wwPDB EM Validation Summary Report (i)

Mar 8, 2023 – 04:11 PM JST

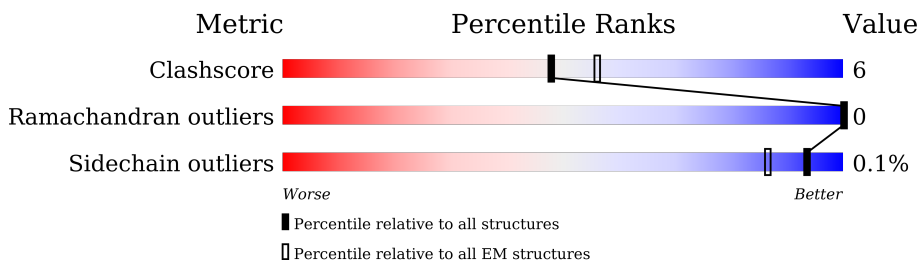|		
PDB ID	:	8HJ0
EMDB ID	:	EMD-33482
Title	:	GPR21(m5) and G15 complex
Authors	:	Chen, B.; Lin, X.
Deposited on	:	2022-11-22
Resolution	:	3.12 Å(reported)

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 3.12 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	Percentile Ranks	Value
Clashscore		6
Ramachandran outliers		0
Sidechain outliers		0.1%

Worse — *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	249	82% · 14% ·
2	B	340	79% · 20% ·
3	G	96	11% · 54% · 5% · 41%
4	N	149	67% · 17% · 15%
5	R	336	11% · 70% · 14% · 16%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 8260 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 Guanine nucleotide-binding protein G(s) subunit alpha isoforms short.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	239	1966	1237	354	369	6	0	0

There are 37 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	49	ASP	GLY	engineered mutation	UNP P63092
A	50	ASN	GLU	engineered mutation	UNP P63092
A	196	GLY	-	linker	UNP P63092
A	197	GLY	-	linker	UNP P63092
A	198	SER	-	linker	UNP P63092
A	199	GLY	-	linker	UNP P63092
A	200	GLY	-	linker	UNP P63092
A	201	SER	-	linker	UNP P63092
A	202	GLY	-	linker	UNP P63092
A	203	GLY	-	linker	UNP P63092
A	249	ASP	ALA	engineered mutation	UNP P63092
A	252	ASP	SER	engineered mutation	UNP P63092
A	?	-	ASN	deletion	UNP P63092
A	?	-	MET	deletion	UNP P63092
A	?	-	VAL	deletion	UNP P63092
A	?	-	ILE	deletion	UNP P63092
A	?	-	ARG	deletion	UNP P63092
A	?	-	GLU	deletion	UNP P63092
A	?	-	ASP	deletion	UNP P63092
A	?	-	ASN	deletion	UNP P63092
A	?	-	GLN	deletion	UNP P63092
A	?	-	THR	deletion	UNP P63092
A	362	ALA	ILE	engineered mutation	UNP P63092
A	365	ILE	VAL	engineered mutation	UNP P63092
A	372	SER	-	expression tag	UNP P63092
A	373	VAL	-	expression tag	UNP P63092
A	374	LEU	-	expression tag	UNP P63092

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Chain	Residue	Modelled	Actual	Comment	Reference
A	375	ALA	-	expression tag	UNP P63092
A	376	ARG	-	expression tag	UNP P63092
A	377	TYR	-	expression tag	UNP P63092
A	378	LEU	-	expression tag	UNP P63092
A	379	ASP	-	expression tag	UNP P63092
A	380	GLU	-	expression tag	UNP P63092
A	381	ILE	-	expression tag	UNP P63092
A	382	ASN	-	expression tag	UNP P63092
A	383	LEU	-	expression tag	UNP P63092
A	384	LEU	-	expression tag	UNP P63092

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	338	2600	1604	467	508	21	0	0

- Molecule 3 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	G	57	436	273	77	83	3	0	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
G	-24	HIS	-	expression tag	UNP P59768
G	-23	HIS	-	expression tag	UNP P59768
G	-22	HIS	-	expression tag	UNP P59768
G	-21	HIS	-	expression tag	UNP P59768
G	-20	HIS	-	expression tag	UNP P59768
G	-19	HIS	-	expression tag	UNP P59768
G	-18	GLY	-	expression tag	UNP P59768
G	-17	GLY	-	expression tag	UNP P59768
G	-16	GLY	-	expression tag	UNP P59768
G	-15	SER	-	expression tag	UNP P59768
G	-14	ASP	-	expression tag	UNP P59768
G	-13	SER	-	expression tag	UNP P59768
G	-12	LEU	-	expression tag	UNP P59768
G	-11	GLU	-	expression tag	UNP P59768

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-10	PHE	-	expression tag	UNP P59768
G	-9	ILE	-	expression tag	UNP P59768
G	-8	ALA	-	expression tag	UNP P59768
G	-7	SER	-	expression tag	UNP P59768
G	-6	LYS	-	expression tag	UNP P59768
G	-5	LEU	-	expression tag	UNP P59768
G	-4	ALA	-	expression tag	UNP P59768
G	-3	GLY	-	expression tag	UNP P59768
G	-2	GLY	-	expression tag	UNP P59768
G	-1	GLY	-	expression tag	UNP P59768
G	0	SER	-	expression tag	UNP P59768
G	68	SER	CYS	engineered mutation	UNP P59768

- Molecule 4 is a protein called Nb35.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	N	126	961	599	168	188	6	0	0

- Molecule 5 is a protein called Probable G-protein coupled receptor 21.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	R	283	2297	1537	361	383	16	0	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	118	TRP	ALA	conflict	UNP Q99679
R	301	PRO	CYS	conflict	UNP Q99679
R	305	ALA	SER	conflict	UNP Q99679
R	308	ASP	ASN	conflict	UNP Q99679
R	310	THR	VAL	conflict	UNP Q99679
R	328	GLU	-	expression tag	UNP Q99679
R	329	PHE	-	expression tag	UNP Q99679
R	330	LEU	-	expression tag	UNP Q99679
R	331	GLU	-	expression tag	UNP Q99679
R	332	VAL	-	expression tag	UNP Q99679
R	333	LEU	-	expression tag	UNP Q99679
R	334	PHE	-	expression tag	UNP Q99679
R	335	GLN	-	expression tag	UNP Q99679
R	336	GLY	-	expression tag	UNP Q99679

