



wwPDB EM Validation Summary Report ⓘ

Nov 13, 2022 – 10:51 AM EST

PDB ID : 7UT1
EMDB ID : EMD-26744
Title : Higher-order assembly of multiple MMTV strand transfer complex intasomes
Authors : Jozwik, I.; Lyumkis, D.
Deposited on : 2022-04-26
Resolution : 3.80 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:

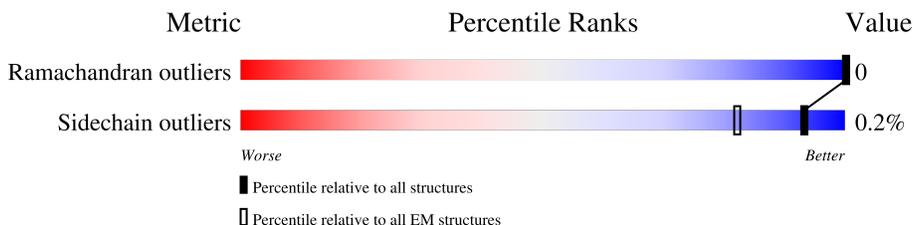
EMDB validation analysis : 0.0.1.dev43
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.2

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 3.80 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.



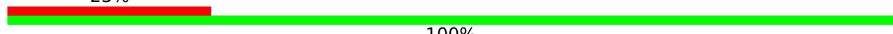
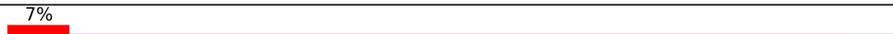
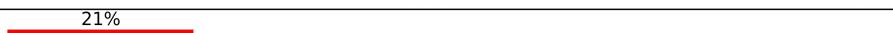
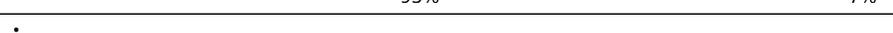
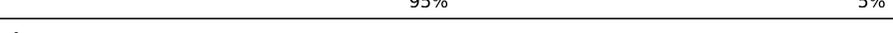
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	319	
1	B	319	
1	C	319	
1	D	319	
1	E	319	
1	F	319	
1	G	319	
1	H	319	
1	a	319	

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Mol	Chain	Length	Quality of chain
1	b	319	 76% 24%
1	c	319	 15% 85%
1	d	319	 15% 85%
1	e	319	 83% 17%
1	f	319	 76% 24%
1	g	319	 74% 26%
1	h	319	 72% 28%
2	I	22	 23% 100%
2	L	22	 23% 100%
2	i	22	 100%
2	l	22	 5% 100%
3	J	42	 7% 95% 5%
3	M	42	 21% 93% 7%
3	j	42	 95% 5%
3	m	42	 90% 10%
4	K	16	 88% 12%
4	N	16	 25% 81% 19%
4	k	16	 88% 12%
4	n	16	 75% 25%

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 31319 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 Integrase.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	a	264	Total	C	N	O	S	0	0
			2114	1353	386	367	8		
1	b	244	Total	C	N	O	S	0	0
			1957	1253	356	340	8		
1	c	48	Total	C	N	O	S	0	0
			385	255	63	64	3		
1	d	49	Total	C	N	O	S	0	0
			392	259	64	66	3		
1	e	264	Total	C	N	O	S	0	0
			2114	1353	386	367	8		
1	f	243	Total	C	N	O	S	0	0
			1951	1250	354	339	8		
1	g	236	Total	C	N	O	S	0	0
			1893	1213	347	325	8		
1	h	231	Total	C	N	O	S	0	0
			1833	1177	330	318	8		
1	A	264	Total	C	N	O	S	0	0
			2114	1353	386	367	8		
1	B	242	Total	C	N	O	S	0	0
			1944	1246	353	337	8		
1	C	48	Total	C	N	O	S	0	0
			385	255	63	64	3		
1	D	49	Total	C	N	O	S	0	0
			392	259	64	66	3		
1	E	265	Total	C	N	O	S	0	0
			2121	1357	387	369	8		
1	F	235	Total	C	N	O	S	0	0
			1896	1215	346	327	8		
1	G	235	Total	C	N	O	S	0	0
			1886	1209	346	323	8		
1	H	230	Total	C	N	O	S	0	0
			1829	1175	329	317	8		

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
a	252	SER	THR	engineered mutation	UNP O56220
b	252	SER	THR	engineered mutation	UNP O56220
c	252	SER	THR	engineered mutation	UNP O56220
d	252	SER	THR	engineered mutation	UNP O56220
e	252	SER	THR	engineered mutation	UNP O56220
f	252	SER	THR	engineered mutation	UNP O56220
g	252	SER	THR	engineered mutation	UNP O56220
h	252	SER	THR	engineered mutation	UNP O56220
A	252	SER	THR	engineered mutation	UNP O56220
B	252	SER	THR	engineered mutation	UNP O56220
C	252	SER	THR	engineered mutation	UNP O56220
D	252	SER	THR	engineered mutation	UNP O56220
E	252	SER	THR	engineered mutation	UNP O56220
F	252	SER	THR	engineered mutation	UNP O56220
G	252	SER	THR	engineered mutation	UNP O56220
H	252	SER	THR	engineered mutation	UNP O56220

- Molecule 2 is a DNA chain called vDNA strand (non-transferred).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
2	i	22	Total	C	N	O	P	0	0
			447	212	85	129	21		
2	l	22	Total	C	N	O	P	0	0
			447	212	85	129	21		
2	I	22	Total	C	N	O	P	0	0
			447	212	85	129	21		
2	L	22	Total	C	N	O	P	0	0
			447	212	85	129	21		

- Molecule 3 is a DNA chain called vDNA-tDNA strand (transferred).

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
3	j	40	Total	C	N	O	P	0	0
			813	386	142	245	40		
3	m	38	Total	C	N	O	P	0	0
			773	366	138	231	38		
3	J	40	Total	C	N	O	P	0	0
			813	386	142	245	40		
3	M	39	Total	C	N	O	P	0	0
			793	376	140	238	39		

- Molecule 4 is a DNA chain called tDNA strand.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	k	14	Total	C	N	O	P	0	0
			296	139	65	78	14		
4	n	12	Total	C	N	O	P	0	0
			254	119	55	68	12		
4	K	14	Total	C	N	O	P	0	0
			296	139	65	78	14		
4	N	13	Total	C	N	O	P	0	0
			275	129	60	73	13		

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

Mol	Chain	Residues	Atoms		AltConf
5	a	1	Total	Zn	0
			1	1	
5	b	1	Total	Zn	0
			1	1	
5	e	1	Total	Zn	0
			1	1	
5	f	1	Total	Zn	0
			1	1	
5	g	1	Total	Zn	0
			1	1	
5	h	1	Total	Zn	0
			1	1	
5	A	1	Total	Zn	0
			1	1	
5	B	1	Total	Zn	0
			1	1	
5	E	1	Total	Zn	0
			1	1	
5	F	1	Total	Zn	0
			1	1	
5	G	1	Total	Zn	0
			1	1	
5	H	1	Total	Zn	0
			1	1	

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.

