



wwPDB EM Validation Summary Report ⓘ

Mar 9, 2026 – 09:59 AM UTC

PDB ID : 8OPN / pdb_00008opn
EMDB ID : EMD-17077
Title : Human Coronavirus HKU1 spike glycoprotein in complex with an alpha2,8-linked 9-O-acetylated disialoside (1-up state)
Authors : Pronker, M.F.; Creutzmacher, R.; Hurdiss, D.L.
Deposited on : 2023-04-07
Resolution : 4.70 Å(reported)
Based on initial model : .

This is a wwPDB EM Validation Summary 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:

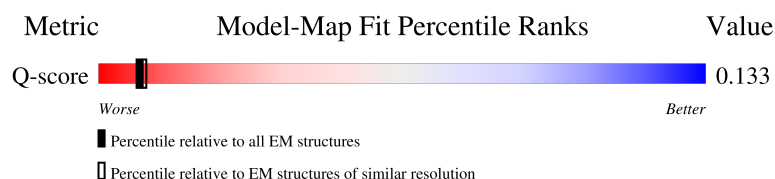
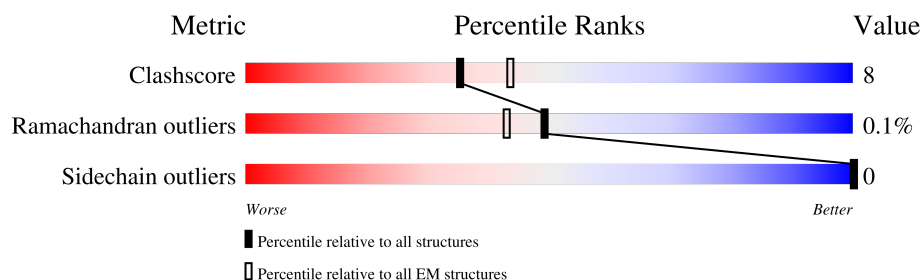
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDb archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance

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

The reported resolution of this entry is 4.70 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	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	1989 (4.20 - 5.20)

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	A	1326	18% 70% 19% 11%
1	B	1326	14% 70% 20% 11%
1	C	1326	14% 71% 19% 11%
2	D	2	50% 100%

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Mol	Chain	Length	Quality of chain
2	E	2	50% 100%
2	F	2	50% 50%
2	G	2	50% 50%
3	H	2	50% 50%
3	I	2	100% 50%
3	J	2	100% 100%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 28543 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 Spike glycoprotein, General control transcription factor GCN4.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1183	Total	C	N	O	S	1	0
			9295	5933	1522	1784	56		
1	B	1186	Total	C	N	O	S	1	0
			9321	5953	1524	1787	57		
1	C	1186	Total	C	N	O	S	1	0
			9319	5950	1524	1788	57		

There are 168 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	MET	-	initiating methionine	UNP E0YJ44
A	-9	PRO	-	expression tag	UNP E0YJ44
A	-8	MET	-	expression tag	UNP E0YJ44
A	-7	GLY	-	expression tag	UNP E0YJ44
A	-6	SER	-	expression tag	UNP E0YJ44
A	-5	LEU	-	expression tag	UNP E0YJ44
A	-4	GLN	-	expression tag	UNP E0YJ44
A	-3	PRO	-	expression tag	UNP E0YJ44
A	-2	LEU	-	expression tag	UNP E0YJ44
A	-1	ALA	-	expression tag	UNP E0YJ44
A	0	THR	-	expression tag	UNP E0YJ44
A	1	LEU	-	expression tag	UNP E0YJ44
A	2	TYR	-	expression tag	UNP E0YJ44
A	3	LEU	-	expression tag	UNP E0YJ44
A	4	LEU	-	expression tag	UNP E0YJ44
A	5	GLY	-	expression tag	UNP E0YJ44
A	6	MET	-	expression tag	UNP E0YJ44
A	7	LEU	-	expression tag	UNP E0YJ44
A	8	VAL	-	expression tag	UNP E0YJ44
A	9	ALA	-	expression tag	UNP E0YJ44
A	10	SER	-	expression tag	UNP E0YJ44
A	11	VAL	-	expression tag	UNP E0YJ44
A	756	GLY	ARG	engineered mutation	UNP E0YJ44
A	757	GLY	ARG	engineered mutation	UNP E0YJ44

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Chain	Residue	Modelled	Actual	Comment	Reference
A	758	SER	LYS	engineered mutation	UNP E0YJ44
A	759	GLY	ARG	engineered mutation	UNP E0YJ44
A	760	SER	ARG	engineered mutation	UNP E0YJ44
A	1267	LEU	-	linker	UNP E0YJ44
A	1268	ILE	-	linker	UNP E0YJ44
A	1269	LYS	-	linker	UNP E0YJ44
A	1274	ILE	LEU	engineered mutation	UNP P03069
A	1278	ILE	VAL	engineered mutation	UNP P03069
A	1281	ILE	LEU	engineered mutation	UNP P03069
A	1282	GLU	LEU	engineered mutation	UNP P03069
A	1285	GLN	ASN	engineered mutation	UNP P03069
A	1286	LYS	TYR	engineered mutation	UNP P03069
A	1287	LYS	HIS	engineered mutation	UNP P03069
A	1288	ILE	LEU	engineered mutation	UNP P03069
A	1292	ILE	VAL	engineered mutation	UNP P03069
A	1295	ILE	LEU	engineered mutation	UNP P03069
A	1297	LYS	-	insertion	UNP P03069
A	1298	ILE	-	insertion	UNP P03069
A	1302	PRO	-	expression tag	UNP P03069
A	1303	ARG	-	expression tag	UNP P03069
A	1304	GLY	-	expression tag	UNP P03069
A	1305	SER	-	expression tag	UNP P03069
A	1306	LEU	-	expression tag	UNP P03069
A	1307	GLU	-	expression tag	UNP P03069
A	1308	TRP	-	expression tag	UNP P03069
A	1309	SER	-	expression tag	UNP P03069
A	1310	HIS	-	expression tag	UNP P03069
A	1311	PRO	-	expression tag	UNP P03069
A	1312	GLN	-	expression tag	UNP P03069
A	1313	PHE	-	expression tag	UNP P03069
A	1314	GLU	-	expression tag	UNP P03069
A	1315	LYS	-	expression tag	UNP P03069
B	-10	MET	-	initiating methionine	UNP E0YJ44
B	-9	PRO	-	expression tag	UNP E0YJ44
B	-8	MET	-	expression tag	UNP E0YJ44
B	-7	GLY	-	expression tag	UNP E0YJ44
B	-6	SER	-	expression tag	UNP E0YJ44
B	-5	LEU	-	expression tag	UNP E0YJ44
B	-4	GLN	-	expression tag	UNP E0YJ44
B	-3	PRO	-	expression tag	UNP E0YJ44
B	-2	LEU	-	expression tag	UNP E0YJ44
B	-1	ALA	-	expression tag	UNP E0YJ44

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	THR	-	expression tag	UNP E0YJ44
B	1	LEU	-	expression tag	UNP E0YJ44
B	2	TYR	-	expression tag	UNP E0YJ44
B	3	LEU	-	expression tag	UNP E0YJ44
B	4	LEU	-	expression tag	UNP E0YJ44
B	5	GLY	-	expression tag	UNP E0YJ44
B	6	MET	-	expression tag	UNP E0YJ44
B	7	LEU	-	expression tag	UNP E0YJ44
B	8	VAL	-	expression tag	UNP E0YJ44
B	9	ALA	-	expression tag	UNP E0YJ44
B	10	SER	-	expression tag	UNP E0YJ44
B	11	VAL	-	expression tag	UNP E0YJ44
B	756	GLY	ARG	engineered mutation	UNP E0YJ44
B	757	GLY	ARG	engineered mutation	UNP E0YJ44
B	758	SER	LYS	engineered mutation	UNP E0YJ44
B	759	GLY	ARG	engineered mutation	UNP E0YJ44
B	760	SER	ARG	engineered mutation	UNP E0YJ44
B	1267	LEU	-	linker	UNP E0YJ44
B	1268	ILE	-	linker	UNP E0YJ44
B	1269	LYS	-	linker	UNP E0YJ44
B	1274	ILE	LEU	engineered mutation	UNP P03069
B	1278	ILE	VAL	engineered mutation	UNP P03069
B	1281	ILE	LEU	engineered mutation	UNP P03069
B	1282	GLU	LEU	engineered mutation	UNP P03069
B	1285	GLN	ASN	engineered mutation	UNP P03069
B	1286	LYS	TYR	engineered mutation	UNP P03069
B	1287	LYS	HIS	engineered mutation	UNP P03069
B	1288	ILE	LEU	engineered mutation	UNP P03069
B	1292	ILE	VAL	engineered mutation	UNP P03069
B	1295	ILE	LEU	engineered mutation	UNP P03069
B	1297	LYS	-	insertion	UNP P03069
B	1298	ILE	-	insertion	UNP P03069
B	1302	PRO	-	expression tag	UNP P03069
B	1303	ARG	-	expression tag	UNP P03069
B	1304	GLY	-	expression tag	UNP P03069
B	1305	SER	-	expression tag	UNP P03069
B	1306	LEU	-	expression tag	UNP P03069
B	1307	GLU	-	expression tag	UNP P03069
B	1308	TRP	-	expression tag	UNP P03069
B	1309	SER	-	expression tag	UNP P03069
B	1310	HIS	-	expression tag	UNP P03069
B	1311	PRO	-	expression tag	UNP P03069

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1312	GLN	-	expression tag	UNP P03069
B	1313	PHE	-	expression tag	UNP P03069
B	1314	GLU	-	expression tag	UNP P03069
B	1315	LYS	-	expression tag	UNP P03069
C	-10	MET	-	initiating methionine	UNP E0YJ44
C	-9	PRO	-	expression tag	UNP E0YJ44
C	-8	MET	-	expression tag	UNP E0YJ44
C	-7	GLY	-	expression tag	UNP E0YJ44
C	-6	SER	-	expression tag	UNP E0YJ44
C	-5	LEU	-	expression tag	UNP E0YJ44
C	-4	GLN	-	expression tag	UNP E0YJ44
C	-3	PRO	-	expression tag	UNP E0YJ44
C	-2	LEU	-	expression tag	UNP E0YJ44
C	-1	ALA	-	expression tag	UNP E0YJ44
C	0	THR	-	expression tag	UNP E0YJ44
C	1	LEU	-	expression tag	UNP E0YJ44
C	2	TYR	-	expression tag	UNP E0YJ44
C	3	LEU	-	expression tag	UNP E0YJ44
C	4	LEU	-	expression tag	UNP E0YJ44
C	5	GLY	-	expression tag	UNP E0YJ44
C	6	MET	-	expression tag	UNP E0YJ44
C	7	LEU	-	expression tag	UNP E0YJ44
C	8	VAL	-	expression tag	UNP E0YJ44
C	9	ALA	-	expression tag	UNP E0YJ44
C	10	SER	-	expression tag	UNP E0YJ44
C	11	VAL	-	expression tag	UNP E0YJ44
C	756	GLY	ARG	engineered mutation	UNP E0YJ44
C	757	GLY	ARG	engineered mutation	UNP E0YJ44
C	758	SER	LYS	engineered mutation	UNP E0YJ44
C	759	GLY	ARG	engineered mutation	UNP E0YJ44
C	760	SER	ARG	engineered mutation	UNP E0YJ44
C	1267	LEU	-	linker	UNP E0YJ44
C	1268	ILE	-	linker	UNP E0YJ44
C	1269	LYS	-	linker	UNP E0YJ44
C	1274	ILE	LEU	engineered mutation	UNP P03069
C	1278	ILE	VAL	engineered mutation	UNP P03069
C	1281	ILE	LEU	engineered mutation	UNP P03069
C	1282	GLU	LEU	engineered mutation	UNP P03069
C	1285	GLN	ASN	engineered mutation	UNP P03069
C	1286	LYS	TYR	engineered mutation	UNP P03069
C	1287	LYS	HIS	engineered mutation	UNP P03069
C	1288	ILE	LEU	engineered mutation	UNP P03069

