



## Full wwPDB EM Validation Report ⓘ

Nov 14, 2022 – 05:16 PM EST

PDB ID : 7KC4  
EMDB ID : EMD-22806  
Title : Human WLS in complex with WNT8A  
Authors : Nygaard, R.; Jia, Y.; Kim, J.; Ross, D.; Parisi, G.; Clarke, O.B.; Virshup, D.M.; Mancina, F.  
Deposited on : 2020-10-05  
Resolution : 3.19 Å(reported)  
Based on initial model : 4F0A

This is a Full wwPDB EM Validation 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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
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

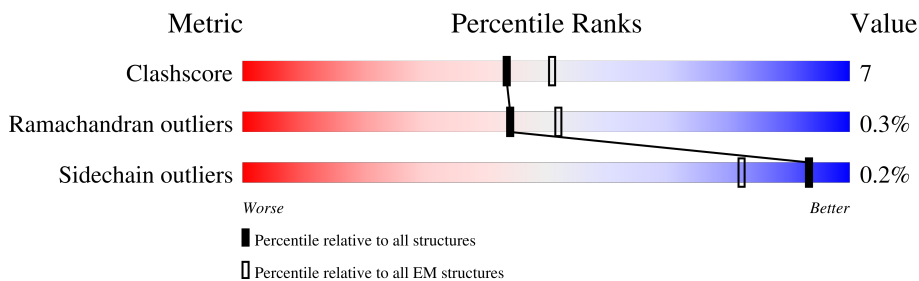
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.19 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	D	361	
2	B	567	
3	A	2	
4	C	6	

## 2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 6477 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 Protein Wnt-8a.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	D	278	2164	1346	378	411	29	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	352	GLY	-	expression tag	UNP Q9H1J5
D	353	GLY	-	expression tag	UNP Q9H1J5
D	354	TRP	-	expression tag	UNP Q9H1J5
D	355	SER	-	expression tag	UNP Q9H1J5
D	356	HIS	-	expression tag	UNP Q9H1J5
D	357	PRO	-	expression tag	UNP Q9H1J5
D	358	GLN	-	expression tag	UNP Q9H1J5
D	359	PHE	-	expression tag	UNP Q9H1J5
D	360	GLU	-	expression tag	UNP Q9H1J5
D	361	LYS	-	expression tag	UNP Q9H1J5

- Molecule 2 is a protein called Protein wntless homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	493	4008	2657	651	663	37	0	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	542	ALA	-	expression tag	UNP Q5T9L3
B	543	GLU	-	expression tag	UNP Q5T9L3
B	544	ASN	-	expression tag	UNP Q5T9L3
B	545	LEU	-	expression tag	UNP Q5T9L3
B	546	TYR	-	expression tag	UNP Q5T9L3
B	547	PHE	-	expression tag	UNP Q5T9L3
B	548	GLN	-	expression tag	UNP Q5T9L3

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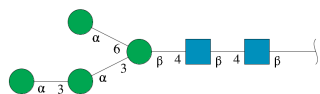
Chain	Residue	Modelled	Actual	Comment	Reference
B	549	SER	-	expression tag	UNP Q5T9L3
B	550	HIS	-	expression tag	UNP Q5T9L3
B	551	HIS	-	expression tag	UNP Q5T9L3
B	552	HIS	-	expression tag	UNP Q5T9L3
B	553	HIS	-	expression tag	UNP Q5T9L3
B	554	HIS	-	expression tag	UNP Q5T9L3
B	555	HIS	-	expression tag	UNP Q5T9L3
B	556	HIS	-	expression tag	UNP Q5T9L3
B	557	HIS	-	expression tag	UNP Q5T9L3
B	558	HIS	-	expression tag	UNP Q5T9L3
B	559	HIS	-	expression tag	UNP Q5T9L3
B	560	ASP	-	expression tag	UNP Q5T9L3
B	561	TYR	-	expression tag	UNP Q5T9L3
B	562	LYS	-	expression tag	UNP Q5T9L3
B	563	ASP	-	expression tag	UNP Q5T9L3
B	564	ASP	-	expression tag	UNP Q5T9L3
B	565	ASP	-	expression tag	UNP Q5T9L3
B	566	ASP	-	expression tag	UNP Q5T9L3
B	567	LYS	-	expression tag	UNP Q5T9L3

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



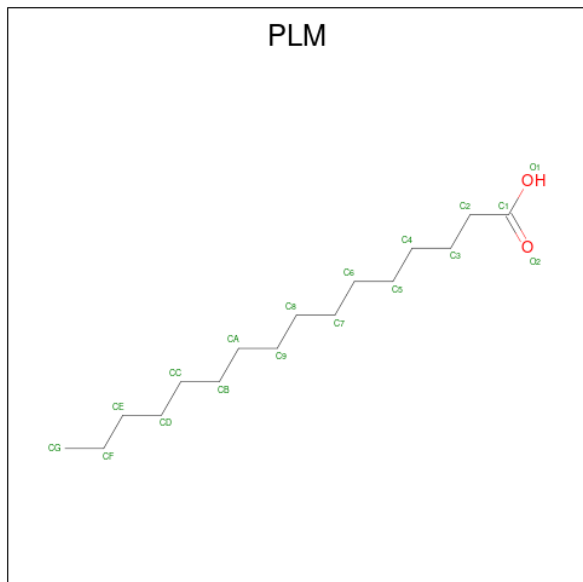
Mol	Chain	Residues	Atoms			AltConf	Trace	
			Total	C	N			O
3	A	2	28	16	2	10	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



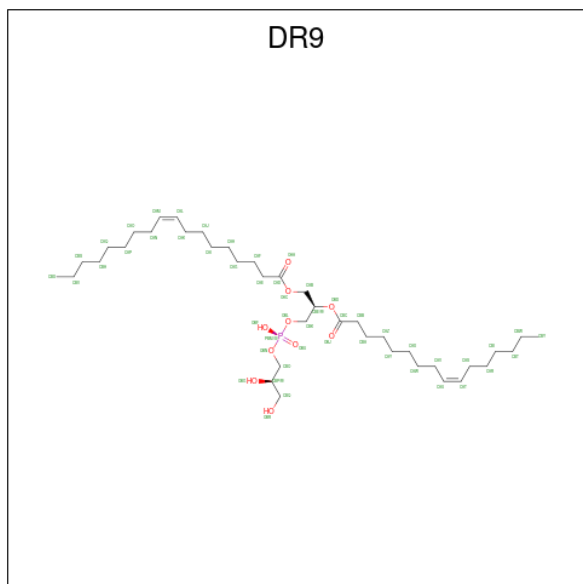
Mol	Chain	Residues	Atoms			AltConf	Trace	
			Total	C	N			O
4	C	6	72	40	2	30	0	0

- Molecule 5 is PALMITIC ACID (three-letter code: PLM) (formula:  $C_{16}H_{32}O_2$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
			Total	C	O	
5	D	1	17	16	1	0

- Molecule 6 is 1-CIS-9-OCTADECANOYL-2-CIS-9-HEXADECANOYL PHOSPHATIDYL GLYCEROL (three-letter code: DR9) (formula:  $C_{40}H_{75}O_{10}P$ ).



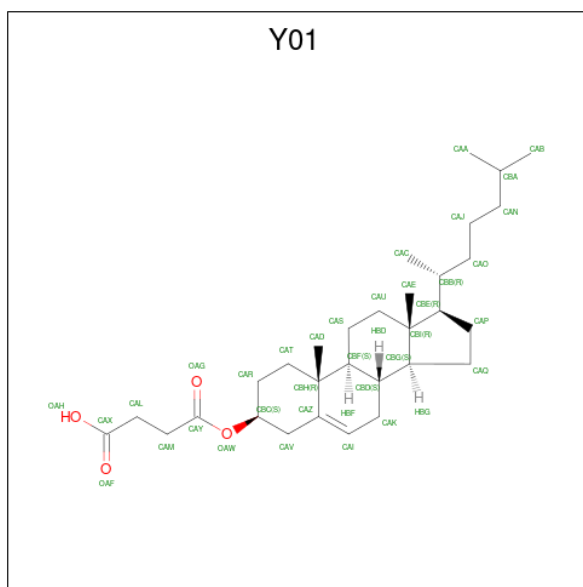
Mol	Chain	Residues	Atoms				AltConf
			Total	C	O	P	
6	B	1	153	120	30	3	0

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Mol	Chain	Residues	Atoms				AltConf
6	B	1	Total	C	O	P	0
			153	120	30	3	
6	B	1	Total	C	O	P	0
			153	120	30	3	

- Molecule 7 is CHOLESTEROL HEMISUCCINATE (three-letter code: Y01) (formula: C<sub>31</sub>H<sub>50</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms			AltConf
7	B	1	Total	C	O	0
			35	31	4	







## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	27288	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Patch CTF	Depositor
Microscope	FEI TITAN	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	58	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	4.150	Depositor
Minimum map value	-2.351	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.223	Depositor
Recommended contour level	0.463	Depositor
Map size (Å)	100.43, 101.259995, 145.25	wwPDB
Map dimensions	121, 122, 175	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.83, 0.83, 0.83	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: MAN, DR9, Y01, NAG, BMA, PLM

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	D	0.28	0/2203	0.49	0/2965
2	B	0.27	0/4132	0.46	0/5605
All	All	0.27	0/6335	0.47	0/8570

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	D	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	319	CYS	Peptide

