WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Nov 18, 2024 – 06:14 PM JST

PDB ID	:	8WGD
EMDB ID	:	EMD-37509
Title	:	mGlu2-4 inactive heterodimer
Authors	:	Zhang, Y.; Liu, J.
Deposited on	:	2023-09-20
Resolution	:	4.45 Å(reported)

This is a Full wwPDB EM Validation 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 (i) 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 (i)) were used in the production of this report:

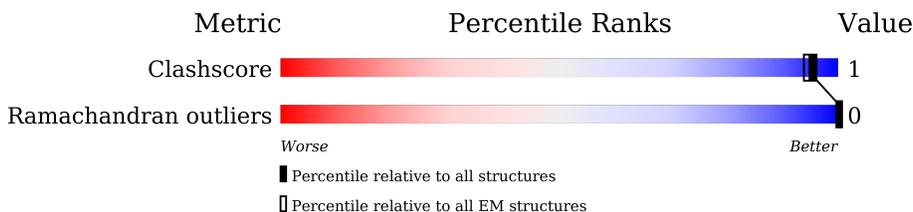|		
EMDB validation analysis	:	0.0.1.dev113
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 4.45 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		1
Ramachandran outliers		0

Worse   *Better*

▌Percentile relative to all structures

▯Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835

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	C	854	20% / 88% · 11%
2	B	880	12% / 85% 15%

2　Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 6076 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 Metabotropic glutamate receptor 2.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
1	C	756	3024	1512	756	756	0	0

- Molecule 2 is a protein called Metabotropic glutamate receptor 4.

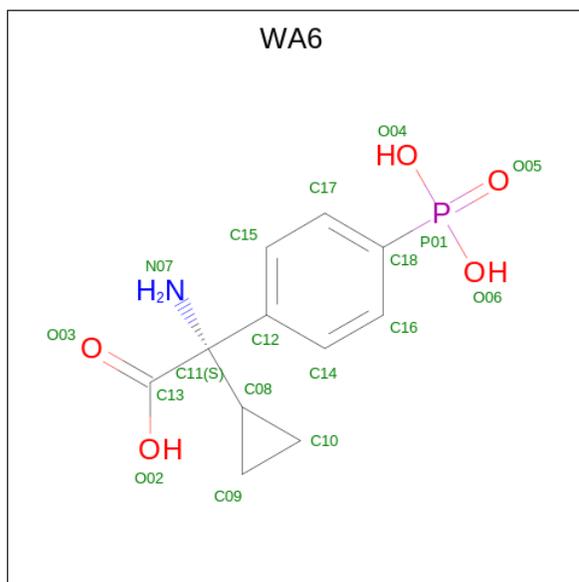| Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	B	752	3008	1504	752	752	0	0

- Molecule 3 is (1S,2R)-2-[(2S)-2-azanyl-1-oxidanyl-1-oxidanylidene-3-(9H-xanthen-9-yl)propan-2-yl]cyclopropane-1-carboxylic acid (three-letter code: WAG) (formula: $C_{20}H_{19}NO_5$) (labeled as "Ligand of Interest" by depositor).
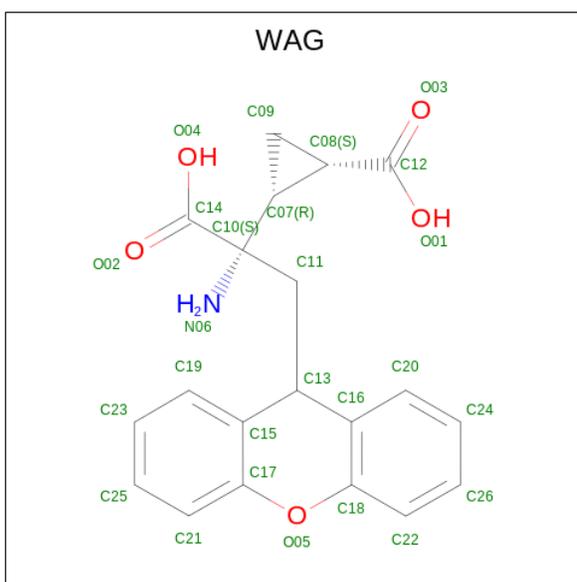
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
3	C	1	26	20	1	5	0

- Molecule 4 is (2S)-2-azanyl-2-cyclopropyl-2-(4-phosphonophenyl)ethanoic acid (three-letter

code: WA6) (formula: $C_{11}H_{14}NO_5P$) (labeled as "Ligand of Interest" by depositor).
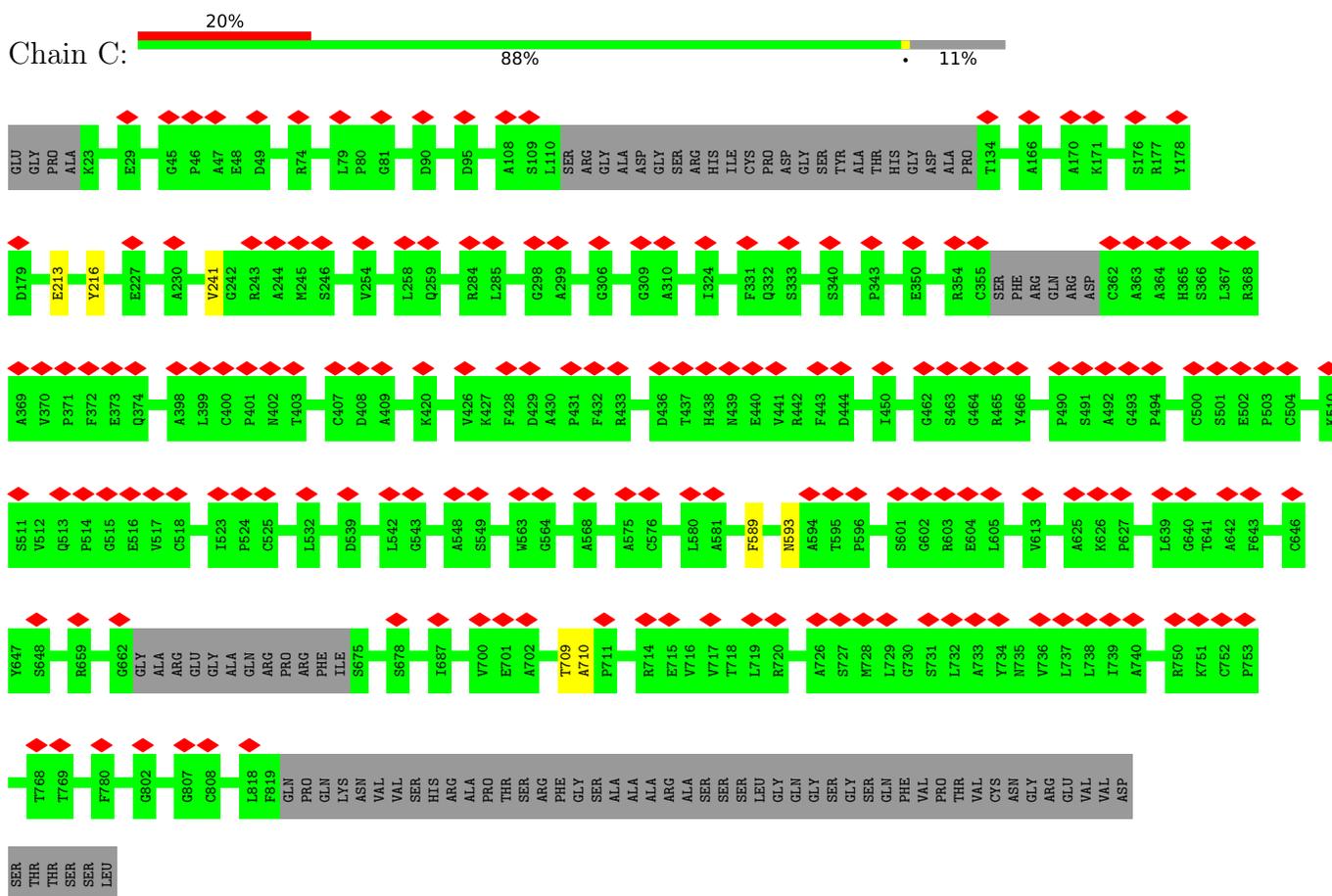

