



## Full wwPDB EM Validation Report ⓘ

Jul 15, 2024 – 10:09 AM EDT

PDB ID : 8TGZ  
EMDB ID : EMD-41247  
Title : CryoEM structure of neutralizing antibody HC84.26 in complex with Hepatitis C virus envelope glycoprotein E2  
Authors : Shahid, S.; Liqun, J.; Liu, Y.; Hasan, S.S.; Mariuzza, R.A.  
Deposited on : 2023-07-13  
Resolution : 3.78 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](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.dev92  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

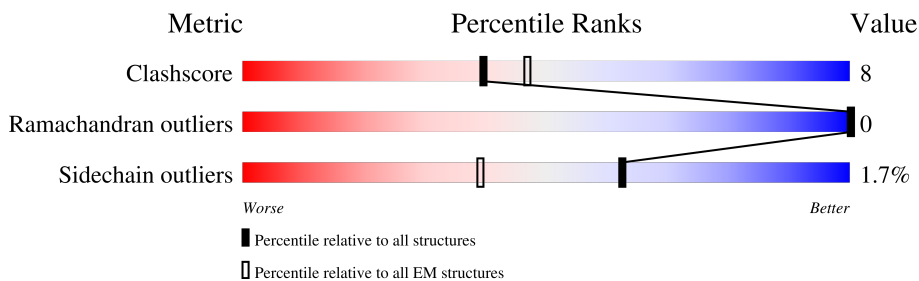
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.78 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



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

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

Mol	Chain	Length	Quality of chain
1	A	291	
2	E	255	
2	N	255	
3	F	234	
3	M	234	
4	B	5	
5	C	2	
6	D	4	

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 12979 atoms, of which 6281 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 envelope glycoprotein E2.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	A	234	3395	1133	1606	325	312	19	0	0

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	363	MET	-	initiating methionine	UNP X4ZFZ7
A	364	GLU	-	expression tag	UNP X4ZFZ7
A	365	THR	-	expression tag	UNP X4ZFZ7
A	366	ASP	-	expression tag	UNP X4ZFZ7
A	367	THR	-	expression tag	UNP X4ZFZ7
A	368	LEU	-	expression tag	UNP X4ZFZ7
A	369	LEU	-	expression tag	UNP X4ZFZ7
A	370	LEU	-	expression tag	UNP X4ZFZ7
A	371	TRP	-	expression tag	UNP X4ZFZ7
A	372	VAL	-	expression tag	UNP X4ZFZ7
A	373	LEU	-	expression tag	UNP X4ZFZ7
A	374	LEU	-	expression tag	UNP X4ZFZ7
A	375	LEU	-	expression tag	UNP X4ZFZ7
A	376	TRP	-	expression tag	UNP X4ZFZ7
A	377	VAL	-	expression tag	UNP X4ZFZ7
A	378	PRO	-	expression tag	UNP X4ZFZ7
A	379	GLY	-	expression tag	UNP X4ZFZ7
A	380	SER	-	expression tag	UNP X4ZFZ7
A	381	THR	-	expression tag	UNP X4ZFZ7
A	382	GLY	-	expression tag	UNP X4ZFZ7
A	383	ASP	-	expression tag	UNP X4ZFZ7
A	646	ILE	-	expression tag	UNP X4ZFZ7
A	647	GLY	-	expression tag	UNP X4ZFZ7
A	648	HIS	-	expression tag	UNP X4ZFZ7
A	649	HIS	-	expression tag	UNP X4ZFZ7
A	650	HIS	-	expression tag	UNP X4ZFZ7
A	651	HIS	-	expression tag	UNP X4ZFZ7
A	652	HIS	-	expression tag	UNP X4ZFZ7

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Chain	Residue	Modelled	Actual	Comment	Reference
A	653	HIS	-	expression tag	UNP X4ZFY7

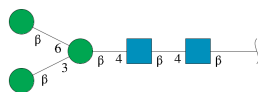
- Molecule 2 is a protein called HC84.26 Heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
2	E	214	3129	1005	1537	266	313	8	0	0
2	N	104	1480	469	733	124	151	3	0	0

- Molecule 3 is a protein called HC84.26 Light chain.

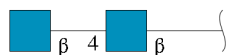
Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
3	F	213	3104	992	1511	268	327	6	0	0
3	M	106	1531	494	735	133	166	3	0	0

- Molecule 4 is an oligosaccharide called beta-D-mannopyranose-(1-3)-[beta-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	H	N	O		
4	B	5	113	34	52	2	25	0	0

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



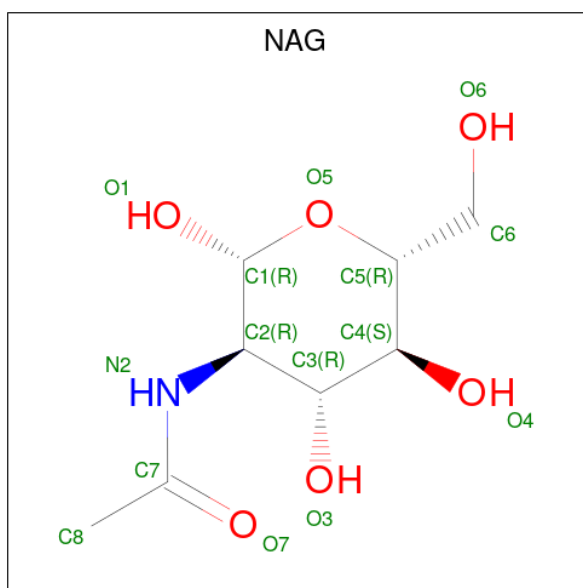
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	H	N	O		
5	C	2	53	16	25	2	10	0	0

- Molecule 6 is an oligosaccharide called beta-D-mannopyranose-(1-4)-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	H	N	O		
6	D	4	93	28	43	2	20	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).




Mol	Chain	Residues	Atoms					AltConf
			Total	C	H	N	O	
7	A	1	27	8	13	1	5	0
7	A	1	27	8	13	1	5	0
7	A	1	27	8	13	1	5	0



PHE  
GLU  
LYS


- Molecule 3: HC84.26 Light chain

Chain F:  81% 10% 9%

MET GLU THR ASP THR LEU LEU TRP VAL PRO GLY SER THR GLY ASP  
S1 Q6 A18 K26 D29 K30 Q49 D60 R53 I57 R60 I74 D81 Q88 D91 L95 G99 S113 L134 L135 M136 R141

E160 L174 S175 E194 C213

- Molecule 3: HC84.26 Light chain

Chain M:  39% 6% 55%

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

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


GLY THR LYS LEU VAL LEU ARG T108 F117 Y132 E142 D150 M151 T163 E164 S173 L174 S175 V195 Q198 G199 L200 V204 R210 C213

- Molecule 4: beta-D-mannopyranose-(1-3)-[beta-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

Chain B:  40% 20% 40%


MAG1 MAG2 BM43 BM44 BM45

- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:  50% 50%

MAG1 MAG2

- Molecule 6: beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:  25% 25% 50%

MAG1 MAG2 BM43 BM44

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	180188	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.620	Depositor
Minimum map value	-2.796	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.042	Depositor
Recommended contour level	0.22	Depositor
Map size (Å)	380.8, 380.8, 380.8	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.4875, 1.4875, 1.4875	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: BMA, NAG

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z  > 5$	RMSZ	# $ Z  > 5$
1	A	0.30	1/1854 (0.1%)	0.58	1/2541 (0.0%)
2	E	0.26	0/1633	0.52	0/2230
2	N	0.26	0/765	0.51	0/1048
3	F	0.26	0/1628	0.49	0/2219
3	M	0.27	0/812	0.50	0/1106
All	All	0.28	1/6692 (0.0%)	0.53	1/9144 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	552	CYS	CB-SG	-5.33	1.73	1.81

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	552	CYS	CA-CB-SG	6.88	126.38	114.00

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	A	1789	1606	1605	38	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	1592	1537	1537	24	0
2	N	747	733	733	11	0
3	F	1593	1511	1513	14	0
3	M	796	735	735	9	0
4	B	61	52	52	4	0
5	C	28	25	25	3	0
6	D	50	43	43	6	0
7	A	42	39	39	5	0
All	All	6698	6281	6282	100	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 8.

