



## wwPDB EM Validation Summary Report ⓘ

Oct 27, 2024 – 02:27 PM JST

PDB ID : 7CN9  
EMDB ID : EMD-30419  
Title : Cryo-EM structure of SARS-CoV-2 Spike ectodomain  
Authors : Ho, M.; Chang, Y.; Wang, C.; Wu, Y.; Huang, H.; Chen, T.; Lo, J.M.; Chen, X.; Ma, C.  
Deposited on : 2020-07-30  
Resolution : 4.70 Å(reported)

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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.dev113  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
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) : 2.39

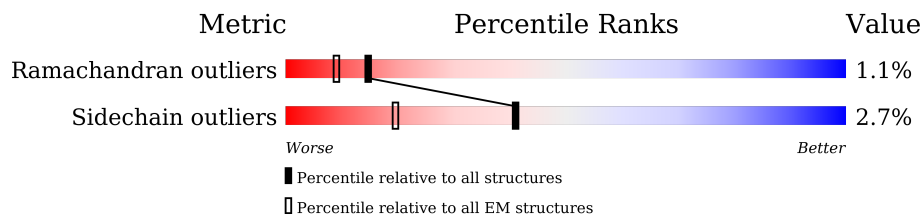
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 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)
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	1127	44% (Poor fit) 87% (0 outliers) 10% (1 outlier) • (2 outliers) • (3+ outliers)
1	B	1127	37% (Poor fit) 87% (0 outliers) 10% (1 outlier) • (2 outliers) • (3+ outliers)
1	C	1127	39% (Poor fit) 89% (0 outliers) 8% (1 outlier) • (2 outliers) • (3+ outliers)
2	E	2	100% (0 outliers) 50% (1 outlier) 50% (2 outliers)
2	H	2	100% (0 outliers)
2	N	2	100% (0 outliers) 50% (1 outlier) 50% (2 outliers)
2	W	2	100% (0 outliers)
2	X	2	100% (0 outliers) 50% (1 outlier)
2	Z	2	100% (0 outliers) 50% (1 outlier) 50% (2 outliers)

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Mol	Chain	Length	Quality of chain
2	d	2	<p>50% 50%</p>
2	f	2	<p>50% 50%</p>
3	k	3	<p>67% 33% 67%</p>
4	V	3	<p>67% 100%</p>
4	p	3	<p>33% 100%</p>
5	h	4	<p>50% 100% 50%</p>
6	Q	4	<p>75% 100%</p>

## 2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 24052 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.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1011	7727	4935	1292	1465	35	0	0
1	B	1010	7674	4895	1285	1458	36	0	0
1	C	1037	7889	5040	1316	1498	35	0	0

There are 15 discrepancies between the modelled and reference sequences:

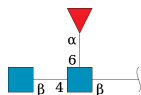
Chain	Residue	Modelled	Actual	Comment	Reference
A	682	GLY	ARG	engineered mutation	UNP P0DTC2
A	683	SER	ARG	engineered mutation	UNP P0DTC2
A	685	GLY	ARG	engineered mutation	UNP P0DTC2
A	986	PRO	LYS	engineered mutation	UNP P0DTC2
A	987	PRO	VAL	engineered mutation	UNP P0DTC2
B	682	GLY	ARG	engineered mutation	UNP P0DTC2
B	683	SER	ARG	engineered mutation	UNP P0DTC2
B	685	GLY	ARG	engineered mutation	UNP P0DTC2
B	986	PRO	LYS	engineered mutation	UNP P0DTC2
B	987	PRO	VAL	engineered mutation	UNP P0DTC2
C	682	GLY	ARG	engineered mutation	UNP P0DTC2
C	683	SER	ARG	engineered mutation	UNP P0DTC2
C	685	GLY	ARG	engineered mutation	UNP P0DTC2
C	986	PRO	LYS	engineered mutation	UNP P0DTC2
C	987	PRO	VAL	engineered mutation	UNP P0DTC2

- 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	E	2	Total	C	N	O	0	0
			28	16	2	10		
2	X	2	Total	C	N	O	0	0
			28	16	2	10		
2	W	2	Total	C	N	O	0	0
			28	16	2	10		
2	Z	2	Total	C	N	O	0	0
			28	16	2	10		
2	d	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	H	2	Total	C	N	O	0	0
			28	16	2	10		
2	N	2	Total	C	N	O	0	0
			28	16	2	10		

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



Mol	Chain	Residues	Atoms				AltConf	Trace
3	k	3	Total	C	N	O	0	0
			38	22	2	14		

- Molecule 4 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
4	p	3	Total	C	N	O	0	0
			39	22	2	15		
4	V	3	Total	C	N	O	0	0
			39	22	2	15		

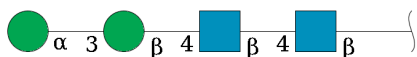
- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

pyranose.



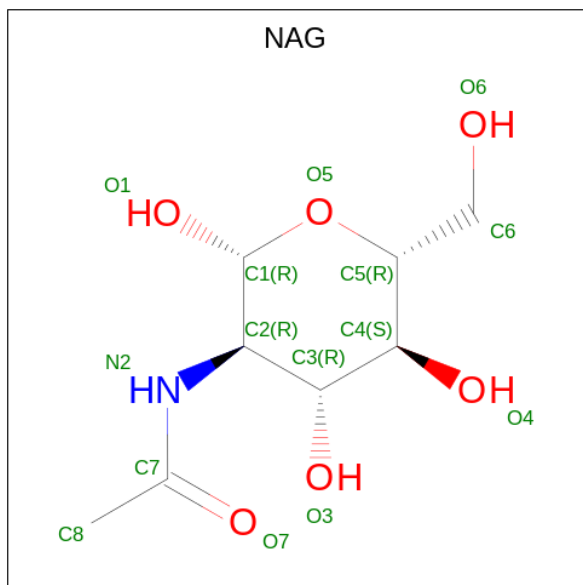
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	h	4	50	28	2	20	0	0

- Molecule 6 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-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	Q	4	50	28	2	20	0	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: 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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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	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	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	1	Total 14	8	1	5	0
7	B	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