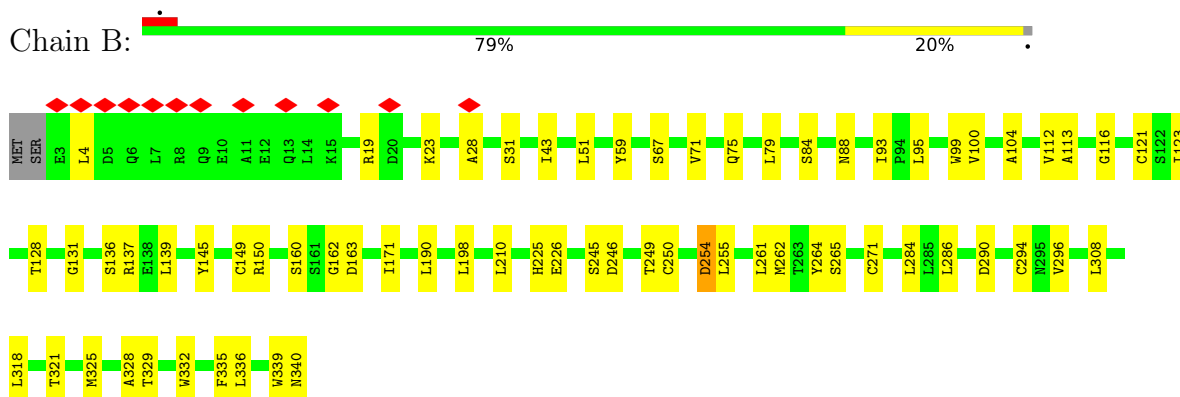# 3   Residue-property plots ⓘ

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: Guanine nucleotide-binding protein G(s) subunit alpha isoforms short

Chain A:

82%   14%

GLY ASN SER LYS T9 E10 D11 Q12 R20 T40 H41 R42 L43 L44 L45 K53 V57 L63 HIS GLY GLY SER GLY GLY S201 F208 E209 H220 M221 F222 D223 R228 D229 E230 R231 R232 K233 Q257 N261 N268 N269 R270 W271 L272 I275 V291

I298 F302 P316 E317 E320 D321 P322 R323 V324 T325 K328 L336 S339 G343 D344 H352 F353 T354 C355 A356 N361 D368 E380 L384
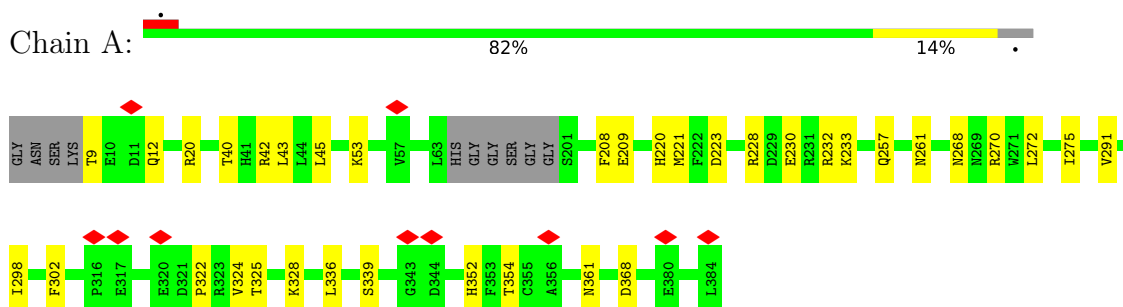
- Molecule 2: Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1

Chain B:

79%   20%

MET SER E3 L4 D5 Q6 L7 R8 Q9 E10 A11 E12 Q13 L14 K15 R19 D20 K23 A28 S31 I43 L51 Y59 S67 V71 Q75 L79 S84 N88 I93 P94 L95 W99 V100 A104 V112 A113 G116 C121 S122 I123

T128 G131 S136 R137 E138 L139 Y145 C149 R150 S160 G161 G162 D163 I171 L190 L198 L210 H225 E226 S245 D246 T249 C250 D254 L255 L261 M262 T263 Y264 S265 C271 L284 L285 L286 D290 C294 N295 V296 L308

L318 T321 M325 A328 T329 W332 F335 L336 W339 N340

- Molecule 3: Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2

Chain G:

11%

54%   5%   41%

HIS HIS HIS HIS HIS HIS GLY GLY GLY SER ASP SER LEU GLU PHE ILE ALA SER LYS LEU ALA GLY GLY GLY SER MET ALA SER ASN ASN T6 A7 S8 I9 A10 Q11 A12 R13 K14 L15 V16 E17 Q18 L19 K20 K29 V30 S31 F61 R62 GLU LYS LYS PHE PHE SER ALA ILE

LEU

- Molecule 4: Nb35

Chain N:

67%   17%   15%

MET LYS TYR LEU LEU PRO THR ALA ALA ALA GLY LEU LEU LEU LEU ALA ALA GLN PRO ALA MET ALA MET Q1 S7 L11 S17 S21 R38 Q39 A40 K43 W47 V48 Q53 Y60 V64 K65 F68 I69 I70 S71 R72 Y80 L81 Q82 M83

V93 R98 C99 T104 R105 D106 V110 T111 S112 Y115 V126

• Molecule 5: Probable G-protein coupled receptor 21

11%

Chain R:

70%   14%   16%

MET ASN SER THR LEU ASP GLY ASN GLN SER SER HIS PRO PHE CYS LEU LEU ALA PHE GLY TYR LEU GLU THR V25 N26 F27 C28 L29 V32 L33 I34 I35 V36 F37 L38 I42 G45 I48 V49 I50 F51 V52 F53 H54 C55 A56 P57 L58 L59 N60 H61 H62 T63 Y66

Q69 D75 L76 F77 V80 V83 V84 P85 S86 L87 L90 H91 H92 P93 L94 E97 C102 Q103 S114 V115 S116 M117 W118 S119 L120 A121 C122 I125 D126 L146 C149 I153 V160 H167 V177 F178 Q179 W180 S189 V196 L199 Y200

R228 R231 S234 GLN SER GLY GLU THR GLY GLU VAL GLN ALA CYS PRO ASP LYS ARG TYR ALA M252 T258 Y271 E275 S276 G279 H280 S281 F287 S297 F298 A305 L306 S307 D308 S309 T310 F311 Q312 R313 G314 A321 T324 SER CYS ALA GLU PHE

LEU GLU VAL LEU PHE GLN GLY

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	119479	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 $(e^-/\text{Å}^2)$	60	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.187	Depositor
Minimum map value	-0.142	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.015	Depositor
Map size (Å)	199.68, 199.68, 199.68	wwPDB
Map dimensions	192, 192, 192	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.04, 1.04, 1.04	Depositor

5   Model quality ⓘ

5.1   Standard geometry ⓘ

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	0.30	0/2002	0.52	0/2695
2	B	0.33	0/2647	0.68	1/3589 (0.0%)
3	G	0.29	0/442	0.51	0/597
4	N	0.34	0/981	0.63	0/1329
5	R	0.33	0/2371	0.61	2/3239 (0.1%)
All	All	0.32	0/8443	0.61	3/11449 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	R	126	ASP	CB-CG-OD1	9.06	126.45	118.30
2	B	254	ASP	CB-CG-OD2	6.68	124.31	118.30
5	R	146	LEU	CA-CB-CG	5.23	127.33	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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	1966	0	1940	21	0
2	B	2600	0	2505	42	0
3	G	436	0	448	4	0
4	N	961	0	928	17	0
5	R	2297	0	2299	27	0

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WORLDWIDE
wwPDB
PROTEIN DATA BANK

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	8260	0	8120	103	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 6.