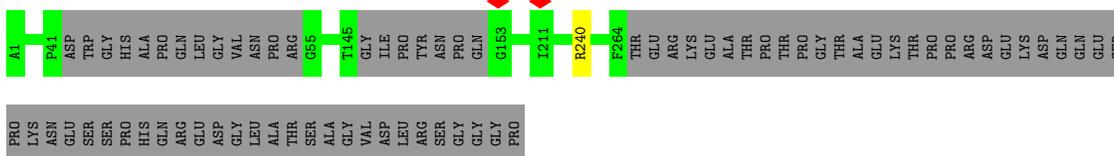
- Molecule 1: Integrase

Chain a:  83% 17%



- Molecule 1: Integrase

Chain b:  76% 24%



- Molecule 1: Integrase

Chain c:  15% 85%

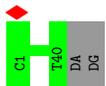


- Molecule 1: Integrase

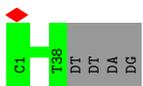
Chain d:  15% 85%



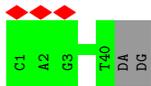
- Molecule 3: vDNA-tDNA strand (transferred)



- Molecule 3: vDNA-tDNA strand (transferred)



- Molecule 3: vDNA-tDNA strand (transferred)



- Molecule 3: vDNA-tDNA strand (transferred)



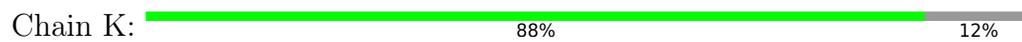
- Molecule 4: tDNA strand



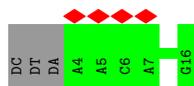
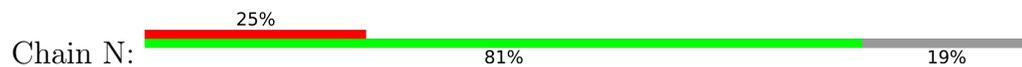
- Molecule 4: tDNA strand



- Molecule 4: tDNA strand



● Molecule 4: tDNA strand



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	86379	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	67	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	38167	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.850	Depositor
Minimum map value	-0.369	Depositor
Average map value	0.006	Depositor
Map value standard deviation	0.034	Depositor
Recommended contour level	0.2	Depositor
Map size (Å)	335.36, 335.36, 335.36	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.31, 1.31, 1.31	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	A	0.25	0/2181	0.47	0/2970
1	B	0.24	0/2001	0.46	0/2718
1	C	0.25	0/400	0.50	0/546
1	D	0.26	0/407	0.56	0/556
1	E	0.26	0/2188	0.48	0/2980
1	F	0.25	0/1950	0.47	0/2644
1	G	0.26	0/1940	0.50	0/2632
1	H	0.25	0/1882	0.47	0/2560
1	a	0.27	0/2181	0.47	0/2970
1	b	0.26	0/2014	0.48	0/2735
1	c	0.27	0/400	0.56	0/546
1	d	0.27	0/407	0.53	0/556
1	e	0.27	0/2181	0.47	0/2970
1	f	0.25	0/2008	0.47	0/2728
1	g	0.26	0/1947	0.50	0/2642
1	h	0.26	0/1886	0.48	0/2565
2	I	0.46	0/501	0.80	0/771
2	L	0.44	0/501	0.80	0/771
2	i	0.48	0/501	0.82	0/771
2	l	0.47	0/501	0.81	0/771
3	J	0.50	0/908	0.88	0/1398
3	M	0.50	0/886	0.88	0/1364
3	j	0.51	0/908	0.89	0/1398
3	m	0.51	0/864	0.87	0/1330
4	K	0.50	0/335	0.74	0/516
4	N	0.51	0/311	0.78	0/479
4	k	0.51	0/335	0.77	0/516
4	n	0.54	0/287	0.79	0/442
All	All	0.32	0/32811	0.58	0/45845

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](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

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	262/319 (82%)	255 (97%)	7 (3%)	0	100	100
1	B	236/319 (74%)	229 (97%)	7 (3%)	0	100	100
1	C	46/319 (14%)	43 (94%)	3 (6%)	0	100	100
1	D	47/319 (15%)	45 (96%)	2 (4%)	0	100	100
1	E	263/319 (82%)	256 (97%)	7 (3%)	0	100	100
1	F	227/319 (71%)	222 (98%)	5 (2%)	0	100	100
1	G	227/319 (71%)	215 (95%)	12 (5%)	0	100	100
1	H	220/319 (69%)	209 (95%)	11 (5%)	0	100	100
1	a	262/319 (82%)	250 (95%)	12 (5%)	0	100	100
1	b	238/319 (75%)	233 (98%)	5 (2%)	0	100	100
1	c	46/319 (14%)	42 (91%)	4 (9%)	0	100	100
1	d	47/319 (15%)	45 (96%)	2 (4%)	0	100	100
1	e	262/319 (82%)	254 (97%)	8 (3%)	0	100	100
1	f	237/319 (74%)	231 (98%)	6 (2%)	0	100	100
1	g	228/319 (72%)	217 (95%)	11 (5%)	0	100	100
1	h	221/319 (69%)	207 (94%)	14 (6%)	0	100	100
All	All	3069/5104 (60%)	2953 (96%)	116 (4%)	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	A	222/267 (83%)	222 (100%)	0	100	100
1	B	205/267 (77%)	205 (100%)	0	100	100
1	C	41/267 (15%)	41 (100%)	0	100	100
1	D	42/267 (16%)	42 (100%)	0	100	100
1	E	223/267 (84%)	223 (100%)	0	100	100
1	F	199/267 (74%)	198 (100%)	1 (0%)	88	94
1	G	196/267 (73%)	196 (100%)	0	100	100
1	H	189/267 (71%)	189 (100%)	0	100	100
1	a	222/267 (83%)	222 (100%)	0	100	100
1	b	206/267 (77%)	205 (100%)	1 (0%)	88	94
1	c	41/267 (15%)	41 (100%)	0	100	100
1	d	42/267 (16%)	42 (100%)	0	100	100
1	e	222/267 (83%)	222 (100%)	0	100	100
1	f	206/267 (77%)	204 (99%)	2 (1%)	76	86
1	g	197/267 (74%)	197 (100%)	0	100	100
1	h	189/267 (71%)	188 (100%)	1 (0%)	88	94
All	All	2642/4272 (62%)	2637 (100%)	5 (0%)	93	97

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	b	240	ARG
1	f	31	ARG
1	f	240	ARG
1	h	196	MET
1	F	240	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	6	GLN
1	G	9	HIS
1	H	68	HIS
1	H	9	HIS
1	g	104	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 12 ligands modelled in this entry, 12 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

There are no chain breaks in this entry.

