



## wwPDB EM Validation Summary Report ⓘ

Sep 3, 2023 – 07:17 am BST

PDB ID : 8P8J  
EMDB ID : EMD-17547  
Title : Structure of 5D3-Fab and nanobody(Nb96)-bound ABCG2  
Authors : Irobalieva, R.N.; Manolaridis, I.; Jackson, S.M.; Ni, D.; Pardon, E.; Stahlberg, H.; Steyaert, J.; Locher, K.P.  
Deposited on : 2023-06-01  
Resolution : 3.49 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](mailto: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.dev50  
Mogul : 1.8.4, CSD as541be (2020)  
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) : 2.35

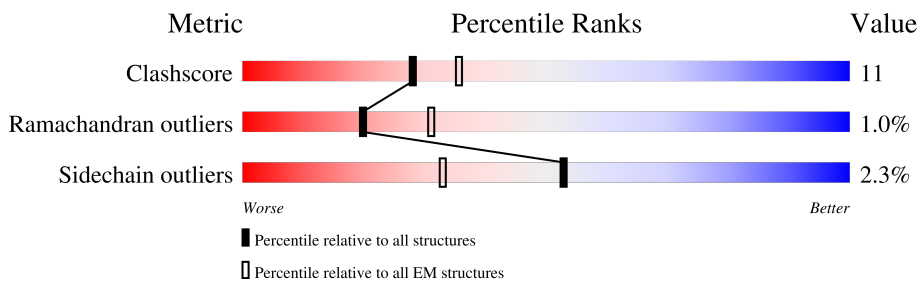
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.49 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  $\geq 3$ , 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	655	 7% 66% 21% 13%
1	B	655	 12% 67% 18% 15%
2	C	214	 36% 14% 50%
2	E	214	 37% 13% 50%
3	D	221	 37% 15% 47%
3	F	221	 39% 13% 47%
4	Z	125	 22% 58% 39%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 13289 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 ATP-binding cassette sub-family G member 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	B	560	Total	C	N	O	S	0	0
			4360	2832	718	781	29		
1	A	573	Total	C	N	O	S	0	0
			4458	2894	734	801	29		

- Molecule 2 is a protein called 5D3(Fab) light chain variable domain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	E	107	Total	C	N	O	S	0	0
			822	521	137	162	2		
2	C	107	Total	C	N	O	S	0	0
			822	521	137	162	2		

- Molecule 3 is a protein called 5D3(Fab) heavy chain variable domain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	F	118	Total	C	N	O	S	0	0
			928	592	153	180	3		
3	D	118	Total	C	N	O	S	0	0
			928	592	153	180	3		

- Molecule 4 is a protein called Nanobody.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	Z	122	Total	C	N	O	S	0	0
			943	588	164	186	5		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



Mol	Chain	Residues	Atoms			AltConf	
			Total	C	N		O
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	

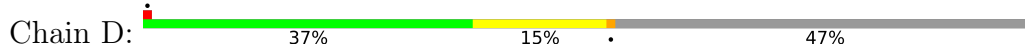




THR THR  
LEU PRO  
SER PRO  
SER VAL  
SER TYR  
PRO PRO  
LEU ALA  
SER PRO  
SER VAL  
THR CYS  
GLY ASP  
THR GLN  
SER THR  
GLY ILE  
SER THR  
SER CYS  
SER VAL  
VAL THR  
LEU ALA  
THR GLY  
CYS LEU  
LEU VAL

THR  
LEU  
SER  
SER  
VAL  
THR  
THR  
SER  
SER  
THR  
PRO  
SER  
GLN  
THR  
ILE  
THR  
CYS  
ASN  
VAL  
ALA  
THR  
HIS  
CYS  
PRO  
ALA  
SER  
SER  
THR  
LYS  
LYS  
VAL  
ASP  
GLU  
PRO  
LYS  
ILE  
GLU  
PRO  
ARG  
GLY  
PRO

● Molecule 3: 5D3(Fab) heavy chain variable domain



GLN Y2  
S15  
L18  
S19  
T23  
S28  
S31  
D32  
W35  
N36  
F41  
P42  
G43  
K44  
W48  
M49  
G50  
Y51  
F54  
T59  
Y60  
M61  
R65  
G66  
R67  
I68  
R72  
Q78  
L81  
Q82  
L83  
R84  
S85  
V86  
T87  
P88  
E89  
D90  
T91  
Y94  
T98  
F99

K103  
G112  
S119  
ALA  
LYS  
THR  
THR  
LEU  
SER  
PRO  
SER  
SER  
VAL  
VAL  
THR  
PRO  
LEU  
THR  
SER  
PRO  
ALA  
SER  
THR  
VAL  
CYS  
GLY  
ASP  
THR  
SER  
SER  
GLY  
SER  
SER  
VAL  
THR  
LEU  
GLY  
HIS  
CYS  
PRO  
ALA  
LEU  
SER  
VAL  
LYS  
TYR  
PHE  
PRO  
PRO  
VAL  
THR  
LEU  
THR  
TRP  
ASN  
SER  
GLY  
SER  
LEU  
SER  
SER  
GLY  
VAL  
HIS  
THR  
PHE  
PRO  
ALA

VAL  
LEU  
GLN  
SER  
ASP  
LEU  
TYR  
THR  
LEU  
SER  
SER  
SER  
VAL  
VAL  
THR  
VAL  
SER  
SER  
THR  
TRP  
PRO  
SER  
GLN  
SER  
SER  
ILE  
THR  
CYS  
ASN  
VAL  
ALA  
HIS  
PRO  
PRO  
ALA  
SER  
SER  
THR  
LYS  
VAL  
PHE  
ASP  
LYS  
LYS  
ILE  
GLU  
PRO  
ARG  
GLY  
PRO

● Molecule 4: Nanobody



Q3  
L6  
Q7  
E8  
S9  
G10  
L13  
V14  
Q15  
A16  
G17  
G18  
S19  
L22  
A26  
S27  
G28  
R29  
S30  
F31  
Y34  
W38  
F39  
R40  
Q41  
A42  
P43  
C44  
K45  
E46  
R47  
E48  
F49  
V50  
K54  
I59  
T60  
K61  
Y62  
V63  
D64  
S65  
V66  
R69  
I72  
S73  
R74  
K78  
N79

Y82  
L83  
N86  
S87  
L88  
K89  
P90  
E91  
D92  
T93  
A94  
V95  
Y96  
Y97  
A100  
D101  
N102  
T103  
S110  
R111  
S112  
S113  
M114  
W117  
G118  
Q122  
V123  
T124  
VAL  
SER  
SER