The worst 5 of 103 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)
2:B:250:CYS:HB2	2:B:264:TYR:HB2	1.73	0.69
1:A:208:PHE:HB3	1:A:223:ASP:HB3	1.76	0.66
2:B:67:SER:HB2	2:B:321:THR:HB	1.79	0.65
2:B:294:CYS:HB2	2:B:308:LEU:HB2	1.82	0.62
4:N:98:ARG:NH1	4:N:99:CYS:O	2.33	0.62

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	235/249 (94%)	224 (95%)	11 (5%)	0	100	100
2	B	336/340 (99%)	321 (96%)	15 (4%)	0	100	100
3	G	55/96 (57%)	54 (98%)	1 (2%)	0	100	100
4	N	124/149 (83%)	119 (96%)	5 (4%)	0	100	100
5	R	279/336 (83%)	264 (95%)	15 (5%)	0	100	100
All	All	1029/1170 (88%)	982 (95%)	47 (5%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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	213/218 (98%)	212 (100%)	1 (0%)	88	94
2	B	281/283 (99%)	281 (100%)	0	100	100
3	G	46/75 (61%)	46 (100%)	0	100	100
4	N	104/119 (87%)	104 (100%)	0	100	100
5	R	259/304 (85%)	259 (100%)	0	100	100
All	All	903/999 (90%)	902 (100%)	1 (0%)	93	98

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

Mol	Chain	Res	Type
1	A	270	ARG

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6   Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-33482. 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 ⓘ
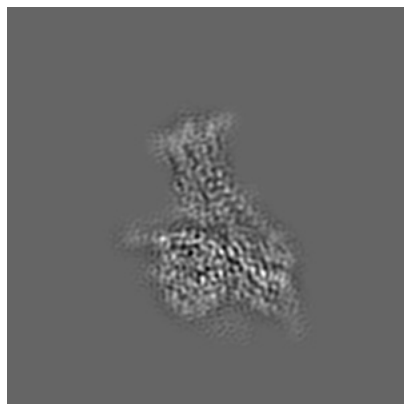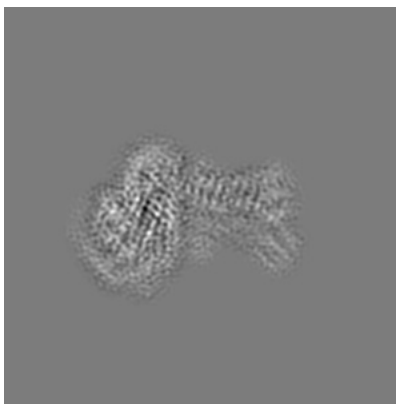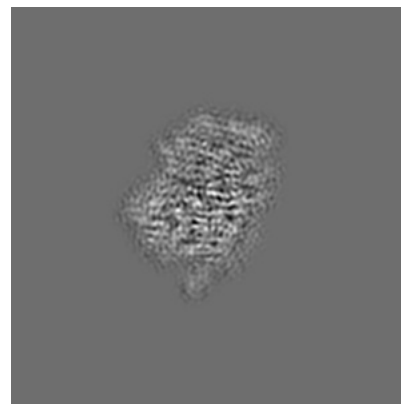
6.1.1   Primary map

| X | Y | Z |

6.1.2   Raw map

| X | Y | Z |
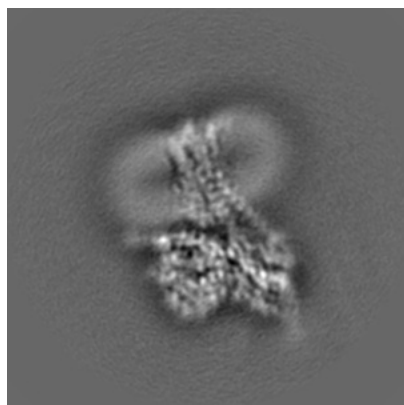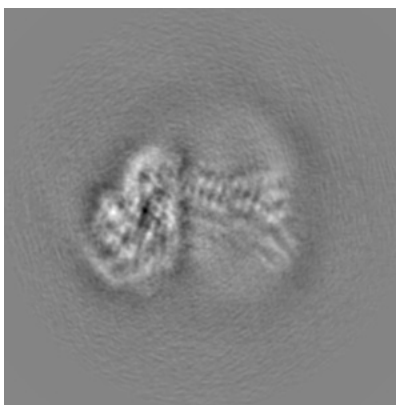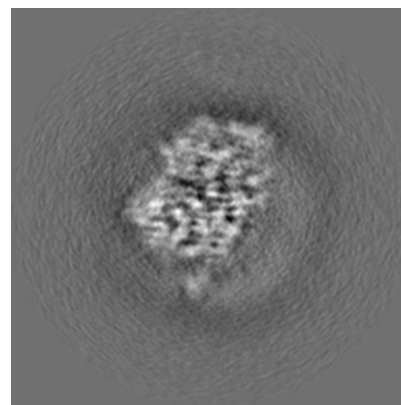
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map
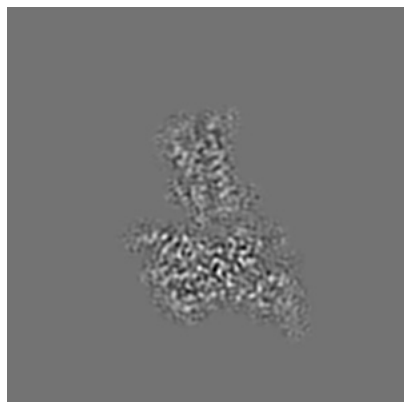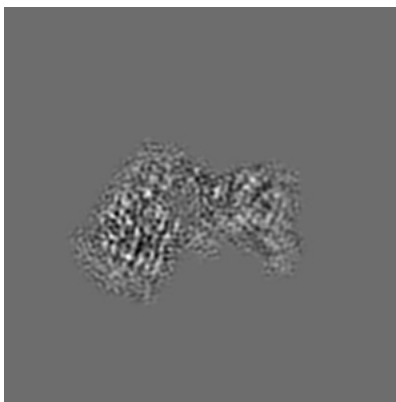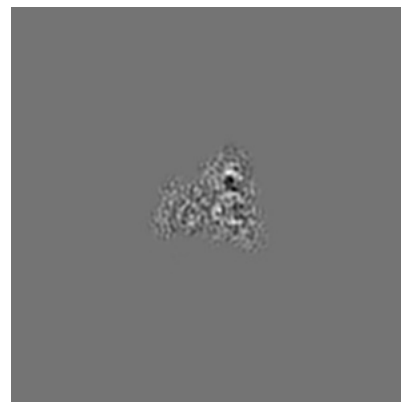
| X Index: 96 | Y Index: 96 | Z Index: 96 |