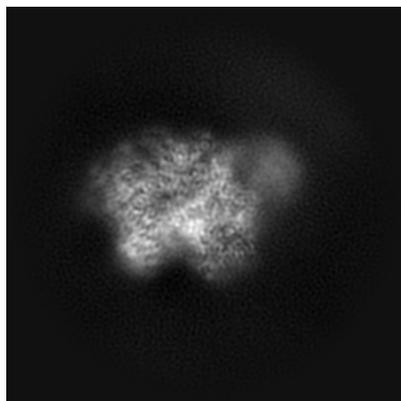
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-26744. These allow visual inspection of the internal detail of the map and identification of artifacts.

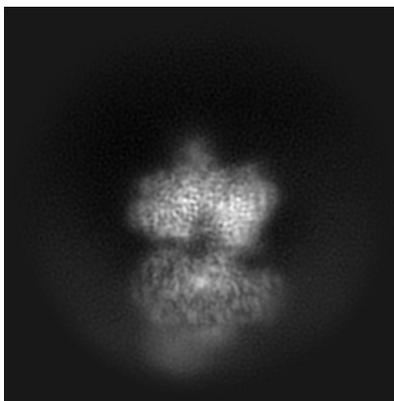
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

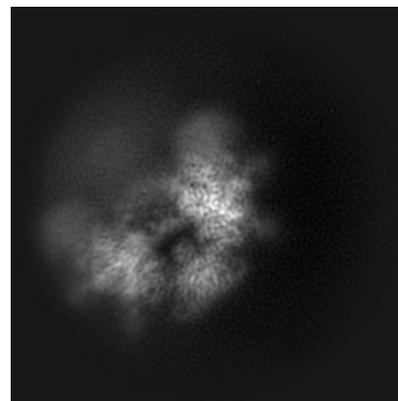
6.1.1 Primary map



X

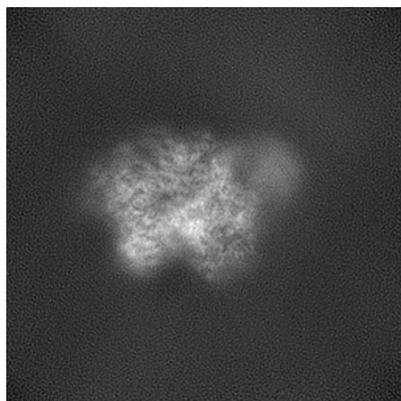


Y

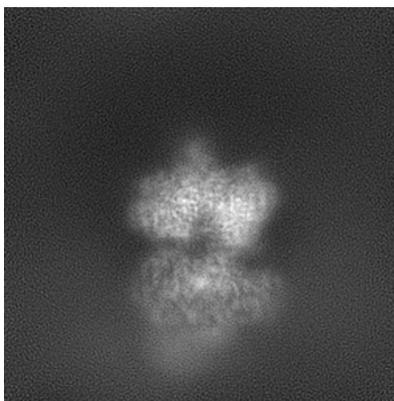


Z

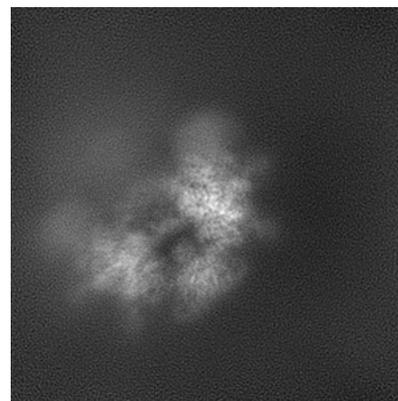
6.1.2 Raw map



X



Y

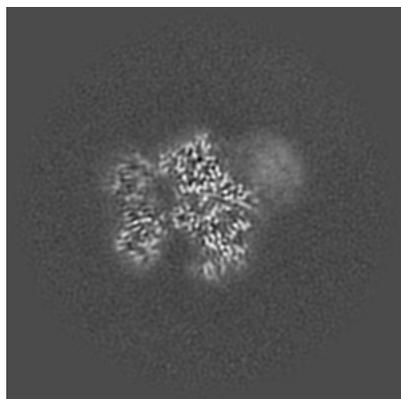


Z

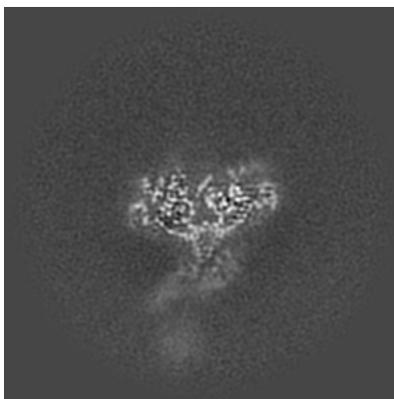
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