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1292	ILE	VAL	engineered mutation	UNP P03069
C	1295	ILE	LEU	engineered mutation	UNP P03069
C	1297	LYS	-	insertion	UNP P03069
C	1298	ILE	-	insertion	UNP P03069
C	1302	PRO	-	expression tag	UNP P03069
C	1303	ARG	-	expression tag	UNP P03069
C	1304	GLY	-	expression tag	UNP P03069
C	1305	SER	-	expression tag	UNP P03069
C	1306	LEU	-	expression tag	UNP P03069
C	1307	GLU	-	expression tag	UNP P03069
C	1308	TRP	-	expression tag	UNP P03069
C	1309	SER	-	expression tag	UNP P03069
C	1310	HIS	-	expression tag	UNP P03069
C	1311	PRO	-	expression tag	UNP P03069
C	1312	GLN	-	expression tag	UNP P03069
C	1313	PHE	-	expression tag	UNP P03069
C	1314	GLU	-	expression tag	UNP P03069
C	1315	LYS	-	expression tag	UNP P03069

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



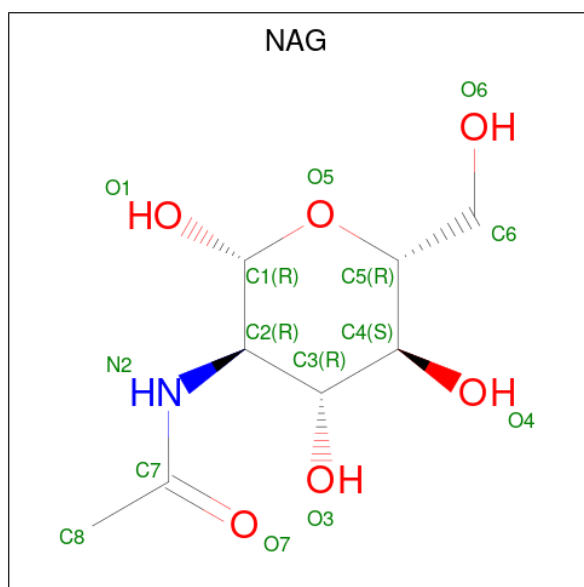
Mol	Chain	Residues	Atoms				AltConf	Trace
2	D	2	Total	C	N	O	0	0
			28	16	2	10		
2	E	2	Total	C	N	O	0	0
			28	16	2	10		
2	F	2	Total	C	N	O	0	0
			28	16	2	10		
2	G	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 3 is an oligosaccharide called 9-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-8)-N-acetyl-alpha-neuraminic acid.



Mol	Chain	Residues	Atoms				AltConf	Trace
3	H	2	Total	C	N	O	0	0
			44	24	2	18		
3	I	2	Total	C	N	O	0	0
			44	24	2	18		
3	J	2	Total	C	N	O	0	0
			44	24	2	18		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

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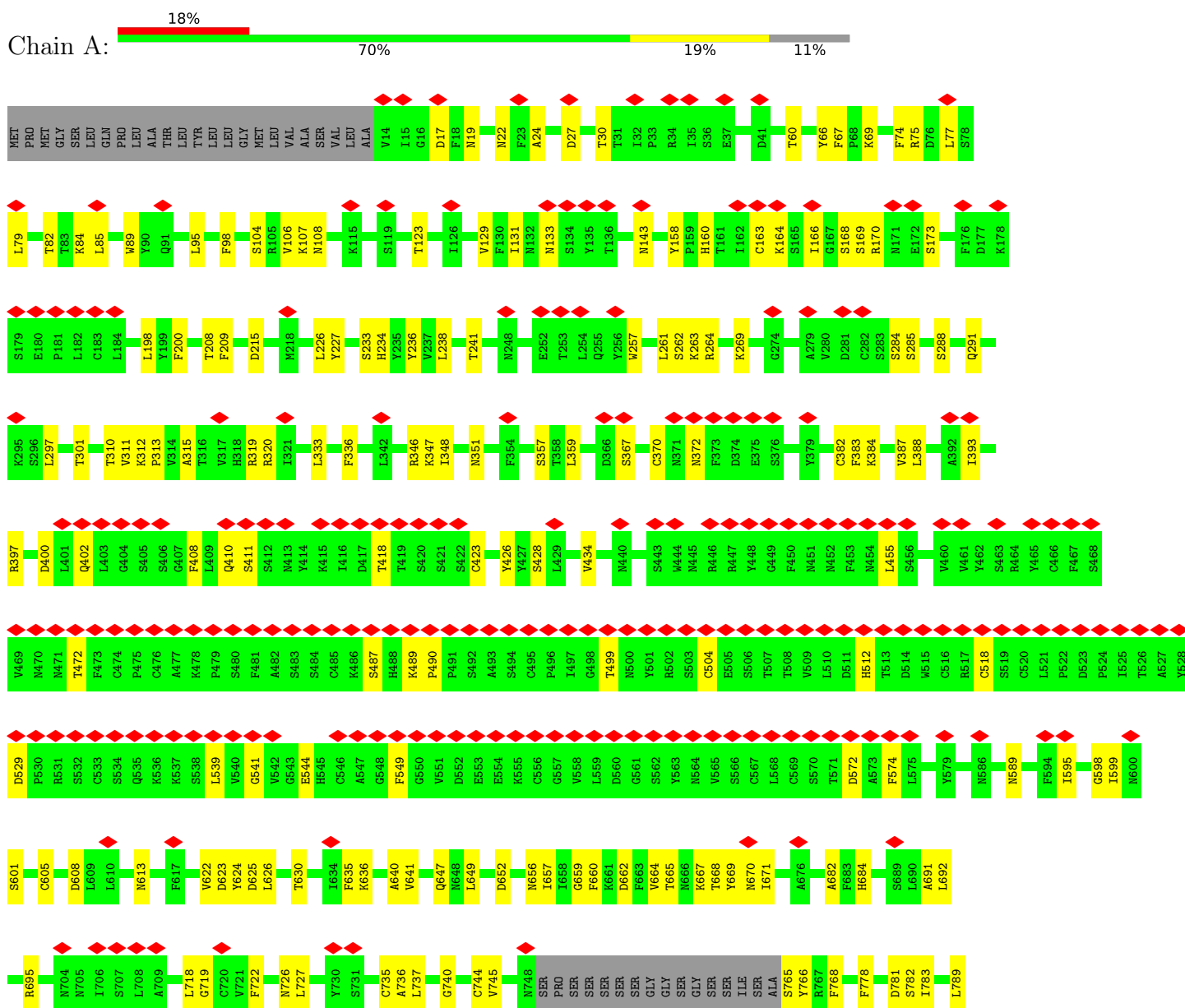
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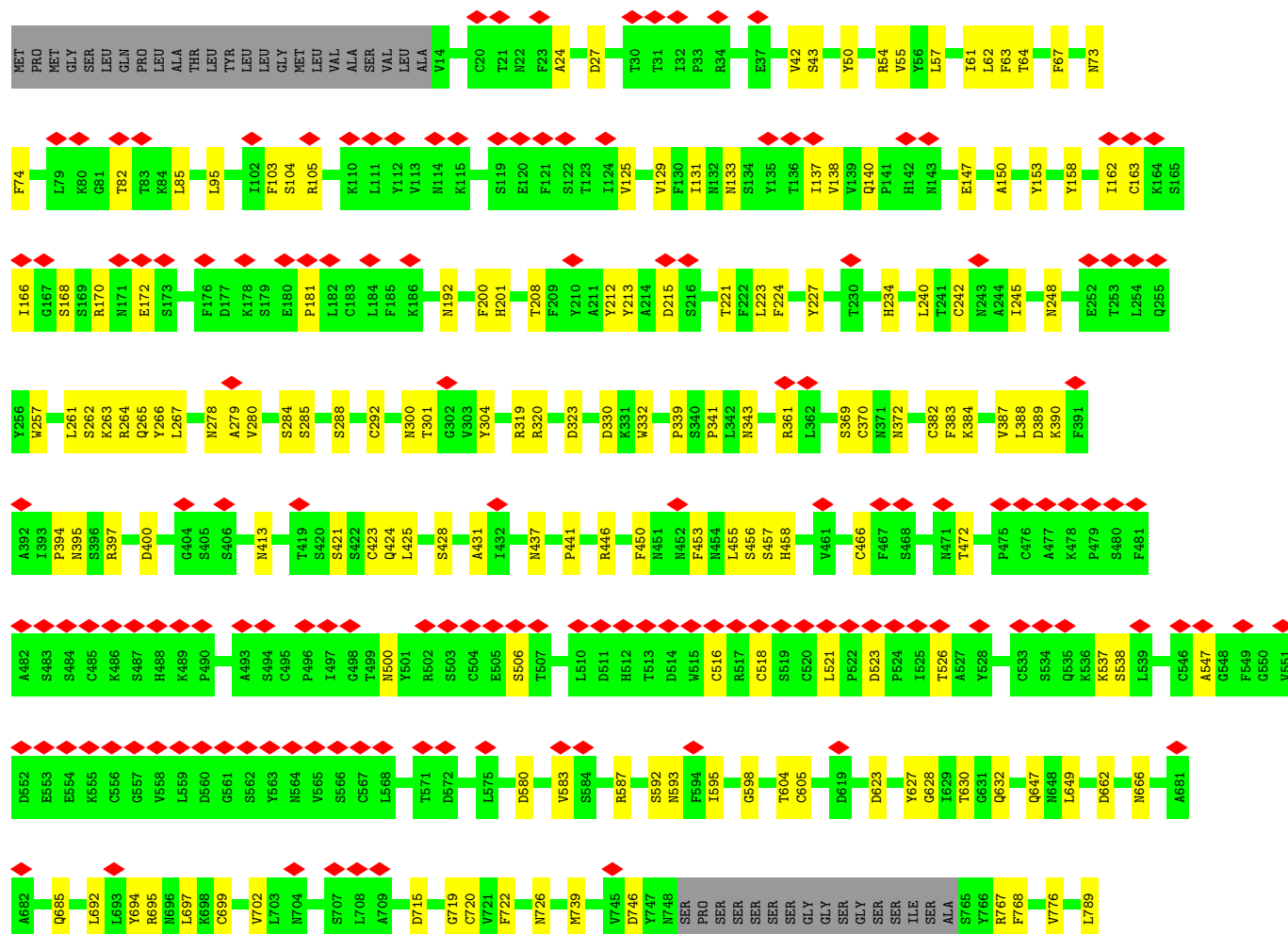
Mol	Chain	Residues	Atoms				AltConf
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B	1	Total 14	C 8	N 1	O 5	0
4	B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

3 Residue-property plots

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

- Molecule 1: Spike glycoprotein, General control transcription factor GCN4









- Molecule 3: 9-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-8)-N-acetyl-alpha-neuraminic acid

Chain H:
50% 50%



- Molecule 3: 9-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-8)-N-acetyl-alpha-neuraminic acid

Chain I:
50% 100% 50%



- Molecule 3: 9-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-8)-N-acetyl-alpha-neuraminic acid

Chain J:
100% 100%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	36048	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 ($e^-/\text{\AA}^2$)	46	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.656	Depositor
Minimum map value	-0.005	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.027	Depositor
Recommended contour level	0.073	Depositor
Map size (Å)	332.00998, 332.00998, 332.00998	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.1067, 1.1067, 1.1067	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, SIA, 5N6

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	0.17	0/9524	0.48	1/12961 (0.0%)
1	B	0.17	0/9551	0.49	0/12998
1	C	0.19	0/9549	0.50	3/12995 (0.0%)
All	All	0.18	0/28624	0.49	4/38954 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	970	ALA	CA-C-N	-5.65	113.79	122.60
1	C	970	ALA	C-N-CA	-5.65	113.79	122.60
1	A	641	VAL	N-CA-C	-5.51	108.47	113.71
1	C	1095	GLN	N-CA-CB	5.29	118.48	110.28

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	9295	0	8943	159	0
1	B	9321	0	8968	153	0
1	C	9319	0	8966	146	0
2	D	28	0	25	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	28	0	25	0	0
2	F	28	0	25	0	0
2	G	28	0	25	0	0
3	H	44	0	17	1	0
3	I	44	0	17	1	0
3	J	44	0	17	3	0
4	A	98	0	91	1	0
4	B	168	0	156	1	0
4	C	98	0	91	0	0
All	All	28543	0	27366	439	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.