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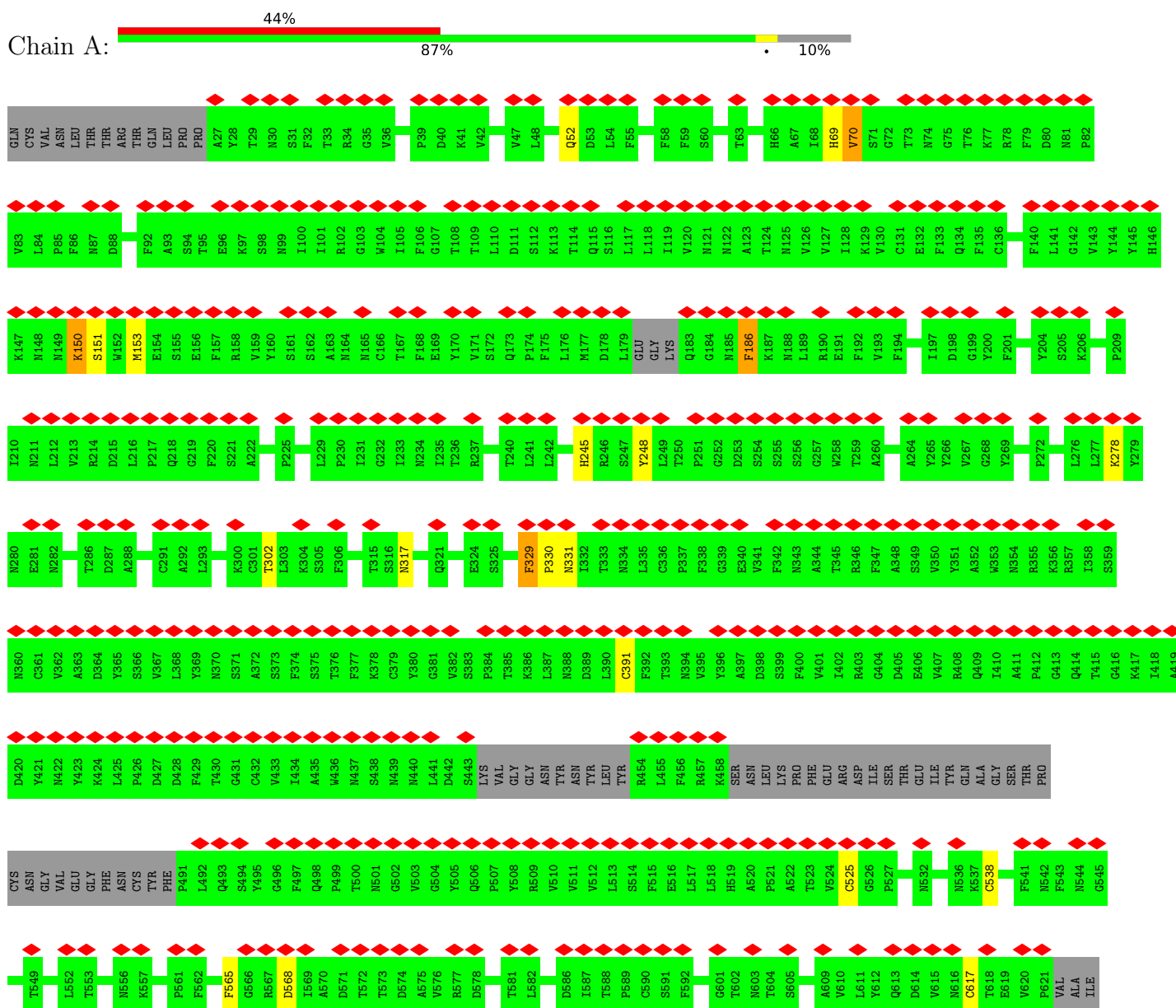
Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
7	C	1	14	8	1	5	0