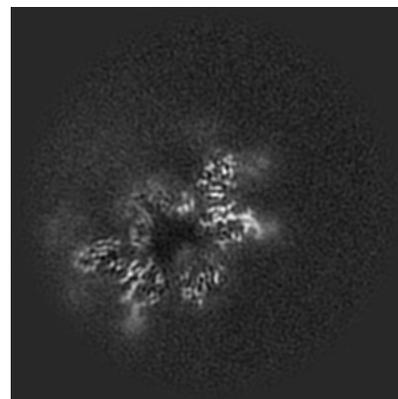
6.2.1 Primary map



X Index: 128

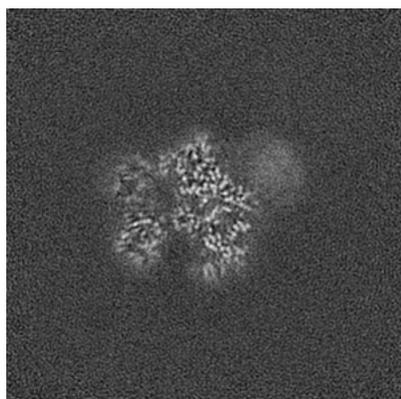


Y Index: 128

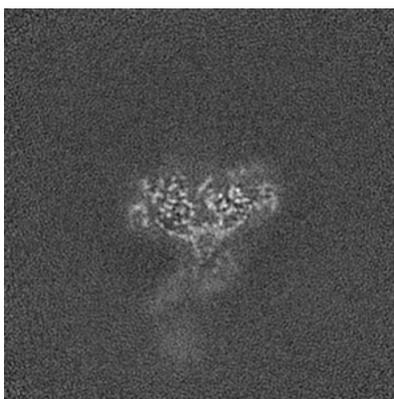


Z Index: 128

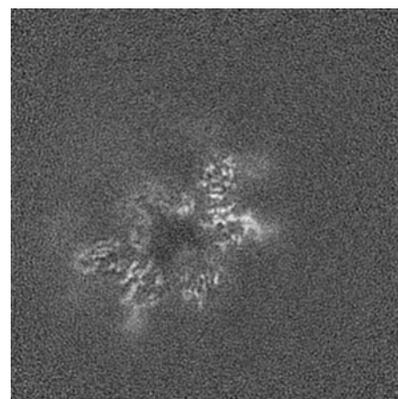
6.2.2 Raw map



X Index: 128



Y Index: 128

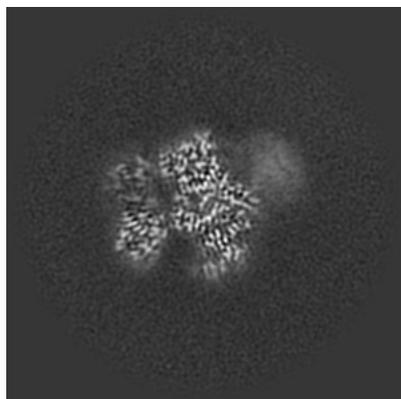


Z Index: 128

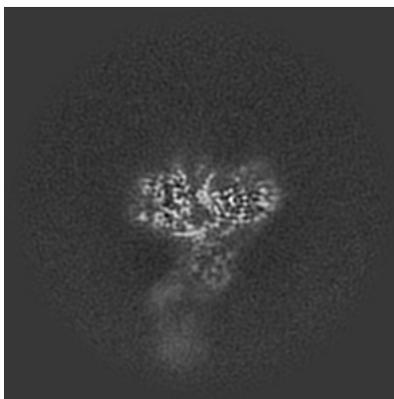
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

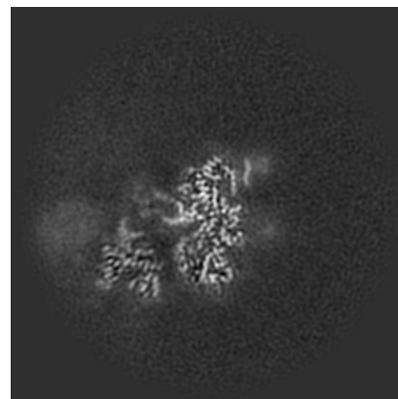
6.3.1 Primary map



X Index: 129

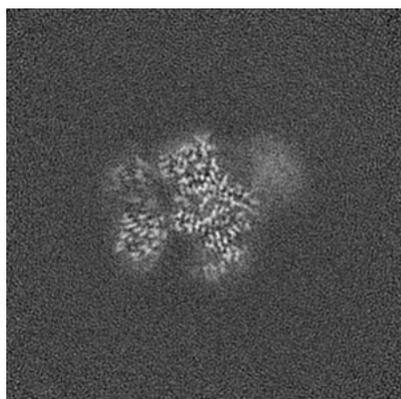


Y Index: 126

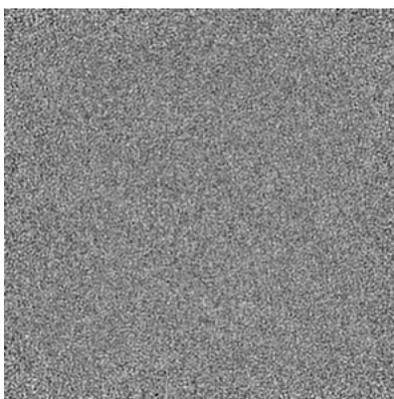


Z Index: 116

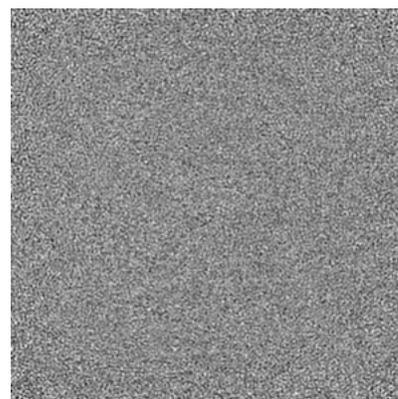
6.3.2 Raw map



X Index: 129



Y Index: 0



Z Index: 0

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

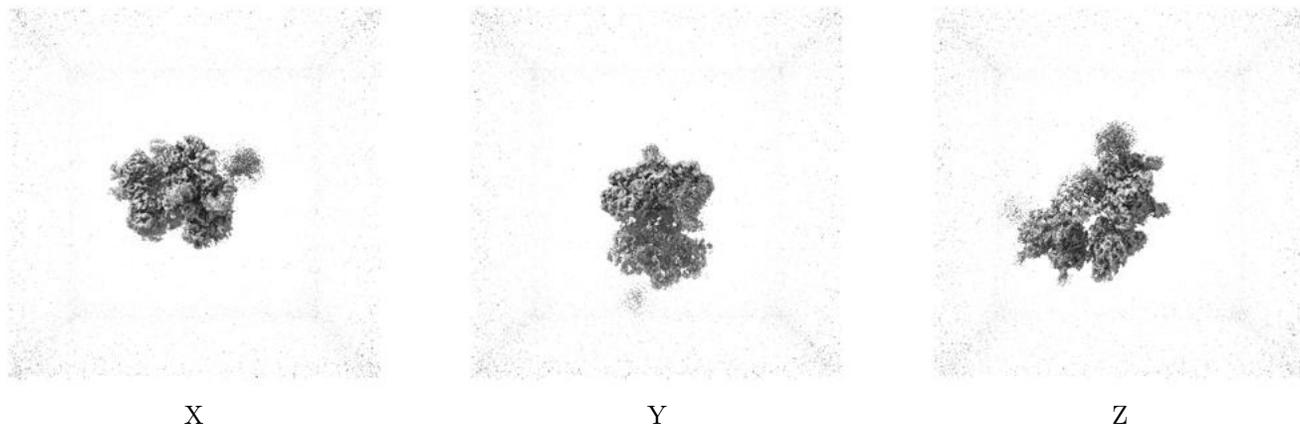
6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.2. 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.

