



Full wwPDB EM Validation Report ⓘ

Mar 26, 2026 – 10:35 AM EDT

PDB ID : 9NJA / pdb_00009nja
EMDB ID : EMD-49477
Title : Computationally optimized broadly reactive influenza B hemagglutinin BC2 bound by antibody #46
Authors : Dzimianski, J.V.; Kunkel, I.; Balasco Serrao, V.H.; DuBois, R.M.
Deposited on : 2025-02-27
Resolution : 2.50 Å (reported)
Based on initial models : 9NJ3, .

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 ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

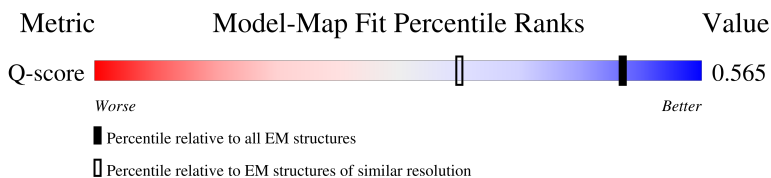
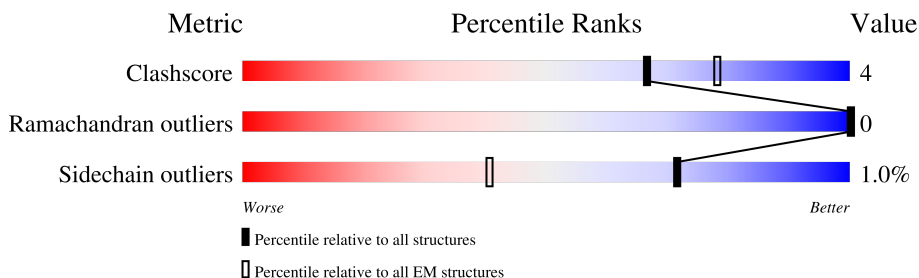
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.48.1

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 2.50 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.



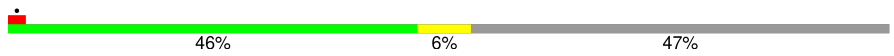
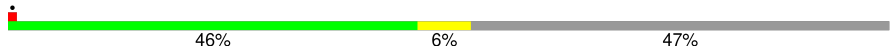
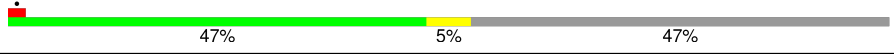
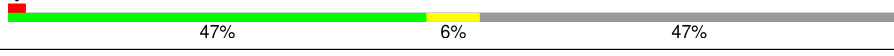
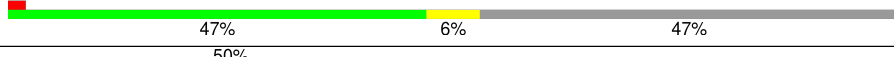



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	7115 (2.00 - 3.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	K	218	
1	L	218	
1	P	218	
2	H	233	

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Mol	Chain	Length	Quality of chain
2	J	233	
2	Q	233	
3	A	530	
3	B	530	
3	C	530	
4	D	2	
4	E	2	
4	F	2	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 11688 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 Fab A Light Chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	L	103	768	472	135	158	3	0	0
1	K	103	768	472	135	158	3	0	0
1	P	103	768	472	135	158	3	0	0

- Molecule 2 is a protein called Fab A Heavy Chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	H	123	951	610	160	177	4	0	0
2	J	123	951	610	160	177	4	0	0
2	Q	123	951	610	160	177	4	0	0

- Molecule 3 is a protein called Hemagglutinin.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	A	280	2121	1326	382	398	15	0	0
3	B	280	2121	1326	382	398	15	0	0
3	C	280	2121	1326	382	398	15	0	0

There are 51 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	88	ARG	LYS	conflict	UNP P17504
A	116	ASN	HIS	conflict	UNP P17504
A	129	LYS	THR	conflict	UNP P17504

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Chain	Residue	Modelled	Actual	Comment	Reference
A	136	ARG	LYS	conflict	UNP P17504
A	137	ILE	VAL	conflict	UNP P17504
A	199	THR	ALA	conflict	UNP P17504
A	202	LYS	VAL	conflict	UNP P17504
A	235	THR	ALA	conflict	UNP P17504
A	262	VAL	THR	conflict	UNP P17504
A	293	ALA	ARG	conflict	UNP P17504
A	524	SER	-	expression tag	UNP P17504
A	525	GLY	-	expression tag	UNP P17504
A	526	ARG	-	expression tag	UNP P17504
A	527	LEU	-	expression tag	UNP P17504
A	528	VAL	-	expression tag	UNP P17504
A	529	PRO	-	expression tag	UNP P17504
A	530	ARG	-	expression tag	UNP P17504
B	88	ARG	LYS	conflict	UNP P17504
B	116	ASN	HIS	conflict	UNP P17504
B	129	LYS	THR	conflict	UNP P17504
B	136	ARG	LYS	conflict	UNP P17504
B	137	ILE	VAL	conflict	UNP P17504
B	199	THR	ALA	conflict	UNP P17504
B	202	LYS	VAL	conflict	UNP P17504
B	235	THR	ALA	conflict	UNP P17504
B	262	VAL	THR	conflict	UNP P17504
B	293	ALA	ARG	conflict	UNP P17504
B	524	SER	-	expression tag	UNP P17504
B	525	GLY	-	expression tag	UNP P17504
B	526	ARG	-	expression tag	UNP P17504
B	527	LEU	-	expression tag	UNP P17504
B	528	VAL	-	expression tag	UNP P17504
B	529	PRO	-	expression tag	UNP P17504
B	530	ARG	-	expression tag	UNP P17504
C	88	ARG	LYS	conflict	UNP P17504
C	116	ASN	HIS	conflict	UNP P17504
C	129	LYS	THR	conflict	UNP P17504
C	136	ARG	LYS	conflict	UNP P17504
C	137	ILE	VAL	conflict	UNP P17504
C	199	THR	ALA	conflict	UNP P17504
C	202	LYS	VAL	conflict	UNP P17504
C	235	THR	ALA	conflict	UNP P17504
C	262	VAL	THR	conflict	UNP P17504
C	293	ALA	ARG	conflict	UNP P17504
C	524	SER	-	expression tag	UNP P17504

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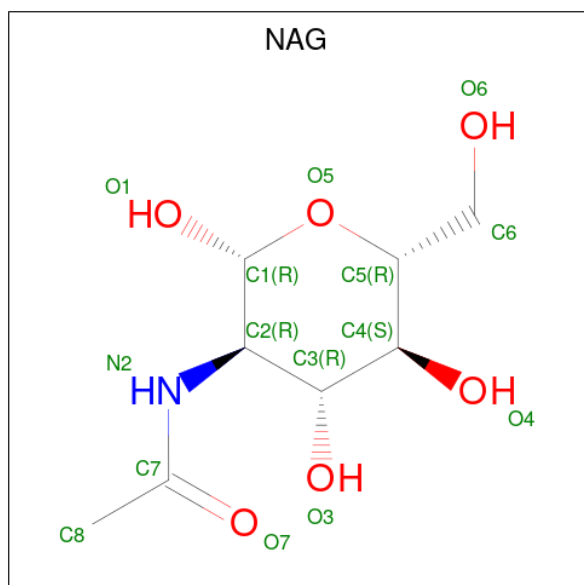
Chain	Residue	Modelled	Actual	Comment	Reference
C	525	GLY	-	expression tag	UNP P17504
C	526	ARG	-	expression tag	UNP P17504
C	527	LEU	-	expression tag	UNP P17504
C	528	VAL	-	expression tag	UNP P17504
C	529	PRO	-	expression tag	UNP P17504
C	530	ARG	-	expression tag	UNP P17504

- Molecule 4 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		
4	D	2	28	16	2	10	0	0
4	E	2	28	16	2	10	0	0
4	F	2	28	16	2	10	0	0

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

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

ALA ALA GLY THR PHE ASN ALA GLY GLU PHE SER LEU PRO THR PHE ASP SER LEU ASN ILE THR ALA ALA SER SER GLY ARG LEU VAL PRO LYS ARG

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1
MAG2

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C3	Depositor
Number of particles used	209227	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOCONTINUUM (6k x 4k)	Depositor
Maximum map value	4.670	Depositor
Minimum map value	-2.904	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.061	Depositor
Recommended contour level	0.3	Depositor
Map size (Å)	329.8752, 329.8752, 329.8752	wwPDB
Map dimensions	576, 576, 576	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.5727, 0.5727, 0.5727	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	K	0.10	0/782	0.30	0/1062
1	L	0.10	0/782	0.30	0/1062
1	P	0.10	0/782	0.30	0/1062
2	H	0.11	0/977	0.26	0/1328
2	J	0.11	0/977	0.26	0/1328
2	Q	0.11	0/977	0.26	0/1328
3	A	0.12	0/2167	0.27	0/2933
3	B	0.12	0/2167	0.27	0/2933
3	C	0.12	0/2167	0.27	0/2933
All	All	0.11	0/11778	0.27	0/15969

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	K	768	0	740	4	0
1	L	768	0	740	5	0
1	P	768	0	740	3	0
2	H	951	0	923	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	J	951	0	923	9	0
2	Q	951	0	923	9	0
3	A	2121	0	2110	16	0
3	B	2121	0	2110	18	0
3	C	2121	0	2110	18	0
4	D	28	0	25	0	0
4	E	28	0	25	0	0
4	F	28	0	25	0	0
5	A	28	0	26	0	0
5	B	28	0	26	0	0
5	C	28	0	26	0	0
All	All	11688	0	11472	86	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 4.