6.2.2 Raw map
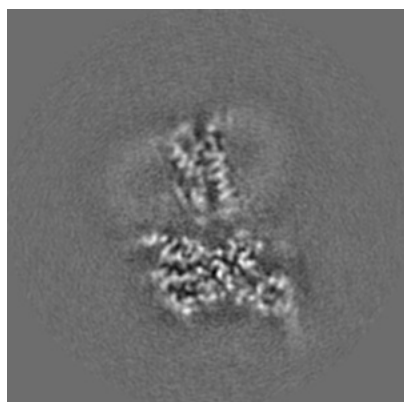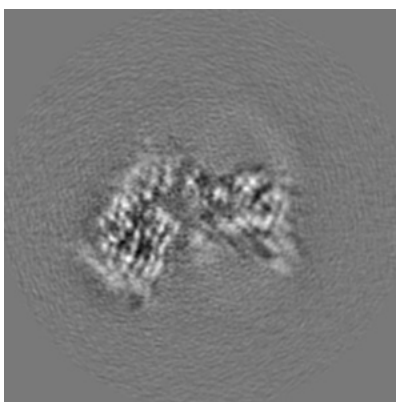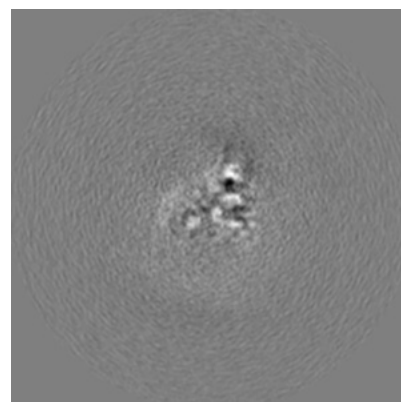
| X Index: 96 | Y Index: 96 | Z Index: 96 |

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

6.3   Largest variance slices (i)

6.3.1   Primary map
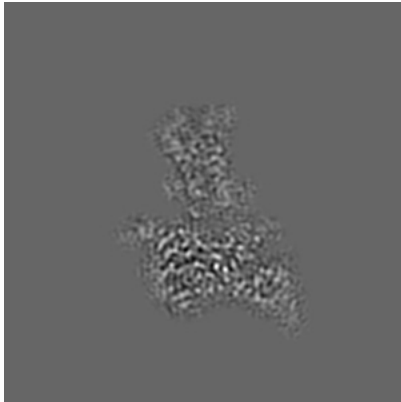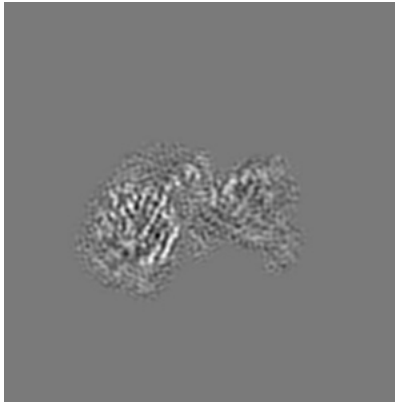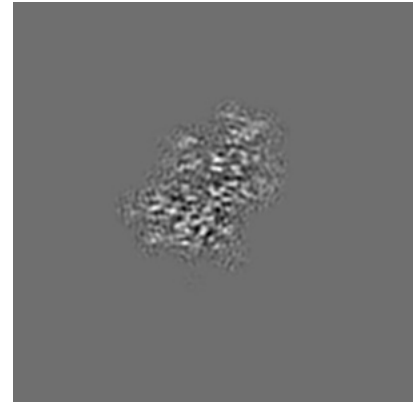
X Index: 95   Y Index: 93   Z Index: 70

6.3.2   Raw map
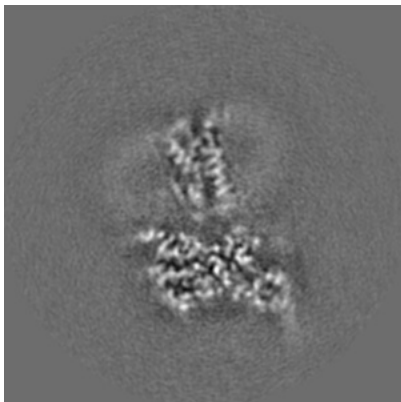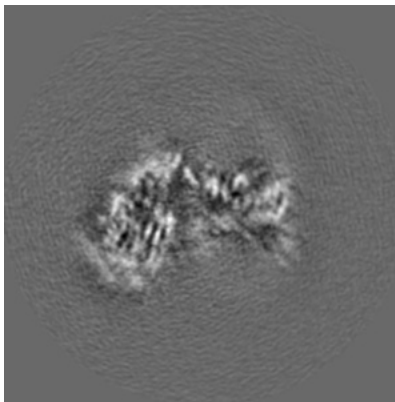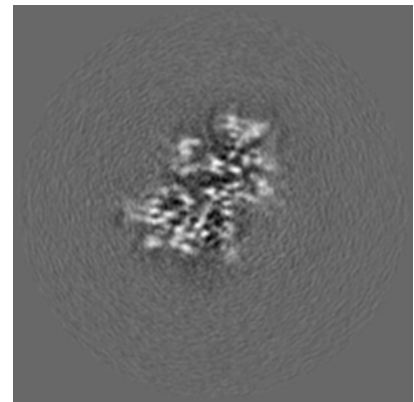
X Index: 96   Y Index: 98   Z Index: 69

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

| X | Y | Z |
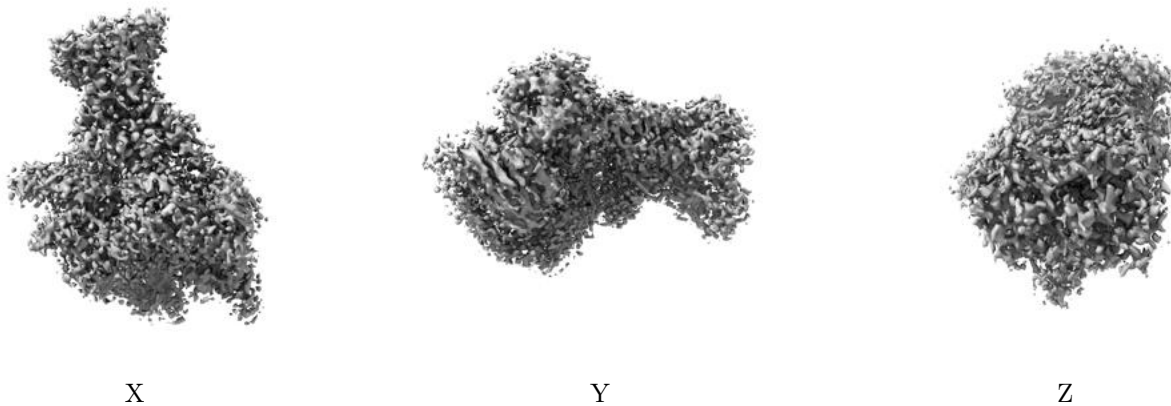
The images above show the 3D surface view of the map at the recommended contour level 0.015. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.4.2 Raw map