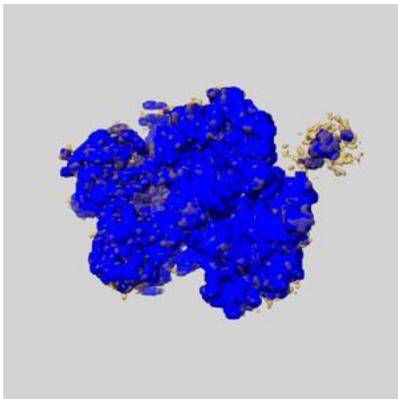
6.5 Mask visualisation [i](#)

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

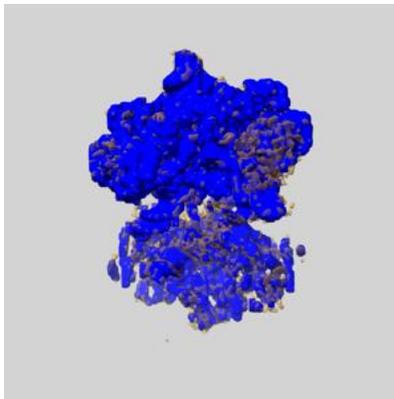
A mask typically either:

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

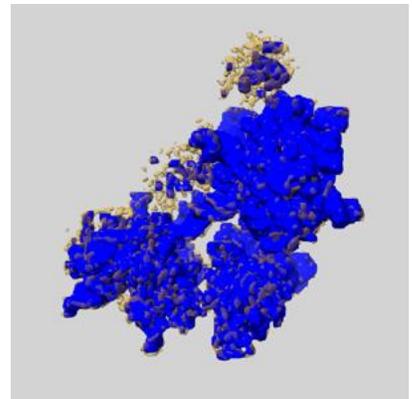
6.5.1 emd_26744_msk_1.map [i](#)



X



Y

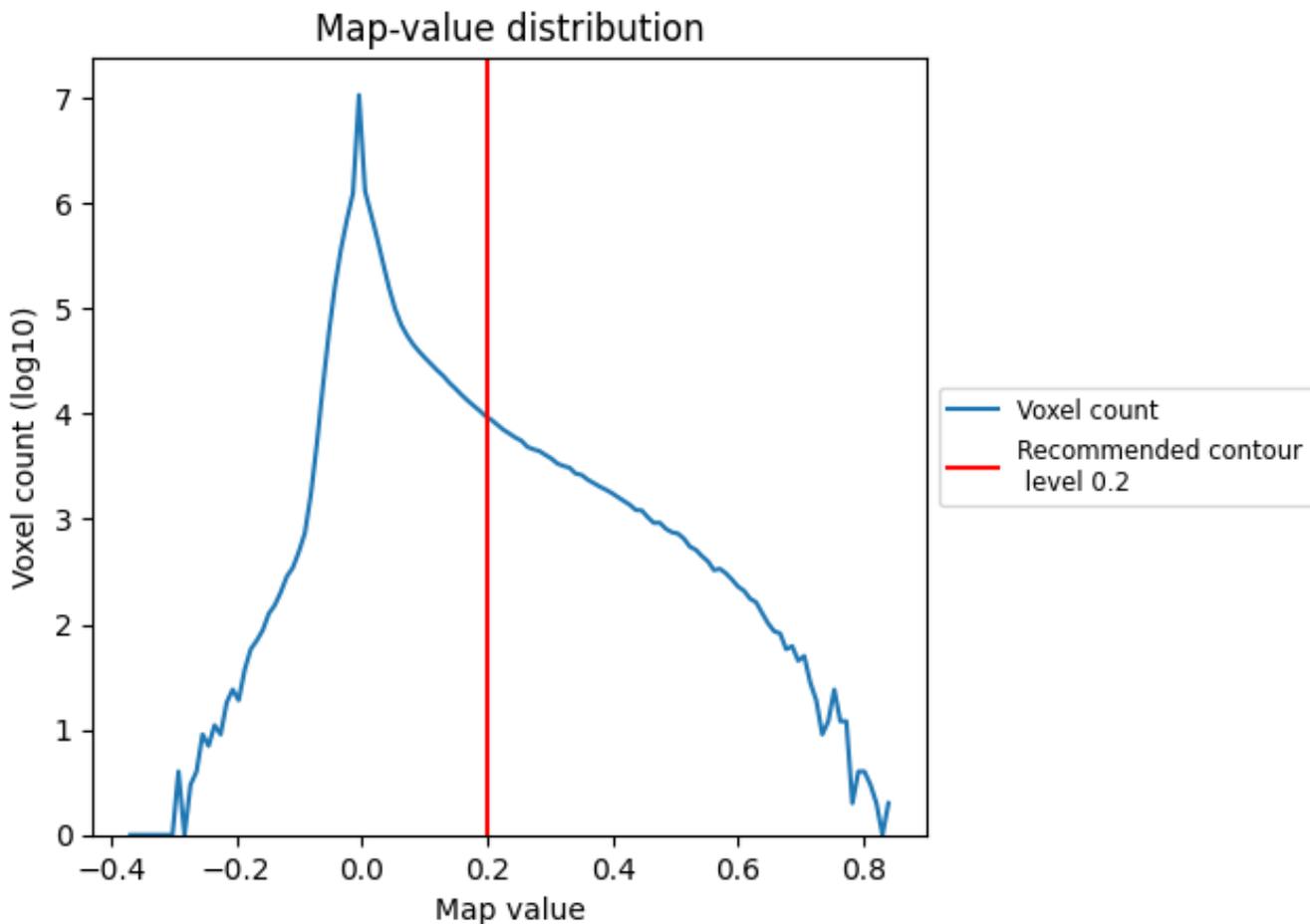


Z

7 Map analysis [i](#)

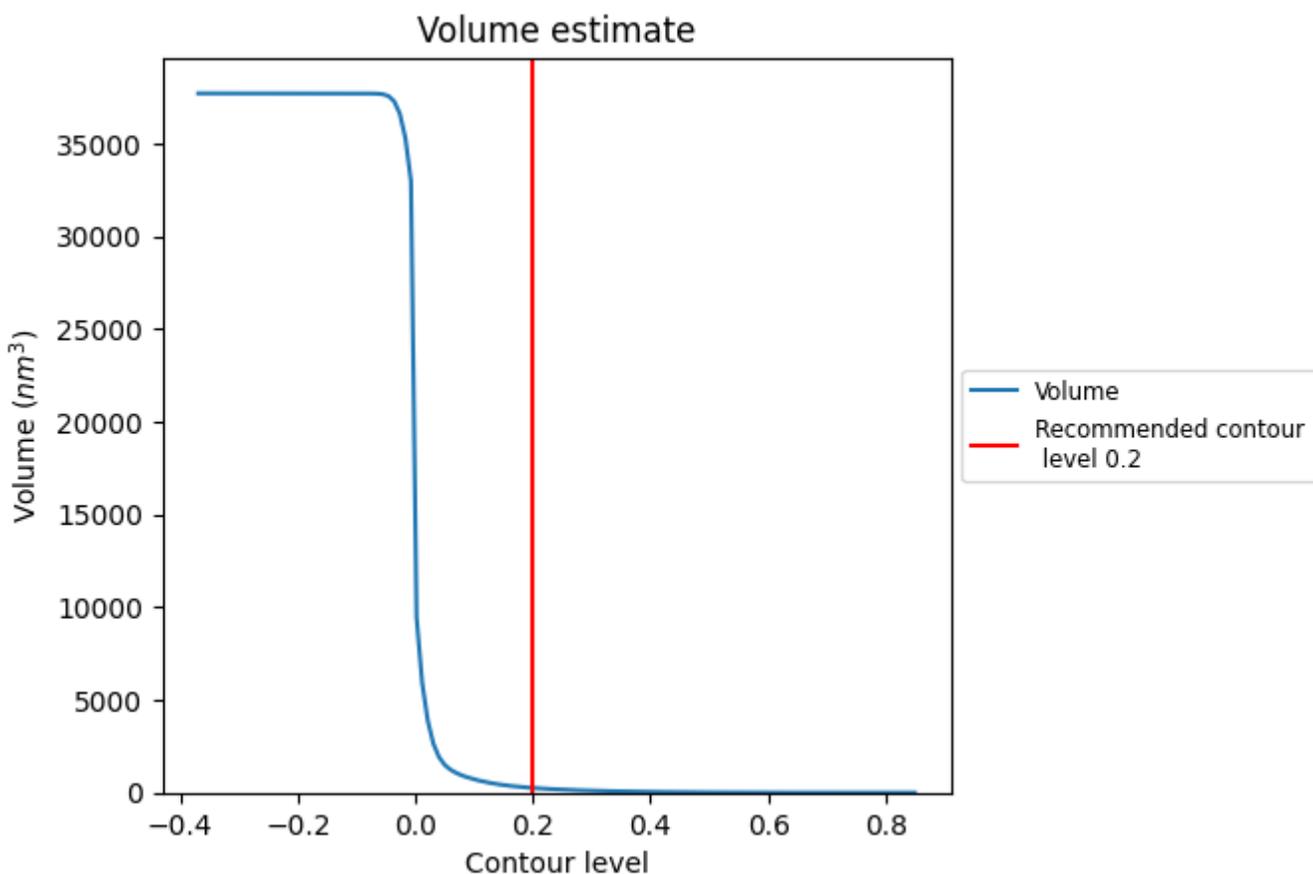
This section contains the results of statistical analysis of the map.