All (100) 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:A:508:CYS:HA	1:A:552:CYS:HB3	1.49	0.94
3:M:164:GLU:N	3:M:164:GLU:OE1	2.16	0.79
2:N:153:GLU:N	2:N:153:GLU:OE1	2.16	0.78
1:A:465:PHE:O	1:A:577:ASN:ND2	2.16	0.78
1:A:540:ASN:OD1	5:C:1:NAG:N2	2.18	0.76
3:F:141:ARG:O	3:F:141:ARG:NH1	2.19	0.75
1:A:520:ASP:OD1	1:A:521:ARG:N	2.22	0.72
1:A:508:CYS:HA	1:A:552:CYS:CB	2.20	0.72
2:E:38:ARG:NH1	2:E:90:ASP:OD1	2.23	0.70
4:B:1:NAG:H3	4:B:2:NAG:H2	1.73	0.69
1:A:510:THR:OG1	1:A:512:SER:N	2.25	0.69
2:E:89:GLU:N	2:E:89:GLU:OE2	2.25	0.69
3:M:142:GLU:OE2	3:M:198:GLN:NE2	2.26	0.68
1:A:493:GLN:OE1	1:A:493:GLN:N	2.27	0.67
1:A:473:THR:O	1:A:570:ASN:N	2.28	0.66
2:E:62:GLN:N	2:E:62:GLN:OE1	2.29	0.63
7:A:701:NAG:O7	7:A:701:NAG:H3	1.98	0.62
3:F:6:GLN:NE2	3:F:99:GLY:O	2.30	0.62
1:A:560:PHE:HB2	6:D:1:NAG:H83	1.83	0.60
1:A:423:ASN:ND2	4:B:1:NAG:H4	2.17	0.59
2:E:107:ASP:OD1	2:E:108:TYR:N	2.35	0.59
3:F:26:LYS:HE3	3:F:26:LYS:HA	1.83	0.59
2:E:74:GLU:N	2:E:74:GLU:OE1	2.36	0.59
1:A:553:THR:HG23	1:A:562:LYS:O	2.04	0.58
1:A:417:ASN:OD1	1:A:418:GLY:N	2.38	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:A:703:NAG:O7	7:A:703:NAG:H3	2.05	0.56
2:E:215:ARG:NH2	2:E:217:GLU:OE2	2.38	0.56
3:F:60:ARG:NH2	3:F:81:ASP:OD2	2.38	0.55
1:A:596:LYS:HA	1:A:596:LYS:HE2	1.87	0.55
7:A:701:NAG:O7	7:A:701:NAG:H5	2.08	0.53
2:N:136:THR:HG23	2:N:136:THR:O	2.10	0.52
2:E:148:LYS:HG3	2:E:149:ASP:OD1	2.09	0.52
1:A:507:TYR:O	1:A:552:CYS:HB2	2.10	0.52
3:M:163:THR:OG1	3:M:173:SER:OG	2.28	0.51
1:A:423:ASN:ND2	4:B:1:NAG:C4	2.74	0.51
2:N:213:ASP:OD1	2:N:213:ASP:N	2.42	0.51
3:M:195:VAL:HG22	3:M:204:VAL:HG13	1.93	0.50
4:B:1:NAG:H3	4:B:2:NAG:C2	2.40	0.50
2:E:67:ARG:NH2	2:E:90:ASP:OD2	2.45	0.50
2:E:108:TYR:CG	2:E:108:TYR:O	2.65	0.49
2:E:189:VAL:HG11	2:E:199:TYR:HE2	1.77	0.49
3:M:142:GLU:OE1	3:M:142:GLU:C	2.51	0.49
6:D:2:NAG:H3	6:D:2:NAG:H82	1.94	0.49
6:D:1:NAG:H3	6:D:1:NAG:H82	1.95	0.49
2:E:126:VAL:HG22	2:E:147:VAL:HG22	1.96	0.48
2:N:222:ASP:N	2:N:222:ASP:OD1	2.44	0.47
1:A:481:ASP:OD1	1:A:482:GLN:N	2.48	0.47
2:E:43:GLN:HA	2:E:43:GLN:OE1	2.15	0.47
6:D:1:NAG:H3	6:D:2:NAG:H2	1.96	0.47
2:N:150:TYR:CE2	2:N:155:VAL:HG13	2.49	0.47
1:A:630:ARG:NE	1:A:637:GLU:OE2	2.47	0.46
2:E:65:GLN:OE1	2:E:66:GLY:N	2.49	0.46
2:N:159:TRP:HE1	2:N:168:VAL:HG23	1.80	0.46
7:A:701:NAG:O7	7:A:701:NAG:C3	2.63	0.46
2:E:108:TYR:O	2:E:108:TYR:CD2	2.69	0.46
1:A:438:LEU:HD21	2:E:57:THR:HG21	1.98	0.46
1:A:589:HIS:CG	1:A:590:PRO:HD2	2.51	0.45
1:A:640:LEU:HD12	1:A:641:ASN:H	1.80	0.45
2:E:38:ARG:NH2	2:E:46:GLU:OE1	2.47	0.45
3:F:174:LEU:HD12	3:F:175:SER:N	2.31	0.45
3:F:53:ARG:NH2	3:F:57:ILE:O	2.50	0.45
1:A:415:ASN:OD1	1:A:415:ASN:C	2.55	0.45
1:A:501:GLN:HB3	1:A:556:ASN:OD1	2.17	0.45
5:C:1:NAG:O3	5:C:1:NAG:H82	2.16	0.45
3:M:150:ASP:C	3:M:151:ASN:OD1	2.56	0.44
3:M:200:LEU:CD1	3:M:204:VAL:HG12	2.48	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:N:146:LEU:HD12	2:N:183:LEU:O	2.17	0.44
1:A:495:GLY:HA3	5:C:1:NAG:O5	2.17	0.44
1:A:613:TYR:OH	2:E:54:ASP:OD2	2.29	0.43
1:A:501:GLN:O	1:A:557:SER:N	2.51	0.43
1:A:560:PHE:CB	6:D:1:NAG:H83	2.48	0.43
2:E:10:GLU:OE1	2:E:11:VAL:N	2.52	0.43
3:F:160:GLU:HG2	3:F:174:LEU:HD11	2.01	0.43
1:A:448:ASN:CB	7:A:701:NAG:H2	2.49	0.43
1:A:430:ASN:ND2	1:A:431:ASP:H	2.17	0.43
1:A:532:ASN:OD1	1:A:533:GLU:N	2.51	0.42
2:E:189:VAL:HG11	2:E:199:TYR:CE2	2.54	0.42
1:A:424:ARG:HG2	1:A:424:ARG:O	2.19	0.42
1:A:424:ARG:HE	1:A:517:GLY:HA3	1.85	0.42
3:F:30:LYS:HZ1	3:F:91:ASP:CG	2.23	0.42
1:A:442:PHE:CZ	2:E:52:ILE:HD11	2.55	0.42
3:F:88:GLN:OE1	3:F:95:LEU:HD11	2.20	0.42
1:A:456:MET:HE3	1:A:485:TYR:HB3	2.01	0.42
2:N:126:VAL:HG21	2:N:212:VAL:HG11	2.00	0.42
2:E:155:VAL:HG23	2:E:205:HIS:HB2	2.01	0.42
1:A:460:ARG:HB2	1:A:464:GLU:HG3	2.02	0.41
1:A:508:CYS:CA	1:A:552:CYS:HB3	2.25	0.41
1:A:589:HIS:O	1:A:591:GLU:N	2.49	0.41
2:E:171:PHE:CE2	3:M:175:SER:HB2	2.55	0.41
3:F:18:ALA:HB3	3:F:74:ILE:HG22	2.02	0.41
2:E:143:LEU:HD11	2:E:194:LEU:HD11	2.02	0.41
1:A:558:THR:HG1	6:D:1:NAG:C3	2.14	0.41
2:N:136:THR:O	2:N:136:THR:CG2	2.68	0.41
3:F:50:ASP:N	3:F:50:ASP:OD1	2.54	0.41
1:A:424:ARG:HG2	1:A:518:THR:OG1	2.21	0.40
2:N:139:GLY:O	2:N:140:THR:C	2.60	0.40
3:M:117:PHE:HB2	3:M:132:VAL:HG12	2.03	0.40
2:E:103:ARG:NH2	3:F:49:GLN:OE1	2.55	0.40
3:F:113:SER:HB2	3:F:136:ASN:OD1	2.21	0.40
3:F:134:LEU:HD22	2:N:186:VAL:HG21	2.03	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	A	228/291 (78%)	205 (90%)	23 (10%)	0	100	100
2	E	212/255 (83%)	201 (95%)	11 (5%)	0	100	100
2	N	102/255 (40%)	89 (87%)	13 (13%)	0	100	100
3	F	211/234 (90%)	205 (97%)	6 (3%)	0	100	100
3	M	104/234 (44%)	100 (96%)	4 (4%)	0	100	100
All	All	857/1269 (68%)	800 (93%)	57 (7%)	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	A	184/245 (75%)	180 (98%)	4 (2%)	52	73
2	E	175/214 (82%)	173 (99%)	2 (1%)	73	85
2	N	89/214 (42%)	87 (98%)	2 (2%)	52	73
3	F	177/203 (87%)	175 (99%)	2 (1%)	73	85
3	M	88/203 (43%)	86 (98%)	2 (2%)	50	72
All	All	713/1079 (66%)	701 (98%)	12 (2%)	62	79

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

Mol	Chain	Res	Type
1	A	469	TRP
1	A	500	SER
1	A	627	PHE
1	A	631	MET
2	E	65	GLN
2	E	80	TYR
3	F	29	ASP
3	F	194	GLU
3	M	142	GLU
3	M	210	ARG
2	N	150	TYR
2	N	161	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](#)