Mol	Chain	Residues	Atoms					AltConf
4	B	1	Total	C	N	O	P	0
			18	11	1	5	1	

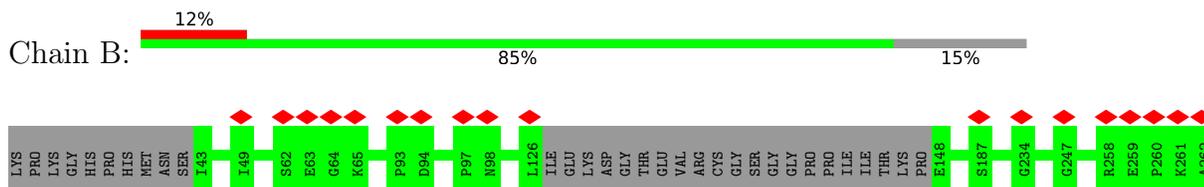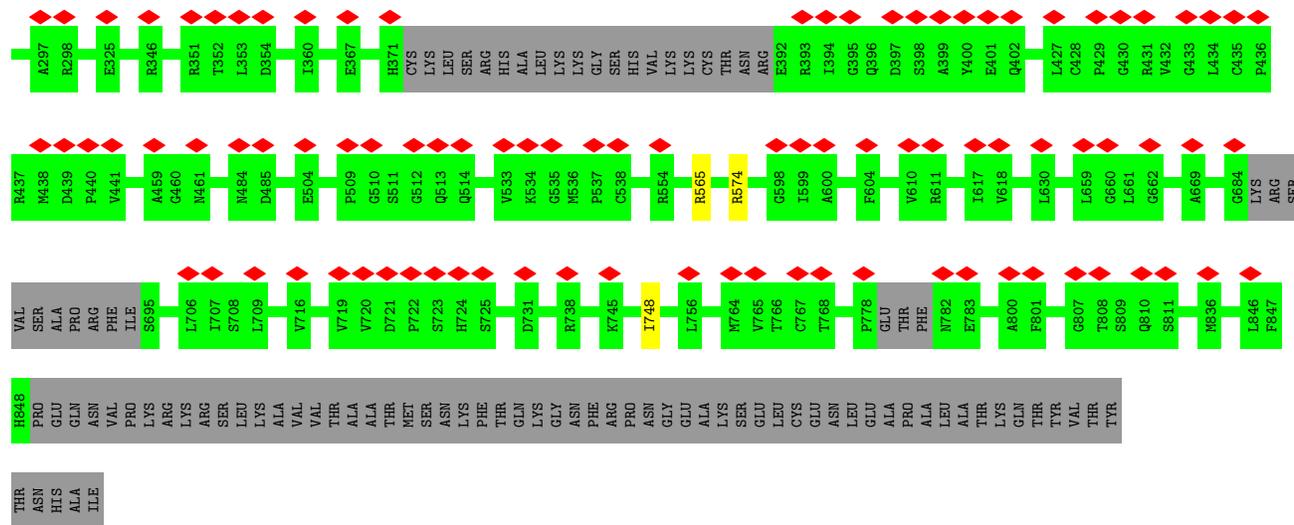# 3 Residue-property plots ⓘ

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: Metabotropic glutamate receptor 2

• Molecule 2: Metabotropic glutamate receptor 4

A297 R298 E325 R346 R351 T352 L353 D354 I360 E367 H371 CYS LYS LEU SER ARG HIS ALA LEU LYS LYS GLY SER HIS VAL LYS LYS CYS THR ASN ARG E392 R393 I394 G395 Q396 D397 S398 A399 Y400 E401 Q402 L427 C428 P429 G430 R431 V432 G433 L434 C435 P436

R437 M438 D439 P440 V441 A459 G460 N461 N484 D485 E504 P509 G510 S511 G512 Q513 Q514 V533 K534 C535 M536 P537 C538 R554 R565 R574 G598 I599 A600 F604 V610 R611 I617 V618 L630 L659 G660 L661 G662 A669 G684 LYS ARG SER

VAL SER ALA PRO ARG PHE ILE S695 L706 I707 S708 L709 V716 V719 V720 D721 P722 S723 H724 S725 D731 R738 K745 I748 L756 M764 V765 T766 C767 T768 P778 GLU THR PHE N782 E783 A800 F801 G807 T808 S809 Q810 S811 M836 L846 F847

