



## Full wwPDB EM Validation Report ⓘ

May 5, 2025 – 04:08 AM EDT

PDB ID : 8TP3 / pdb\_00008tp3  
EMDB ID : EMD-41465  
Title : H1 hemagglutinin (NC99) in complex with RBS-targeting Fab 1-1-1F05  
Authors : Yang, Y.R.; Han, J.; Perrett, H.R.; Ward, A.B.  
Deposited on : 2023-08-04  
Resolution : 3.60 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.dev118  
Mogul : 2022.3.0, CSD as543be (2022)  
MolProbity : 4-5-2 with Phenix2.0rc1  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.43.1

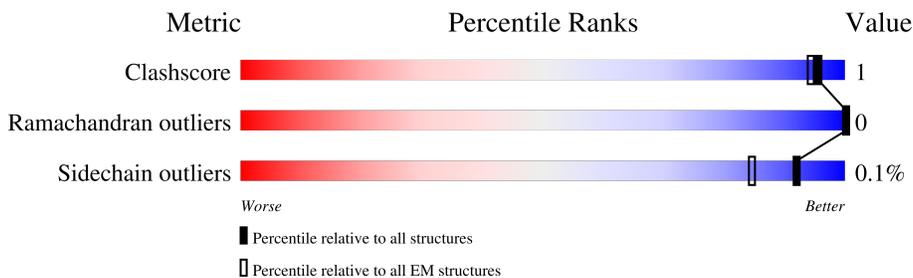
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.60 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.



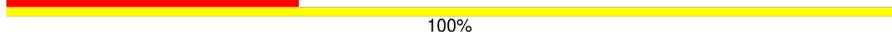
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	343	
1	C	343	
1	G	343	
2	B	222	
2	D	222	
2	I	222	
3	H	126	
4	L	107	

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Mol	Chain	Length	Quality of chain
5	E	2	 100%
5	J	2	 50% 100%
6	F	3	 33% 100%

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 13691 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 Hemagglutinin HA1 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	322	2530	1601	436	482	11	0	0
1	C	322	2530	1601	436	482	11	0	0
1	G	322	2530	1601	436	482	11	0	0

- Molecule 2 is a protein called Hemagglutinin HA2 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	171	1377	862	236	272	7	0	0
2	D	163	1328	829	228	264	7	0	0
2	I	171	1377	862	236	272	7	0	0

- Molecule 3 is a protein called Heavy chain of Fab 1-1-1F05.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	H	124	946	602	158	184	2	0	0

- Molecule 4 is a protein called Light chain of Fab 1-1-1F05.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	L	105	796	497	137	159	3	0	0

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



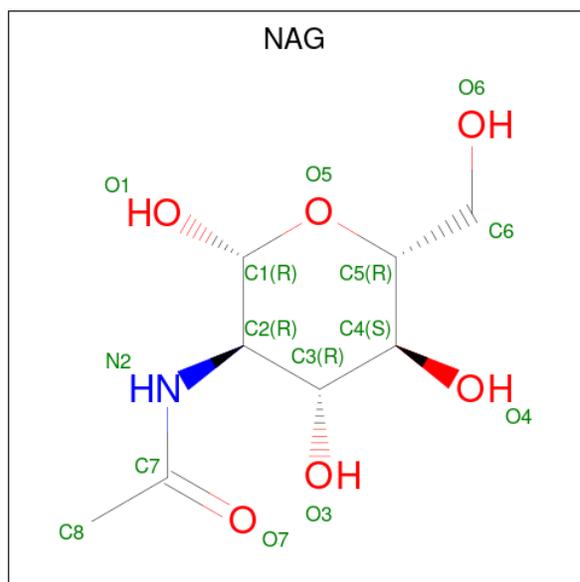
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	E	2	28	16	2	10	0	0
5	J	2	28	16	2	10	0	0

- Molecule 6 is an oligosaccharide called 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		
6	F	3	39	22	2	15	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



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

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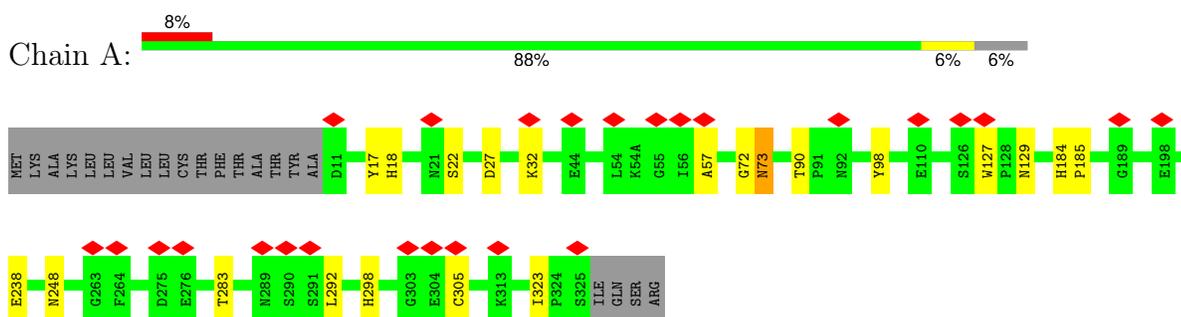
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Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
7	A	1	Total 14	8	1	5	0
7	A	1	Total 14	8	1	5	0
7	A	1	Total 14	8	1	5	0
7	C	1	Total 14	8	1	5	0
7	C	1	Total 14	8	1	5	0
7	C	1	Total 14	8	1	5	0
7	C	1	Total 14	8	1	5	0
7	C	1	Total 14	8	1	5	0
7	C	1	Total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

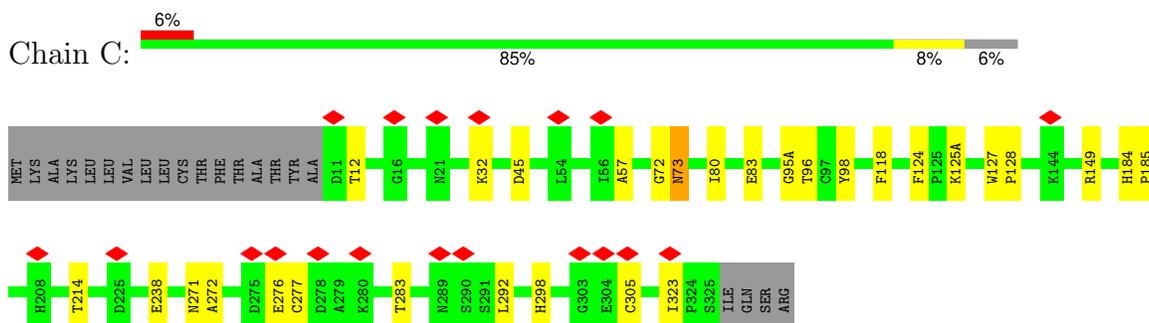
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

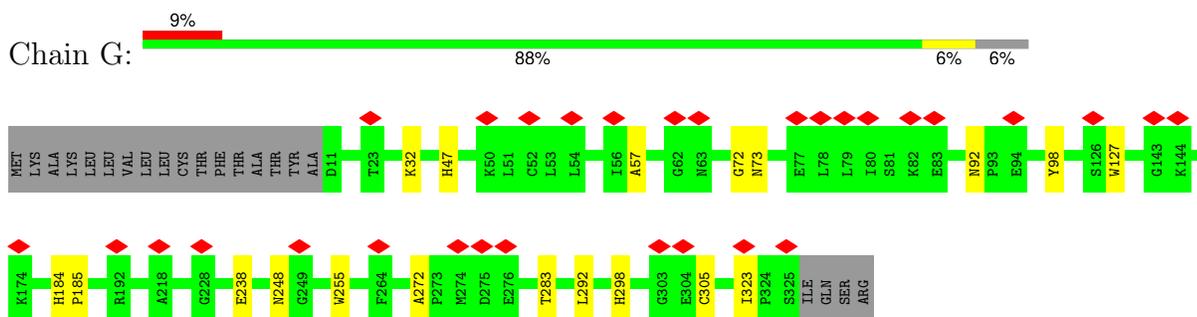
- Molecule 1: Hemagglutinin HA1 chain



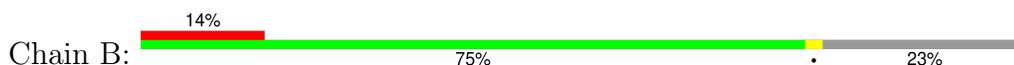
- Molecule 1: Hemagglutinin HA1 chain



- Molecule 1: Hemagglutinin HA1 chain



- Molecule 2: Hemagglutinin HA2 chain





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



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



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	105408	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	49	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.545	Depositor
Minimum map value	-0.939	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.026	Depositor
Recommended contour level	0.222	Depositor
Map size (Å)	368.0, 368.0, 368.0	wwPDB
Map dimensions	320, 320, 320	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.15, 1.15, 1.15	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, BMA

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	1.02	1/2598 (0.0%)	1.31	30/3541 (0.8%)
1	C	1.07	1/2598 (0.0%)	1.32	33/3541 (0.9%)
1	G	1.03	2/2598 (0.1%)	1.31	26/3541 (0.7%)
2	B	0.99	0/1404	1.05	4/1887 (0.2%)
2	D	1.02	2/1354 (0.1%)	1.09	3/1820 (0.2%)
2	I	0.98	0/1404	1.04	1/1887 (0.1%)
3	H	1.12	3/972 (0.3%)	1.35	15/1329 (1.1%)
4	L	1.02	0/815	1.24	7/1110 (0.6%)
All	All	1.03	9/13743 (0.1%)	1.24	119/18656 (0.6%)

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	52	HIS	CB-CG	-6.92	1.40	1.50
1	G	47	HIS	CB-CG	-6.42	1.41	1.50
2	D	137	CYS	N-CA	5.43	1.52	1.46
1	A	18	HIS	CB-CG	-5.25	1.42	1.50
2	D	9	PHE	CG-CD2	5.17	1.49	1.38
1	C	118	PHE	CB-CG	-5.16	1.38	1.50
1	G	298	HIS	CB-CG	-5.07	1.43	1.50
3	H	34	TRP	NE1-CE2	-5.06	1.31	1.37
3	H	32	HIS	CB-CG	-5.00	1.43	1.50

All (119) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	184	HIS	CA-C-N	9.42	126.54	119.66
1	A	184	HIS	C-N-CA	9.42	126.54	119.66
1	G	184	HIS	CA-C-N	9.14	126.33	119.66
1	G	184	HIS	C-N-CA	9.14	126.33	119.66