11 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	B	1	4,1	14,14,15	0.22	0	17,19,21	1.01	1 (5%)
4	NAG	B	2	4	14,14,15	0.23	0	17,19,21	0.89	1 (5%)
4	BMA	B	3	4	11,11,12	0.88	1 (9%)	15,15,17	1.28	1 (6%)
4	BMA	B	4	4	11,11,12	0.85	0	15,15,17	0.89	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	BMA	B	5	4	11,11,12	0.73	0	15,15,17	0.70	0
5	NAG	C	1	1,5	14,14,15	0.76	1 (7%)	17,19,21	1.46	1 (5%)
5	NAG	C	2	5	14,14,15	0.84	1 (7%)	17,19,21	0.72	0
6	NAG	D	1	6,1	14,14,15	1.48	2 (14%)	17,19,21	1.13	1 (5%)
6	NAG	D	2	6	14,14,15	1.38	1 (7%)	17,19,21	0.64	0
6	BMA	D	3	6	11,11,12	0.98	1 (9%)	15,15,17	1.70	3 (20%)
6	BMA	D	4	6	11,11,12	0.89	0	15,15,17	0.74	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	B	1	4,1	-	3/6/23/26	0/1/1/1
4	NAG	B	2	4	-	2/6/23/26	0/1/1/1
4	BMA	B	3	4	-	1/2/19/22	0/1/1/1
4	BMA	B	4	4	-	2/2/19/22	0/1/1/1
4	BMA	B	5	4	-	1/2/19/22	0/1/1/1
5	NAG	C	1	1,5	-	4/6/23/26	0/1/1/1
5	NAG	C	2	5	-	4/6/23/26	0/1/1/1
6	NAG	D	1	6,1	-	5/6/23/26	0/1/1/1
6	NAG	D	2	6	-	5/6/23/26	0/1/1/1
6	BMA	D	3	6	-	0/2/19/22	0/1/1/1
6	BMA	D	4	6	-	0/2/19/22	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	D	2	NAG	O5-C1	4.81	1.51	1.43
6	D	1	NAG	O5-C1	-4.75	1.36	1.43
5	C	1	NAG	O5-C1	2.74	1.48	1.43
5	C	2	NAG	C1-C2	2.56	1.56	1.52
6	D	3	BMA	C2-C3	2.48	1.56	1.52
6	D	1	NAG	C1-C2	2.16	1.55	1.52
4	B	3	BMA	C4-C3	2.07	1.57	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	1	NAG	C1-O5-C5	5.33	119.41	112.19
6	D	3	BMA	C2-C3-C4	3.67	117.25	110.89
4	B	3	BMA	C1-C2-C3	-3.46	105.42	109.67
6	D	3	BMA	C1-C2-C3	3.06	113.43	109.67
4	B	2	NAG	C1-O5-C5	3.06	116.34	112.19
4	B	1	NAG	C1-O5-C5	3.00	116.25	112.19
6	D	1	NAG	C1-O5-C5	-2.98	108.16	112.19
6	D	3	BMA	O5-C5-C6	2.42	111.00	107.20

There are no chirality outliers.

All (27) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	2	NAG	C4-C5-C6-O6
6	D	1	NAG	O5-C5-C6-O6
4	B	1	NAG	O5-C5-C6-O6
6	D	2	NAG	O5-C5-C6-O6
5	C	2	NAG	O5-C5-C6-O6
6	D	1	NAG	C4-C5-C6-O6
4	B	1	NAG	C4-C5-C6-O6
5	C	1	NAG	C8-C7-N2-C2
5	C	1	NAG	O7-C7-N2-C2
5	C	2	NAG	C8-C7-N2-C2
5	C	2	NAG	O7-C7-N2-C2
6	D	1	NAG	C8-C7-N2-C2
6	D	1	NAG	O7-C7-N2-C2
6	D	2	NAG	C8-C7-N2-C2
6	D	2	NAG	O7-C7-N2-C2
5	C	1	NAG	O5-C5-C6-O6
4	B	3	BMA	O5-C5-C6-O6
6	D	2	NAG	C4-C5-C6-O6
4	B	5	BMA	O5-C5-C6-O6
4	B	4	BMA	C4-C5-C6-O6
5	C	1	NAG	C4-C5-C6-O6
4	B	2	NAG	C1-C2-N2-C7
6	D	1	NAG	C1-C2-N2-C7
4	B	4	BMA	O5-C5-C6-O6
4	B	1	NAG	C3-C2-N2-C7
6	D	2	NAG	C1-C2-N2-C7
4	B	2	NAG	C3-C2-N2-C7

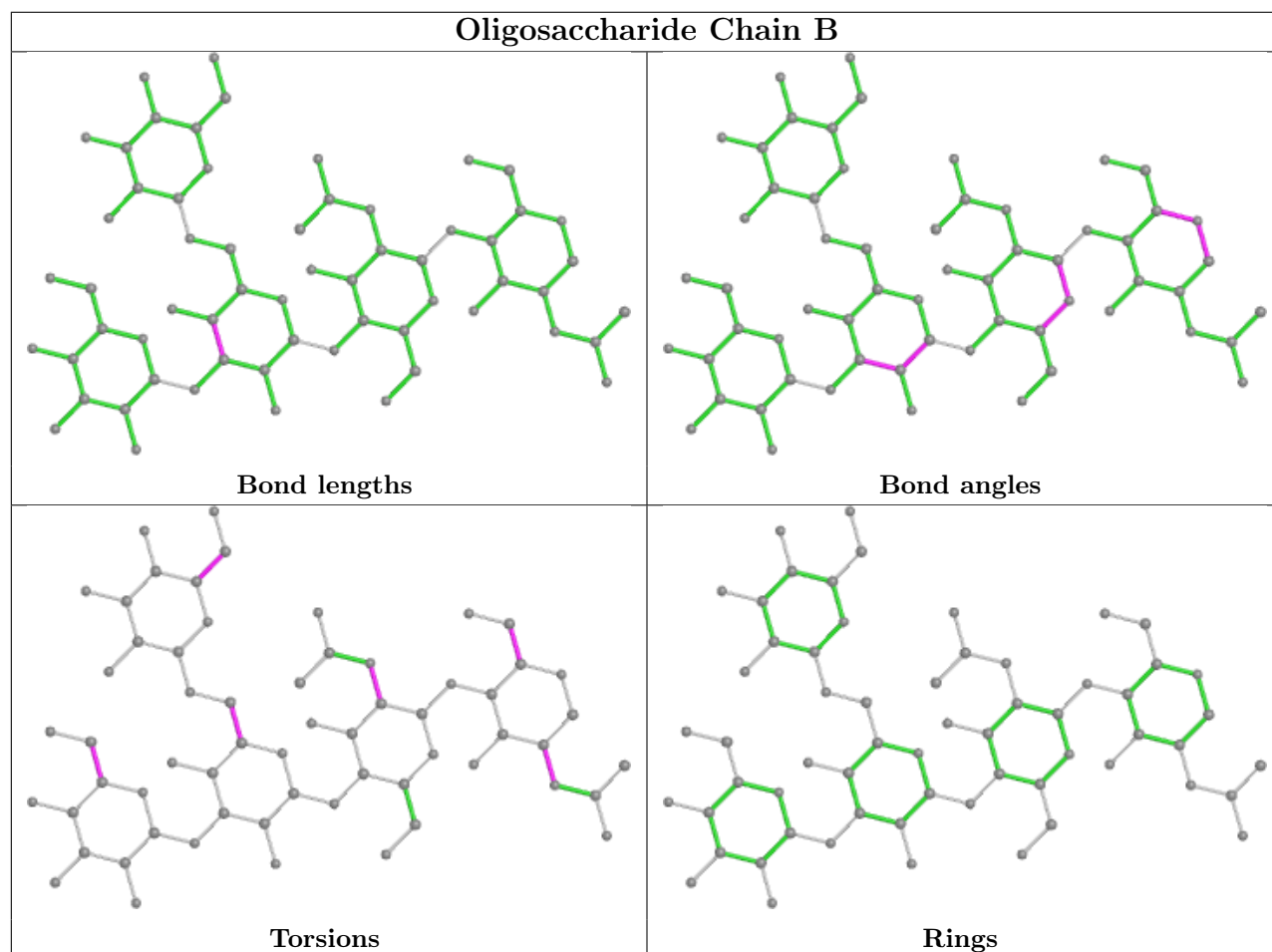
There are no ring outliers.

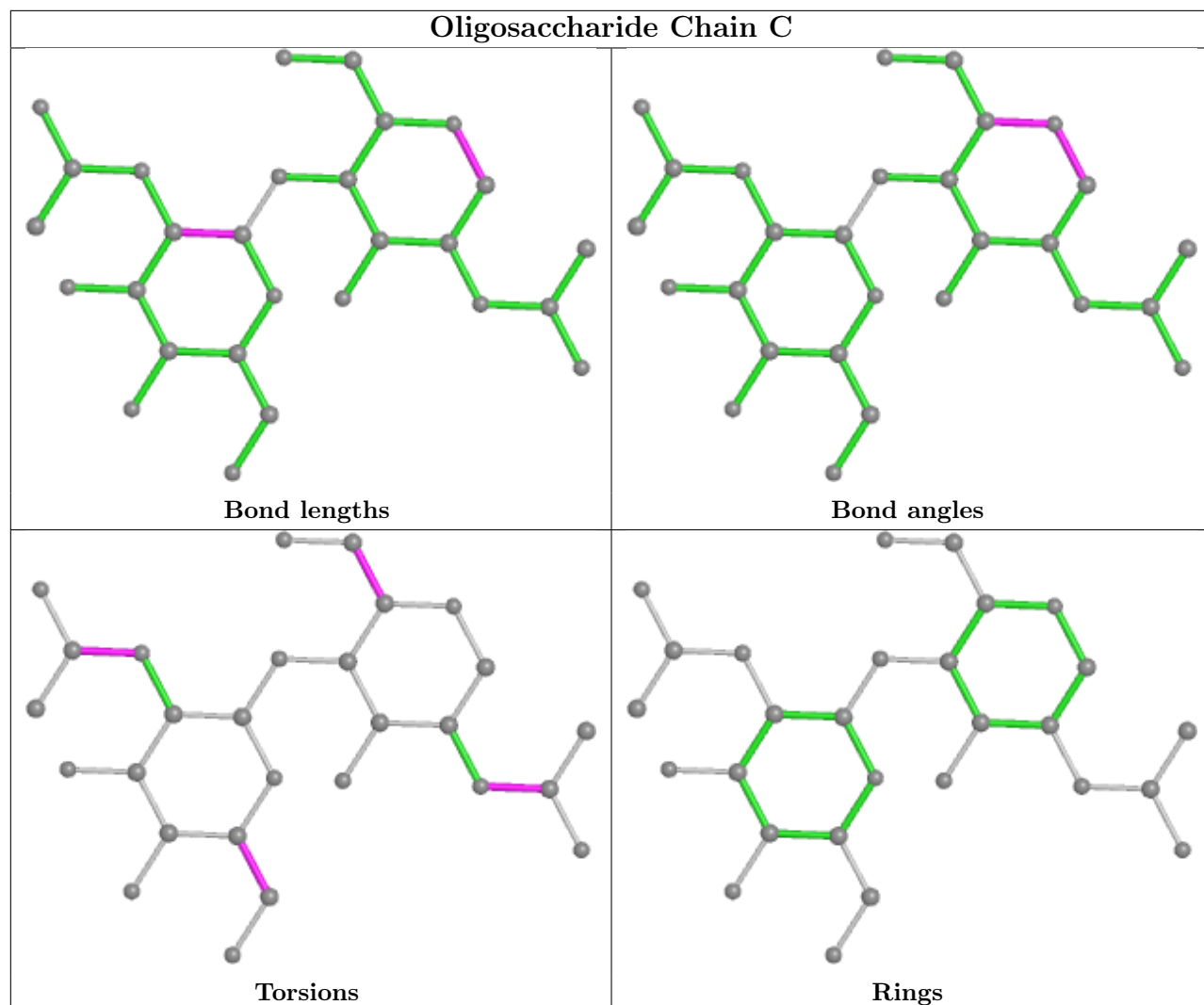
5 monomers are involved in 13 short contacts:

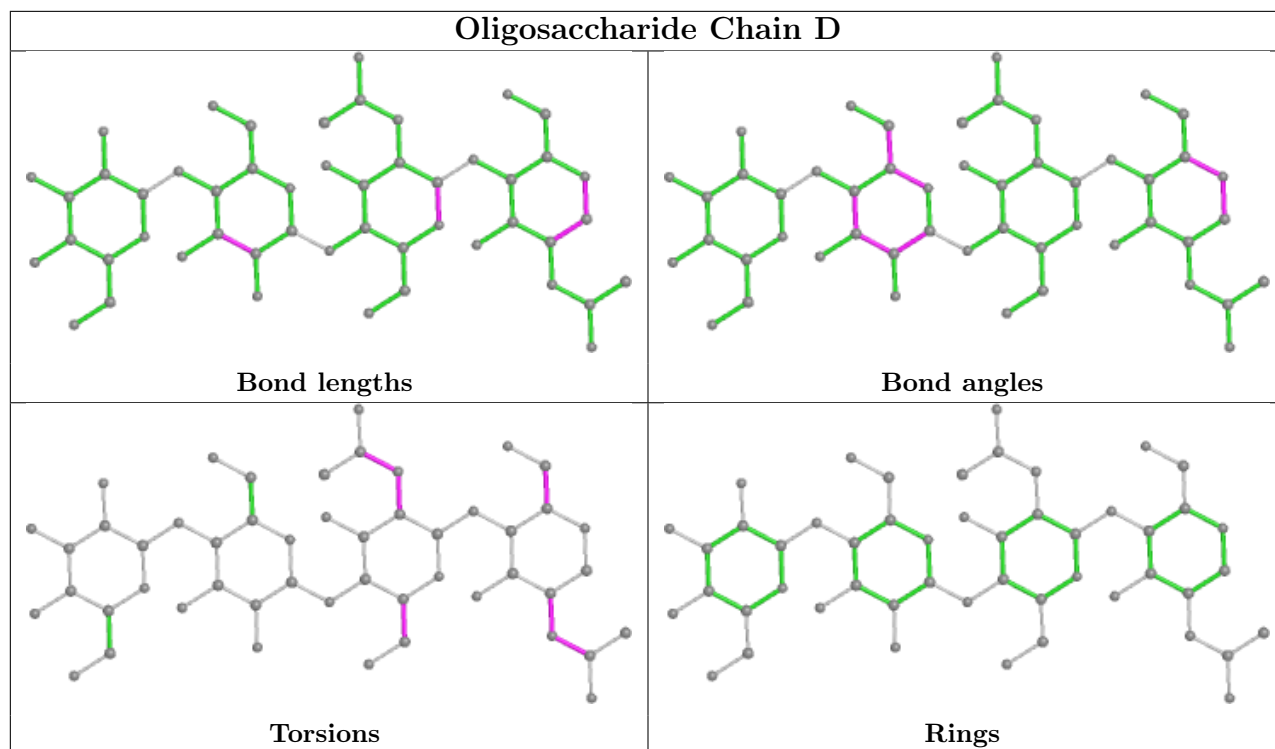


Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1	NAG	4	0
5	C	1	NAG	3	0
6	D	2	NAG	2	0
6	D	1	NAG	5	0
4	B	2	NAG	2	0

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](#)

3 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
7	NAG	A	701	1	14,14,15	0.43	0	17,19,21	1.07	2 (11%)
7	NAG	A	703	1	14,14,15	0.64	0	17,19,21	0.76	0
7	NAG	A	702	1	14,14,15	0.48	0	17,19,21	0.41	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	A	701	1	-	1/6/23/26	0/1/1/1

*Continued on next page...*

*Continued from previous page...*

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	A	703	1	-	2/6/23/26	0/1/1/1
7	NAG	A	702	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	701	NAG	C1-O5-C5	2.98	116.24	112.19
7	A	701	NAG	C2-N2-C7	2.68	126.72	122.90

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	701	NAG	C3-C2-N2-C7
7	A	703	NAG	C3-C2-N2-C7
7	A	703	NAG	C1-C2-N2-C7

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	701	NAG	4	0
7	A	703	NAG	1	0

## 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.

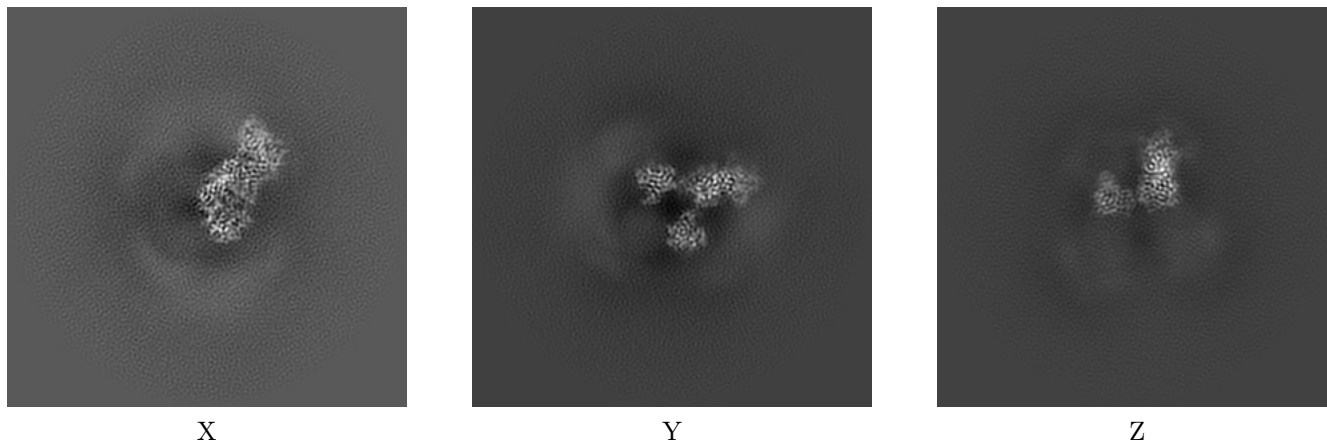
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-41247. These allow visual inspection of the internal detail of the map and identification of artifacts.

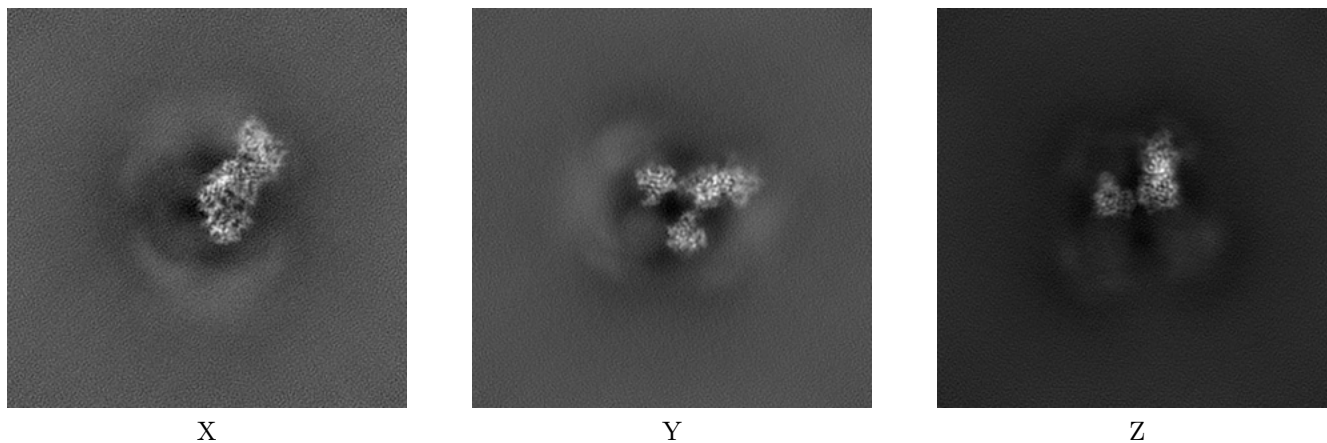
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