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	98009	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 ( $e^-/\text{\AA}^2$ )	72	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2800	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	3.168	Depositor
Minimum map value	-1.392	Depositor
Average map value	0.008	Depositor
Map value standard deviation	0.070	Depositor
Recommended contour level	0.5	Depositor
Map size (Å)	287.0, 287.0, 287.0	wwPDB
Map dimensions	350, 350, 350	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.82, 0.82, 0.82	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: NAG

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	0.42	0/4551	0.53	0/6157
1	B	0.41	0/4452	0.53	0/6026
2	C	0.53	0/842	0.56	0/1144
2	E	0.53	0/842	0.56	0/1144
3	D	0.57	0/953	0.70	1/1297 (0.1%)
3	F	0.56	0/953	0.65	0/1297
4	Z	0.41	0/964	0.59	0/1302
All	All	0.45	0/13557	0.56	1/18367 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	98	THR	CB-CA-C	-5.13	97.75	111.60

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4458	0	4535	95	0
1	B	4360	0	4435	80	0
2	C	822	0	801	19	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	822	0	801	16	0
3	D	928	0	890	23	0
3	F	928	0	890	20	0
4	Z	943	0	895	40	0
5	A	14	0	13	0	0
5	B	14	0	13	0	0
All	All	13289	0	13273	281	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 11.

The worst 5 of 281 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:B:454:LEU:HG	1:B:458:GLU:OE2	1.60	1.00
2:E:6:GLN:NE2	2:E:88:CYS:SG	2.44	0.89
2:C:6:GLN:NE2	2:C:88:CYS:SG	2.44	0.89
2:E:59:PRO:HG2	2:E:61:ARG:HH21	1.50	0.77
1:A:257:THR:HG22	1:A:267:HIS:HD2	1.50	0.75

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	565/655 (86%)	514 (91%)	43 (8%)	8 (1%)	11	46
1	B	552/655 (84%)	499 (90%)	47 (8%)	6 (1%)	14	52
2	C	105/214 (49%)	85 (81%)	20 (19%)	0	100	100
2	E	105/214 (49%)	85 (81%)	20 (19%)	0	100	100
3	D	116/221 (52%)	101 (87%)	15 (13%)	0	100	100

Continued on next page...

*Continued from previous page...*

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	F	116/221 (52%)	101 (87%)	15 (13%)	0	100	100
4	Z	120/125 (96%)	86 (72%)	32 (27%)	2 (2%)	9	42
All	All	1679/2305 (73%)	1471 (88%)	192 (11%)	16 (1%)	20	54

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	Z	59	ILE
1	A	185	GLY
1	B	112	PRO
1	B	499	LEU
1	A	235	GLY

### 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	487/560 (87%)	482 (99%)	5 (1%)	76	88
1	B	477/560 (85%)	469 (98%)	8 (2%)	60	82
2	C	91/189 (48%)	87 (96%)	4 (4%)	28	62
2	E	91/189 (48%)	87 (96%)	4 (4%)	28	62
3	D	102/193 (53%)	95 (93%)	7 (7%)	15	47
3	F	102/193 (53%)	97 (95%)	5 (5%)	25	59
4	Z	100/103 (97%)	99 (99%)	1 (1%)	76	88
All	All	1450/1987 (73%)	1416 (98%)	34 (2%)	53	77

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	D	98	THR
3	D	99	PHE
2	C	56	THR
3	F	15	SER

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
2	E	94	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 21 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	267	HIS
1	A	582	GLN
3	D	5	GLN
1	A	583	HIS
1	A	457	HIS

### 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](#)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
5	NAG	B	1001	1	14,14,15	0.23	0	17,19,21	0.52	0
5	NAG	A	1001	1	14,14,15	0.25	0	17,19,21	0.59	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	B	1001	1	-	4/6/23/26	0/1/1/1
5	NAG	A	1001	1	-	3/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	1001	NAG	O5-C5-C6-O6
5	A	1001	NAG	O5-C5-C6-O6
5	A	1001	NAG	C4-C5-C6-O6
5	B	1001	NAG	C4-C5-C6-O6
5	B	1001	NAG	C1-C2-N2-C7

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.

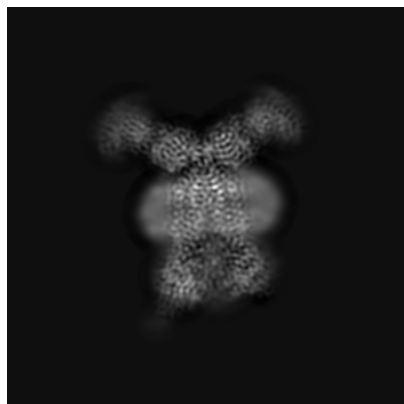
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-17547. These allow visual inspection of the internal detail of the map and identification of artifacts.

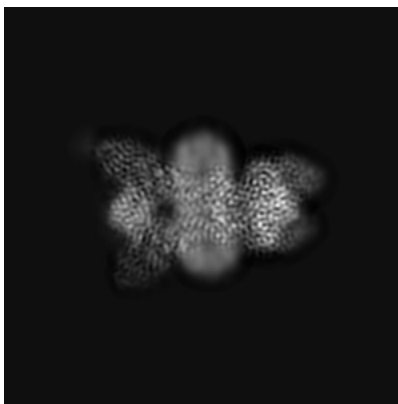
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