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.

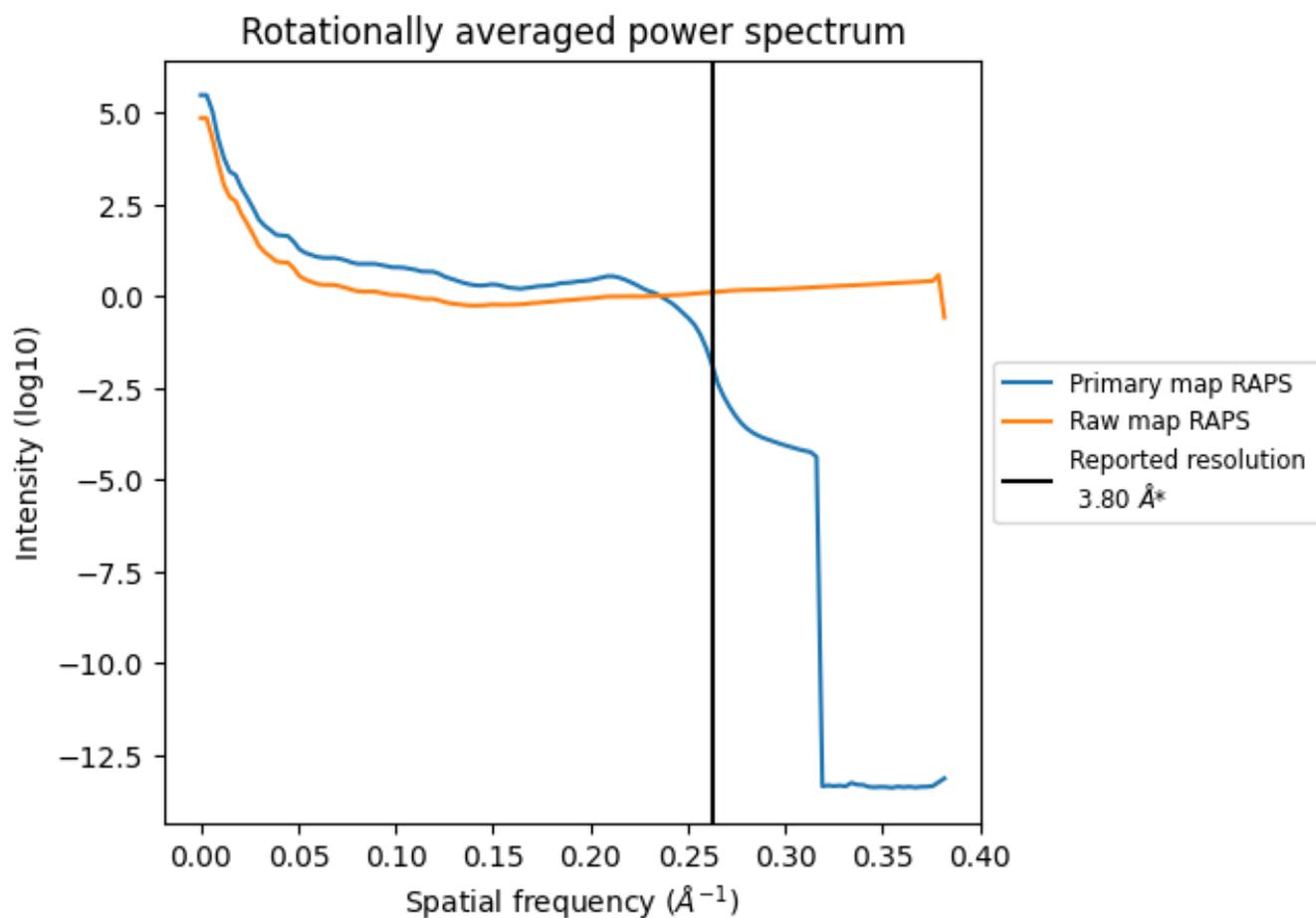
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 252 nm³; this corresponds to an approximate mass of 228 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](#)