The worst 5 of 439 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:1064:GLU:O	1:C:1068:ARG:HB3	1.89	0.73
1:A:131:ILE:HG13	1:A:133:ASN:H	1.56	0.69
1:B:320:ARG:HH21	1:B:627:TYR:H	1.39	0.69
1:B:423:CYS:HB2	1:B:594:PHE:HB2	1.73	0.69
1:B:104:SER:HB3	1:B:200:PHE:HB2	1.79	0.65

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	1178/1326 (89%)	1093 (93%)	84 (7%)	1 (0%)	48 83
1	B	1181/1326 (89%)	1098 (93%)	81 (7%)	2 (0%)	43 78

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	1181/1326 (89%)	1111 (94%)	68 (6%)	2 (0%)	43	78
All	All	3540/3978 (89%)	3302 (93%)	233 (7%)	5 (0%)	49	83

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	166	ILE
1	A	166	ILE
1	B	166	ILE
1	B	184	LEU
1	C	245	ILE

5.3.2 Protein sidechains ⓘ

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	1063/1190 (89%)	1063 (100%)	0	100	100
1	B	1066/1190 (90%)	1066 (100%)	0	100	100
1	C	1066/1190 (90%)	1066 (100%)	0	100	100
All	All	3195/3570 (90%)	3195 (100%)	0	100	100

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

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 46 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	1077	GLN
1	C	684	HIS
1	B	1090	ASN
1	C	19	ASN
1	C	858	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

14 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$
2	NAG	D	1	2,1	14,14,15	0.27	0	17,19,21	0.59	0
2	NAG	D	2	2	14,14,15	0.48	0	17,19,21	0.46	0
2	NAG	E	1	2,1	14,14,15	0.29	0	17,19,21	0.53	0
2	NAG	E	2	2	14,14,15	0.37	0	17,19,21	0.49	0
2	NAG	F	1	2,1	14,14,15	0.39	0	17,19,21	1.05	1 (5%)
2	NAG	F	2	2	14,14,15	0.35	0	17,19,21	0.64	0
2	NAG	G	1	2,1	14,14,15	0.37	0	17,19,21	0.67	1 (5%)
2	NAG	G	2	2	14,14,15	0.39	0	17,19,21	0.56	0
3	SIA	H	1	3	21,21,21	1.55	2 (9%)	24,31,31	1.86	3 (12%)
3	5N6	H	2	3	23,23,24	2.29	6 (26%)	25,32,35	1.33	3 (12%)
3	SIA	I	1	3	21,21,21	1.56	2 (9%)	24,31,31	1.79	1 (4%)
3	5N6	I	2	3	23,23,24	2.12	6 (26%)	25,32,35	1.24	3 (12%)
3	SIA	J	1	3	21,21,21	1.55	2 (9%)	24,31,31	1.78	1 (4%)
3	5N6	J	2	3	23,23,24	2.13	6 (26%)	25,32,35	1.26	3 (12%)

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
2	NAG	D	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	2/6/23/26	0/1/1/1
2	NAG	E	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	E	2	2	-	2/6/23/26	0/1/1/1
2	NAG	F	1	2,1	-	4/6/23/26	0/1/1/1
2	NAG	F	2	2	-	2/6/23/26	0/1/1/1
2	NAG	G	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	G	2	2	-	2/6/23/26	0/1/1/1
3	SIA	H	1	3	-	12/20/38/38	0/1/1/1
3	5N6	H	2	3	-	8/21/37/41	0/1/1/1
3	SIA	I	1	3	-	7/20/38/38	0/1/1/1
3	5N6	I	2	3	-	8/21/37/41	0/1/1/1
3	SIA	J	1	3	-	12/20/38/38	0/1/1/1
3	5N6	J	2	3	-	6/21/37/41	0/1/1/1

The worst 5 of 24 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	2	5N6	C2-C1	6.83	1.60	1.52
3	I	2	5N6	C2-C1	5.94	1.59	1.52
3	J	2	5N6	C2-C1	5.82	1.59	1.52
3	I	1	SIA	O6-C2	4.74	1.48	1.43
3	J	1	SIA	O6-C2	4.69	1.47	1.43

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	1	SIA	O1A-C1-C2	-6.98	112.21	123.85
3	J	1	SIA	O1A-C1-C2	-6.93	112.28	123.85
3	H	1	SIA	O1A-C1-C2	-6.70	112.67	123.85
3	J	2	5N6	O1A-C1-C2	-3.27	115.79	122.85
2	F	1	NAG	C2-N2-C7	3.26	127.27	122.90

There are no chirality outliers.

5 of 67 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	H	1	SIA	C5-C6-C7-C8
3	H	1	SIA	C5-C6-C7-O7
3	H	1	SIA	O6-C6-C7-C8

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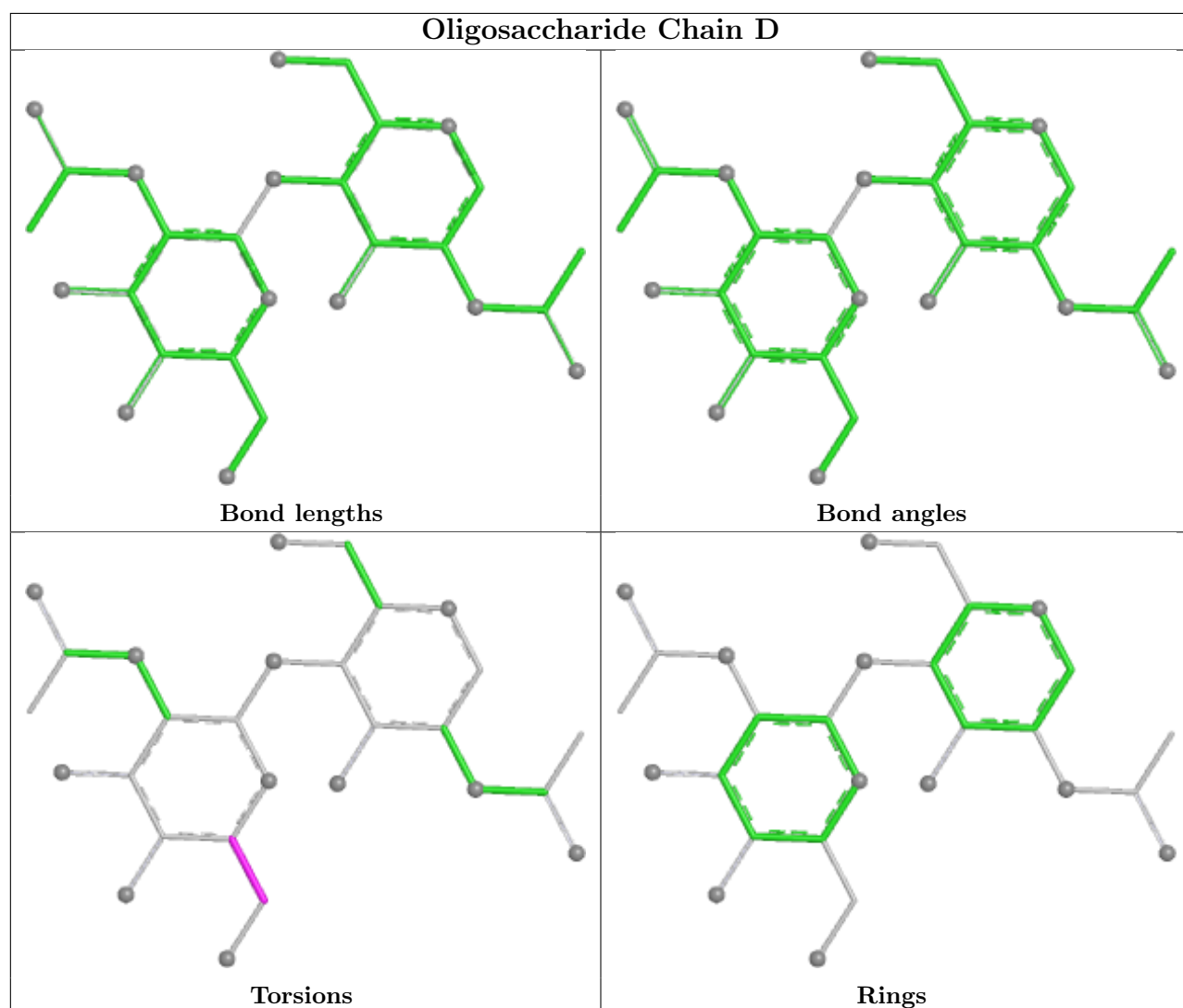
Mol	Chain	Res	Type	Atoms
3	H	1	SIA	O6-C6-C7-O7
3	H	1	SIA	C6-C7-C8-C9

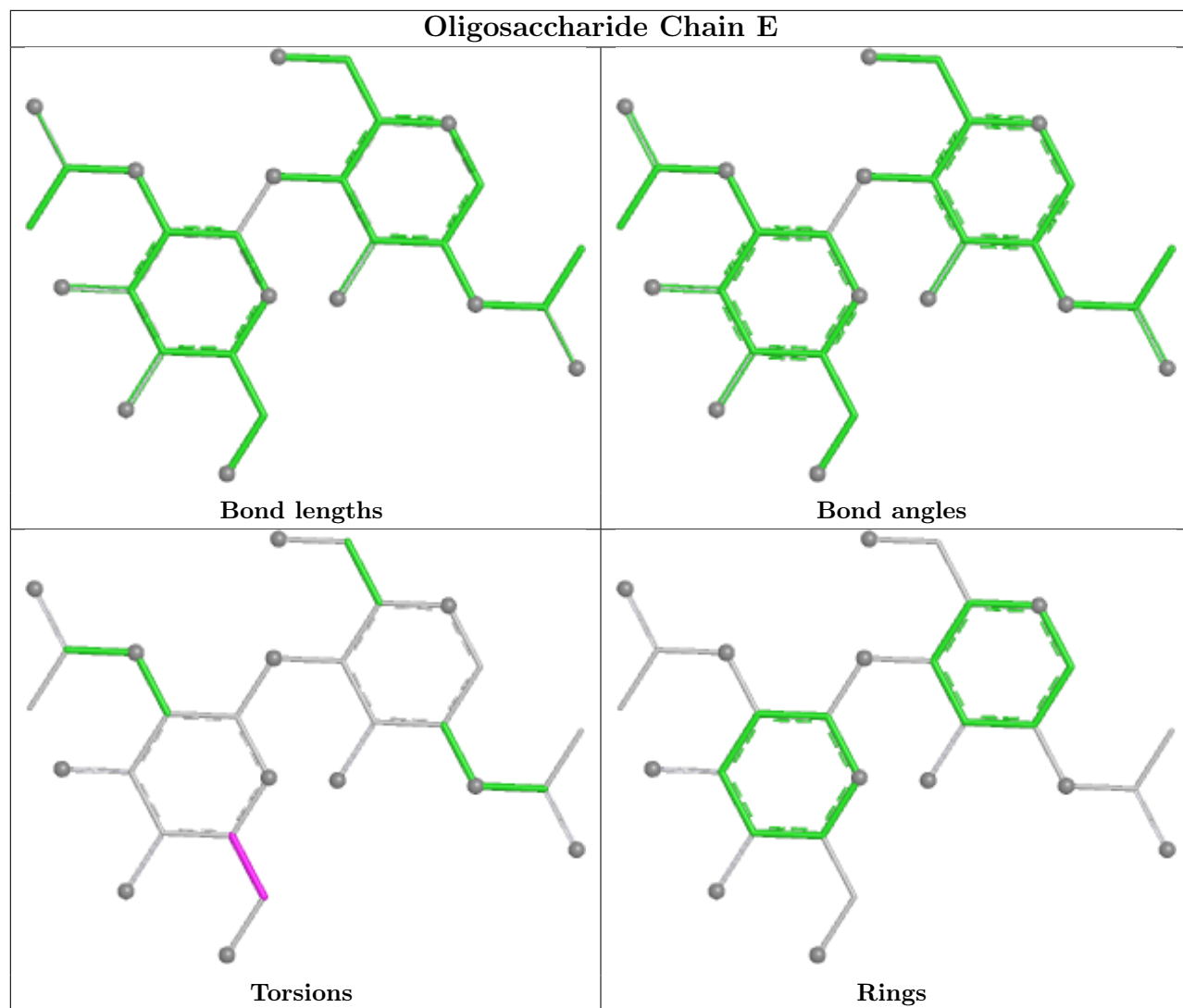
There are no ring outliers.