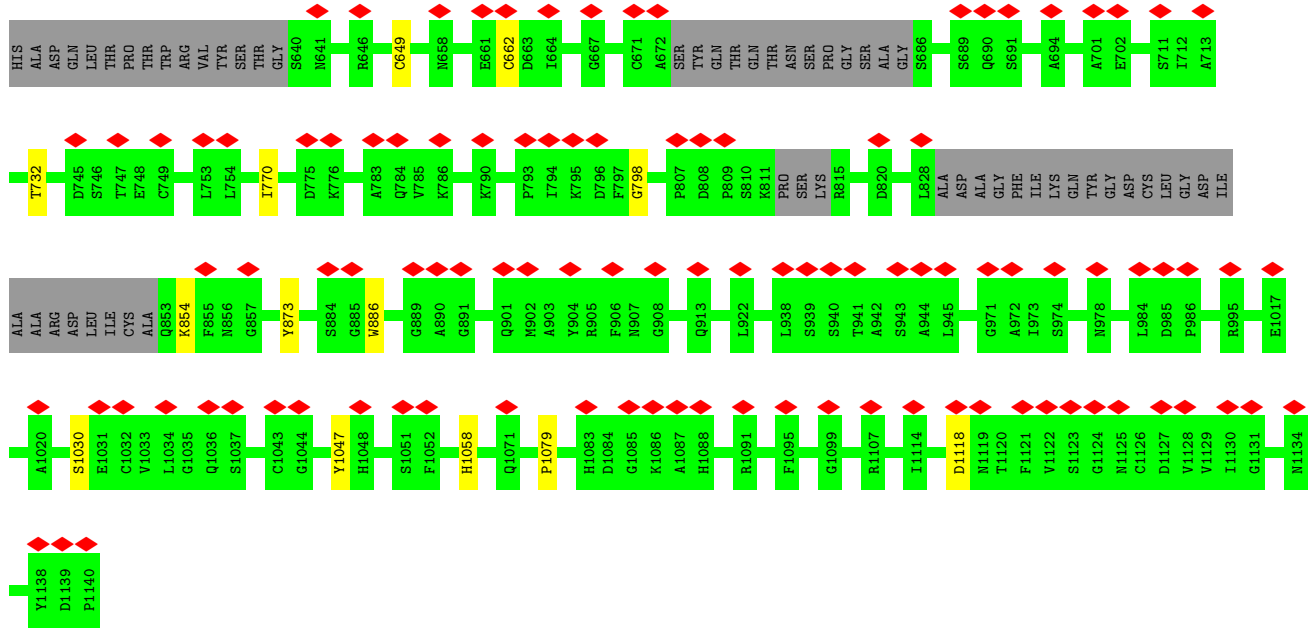


### 3 Residue-property plots

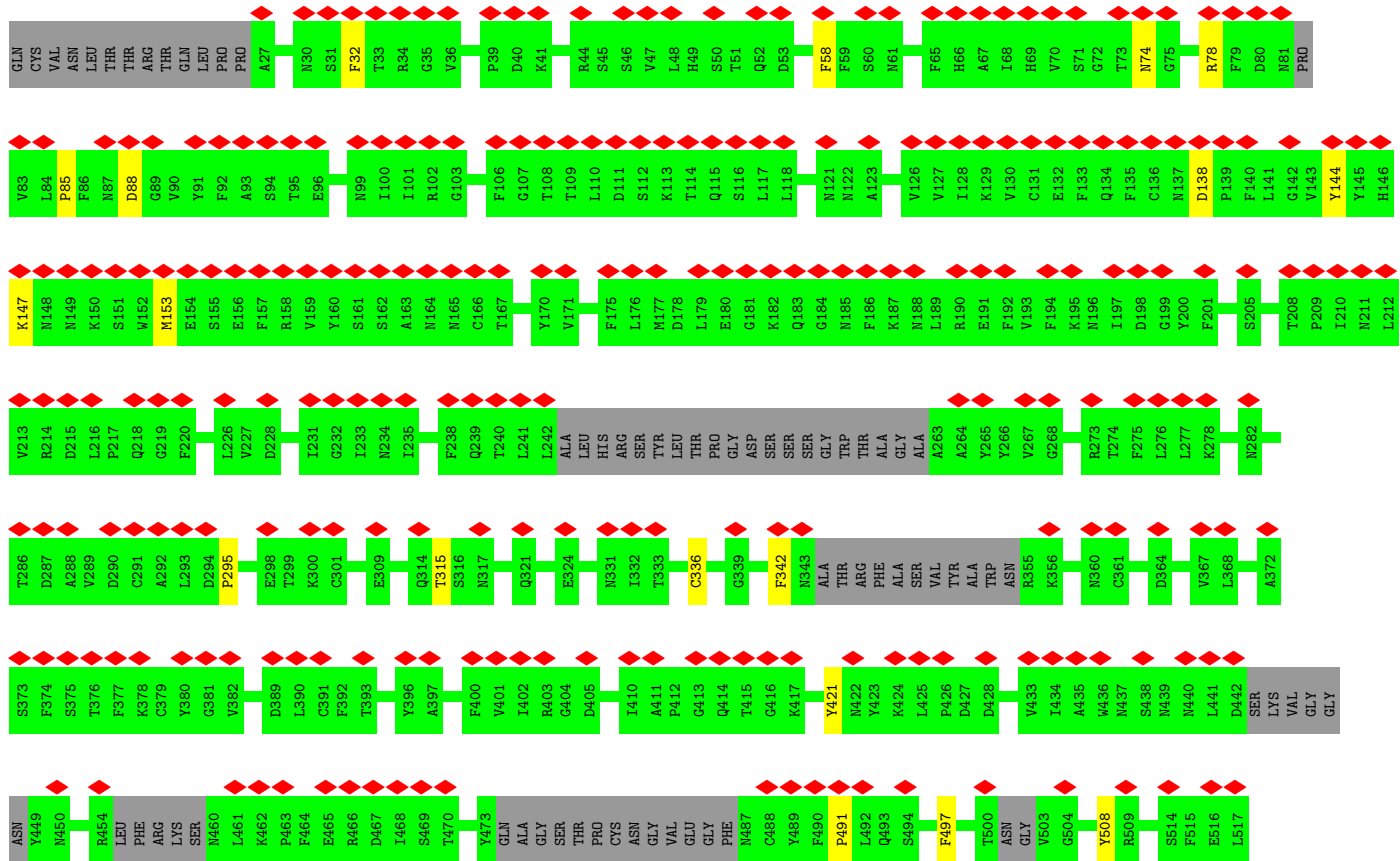
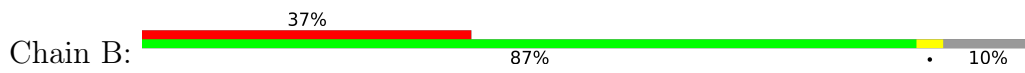
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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.