All (86) 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:P:52:LEU:HD21	1:P:55:TYR:HB3	1.67	0.76
1:K:52:LEU:HD21	1:K:55:TYR:HB3	1.67	0.75
1:L:52:LEU:HD21	1:L:55:TYR:HB3	1.67	0.74
1:K:95:GLN:HE21	1:K:102:VAL:HG13	1.65	0.61
1:L:95:GLN:HE21	1:L:102:VAL:HG13	1.65	0.61
1:P:95:GLN:HE21	1:P:102:VAL:HG13	1.65	0.60
3:C:82:SER:HB2	3:C:282:VAL:HG22	1.84	0.59
3:A:82:SER:HB2	3:A:282:VAL:HG22	1.84	0.59
3:B:82:SER:HB2	3:B:282:VAL:HG22	1.84	0.59
3:A:240:LEU:HD12	3:A:241:PRO:HD2	1.87	0.57
3:B:240:LEU:HD12	3:B:241:PRO:HD2	1.87	0.56
3:C:240:LEU:HD12	3:C:241:PRO:HD2	1.86	0.56
3:C:73:MET:HE1	3:C:154:ALA:HB2	1.88	0.56
3:A:73:MET:HE1	3:A:154:ALA:HB2	1.88	0.55
3:B:73:MET:HE1	3:B:154:ALA:HB2	1.88	0.55
3:C:185:GLU:HG2	3:C:277:SER:HB3	1.90	0.54
3:A:185:GLU:HG2	3:A:277:SER:HB3	1.89	0.54
3:B:185:GLU:HG2	3:B:277:SER:HB3	1.90	0.53
3:A:135:TYR:CG	3:A:159:ALA:HB1	2.45	0.52
3:C:135:TYR:CG	3:C:159:ALA:HB1	2.45	0.51
3:B:70:PRO:HA	3:B:73:MET:HE2	1.93	0.51
3:B:135:TYR:CG	3:B:159:ALA:HB1	2.45	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:70:PRO:HA	3:A:73:MET:HE2	1.93	0.50
3:C:70:PRO:HA	3:C:73:MET:HE2	1.93	0.50
1:L:43:ARG:HE	1:L:51:LEU:HD11	1.77	0.50
2:H:87:THR:HA	2:H:109:VAL:O	2.13	0.49
1:K:43:ARG:HE	1:K:51:LEU:HD11	1.77	0.49
1:P:43:ARG:HE	1:P:51:LEU:HD11	1.77	0.49
2:Q:87:THR:HA	2:Q:109:VAL:O	2.13	0.48
3:A:83:ILE:HD11	3:A:296:LEU:HD13	1.96	0.48
2:J:87:THR:HA	2:J:109:VAL:O	2.13	0.48
3:C:83:ILE:HD11	3:C:296:LEU:HD13	1.96	0.47
2:Q:2:VAL:HA	2:Q:25:SER:O	2.15	0.47
3:C:214:THR:HG23	3:C:262:VAL:HB	1.96	0.47
3:B:214:THR:HG23	3:B:262:VAL:HB	1.96	0.47
2:H:2:VAL:HA	2:H:25:SER:O	2.15	0.47
3:A:214:THR:HG23	3:A:262:VAL:HB	1.96	0.47
2:J:2:VAL:HA	2:J:25:SER:O	2.15	0.47
3:B:83:ILE:HD11	3:B:296:LEU:HD13	1.96	0.47
3:A:173:LEU:O	3:A:262:VAL:HA	2.16	0.46
3:B:173:LEU:O	3:B:262:VAL:HA	2.16	0.46
3:B:198:GLU:HG2	3:B:208:SER:HB2	1.98	0.46
2:Q:12:LYS:HG3	2:Q:18:VAL:HB	1.98	0.46
3:C:198:GLU:HG2	3:C:208:SER:HB2	1.98	0.45
3:A:123:ASN:HA	3:A:271:GLN:O	2.17	0.45
3:A:198:GLU:HG2	3:A:208:SER:HB2	1.98	0.45
3:C:173:LEU:O	3:C:262:VAL:HA	2.16	0.45
3:C:123:ASN:HA	3:C:271:GLN:O	2.17	0.45
2:H:12:LYS:HG3	2:H:18:VAL:HB	1.98	0.45
2:J:12:LYS:HG3	2:J:18:VAL:HB	1.98	0.44
3:B:123:ASN:HA	3:B:271:GLN:O	2.17	0.44
3:B:188:ILE:HB	3:B:274:TRP:HB2	2.00	0.44
3:A:188:ILE:HB	3:A:274:TRP:HB2	2.00	0.43
3:B:98:MET:HE2	3:B:245:ARG:HB2	2.00	0.43
2:Q:100(D):GLY:HA3	3:C:136:ARG:HD3	2.00	0.43
3:A:98:MET:HE2	3:A:245:ARG:HB2	2.00	0.43
3:C:188:ILE:HB	3:C:274:TRP:HB2	2.00	0.43
2:J:17:SER:HA	2:J:82:ILE:O	2.19	0.43
3:C:98:MET:HE2	3:C:245:ARG:HB2	2.00	0.43
2:J:100(D):GLY:HA3	3:B:136:ARG:HD3	2.00	0.42
2:H:17:SER:HA	2:H:82:ILE:O	2.19	0.42
2:H:100(D):GLY:HA3	3:A:136:ARG:HD3	2.00	0.42
3:A:69:ARG:HD3	3:A:72:CYS:SG	2.60	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:69:ARG:HD3	3:B:72:CYS:SG	2.60	0.42
2:Q:17:SER:HA	2:Q:82:ILE:O	2.19	0.42
2:Q:35:ASN:ND2	2:Q:95:GLU:HB2	2.35	0.42
3:C:69:ARG:HD3	3:C:72:CYS:SG	2.60	0.41
2:H:99:TRP:CD2	2:H:100:PRO:HA	2.55	0.41
2:J:35:ASN:ND2	2:J:95:GLU:HB2	2.35	0.41
2:J:99:TRP:CD2	2:J:100:PRO:HA	2.55	0.41
3:B:90:VAL:HG12	3:B:105:ARG:HH12	1.86	0.41
3:B:40:HIS:CD2	3:B:290:ILE:HB	2.56	0.41
2:Q:38:ARG:HB2	2:Q:48:MET:SD	2.61	0.41
1:L:61:PRO:HD2	1:L:64:ILE:HG13	2.03	0.41
3:C:90:VAL:HG12	3:C:105:ARG:HH12	1.86	0.41
2:H:35:ASN:ND2	2:H:95:GLU:HB2	2.35	0.41
2:H:38:ARG:HB2	2:H:48:MET:SD	2.61	0.41
2:J:38:ARG:HB2	2:J:48:MET:SD	2.61	0.41
3:C:42:ALA:H	3:C:296:LEU:HD21	1.86	0.41
1:L:102:VAL:HB	2:H:47:TRP:CG	2.56	0.40
2:Q:99:TRP:CD2	2:Q:100:PRO:HA	2.55	0.40
3:B:42:ALA:H	3:B:296:LEU:HD21	1.86	0.40
1:K:102:VAL:HB	2:J:47:TRP:CG	2.57	0.40
2:Q:12:LYS:HB2	2:Q:82(C):LEU:HD23	2.04	0.40
3:A:40:HIS:CD2	3:A:290:ILE:HB	2.56	0.40
3:C:40:HIS:CD2	3:C:290:ILE:HB	2.56	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	K	101/218 (46%)	99 (98%)	2 (2%)	0	100	100
1	L	101/218 (46%)	99 (98%)	2 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	P	101/218 (46%)	99 (98%)	2 (2%)	0	100	100
2	H	121/233 (52%)	119 (98%)	2 (2%)	0	100	100
2	J	121/233 (52%)	119 (98%)	2 (2%)	0	100	100
2	Q	121/233 (52%)	119 (98%)	2 (2%)	0	100	100
3	A	276/530 (52%)	272 (99%)	4 (1%)	0	100	100
3	B	276/530 (52%)	272 (99%)	4 (1%)	0	100	100
3	C	276/530 (52%)	272 (99%)	4 (1%)	0	100	100
All	All	1494/2943 (51%)	1470 (98%)	24 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	K	85/183 (46%)	85 (100%)	0	100	100
1	L	85/183 (46%)	85 (100%)	0	100	100
1	P	85/183 (46%)	85 (100%)	0	100	100
2	H	99/195 (51%)	98 (99%)	1 (1%)	73	88
2	J	99/195 (51%)	98 (99%)	1 (1%)	73	88
2	Q	99/195 (51%)	98 (99%)	1 (1%)	73	88
3	A	234/441 (53%)	231 (99%)	3 (1%)	65	85
3	B	234/441 (53%)	231 (99%)	3 (1%)	65	85
3	C	234/441 (53%)	231 (99%)	3 (1%)	65	85
All	All	1254/2457 (51%)	1242 (99%)	12 (1%)	71	88

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	87	THR

Continued on next page...

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Mol	Chain	Res	Type
3	A	94	CYS
3	A	136	ARG
3	A	214	THR
2	J	87	THR
3	B	94	CYS
3	B	136	ARG
3	B	214	THR
2	Q	87	THR
3	C	94	CYS
3	C	136	ARG
3	C	214	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	48	GLN
1	L	57	ASN
2	H	100(A)	ASN
3	A	122	HIS
3	A	163	ASN
3	A	200	GLN
3	A	253	GLN
1	K	48	GLN
1	K	57	ASN
2	J	100(A)	ASN
3	B	122	HIS
3	B	200	GLN
3	B	253	GLN
1	P	48	GLN
1	P	57	ASN
2	Q	100(A)	ASN
3	C	122	HIS
3	C	200	GLN
3	C	253	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

6 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
4	NAG	D	1	3,4	14,14,15	0.71	0	17,19,21	1.01	1 (5%)
4	NAG	D	2	4	14,14,15	0.73	0	17,19,21	0.89	0
4	NAG	E	1	3,4	14,14,15	0.71	0	17,19,21	1.01	1 (5%)
4	NAG	E	2	4	14,14,15	0.73	0	17,19,21	0.89	0
4	NAG	F	1	3,4	14,14,15	0.71	0	17,19,21	1.01	1 (5%)
4	NAG	F	2	4	14,14,15	0.73	0	17,19,21	0.89	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	D	1	3,4	-	1/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	NAG	E	1	3,4	-	1/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
4	NAG	F	1	3,4	-	1/6/23/26	0/1/1/1
4	NAG	F	2	4	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	NAG	O5-C1-C2	-2.59	107.28	111.29

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	1	NAG	O5-C1-C2	-2.59	107.28	111.29
4	E	1	NAG	O5-C1-C2	-2.59	107.29	111.29

There are no chirality outliers.