| X | Y | Z |
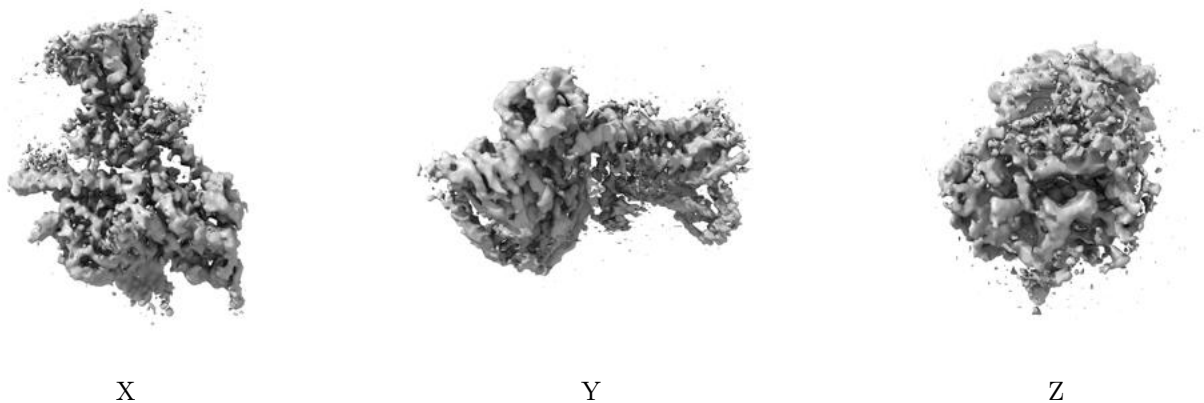
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.5 Mask visualisation (i)

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

7   Map analysis ⓘ

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

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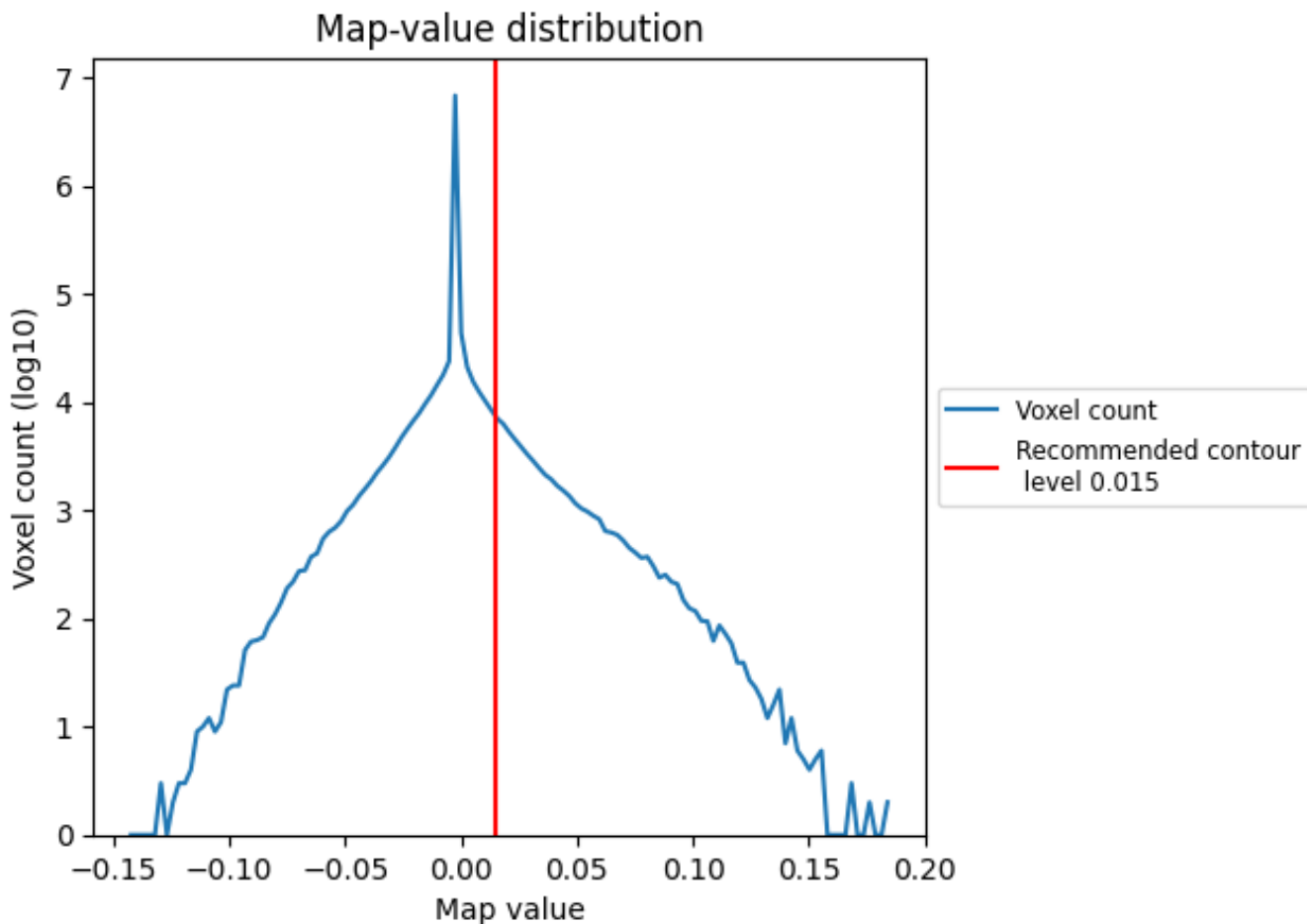
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate ⓘ
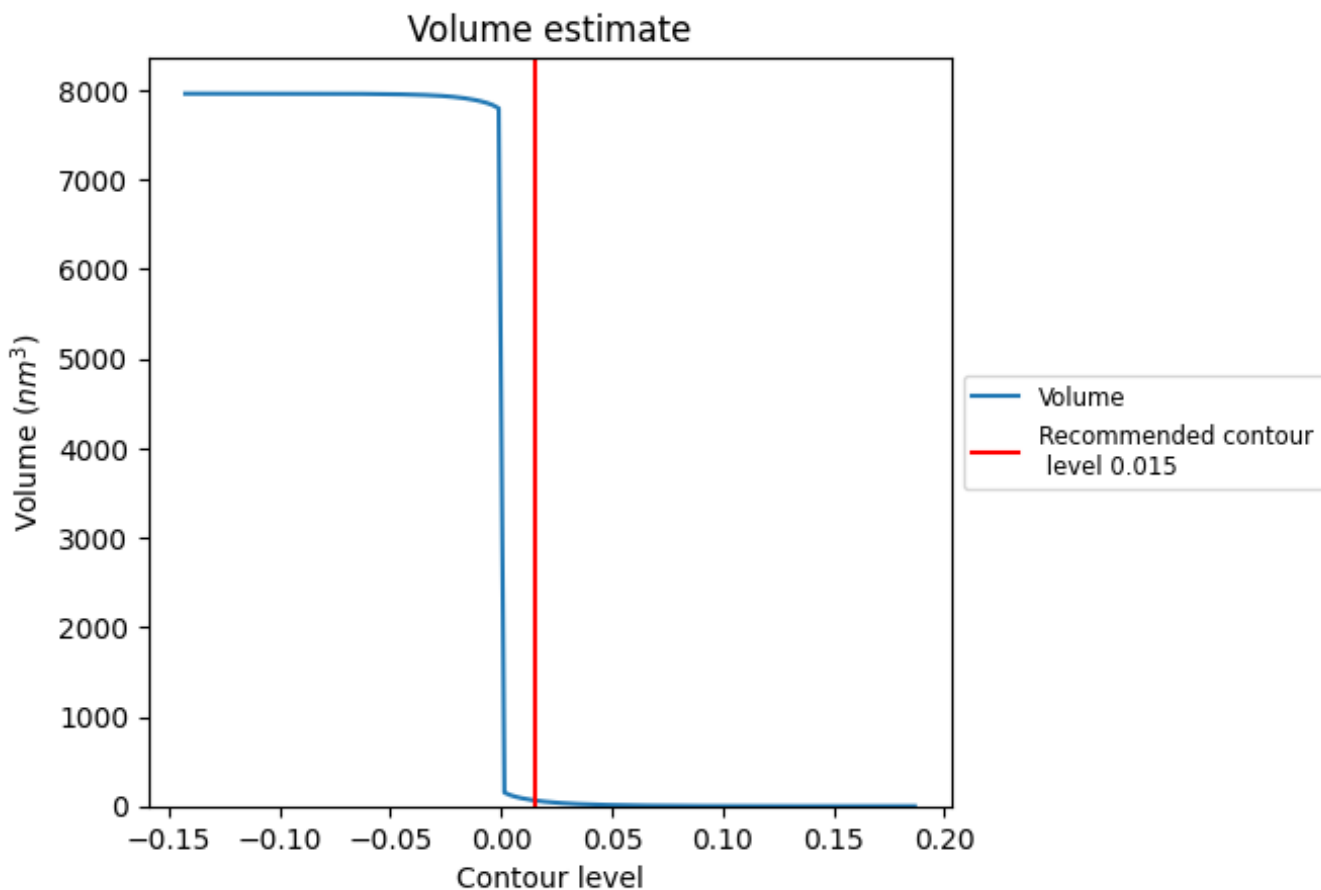
The volume at the recommended contour level is 64 nm^3; this corresponds to an approximate mass of 58 kDa.