### 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	D	2164	0	2055	30	0
2	B	4008	0	4010	62	0
3	A	28	0	25	0	0
4	C	72	0	61	0	0
5	D	17	0	31	3	0
6	B	153	0	222	10	0
7	B	35	0	43	2	0
All	All	6477	0	6447	91	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (91) 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)
7:B:804:Y01:CAP	7:B:804:Y01:CAQ	1.81	1.54
2:B:283:PRO:HB2	2:B:286:TRP:HD1	1.47	0.80
2:B:283:PRO:HB2	2:B:286:TRP:CD1	2.22	0.74
1:D:64:ASN:HD21	1:D:273:ARG:HE	1.35	0.73
2:B:107:PHE:HB3	2:B:225:HIS:HB2	1.72	0.72
2:B:298:LEU:HD11	2:B:358:GLY:HA2	1.72	0.71
2:B:411:GLN:HA	2:B:414:LEU:HD23	1.73	0.69
1:D:184:GLY:HA2	1:D:191:ILE:HG22	1.74	0.69
5:D:1001:PLM:H52	2:B:305:GLY:HA3	1.75	0.68
2:B:378:ALA:O	2:B:382:ILE:HD12	1.93	0.68
1:D:81:ALA:HB1	1:D:160:MET:HE1	1.76	0.67
2:B:107:PHE:HB2	2:B:190:VAL:HG21	1.78	0.66
2:B:451:ILE:HD11	6:B:802:DR9:HBY3	1.78	0.65
2:B:41:THR:OG1	2:B:227:ASN:OD1	2.14	0.65
1:D:64:ASN:OD1	1:D:273:ARG:NH2	2.30	0.64
2:B:49:LYS:NZ	2:B:218:ASP:OD1	2.28	0.64
2:B:278:THR:O	2:B:282:ILE:HG12	1.98	0.63
1:D:321:THR:HB	2:B:81:ILE:HA	1.80	0.62
1:D:200:GLU:OE2	2:B:175:ARG:NE	2.32	0.61
2:B:97:PRO:HG2	2:B:194:PHE:HA	1.83	0.61
2:B:285:GLU:HA	2:B:296:MET:HE3	1.82	0.60
2:B:456:THR:HG21	2:B:460:TRP:HE1	1.67	0.59
1:D:54:CYS:HB2	1:D:91:ILE:HG21	1.85	0.59
1:D:219:GLU:O	1:D:220:MET:HG2	2.03	0.59
2:B:113:ILE:HD12	2:B:181:VAL:HG11	1.86	0.58
2:B:238:LYS:NZ	6:B:802:DR9:OBU	2.37	0.57
2:B:6:ILE:HB	2:B:491:LEU:HB3	1.88	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:307:GLU:HA	1:D:330:VAL:HA	1.88	0.56
2:B:166:SER:OG	2:B:172:HIS:ND1	2.38	0.54
2:B:111:LEU:HB2	2:B:224:ILE:HB	1.88	0.54
2:B:80:ALA:HB1	2:B:85:ILE:HB	1.88	0.53
1:D:271:GLU:HA	1:D:337:ALA:HB3	1.91	0.53
1:D:303:GLU:HG2	1:D:305:LYS:HG3	1.90	0.53
5:D:1001:PLM:H21	6:B:801:DR9:HAN1	1.91	0.53
1:D:64:ASN:HD21	1:D:273:ARG:NE	2.06	0.53
1:D:317:GLN:HB2	1:D:319:CYS:O	2.10	0.52
1:D:141:ARG:O	1:D:145:LEU:HG	2.10	0.52
1:D:306:THR:HB	1:D:333:LYS:HD3	1.90	0.52
2:B:437:LEU:HD22	6:B:803:DR9:HBA1	1.92	0.51
2:B:252:TYR:CZ	2:B:256:ILE:HD11	2.45	0.51
2:B:417:MET:HB2	2:B:422:ARG:HB2	1.93	0.51
1:D:245:ALA:HB3	1:D:248:GLU:HG3	1.92	0.50
1:D:185:ILE:O	2:B:357:ARG:NH1	2.45	0.49
1:D:300:GLN:HB3	1:D:337:ALA:HA	1.94	0.49
2:B:251:TRP:CE2	2:B:255:ARG:HD2	2.48	0.49
2:B:21:LEU:HG	2:B:483:LEU:HD22	1.95	0.48
2:B:22:LEU:O	2:B:26:ILE:HG12	2.14	0.48
2:B:155:ARG:HH21	2:B:157:PRO:HB3	1.78	0.48
2:B:127:ARG:HH11	2:B:212:GLY:HA3	1.79	0.48
7:B:804:Y01:HAE2	7:B:804:Y01:HBB	1.67	0.47
2:B:5:ILE:HG12	2:B:495:SER:HB2	1.96	0.47
1:D:319:CYS:C	1:D:320:CYS:SG	2.94	0.46
2:B:427:GLY:O	2:B:431:ARG:HG3	2.16	0.46
2:B:418:SER:O	2:B:419:LYS:HG2	2.16	0.46
2:B:91:VAL:HG22	2:B:200:ARG:HE	1.81	0.45
5:D:1001:PLM:H71	2:B:350:PHE:HB2	1.99	0.45
2:B:367:SER:O	2:B:370:THR:HG22	2.17	0.45
2:B:21:LEU:HD23	6:B:803:DR9:HAP1	1.98	0.45
1:D:62:ARG:HH11	1:D:259:CYS:HB3	1.82	0.44
2:B:481:TRP:CD1	6:B:802:DR9:HAF2	2.52	0.44
2:B:110:MET:HG3	2:B:190:VAL:HG22	1.99	0.44
2:B:264:VAL:HG22	2:B:267:GLU:HG3	2.00	0.44
2:B:47:SER:HB3	2:B:92:PHE:HB3	2.00	0.43
2:B:295:TRP:HB3	2:B:361:LEU:HD21	2.00	0.43
2:B:434:PHE:HE2	6:B:803:DR9:HAG1	1.83	0.43
2:B:308:TYR:HB2	6:B:801:DR9:HAP1	1.99	0.43
2:B:353:ASP:OD1	2:B:354:MET:N	2.52	0.43
2:B:78:GLU:HA	2:B:81:ILE:HD12	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:218:ILE:HG21	1:D:222:LYS:HA	1.99	0.43
2:B:122:LEU:HD23	2:B:122:LEU:HA	1.91	0.43
2:B:280:ILE:HD11	2:B:304:GLN:HA	2.00	0.43
2:B:481:TRP:CE2	6:B:802:DR9:HAH2	2.54	0.42
1:D:182:CYS:O	6:B:801:DR9:OBR	2.37	0.42
2:B:188:GLY:HA2	2:B:297:LEU:HD13	2.01	0.42
2:B:242:THR:HB	2:B:281:ASN:O	2.19	0.42
1:D:83:ARG:O	1:D:86:SER:OG	2.32	0.42
1:D:142:ILE:HD13	1:D:142:ILE:HA	1.90	0.42
1:D:23:TRP:HD1	1:D:70:LEU:HG	1.84	0.42
1:D:195:TRP:CH2	2:B:113:ILE:HD11	2.54	0.42
2:B:342:ILE:HD11	2:B:392:TYR:CE1	2.54	0.42
2:B:387:ILE:HD13	2:B:387:ILE:HA	1.93	0.42
1:D:198:LEU:HD23	1:D:198:LEU:HA	1.91	0.42
1:D:320:CYS:O	1:D:322:VAL:HG13	2.19	0.42
2:B:435:LEU:HD21	2:B:488:LEU:HD21	2.02	0.41
2:B:27:ILE:O	2:B:31:VAL:HG23	2.20	0.41
2:B:102:GLU:OE1	2:B:193:LYS:HD3	2.21	0.41
1:D:58:PHE:HB3	1:D:63:TRP:O	2.21	0.41
2:B:5:ILE:HG13	2:B:493:ALA:O	2.21	0.41
1:D:63:TRP:CE2	1:D:66:PRO:HD2	2.56	0.40
2:B:405:ARG:HD2	2:B:405:ARG:HA	1.89	0.40
2:B:109:PHE:CE1	2:B:226:GLN:HB2	2.57	0.40

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	D	270/361 (75%)	247 (92%)	21 (8%)	2 (1%)	22 61
2	B	491/567 (87%)	460 (94%)	31 (6%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	761/928 (82%)	707 (93%)	52 (7%)	2 (0%)	44	74

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	320	CYS
1	D	185	ILE

### 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	D	235/297 (79%)	234 (100%)	1 (0%)	91	95
2	B	431/498 (86%)	431 (100%)	0	100	100
All	All	666/795 (84%)	665 (100%)	1 (0%)	93	98

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

Mol	Chain	Res	Type
1	D	186	SER

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

### 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

8 monosaccharides 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
3	NAG	A	1	1,3	14,14,15	0.21	0	17,19,21	0.51	0
3	NAG	A	2	3	14,14,15	0.23	0	17,19,21	0.42	0
4	NAG	C	1	1,4	14,14,15	0.28	0	17,19,21	0.40	0
4	NAG	C	2	4	14,14,15	0.68	1 (7%)	17,19,21	0.47	0
4	BMA	C	3	4	11,11,12	0.58	0	15,15,17	0.79	0
4	MAN	C	4	4	11,11,12	0.75	0	15,15,17	1.01	1 (6%)
4	MAN	C	5	4	11,11,12	0.63	0	15,15,17	0.96	2 (13%)
4	MAN	C	6	4	11,11,12	0.89	0	15,15,17	1.15	2 (13%)

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
3	NAG	A	1	1,3	-	3/6/23/26	0/1/1/1
3	NAG	A	2	3	-	1/6/23/26	0/1/1/1
4	NAG	C	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	C	2	4	-	2/6/23/26	0/1/1/1
4	BMA	C	3	4	-	1/2/19/22	0/1/1/1
4	MAN	C	4	4	-	0/2/19/22	0/1/1/1
4	MAN	C	5	4	-	0/2/19/22	0/1/1/1
4	MAN	C	6	4	-	0/2/19/22	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	2	NAG	O5-C1	-2.15	1.40	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	6	MAN	C1-O5-C5	2.52	115.61	112.19
4	C	6	MAN	O2-C2-C3	-2.31	105.51	110.14
4	C	4	MAN	O2-C2-C3	-2.26	105.62	110.14
4	C	5	MAN	C1-O5-C5	2.21	115.18	112.19
4	C	5	MAN	O2-C2-C3	-2.19	105.74	110.14

There are no chirality outliers.