#### 6.1.1 Primary map



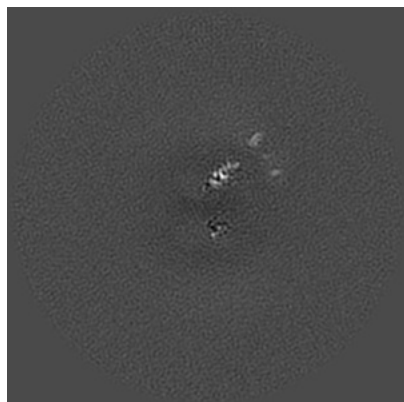
#### 6.1.2 Raw map



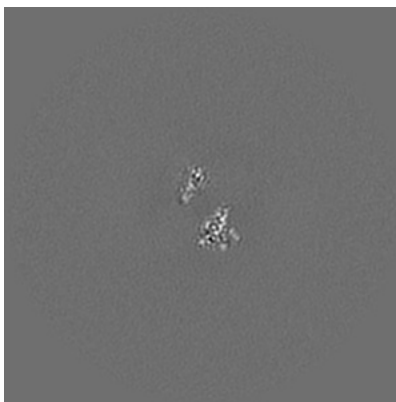
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

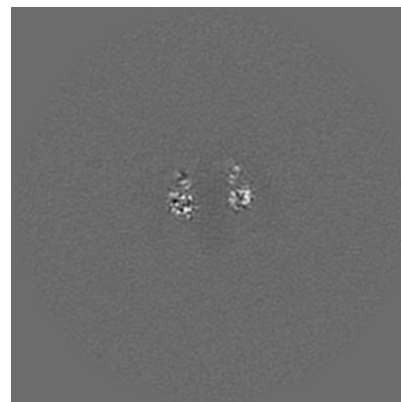
### 6.2.1 Primary map



X Index: 128

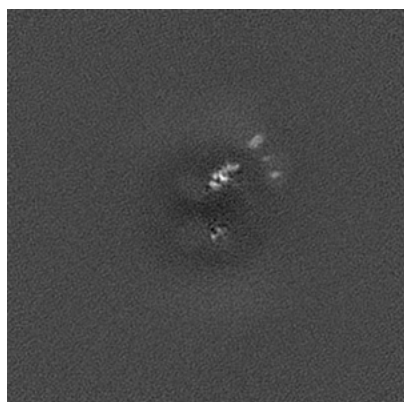


Y Index: 128

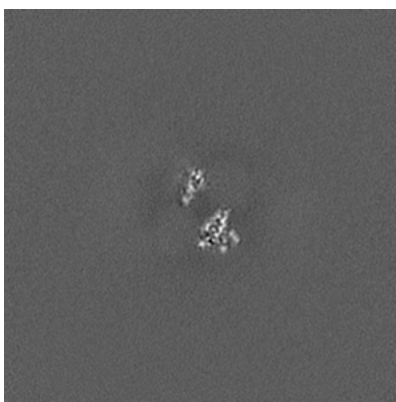


Z Index: 128

### 6.2.2 Raw map



X Index: 128



Y Index: 128

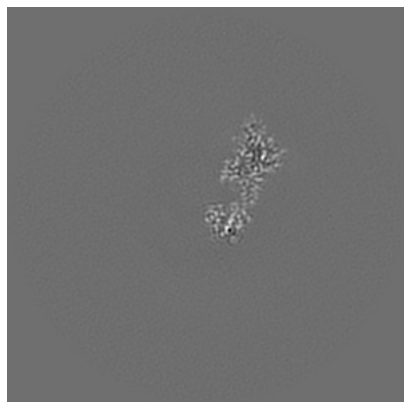


Z Index: 128

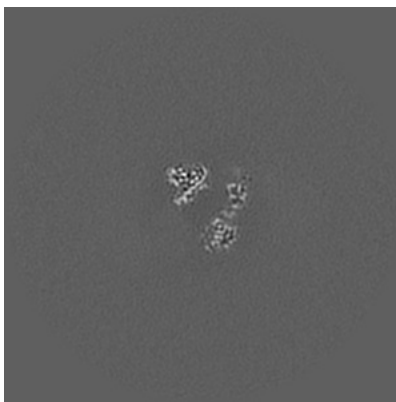
The images above show central slices of the map in three orthogonal directions.

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

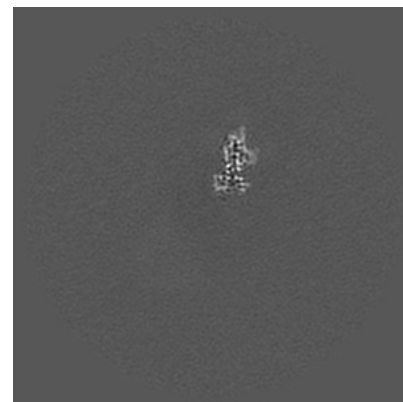
### 6.3.1 Primary map



X Index: 142

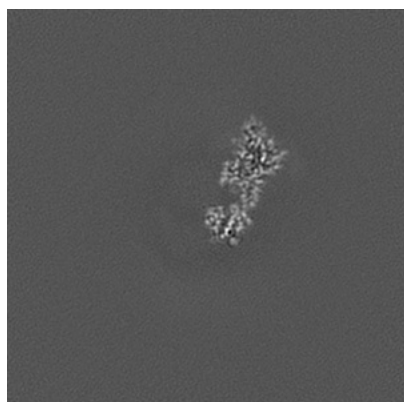


Y Index: 137

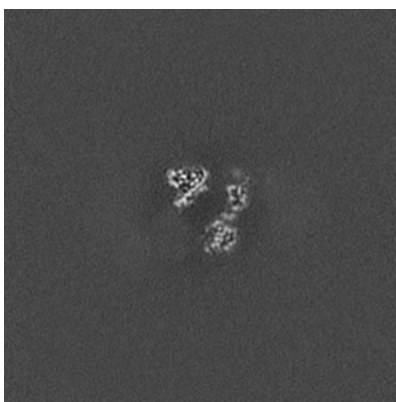


Z Index: 155

### 6.3.2 Raw map



X Index: 142



Y Index: 137

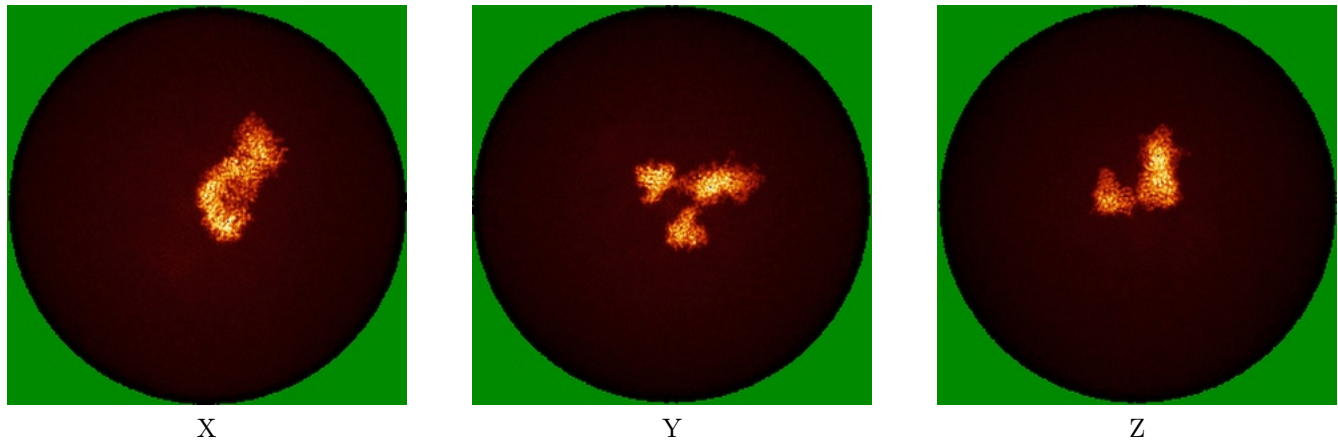


Z Index: 155

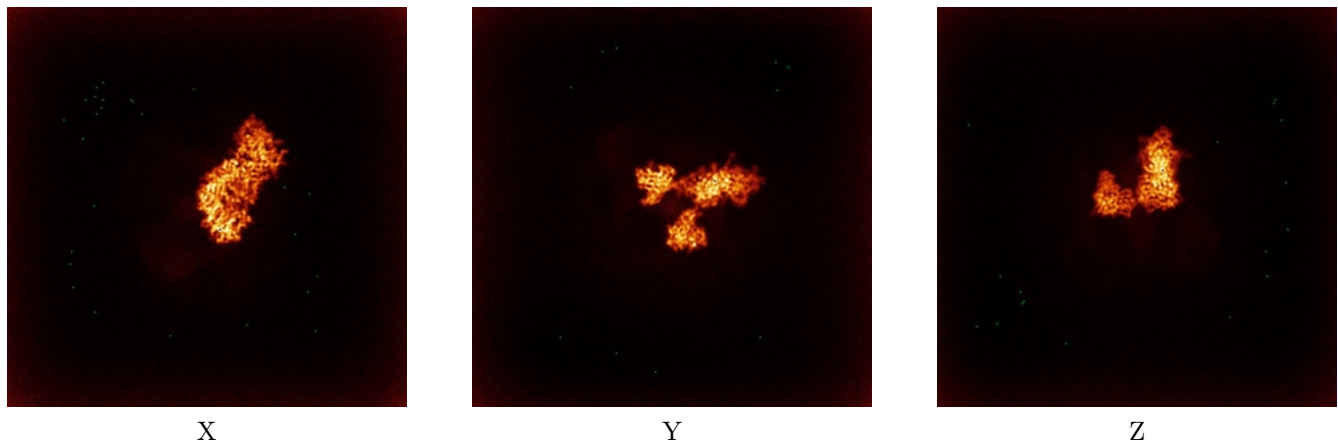
The images above show the largest variance slices of the map in three orthogonal directions.