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	323	ILE	CA-C-N	7.42	127.58	120.31
1	A	323	ILE	C-N-CA	7.42	127.58	120.31
1	A	32	LYS	N-CA-C	7.19	120.16	111.82
1	C	305	CYS	CA-C-N	7.12	127.11	119.78
1	C	305	CYS	C-N-CA	7.12	127.11	119.78
3	H	30	SER	N-CA-C	6.97	121.02	111.54
2	I	112	ASP	CA-CB-CG	6.94	119.54	112.60
1	G	298	HIS	CA-C-N	6.70	126.33	119.56
1	G	298	HIS	C-N-CA	6.70	126.33	119.56
2	D	66	VAL	N-CA-C	6.64	119.55	113.10
2	B	112	ASP	CA-CB-CG	6.63	119.23	112.60
1	C	305	CYS	N-CA-C	6.53	119.31	110.29
1	A	57	ALA	CA-C-N	6.38	126.34	120.03
1	A	57	ALA	C-N-CA	6.38	126.34	120.03
1	G	283	THR	CA-C-N	6.36	126.05	119.56
1	G	283	THR	C-N-CA	6.36	126.05	119.56
1	C	32	LYS	N-CA-C	6.30	121.04	113.23
4	L	58	ILE	CA-C-N	6.28	126.25	119.78
4	L	58	ILE	C-N-CA	6.28	126.25	119.78
1	G	32	LYS	N-CA-C	6.27	120.67	112.89
1	A	98	TYR	CA-C-N	6.22	126.24	119.89
1	A	98	TYR	C-N-CA	6.22	126.24	119.89
3	H	35	SER	N-CA-C	6.09	119.48	109.85
1	C	57	ALA	CA-C-N	6.05	126.51	120.52
1	C	57	ALA	C-N-CA	6.05	126.51	120.52
1	C	185	PRO	CA-C-N	6.04	126.57	120.04
1	C	185	PRO	C-N-CA	6.04	126.57	120.04
1	G	323	ILE	CA-C-N	5.97	126.47	120.14
1	G	323	ILE	C-N-CA	5.97	126.47	120.14
1	C	272	ALA	CA-C-N	5.93	126.13	120.31
1	C	272	ALA	C-N-CA	5.93	126.13	120.31
1	C	98	TYR	N-CA-C	-5.90	99.30	109.15
1	C	323	ILE	CA-C-N	5.82	126.31	120.14
1	C	323	ILE	C-N-CA	5.82	126.31	120.14
1	A	185	PRO	CA-C-N	5.80	125.42	119.56
1	A	185	PRO	C-N-CA	5.80	125.42	119.56
1	C	184	HIS	CA-C-N	5.75	126.31	120.38
1	C	184	HIS	C-N-CA	5.75	126.31	120.38
1	G	292	LEU	CA-C-N	5.75	125.37	119.56
1	G	292	LEU	C-N-CA	5.75	125.37	119.56
3	H	101	ASP	N-CA-C	5.75	122.51	109.81
2	B	147	GLU	CA-C-N	5.74	127.90	120.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	147	GLU	C-N-CA	5.74	127.90	120.44
3	H	78	PHE	CA-CB-CG	5.74	119.54	113.80
1	C	73	ASN	CA-C-N	5.74	125.86	119.32
1	C	73	ASN	C-N-CA	5.74	125.86	119.32
1	G	185	PRO	CA-C-N	5.73	125.35	119.56
1	G	185	PRO	C-N-CA	5.73	125.35	119.56
1	C	292	LEU	CA-C-N	5.73	125.35	119.56
1	C	292	LEU	C-N-CA	5.73	125.35	119.56
3	H	79	SER	N-CA-C	5.71	117.76	109.07
1	G	92	ASN	CA-C-N	5.71	125.66	119.78
1	G	92	ASN	C-N-CA	5.71	125.66	119.78
3	H	8	GLY	CA-C-N	5.69	125.62	119.76
3	H	8	GLY	C-N-CA	5.69	125.62	119.76
3	H	85	ALA	N-CA-C	-5.68	106.11	113.16
1	G	57	ALA	CA-C-N	5.68	125.66	120.03
1	G	57	ALA	C-N-CA	5.68	125.66	120.03
1	C	125(A)	LYS	N-CA-C	5.65	117.89	111.11
1	A	27	ASP	CA-CB-CG	5.64	118.24	112.60
3	H	76	ASN	N-CA-C	-5.61	104.25	113.50
1	A	305	CYS	CA-C-N	5.60	125.55	119.78
1	A	305	CYS	C-N-CA	5.60	125.55	119.78
1	G	272	ALA	CA-C-N	5.60	125.50	119.85
1	G	272	ALA	C-N-CA	5.60	125.50	119.85
1	A	127	TRP	CA-C-N	5.58	125.25	119.56
1	A	127	TRP	C-N-CA	5.58	125.25	119.56
1	C	124	PHE	CA-C-N	5.58	125.59	119.90
1	C	124	PHE	C-N-CA	5.58	125.59	119.90
1	G	305	CYS	CA-C-N	5.57	125.52	119.78
1	G	305	CYS	C-N-CA	5.57	125.52	119.78
1	C	283	THR	CA-C-N	5.55	125.22	119.56
1	C	283	THR	C-N-CA	5.55	125.22	119.56
1	A	323	ILE	CA-C-O	-5.51	117.13	120.88
1	C	83	GLU	N-CA-C	5.50	117.08	111.14
1	C	298	HIS	CA-C-N	5.49	125.11	119.56
1	C	298	HIS	C-N-CA	5.49	125.11	119.56
3	H	102	PRO	N-CA-C	-5.48	101.17	112.47
1	A	298	HIS	CA-C-N	5.41	125.03	119.56
1	A	298	HIS	C-N-CA	5.41	125.03	119.56
3	H	100(J)	PHE	CA-CB-CG	-5.38	108.42	113.80
3	H	13	LYS	CA-C-N	5.38	125.71	119.47
3	H	13	LYS	C-N-CA	5.38	125.71	119.47
1	G	323	ILE	CA-C-O	-5.35	117.24	120.88

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	79	GLN	N-CA-C	-5.34	102.61	110.52
1	A	73	ASN	CA-C-N	5.33	125.65	119.47
1	A	73	ASN	C-N-CA	5.33	125.65	119.47
2	B	10	ILE	N-CA-C	-5.32	100.22	107.99
1	A	17	TYR	CA-C-N	5.32	128.42	120.87
1	A	17	TYR	C-N-CA	5.32	128.42	120.87
1	G	255	TRP	N-CA-C	-5.31	105.00	112.12
1	A	283	THR	CA-C-N	5.29	124.96	119.56
1	A	283	THR	C-N-CA	5.29	124.96	119.56
2	D	63	PHE	N-CA-C	5.29	118.32	107.69
1	G	127	TRP	CA-C-N	5.28	124.94	119.56
1	G	127	TRP	C-N-CA	5.28	124.94	119.56
2	D	140	PHE	CA-CB-CG	5.27	119.07	113.80
1	A	292	LEU	CA-C-N	5.26	124.87	119.56
1	A	292	LEU	C-N-CA	5.26	124.87	119.56
1	A	90	THR	CA-C-N	5.25	125.56	119.47
1	A	90	THR	C-N-CA	5.25	125.56	119.47
1	C	118	PHE	N-CA-C	5.24	117.27	107.99
3	H	67	VAL	N-CA-C	5.23	116.11	108.53
1	C	277	CYS	N-CA-C	-5.17	101.21	109.07
3	H	40	PRO	N-CA-C	-5.11	104.46	110.70
1	G	98	TYR	N-CA-C	-5.10	99.51	108.69
4	L	52	SER	N-CA-C	5.10	121.26	113.61
1	C	276	GLU	N-CA-C	5.03	117.72	110.28
4	L	36	TYR	N-CA-C	5.02	117.76	109.72
1	A	18	HIS	N-CA-C	5.01	117.70	110.28
1	C	214	THR	CA-C-N	5.01	125.01	119.90
1	C	214	THR	C-N-CA	5.01	125.01	119.90
4	L	14	SER	CA-C-N	5.00	125.22	120.31
4	L	14	SER	C-N-CA	5.00	125.22	120.31
1	C	12	THR	N-CA-C	5.00	116.68	109.07

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2530	0	2438	5	0
1	C	2530	0	2437	8	0
1	G	2530	0	2438	3	0
2	B	1377	0	1304	2	0
2	D	1328	0	1251	4	0
2	I	1377	0	1304	3	0
3	H	946	0	919	2	0
4	L	796	0	764	0	0
5	E	28	0	25	0	0
5	J	28	0	25	0	0
6	F	39	0	34	0	0
7	A	56	0	52	2	0
7	C	70	0	65	0	0
7	G	56	0	52	0	0
All	All	13691	0	13108	23	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 1.

All (23) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:80:ILE:HD13	1:C:149:ARG:HH22	1.35	0.91
1:C:80:ILE:HD13	1:C:149:ARG:NH2	2.07	0.67
1:A:129:ASN:HD22	7:A:404:NAG:H83	1.62	0.65
2:D:72:LYS:NZ	1:G:238:GLU:OE2	2.40	0.54
1:A:238:GLU:OE2	2:I:72:LYS:NZ	2.41	0.53
2:B:72:LYS:NZ	1:C:238:GLU:OE2	2.41	0.53
1:C:95(A):GLY:O	1:C:96:THR:C	2.51	0.52
2:D:69:GLU:N	2:D:69:GLU:OE1	2.47	0.47
2:D:133:ILE:HB	2:D:137:CYS:O	2.14	0.46
1:A:72:GLY:O	1:A:73:ASN:C	2.58	0.46
1:G:72:GLY:O	1:G:73:ASN:C	2.59	0.44
2:D:83:LYS:NZ	2:I:85:ASP:OD1	2.34	0.43
2:I:19:ASP:OD1	2:I:19:ASP:N	2.43	0.43
1:G:248:ASN:N	1:G:248:ASN:OD1	2.51	0.43
1:A:22:SER:HA	7:A:401:NAG:H82	2.00	0.42
3:H:4:LEU:HB3	3:H:22:CYS:SG	2.60	0.42
2:B:69:GLU:OE1	2:B:69:GLU:N	2.47	0.42
1:C:271:ASN:OD1	1:C:271:ASN:N	2.49	0.42
1:C:45:ASP:OD1	1:C:45:ASP:N	2.50	0.41
1:C:127:TRP:N	1:C:128:PRO:HD3	2.36	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:H:111:VAL:HG12	3:H:111:VAL:O	2.21	0.41
1:A:248:ASN:N	1:A:248:ASN:OD1	2.54	0.40
1:C:72:GLY:O	1:C:73:ASN:C	2.61	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	320/343 (93%)	315 (98%)	5 (2%)	0	100	100
1	C	320/343 (93%)	312 (98%)	8 (2%)	0	100	100
1	G	320/343 (93%)	315 (98%)	5 (2%)	0	100	100
2	B	169/222 (76%)	167 (99%)	2 (1%)	0	100	100
2	D	161/222 (72%)	160 (99%)	1 (1%)	0	100	100
2	I	169/222 (76%)	167 (99%)	2 (1%)	0	100	100
3	H	122/126 (97%)	119 (98%)	3 (2%)	0	100	100
4	L	103/107 (96%)	100 (97%)	3 (3%)	0	100	100
All	All	1684/1928 (87%)	1655 (98%)	29 (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	A	283/301 (94%)	283 (100%)	0	100	100
1	C	283/301 (94%)	283 (100%)	0	100	100
1	G	283/301 (94%)	283 (100%)	0	100	100
2	B	147/191 (77%)	147 (100%)	0	100	100
2	D	144/191 (75%)	143 (99%)	1 (1%)	81	90
2	I	147/191 (77%)	147 (100%)	0	100	100
3	H	105/107 (98%)	105 (100%)	0	100	100
4	L	87/89 (98%)	87 (100%)	0	100	100
All	All	1479/1672 (88%)	1478 (100%)	1 (0%)	92	97