All (9) torsion outliers are listed below:

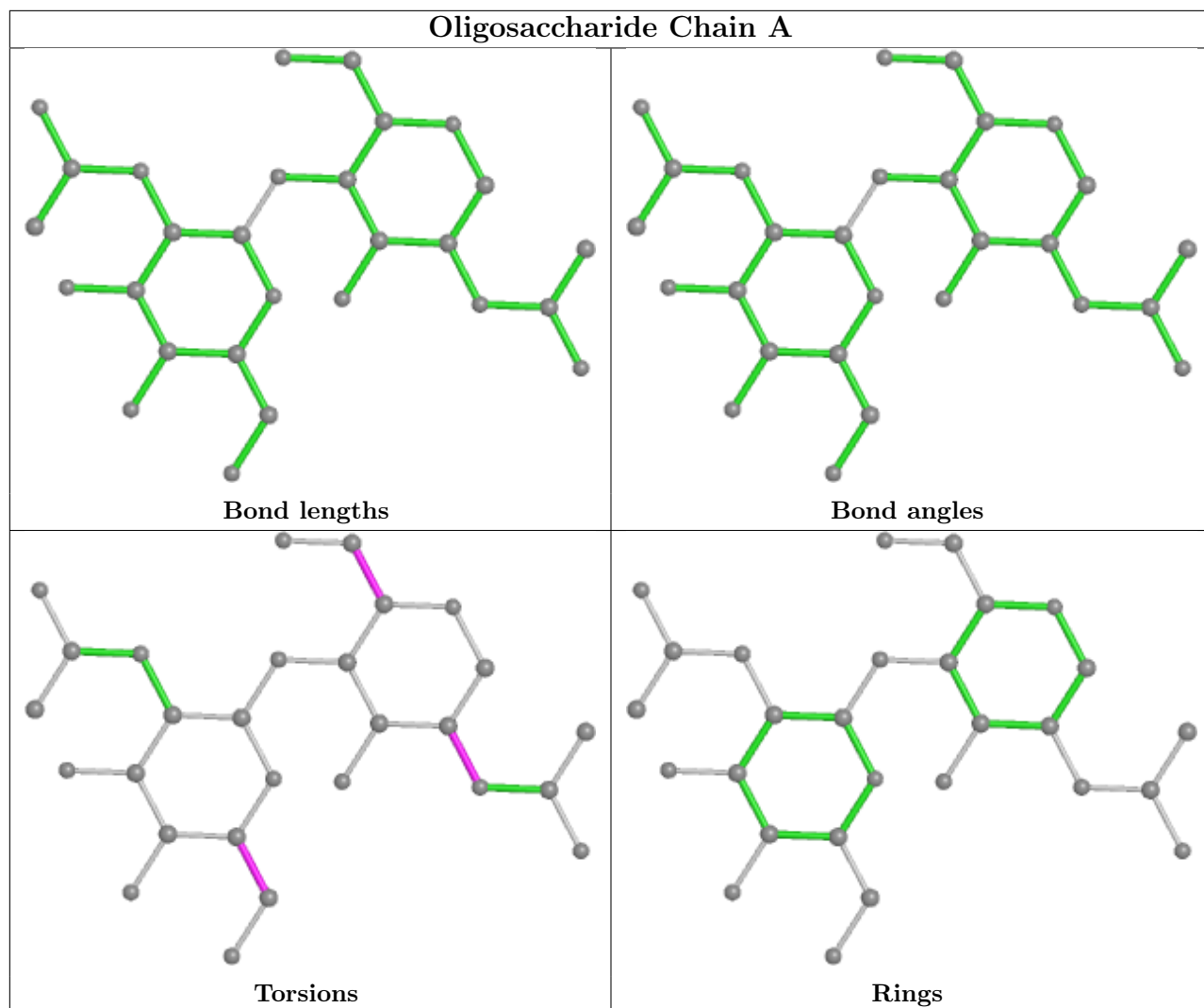
Mol	Chain	Res	Type	Atoms
4	C	2	NAG	C4-C5-C6-O6
4	C	1	NAG	O5-C5-C6-O6
4	C	2	NAG	O5-C5-C6-O6
3	A	1	NAG	O5-C5-C6-O6
3	A	1	NAG	C4-C5-C6-O6
4	C	1	NAG	C4-C5-C6-O6
3	A	2	NAG	O5-C5-C6-O6
4	C	3	BMA	O5-C5-C6-O6
3	A	1	NAG	C3-C2-N2-C7

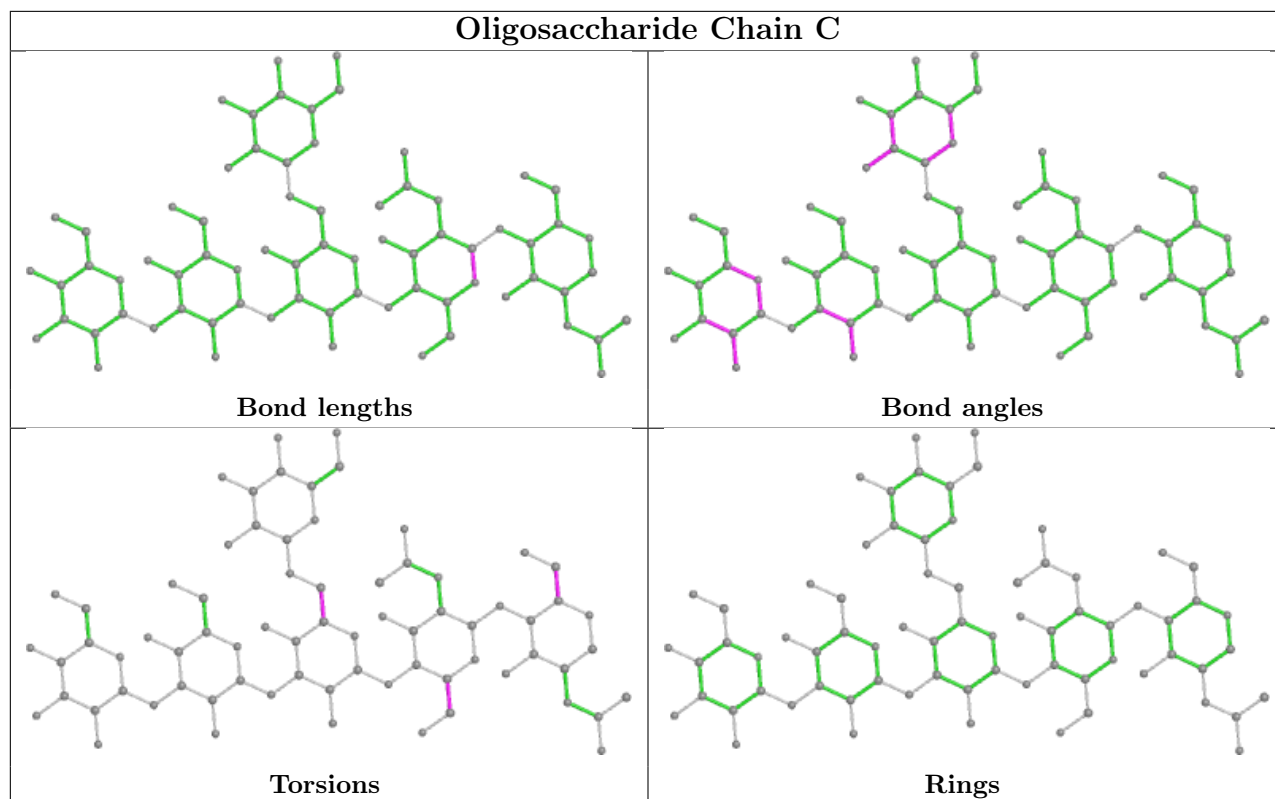
There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.







## 5.6 Ligand geometry [i](#)

5 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	PLM	D	1001	1	16,16,17	0.30	0	15,15,17	0.44	0
6	DR9	B	801	-	50,50,50	0.88	4 (8%)	53,56,56	1.03	2 (3%)
6	DR9	B	803	-	50,50,50	0.88	4 (8%)	53,56,56	1.05	2 (3%)
7	Y01	B	804	-	38,38,38	8.10	25 (65%)	57,57,57	2.15	20 (35%)
6	DR9	B	802	-	50,50,50	0.89	4 (8%)	53,56,56	1.03	2 (3%)

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	PLM	D	1001	1	-	9/13/14/15	-
6	DR9	B	801	-	-	24/55/55/55	-
6	DR9	B	803	-	-	20/55/55/55	-
7	Y01	B	804	-	-	10/19/77/77	0/4/4/4
6	DR9	B	802	-	-	23/55/55/55	-

All (37) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	804	Y01	CBD-CBG	-27.69	1.00	1.53
7	B	804	Y01	CAU-CAS	-16.66	1.17	1.53
7	B	804	Y01	CAU-CBI	-16.55	1.24	1.54
7	B	804	Y01	CAK-CBD	-15.22	1.27	1.53
7	B	804	Y01	CBH-CAZ	-12.62	1.27	1.52
7	B	804	Y01	CAQ-CAP	9.97	1.81	1.54
7	B	804	Y01	CBI-CBE	9.68	1.73	1.55
7	B	804	Y01	CBD-CBF	-9.26	1.35	1.53
7	B	804	Y01	CBH-CBF	9.25	1.71	1.56
7	B	804	Y01	CBB-CBE	-9.25	1.38	1.54
7	B	804	Y01	CAQ-CBG	8.00	1.71	1.54
7	B	804	Y01	CAK-CAI	7.75	1.66	1.50
7	B	804	Y01	CAT-CBH	6.11	1.65	1.54
7	B	804	Y01	CBI-CBG	6.03	1.66	1.55
7	B	804	Y01	CAR-CBC	-5.18	1.37	1.51
7	B	804	Y01	CAP-CBE	4.24	1.63	1.54
7	B	804	Y01	OAW-CAY	4.03	1.45	1.34
7	B	804	Y01	CAI-CAZ	3.46	1.40	1.33
7	B	804	Y01	CAV-CAZ	3.46	1.59	1.51
7	B	804	Y01	CAO-CBB	2.88	1.61	1.54
7	B	804	Y01	CAS-CBF	2.75	1.58	1.53
6	B	802	DR9	OBD-CBE	-2.56	1.40	1.46
6	B	801	DR9	OBD-CBE	-2.49	1.40	1.46
6	B	803	DR9	OBD-CBE	-2.48	1.40	1.46
7	B	804	Y01	CAV-CBC	2.44	1.57	1.52
6	B	803	DR9	OAC-CAD	2.43	1.40	1.33
6	B	802	DR9	OAC-CAD	2.39	1.40	1.33
7	B	804	Y01	CAC-CBB	2.35	1.58	1.53
6	B	801	DR9	OAC-CAD	2.34	1.40	1.33
7	B	804	Y01	CAD-CBH	2.21	1.58	1.54
6	B	803	DR9	OBD-CBC	2.19	1.40	1.34
6	B	801	DR9	OAC-CAB	-2.18	1.40	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	802	DR9	OAC-CAB	-2.18	1.40	1.45
6	B	801	DR9	OBD-CBC	2.15	1.40	1.34
6	B	802	DR9	OBD-CBC	2.13	1.40	1.34
6	B	803	DR9	OAC-CAB	-2.09	1.40	1.45
7	B	804	Y01	CAM-CAY	2.04	1.56	1.50

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	804	Y01	CAK-CAI-CAZ	-5.26	115.36	125.06
7	B	804	Y01	CAE-CBI-CBE	-4.44	103.44	111.71
7	B	804	Y01	CBI-CBE-CBB	-4.34	112.69	119.49
6	B	803	DR9	OBD-CBC-CBB	4.18	120.52	111.50
7	B	804	Y01	CBG-CBI-CBE	4.18	105.02	100.07
6	B	802	DR9	OBD-CBC-CBB	4.03	120.19	111.50
7	B	804	Y01	CBH-CAZ-CAI	-4.02	116.75	122.90
7	B	804	Y01	CAD-CBH-CBF	-3.94	106.98	111.68
6	B	801	DR9	OBD-CBC-CBB	3.91	119.92	111.50
7	B	804	Y01	OAW-CAY-CAM	3.79	119.67	111.50
7	B	804	Y01	CAS-CBF-CBH	-3.73	108.17	113.08
7	B	804	Y01	CAU-CBI-CBG	3.50	112.69	107.27
7	B	804	Y01	CAU-CBI-CBE	3.08	121.17	116.57
7	B	804	Y01	CAQ-CBG-CBD	2.78	123.66	119.08
7	B	804	Y01	CAE-CBI-CAU	-2.66	106.40	110.59
6	B	802	DR9	OAC-CAD-CAE	2.58	120.00	111.91
6	B	801	DR9	OAC-CAD-CAE	2.58	119.99	111.91
7	B	804	Y01	CBF-CBH-CAZ	2.54	113.64	109.65
6	B	803	DR9	OAC-CAD-CAE	2.53	119.86	111.91
7	B	804	Y01	CAE-CBI-CBG	-2.51	107.03	111.71
7	B	804	Y01	CBF-CBD-CBG	2.46	112.38	109.09
7	B	804	Y01	CAP-CBE-CBI	2.45	106.80	103.84
7	B	804	Y01	CAS-CAU-CBI	2.42	116.92	112.78
7	B	804	Y01	CAK-CBD-CBF	2.33	112.54	109.71
7	B	804	Y01	CAV-CAZ-CBH	-2.33	113.33	116.42
7	B	804	Y01	CAM-CAL-CAX	-2.09	109.11	113.60

There are no chirality outliers.