H848 PRO GLU GLN ASN VAL PRO LYS ARG LYS ARG SER LEU LYS ALA VAL VAL THR ALA ALA THR MET SER ASN LYS PHE THR GLN LYS GLY ASN PHE ARG PRO ASN GLY GLU ALA LYS SER GLU LEU CYS GLU ASN LEU GLU GLU ALA PRO ALA LEU ALA THR LYS GLN THR TYR VAL THR TYR

THR ASN HIS ALA ILE

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	94971	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/Å^2)$	52	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	3.995	Depositor
Minimum map value	-0.193	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.027	Depositor
Recommended contour level	0.32	Depositor
Map size (Å)	386.88, 386.88, 386.88	wwPDB
Map dimensions	416, 416, 416	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.93, 0.93, 0.93	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: WA6, WAG

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	C	0.55	0/3020	0.87	0/3768
2	B	0.55	0/3003	0.82	1/3745 (0.0%)
All	All	0.55	0/6023	0.84	1/7513 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	748	ILE	N-CA-C	-5.19	96.99	111.00

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	C	3024	0	820	6	0
2	B	3008	0	820	1	0
3	C	26	0	0	3	0
4	B	18	0	0	0	0
All	All	6076	0	1640	7	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 1.

All (7) 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:C:216:TYR:CA	3:C:901:WAG:C12	2.88	0.51
2:B:565:ARG:N	2:B:574:ARG:O	2.50	0.44
1:C:213:GLU:N	1:C:241:VAL:O	2.51	0.43
1:C:709:THR:O	1:C:710:ALA:C	2.57	0.43
1:C:216:TYR:CA	3:C:901:WAG:C08	2.98	0.42
1:C:216:TYR:CA	3:C:901:WAG:C09	2.98	0.41
1:C:589:PHE:O	1:C:593:ASN:N	2.53	0.41

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	C	748/854 (88%)	710 (95%)	38 (5%)	0	100	100
2	B	742/880 (84%)	714 (96%)	28 (4%)	0	100	100
All	All	1490/1734 (86%)	1424 (96%)	66 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	$\#|Z| > 2$
4	WA6	B	1001	-	15,19,19	5.52	7 (46%)	23,30,30	1.03	1 (4%)
3	WAG	C	901	-	26,29,29	5.61	17 (65%)	36,44,44	2.85	13 (36%)

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
4	WA6	B	1001	-	-	8/20/26/26	0/2/2/2
3	WAG	C	901	-	-	7/15/38/38	0/4/4/4

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	901	WAG	C20-C16	10.88	1.54	1.39
3	C	901	WAG	C19-C15	10.43	1.53	1.39
4	B	1001	WA6	C15-C12	8.83	1.53	1.39
4	B	1001	WA6	C17-C18	8.72	1.53	1.39
4	B	1001	WA6	C14-C12	8.68	1.53	1.39
4	B	1001	WA6	C16-C18	8.57	1.53	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1001	WA6	C17-C15	8.01	1.53	1.38
4	B	1001	WA6	C16-C14	7.95	1.53	1.38
3	C	901	WAG	C25-C21	7.40	1.54	1.38
3	C	901	WAG	C26-C22	7.25	1.54	1.38
3	C	901	WAG	C24-C20	7.13	1.53	1.38
3	C	901	WAG	C22-C18	7.09	1.54	1.39
3	C	901	WAG	O05-C17	7.01	1.49	1.38
3	C	901	WAG	C21-C17	6.95	1.54	1.39
3	C	901	WAG	C23-C19	6.83	1.53	1.38
3	C	901	WAG	O05-C18	6.77	1.49	1.38
3	C	901	WAG	C25-C23	6.29	1.54	1.38
3	C	901	WAG	C17-C15	6.16	1.51	1.39
3	C	901	WAG	C26-C24	6.12	1.54	1.38
3	C	901	WAG	C18-C16	6.00	1.51	1.39
3	C	901	WAG	C11-C13	3.96	1.60	1.54
4	B	1001	WA6	P01-C18	3.80	1.87	1.79
3	C	901	WAG	C15-C13	-2.56	1.47	1.51
3	C	901	WAG	C09-C07	2.10	1.53	1.50

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	901	WAG	O05-C18-C16	-6.97	112.77	122.38
3	C	901	WAG	O05-C17-C15	-6.65	113.21	122.38
3	C	901	WAG	C10-C11-C13	-5.93	107.66	117.06
3	C	901	WAG	O05-C17-C21	5.11	127.70	116.48
3	C	901	WAG	O05-C18-C22	5.00	127.47	116.48
3	C	901	WAG	C17-C15-C13	-4.54	112.92	119.99
3	C	901	WAG	C18-C16-C13	-4.38	113.17	119.99
3	C	901	WAG	C16-C13-C15	4.13	118.21	108.88
3	C	901	WAG	C19-C15-C17	3.32	121.49	117.75
4	B	1001	WA6	C10-C08-C11	-3.32	113.70	122.61
3	C	901	WAG	C20-C16-C18	2.46	120.53	117.75
3	C	901	WAG	C09-C08-C12	-2.40	115.10	119.10
3	C	901	WAG	O04-C14-C10	2.38	120.03	113.60
3	C	901	WAG	C09-C07-C10	-2.35	118.41	122.00

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	901	WAG	N06-C10-C14-O02

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Mol	Chain	Res	Type	Atoms
3	C	901	WAG	C07-C10-C14-O02
3	C	901	WAG	C07-C10-C14-O04
3	C	901	WAG	C09-C07-C10-C14
4	B	1001	WA6	C09-C08-C11-C12
4	B	1001	WA6	C09-C08-C11-C13
4	B	1001	WA6	C08-C11-C13-O02
4	B	1001	WA6	C12-C11-C13-O02
4	B	1001	WA6	C12-C11-C13-O03
3	C	901	WAG	C11-C10-C14-O02
3	C	901	WAG	C11-C10-C14-O04
4	B	1001	WA6	N07-C11-C12-C15
3	C	901	WAG	C10-C11-C13-C16
4	B	1001	WA6	C08-C11-C12-C14
4	B	1001	WA6	C08-C11-C12-C15

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	901	WAG	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand WA6 B 1001