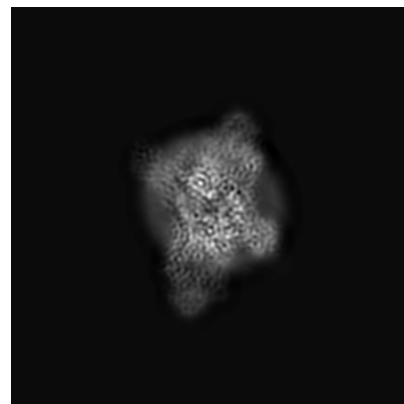
#### 6.1.1 Primary map



X

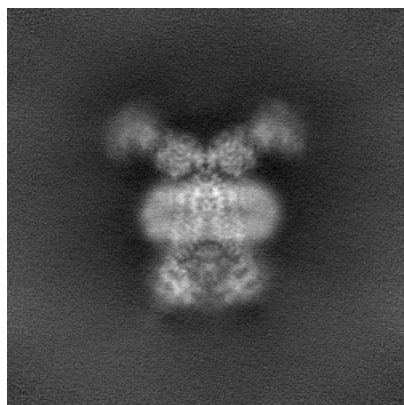


Y

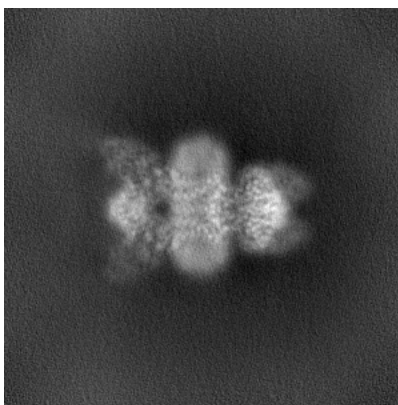


Z

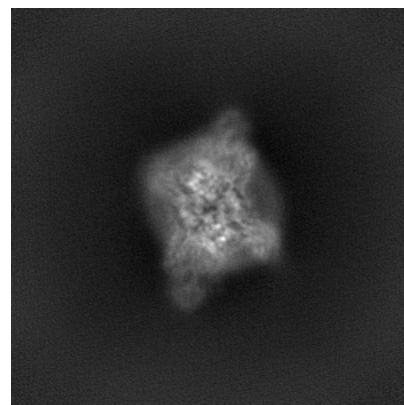
#### 6.1.2 Raw map



X



Y

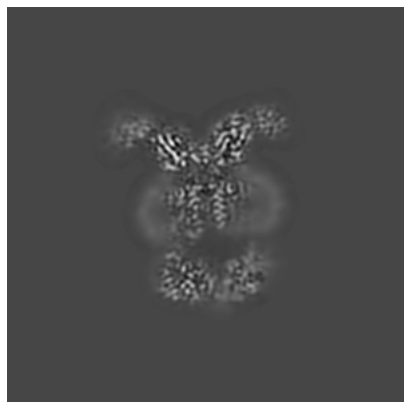


Z

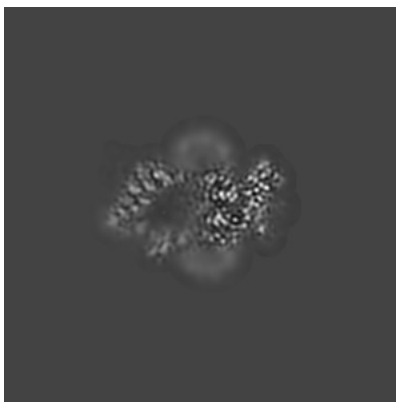
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

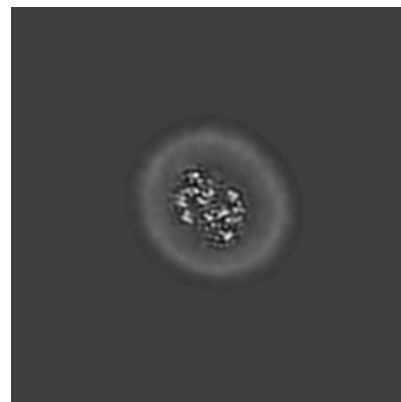
### 6.2.1 Primary map



X Index: 175

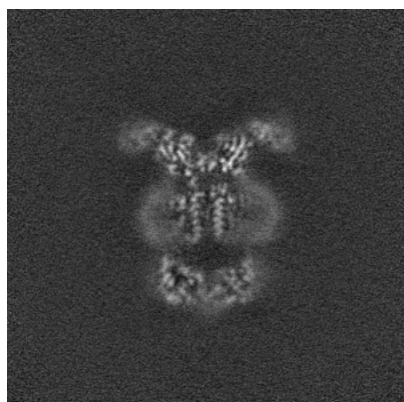


Y Index: 175

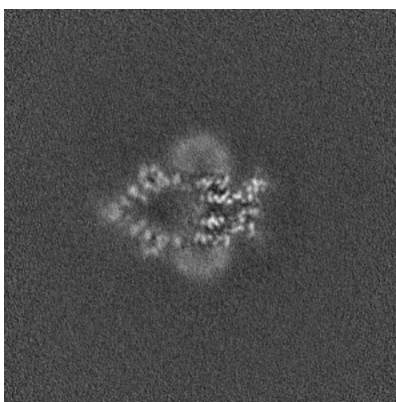


Z Index: 175

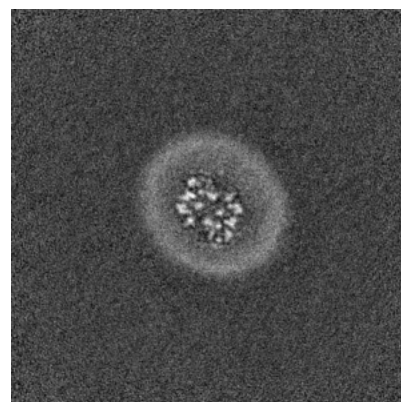
### 6.2.2 Raw map



X Index: 175



Y Index: 175

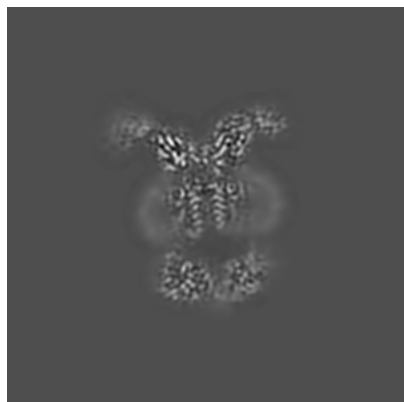


Z Index: 175

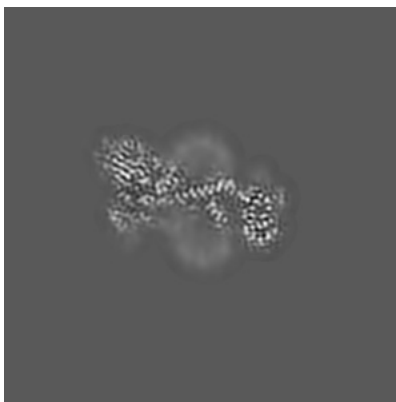
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