All (86) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	801	DR9	CBO-OBN-PBM-OBF
6	B	802	DR9	CBO-CBP-CBQ-OBP

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Mol	Chain	Res	Type	Atoms
6	B	802	DR9	OBG-CBP-CBQ-OBR
6	B	803	DR9	CBO-CBP-CBQ-OBR
6	B	803	DR9	OBJ-CBC-OBD-CBE
6	B	803	DR9	OAA-CAD-OAC-CAB
6	B	803	DR9	CAE-CAD-OAC-CAB
6	B	803	DR9	CBB-CBC-OBD-CBE
7	B	804	Y01	CAJ-CAO-CBB-CAC
6	B	801	DR9	OBN-CBO-CBP-CBQ
6	B	802	DR9	CAE-CAD-OAC-CAB
6	B	802	DR9	OAA-CAD-OAC-CAB
6	B	802	DR9	CAZ-CBA-CBB-CBC
6	B	801	DR9	OBN-CBO-CBP-OBG
6	B	802	DR9	CAX-CAY-CAZ-CBA
6	B	803	DR9	CAX-CAY-CAZ-CBA
6	B	802	DR9	CAW-CAX-CAY-CAZ
5	D	1001	PLM	C2-C3-C4-C5
5	D	1001	PLM	C5-C6-C7-C8
6	B	803	DR9	CAH-CAI-CAJ-CAK
5	D	1001	PLM	C4-C5-C6-C7
5	D	1001	PLM	C8-C9-CA-CB
6	B	801	DR9	CAH-CAI-CAJ-CAK
5	D	1001	PLM	C3-C4-C5-C6
6	B	803	DR9	OBG-CBP-CBQ-OBR
6	B	801	DR9	CBI-CAR-CAS-CAT
6	B	801	DR9	CAW-CAX-CAY-CAZ
6	B	801	DR9	CAV-CAW-CAX-CAY
6	B	801	DR9	CAU-CAV-CAW-CAX
7	B	804	Y01	CAX-CAL-CAM-CAY
5	D	1001	PLM	C7-C8-C9-CA
6	B	803	DR9	CAQ-CBH-CBS-CBV
6	B	801	DR9	CBO-OBN-PBM-OBL
6	B	802	DR9	CBO-OBN-PBM-OBL
7	B	804	Y01	CAC-CBB-CBE-CBI
6	B	802	DR9	CAM-CAN-CAO-CAP
6	B	801	DR9	OAC-CAB-CBE-CBK
6	B	802	DR9	OAC-CAB-CBE-CBK
6	B	802	DR9	CAY-CAZ-CBA-CBB
6	B	803	DR9	CAM-CAN-CAO-CAP
5	D	1001	PLM	CD-CE-CF-CG
7	B	804	Y01	CAC-CBB-CBE-CAP
6	B	801	DR9	OAC-CAB-CBE-OBD
6	B	801	DR9	CAY-CAZ-CBA-CBB

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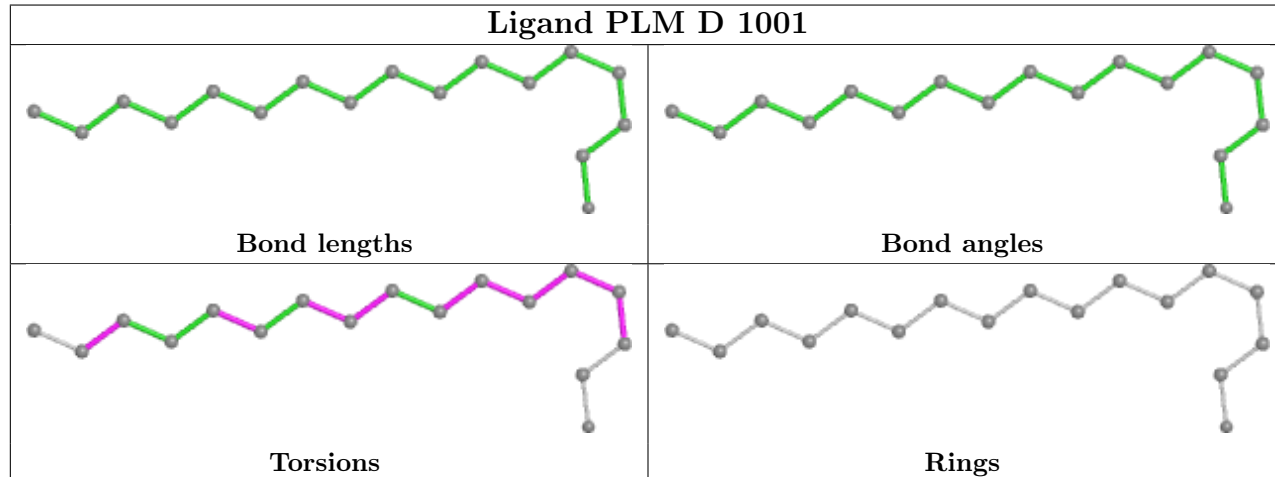
Mol	Chain	Res	Type	Atoms
7	B	804	Y01	CAO-CBB-CBE-CBI
7	B	804	Y01	CAJ-CAN-CBA-CAB
6	B	803	DR9	OBN-CBO-CBP-CBQ
6	B	802	DR9	CBP-CBO-OBN-PBM
7	B	804	Y01	CAJ-CAN-CBA-CAA
6	B	802	DR9	OAC-CAB-CBE-OBD
6	B	802	DR9	CAV-CAW-CAX-CAY
6	B	801	DR9	CAF-CAG-CAH-CAI
6	B	801	DR9	CAS-CAR-CBI-CBT
6	B	803	DR9	CBK-OBL-PBM-OBN
6	B	801	DR9	CBO-OBN-PBM-OBU
6	B	802	DR9	CBO-OBN-PBM-OBF
6	B	802	DR9	CBI-CBT-CBW-CBY
7	B	804	Y01	CAO-CBB-CBE-CAP
6	B	803	DR9	OBN-CBO-CBP-OBG
5	D	1001	PLM	C1-C2-C3-C4
6	B	802	DR9	CAR-CBI-CBT-CBW
6	B	802	DR9	CAL-CAM-CAN-CAO
6	B	803	DR9	CAV-CAW-CAX-CAY
6	B	802	DR9	CAS-CAR-CBI-CBT
6	B	802	DR9	CBK-OBL-PBM-OBN
6	B	802	DR9	CAH-CAI-CAJ-CAK
6	B	803	DR9	CAR-CBI-CBT-CBW
6	B	803	DR9	CAS-CAR-CBI-CBT
6	B	801	DR9	CAX-CAY-CAZ-CBA
6	B	801	DR9	CAE-CAF-CAG-CAH
6	B	801	DR9	CAM-CAN-CAO-CAP
6	B	803	DR9	CAL-CAM-CAN-CAO
6	B	803	DR9	CAO-CAP-CAQ-CBH
6	B	801	DR9	CBA-CBB-CBC-OBD
6	B	801	DR9	CAT-CAU-CAV-CAW
6	B	802	DR9	CAT-CAU-CAV-CAW
7	B	804	Y01	CAM-CAL-CAX-OAH
7	B	804	Y01	CAM-CAL-CAX-OAF
6	B	801	DR9	OBD-CBE-CBK-OBL
6	B	801	DR9	CBA-CBB-CBC-OBJ
6	B	803	DR9	OAC-CAB-CBE-CBK
6	B	802	DR9	CBO-OBN-PBM-OBU
6	B	801	DR9	CAP-CAQ-CBH-CBS
5	D	1001	PLM	CA-CB-CC-CD
6	B	801	DR9	CBI-CBT-CBW-CBY
6	B	803	DR9	CAP-CAQ-CBH-CBS