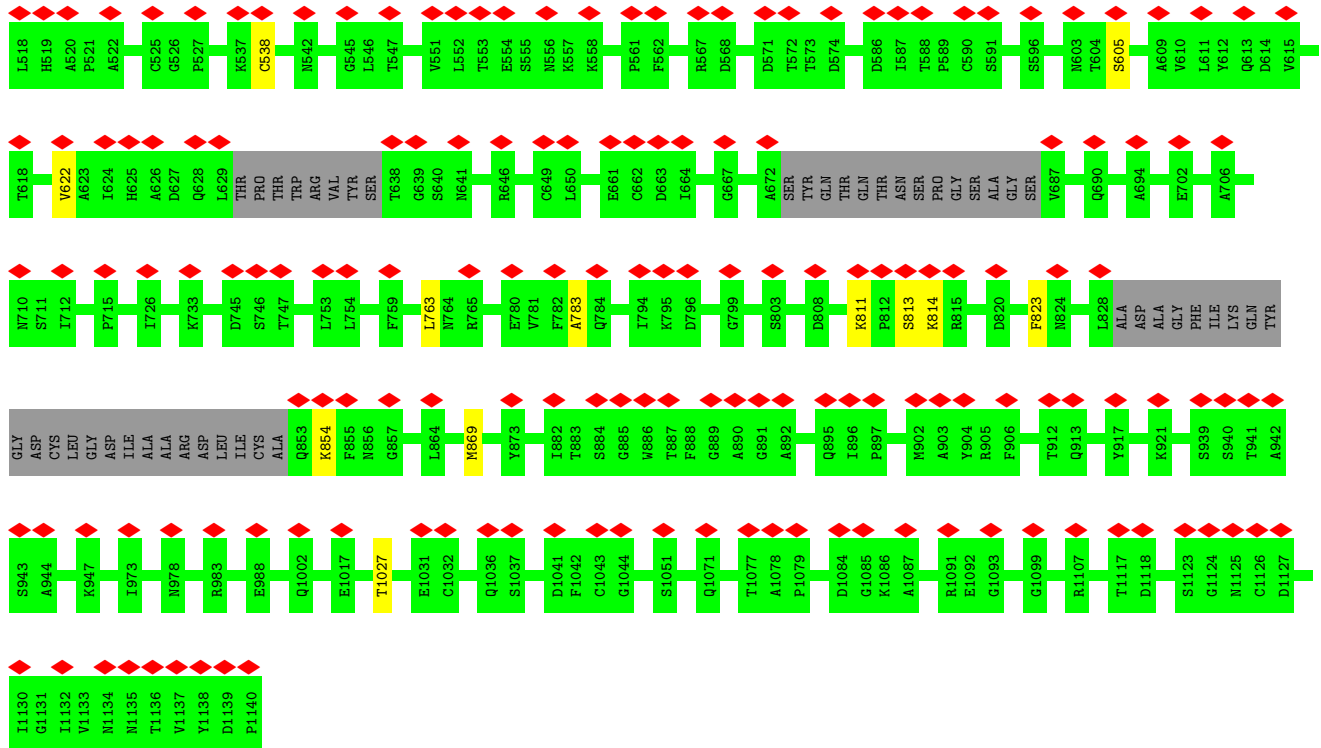
#### • Molecule 1: Spike glycoprotein



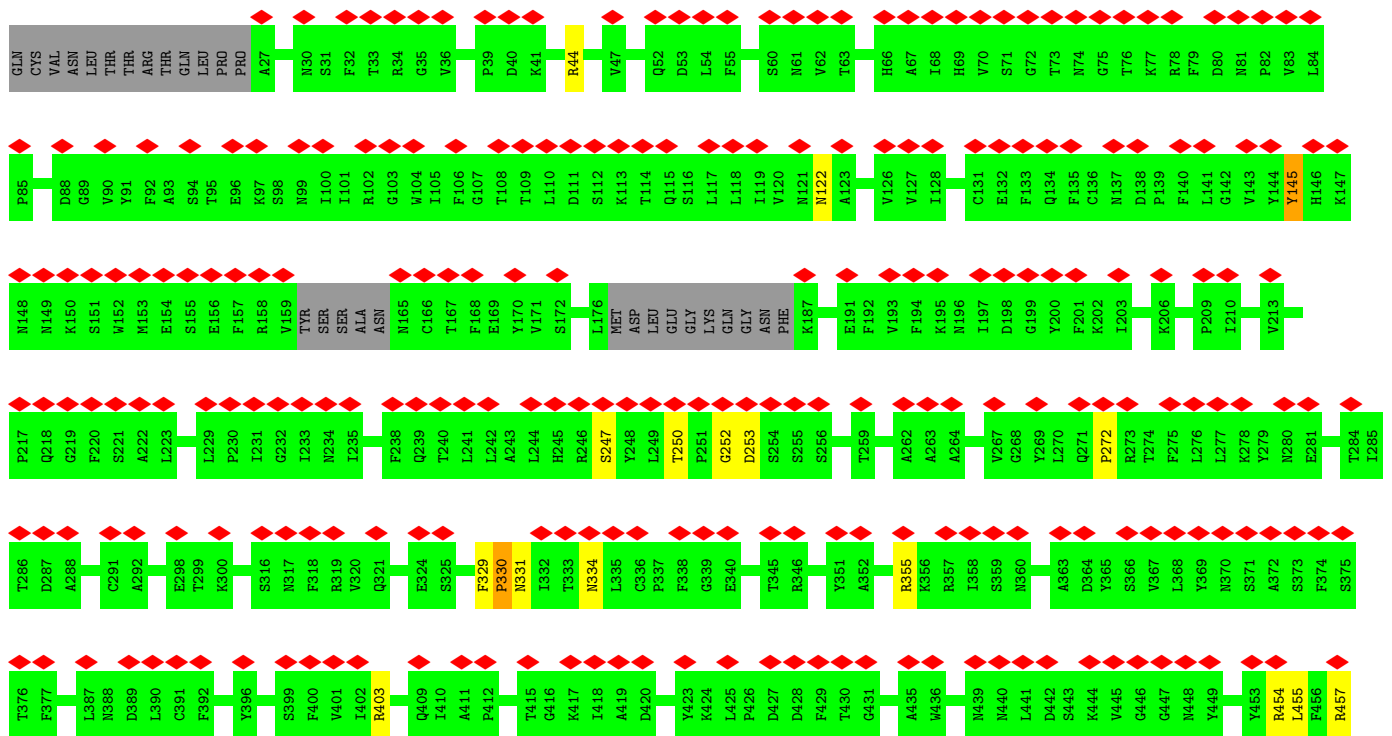
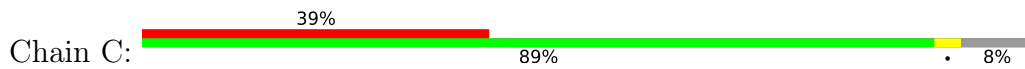