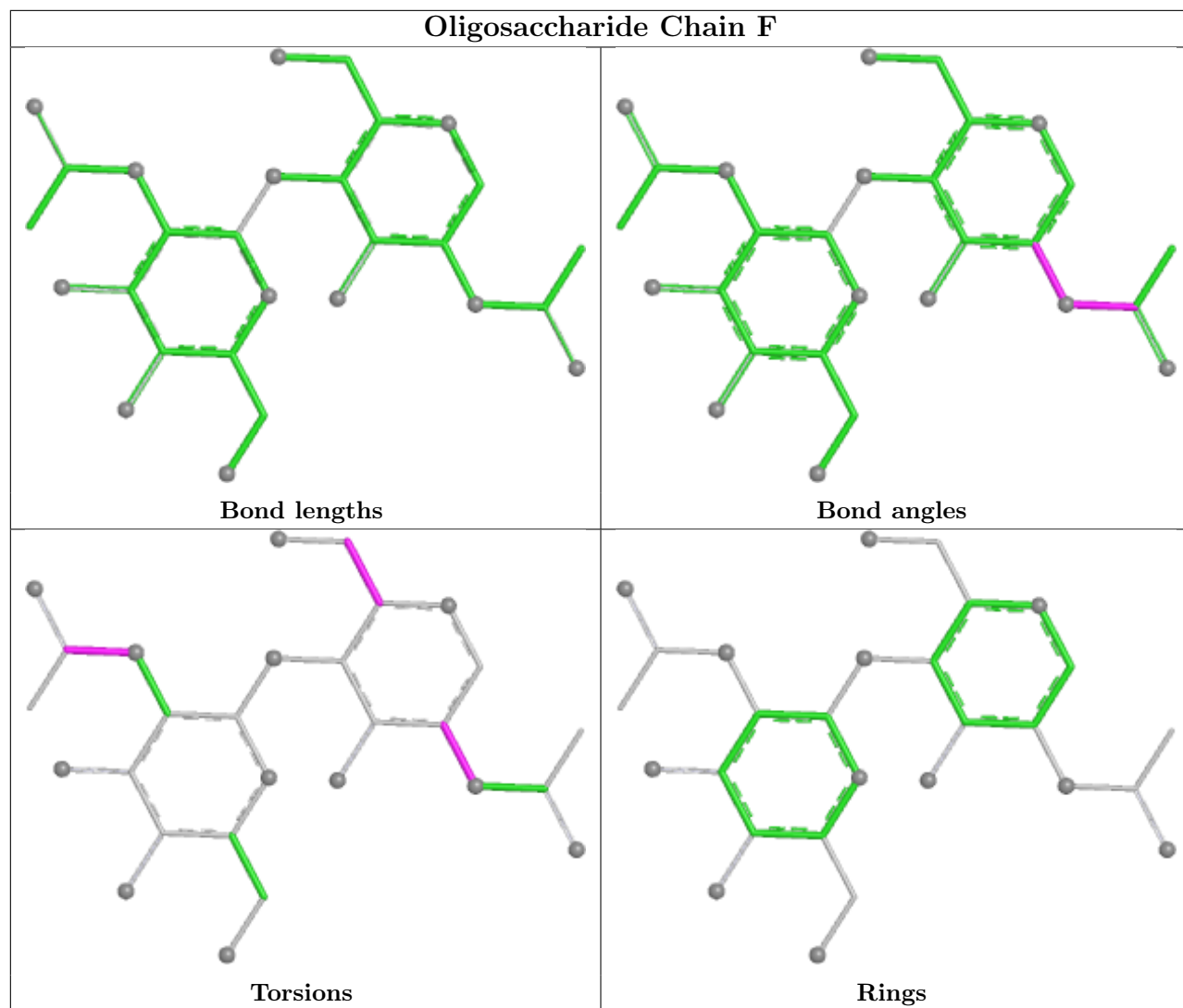
4 monomers are involved in 5 short contacts:

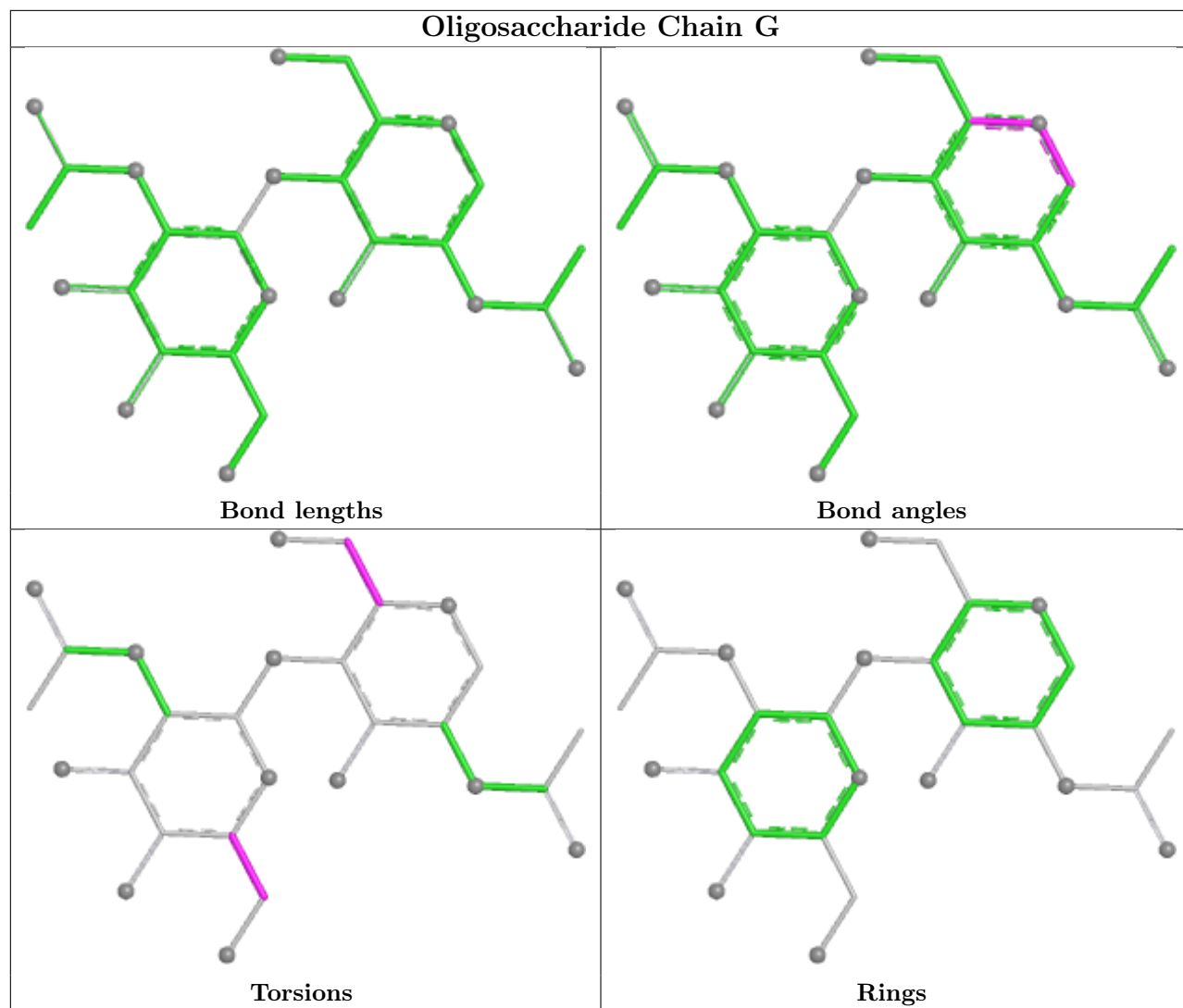
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	I	1	SIA	1	0
3	H	2	5N6	1	0
3	J	2	5N6	1	0
3	J	1	SIA	2	0