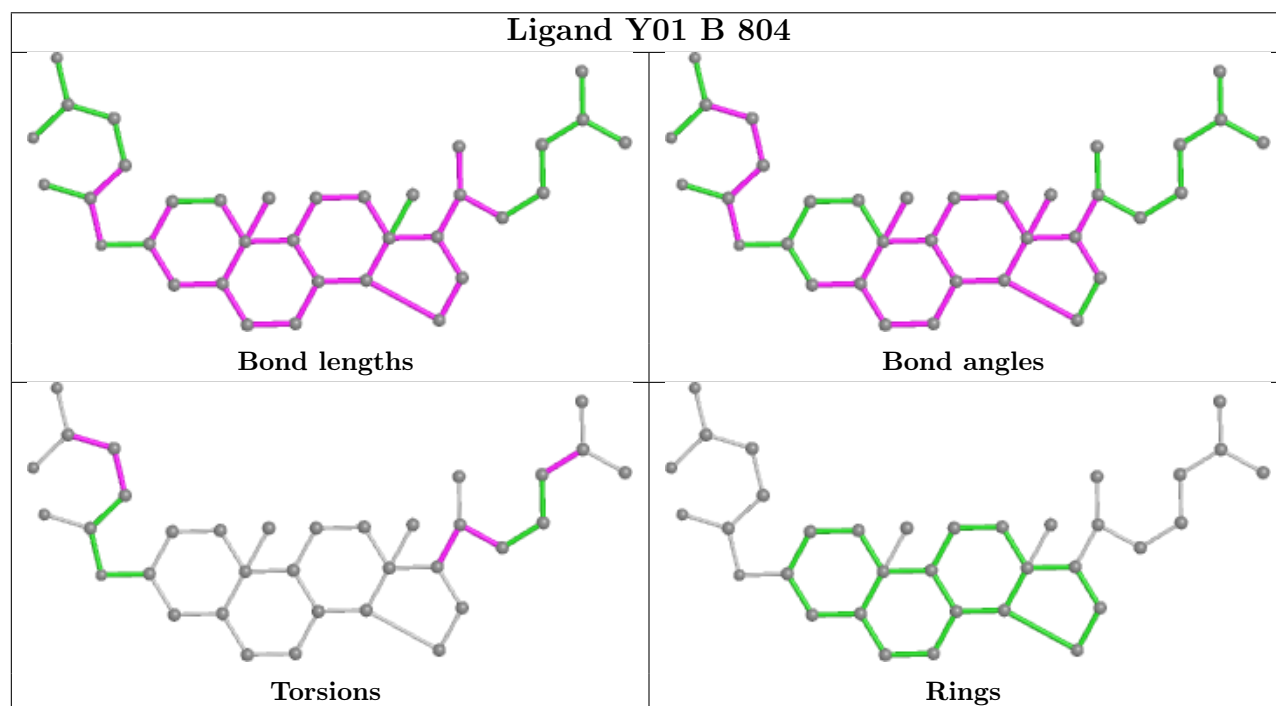
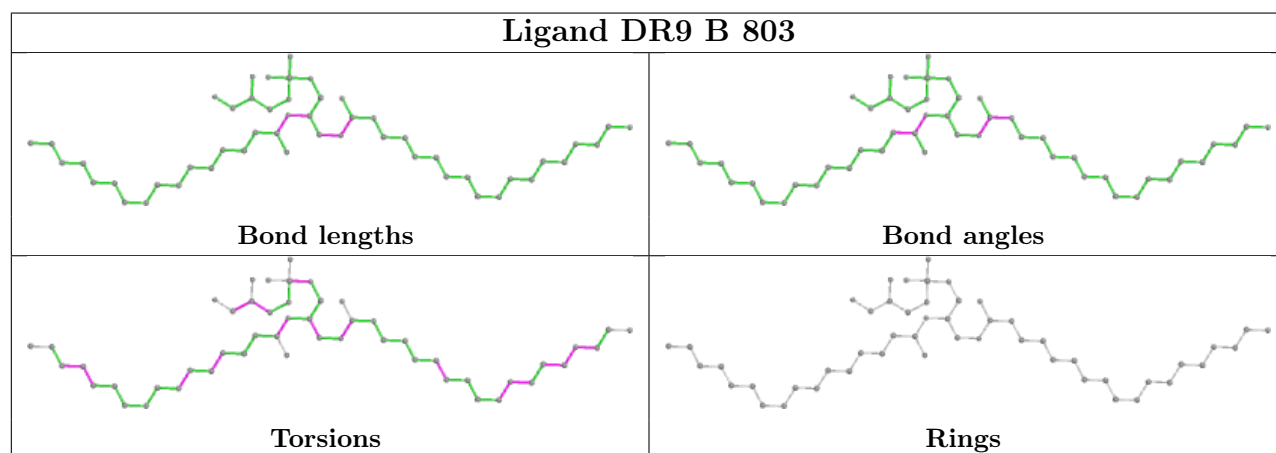
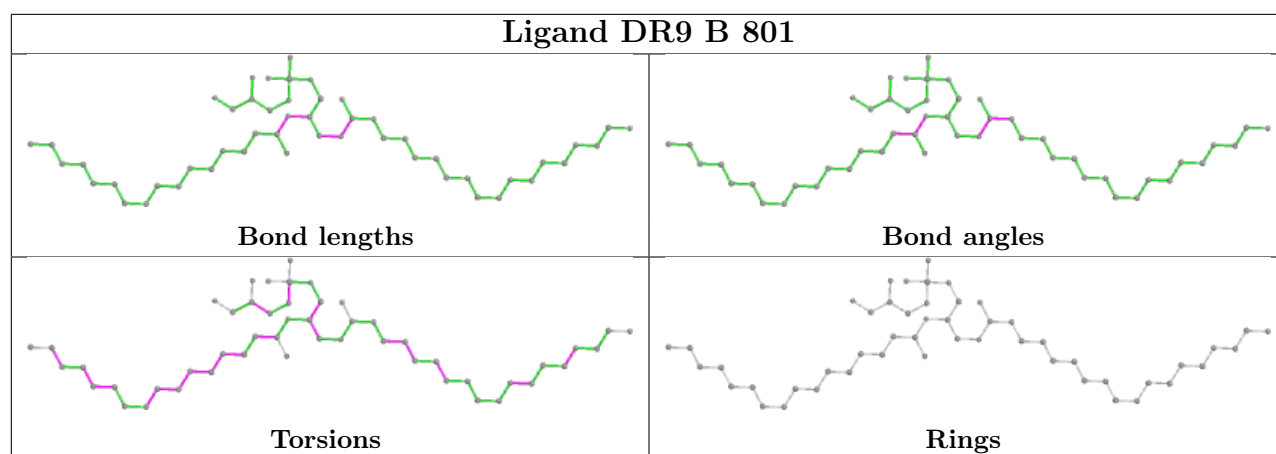
There are no ring outliers.

5 monomers are involved in 14 short contacts:

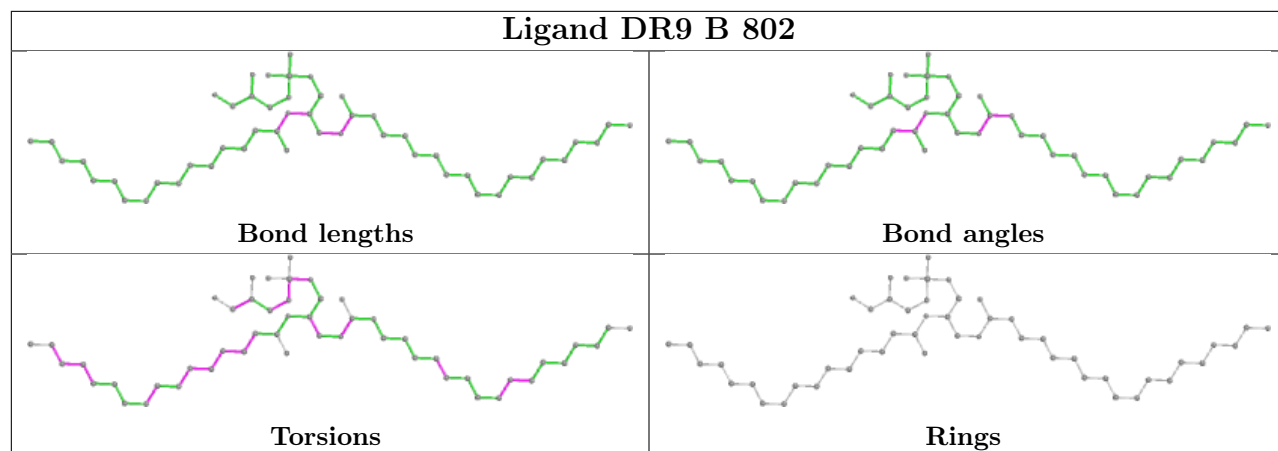
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	1001	PLM	3	0
6	B	801	DR9	3	0
6	B	803	DR9	3	0
7	B	804	Y01	2	0
6	B	802	DR9	4	0

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 than 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.









## 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.

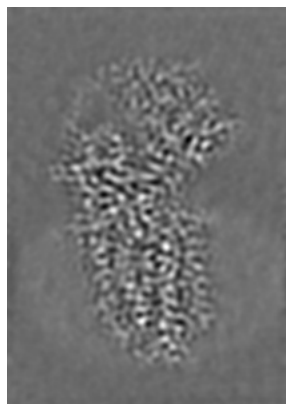
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-22806. These allow visual inspection of the internal detail of the map and identification of artifacts.

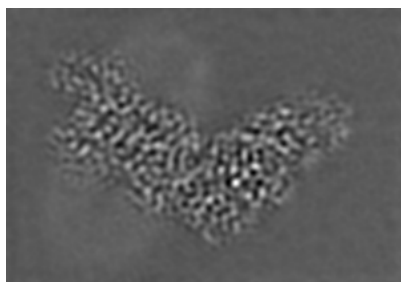
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

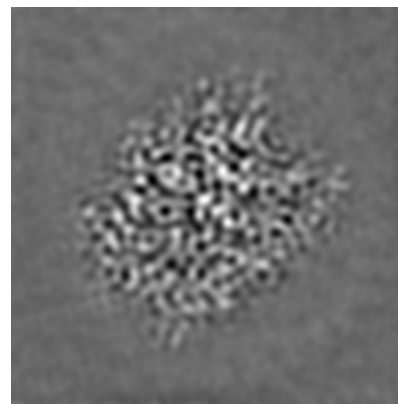
#### 6.1.1 Primary map



X

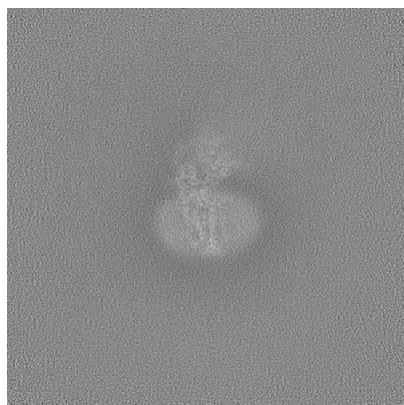


Y

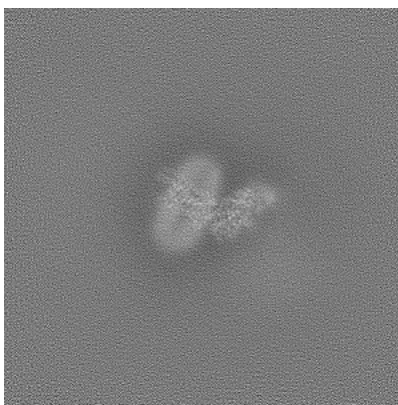


Z

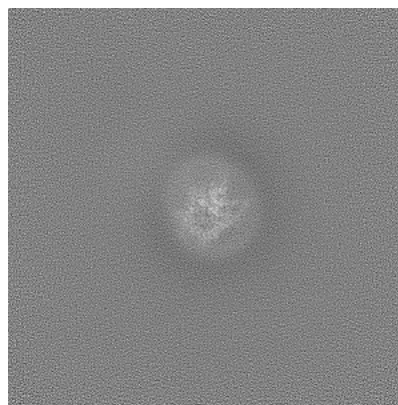
#### 6.1.2 Raw map



X



Y

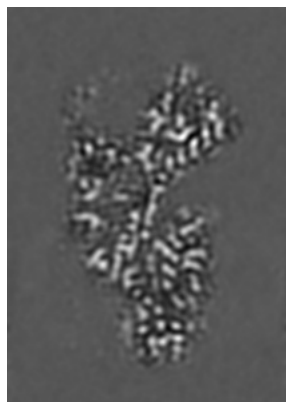


Z

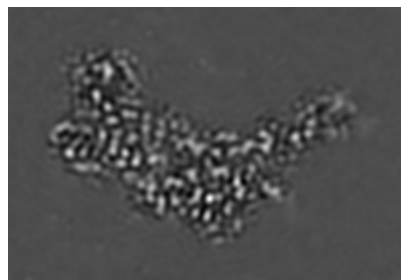
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