Bond lengths

Bond angles

Torsions

Rings

Ligand WAG C 901

Bond lengths

Bond angles

Torsions

Rings
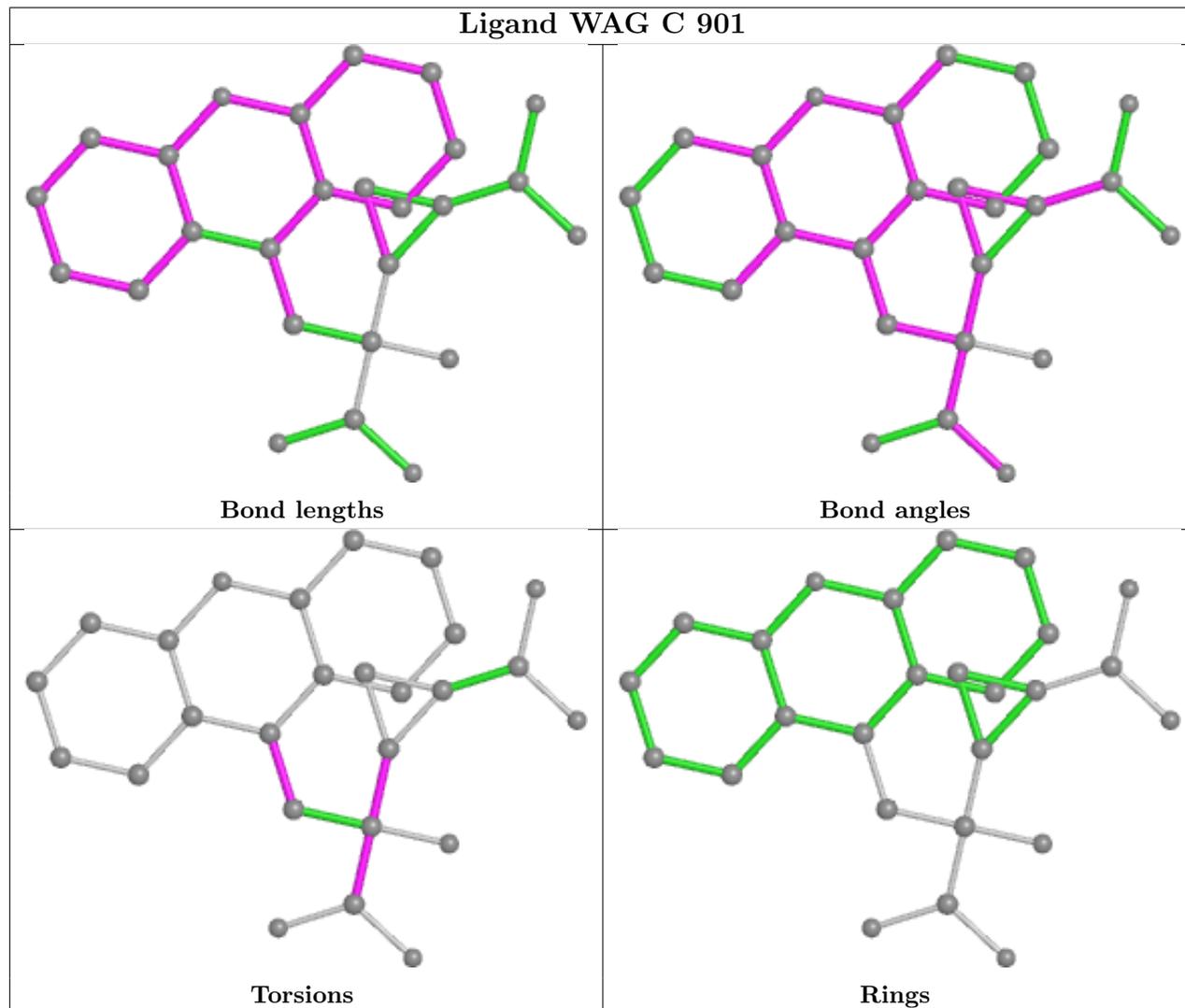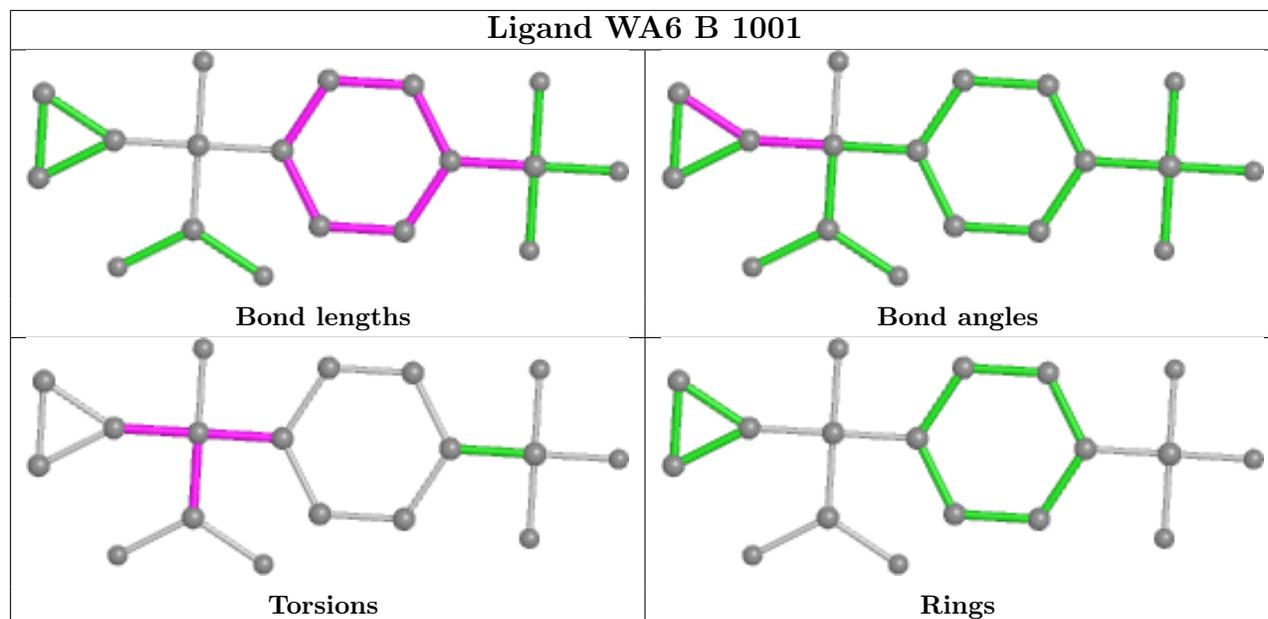
5.7 Other polymers ⓘ

