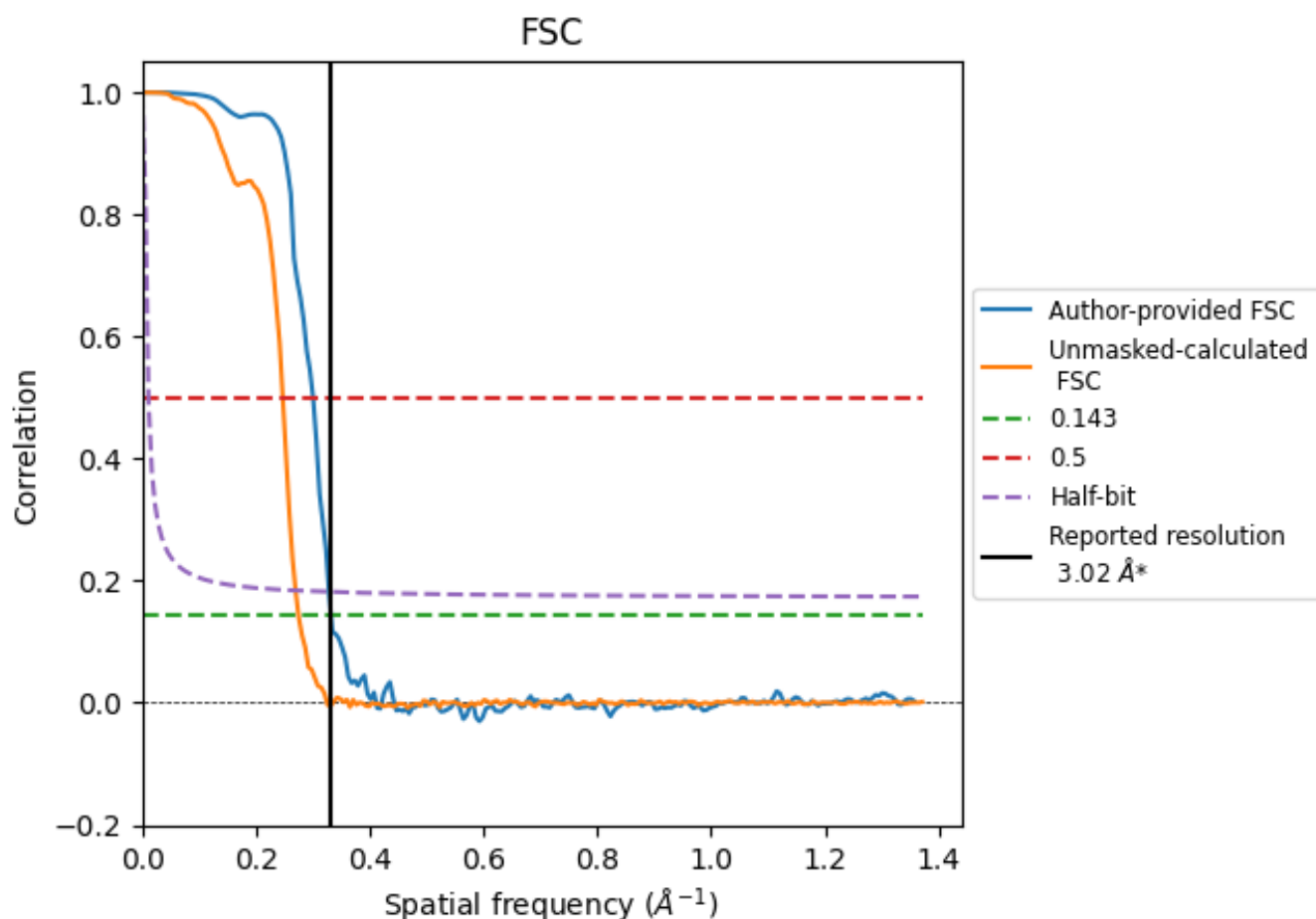


*Reported resolution corresponds to spatial frequency of 0.331 Å⁻¹

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 0.331 Å⁻¹

8.2 Resolution estimates [i](#)

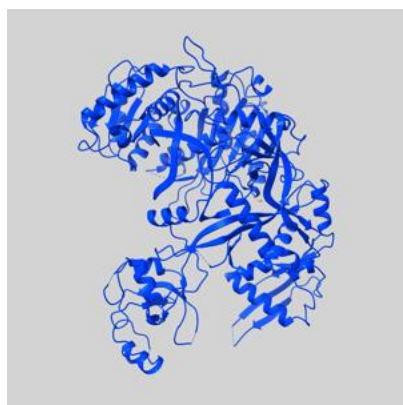
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.02	-	-
Author-provided FSC curve	3.01	3.33	3.05
Unmasked-calculated*	3.64	4.05	3.71

*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 3.64 differs from the reported value 3.02 by more than 10 %