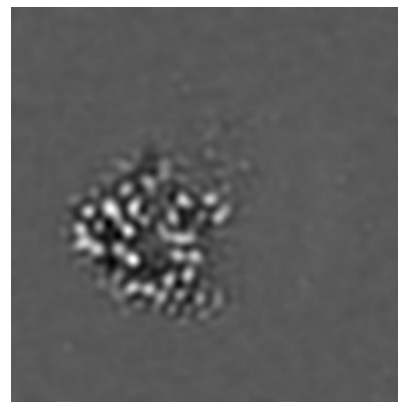
### 6.2.1 Primary map



X Index: 60

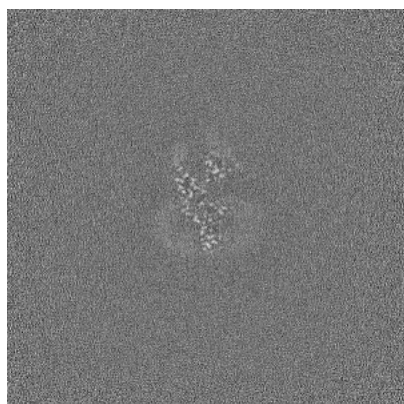


Y Index: 61

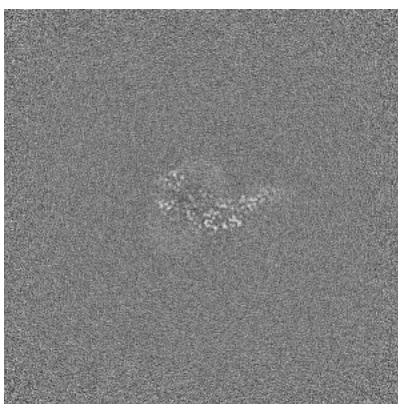


Z Index: 87

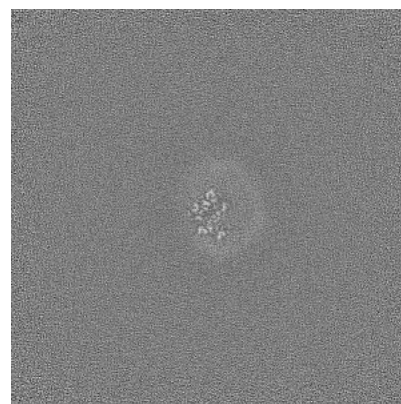
### 6.2.2 Raw map



X Index: 225



Y Index: 225



Z Index: 225

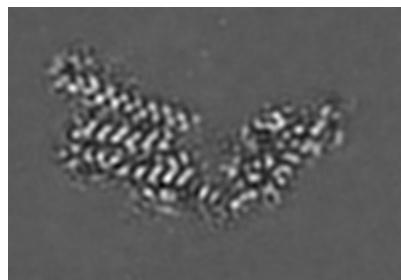
The images above show central slices of the map in three orthogonal directions.

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

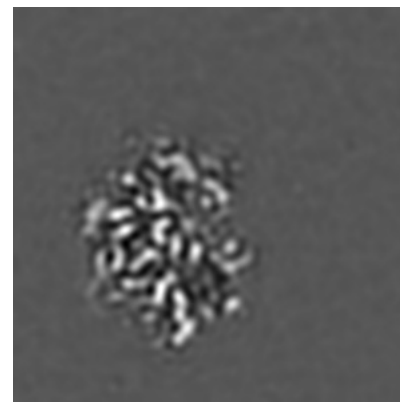
### 6.3.1 Primary map



X Index: 64

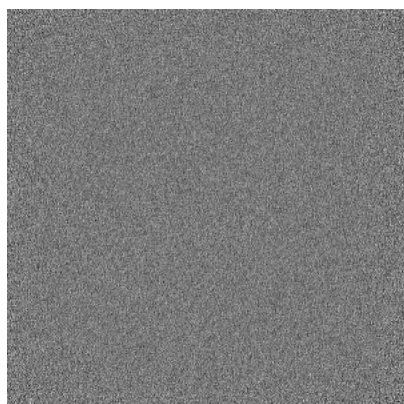


Y Index: 69

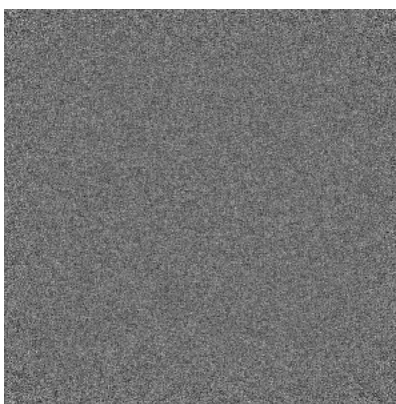


Z Index: 100

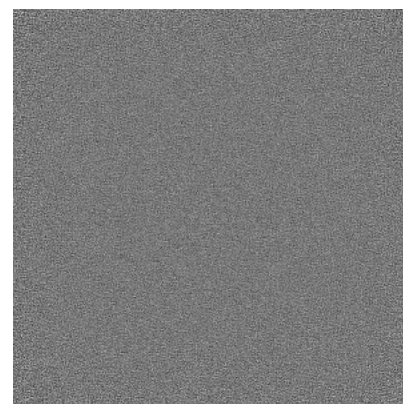
### 6.3.2 Raw map



X Index: 0



Y Index: 0



Z Index: 0

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

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

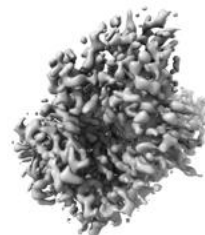
### 6.4.1 Primary map



X



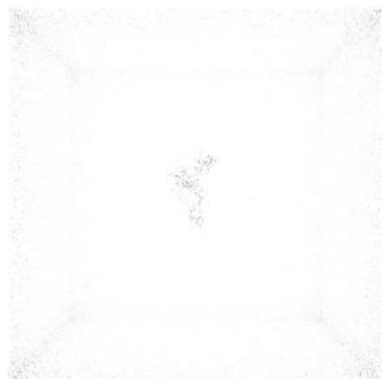
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.463. 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.



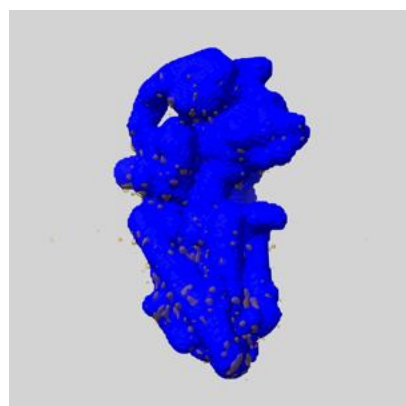
## 6.5 Mask visualisation [i](#)

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

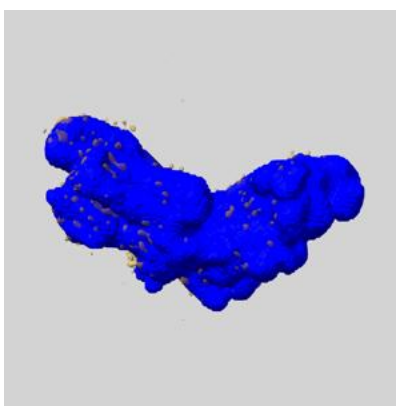
A mask typically either:

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

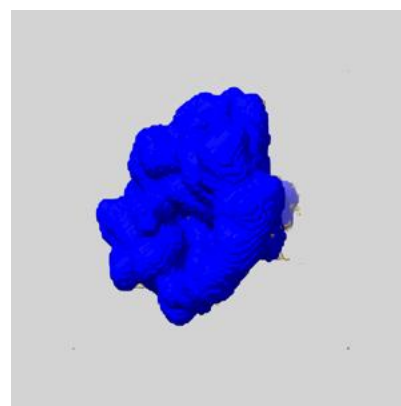
### 6.5.1 emd\_22806\_msk\_1.map [i](#)



X

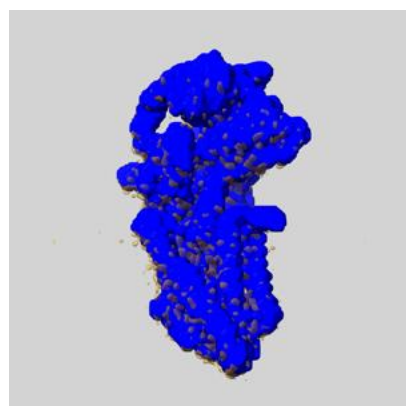


Y

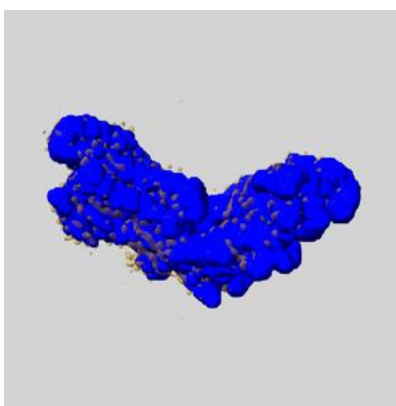


Z

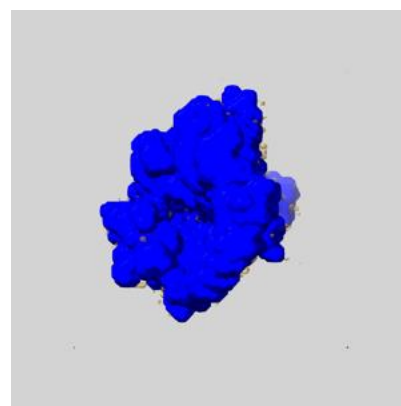
### 6.5.2 emd\_22806\_msk\_2.map [i](#)