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-37509. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections ⓘ

6.1.1 Primary map

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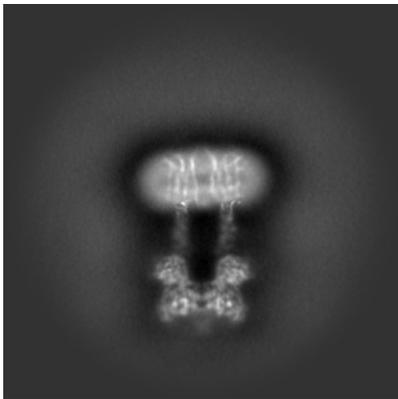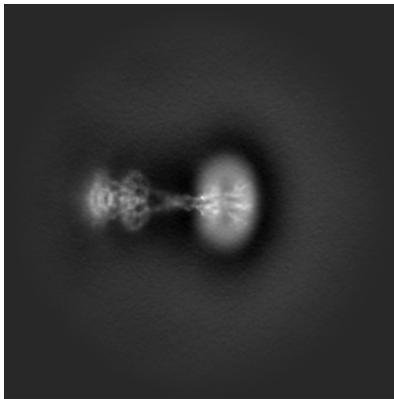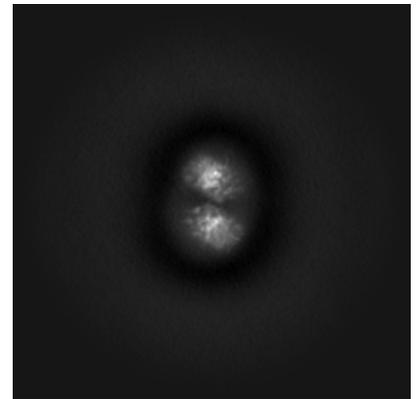
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
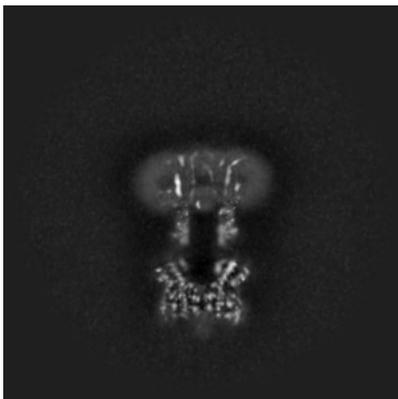
6.2.1 Primary map
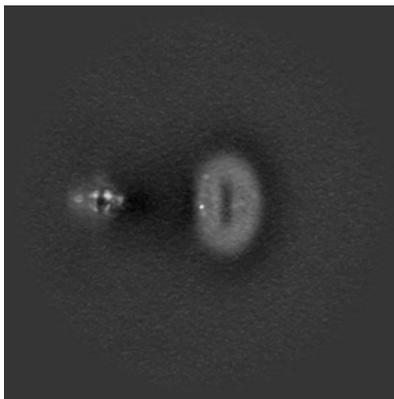
X Index: 208   Y Index: 208   Z Index: 208
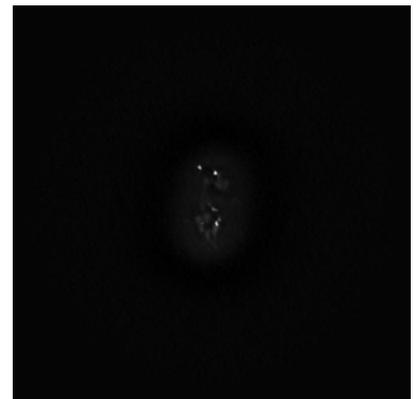
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

6.3.1 Primary map
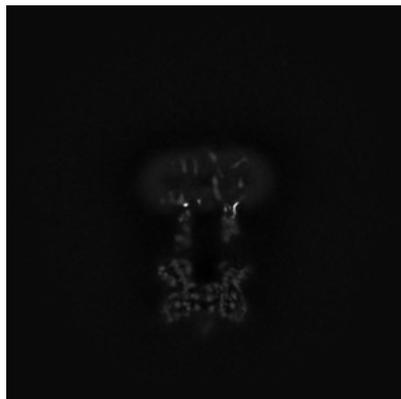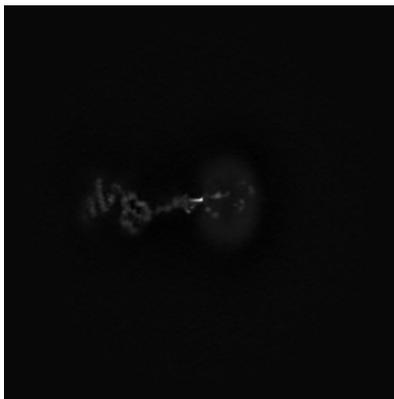
| X Index: 212 | Y Index: 238 | Z Index: 244 |
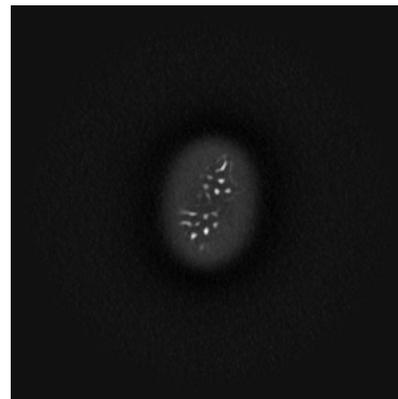
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