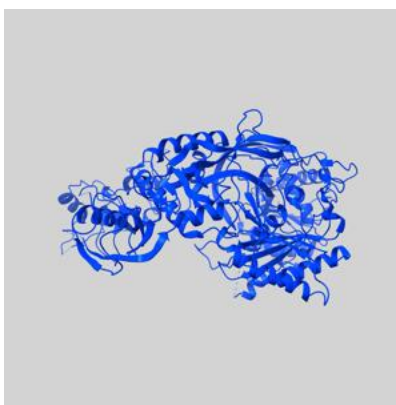
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-75039 and PDB model 10BE. Per-residue inclusion information can be found in section [3](#) on page [4](#).

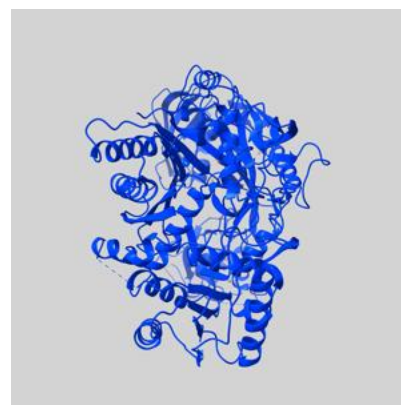
9.1 Map-model overlay [i](#)



X



Y



Z

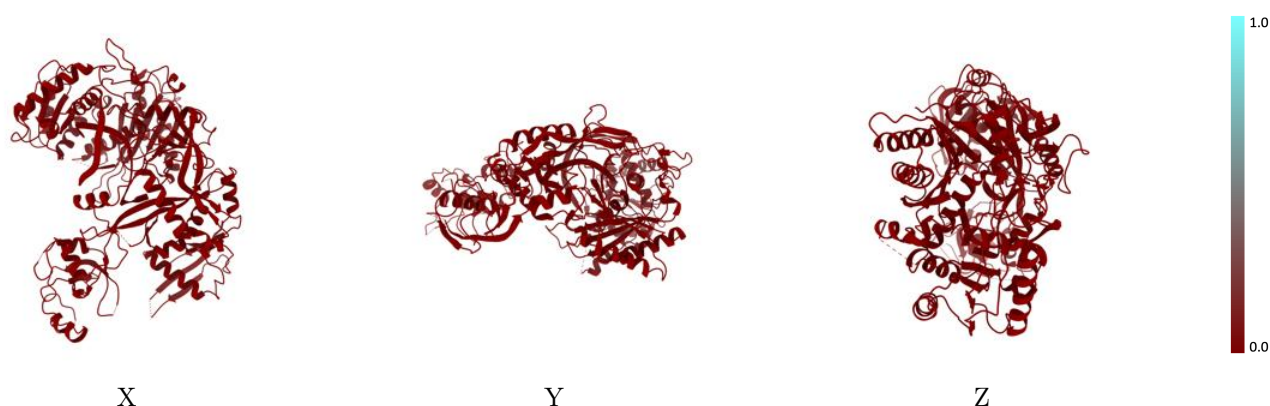
The images above show the 3D surface view of the map at the recommended contour level 0.15 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