### 6.3.1 Primary map



X Index: 174

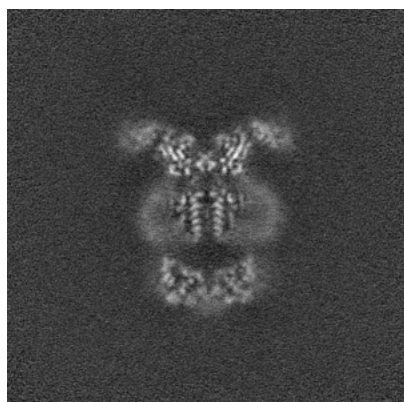


Y Index: 151

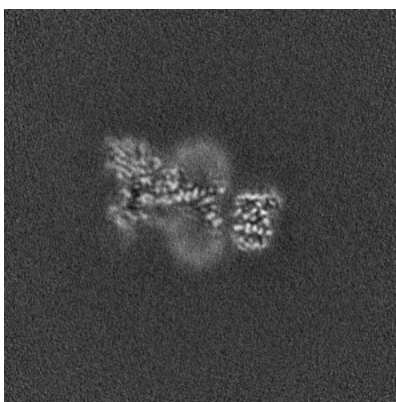


Z Index: 224

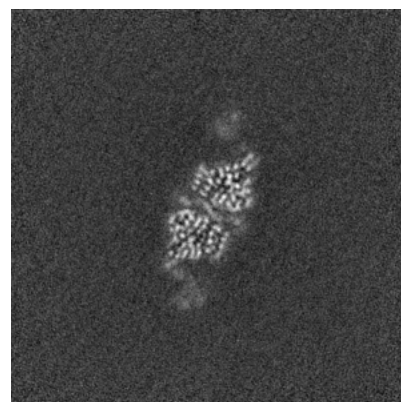
### 6.3.2 Raw map



X Index: 174



Y Index: 148



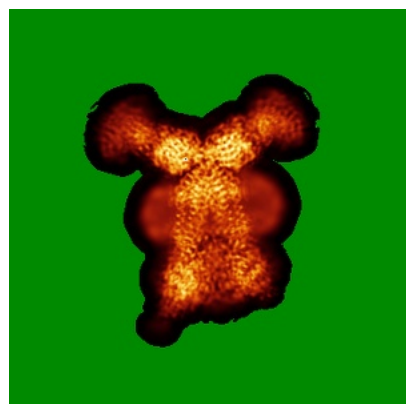
Z Index: 220

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

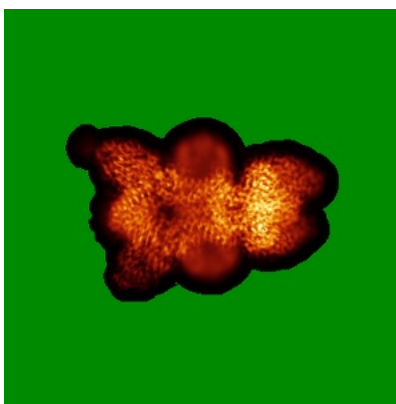


## 6.4 Orthogonal standard-deviation projections (False-color) [i](#)

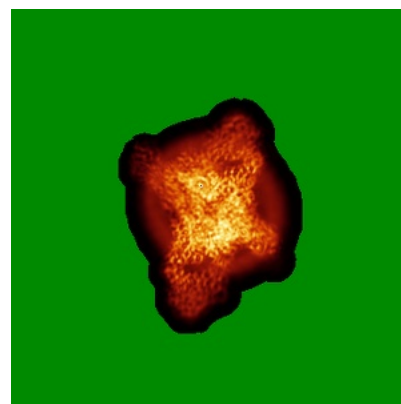
### 6.4.1 Primary map



X

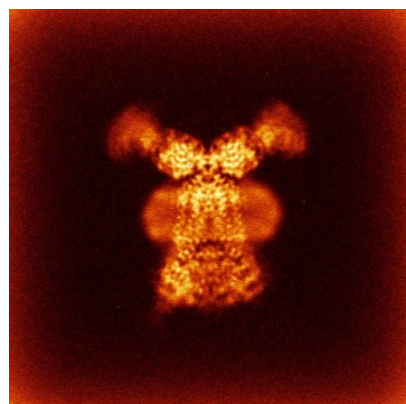


Y

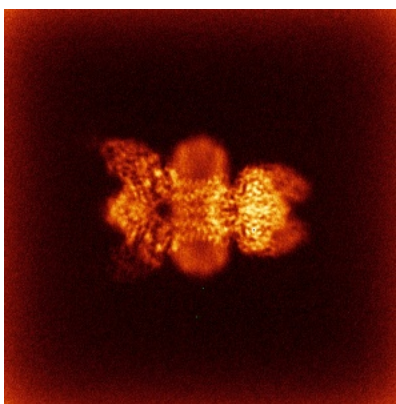


Z

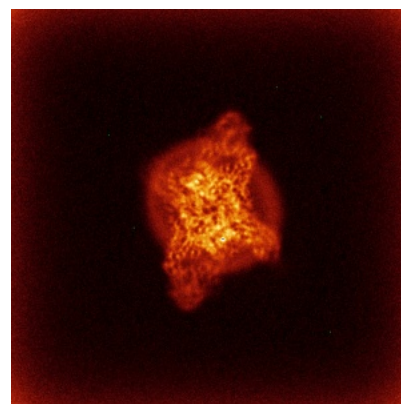
### 6.4.2 Raw map



X



Y

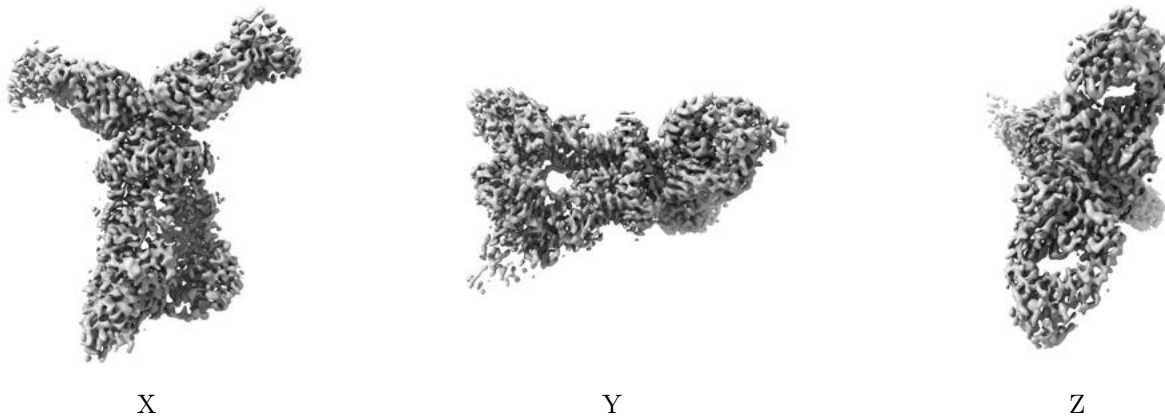


Z

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.