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

Mol	Chain	Res	Type
2	D	137	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	196	HIS
1	C	226	GLN
2	D	27	GLN
2	D	42	GLN
2	I	26	HIS
2	I	42	GLN
3	H	1	GLN
3	H	77	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

7 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
5	NAG	E	1	5,1	14,14,15	2.13	7 (50%)	17,19,21	0.96	0
5	NAG	E	2	5	14,14,15	1.93	4 (28%)	17,19,21	0.94	1 (5%)
6	NAG	F	1	6,1	14,14,15	2.28	5 (35%)	17,19,21	1.27	3 (17%)
6	NAG	F	2	6	14,14,15	1.91	5 (35%)	17,19,21	0.90	0
6	BMA	F	3	6	11,11,12	1.83	4 (36%)	15,15,17	0.71	0
5	NAG	J	1	5,1	14,14,15	2.28	4 (28%)	17,19,21	0.94	0
5	NAG	J	2	5	14,14,15	1.97	4 (28%)	17,19,21	0.90	1 (5%)

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. <sup>1,2</sup> means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	E	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	E	2	5	-	1/6/23/26	0/1/1/1
6	NAG	F	1	6,1	-	0/6/23/26	0/1/1/1
6	NAG	F	2	6	-	1/6/23/26	0/1/1/1
6	BMA	F	3	6	-	1/2/19/22	0/1/1/1
5	NAG	J	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	J	2	5	-	1/6/23/26	0/1/1/1

All (33) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	1	NAG	C1-C2	6.45	1.61	1.52
5	J	1	NAG	C1-C2	6.44	1.61	1.52
5	E	1	NAG	C1-C2	5.70	1.60	1.52
5	J	2	NAG	C1-C2	4.58	1.58	1.52
5	E	2	NAG	C1-C2	4.41	1.58	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	2	NAG	C1-C2	4.28	1.58	1.52
5	E	2	NAG	O5-C5	3.36	1.50	1.43
5	J	2	NAG	O5-C5	3.32	1.49	1.43
6	F	2	NAG	O5-C5	3.15	1.49	1.43
6	F	3	BMA	O5-C5	3.08	1.49	1.43
6	F	3	BMA	C2-C3	3.07	1.57	1.52
5	J	1	NAG	O5-C5	2.91	1.49	1.43
5	E	1	NAG	O5-C5	2.66	1.48	1.43
6	F	1	NAG	O5-C5	2.60	1.48	1.43
6	F	3	BMA	C1-C2	2.47	1.58	1.52
5	J	2	NAG	C3-C2	2.46	1.57	1.52
6	F	2	NAG	C4-C5	2.42	1.58	1.53
5	E	2	NAG	C3-C2	2.40	1.57	1.52
6	F	1	NAG	O5-C1	2.36	1.47	1.43
5	E	2	NAG	C4-C5	2.28	1.57	1.53
6	F	1	NAG	C2-N2	2.27	1.50	1.46
5	J	2	NAG	C4-C5	2.27	1.57	1.53
5	J	1	NAG	O5-C1	2.27	1.47	1.43
6	F	3	BMA	C4-C5	2.25	1.57	1.53
6	F	2	NAG	C3-C2	2.19	1.57	1.52
6	F	2	NAG	C4-C3	2.17	1.58	1.52
5	J	1	NAG	C4-C5	2.14	1.57	1.53
5	E	1	NAG	C4-C5	2.08	1.57	1.53
6	F	1	NAG	C3-C2	2.03	1.56	1.52
5	E	1	NAG	C2-N2	2.03	1.49	1.46
5	E	1	NAG	C3-C2	2.03	1.56	1.52
5	E	1	NAG	C4-C3	2.00	1.57	1.52
5	E	1	NAG	O5-C1	2.00	1.47	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	F	1	NAG	C8-C7-N2	3.01	121.10	116.12
6	F	1	NAG	O7-C7-C8	-2.36	117.84	122.05
6	F	1	NAG	C1-O5-C5	2.29	115.26	112.19
5	J	2	NAG	C8-C7-N2	2.09	119.59	116.12
5	E	2	NAG	C8-C7-N2	2.02	119.47	116.12

There are no chirality outliers.

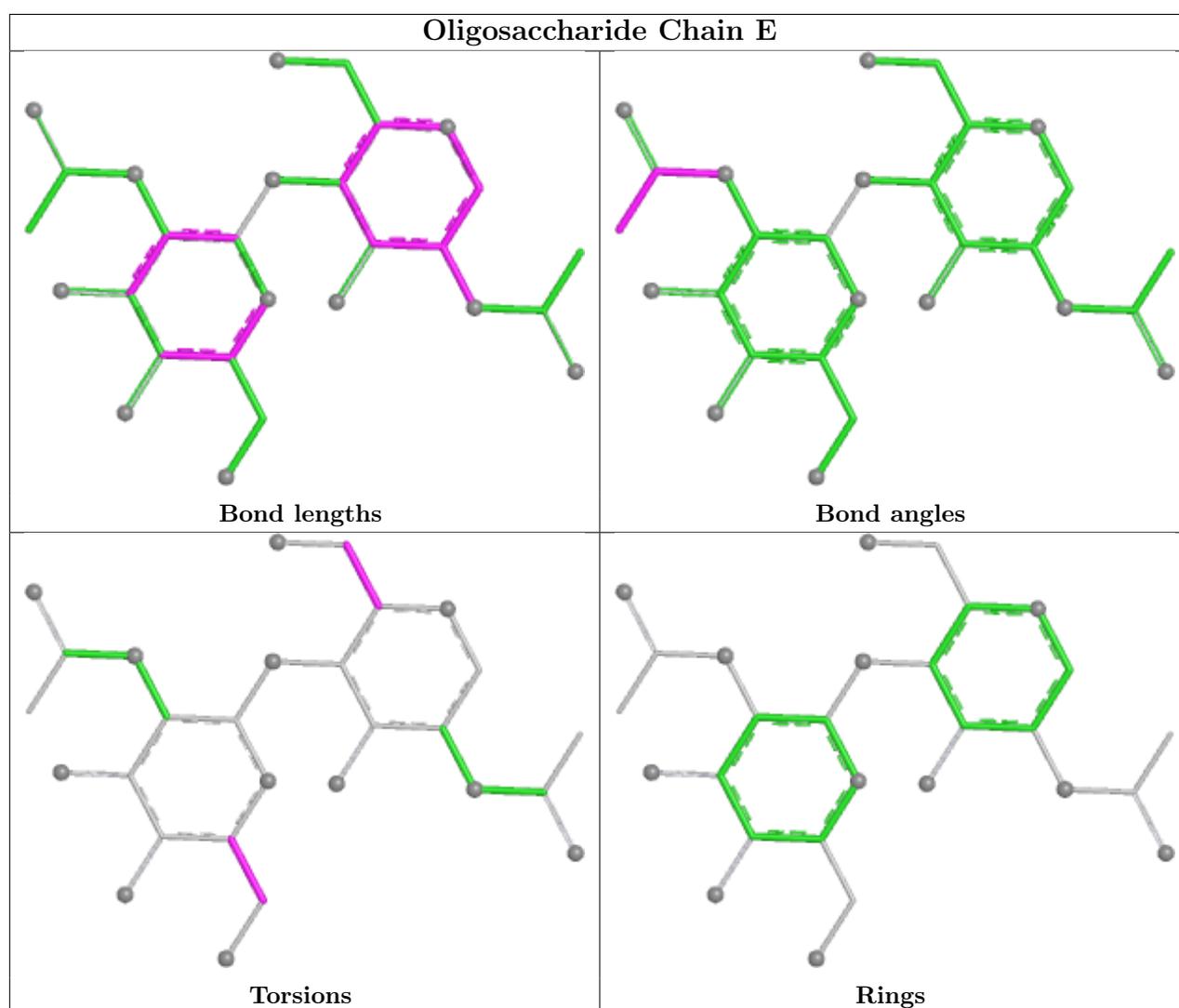
All (6) torsion outliers are listed below:

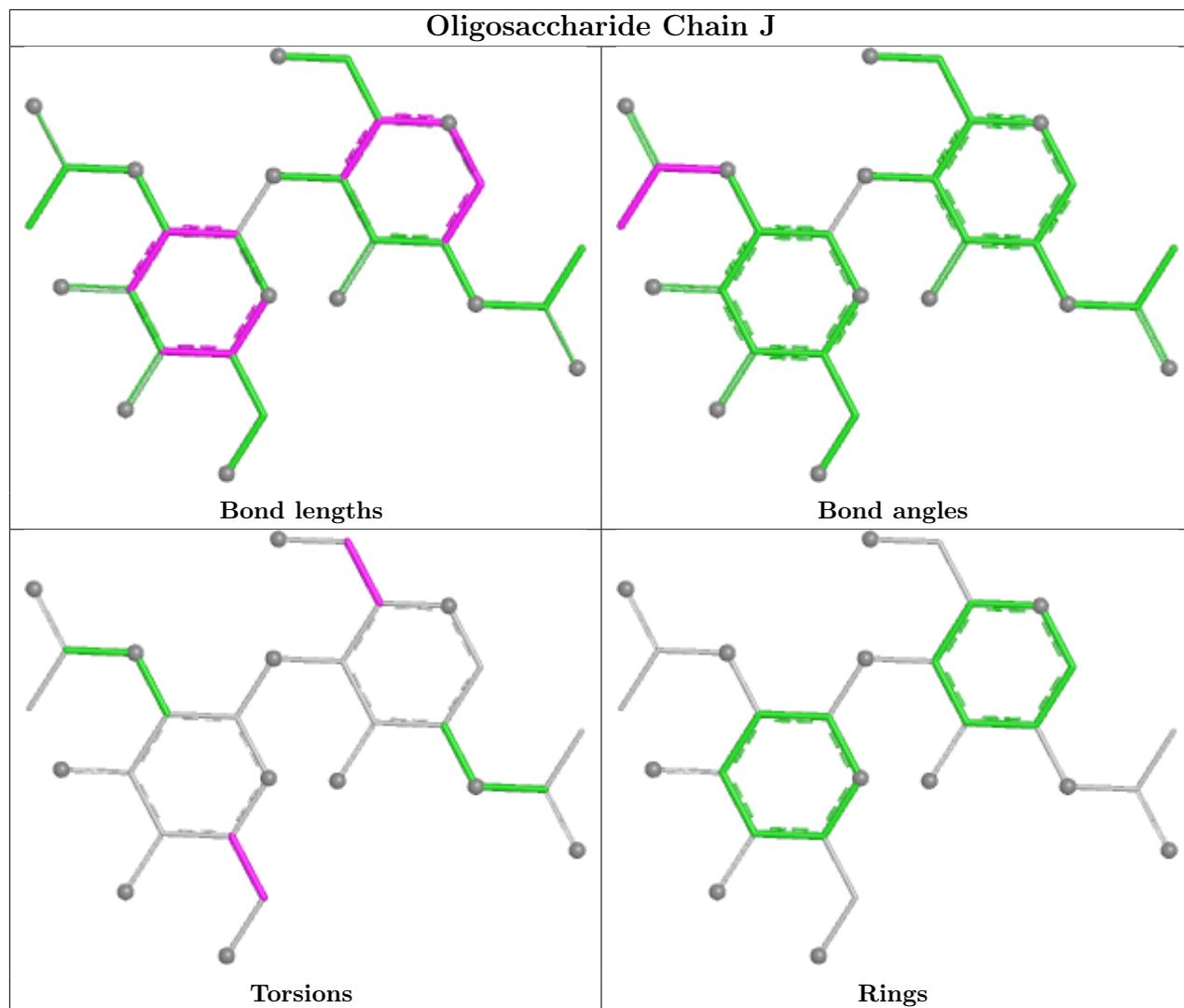
Mol	Chain	Res	Type	Atoms
5	E	2	NAG	O5-C5-C6-O6
6	F	3	BMA	O5-C5-C6-O6
5	J	1	NAG	O5-C5-C6-O6
6	F	2	NAG	O5-C5-C6-O6
5	J	2	NAG	O5-C5-C6-O6
5	E	1	NAG	O5-C5-C6-O6