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

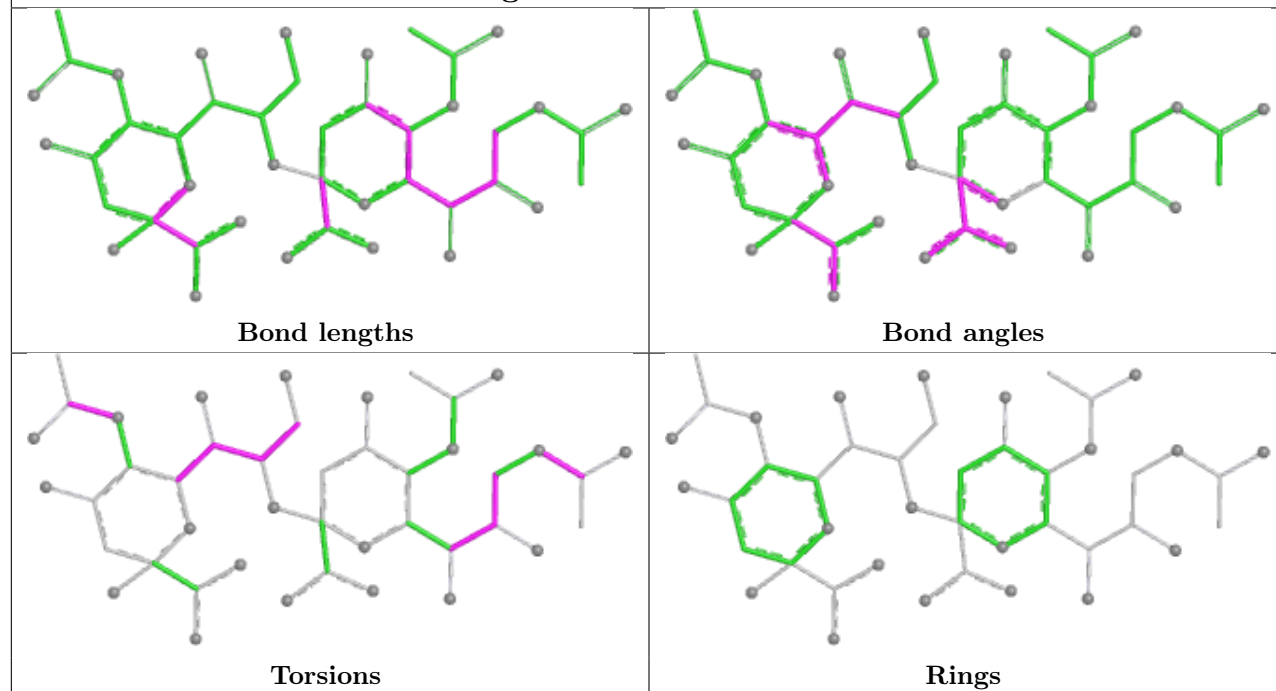




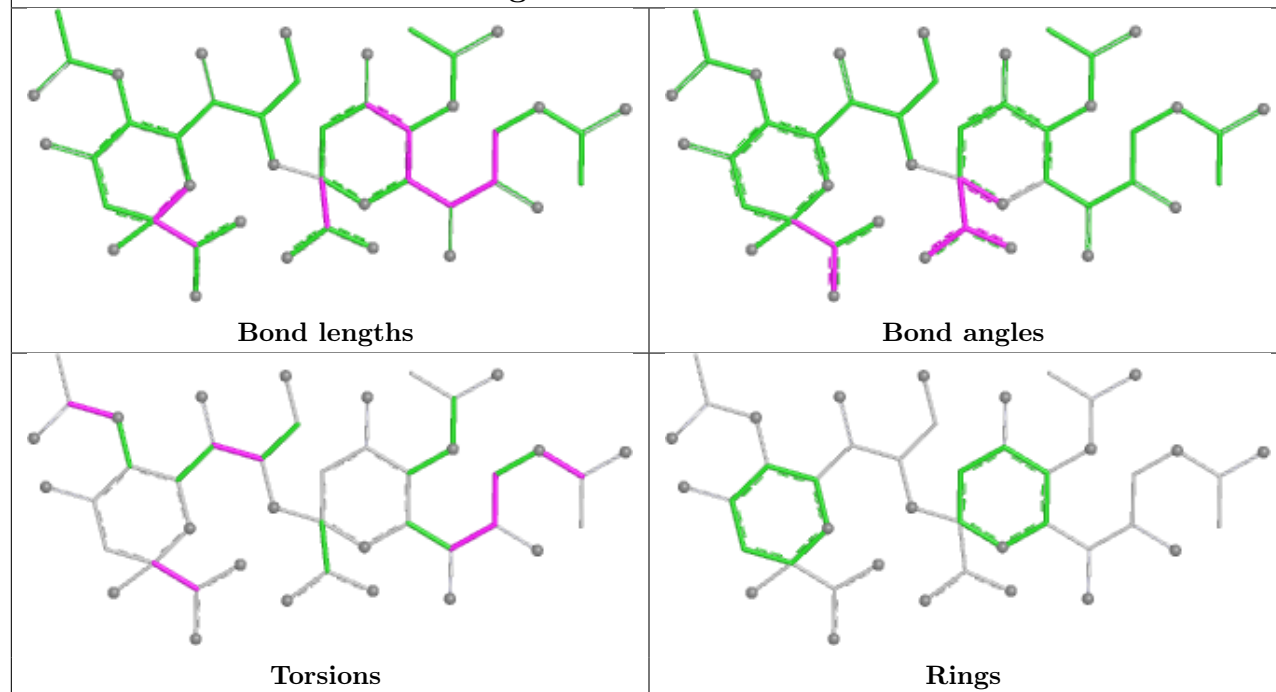


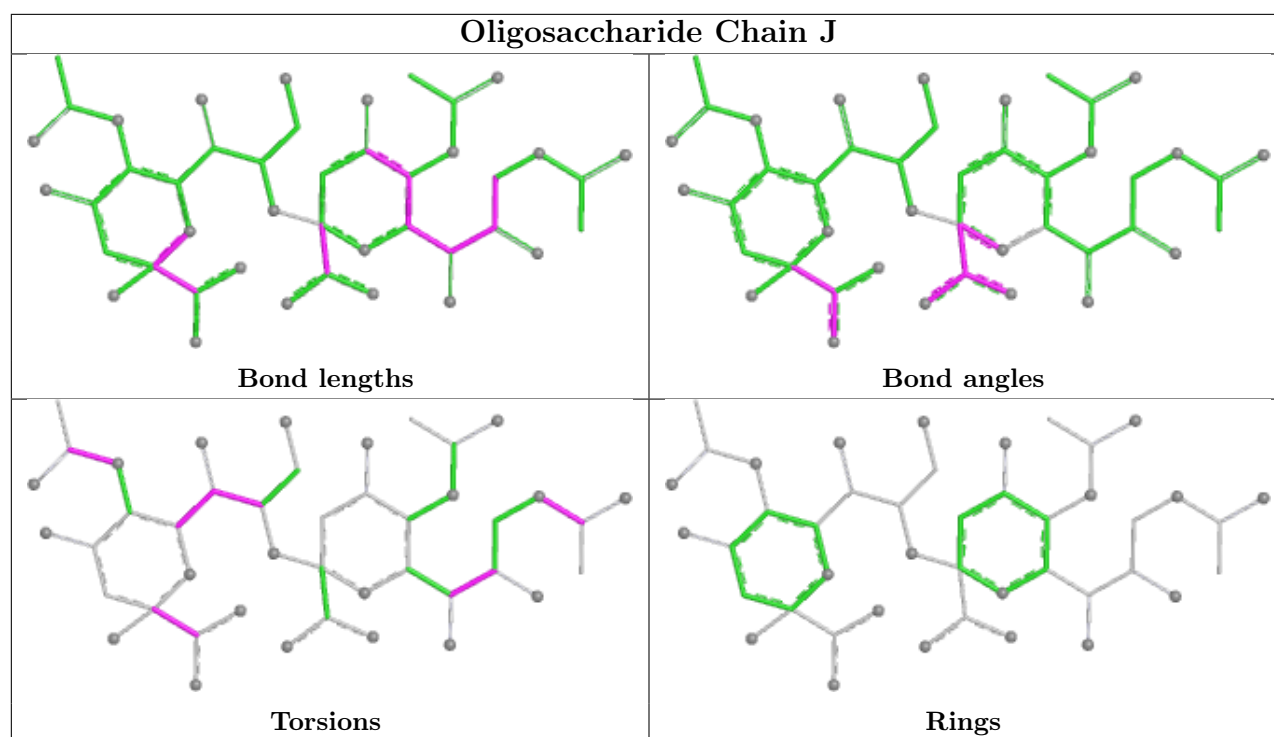


Oligosaccharide Chain H



Oligosaccharide Chain I





5.6 Ligand geometry [i](#)

26 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	NAG	B	1403	1	14,14,15	0.39	0	17,19,21	0.50	0
4	NAG	B	1404	1	14,14,15	0.34	0	17,19,21	0.51	0
4	NAG	C	1406	1	14,14,15	0.42	0	17,19,21	0.46	0
4	NAG	A	1402	1	14,14,15	0.57	0	17,19,21	1.03	1 (5%)
4	NAG	B	1405	1	14,14,15	0.56	0	17,19,21	1.07	2 (11%)
4	NAG	C	1407	1	14,14,15	0.38	0	17,19,21	0.46	0
4	NAG	B	1410	1	14,14,15	0.38	0	17,19,21	0.63	1 (5%)
4	NAG	A	1403	1	14,14,15	0.33	0	17,19,21	0.65	0
4	NAG	B	1401	1	14,14,15	0.32	0	17,19,21	0.50	0
4	NAG	C	1401	1	14,14,15	0.55	0	17,19,21	0.51	0
4	NAG	A	1406	1	14,14,15	0.51	0	17,19,21	1.03	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	B	1409	1	14,14,15	0.38	0	17,19,21	0.50	0
4	NAG	A	1407	1	14,14,15	0.36	0	17,19,21	0.56	0
4	NAG	B	1408	1	14,14,15	0.38	0	17,19,21	0.53	0
4	NAG	B	1406	1	14,14,15	0.40	0	17,19,21	0.49	0
4	NAG	B	1407	1	14,14,15	0.47	0	17,19,21	0.67	1 (5%)
4	NAG	C	1402	1	14,14,15	0.34	0	17,19,21	0.58	0
4	NAG	A	1404	1	14,14,15	0.53	0	17,19,21	1.01	1 (5%)
4	NAG	C	1403	1	14,14,15	0.38	0	17,19,21	0.60	1 (5%)
4	NAG	B	1411	1	14,14,15	0.35	0	17,19,21	0.50	0
4	NAG	C	1404	1	14,14,15	0.36	0	17,19,21	0.61	0
4	NAG	B	1402	1	14,14,15	0.38	0	17,19,21	0.56	0
4	NAG	B	1412	1	14,14,15	0.43	0	17,19,21	0.52	0
4	NAG	C	1405	1	14,14,15	0.51	0	17,19,21	1.03	1 (5%)
4	NAG	A	1405	1	14,14,15	0.39	0	17,19,21	0.54	0
4	NAG	A	1401	1	14,14,15	0.54	0	17,19,21	1.02	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	B	1403	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1404	1	-	0/6/23/26	0/1/1/1
4	NAG	C	1406	1	-	0/6/23/26	0/1/1/1
4	NAG	A	1402	1	-	3/6/23/26	0/1/1/1
4	NAG	B	1405	1	-	2/6/23/26	0/1/1/1
4	NAG	C	1407	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1410	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1403	1	-	4/6/23/26	0/1/1/1
4	NAG	B	1401	1	-	3/6/23/26	0/1/1/1
4	NAG	C	1401	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1406	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1409	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1407	1	-	0/6/23/26	0/1/1/1
4	NAG	B	1408	1	-	0/6/23/26	0/1/1/1
4	NAG	B	1406	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1407	1	-	4/6/23/26	0/1/1/1
4	NAG	C	1402	1	-	0/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	A	1404	1	-	4/6/23/26	0/1/1/1
4	NAG	C	1403	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1411	1	-	0/6/23/26	0/1/1/1
4	NAG	C	1404	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1402	1	-	2/6/23/26	0/1/1/1
4	NAG	B	1412	1	-	2/6/23/26	0/1/1/1
4	NAG	C	1405	1	-	4/6/23/26	0/1/1/1
4	NAG	A	1405	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1401	1	-	3/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1401	NAG	C2-N2-C7	3.24	127.24	122.90
4	C	1405	NAG	C2-N2-C7	3.21	127.21	122.90
4	A	1406	NAG	C2-N2-C7	3.21	127.21	122.90
4	A	1402	NAG	C2-N2-C7	3.20	127.19	122.90
4	A	1404	NAG	C2-N2-C7	3.18	127.16	122.90

There are no chirality outliers.

5 of 51 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1405	NAG	O5-C5-C6-O6
4	C	1403	NAG	C4-C5-C6-O6
4	C	1405	NAG	O5-C5-C6-O6
4	B	1402	NAG	C4-C5-C6-O6
4	A	1403	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1402	NAG	1	0
4	B	1412	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.

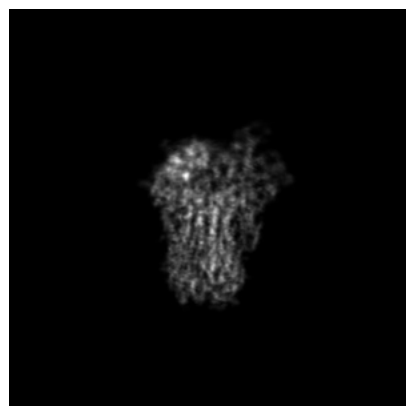
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-17077. These allow visual inspection of the internal detail of the map and identification of artifacts.