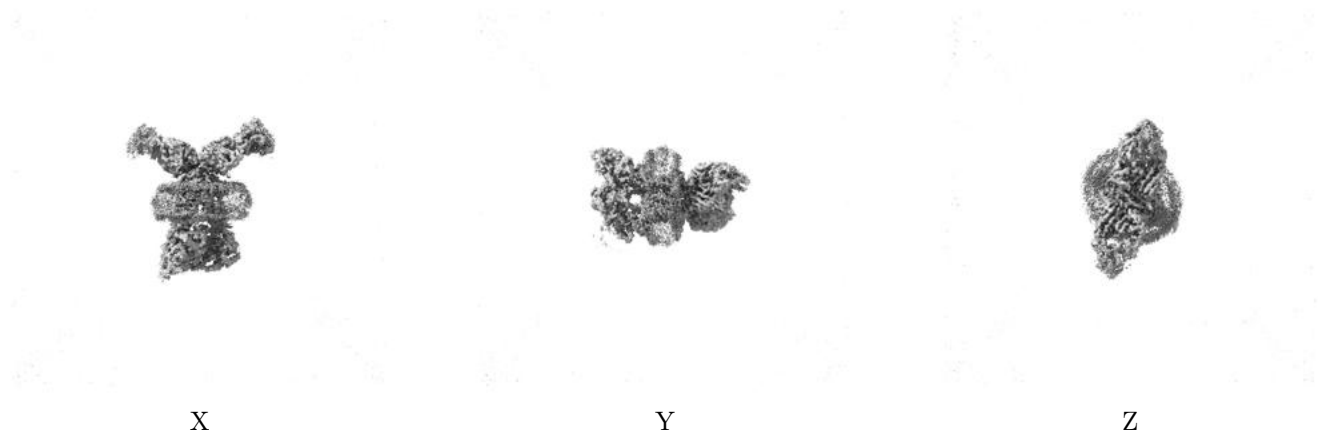
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.5. 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.

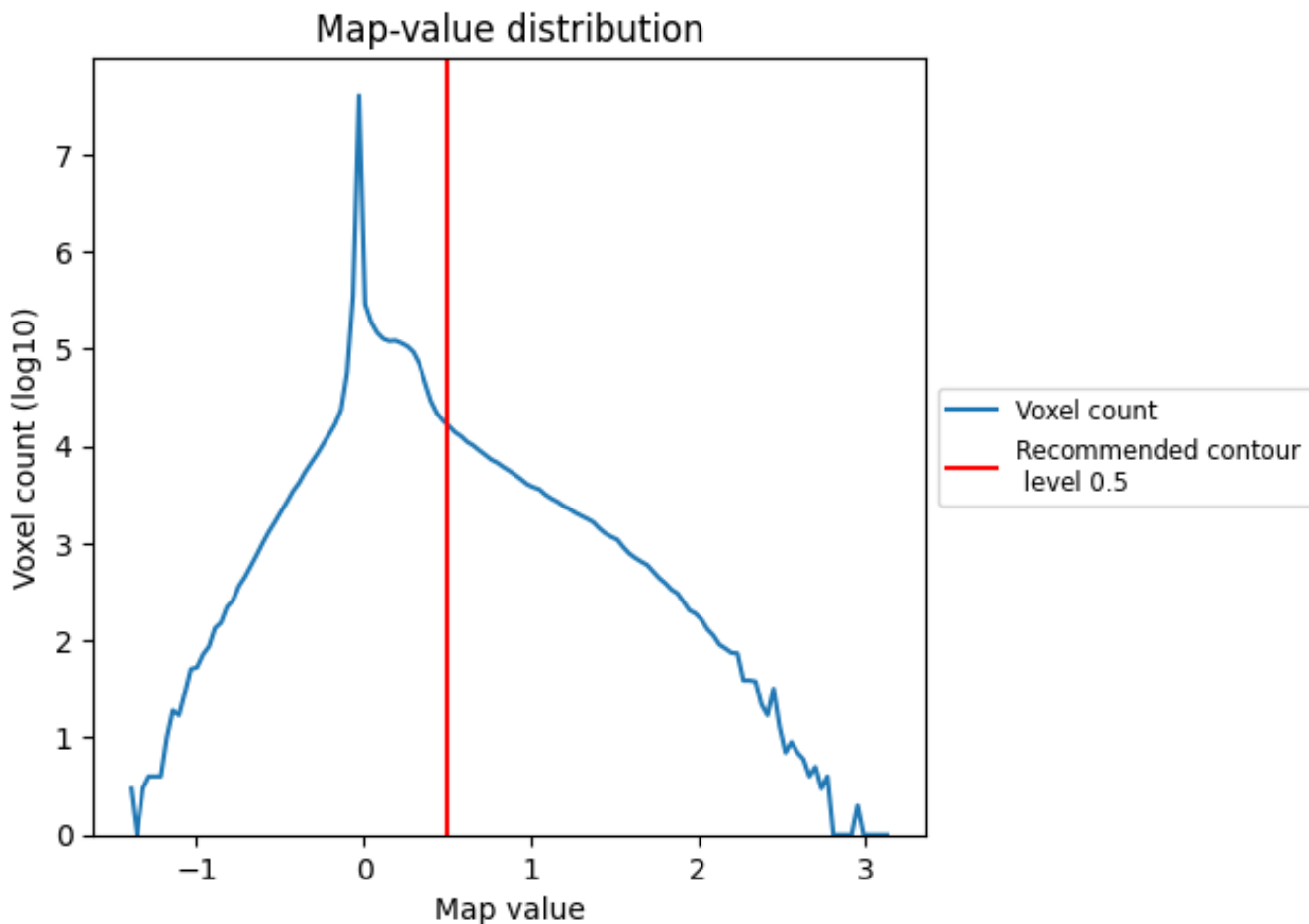
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