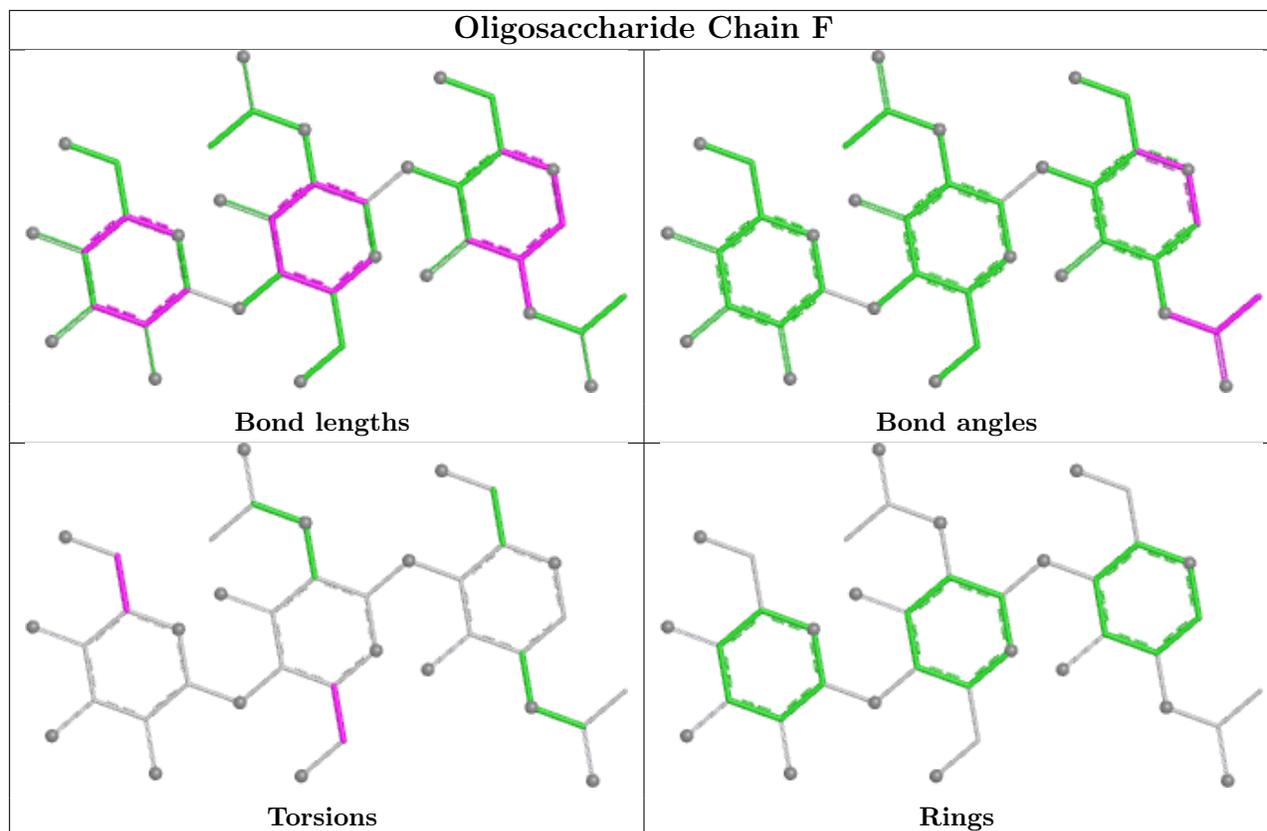
There are no ring outliers.

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](#)

13 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	C	401	1	14,14,15	2.30	6 (42%)	17,19,21	1.05	1 (5%)
7	NAG	G	403	1	14,14,15	2.34	6 (42%)	17,19,21	1.12	2 (11%)
7	NAG	G	402	1	14,14,15	2.19	5 (35%)	17,19,21	1.06	2 (11%)
7	NAG	A	402	1	14,14,15	2.28	6 (42%)	17,19,21	1.23	2 (11%)
7	NAG	A	401	1	14,14,15	0.33	0	17,19,21	0.63	0
7	NAG	C	402	1	14,14,15	2.14	5 (35%)	17,19,21	1.15	2 (11%)
7	NAG	G	401	1	14,14,15	0.35	0	17,19,21	0.54	0
7	NAG	C	405	1	14,14,15	2.21	6 (42%)	17,19,21	1.09	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	NAG	G	404	1	14,14,15	2.20	6 (42%)	17,19,21	2.20	3 (17%)
7	NAG	A	403	1	14,14,15	2.24	6 (42%)	17,19,21	1.14	2 (11%)
7	NAG	A	404	1	14,14,15	2.25	5 (35%)	17,19,21	2.33	3 (17%)
7	NAG	C	403	1	14,14,15	2.19	5 (35%)	17,19,21	1.07	2 (11%)
7	NAG	C	404	1	14,14,15	2.21	5 (35%)	17,19,21	0.98	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
7	NAG	C	401	1	-	1/6/23/26	0/1/1/1
7	NAG	G	403	1	-	2/6/23/26	0/1/1/1
7	NAG	G	402	1	-	1/6/23/26	0/1/1/1
7	NAG	A	402	1	-	2/6/23/26	0/1/1/1
7	NAG	A	401	1	-	0/6/23/26	0/1/1/1
7	NAG	C	402	1	-	1/6/23/26	0/1/1/1
7	NAG	G	401	1	-	2/6/23/26	0/1/1/1
7	NAG	C	405	1	-	0/6/23/26	0/1/1/1
7	NAG	G	404	1	-	3/6/23/26	0/1/1/1
7	NAG	A	403	1	-	0/6/23/26	0/1/1/1
7	NAG	A	404	1	-	3/6/23/26	0/1/1/1
7	NAG	C	403	1	-	0/6/23/26	0/1/1/1
7	NAG	C	404	1	-	0/6/23/26	0/1/1/1

All (61) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	403	NAG	C1-C2	6.11	1.60	1.52
7	C	401	NAG	C1-C2	6.09	1.60	1.52
7	A	402	NAG	C1-C2	6.03	1.60	1.52
7	A	404	NAG	C1-C2	5.99	1.60	1.52
7	G	403	NAG	C1-C2	5.97	1.60	1.52
7	C	404	NAG	C1-C2	5.85	1.60	1.52
7	G	402	NAG	C1-C2	5.78	1.60	1.52
7	A	403	NAG	C1-C2	5.75	1.60	1.52
7	G	404	NAG	C1-C2	5.74	1.60	1.52
7	C	405	NAG	C1-C2	5.62	1.60	1.52
7	C	402	NAG	C1-C2	5.58	1.59	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	G	403	NAG	O5-C5	3.47	1.50	1.43
7	A	403	NAG	O5-C5	3.42	1.50	1.43
7	C	404	NAG	O5-C5	3.37	1.50	1.43
7	C	405	NAG	O5-C5	3.21	1.49	1.43
7	C	402	NAG	O5-C5	3.20	1.49	1.43
7	A	402	NAG	O5-C5	3.18	1.49	1.43
7	A	404	NAG	O5-C5	3.16	1.49	1.43
7	G	402	NAG	O5-C5	3.15	1.49	1.43
7	G	404	NAG	O5-C5	3.09	1.49	1.43
7	C	401	NAG	O5-C5	3.05	1.49	1.43
7	C	403	NAG	O5-C5	2.85	1.49	1.43
7	A	403	NAG	O5-C1	2.80	1.48	1.43
7	G	403	NAG	O5-C1	2.69	1.48	1.43
7	G	402	NAG	O5-C1	2.68	1.48	1.43
7	G	404	NAG	O5-C1	2.64	1.48	1.43
7	C	401	NAG	O5-C1	2.63	1.48	1.43
7	C	405	NAG	O5-C1	2.59	1.48	1.43
7	C	401	NAG	C3-C2	2.59	1.57	1.52
7	A	402	NAG	C3-C2	2.57	1.57	1.52
7	A	404	NAG	O5-C1	2.55	1.48	1.43
7	C	402	NAG	O5-C1	2.53	1.47	1.43
7	C	404	NAG	O5-C1	2.51	1.47	1.43
7	G	403	NAG	C2-N2	2.48	1.50	1.46
7	A	402	NAG	O5-C1	2.44	1.47	1.43
7	G	403	NAG	C3-C2	2.43	1.57	1.52
7	A	402	NAG	C2-N2	2.36	1.50	1.46
7	G	403	NAG	C4-C5	2.35	1.58	1.53
7	A	404	NAG	C3-C2	2.32	1.57	1.52
7	C	405	NAG	C2-N2	2.30	1.50	1.46
7	C	401	NAG	C2-N2	2.29	1.50	1.46
7	C	403	NAG	O5-C1	2.28	1.47	1.43
7	C	405	NAG	C3-C2	2.26	1.57	1.52
7	C	404	NAG	C4-C5	2.25	1.57	1.53
7	G	404	NAG	C3-C2	2.23	1.57	1.52
7	C	405	NAG	C4-C5	2.23	1.57	1.53
7	G	402	NAG	C3-C2	2.23	1.57	1.52
7	C	404	NAG	C3-C2	2.20	1.57	1.52
7	A	403	NAG	C3-C2	2.19	1.57	1.52
7	C	402	NAG	C3-C2	2.19	1.57	1.52
7	C	403	NAG	C3-C2	2.18	1.57	1.52
7	G	402	NAG	C4-C5	2.16	1.57	1.53
7	G	404	NAG	C4-C5	2.15	1.57	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	402	NAG	C4-C5	2.14	1.57	1.53
7	A	404	NAG	C4-C5	2.13	1.57	1.53
7	A	402	NAG	C4-C5	2.12	1.57	1.53
7	A	403	NAG	C4-C5	2.12	1.57	1.53
7	G	404	NAG	C2-N2	2.10	1.49	1.46
7	A	403	NAG	C2-N2	2.09	1.49	1.46
7	C	403	NAG	C4-C5	2.08	1.57	1.53
7	C	401	NAG	C4-C5	2.07	1.57	1.53