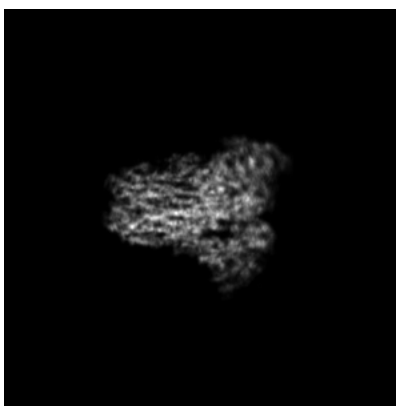
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

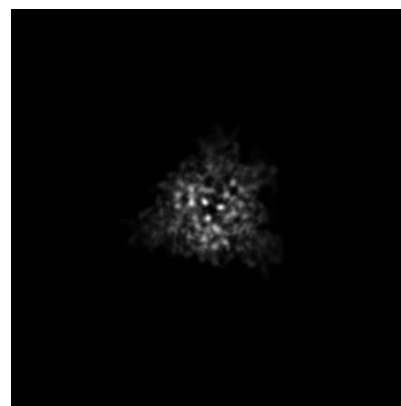
6.1.1 Primary map



X

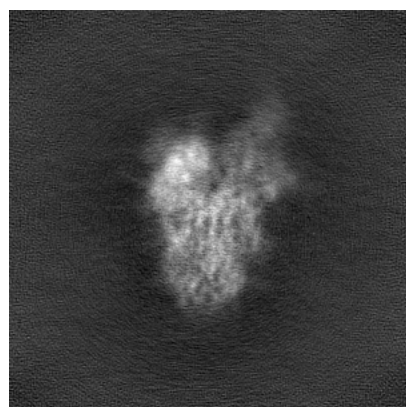


Y

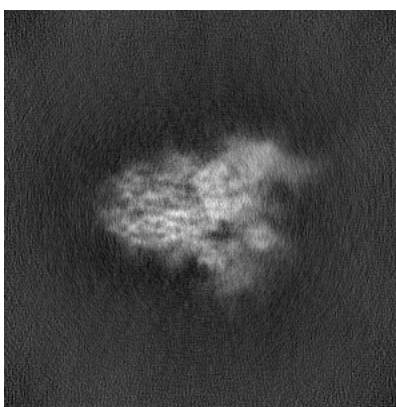


Z

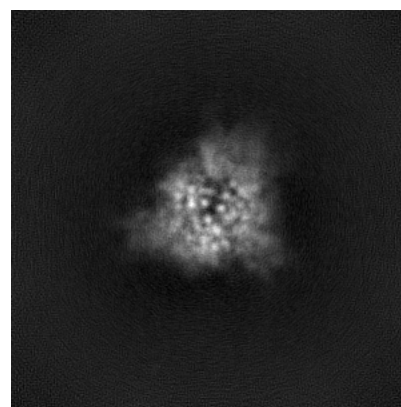
6.1.2 Raw map



X



Y



Z

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

6.2 Central slices [i](#)

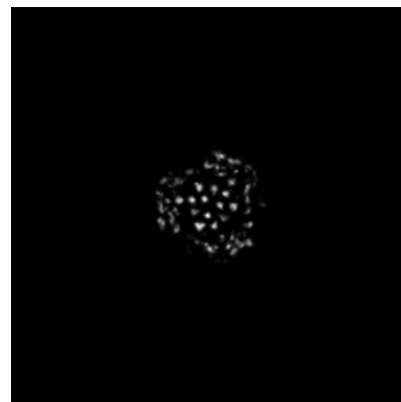
6.2.1 Primary map



X Index: 150

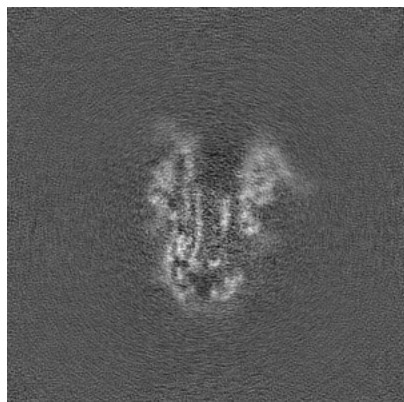


Y Index: 150

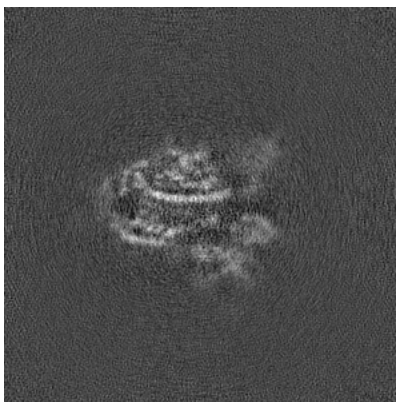


Z Index: 150

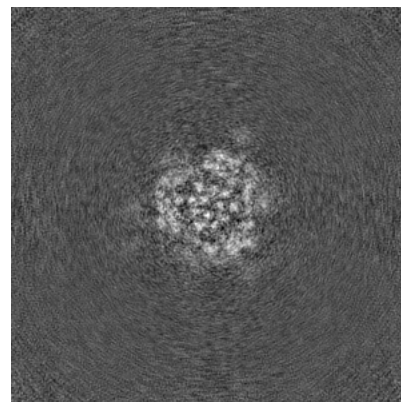
6.2.2 Raw map



X Index: 150



Y Index: 150



Z Index: 150

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: 145

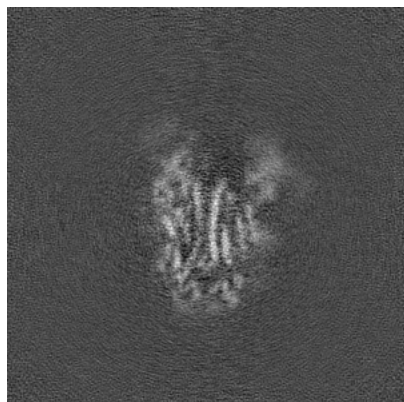


Y Index: 154

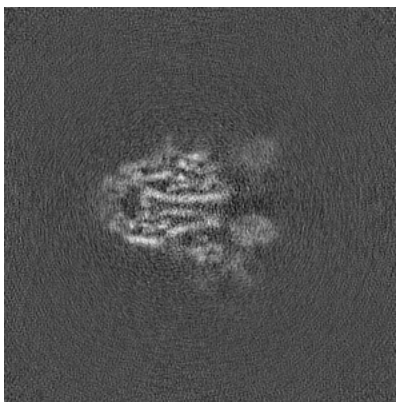


Z Index: 143

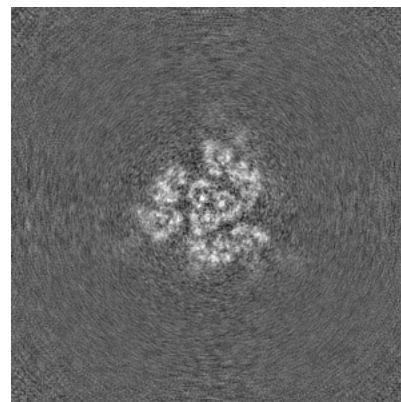
6.3.2 Raw map



X Index: 145



Y Index: 152

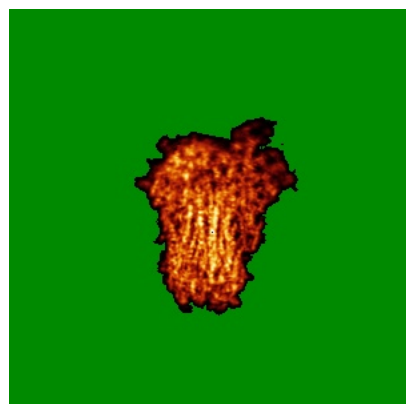


Z Index: 156

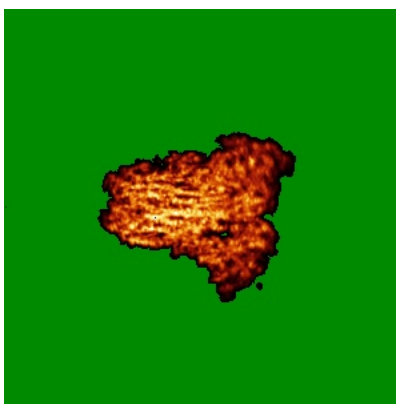
The images above show the largest variance slices of the map in three orthogonal directions.

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

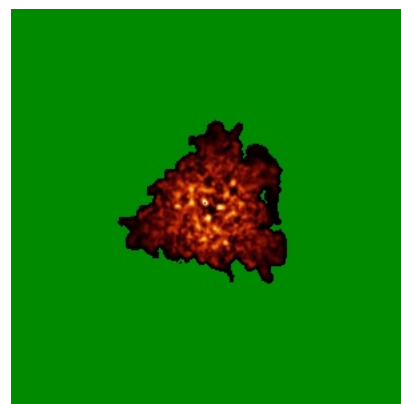
6.4.1 Primary map



X

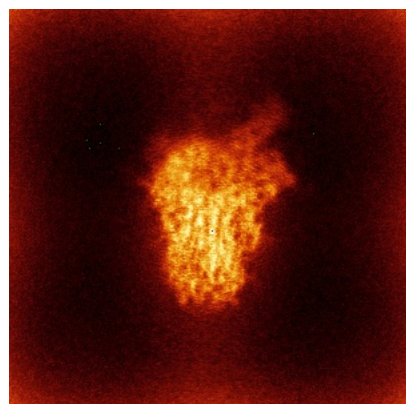


Y

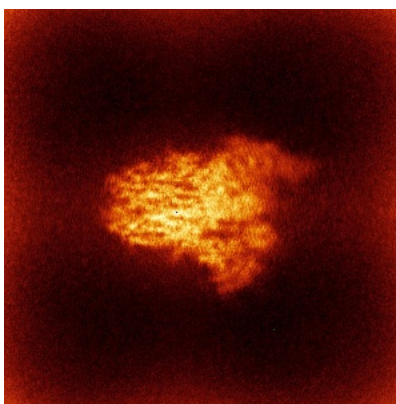


Z

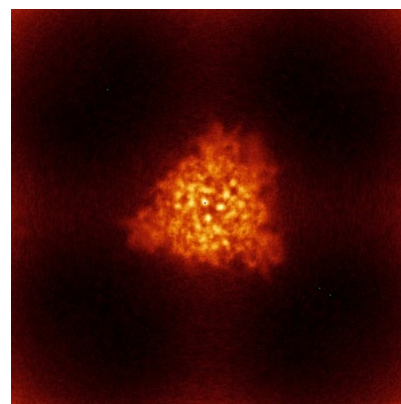
6.4.2 Raw map



X



Y

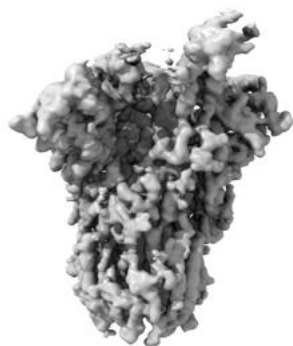


Z

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

6.5 Orthogonal surface views [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 0.073. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

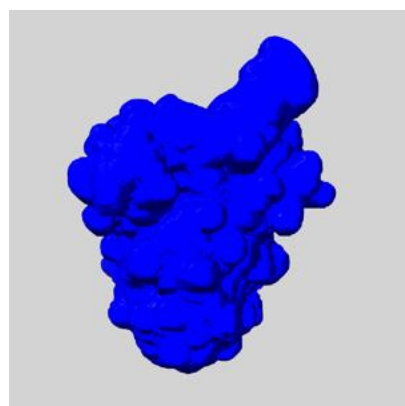
6.6 Mask visualisation [i](#)

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

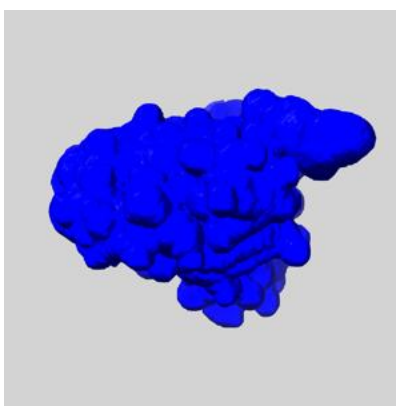
A mask typically either:

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

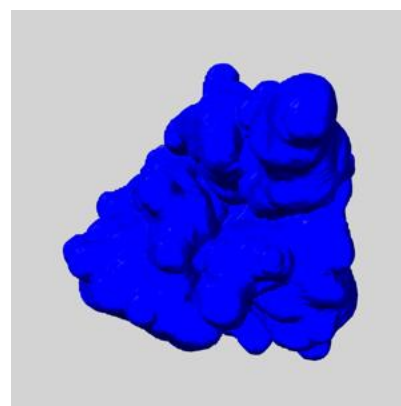
6.6.1 emd_17077_msk_1.map [i](#)