6.4.1 Primary map

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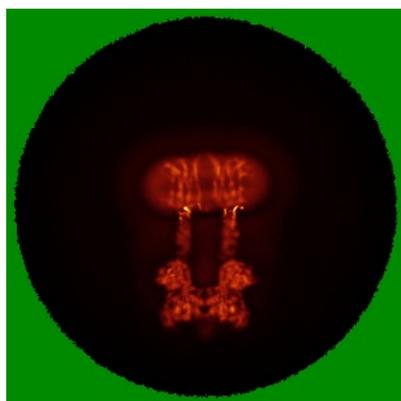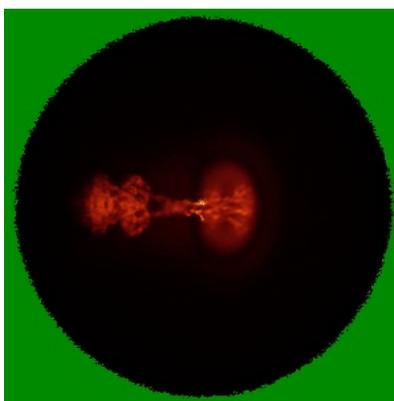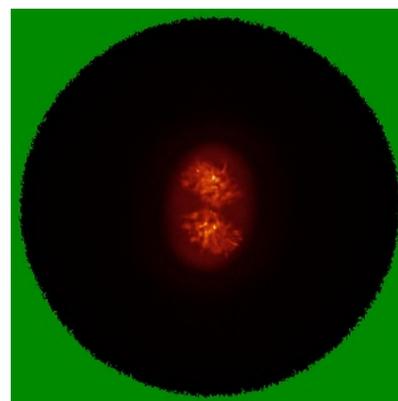
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views ⓘ

6.5.1 Primary map

X   Y   Z

The images above show the 3D surface view of the map at the recommended contour level 0.32. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.6 Mask visualisation ⓘ

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 ⓘ
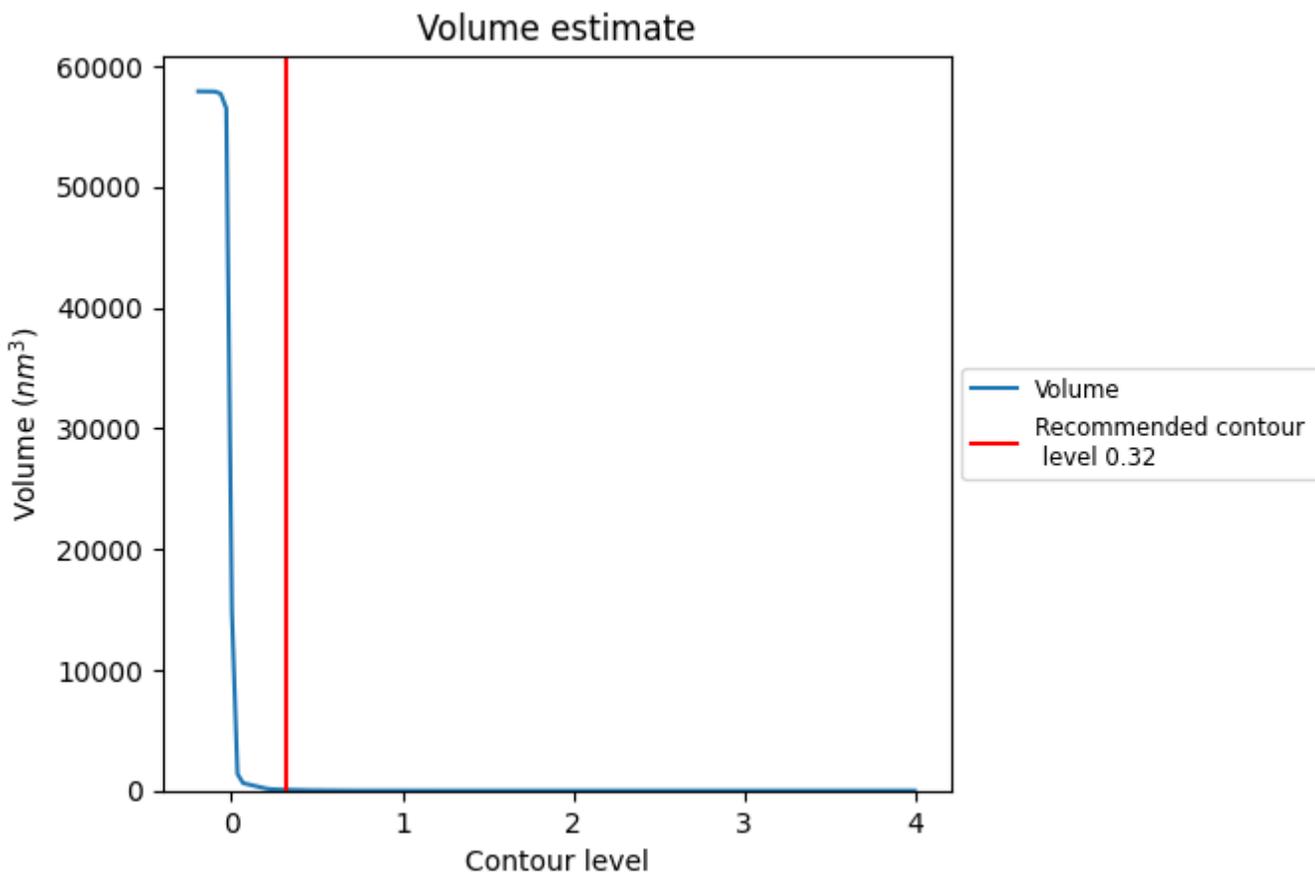
The volume at the recommended contour level is 70 nm^3; this corresponds to an approximate mass of 63 kDa.