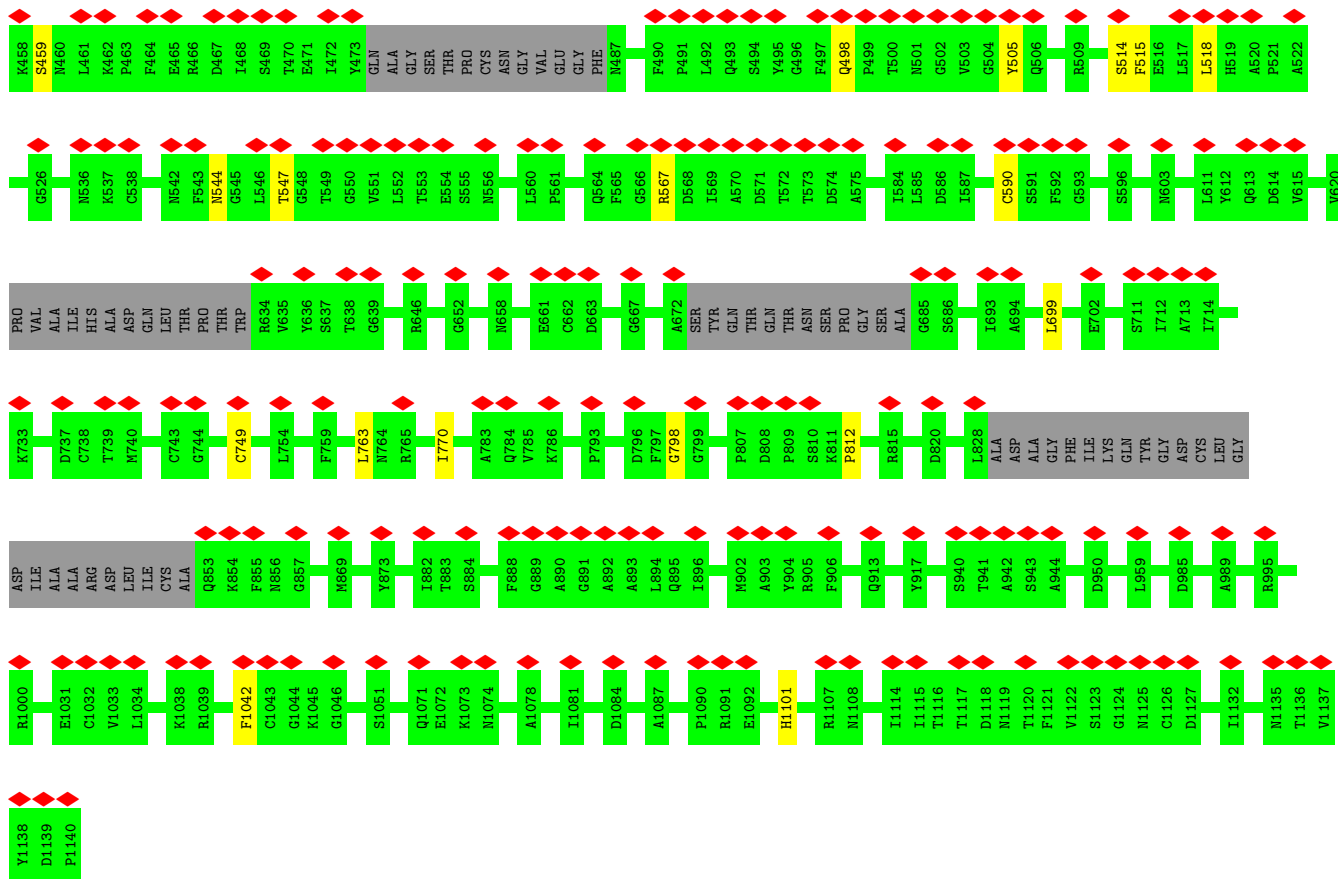
• Molecule 1: Spike glycoprotein





• Molecule 1: Spike glycoprotein





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



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



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



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



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



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



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



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



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



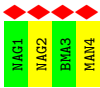
- Molecule 4: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



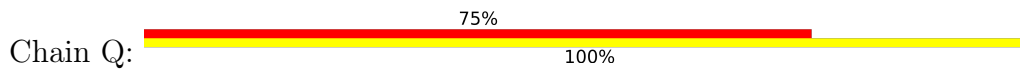
- Molecule 4: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 5: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 6: alpha-D-mannopyranose-(1-3)-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, C1	Depositor
Number of particles used	40162	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)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	165000	Depositor
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.032	Depositor
Minimum map value	-0.024	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.001	Depositor
Recommended contour level	0.00738	Depositor
Map size (Å)	354.24, 354.24, 354.24	wwPDB
Map dimensions	432, 432, 432	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.82, 0.82, 0.82	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MAN, FUC, 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	0.55	2/7900 (0.0%)	0.63	1/10764 (0.0%)
1	B	0.54	0/7839	0.62	0/10679
1	C	0.57	2/8069 (0.0%)	0.62	1/11005 (0.0%)
All	All	0.55	4/23808 (0.0%)	0.62	2/32448 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	330	PRO	N-CA	13.68	1.70	1.47
1	C	330	PRO	N-CA	13.67	1.70	1.47
1	A	329	PHE	C-N	6.05	1.45	1.34
1	C	329	PHE	C-N	6.05	1.45	1.34

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	330	PRO	CA-N-CD	-9.52	98.17	111.50
1	C	330	PRO	CA-N-CD	-8.38	99.76	111.50

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.



## 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	995/1127 (88%)	780 (78%)	205 (21%)	10 (1%)	13	49
1	B	988/1127 (88%)	770 (78%)	206 (21%)	12 (1%)	11	44
1	C	1023/1127 (91%)	780 (76%)	231 (23%)	12 (1%)	11	44
All	All	3006/3381 (89%)	2330 (78%)	642 (21%)	34 (1%)	15	46

5 of 34 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	329	PHE
1	B	538	CYS
1	C	145	TYR
1	C	330	PRO
1	C	498	GLN

### 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	838/976 (86%)	812 (97%)	26 (3%)	35	55
1	B	827/976 (85%)	809 (98%)	18 (2%)	47	66
1	C	850/976 (87%)	827 (97%)	23 (3%)	40	60
All	All	2515/2928 (86%)	2448 (97%)	67 (3%)	41	60