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 ⓘ
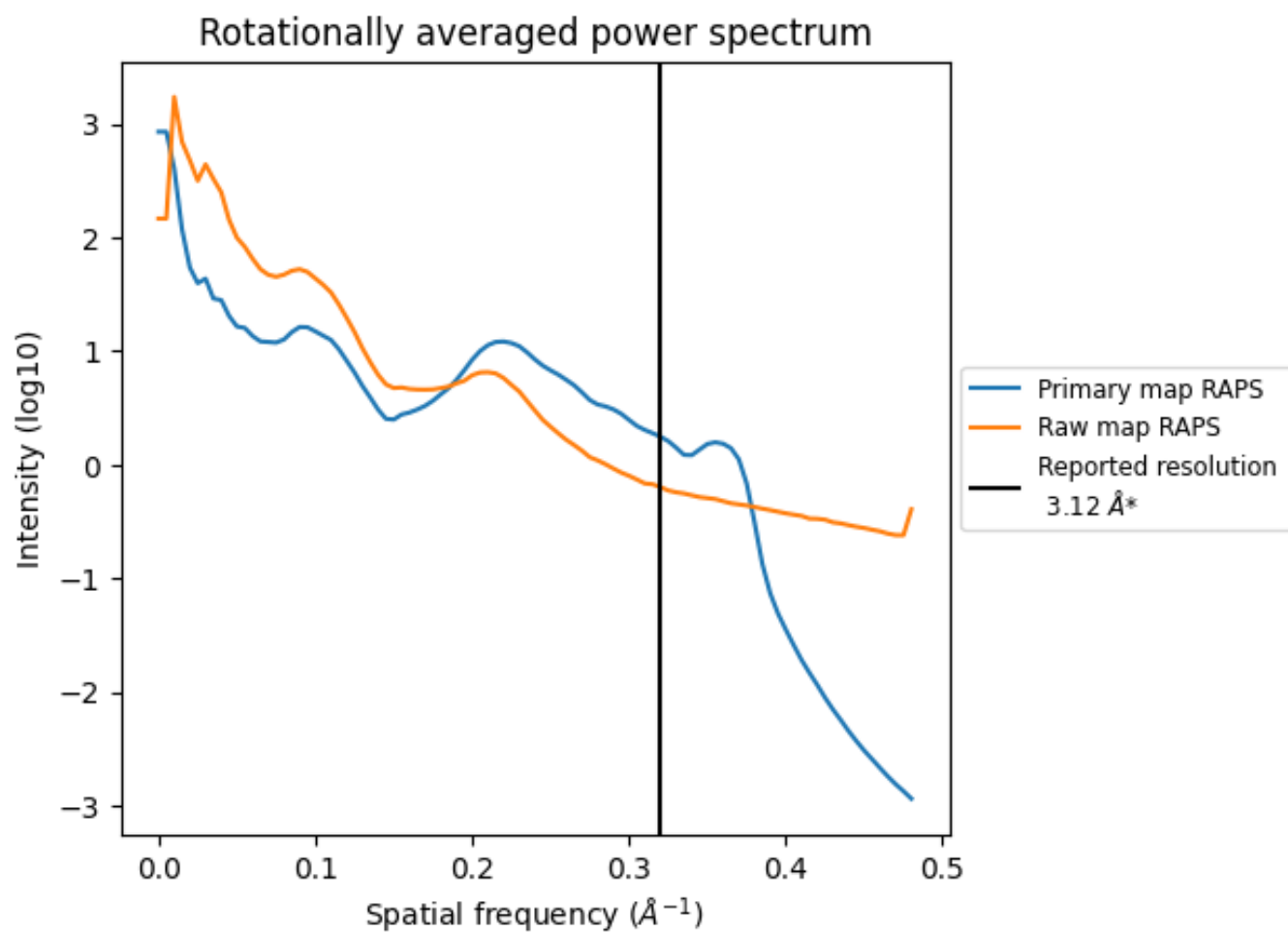
*Reported resolution corresponds to spatial frequency of 0.321 Å^{-1}