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 ⓘ
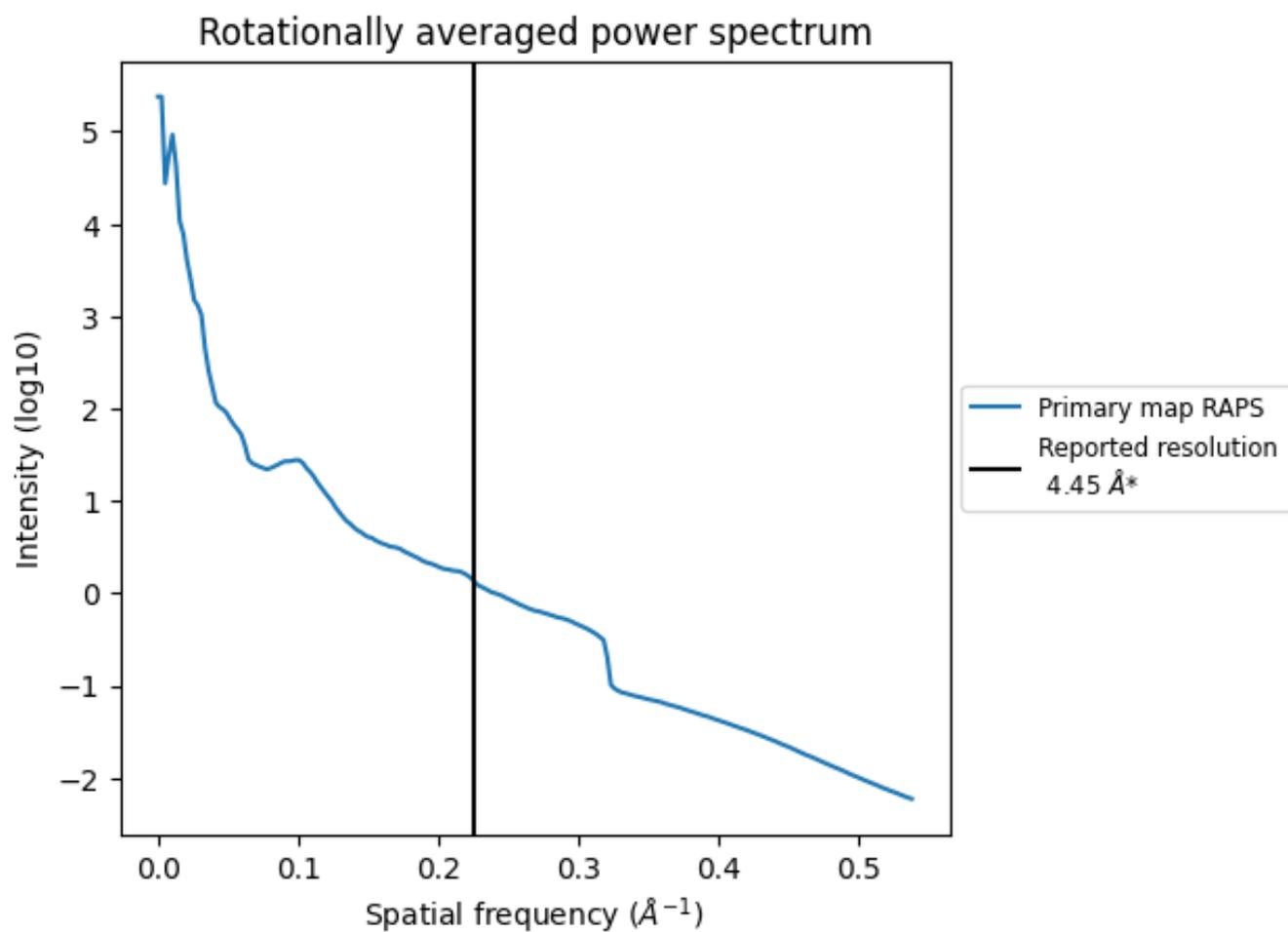
*Reported resolution corresponds to spatial frequency of 0.225 Å^{-1}

8 Fourier-Shell correlation ⓘ

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-37509 and PDB model 8WGD. Per-residue inclusion information can be found in section 3 on page 5.

9.1 Map-model overlay ⓘ

|		
X	Y	Z
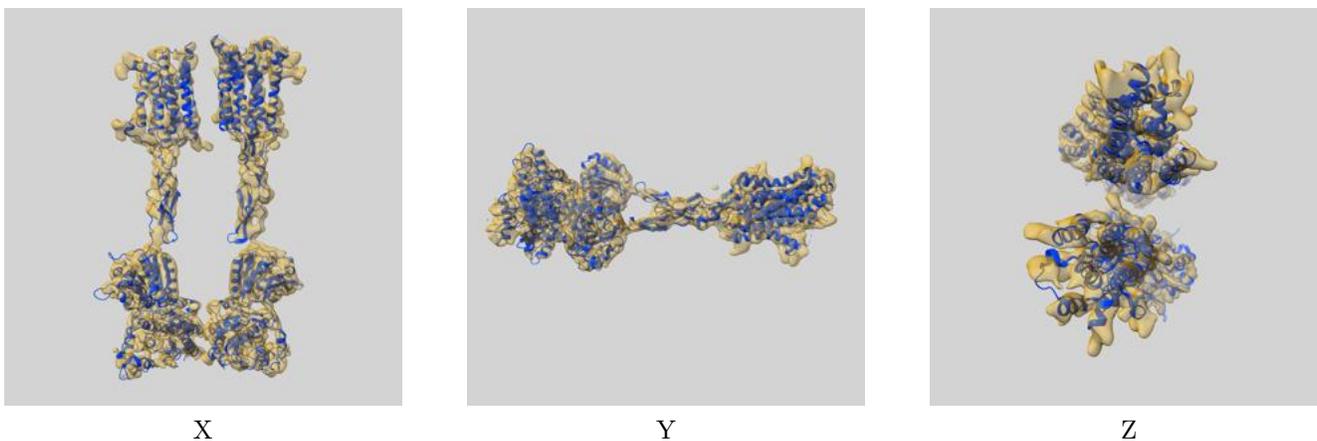
The images above show the 3D surface view of the map at the recommended contour level 0.32 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2　Q-score mapped to coordinate model ⓘ

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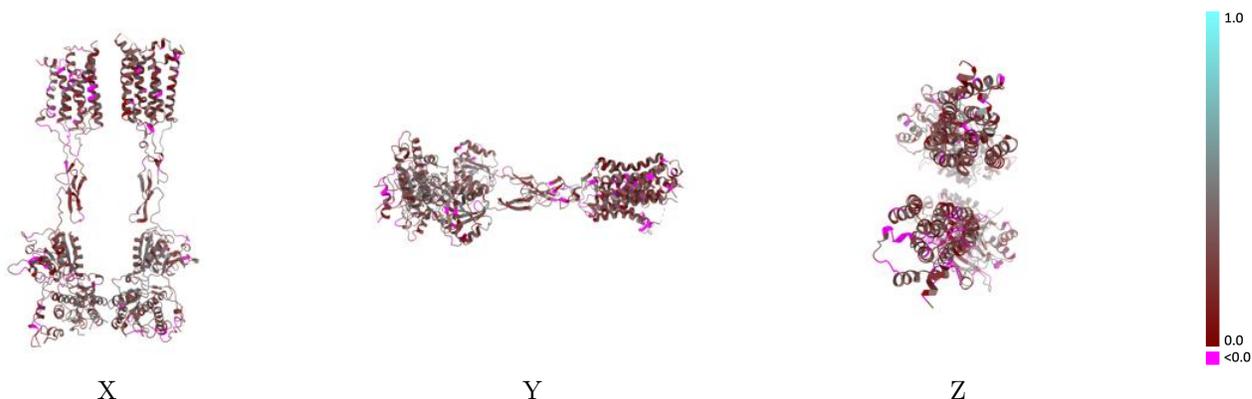
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