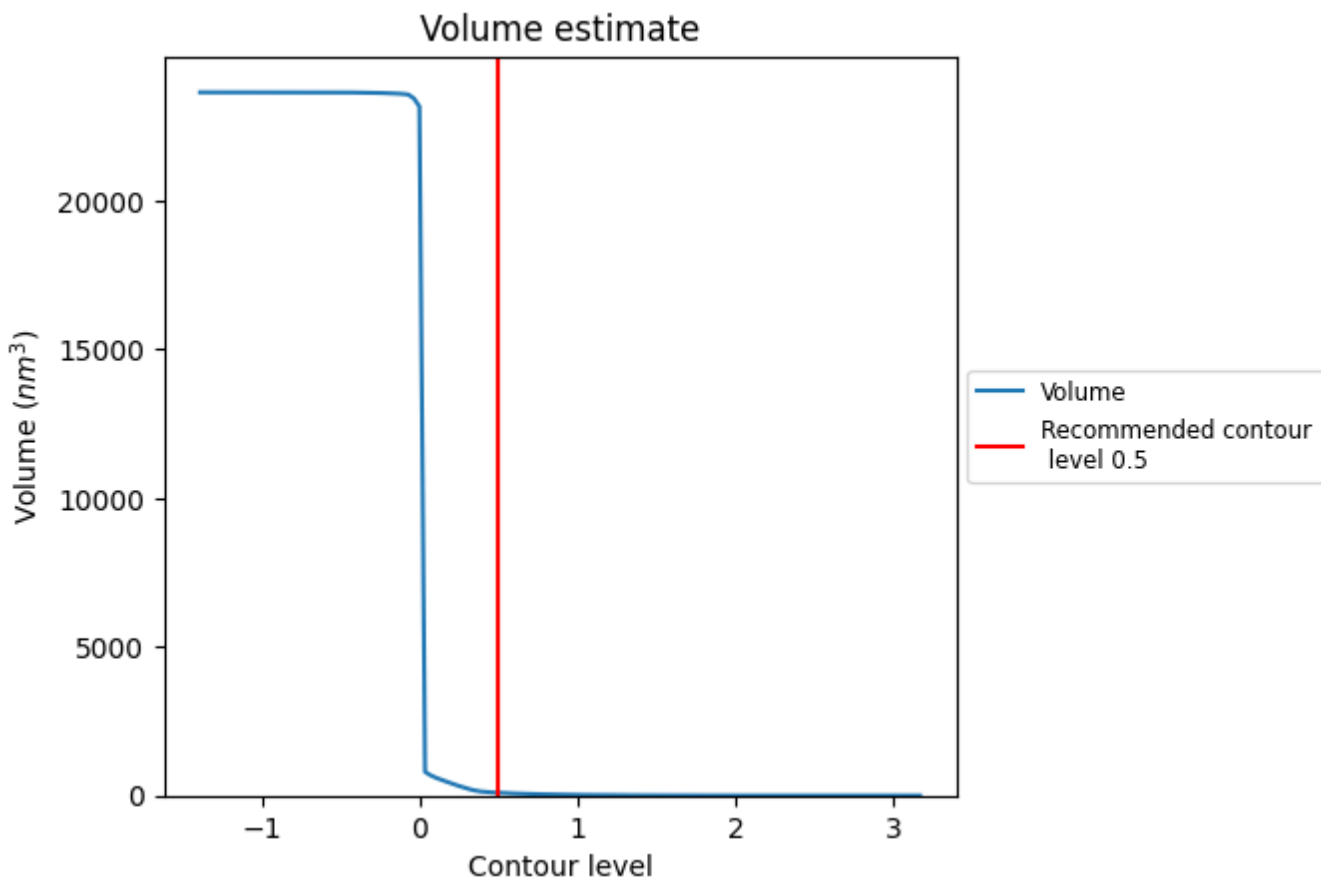
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

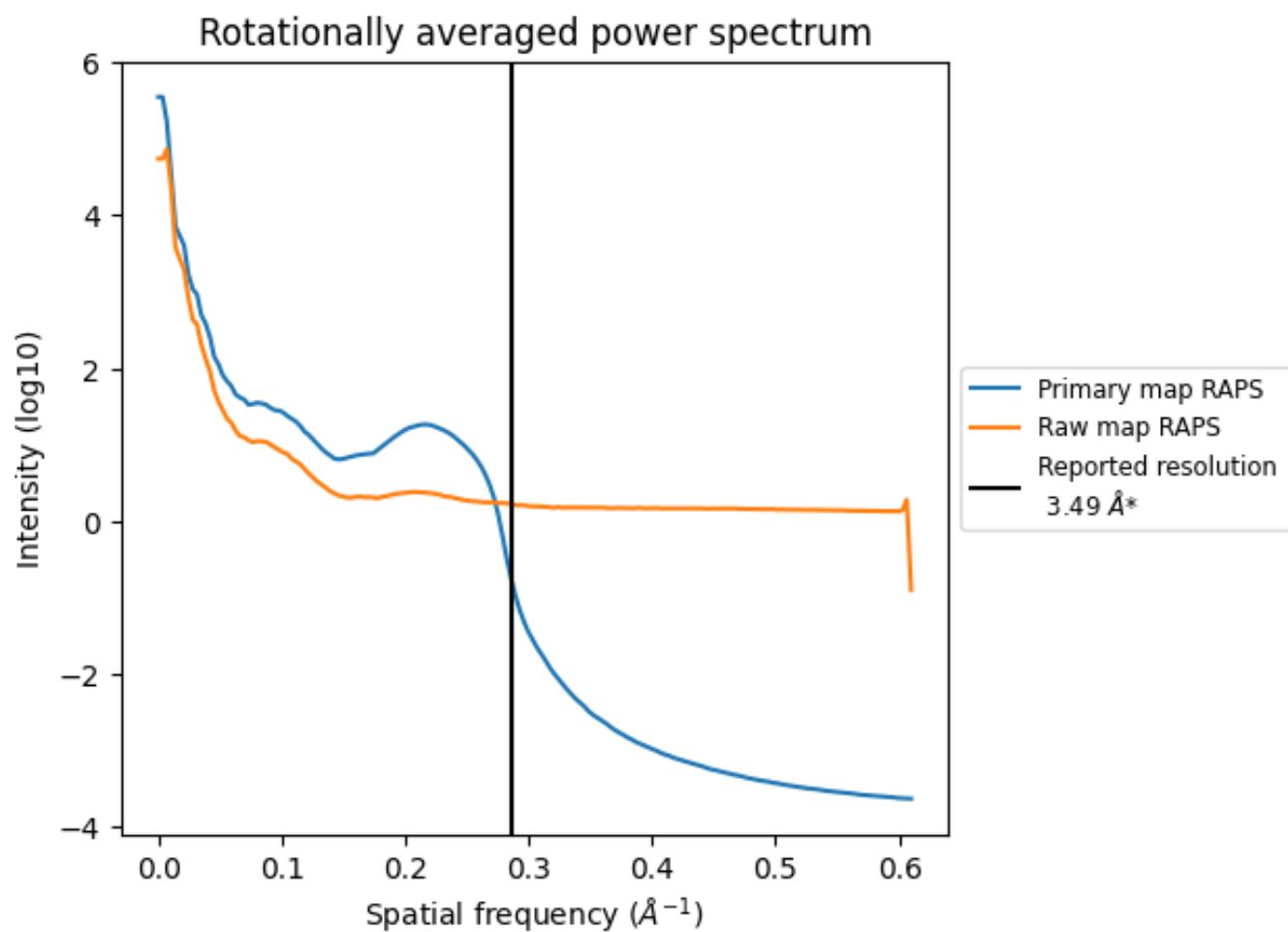
## 7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 92  $\text{nm}^3$ ; this corresponds to an approximate mass of 83 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 [\(i\)](#)