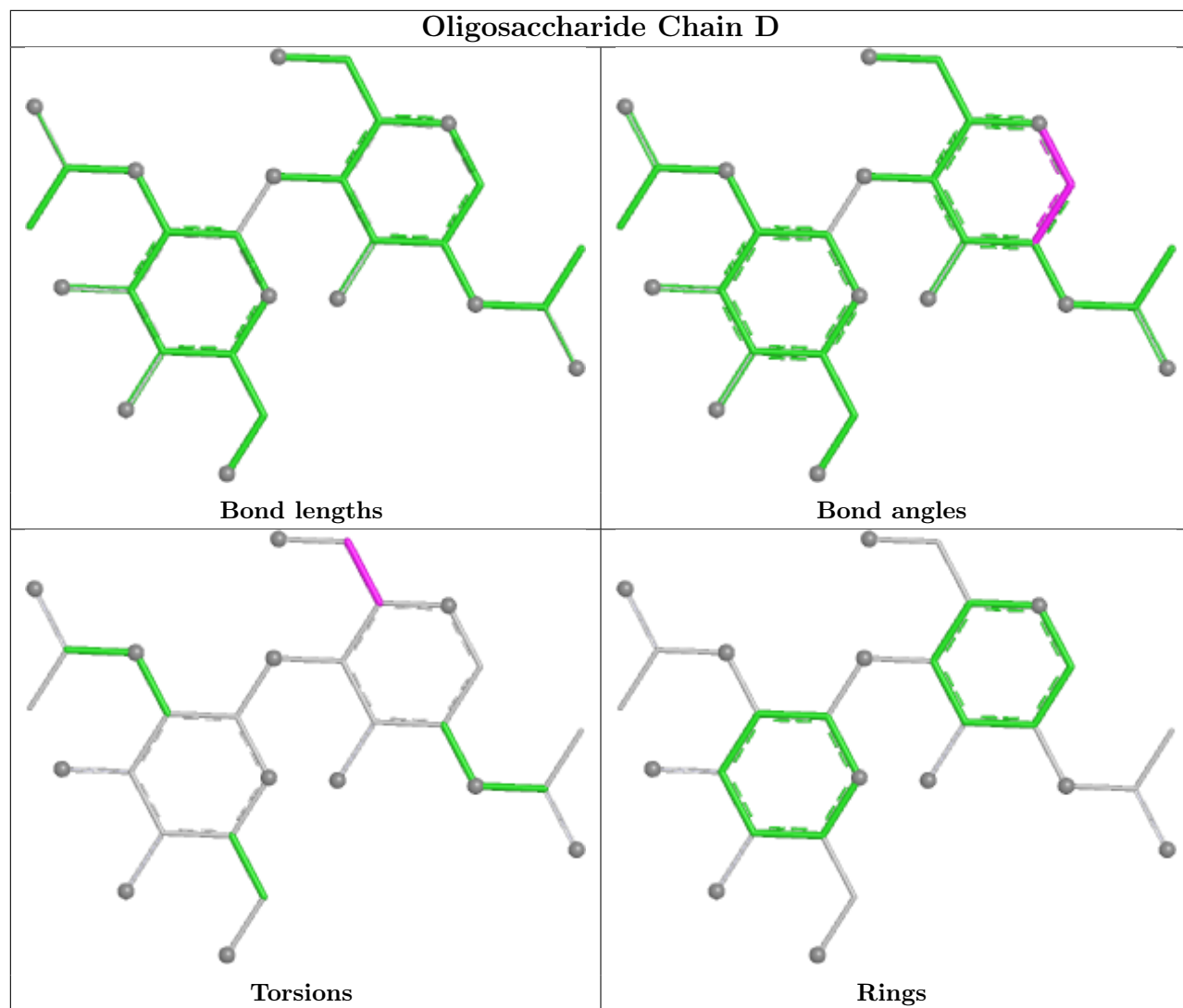
All (3) torsion outliers are listed below:

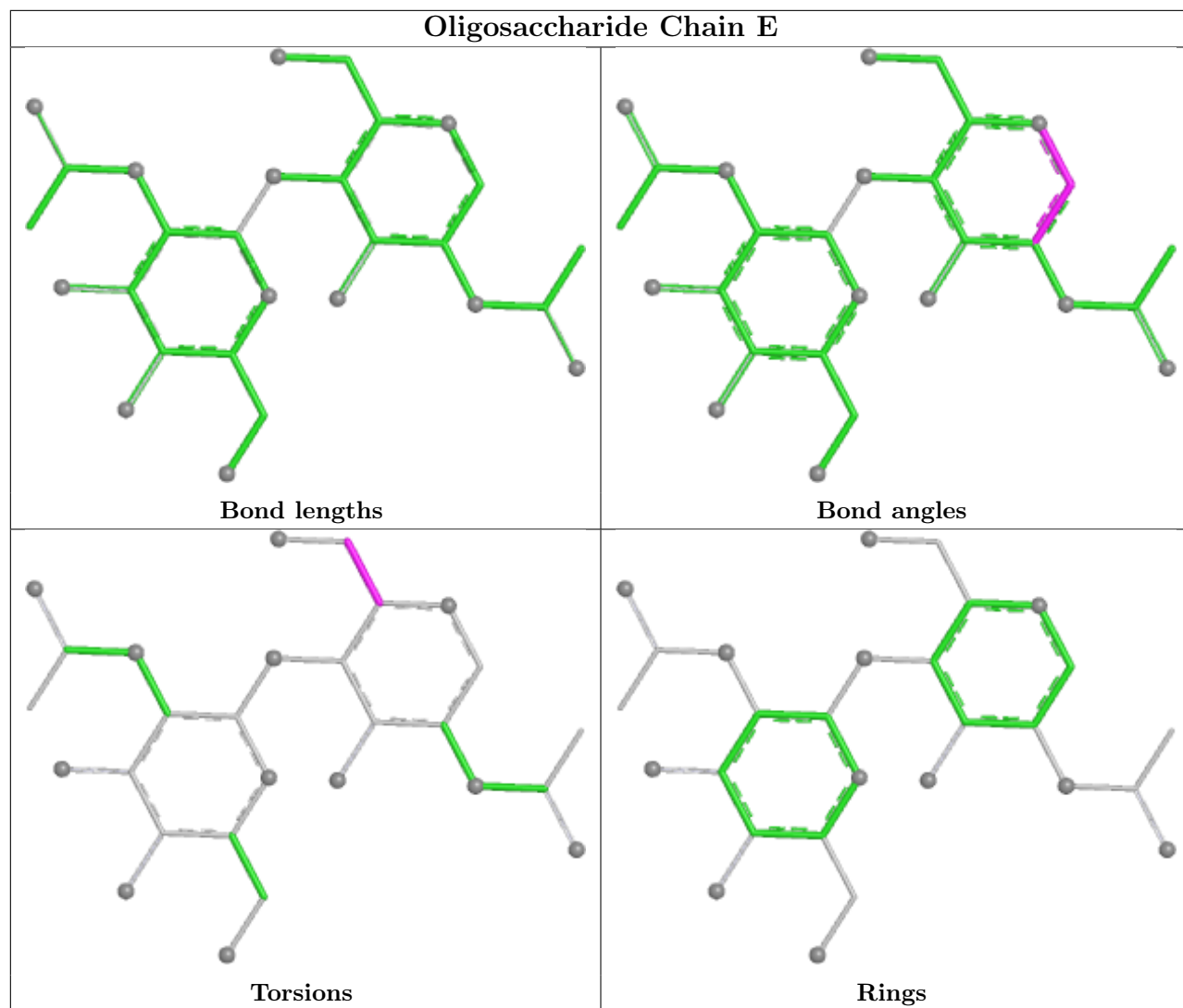
Mol	Chain	Res	Type	Atoms
4	D	1	NAG	C4-C5-C6-O6
4	E	1	NAG	C4-C5-C6-O6
4	F	1	NAG	C4-C5-C6-O6