X　　　　　　　　　　Y　　　　　　　　　　Z
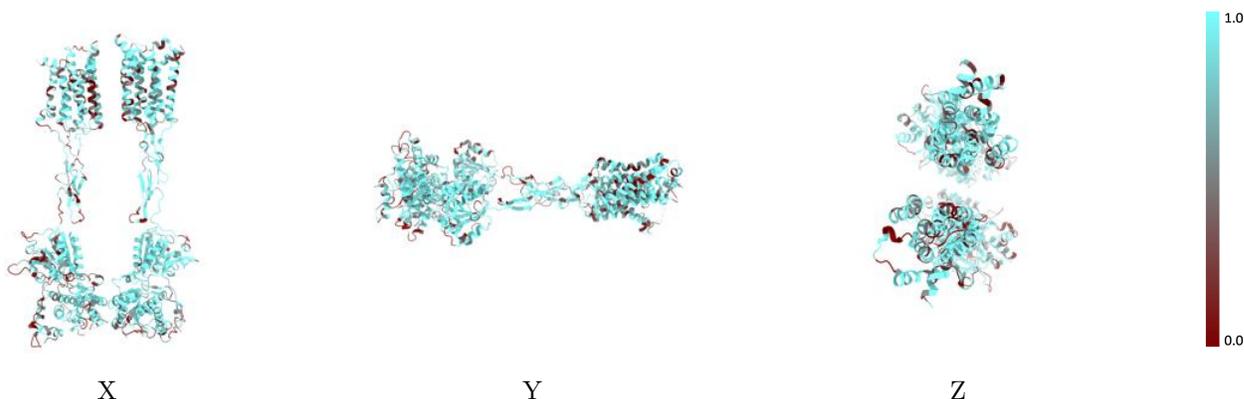
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.32).

9.4　Atom inclusion ⓘ
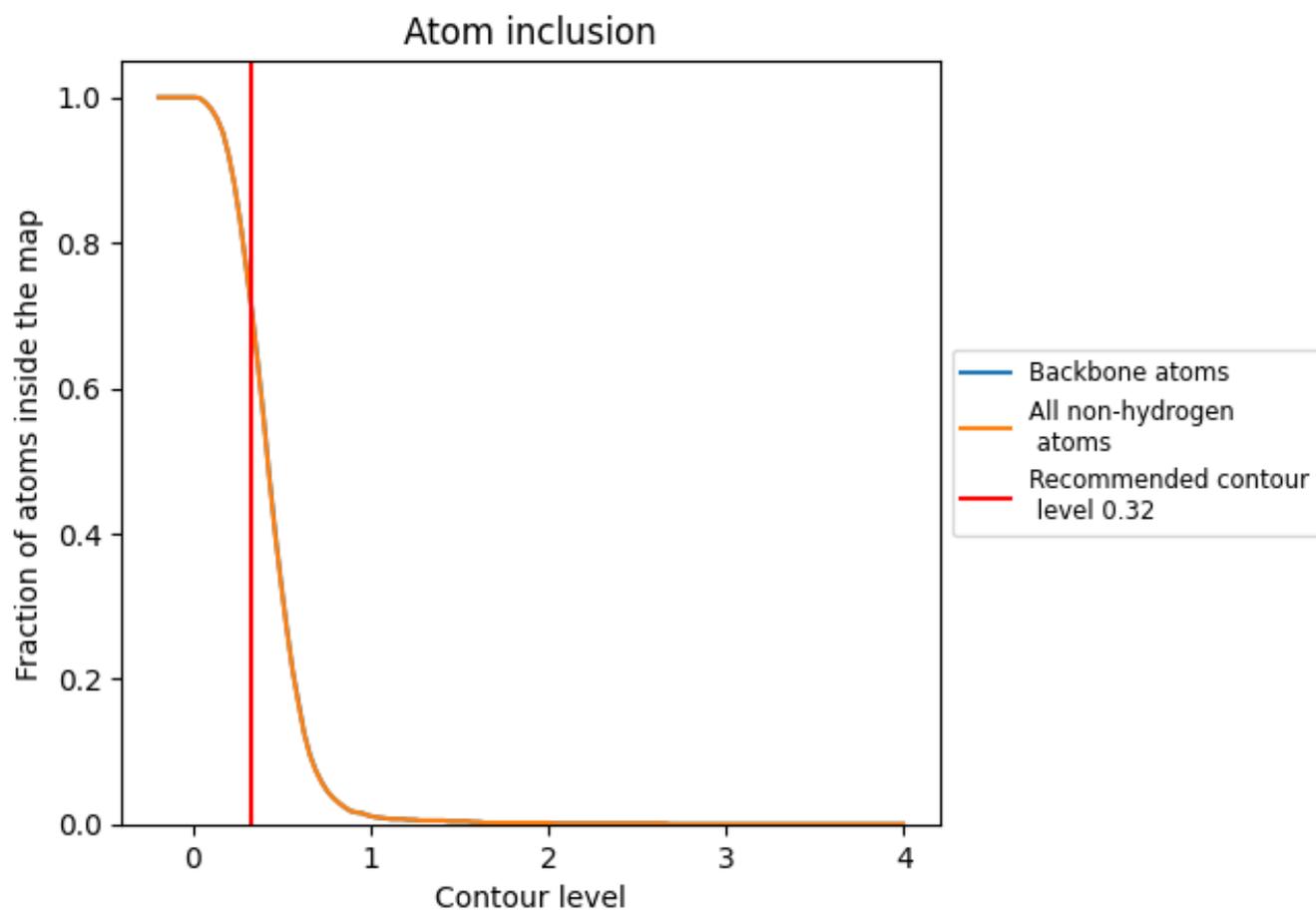
At the recommended contour level, 73% of all backbone atoms, 72% of all non-hydrogen atoms, are inside the map.

9.5   Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.32) and Q-score for the entire model and for each chain.

1.0

Chain	Atom inclusion	Q-score
All	0.7240	0.2620
B	0.7660	0.2810
C	0.6820	0.2420

0.0
<0.0