## 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](#)

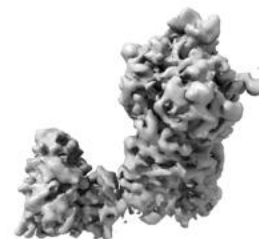
### 6.5.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.22. 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



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.

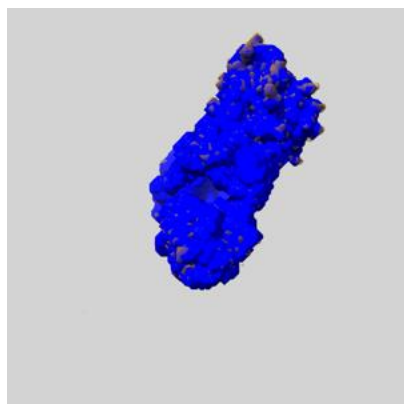
## 6.6 Mask visualisation [i](#)

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

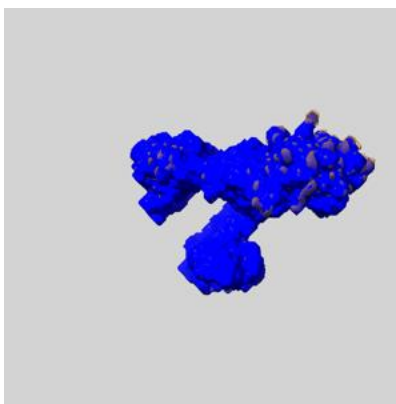
A mask typically either:

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

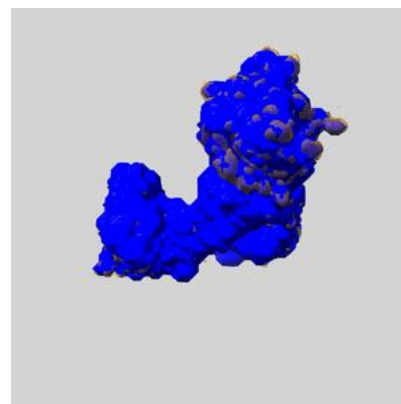
### 6.6.1 emd\_41247\_msk\_1.map [i](#)



X



Y

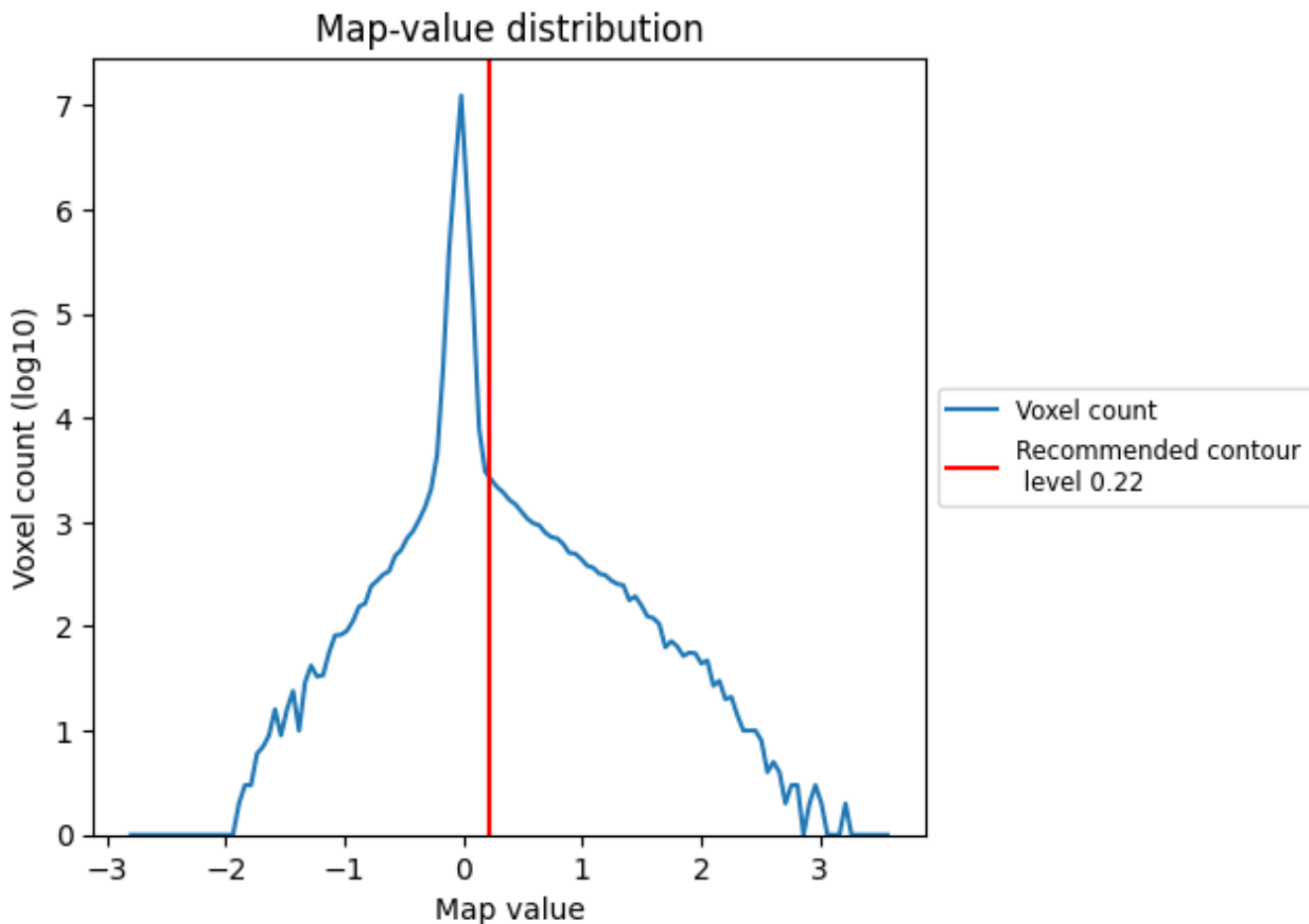


Z

## 7 Map analysis [i](#)

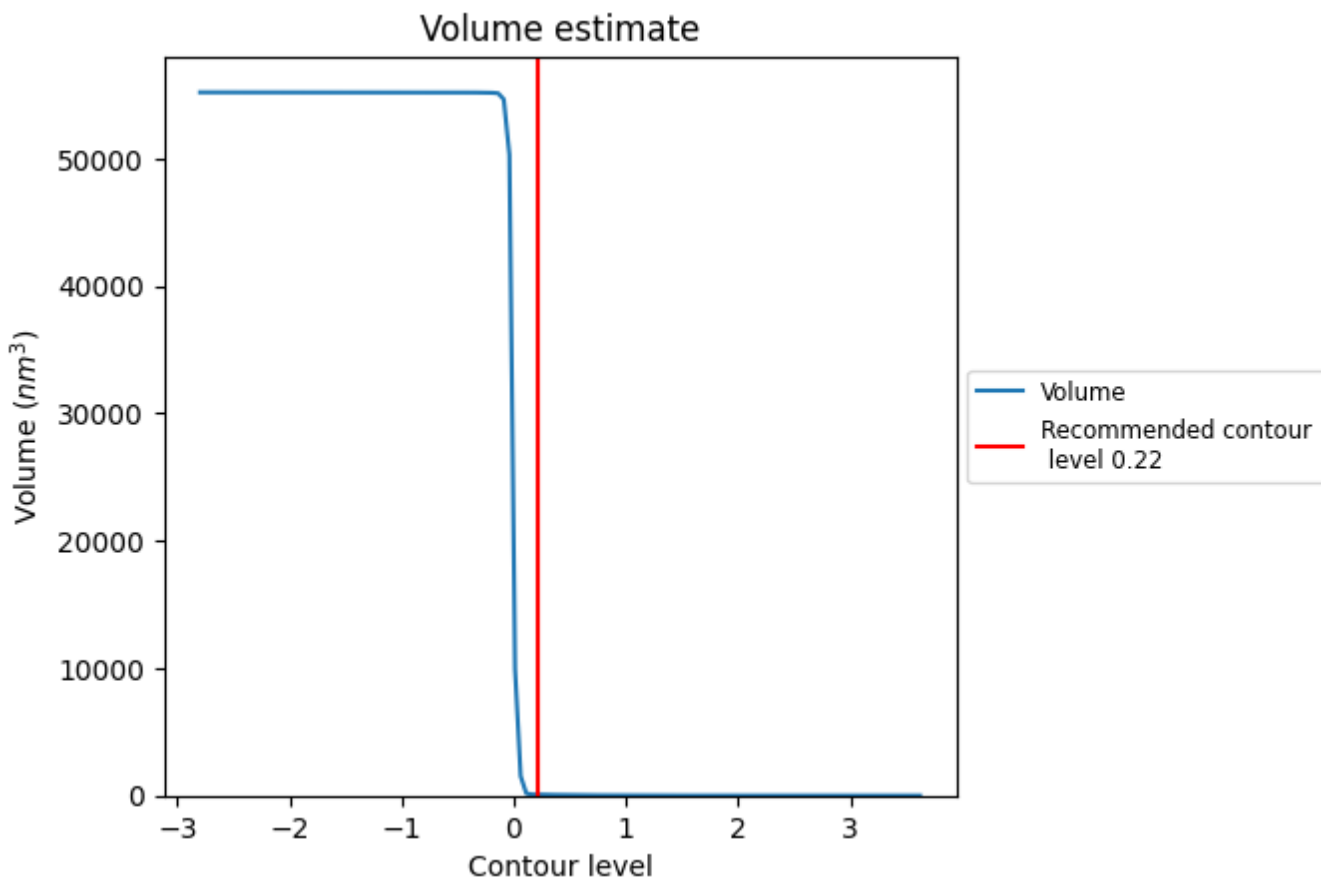
This section contains the results of statistical analysis of the map.