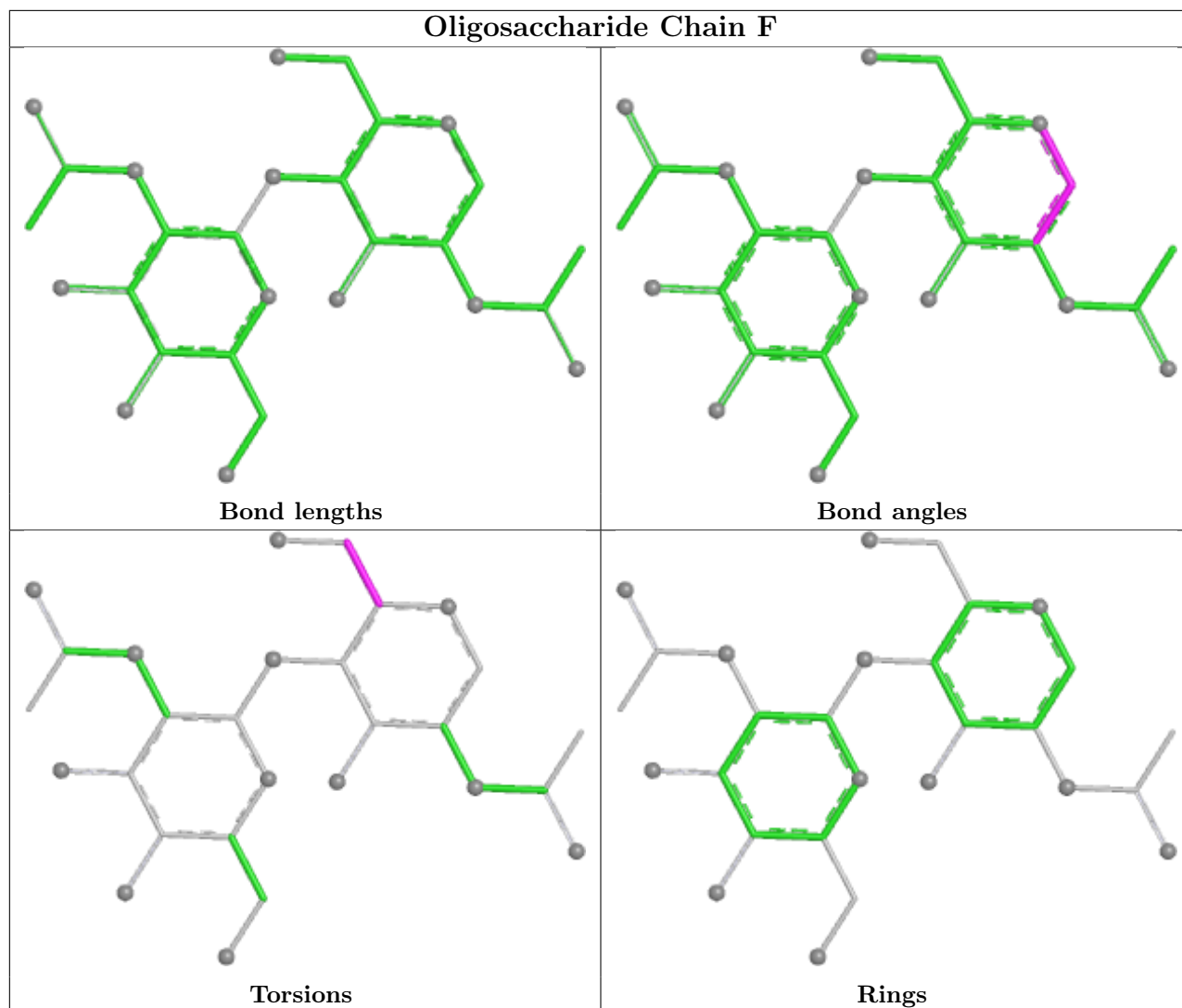
There are no ring outliers.

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](#)

6 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
5	NAG	C	601	3	14,14,15	0.73	0	17,19,21	0.80	0
5	NAG	A	602	3	14,14,15	0.70	0	17,19,21	1.18	1 (5%)
5	NAG	B	602	3	14,14,15	0.70	0	17,19,21	1.18	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	C	602	3	14,14,15	0.70	0	17,19,21	1.18	1 (5%)
5	NAG	A	601	3	14,14,15	0.72	0	17,19,21	0.80	0
5	NAG	B	601	3	14,14,15	0.73	0	17,19,21	0.81	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	C	601	3	-	0/6/23/26	0/1/1/1
5	NAG	A	602	3	-	3/6/23/26	0/1/1/1
5	NAG	B	602	3	-	3/6/23/26	0/1/1/1
5	NAG	C	602	3	-	3/6/23/26	0/1/1/1
5	NAG	A	601	3	-	0/6/23/26	0/1/1/1
5	NAG	B	601	3	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	602	NAG	C2-N2-C7	3.14	127.11	122.90
5	C	602	NAG	C2-N2-C7	3.14	127.11	122.90
5	A	602	NAG	C2-N2-C7	3.14	127.11	122.90

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	602	NAG	O5-C5-C6-O6
5	B	602	NAG	O5-C5-C6-O6
5	C	602	NAG	O5-C5-C6-O6
5	A	602	NAG	C1-C2-N2-C7
5	B	602	NAG	C1-C2-N2-C7
5	C	602	NAG	C1-C2-N2-C7
5	A	602	NAG	C3-C2-N2-C7
5	B	602	NAG	C3-C2-N2-C7
5	C	602	NAG	C3-C2-N2-C7

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

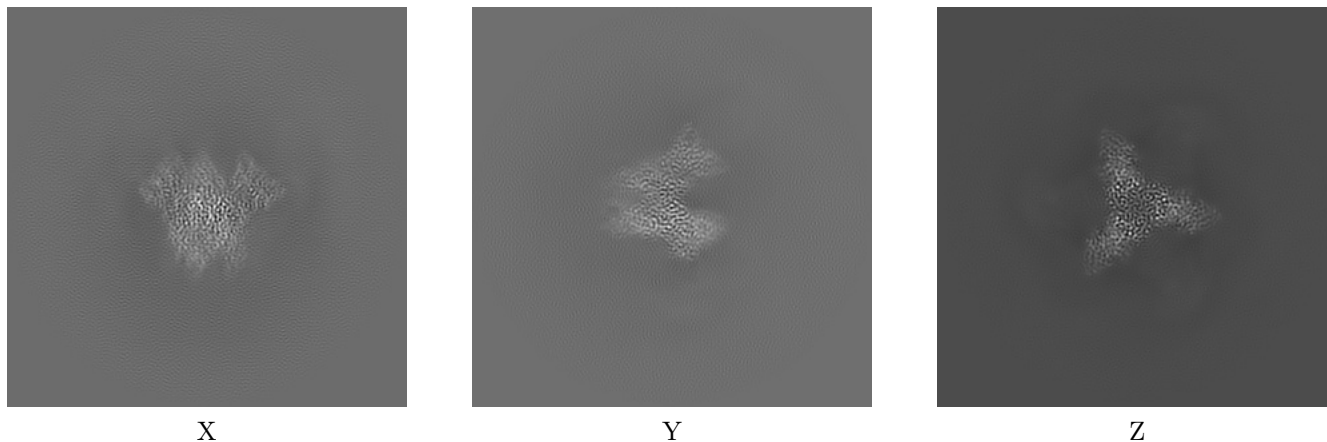
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-49477. These allow visual inspection of the internal detail of the map and identification of artifacts.

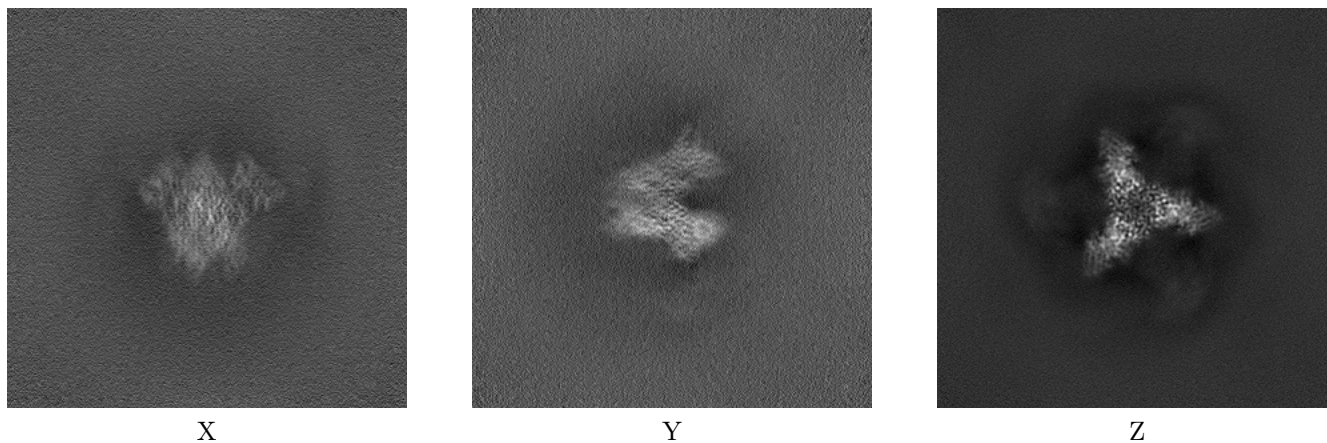
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

6.1.1 Primary map



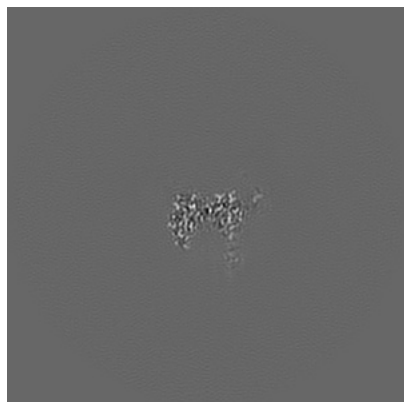
6.1.2 Raw map



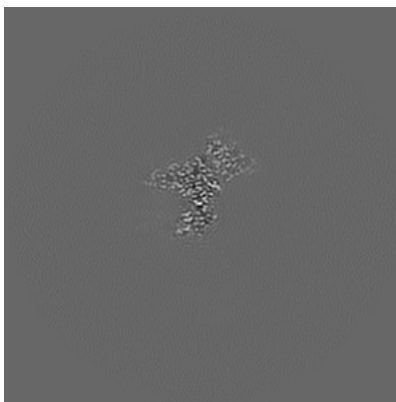
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