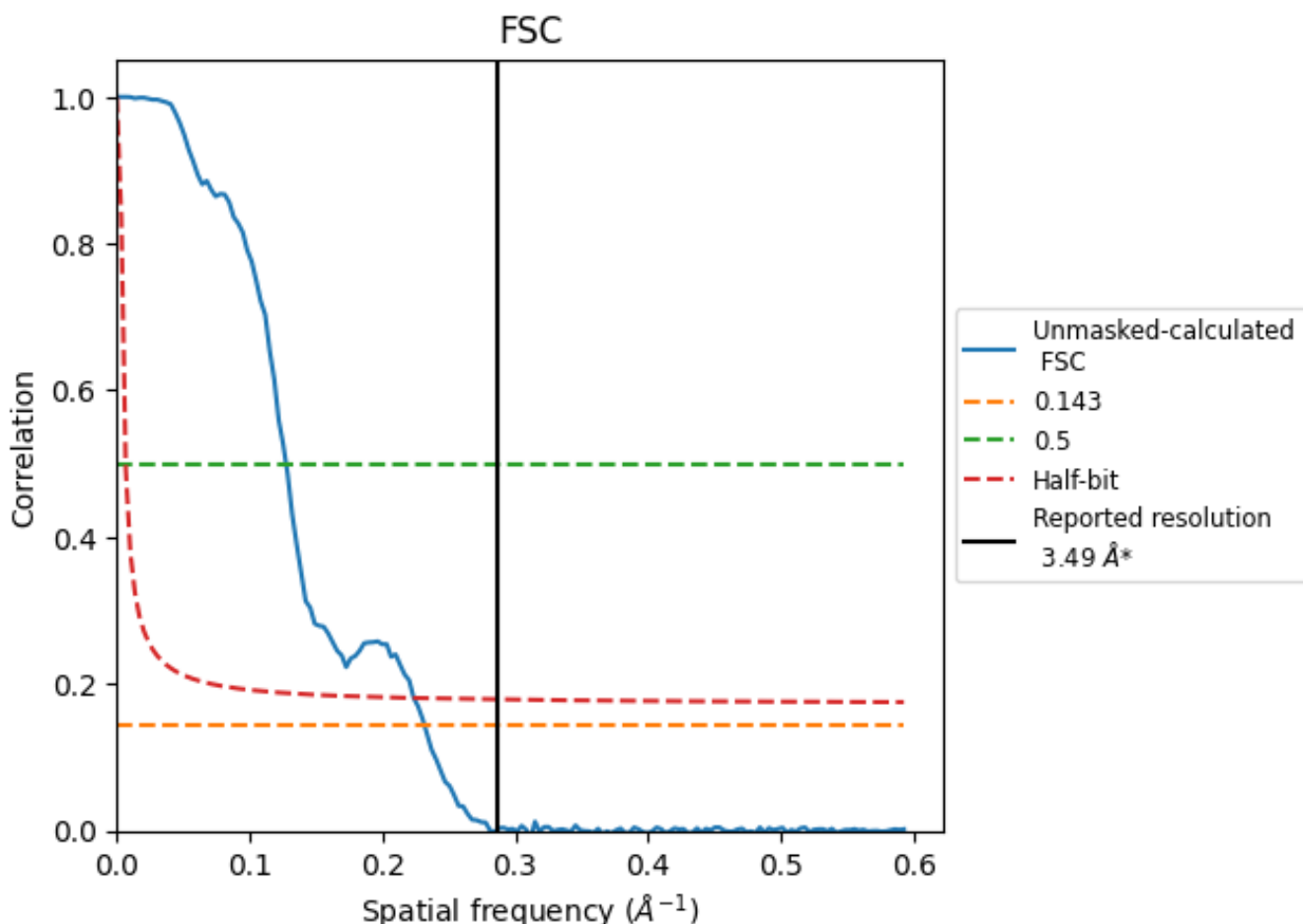


\*Reported resolution corresponds to spatial frequency of  $0.287 \text{ \AA}^{-1}$

## 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 0.287 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

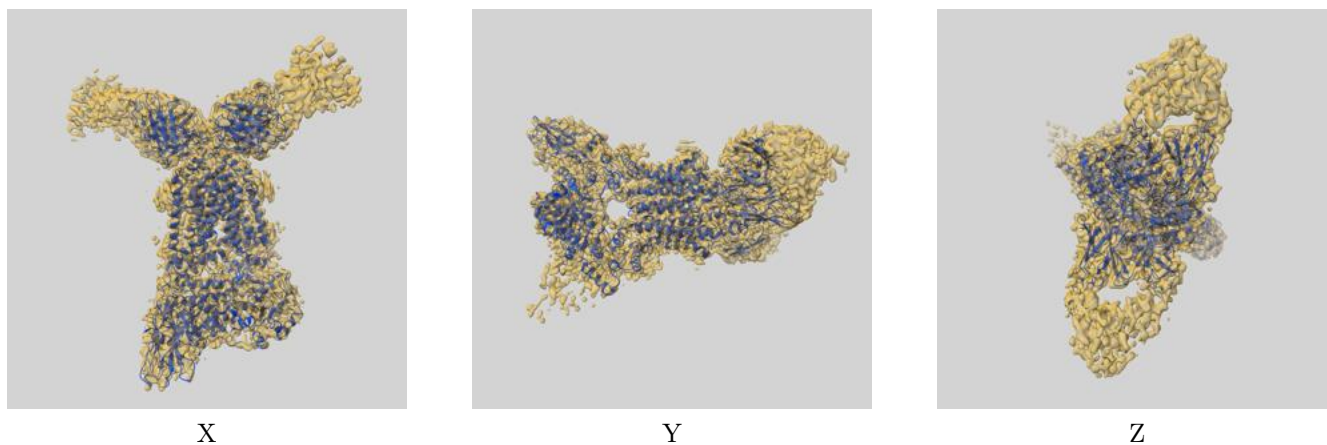
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.49	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.31	7.84	4.47

\*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 4.31 differs from the reported value 3.49 by more than 10 %

## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-17547 and PDB model 8P8J. Per-residue inclusion information can be found in section 3 on page 5.

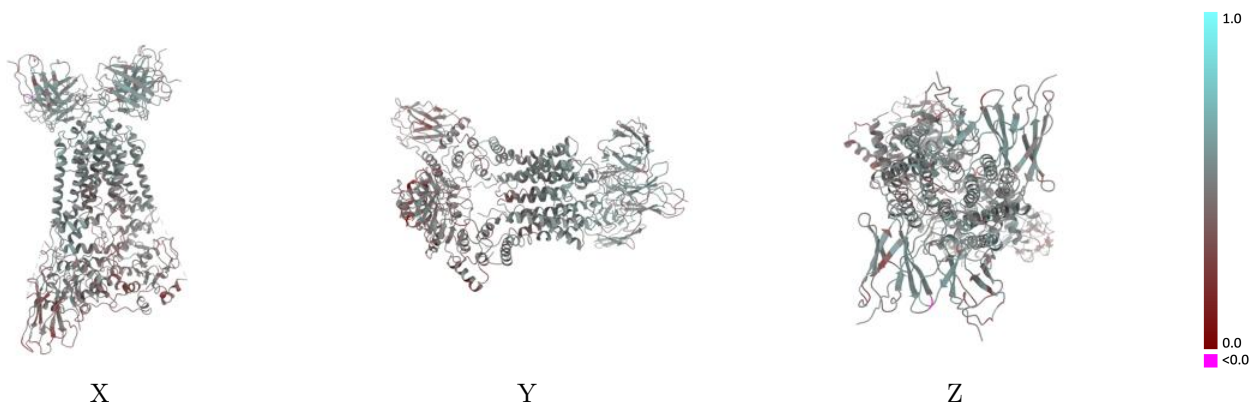
### 9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.5 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.