8 Fourier-Shell correlation ⓘ

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 ⓘ
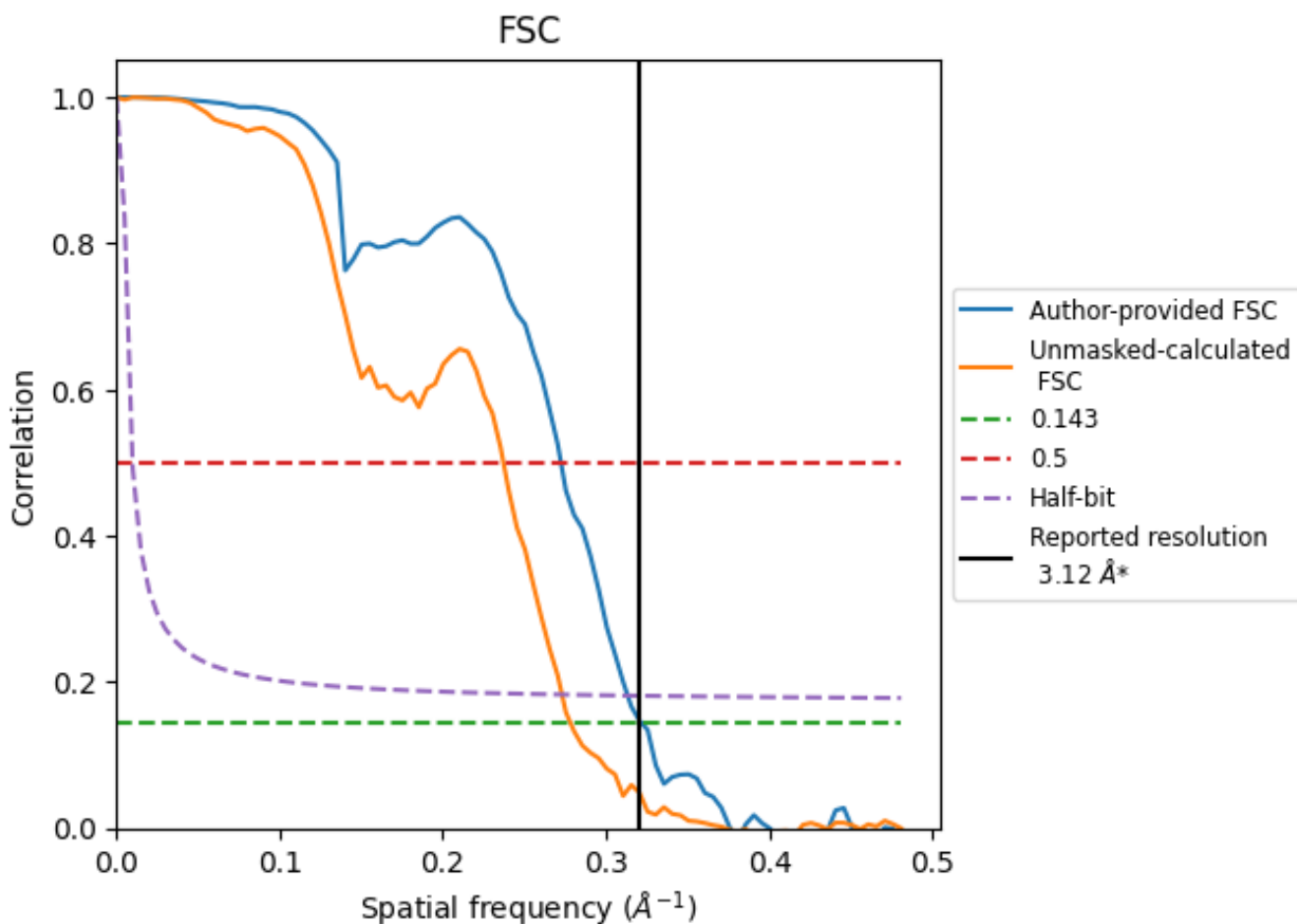
*Reported resolution corresponds to spatial frequency of 0.321 Å^{-1}

8.2   Resolution estimates (i)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.12	-	-
Author-provided FSC curve	3.11	3.67	3.19
Unmasked-calculated*	3.59	4.22	3.66

*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 3.59 differs from the reported value 3.12 by more than 10 %

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-33482 and PDB model 8HJ0. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay ⓘ

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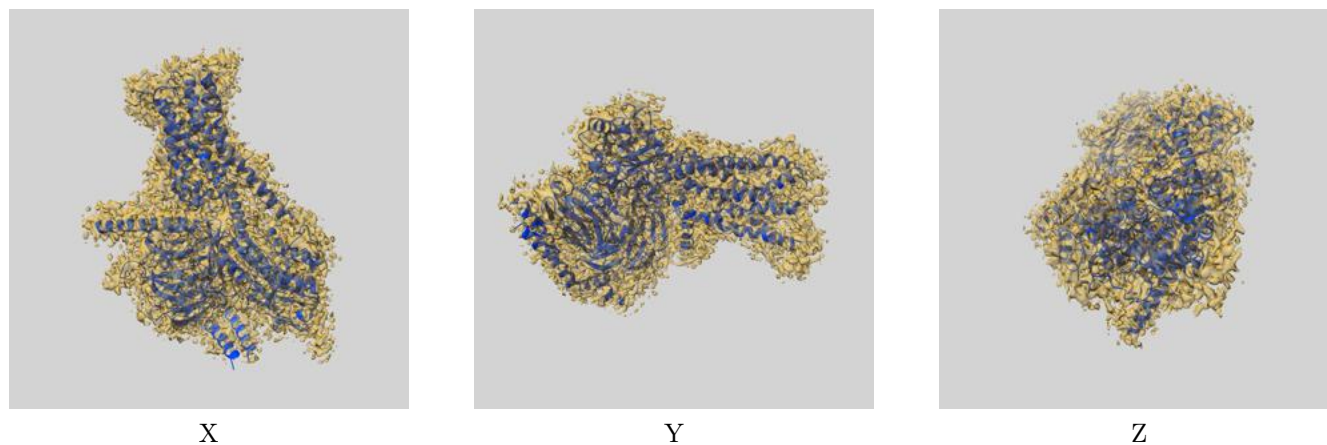
The images above show the 3D surface view of the map at the recommended contour level 0.015 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2　Q-score mapped to coordinate model ⓘ
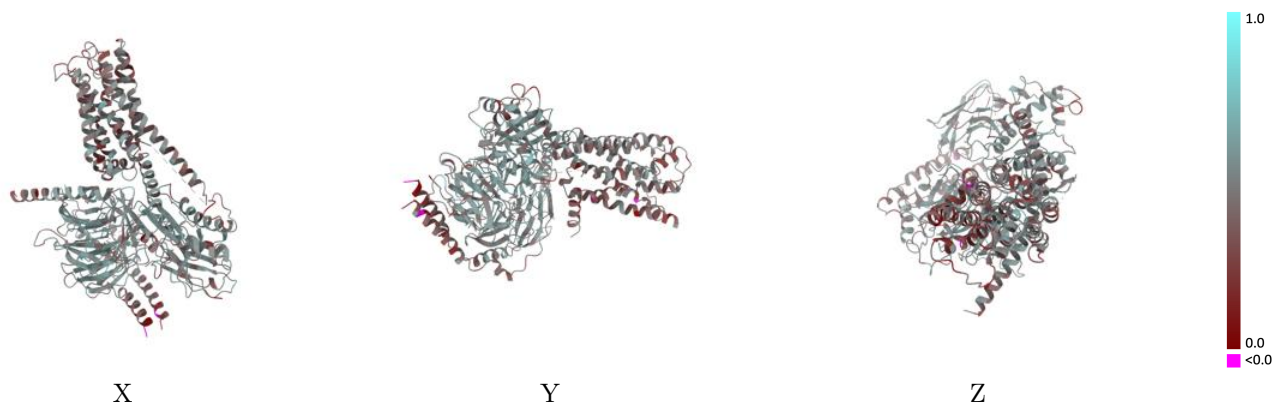
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 ⓘ
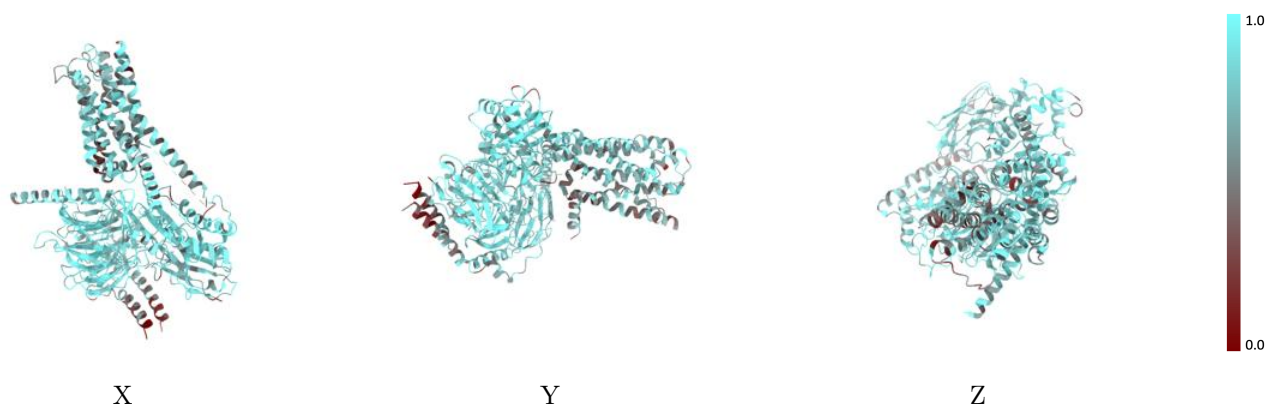
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.015).