5 of 67 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	515	PHE
1	C	547	THR
1	C	1042	PHE
1	A	1058	HIS
1	A	1047	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 64 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	804	GLN
1	C	978	ASN
1	A	1054	GLN
1	A	1048	HIS
1	C	992	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](#)

33 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	E	1	1,2	14,14,15	0.42	0	17,19,21	0.49	0
2	NAG	E	2	2	14,14,15	0.47	0	17,19,21	1.24	1 (5%)
2	NAG	H	1	1,2	14,14,15	0.49	0	17,19,21	0.53	0
2	NAG	H	2	2	14,14,15	0.20	0	17,19,21	0.45	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	NAG	N	1	1,2	14,14,15	0.62	0	17,19,21	1.10	1 (5%)
2	NAG	N	2	2	14,14,15	0.40	0	17,19,21	0.36	0
6	NAG	Q	1	1,6	14,14,15	1.76	1 (7%)	17,19,21	1.54	3 (17%)
6	NAG	Q	2	6	14,14,15	0.29	0	17,19,21	0.78	1 (5%)
6	BMA	Q	3	6	11,11,12	0.85	1 (9%)	15,15,17	0.96	1 (6%)
6	MAN	Q	4	6	11,11,12	0.96	1 (9%)	15,15,17	1.66	2 (13%)
4	NAG	V	1	1,4	14,14,15	0.26	0	17,19,21	0.67	0
4	NAG	V	2	4	14,14,15	0.27	0	17,19,21	0.68	0
4	BMA	V	3	4	11,11,12	0.24	0	15,15,17	0.86	0
2	NAG	W	1	1,2	14,14,15	0.75	1 (7%)	17,19,21	0.73	0
2	NAG	W	2	2	14,14,15	0.85	2 (14%)	17,19,21	0.73	0
2	NAG	X	1	1,2	14,14,15	0.29	0	17,19,21	0.65	0
2	NAG	X	2	2	14,14,15	0.31	0	17,19,21	0.63	0
2	NAG	Z	1	1,2	14,14,15	0.61	1 (7%)	17,19,21	0.46	0
2	NAG	Z	2	2	14,14,15	0.29	0	17,19,21	0.57	0
2	NAG	d	1	1,2	14,14,15	0.52	0	17,19,21	0.61	0
2	NAG	d	2	2	14,14,15	0.16	0	17,19,21	0.85	1 (5%)
2	NAG	f	1	1,2	14,14,15	0.71	1 (7%)	17,19,21	0.48	0
2	NAG	f	2	2	14,14,15	0.35	0	17,19,21	0.50	0
5	NAG	h	1	1,5	14,14,15	0.36	0	17,19,21	0.74	0
5	NAG	h	2	5	14,14,15	0.25	0	17,19,21	0.82	1 (5%)
5	BMA	h	3	5	11,11,12	0.74	0	15,15,17	0.85	0
5	MAN	h	4	5	11,11,12	0.82	1 (9%)	15,15,17	1.39	3 (20%)
3	NAG	k	1	1,3	14,14,15	0.32	0	17,19,21	0.54	0
3	NAG	k	2	3	14,14,15	0.42	0	17,19,21	0.99	1 (5%)
3	FUC	k	3	3	10,10,11	0.88	0	14,14,16	1.80	2 (14%)
4	NAG	p	1	1,4	14,14,15	0.37	0	17,19,21	0.78	0
4	NAG	p	2	4	14,14,15	0.33	0	17,19,21	0.66	0
4	BMA	p	3	4	11,11,12	0.27	0	15,15,17	0.70	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. <sup>1,2</sup> means no outliers of that kind were identified.

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	H	2	2	-	4/6/23/26	0/1/1/1
2	NAG	N	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	N	2	2	-	2/6/23/26	0/1/1/1
6	NAG	Q	1	1,6	-	5/6/23/26	0/1/1/1
6	NAG	Q	2	6	-	3/6/23/26	0/1/1/1
6	BMA	Q	3	6	-	2/2/19/22	0/1/1/1
6	MAN	Q	4	6	-	0/2/19/22	0/1/1/1
4	NAG	V	1	1,4	-	3/6/23/26	0/1/1/1
4	NAG	V	2	4	-	0/6/23/26	0/1/1/1
4	BMA	V	3	4	-	0/2/19/22	0/1/1/1
2	NAG	W	1	1,2	-	3/6/23/26	0/1/1/1
2	NAG	W	2	2	-	2/6/23/26	0/1/1/1
2	NAG	X	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	X	2	2	-	5/6/23/26	0/1/1/1
2	NAG	Z	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	Z	2	2	-	3/6/23/26	0/1/1/1
2	NAG	d	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	d	2	2	-	1/6/23/26	0/1/1/1
2	NAG	f	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	f	2	2	-	4/6/23/26	0/1/1/1
5	NAG	h	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	h	2	5	-	1/6/23/26	0/1/1/1
5	BMA	h	3	5	-	0/2/19/22	0/1/1/1
5	MAN	h	4	5	-	1/2/19/22	0/1/1/1
3	NAG	k	1	1,3	-	4/6/23/26	0/1/1/1
3	NAG	k	2	3	-	3/6/23/26	0/1/1/1
3	FUC	k	3	3	-	-	0/1/1/1
4	NAG	p	1	1,4	-	3/6/23/26	0/1/1/1
4	NAG	p	2	4	-	5/6/23/26	0/1/1/1
4	BMA	p	3	4	-	2/2/19/22	0/1/1/1

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	Q	1	NAG	O5-C1	-6.50	1.33	1.43
2	W	1	NAG	O5-C1	-2.75	1.39	1.43
5	h	4	MAN	C1-C2	2.31	1.57	1.52
2	Z	1	NAG	O5-C1	-2.19	1.40	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	W	2	NAG	C1-C2	2.15	1.55	1.52

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	Q	4	MAN	C1-O5-C5	4.68	118.53	112.19
6	Q	1	NAG	C2-N2-C7	4.30	129.03	122.90
2	E	2	NAG	C2-N2-C7	4.19	128.87	122.90
3	k	3	FUC	C1-O5-C5	4.01	121.87	112.78
3	k	3	FUC	O5-C5-C4	3.88	116.48	109.52

There are no chirality outliers.