### 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.

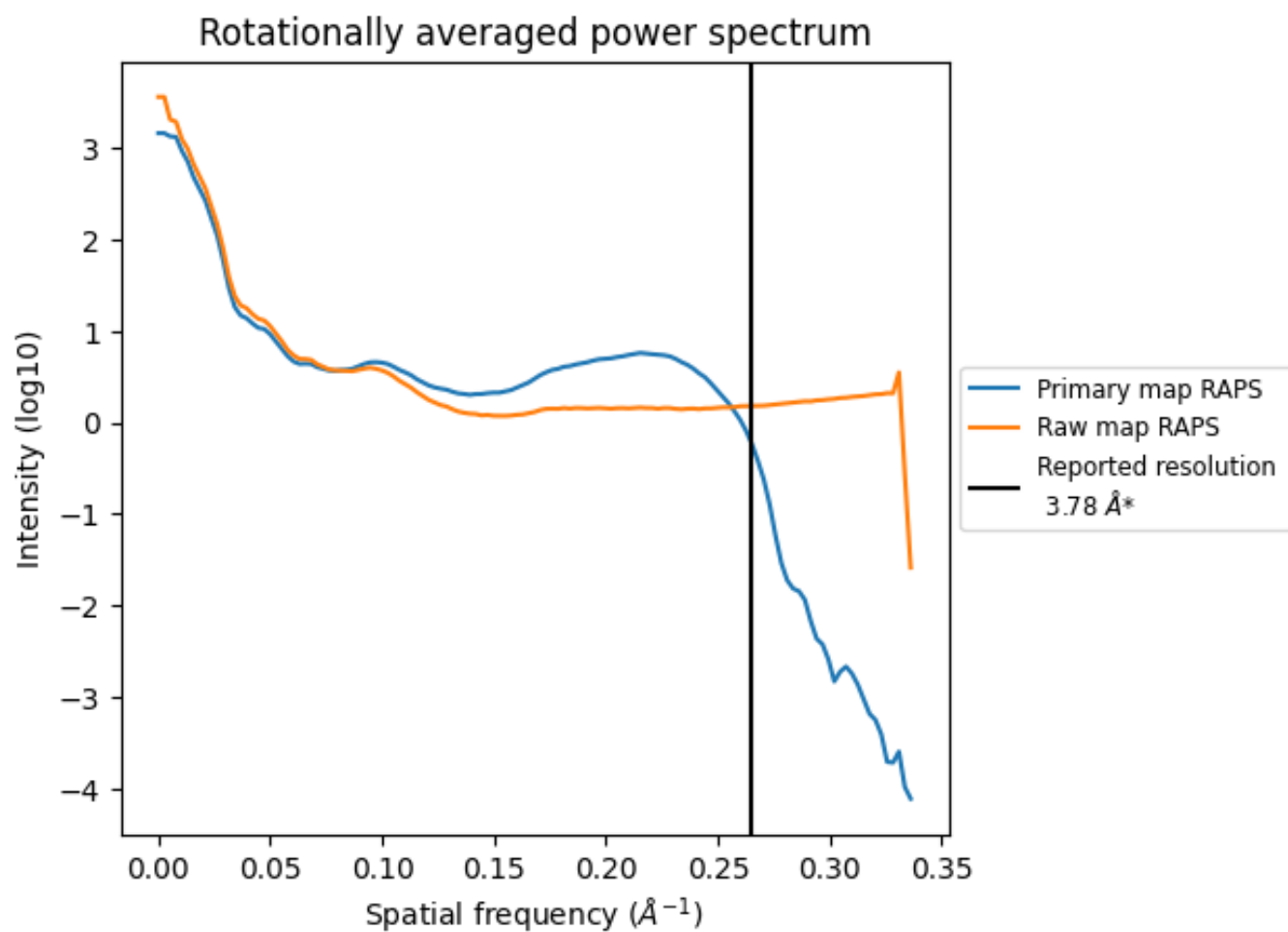
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 75 nm<sup>3</sup>; this corresponds to an approximate mass of 68 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