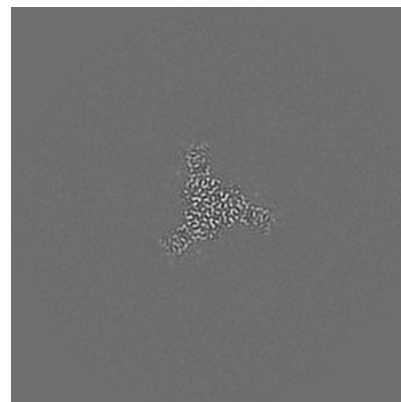
6.2.1 Primary map



X Index: 288

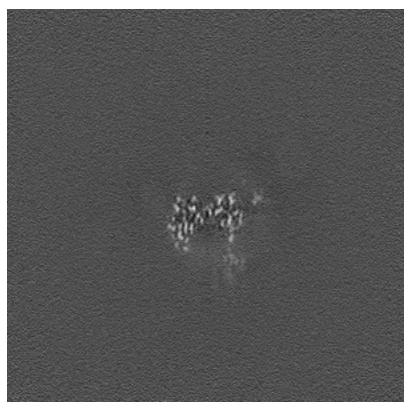


Y Index: 288

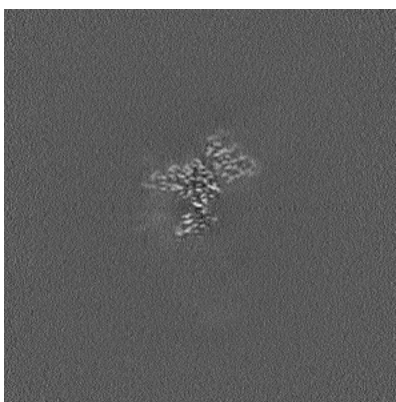


Z Index: 288

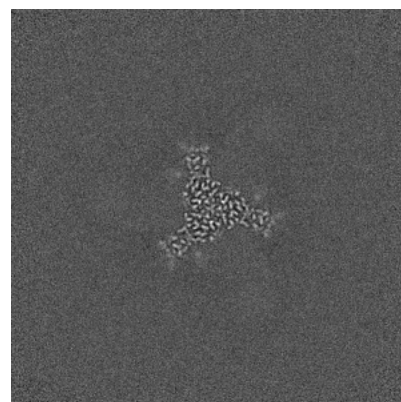
6.2.2 Raw map



X Index: 288



Y Index: 288

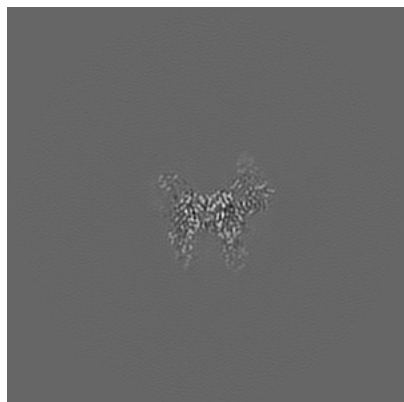


Z Index: 288

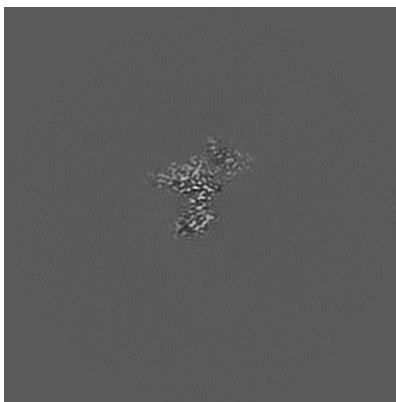
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

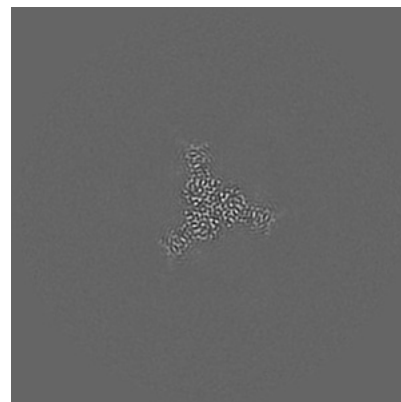
6.3.1 Primary map



X Index: 272

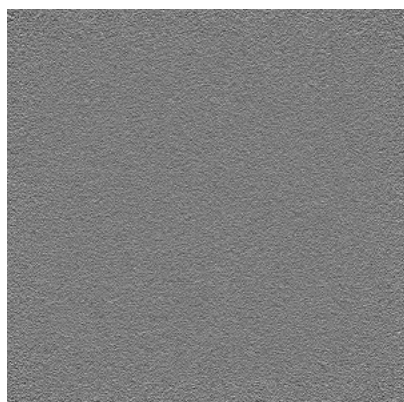


Y Index: 291

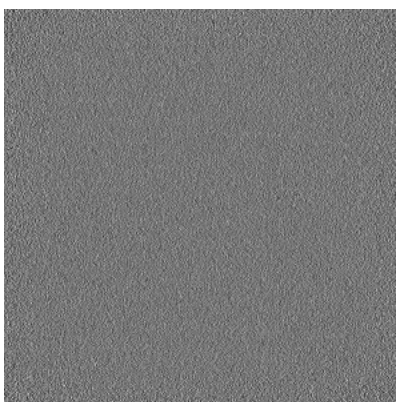


Z Index: 289

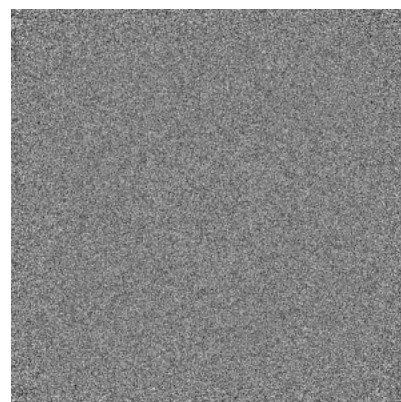
6.3.2 Raw map



X Index: 0



Y Index: 0

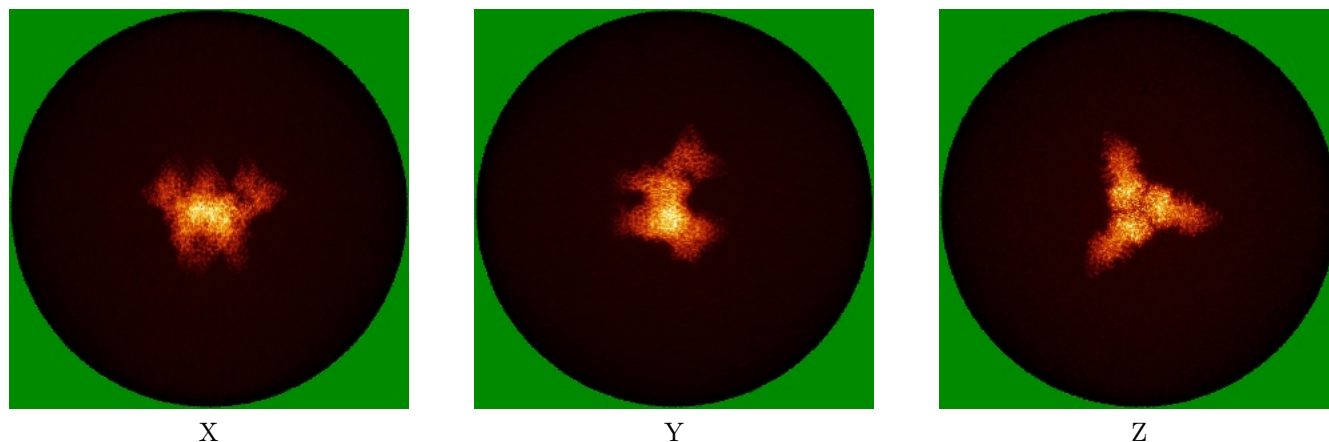


Z Index: 0

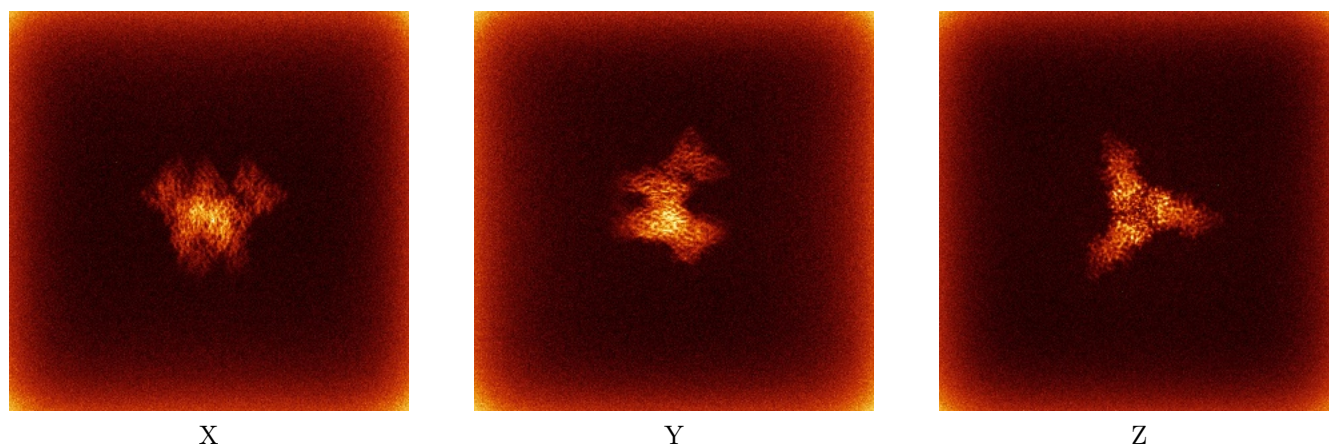
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