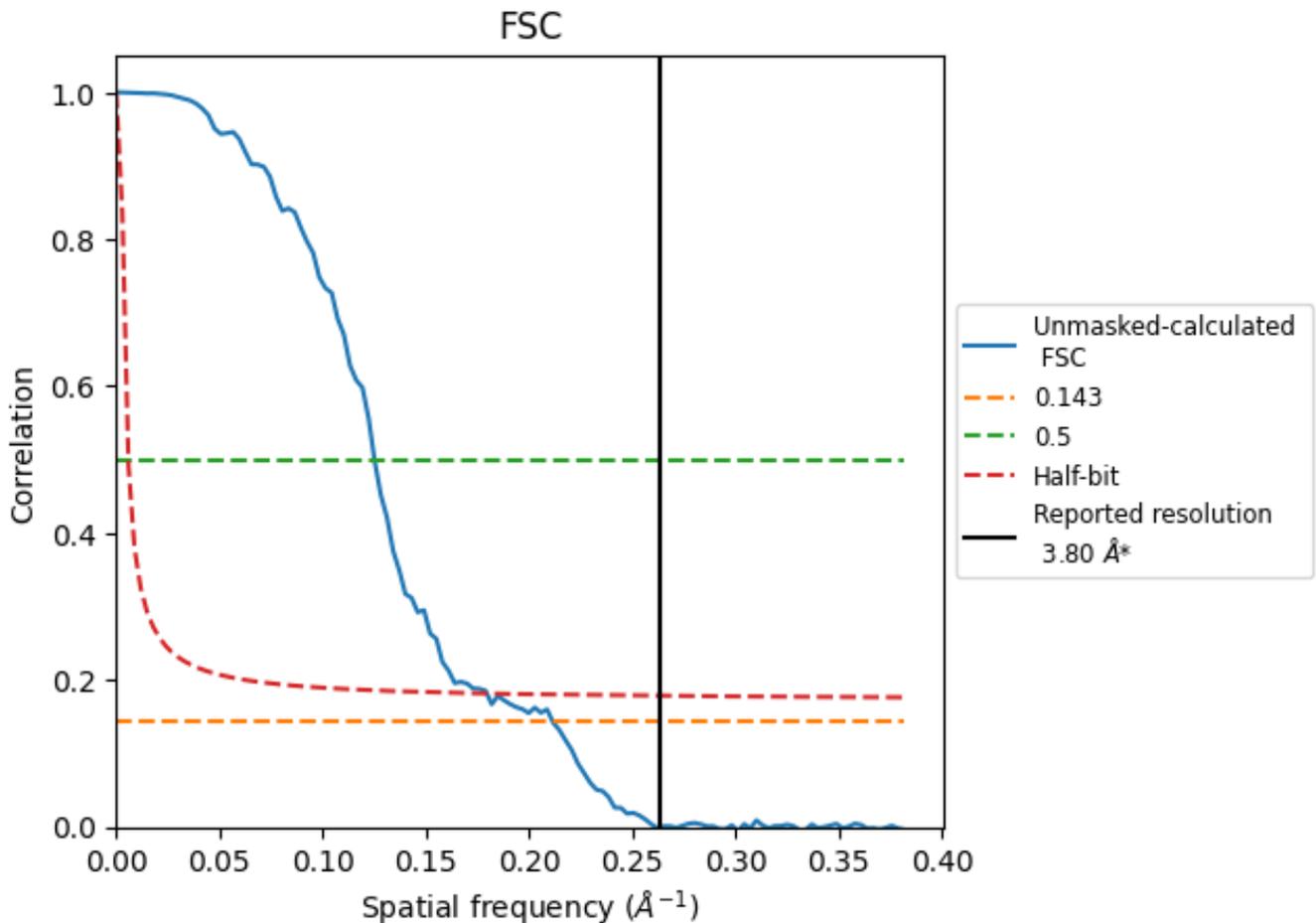


*Reported resolution corresponds to spatial frequency of 0.263 Å⁻¹

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 0.263 Å⁻¹

8.2 Resolution estimates [i](#)

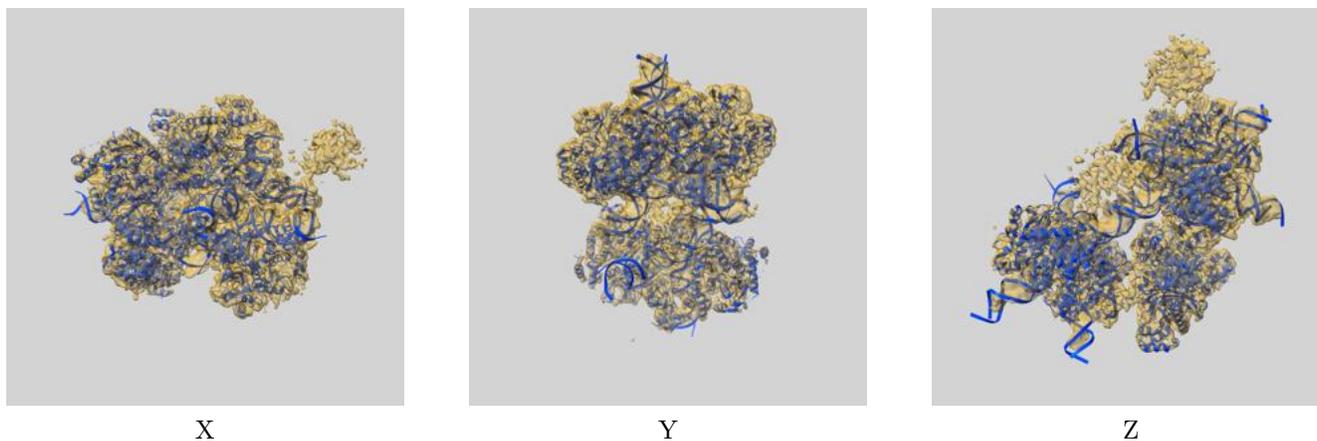
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.80	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.73	7.99	5.57

*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 4.73 differs from the reported value 3.8 by more than 10 %

9 Map-model fit [i](#)

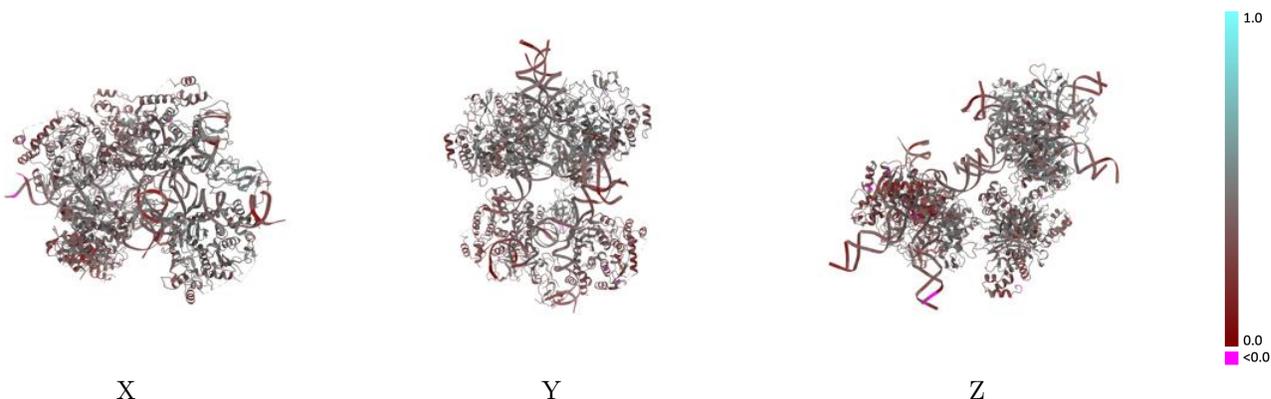
This section contains information regarding the fit between EMDB map EMD-26744 and PDB model 7UT1. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