X



Y

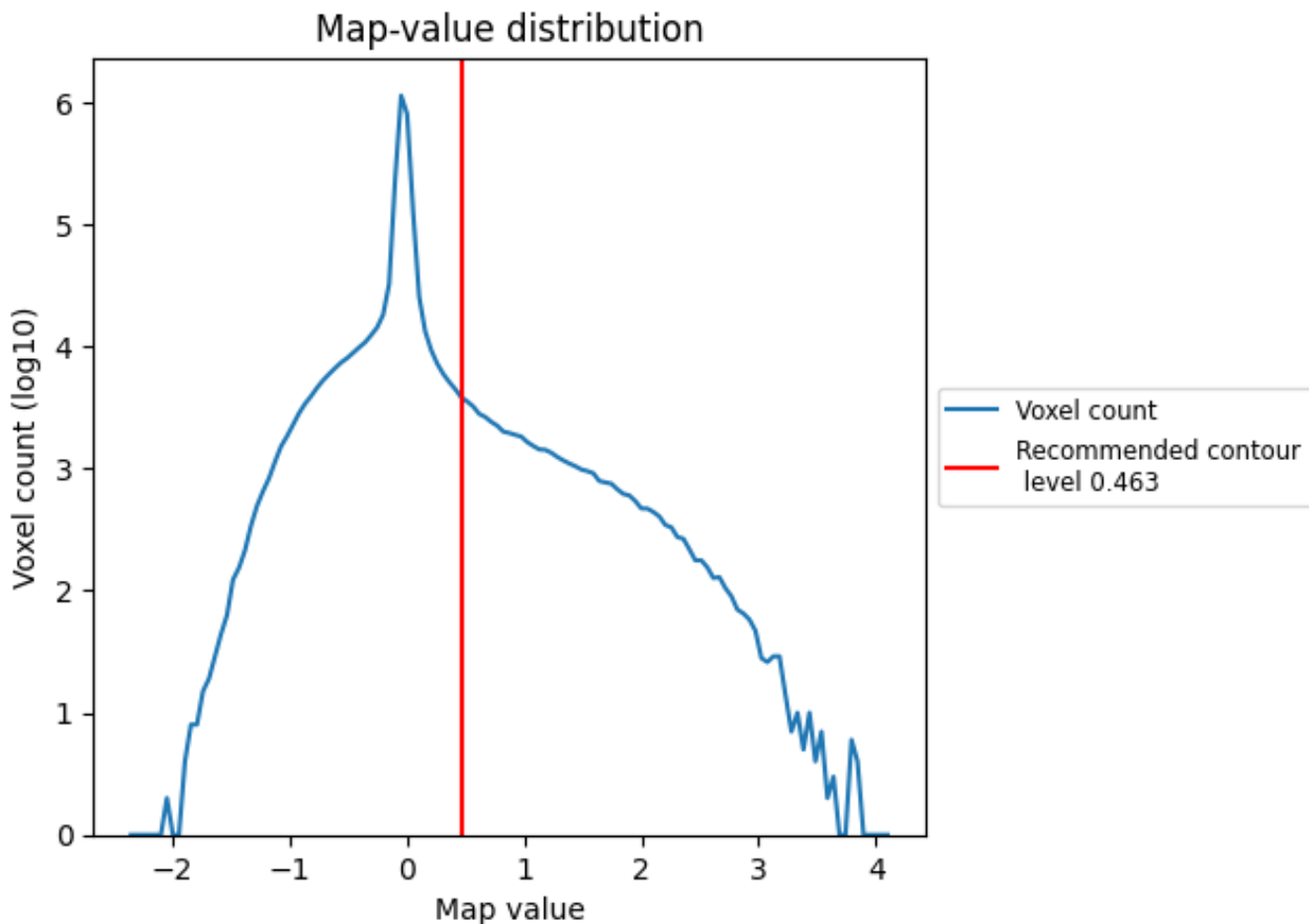


Z

## 7 Map analysis [i](#)

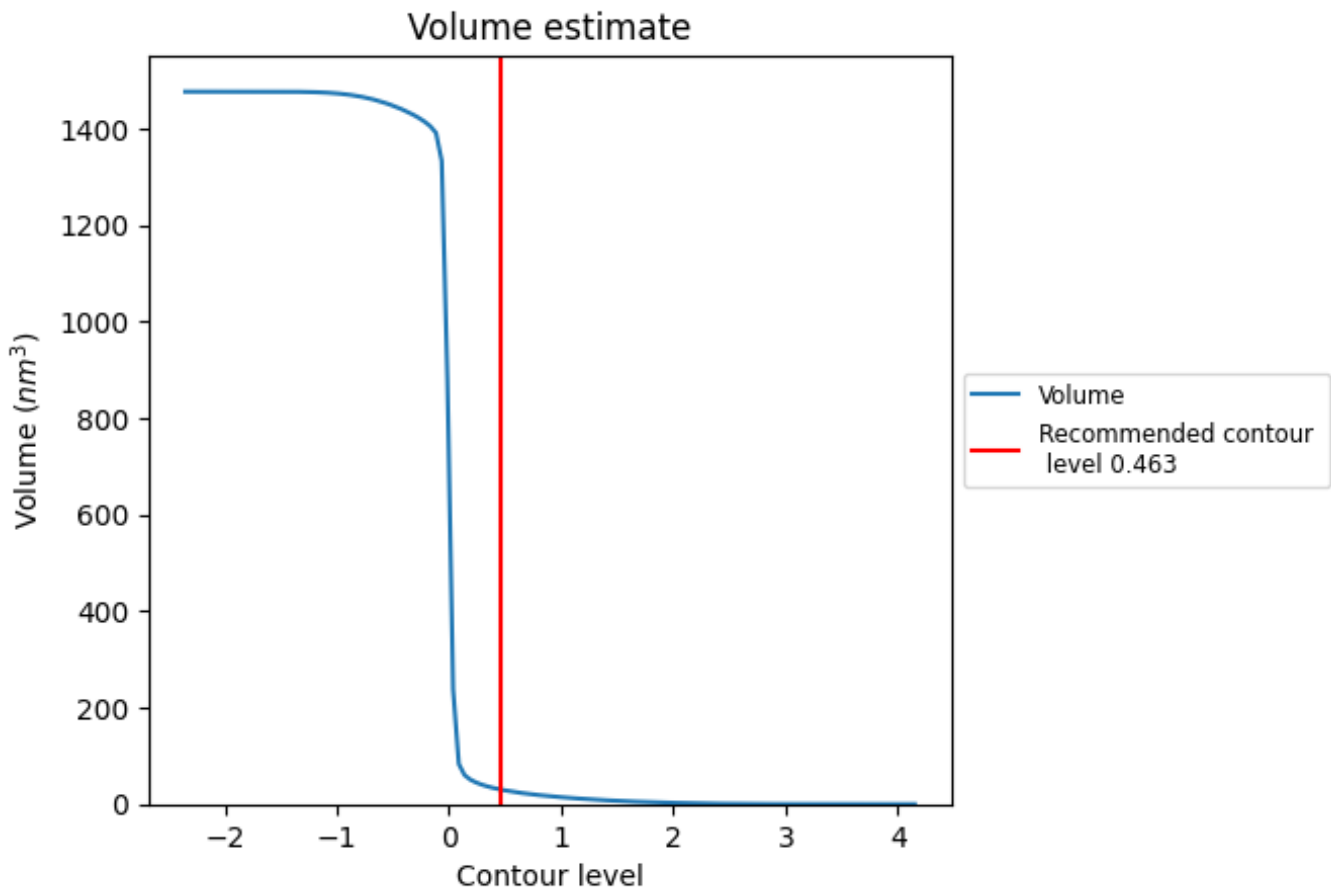
This section contains the results of statistical analysis of the map.

### 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 30 nm<sup>3</sup>; this corresponds to an approximate mass of 27 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](#)

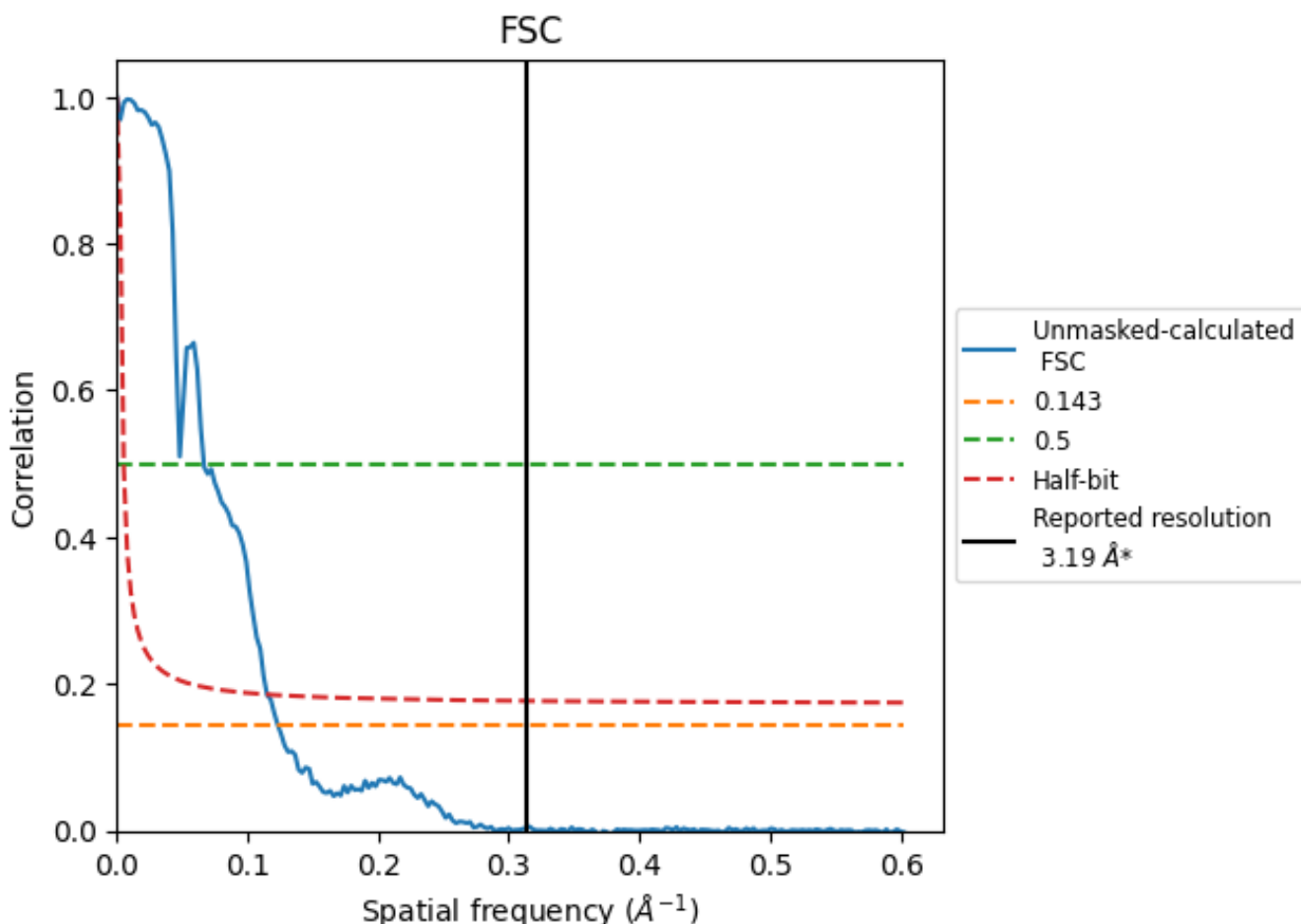
This section was not generated. The rotationally averaged power spectrum is only generated for cubic maps.