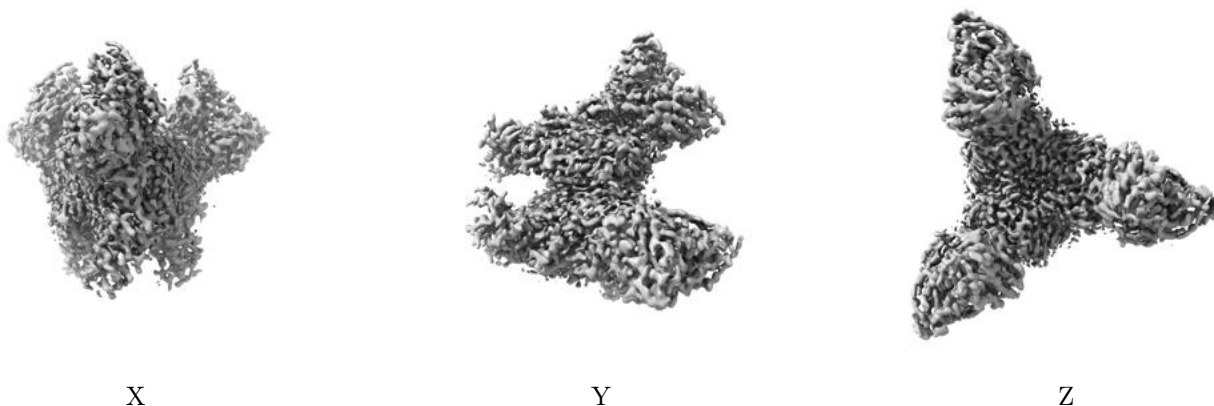
6.4.2 Raw map



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

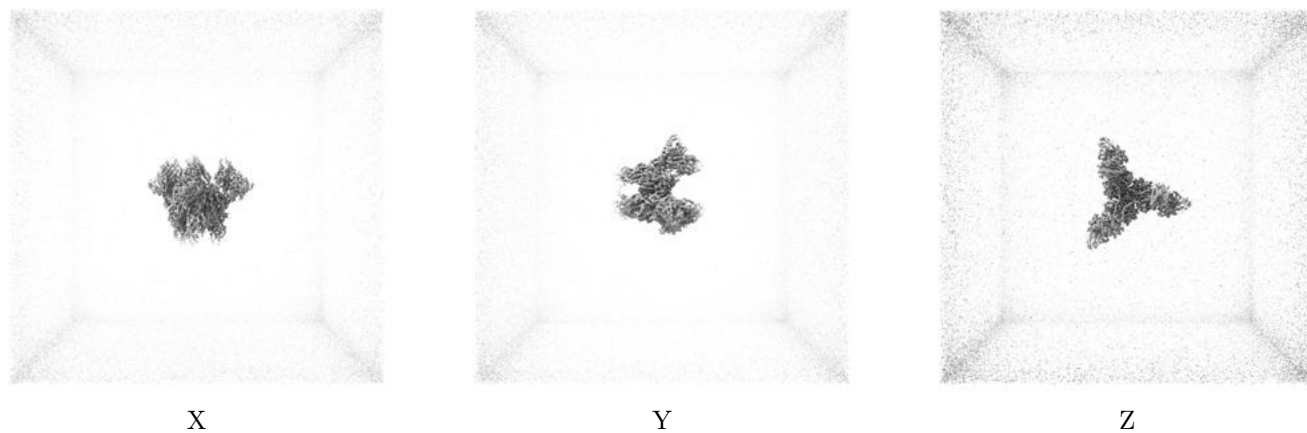
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.3. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

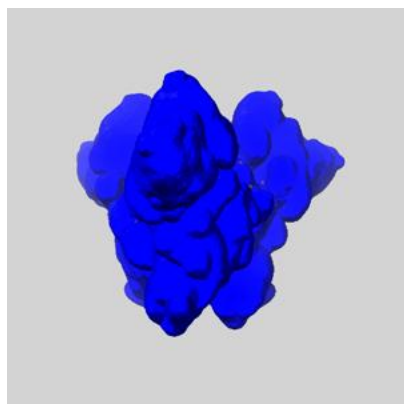
6.6 Mask visualisation [i](#)

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

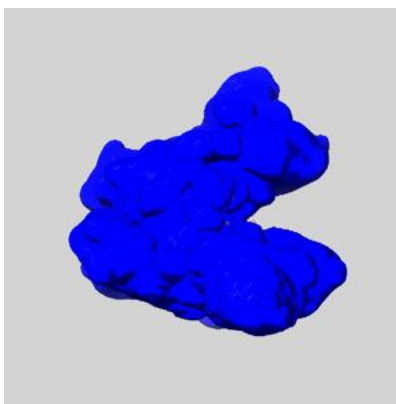
A mask typically either:

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

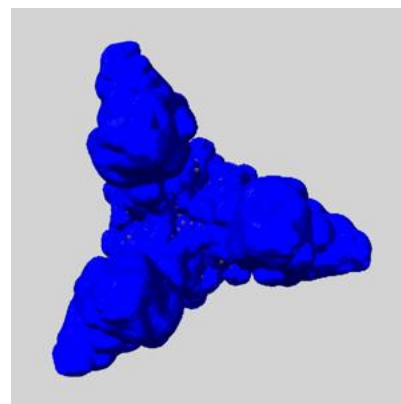
6.6.1 emd_49477_msk_1.map [i](#)