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	404	NAG	C8-C7-N2	7.38	128.37	116.12
7	G	404	NAG	C8-C7-N2	6.84	127.46	116.12
7	G	404	NAG	O7-C7-N2	-4.47	114.08	121.98
7	A	404	NAG	O7-C7-N2	-4.41	114.18	121.98
7	A	403	NAG	C8-C7-N2	2.96	121.03	116.12
7	C	402	NAG	C8-C7-N2	2.69	120.58	116.12
7	C	405	NAG	C8-C7-N2	2.61	120.45	116.12
7	A	404	NAG	O7-C7-C8	-2.58	117.45	122.05
7	C	401	NAG	C8-C7-N2	2.50	120.26	116.12
7	G	402	NAG	C8-C7-N2	2.45	120.18	116.12
7	C	402	NAG	O7-C7-C8	-2.33	117.91	122.05
7	A	403	NAG	O7-C7-C8	-2.31	117.94	122.05
7	C	403	NAG	C1-O5-C5	2.21	115.15	112.19
7	C	403	NAG	C8-C7-N2	2.18	119.73	116.12
7	C	405	NAG	O7-C7-C8	-2.17	118.18	122.05
7	G	402	NAG	O7-C7-C8	-2.15	118.22	122.05
7	A	402	NAG	C2-N2-C7	2.14	125.77	122.90
7	A	402	NAG	C1-O5-C5	2.12	115.03	112.19
7	G	403	NAG	C2-N2-C7	2.08	125.68	122.90
7	G	403	NAG	C8-C7-N2	2.07	119.55	116.12
7	G	404	NAG	O7-C7-C8	-2.02	118.46	122.05

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	G	401	NAG	C8-C7-N2-C2
7	G	401	NAG	O7-C7-N2-C2
7	A	404	NAG	C8-C7-N2-C2
7	A	404	NAG	O7-C7-N2-C2

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Mol	Chain	Res	Type	Atoms
7	G	404	NAG	C8-C7-N2-C2
7	G	404	NAG	O7-C7-N2-C2
7	C	401	NAG	O5-C5-C6-O6
7	A	404	NAG	O5-C5-C6-O6
7	C	402	NAG	O5-C5-C6-O6
7	G	404	NAG	O5-C5-C6-O6
7	G	402	NAG	O5-C5-C6-O6
7	A	402	NAG	C1-C2-N2-C7
7	G	403	NAG	C3-C2-N2-C7
7	G	403	NAG	C1-C2-N2-C7
7	A	402	NAG	C3-C2-N2-C7

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	401	NAG	1	0
7	A	404	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.

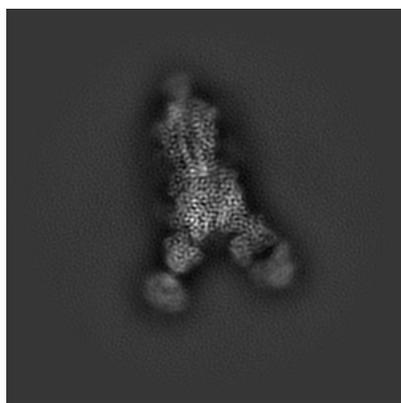
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-41465. These allow visual inspection of the internal detail of the map and identification of artifacts.

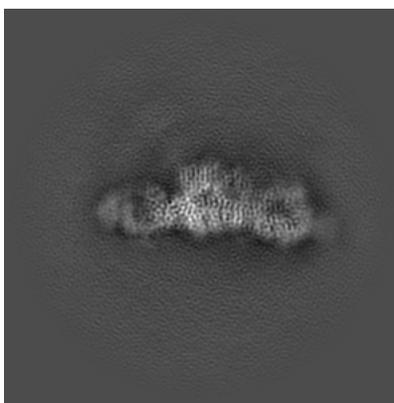
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

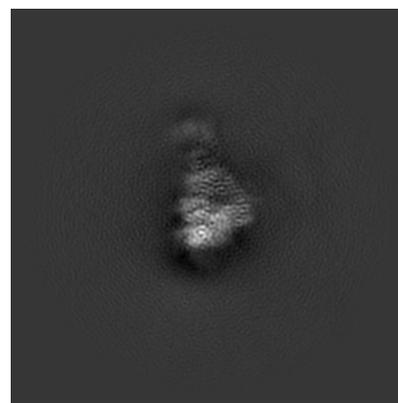
#### 6.1.1 Primary map



X

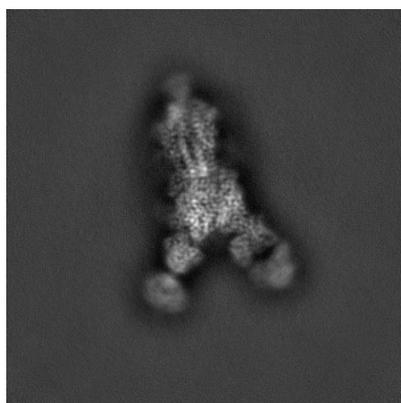


Y

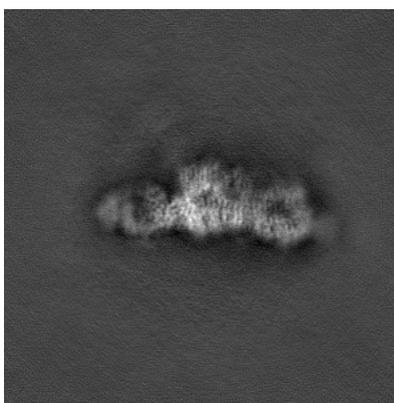


Z

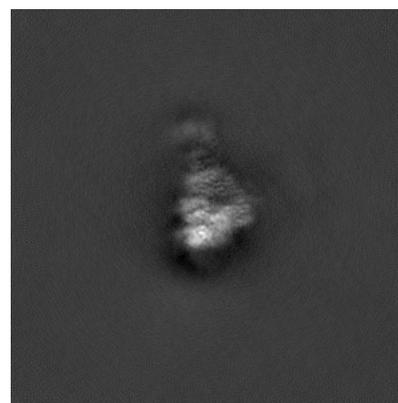
#### 6.1.2 Raw map



X



Y

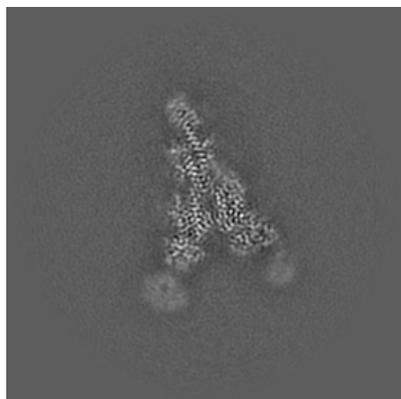


Z

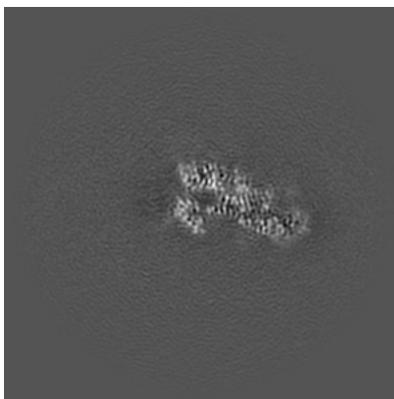
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

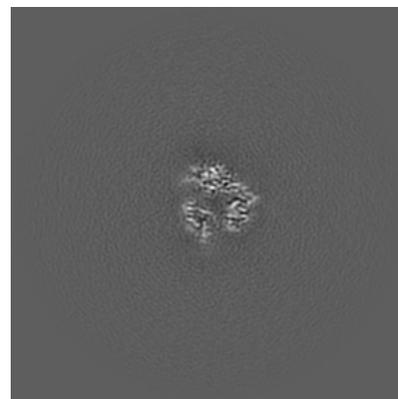
### 6.2.1 Primary map



X Index: 160

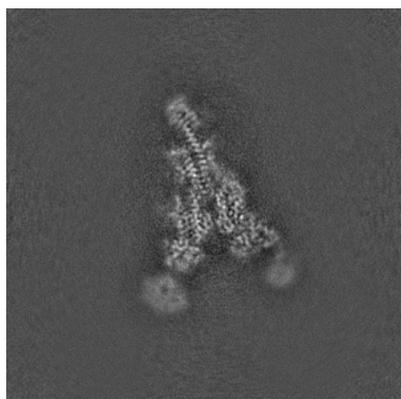


Y Index: 160

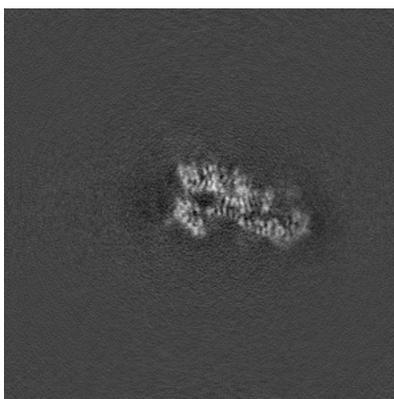


Z Index: 160

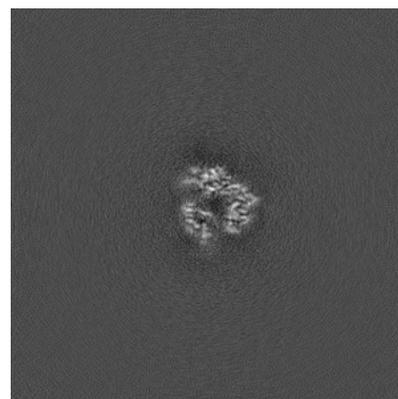
### 6.2.2 Raw map



X Index: 160



Y Index: 160

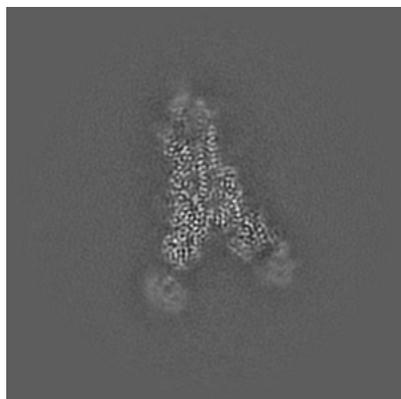


Z Index: 160

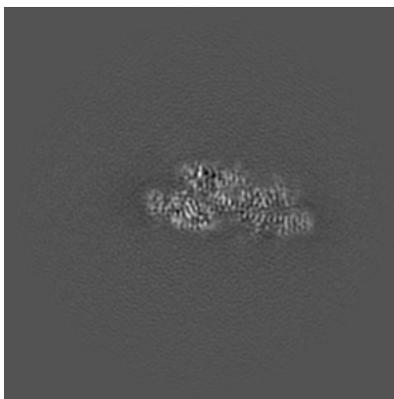
The images above show central slices of the map in three orthogonal directions.