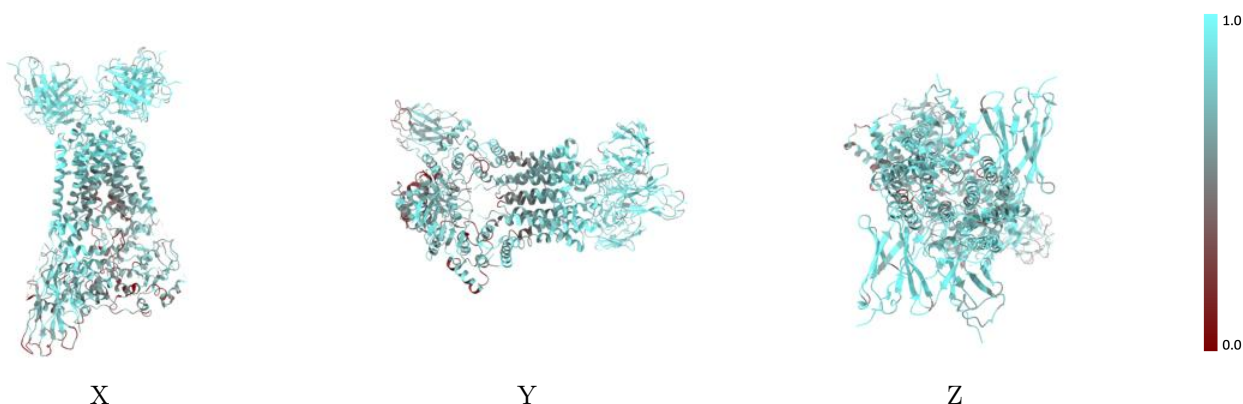


## 9.2 Q-score mapped to coordinate model [i](#)



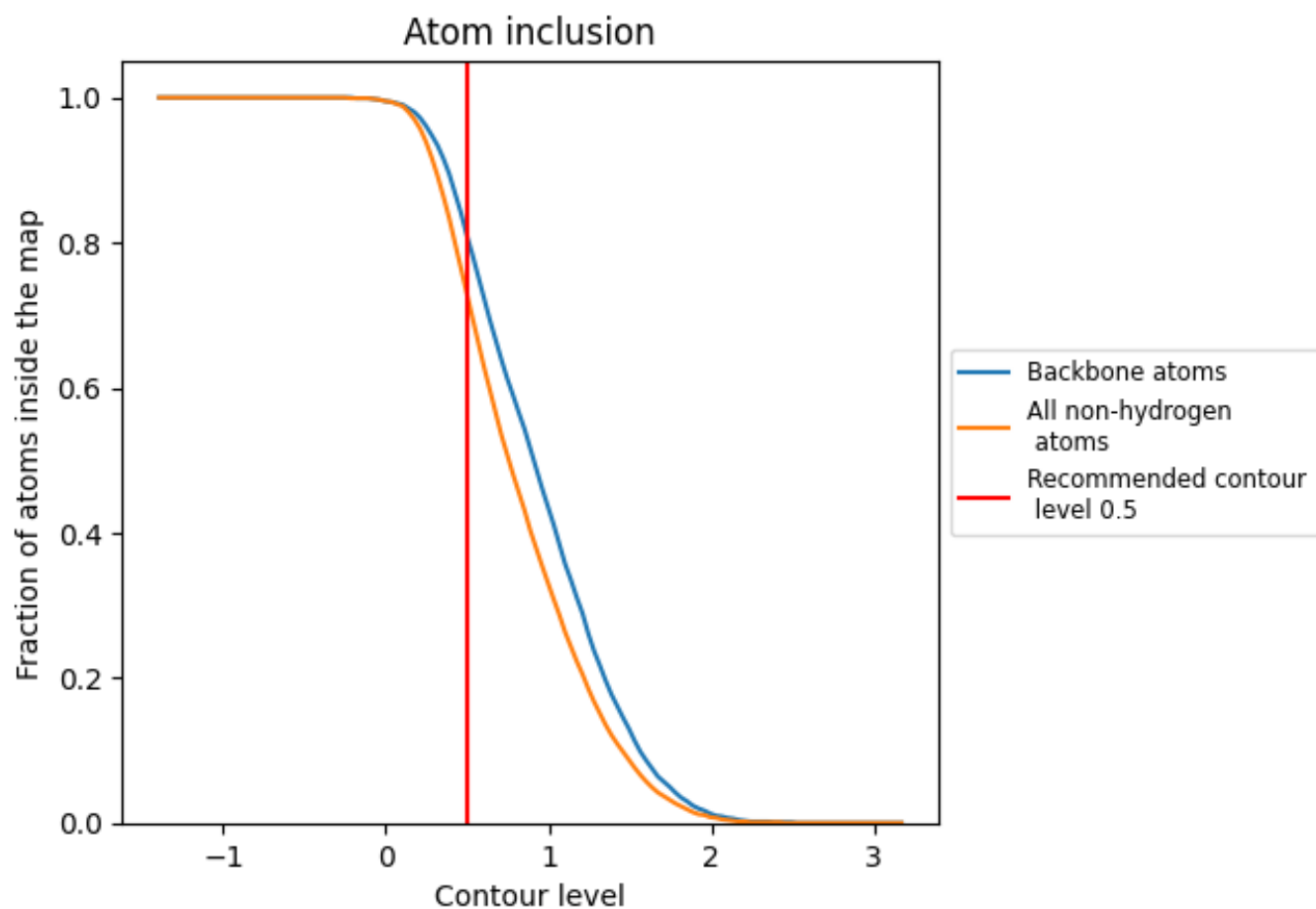
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.5).

















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 81% of all backbone atoms, 73% 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 (0.5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7280	 0.4710
A	 0.7230	 0.4790
B	 0.6700	 0.4520
C	 0.8280	 0.5040
D	 0.8370	 0.5070
E	 0.8080	 0.4950
F	 0.8690	 0.5060
Z	 0.6160	 0.4040