X



Y

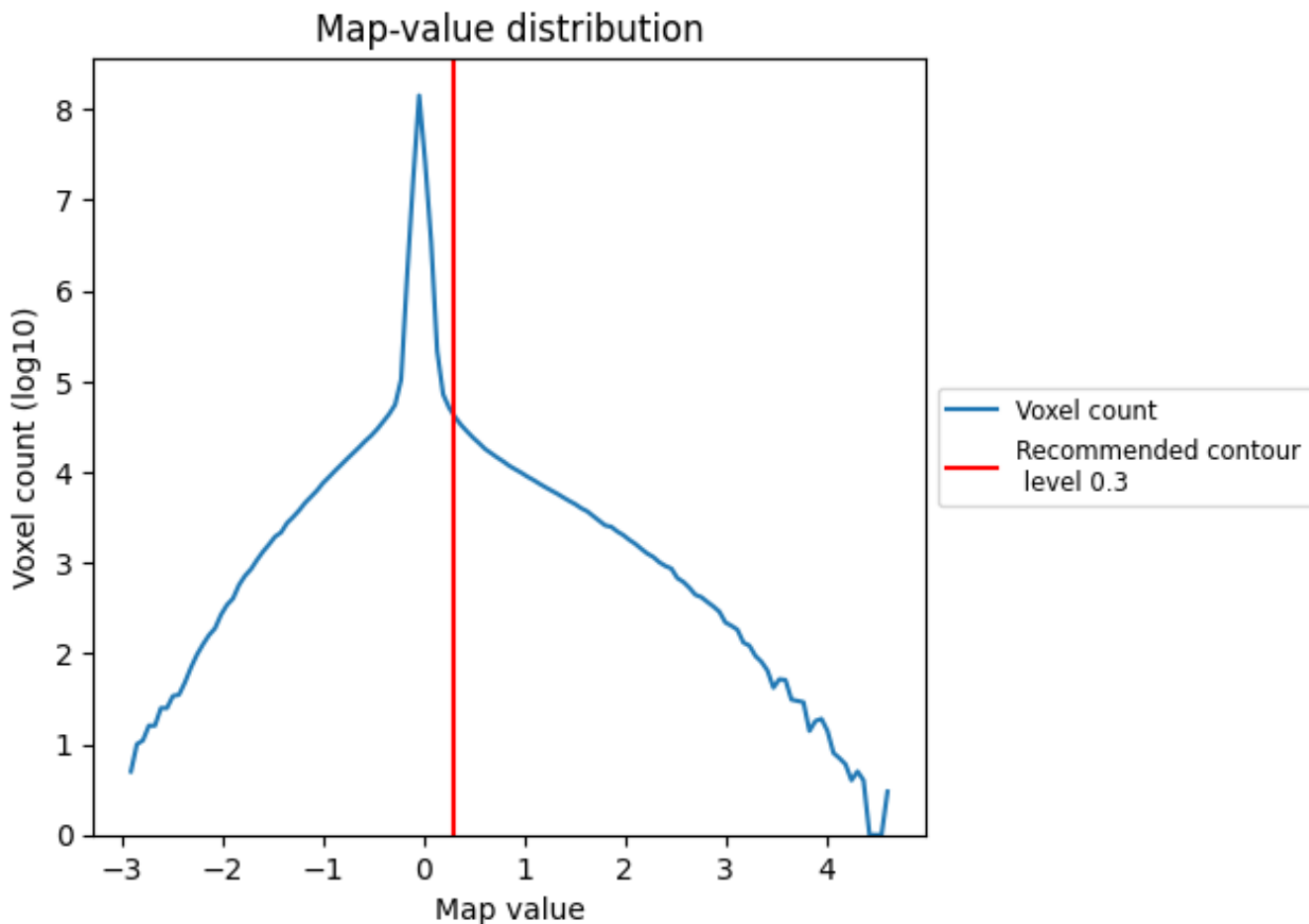


Z

7 Map analysis [i](#)

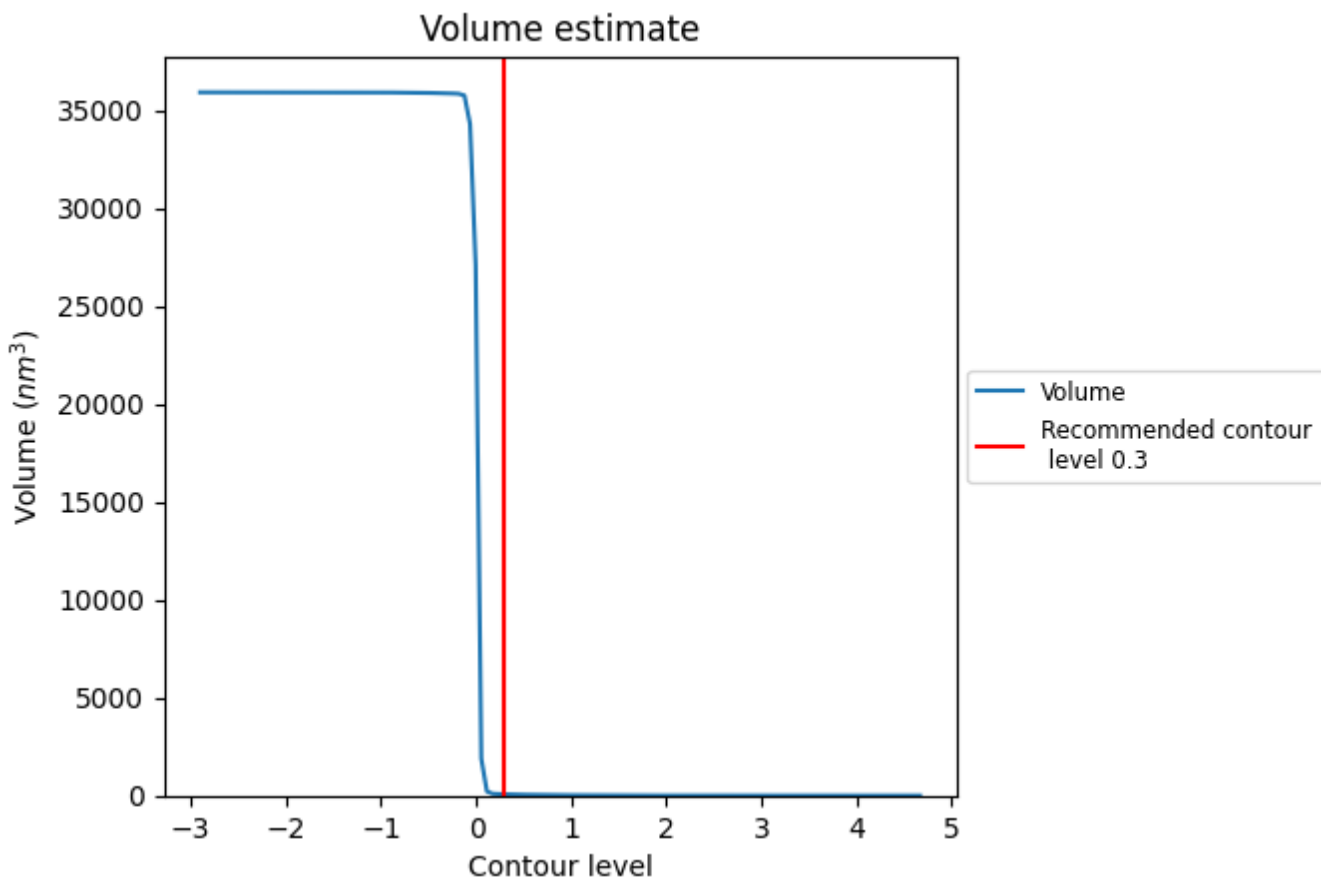
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

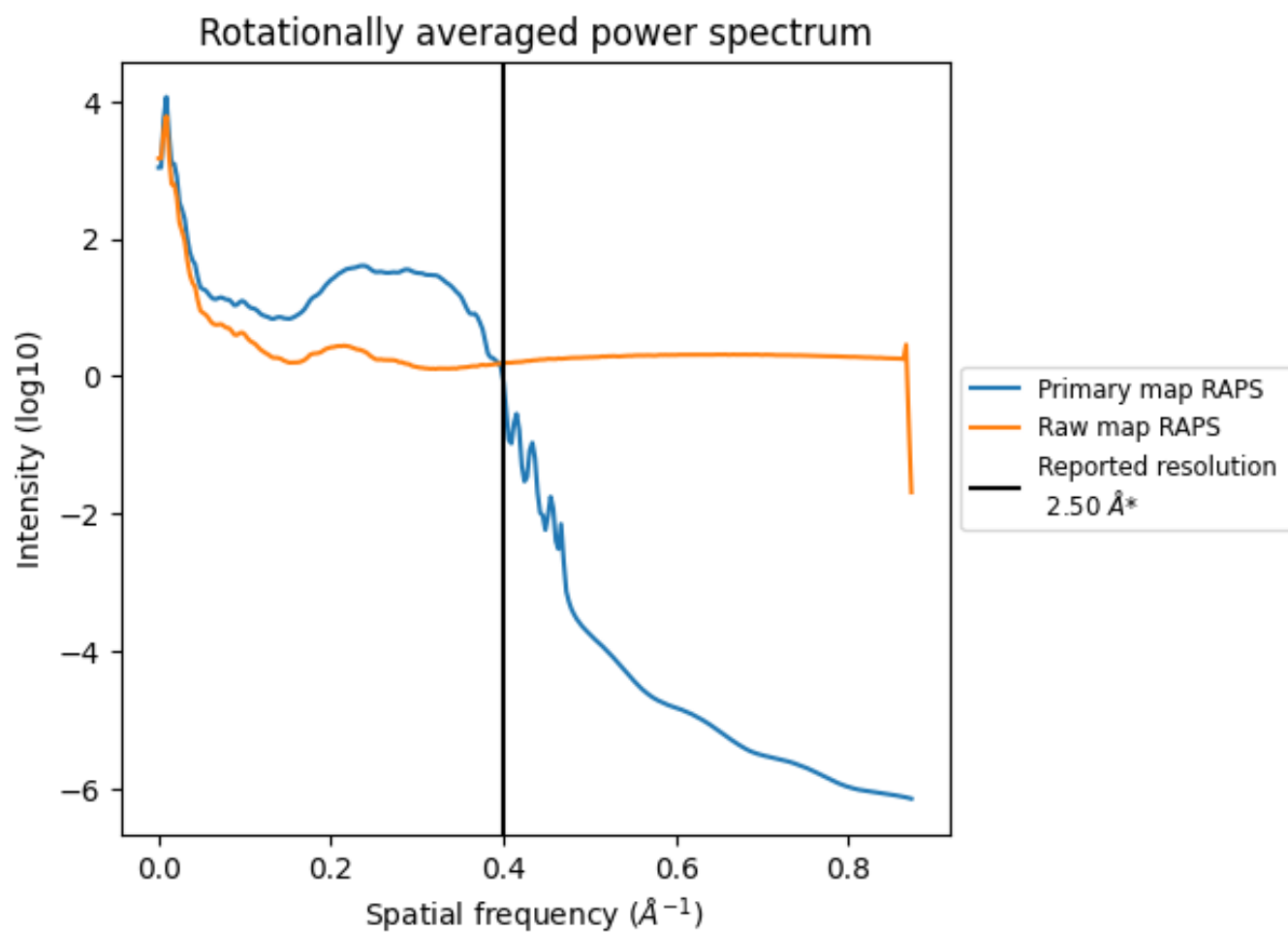
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 66 nm³; this corresponds to an approximate mass of 59 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)

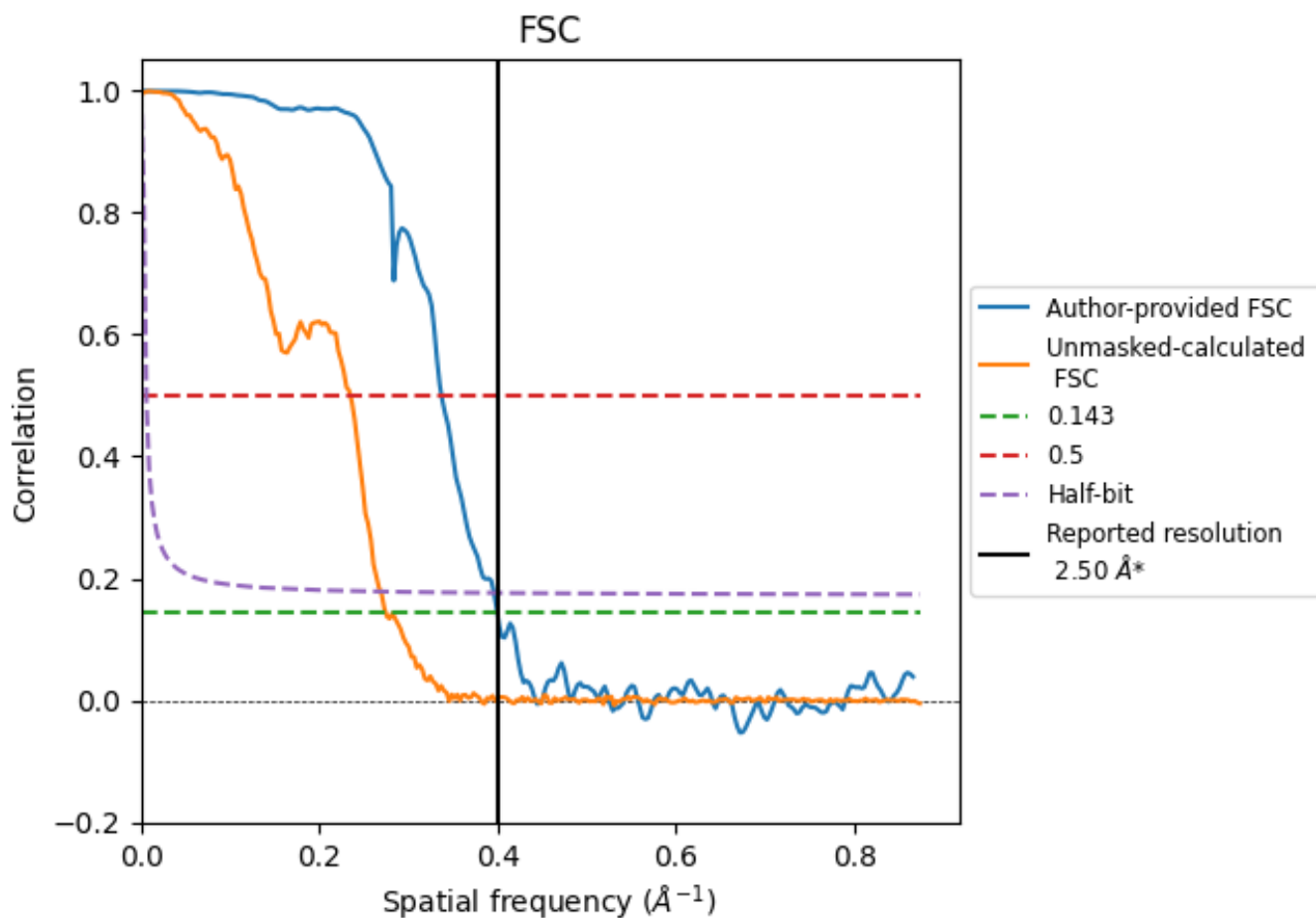


*Reported resolution corresponds to spatial frequency of 0.400 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.400 Å⁻¹