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

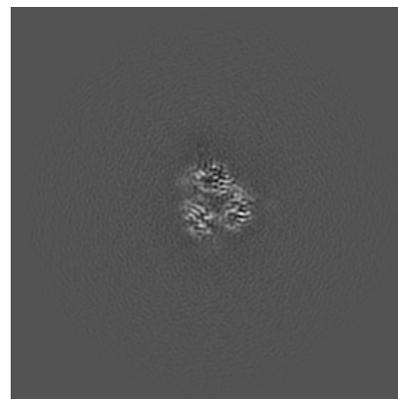
### 6.3.1 Primary map



X Index: 154

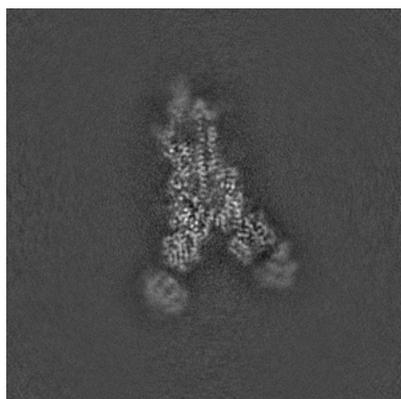


Y Index: 153

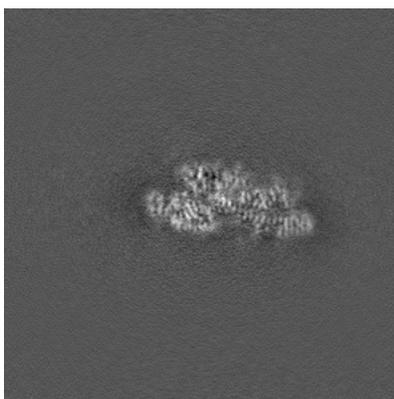


Z Index: 157

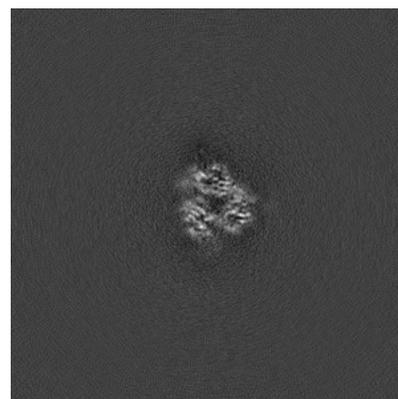
### 6.3.2 Raw map



X Index: 153



Y Index: 153

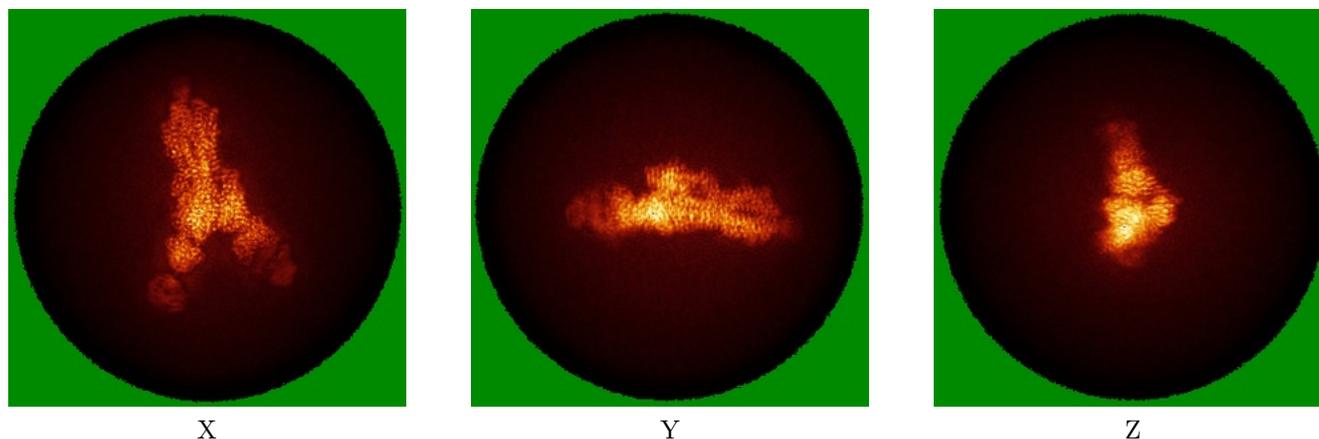


Z Index: 157

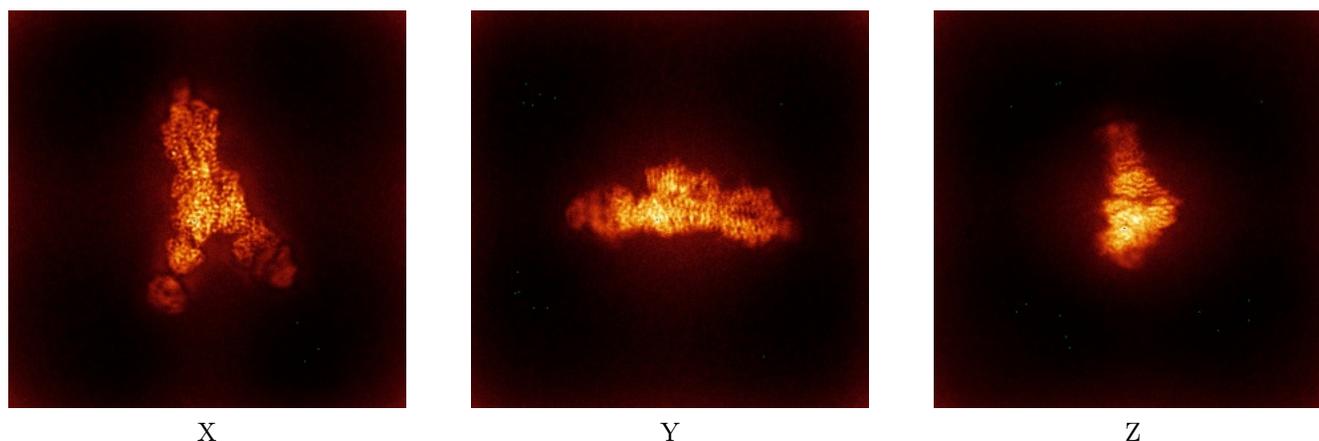
The images above show the largest variance slices of the map in three orthogonal directions.

## 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 0.222. 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.

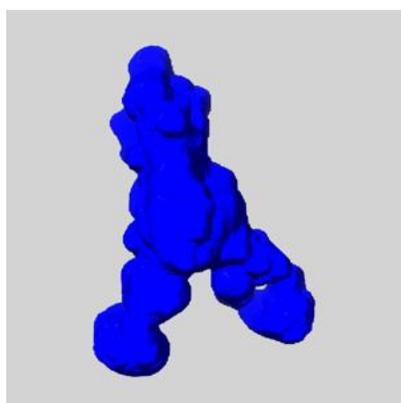
## 6.6 Mask visualisation [i](#)

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

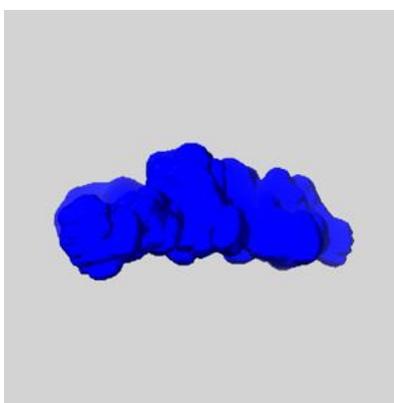
A mask typically either:

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

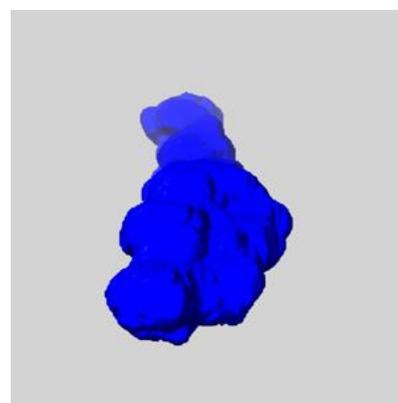
### 6.6.1 emd\_41465\_msk\_1.map [i](#)