9.4 Atom inclusion ⓘ
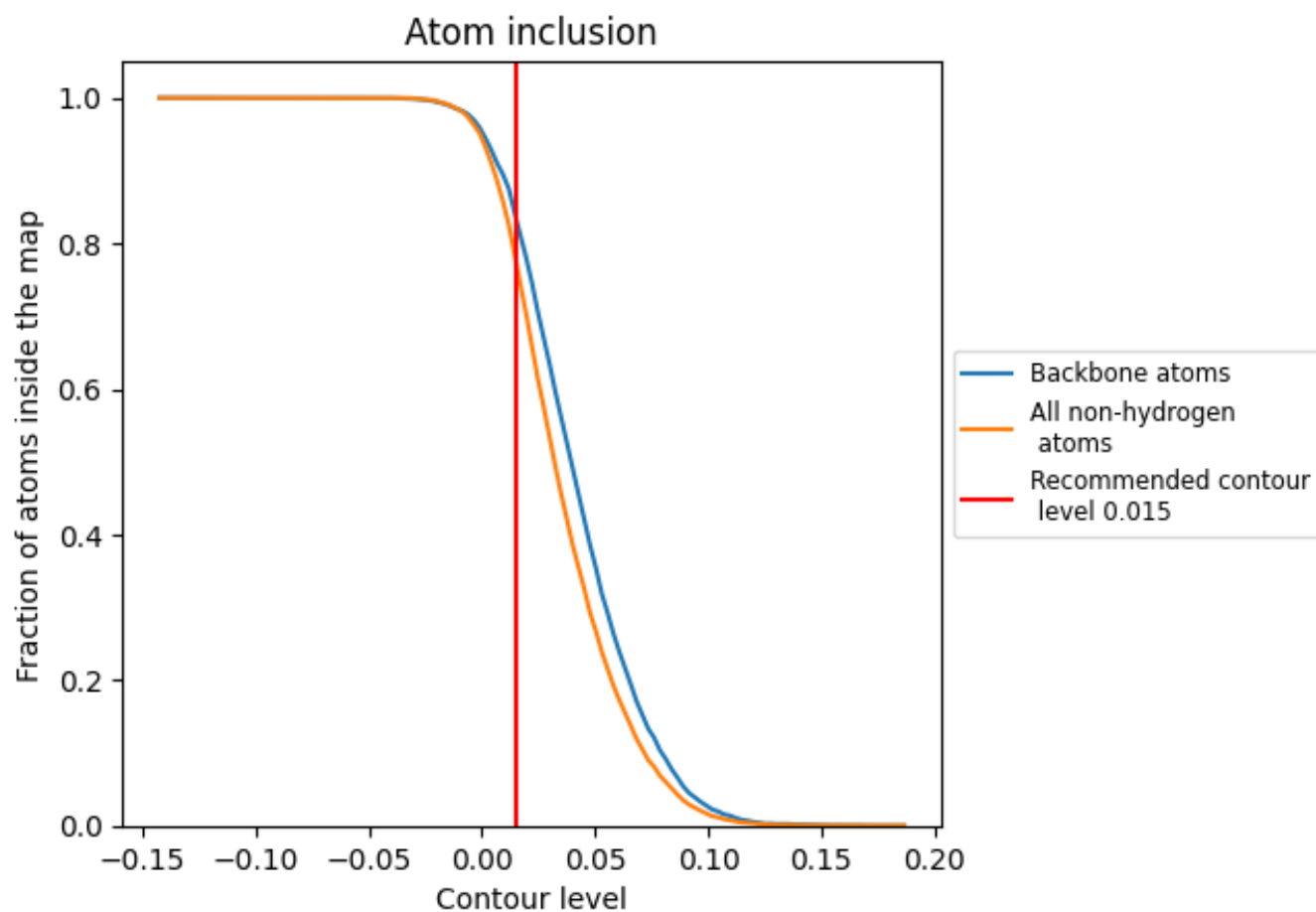
At the recommended contour level, 84% of all backbone atoms, 78% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.015) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7761	0.4660
A	0.8270	0.4980
B	0.8394	0.5050
G	0.6503	0.3960
N	0.8156	0.4900
R	0.6693	0.3970

1.0

0.0
<0.0