X



Y

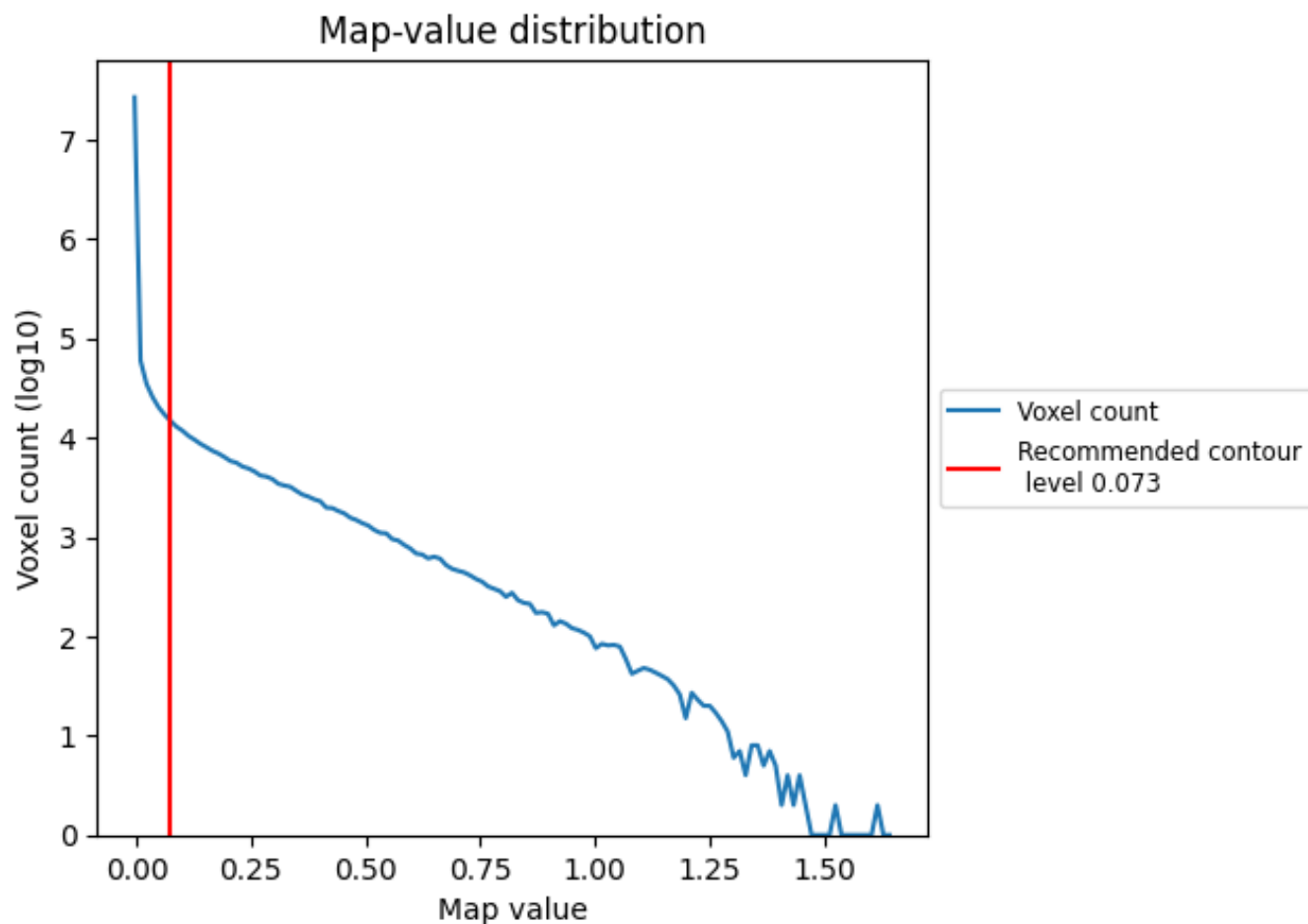


Z

7 Map analysis [i](#)

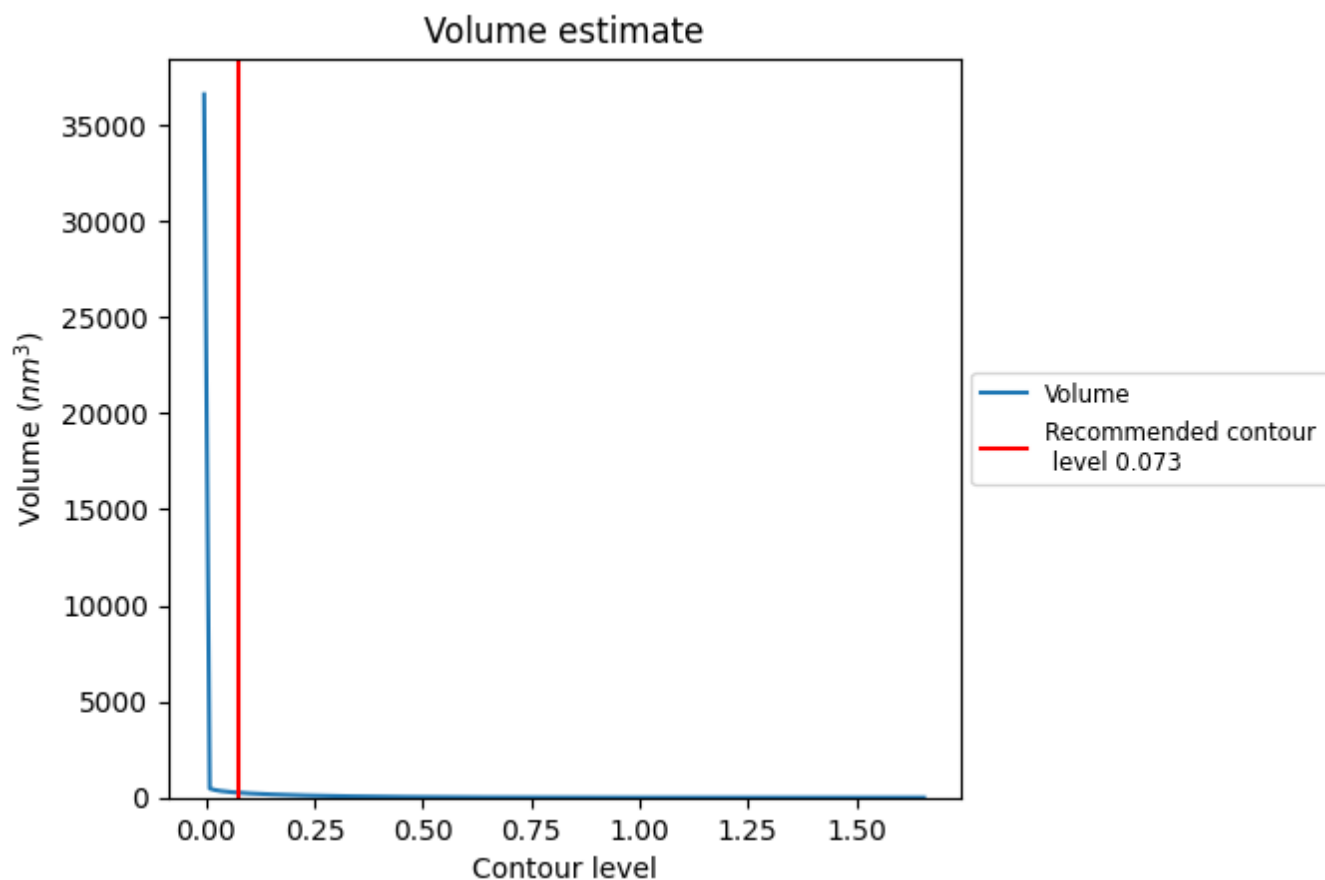
This section contains the results of statistical analysis of the map.

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.

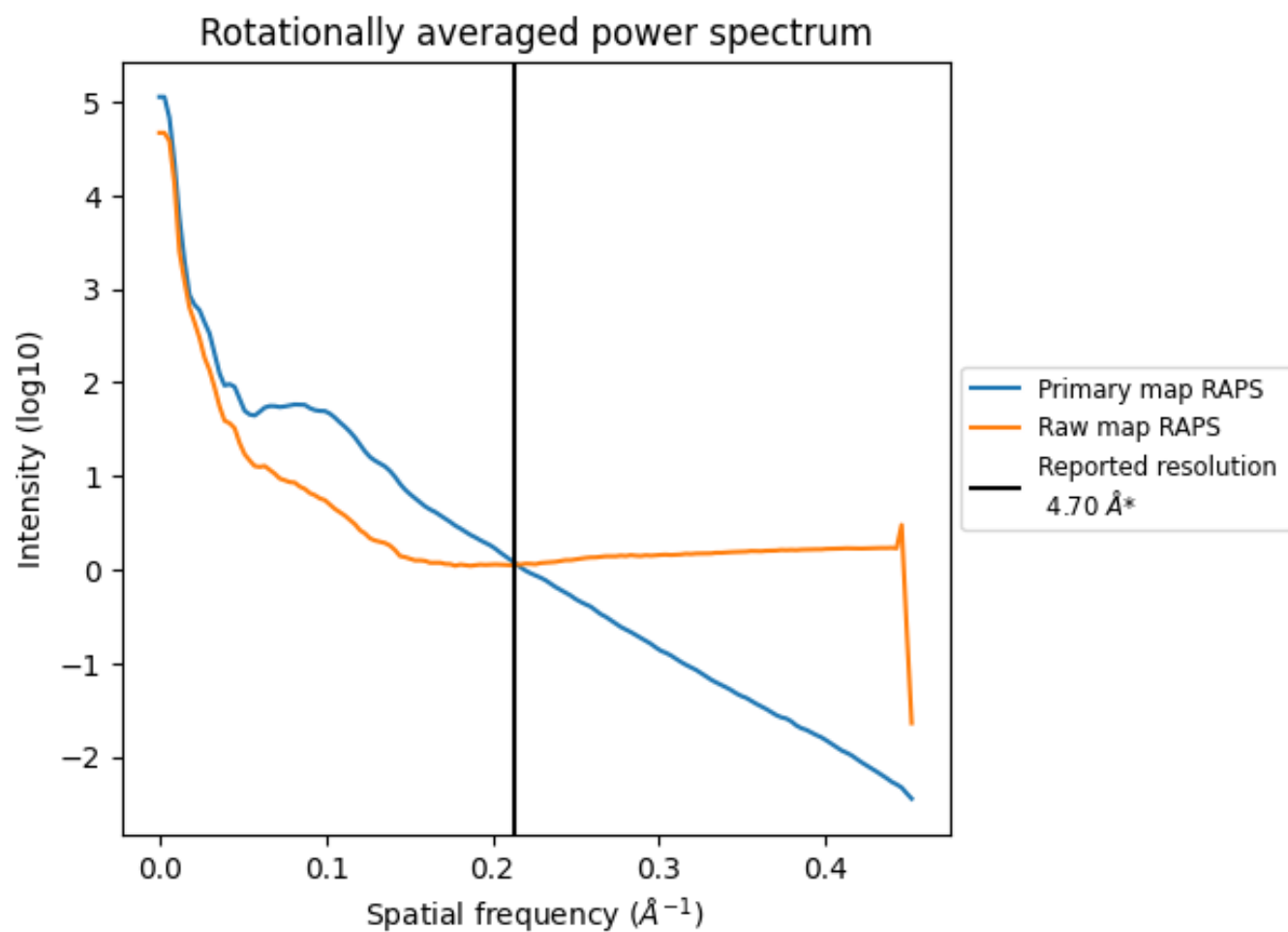
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 257 nm^3 ; this corresponds to an approximate mass of 232 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ

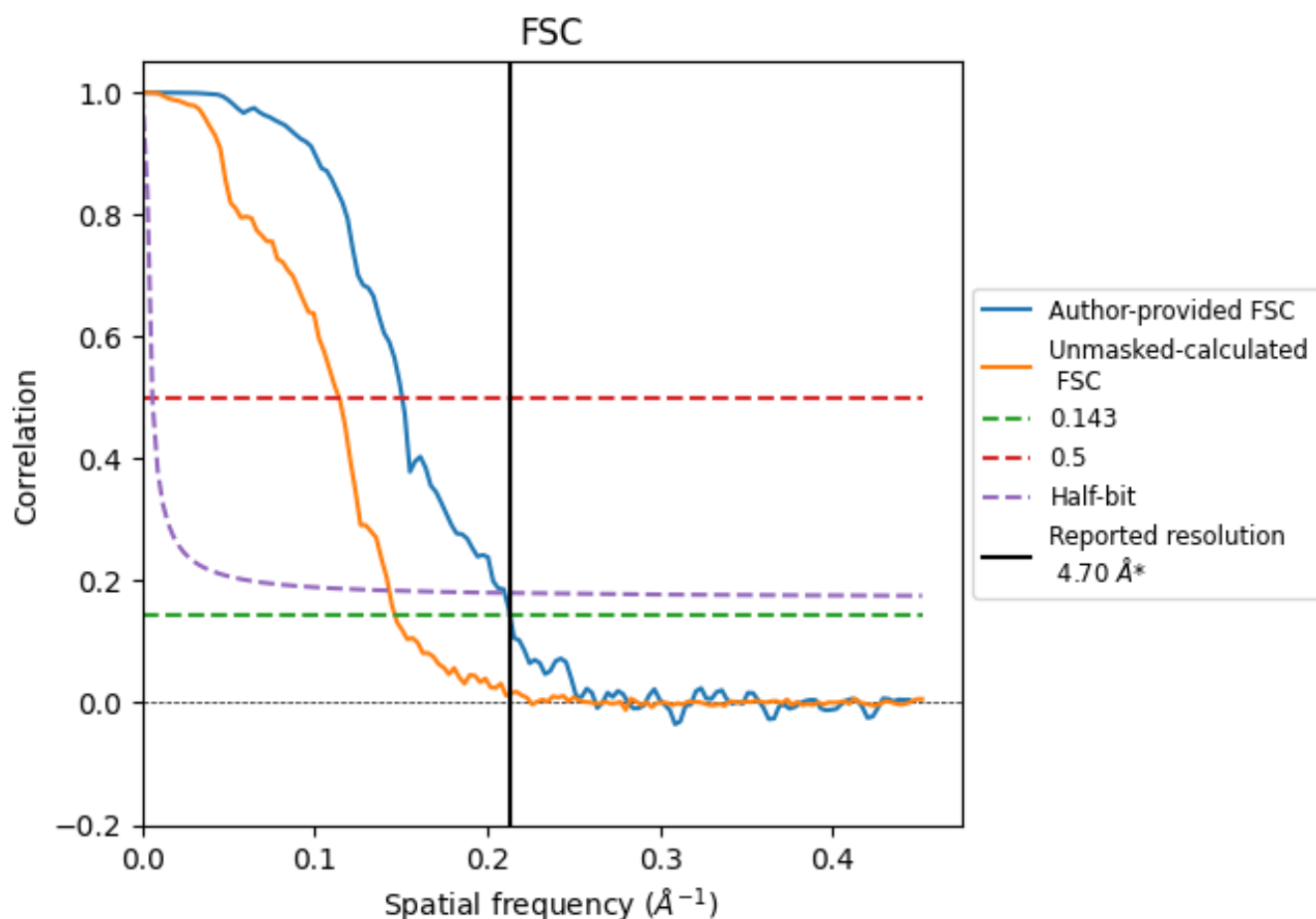


*Reported resolution corresponds to spatial frequency of $0.213 \text{ \AA}^{-1}$

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 0.213 Å⁻¹

8.2 Resolution estimates [i](#)

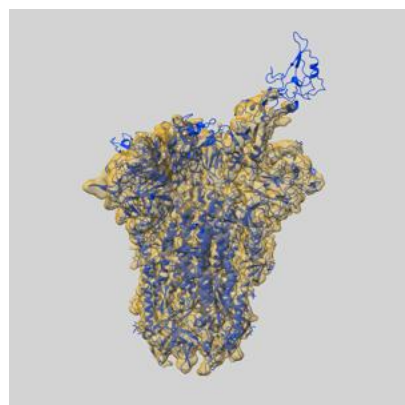
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.70	-	-
Author-provided FSC curve	4.69	6.64	4.76
Unmasked-calculated*	6.83	8.77	6.99

*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 6.83 differs from the reported value 4.7 by more than 10 %

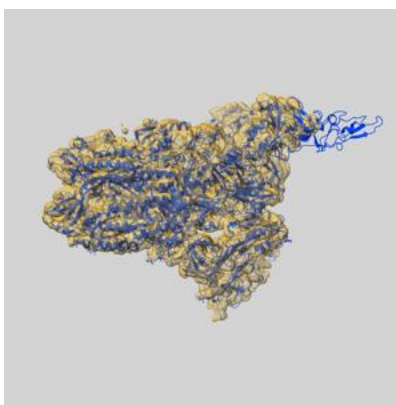
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-17077 and PDB model 8OPN. Per-residue inclusion information can be found in [section 3](#) on [page 11](#).

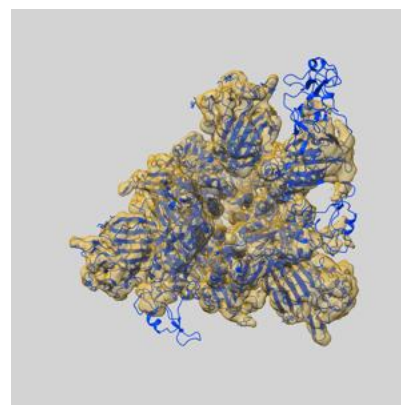
9.1 Map-model overlay [i](#)



X



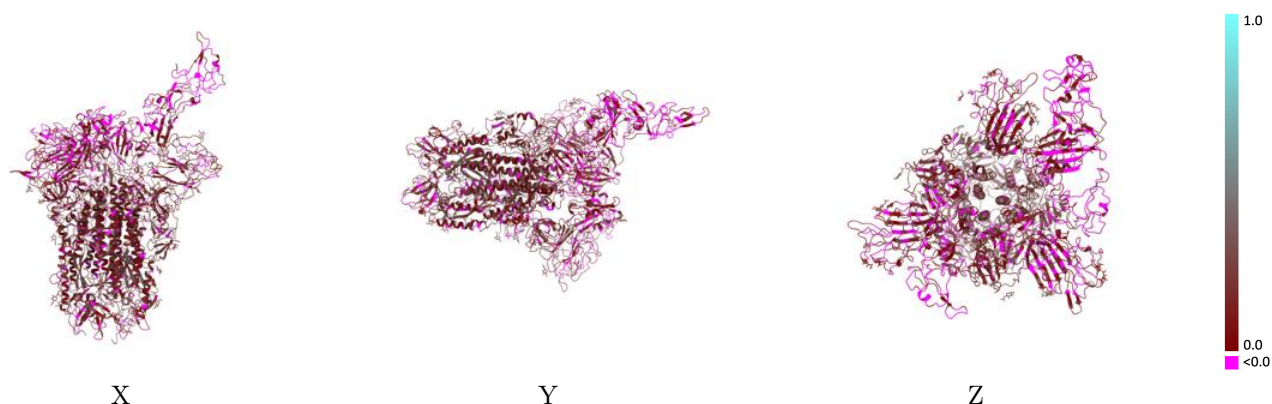
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.073 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](#)

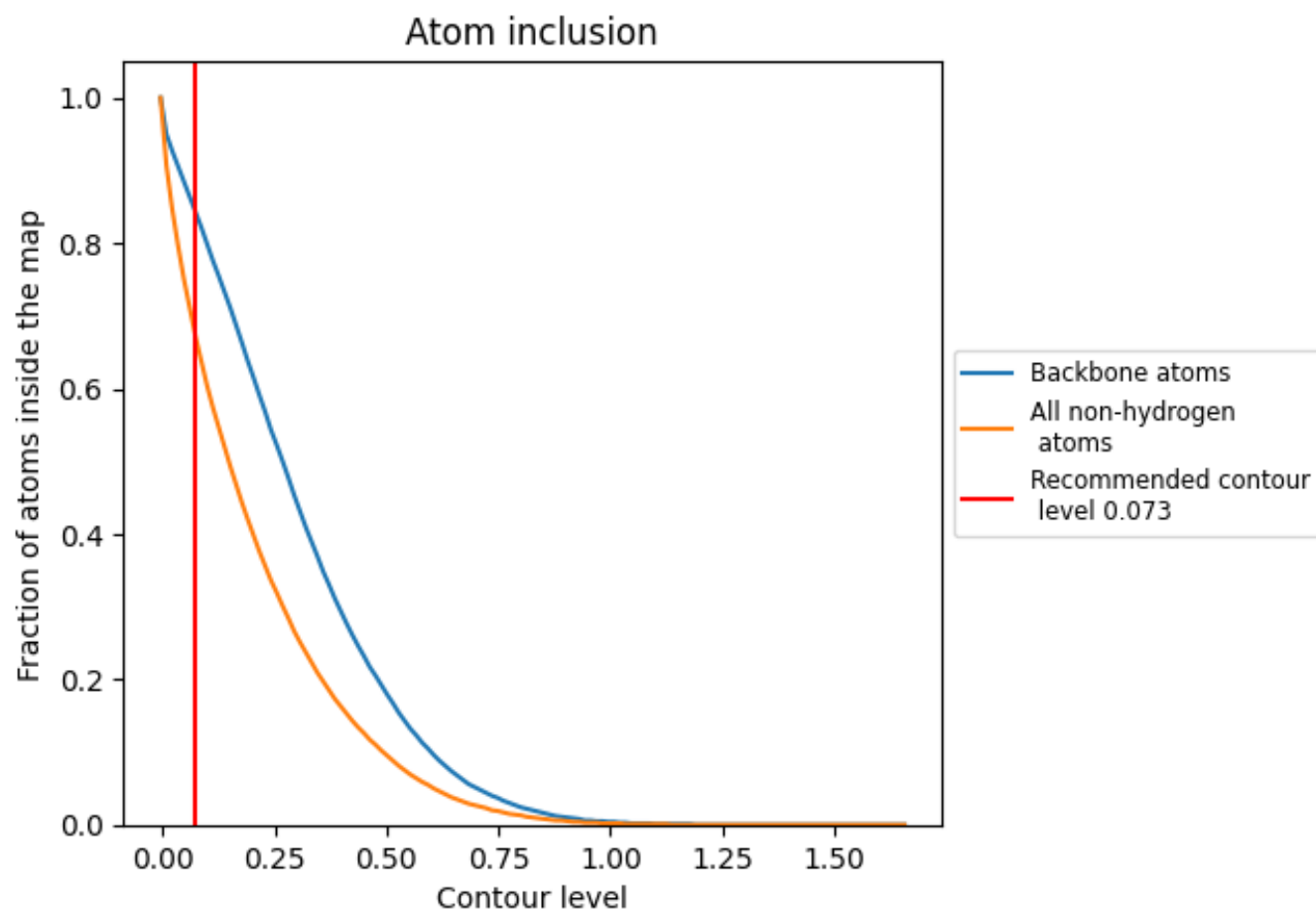


The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

This section was not generated.

9.4 Atom inclusion ⓘ



At the recommended contour level, 84% of all backbone atoms, 67% 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 (0.073) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6730	0.1330
A	0.6450	0.1240
B	0.6900	0.1450
C	0.6910	0.1300
D	0.2500	0.0590
E	0.4290	0.1400
F	0.5710	0.2010
G	0.4640	0.1100
H	0.6820	0.0860
I	0.3180	0.0150
J	0.2730	0.0590

1.0

0.0

<0.0