X



Y

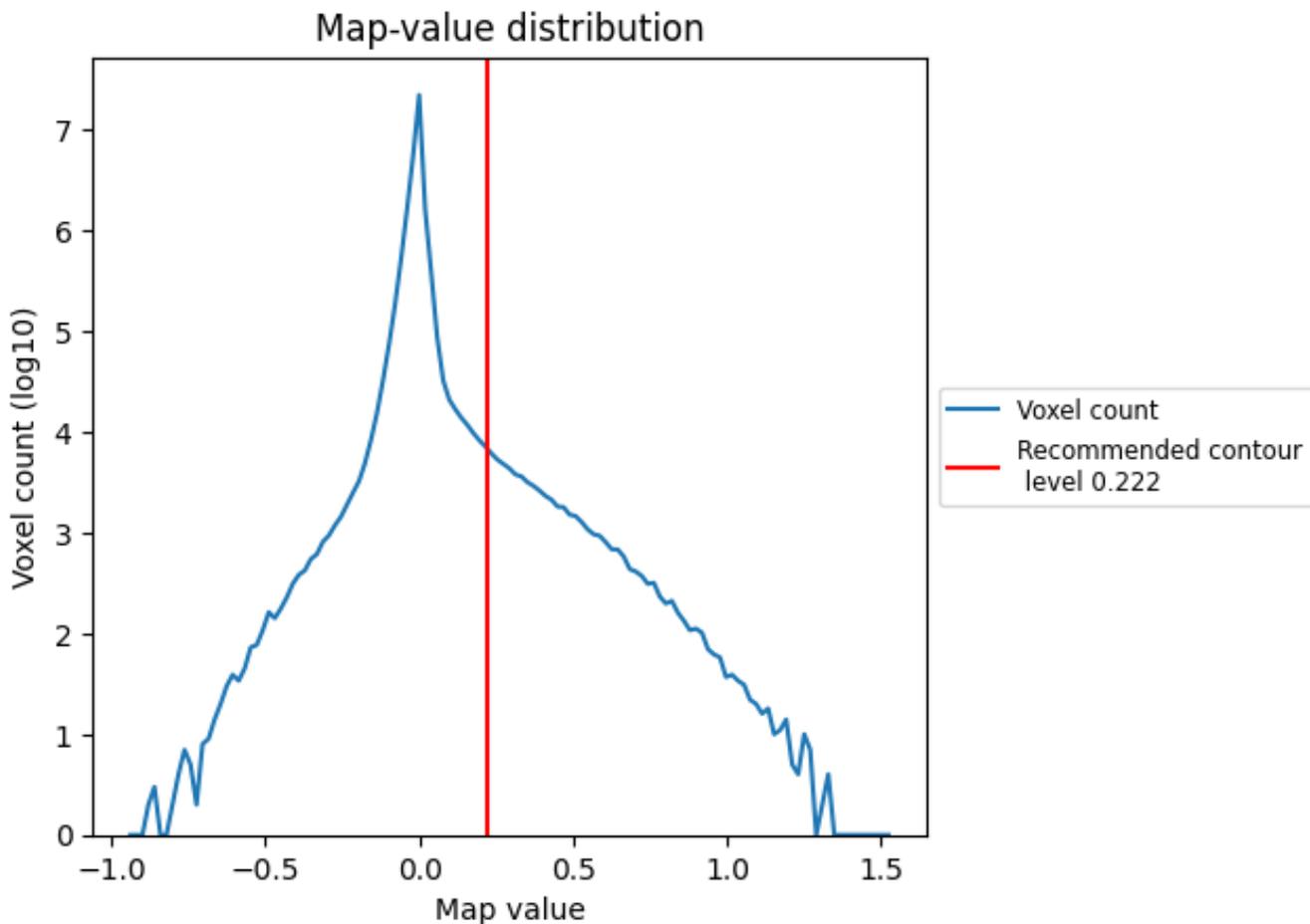


Z

## 7 Map analysis [i](#)

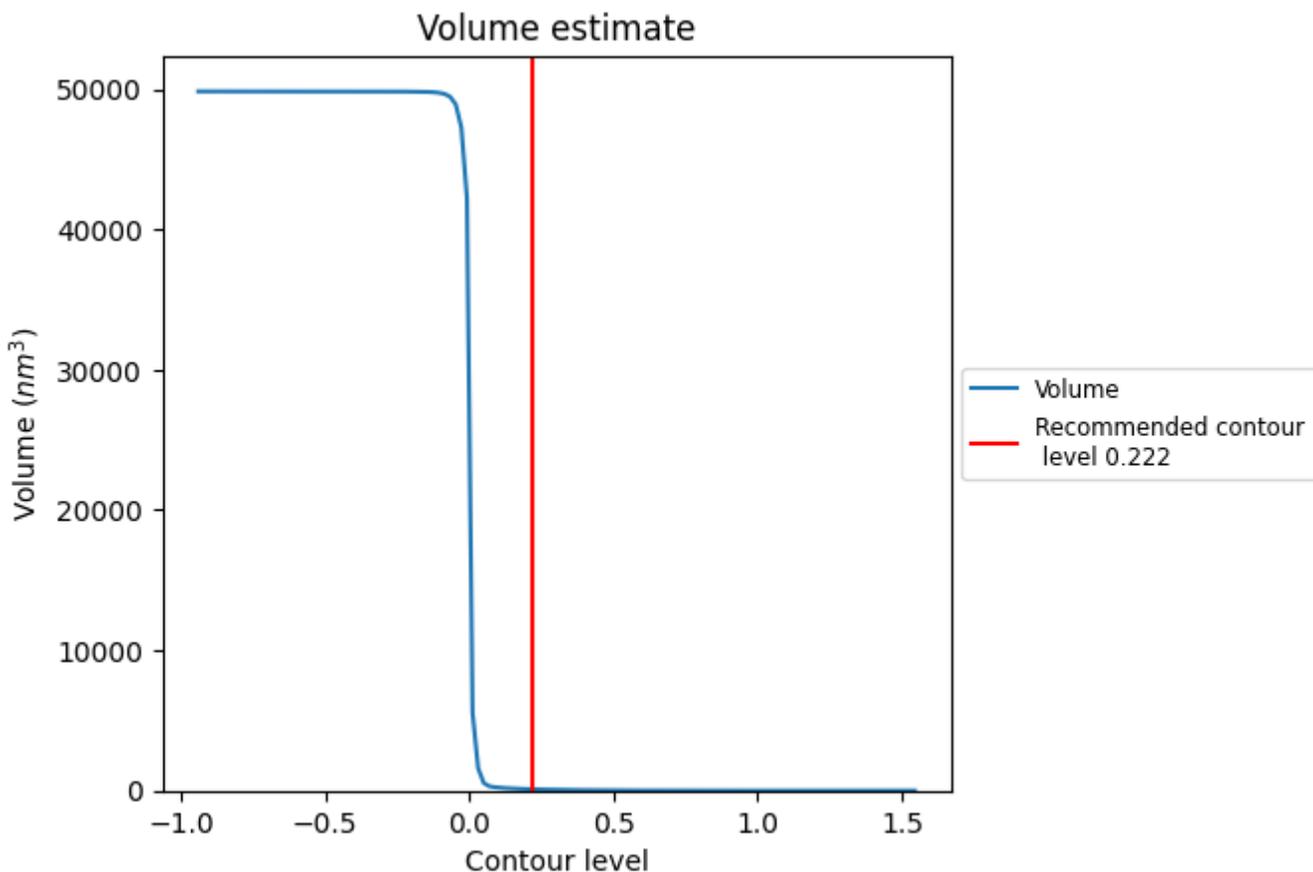
This section contains the results of statistical analysis of the map.

### 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.

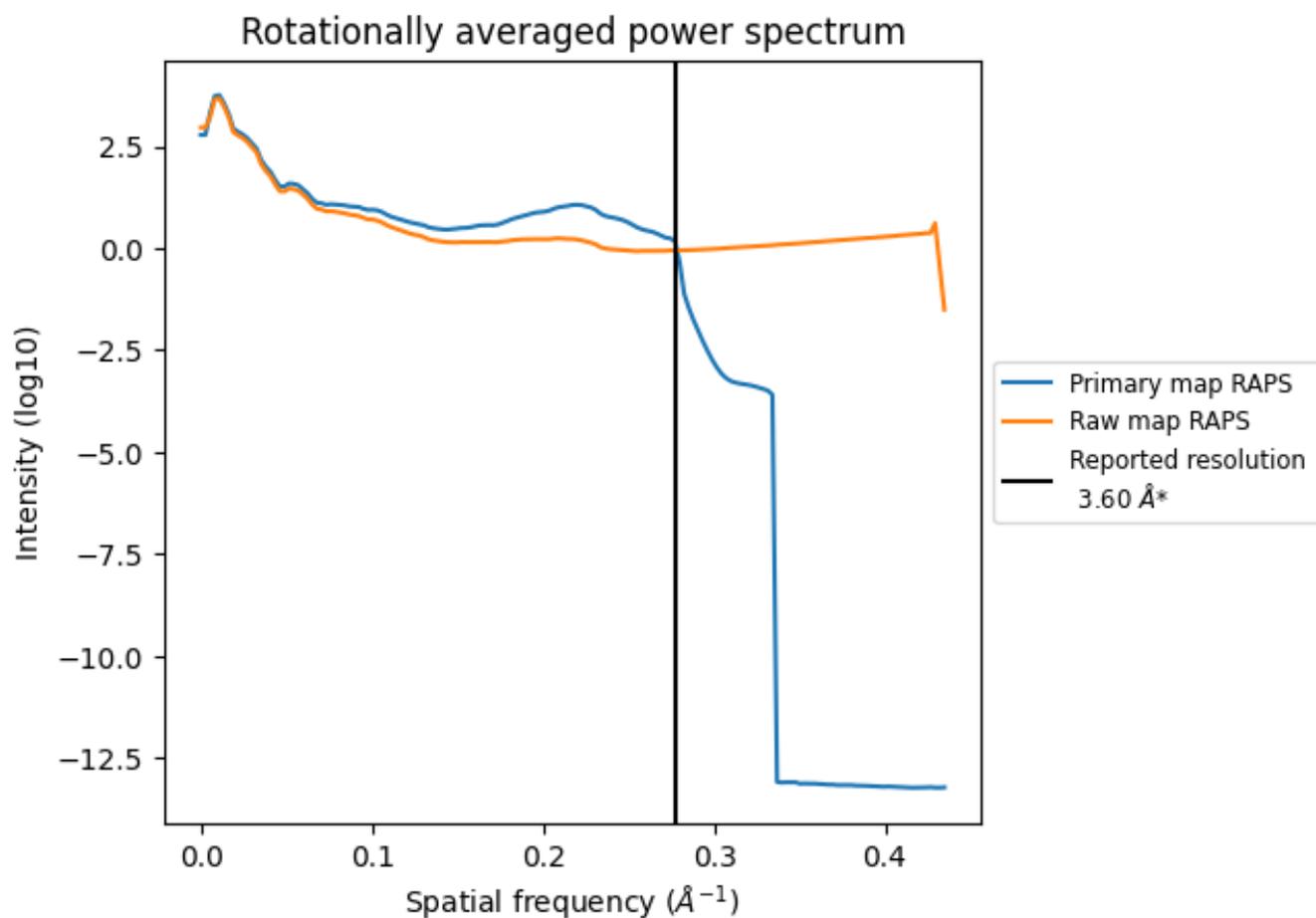
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 96 nm<sup>3</sup>; this corresponds to an approximate mass of 87 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](#)

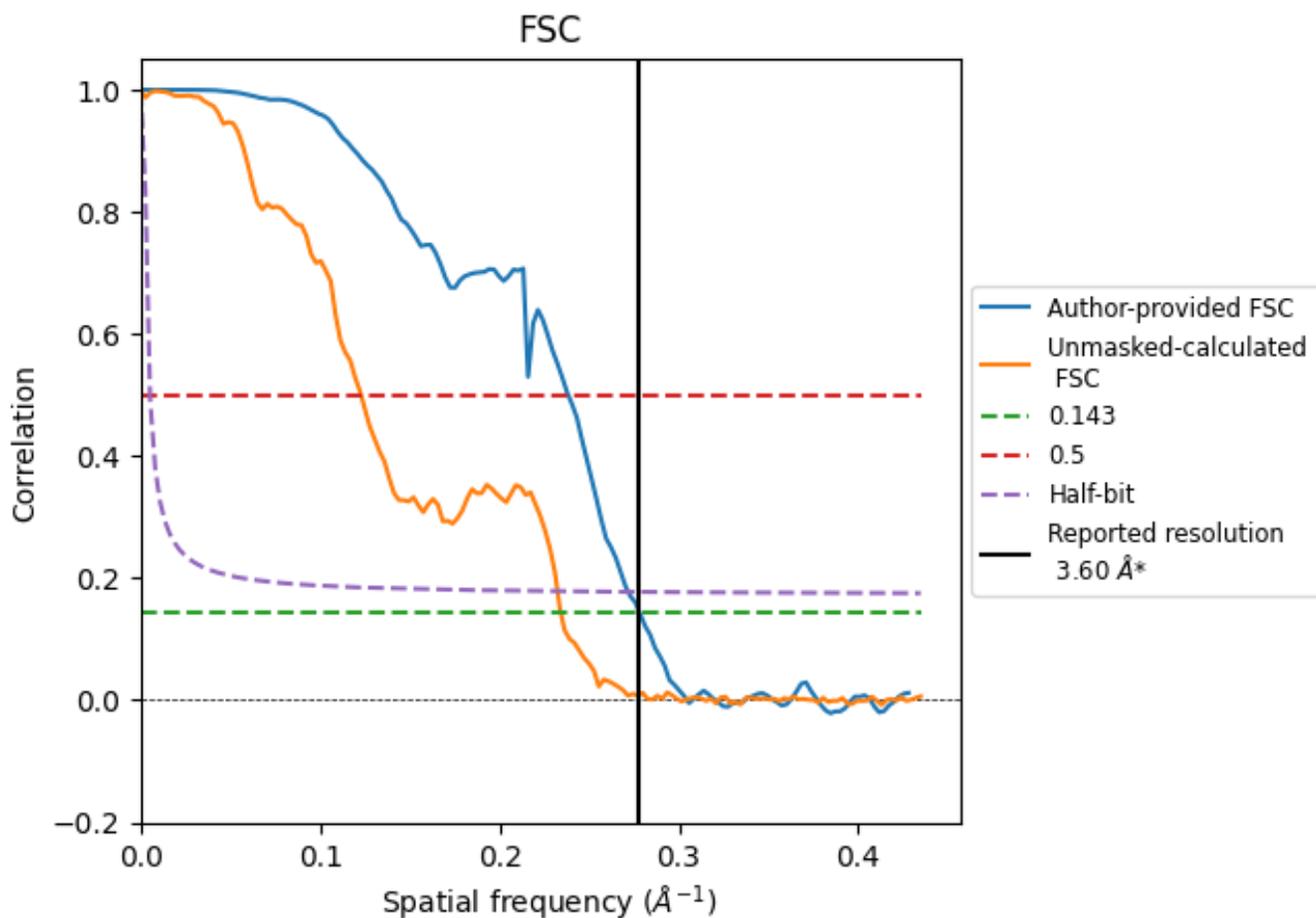


\*Reported resolution corresponds to spatial frequency of 0.278 Å<sup>-1</sup>

## 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  $0.278 \text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