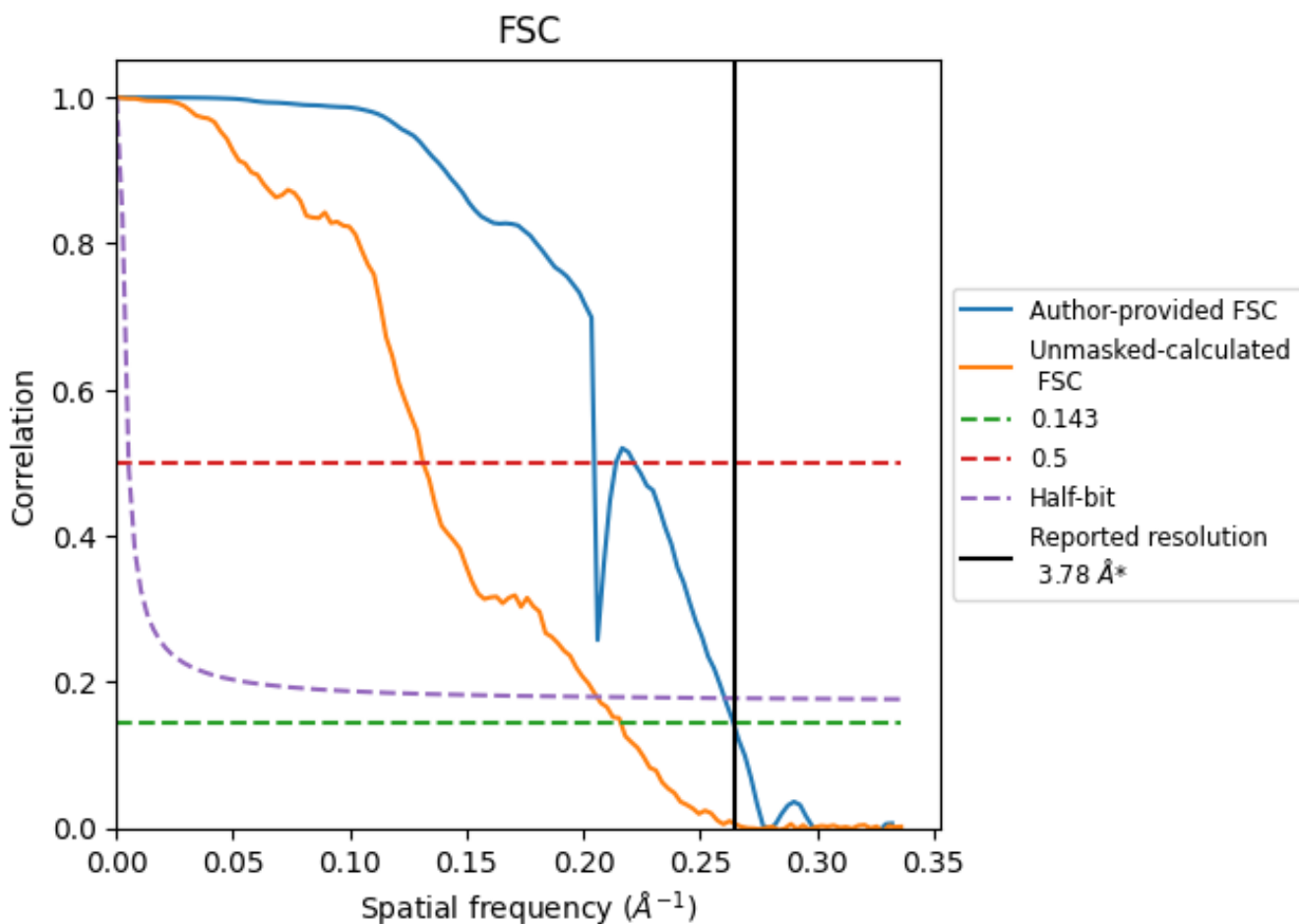


\*Reported resolution corresponds to spatial frequency of 0.265 Å<sup>-1</sup>

## 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 0.265 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

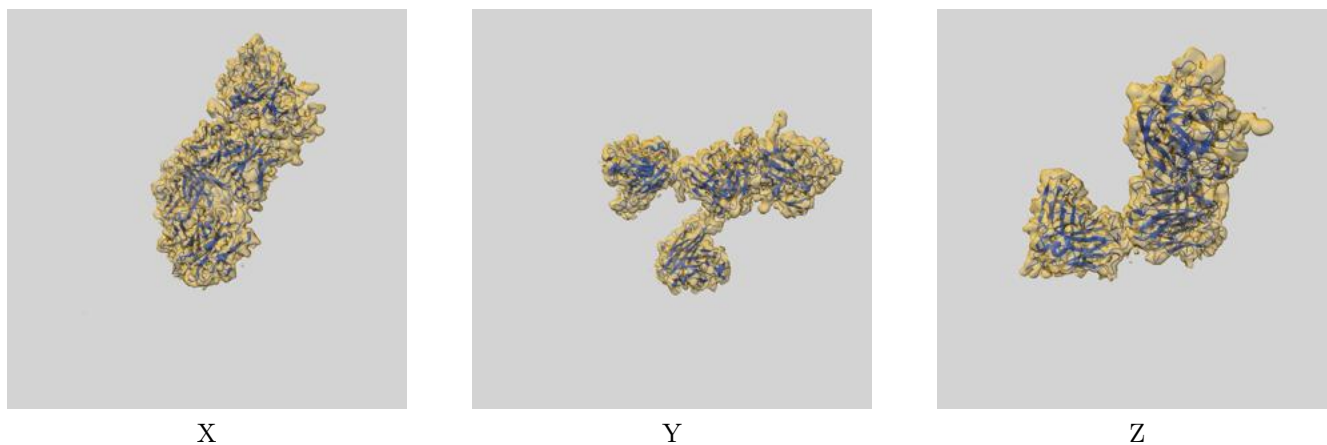
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.78	-	-
Author-provided FSC curve	3.78	4.89	3.84
Unmasked-calculated*	4.63	7.62	4.86

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.63 differs from the reported value 3.78 by more than 10 %

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

This section contains information regarding the fit between EMDB map EMD-41247 and PDB model 8TGZ. Per-residue inclusion information can be found in section 3 on page 6.

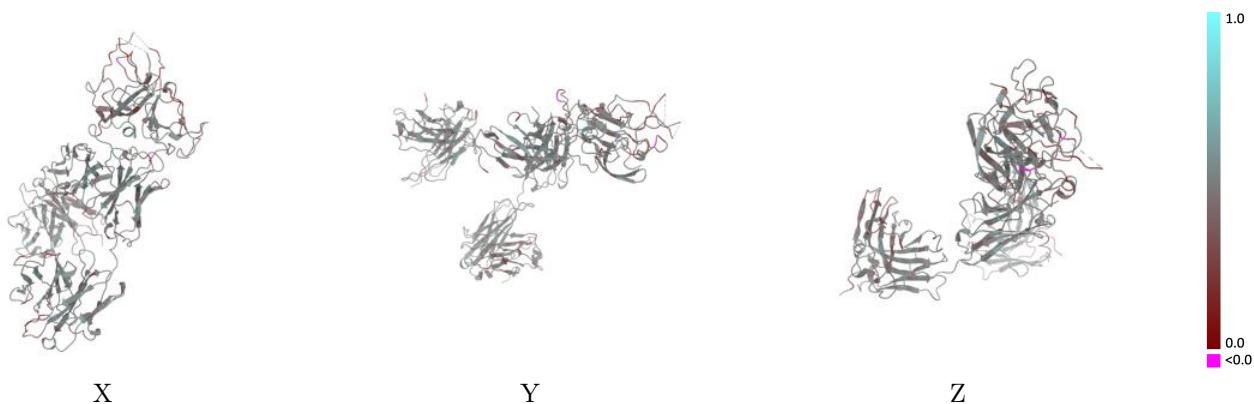
### 9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.22 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.

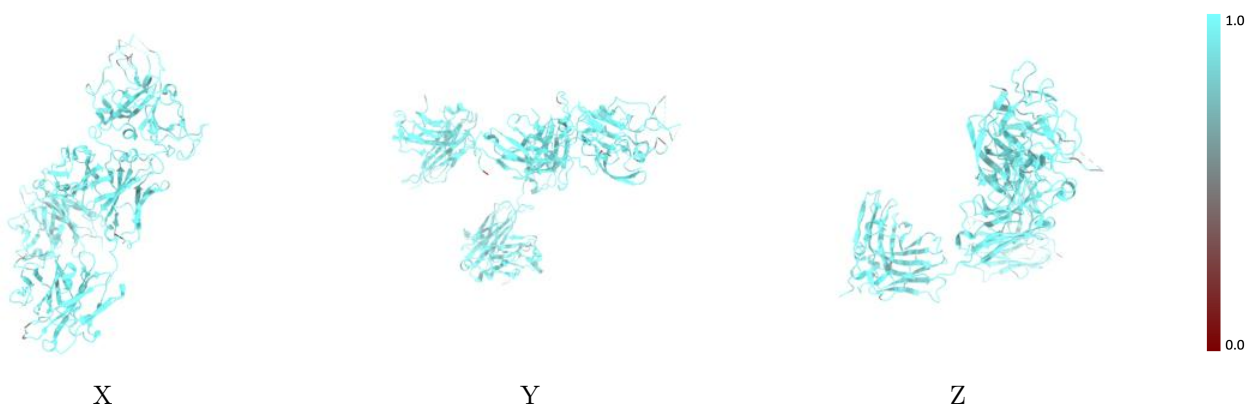


## 9.2 Q-score mapped to coordinate model [\(i\)](#)



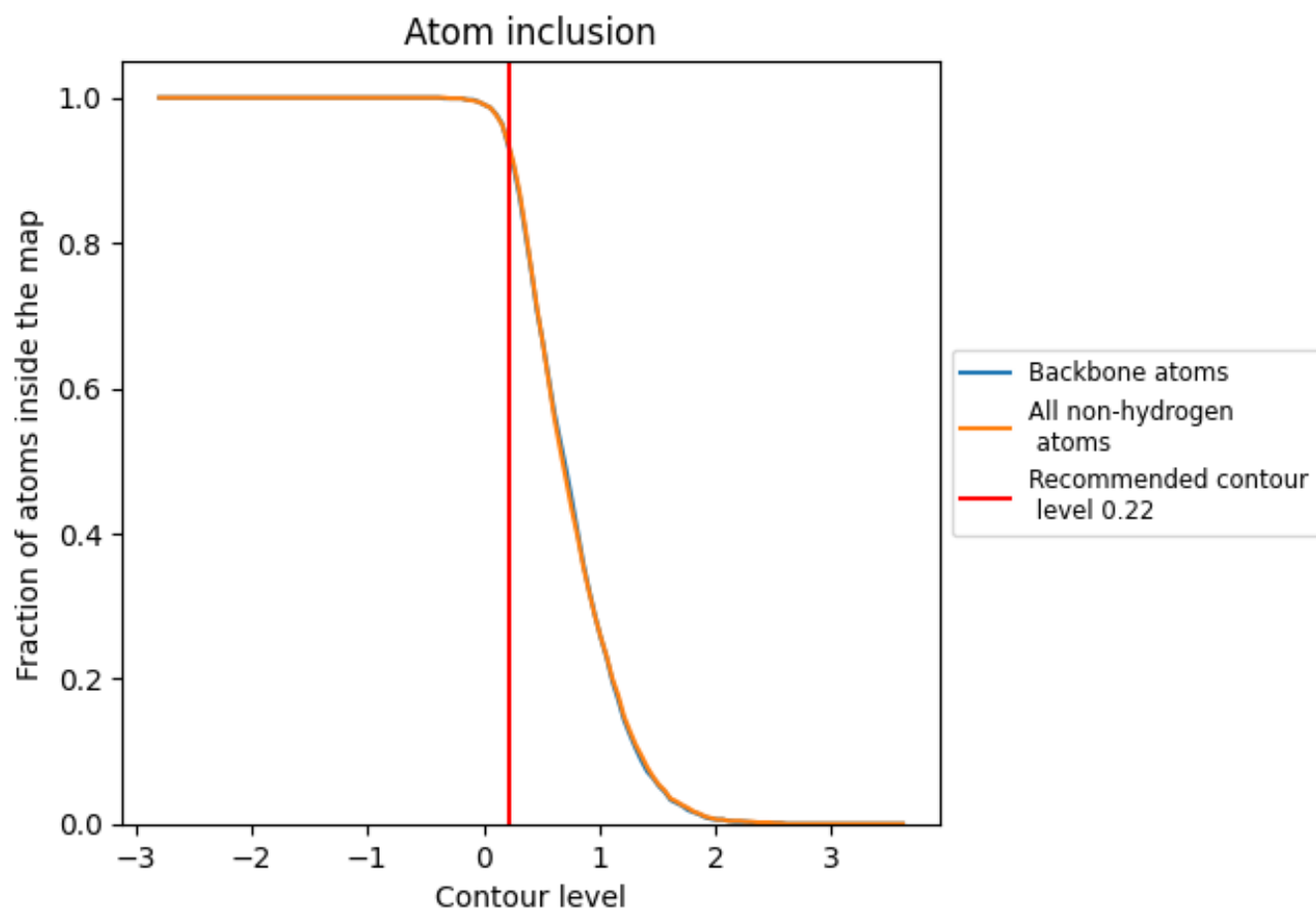
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.22).



















## 9.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 93% 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 (0.22) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9340	 0.4550
A	 0.9160	 0.4270
B	 0.9340	 0.3650
C	 0.9290	 0.4050
D	 0.9200	 0.3680
E	 0.9450	 0.4730
F	 0.9500	 0.4850
M	 0.9290	 0.4660
N	 0.9320	 0.4280