## 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 0.313  $\text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

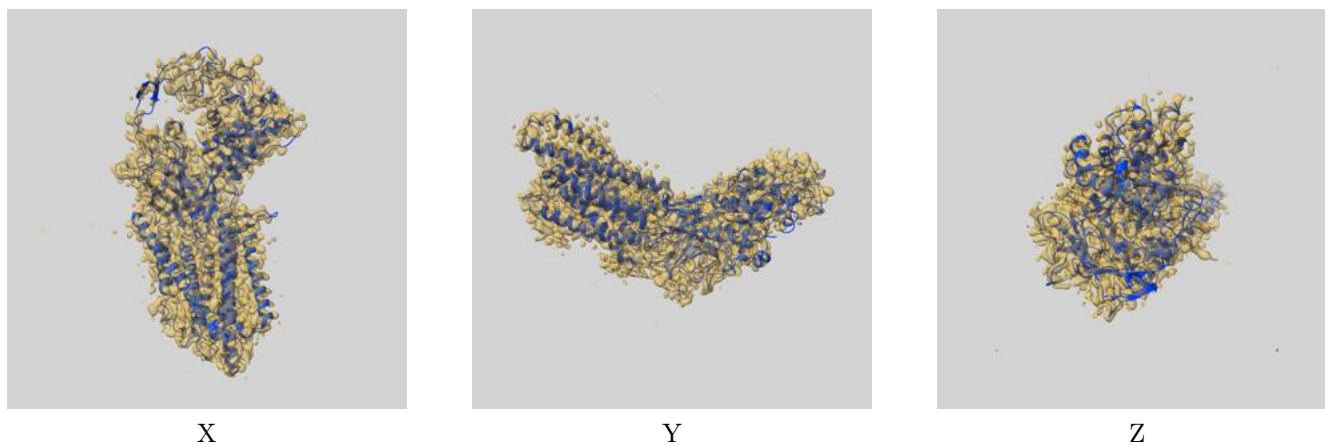
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.19	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	8.11	14.99	8.70

\*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 8.11 differs from the reported value 3.19 by more than 10 %

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

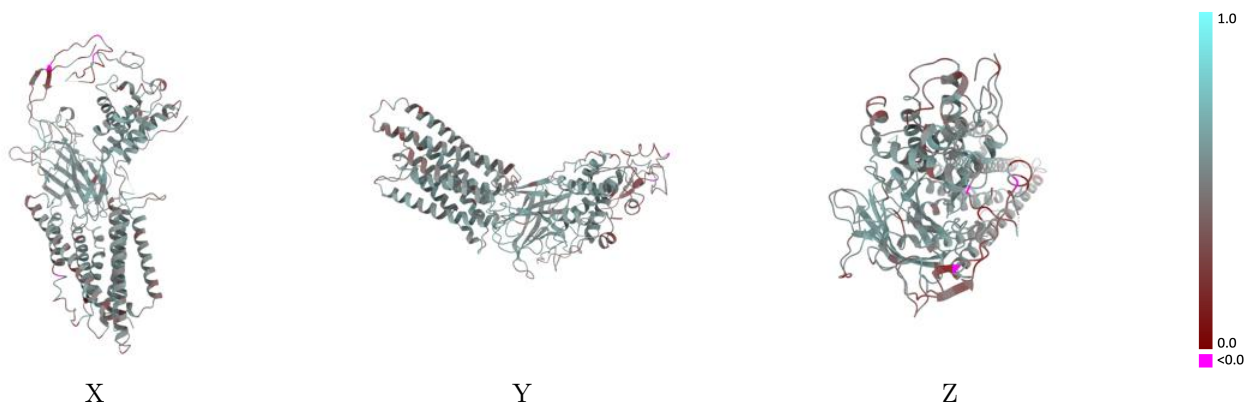
This section contains information regarding the fit between EMDB map EMD-22806 and PDB model 7KC4. Per-residue inclusion information can be found in section 3 on page 7.

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



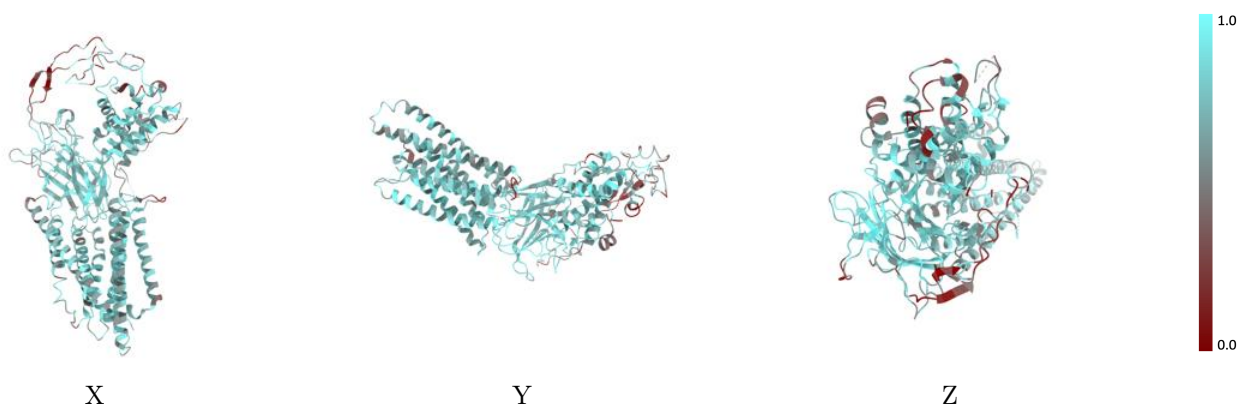
The images above show the 3D surface view of the map at the recommended contour level 0.463 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



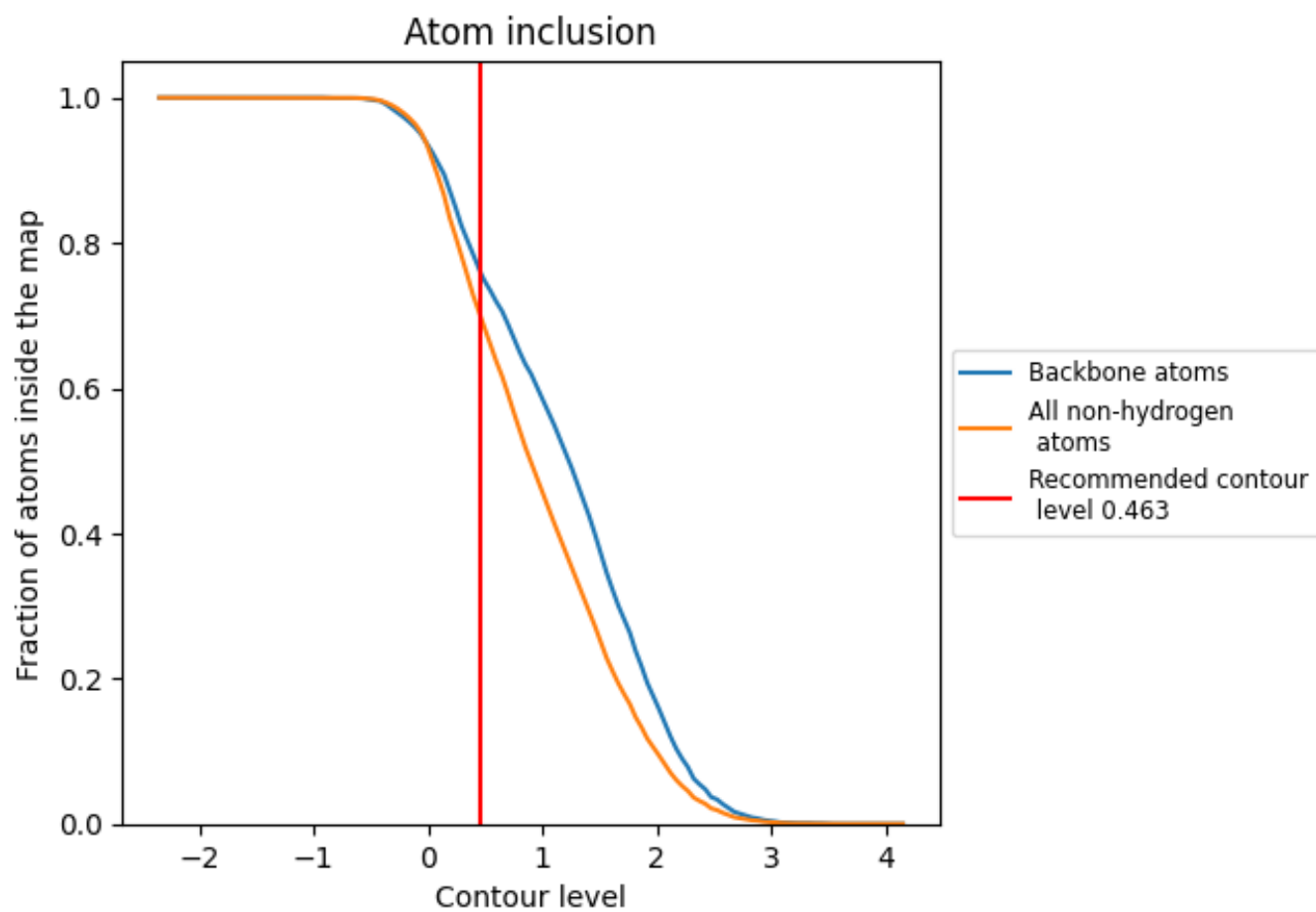
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.463).











## 9.4 Atom inclusion [i](#)



At the recommended contour level, 76% of all backbone atoms, 70% 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 (0.463) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6959	 0.5060
A	 0.1429	 0.3710
B	 0.7360	 0.5230
C	 0.3611	 0.4150
D	 0.6370	 0.4780