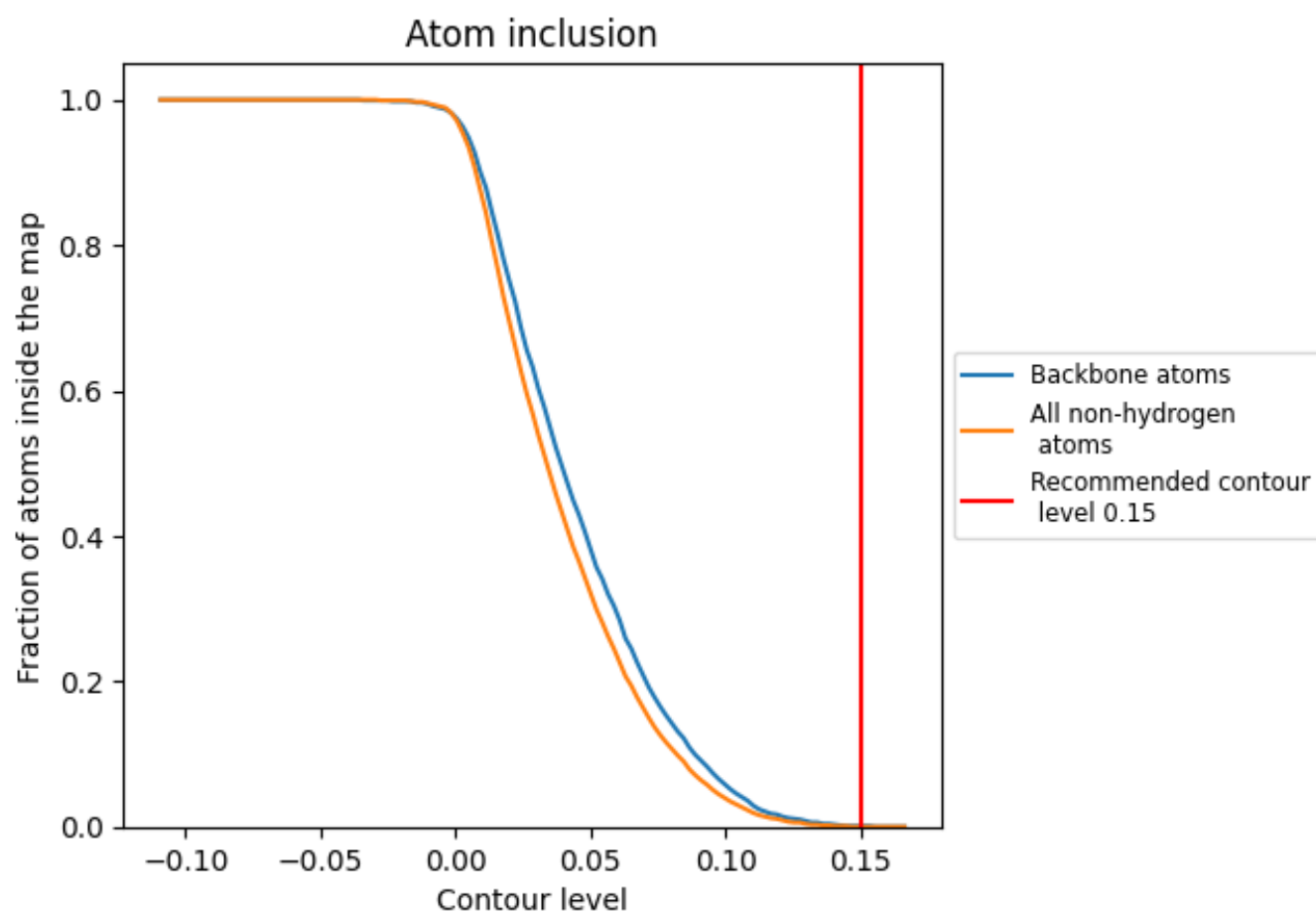
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.15).

9.4 Atom inclusion ⓘ



At the recommended contour level, 0% of all backbone atoms, 0% 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 (0.15) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div><div></div></div> 0.0000	<div><div></div></div> 0.4920
A	<div><div></div></div> 0.0000	<div><div></div></div> 0.4910
B	<div><div></div></div> 0.0000	<div><div></div></div> 0.5240
C	<div><div></div></div> 0.0000	<div><div></div></div> 0.5130