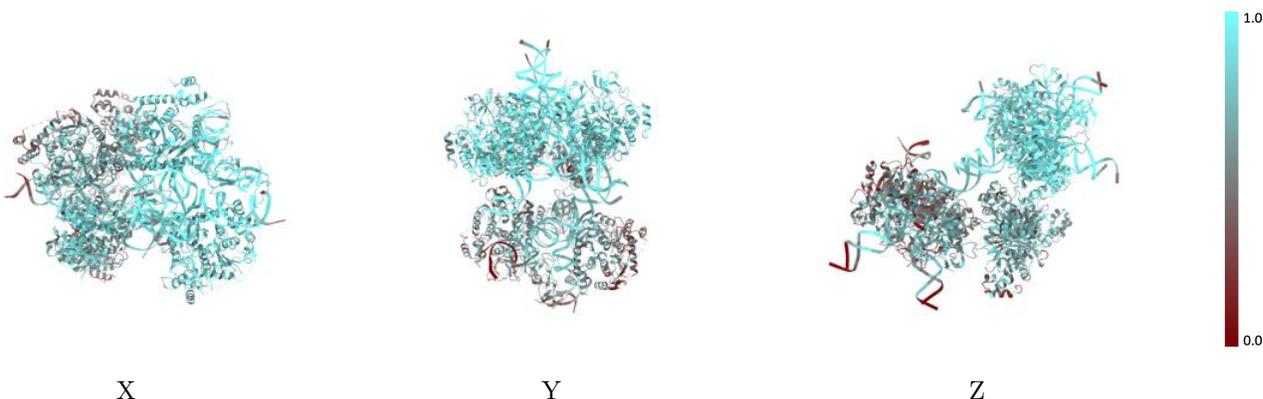
The images above show the 3D surface view of the map at the recommended contour level 0.2 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



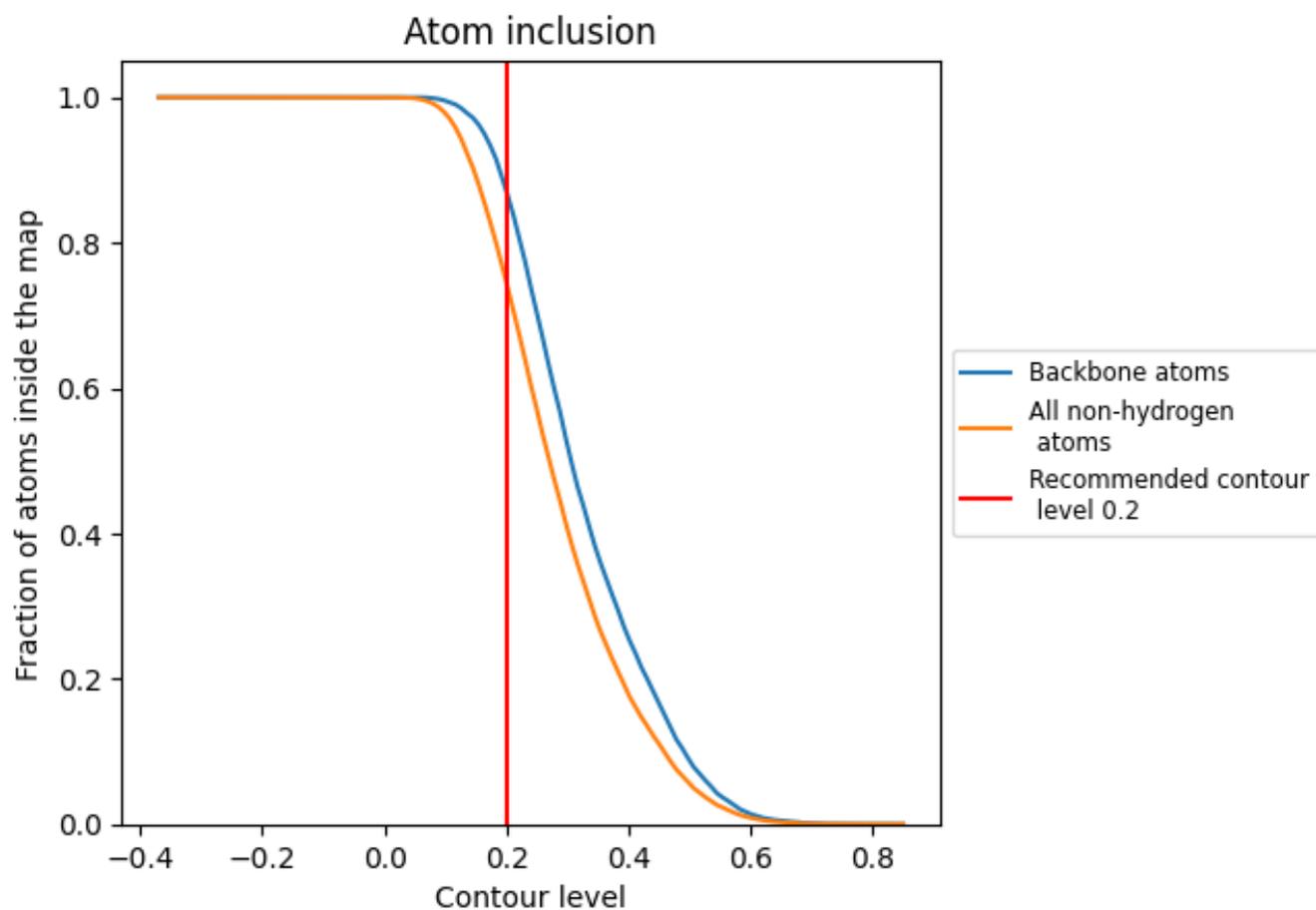
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.2).

9.4 Atom inclusion [i](#)



At the recommended contour level, 87% of all backbone atoms, 75% 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 (0.2) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7452	 0.3900
A	 0.6509	 0.3880
B	 0.5089	 0.3360
C	 0.5173	 0.3440
D	 0.6073	 0.3900
E	 0.6487	 0.3950
F	 0.4118	 0.3000
G	 0.6201	 0.3820
H	 0.6904	 0.4260
I	 0.6734	 0.3340
J	 0.7872	 0.3640
K	 0.7905	 0.3580
L	 0.6801	 0.3330
M	 0.6166	 0.3340
N	 0.4909	 0.2760
a	 0.9190	 0.4480
b	 0.8745	 0.4200
c	 0.8987	 0.4420
d	 0.9110	 0.4720
e	 0.9243	 0.4500
f	 0.8507	 0.4080
g	 0.8113	 0.3880
h	 0.8430	 0.4320
i	 0.9105	 0.3730
j	 0.9483	 0.3790
k	 0.9054	 0.3480
l	 0.8971	 0.3630
m	 0.9120	 0.3640
n	 0.8780	 0.3180