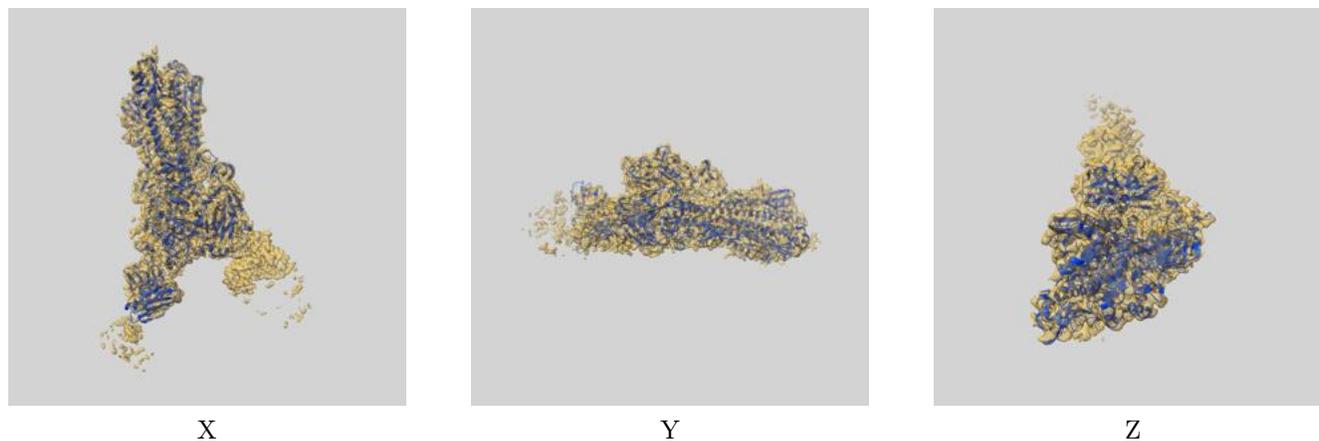
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.60	-	-
Author-provided FSC curve	3.59	4.20	3.68
Unmasked-calculated*	4.27	8.14	4.30

\*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 4.27 differs from the reported value 3.6 by more than 10 %

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

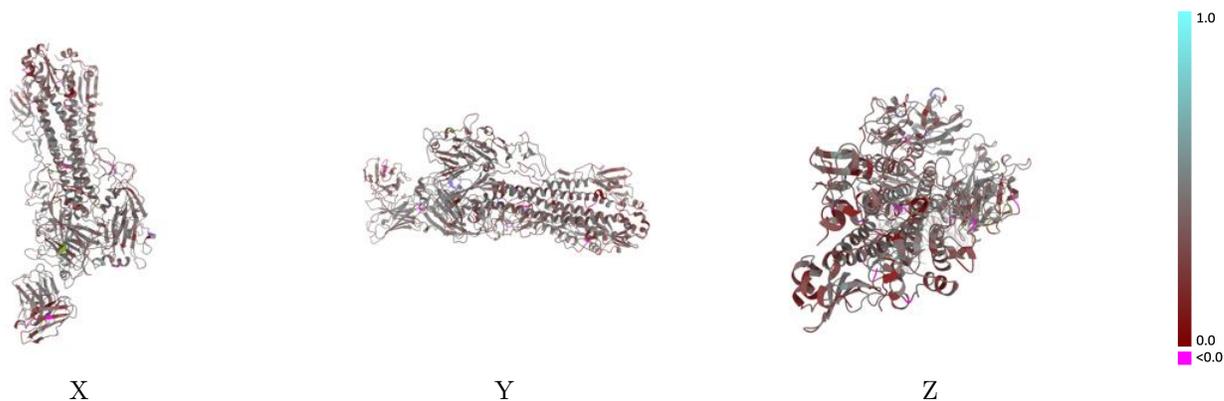
This section contains information regarding the fit between EMDB map EMD-41465 and PDB model 8TP3. Per-residue inclusion information can be found in section 3 on page 7.

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



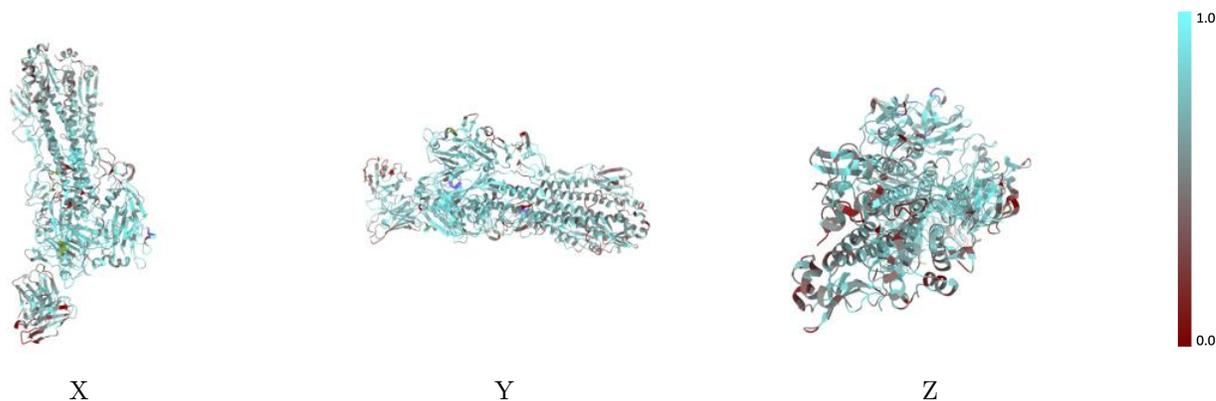
The images above show the 3D surface view of the map at the recommended contour level 0.222 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



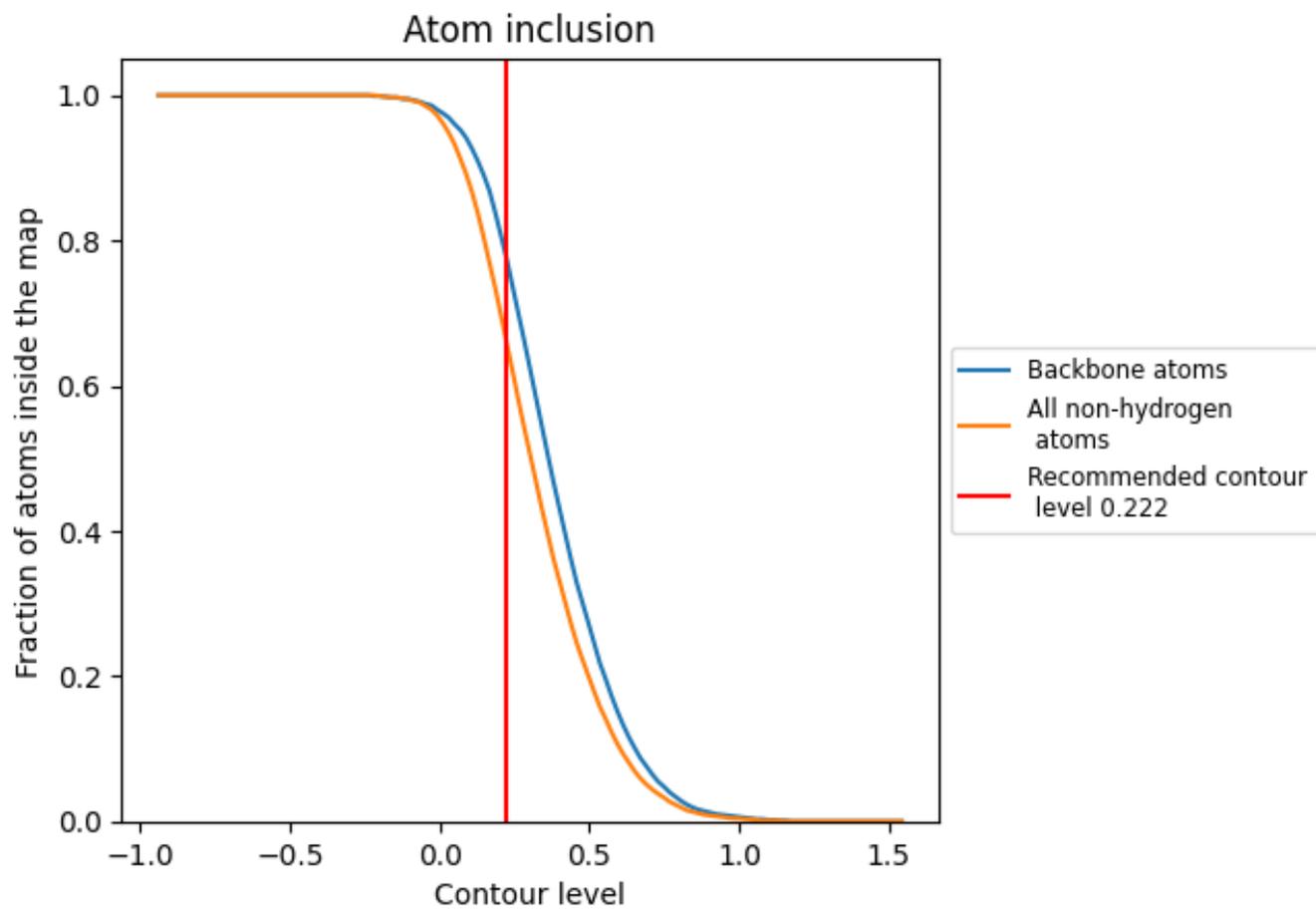
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.222).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 78% of all backbone atoms, 66% 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 (0.222) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6640	 0.3800
A	 0.7170	 0.3920
B	 0.6040	 0.3530
C	 0.7200	 0.4110
D	 0.6150	 0.3620
E	 0.6790	 0.3410
F	 0.6410	 0.4160
G	 0.6950	 0.3880
H	 0.6580	 0.3920
I	 0.6010	 0.3470
J	 0.3570	 0.3240
L	 0.5260	 0.3270