8.2 Resolution estimates [i](#)

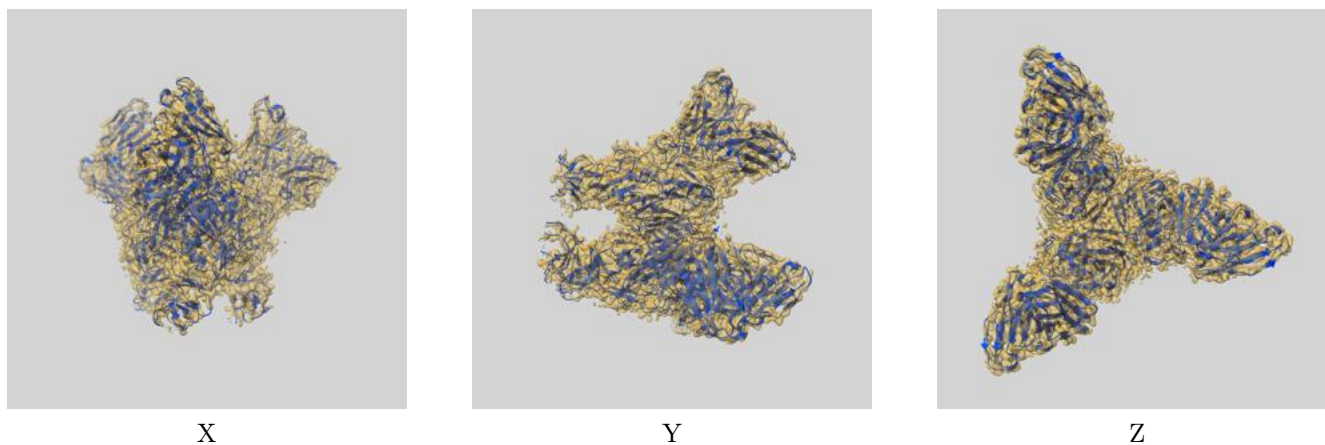
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.50	-	-
Author-provided FSC curve	2.50	2.97	2.53
Unmasked-calculated*	3.64	4.26	3.72

*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 3.64 differs from the reported value 2.5 by more than 10 %

9 Map-model fit [i](#)

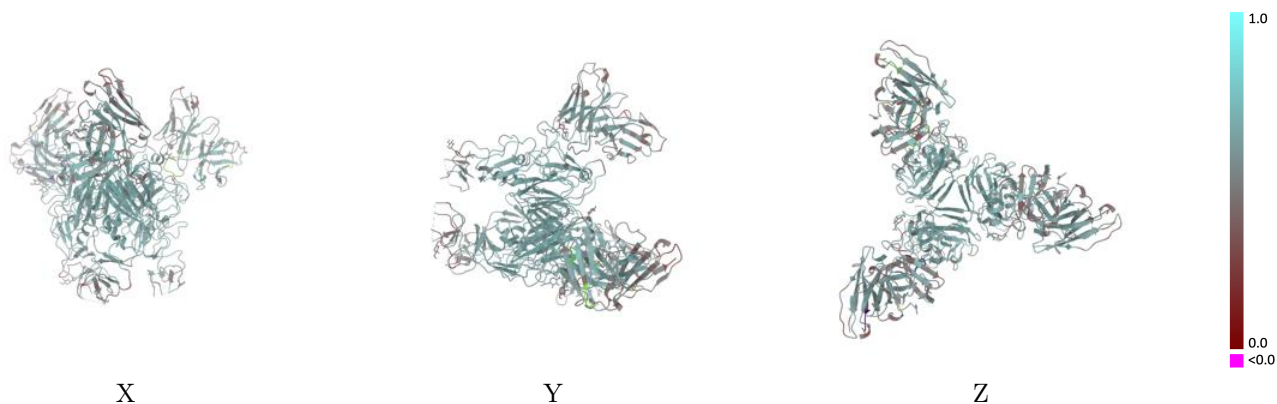
This section contains information regarding the fit between EMDB map EMD-49477 and PDB model 9NJA. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay [i](#)



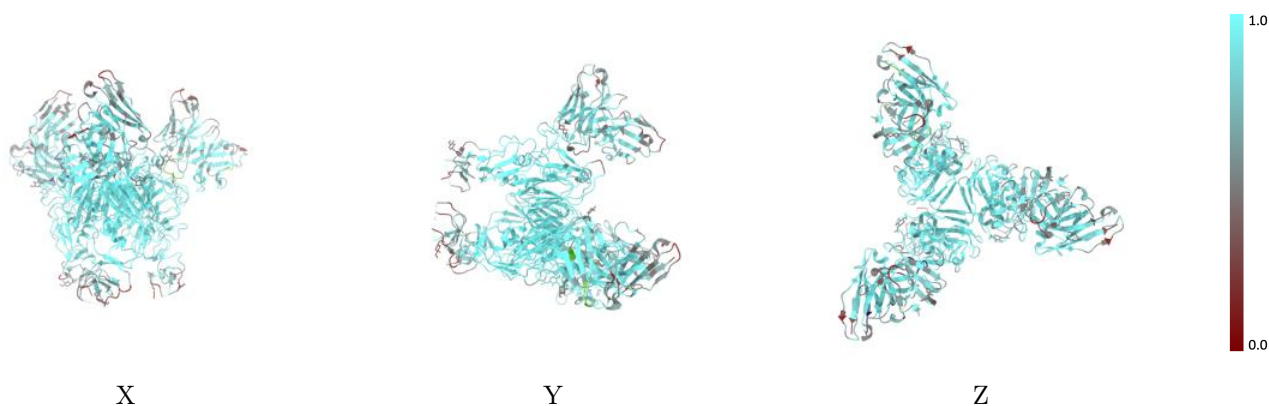
The images above show the 3D surface view of the map at the recommended contour level 0.3 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



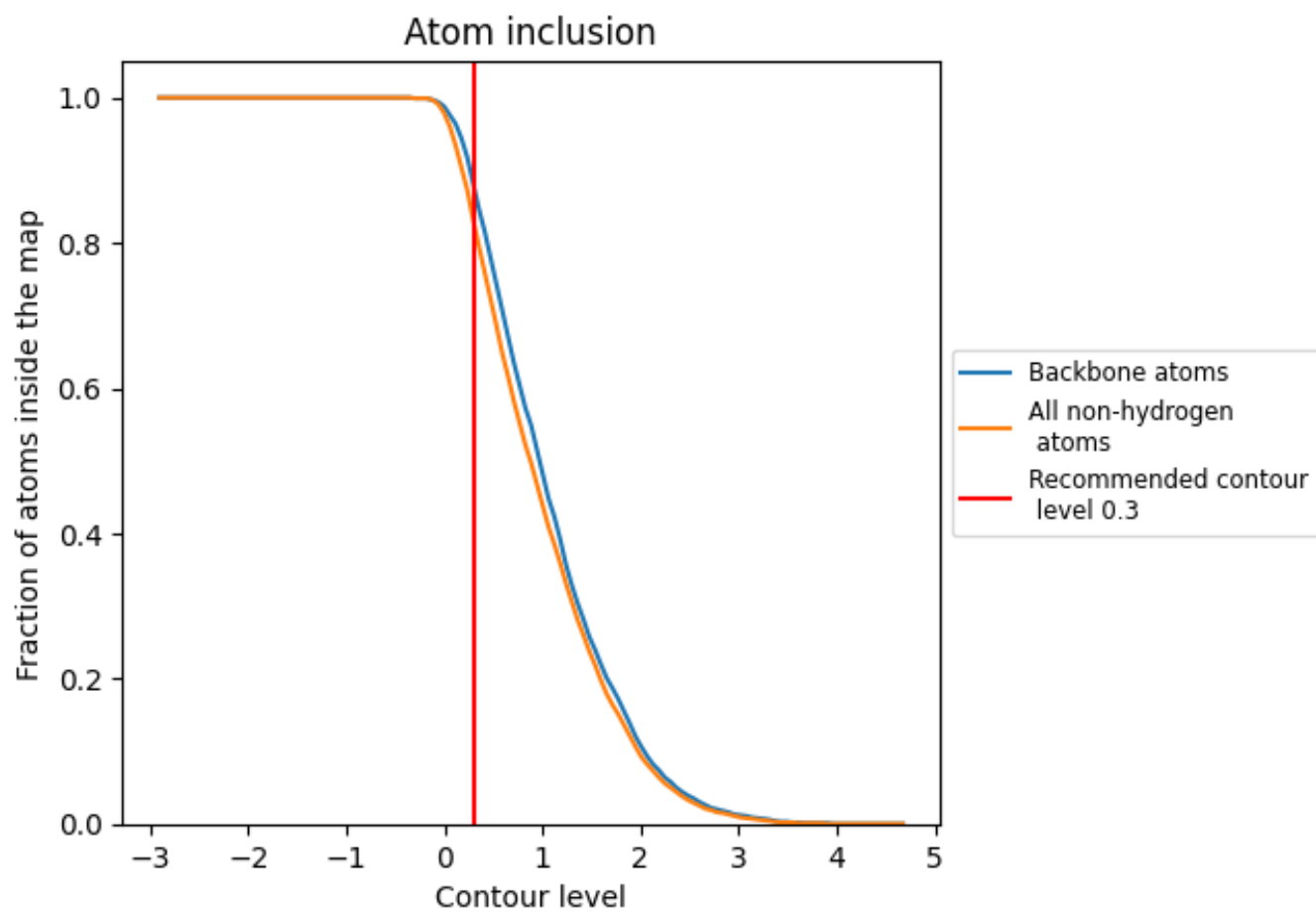
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.3).



























9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 83% 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 (0.3) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8270	 0.5650
A	 0.8730	 0.5920
B	 0.8740	 0.5930
C	 0.8740	 0.5920
D	 0.6070	 0.4360
E	 0.6070	 0.4490
F	 0.5710	 0.4530
H	 0.8260	 0.5540
J	 0.8260	 0.5540
K	 0.7040	 0.5070
L	 0.7140	 0.5050
P	 0.7070	 0.5030
Q	 0.8190	 0.5550