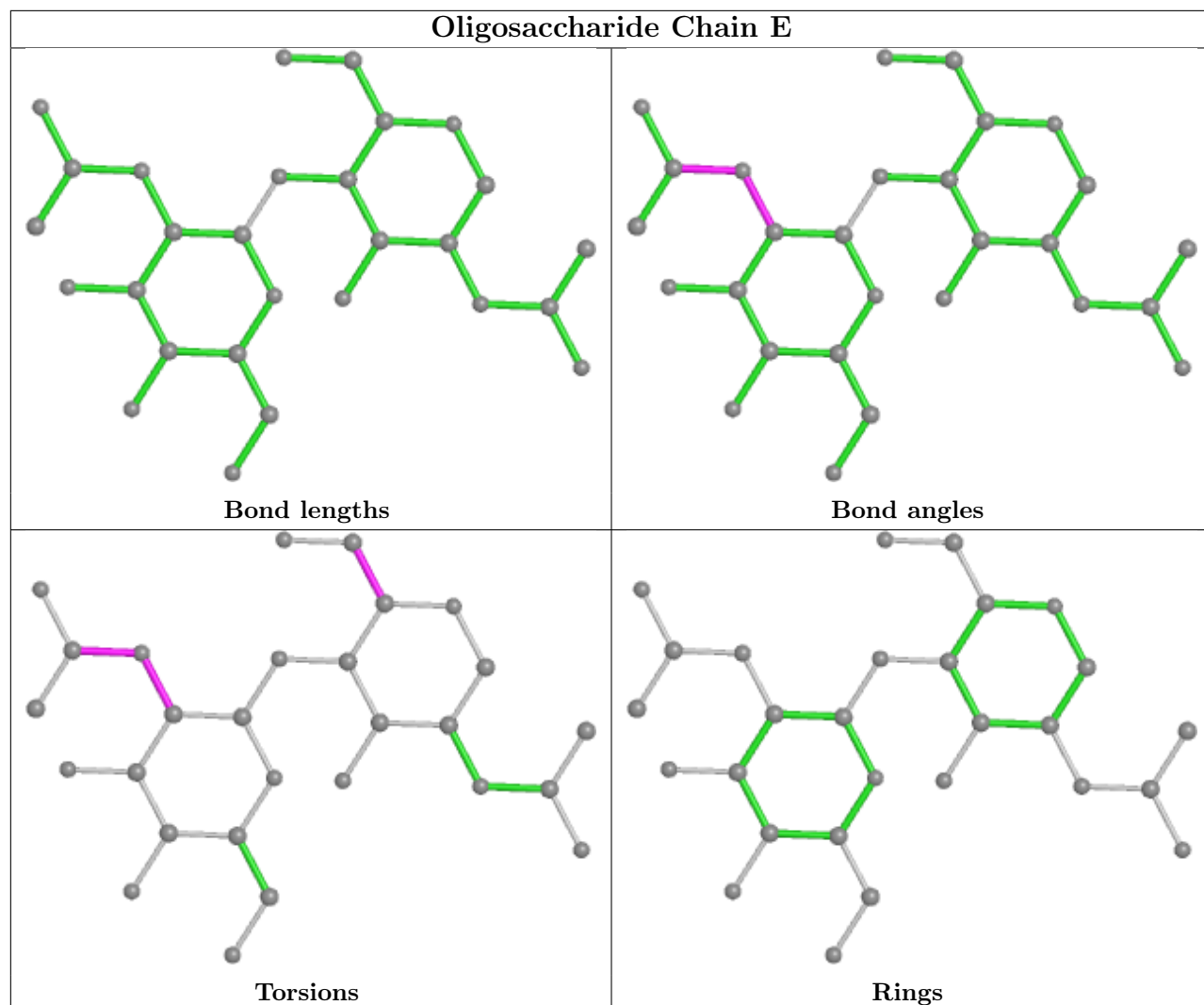
5 of 76 torsion outliers are listed below:

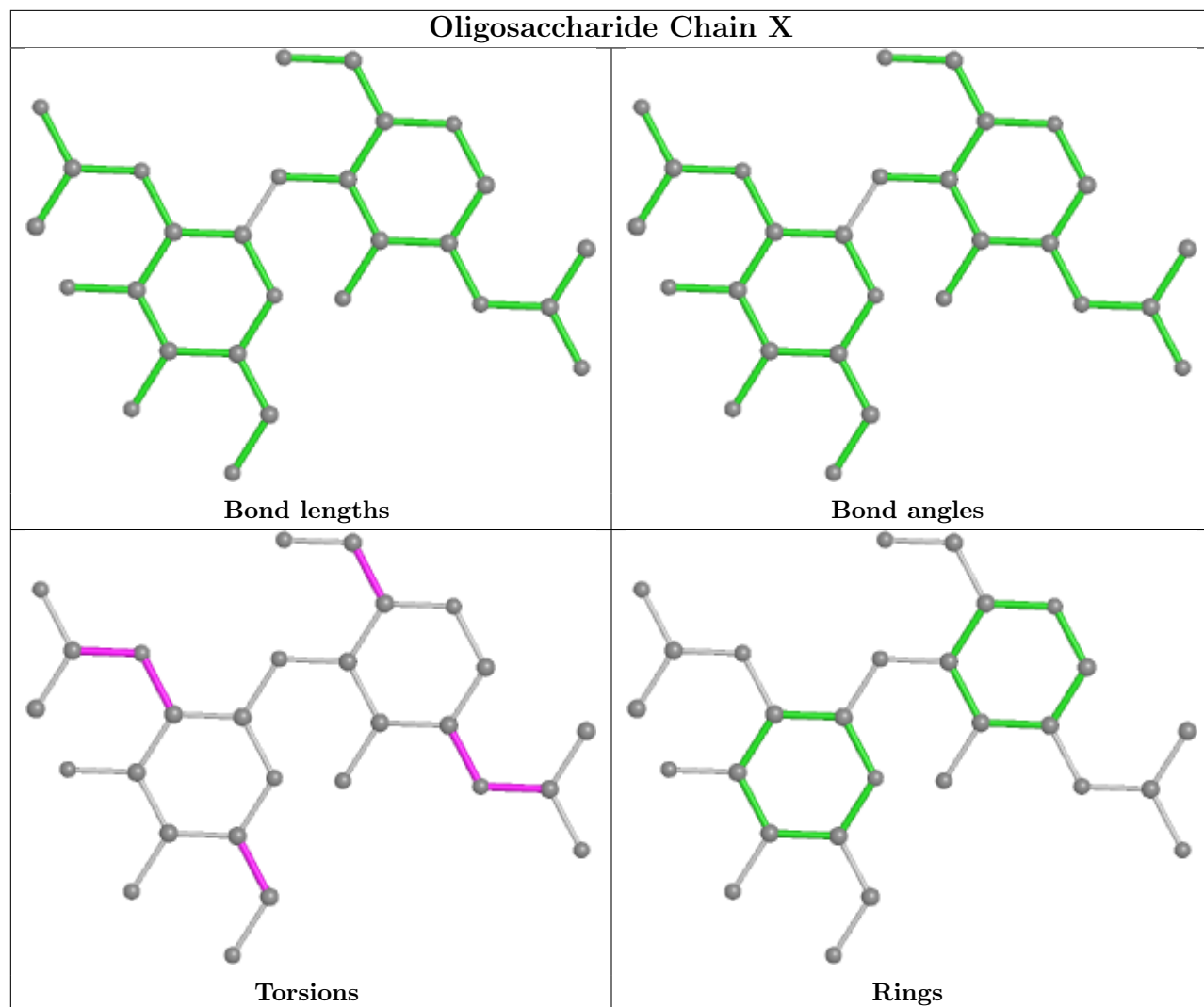
Mol	Chain	Res	Type	Atoms
2	X	1	NAG	C3-C2-N2-C7
2	X	1	NAG	O7-C7-N2-C2
4	p	2	NAG	C3-C2-N2-C7
4	V	1	NAG	C3-C2-N2-C7
4	V	1	NAG	C8-C7-N2-C2

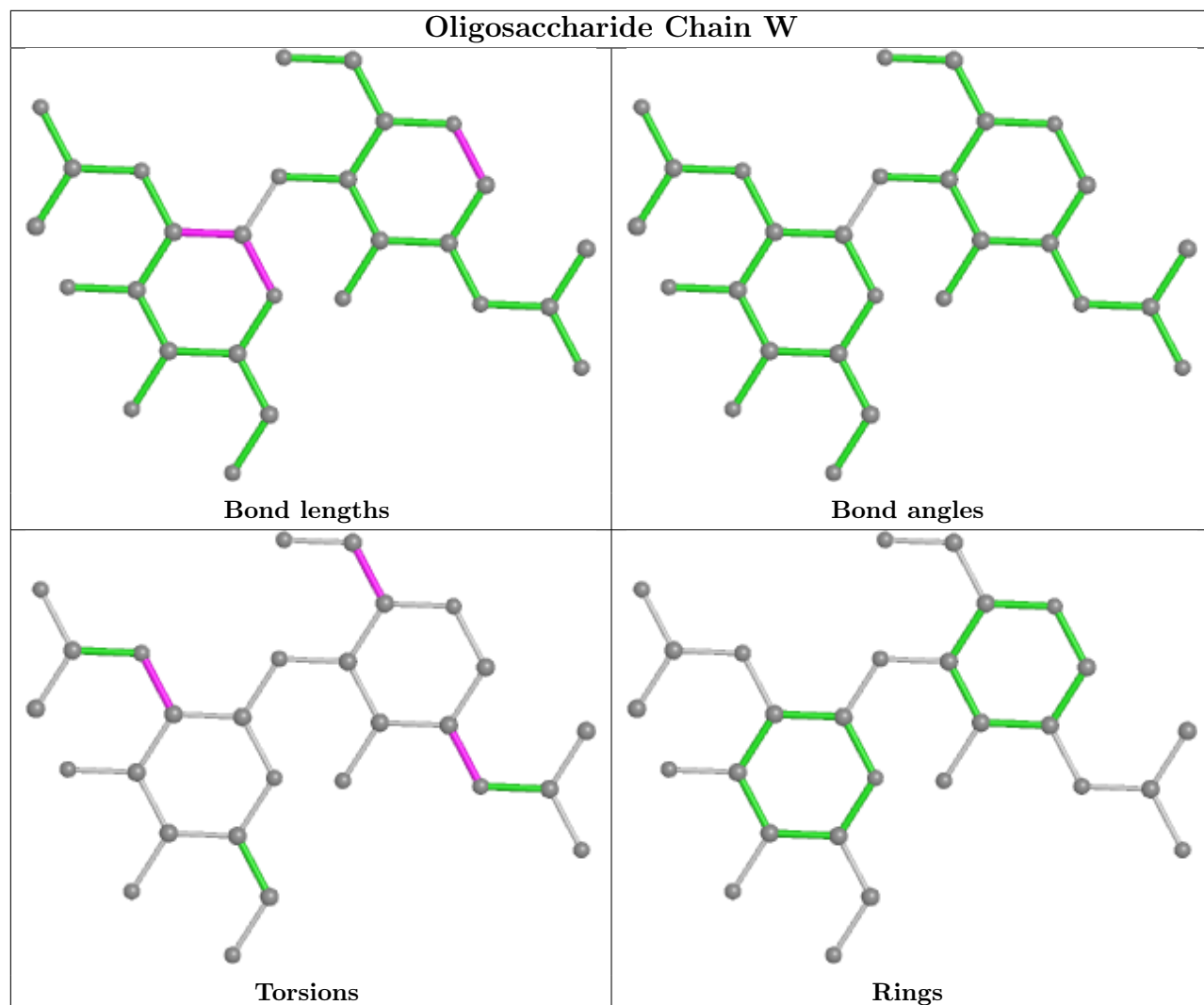
There are no ring outliers.

No monomer is involved in short contacts.

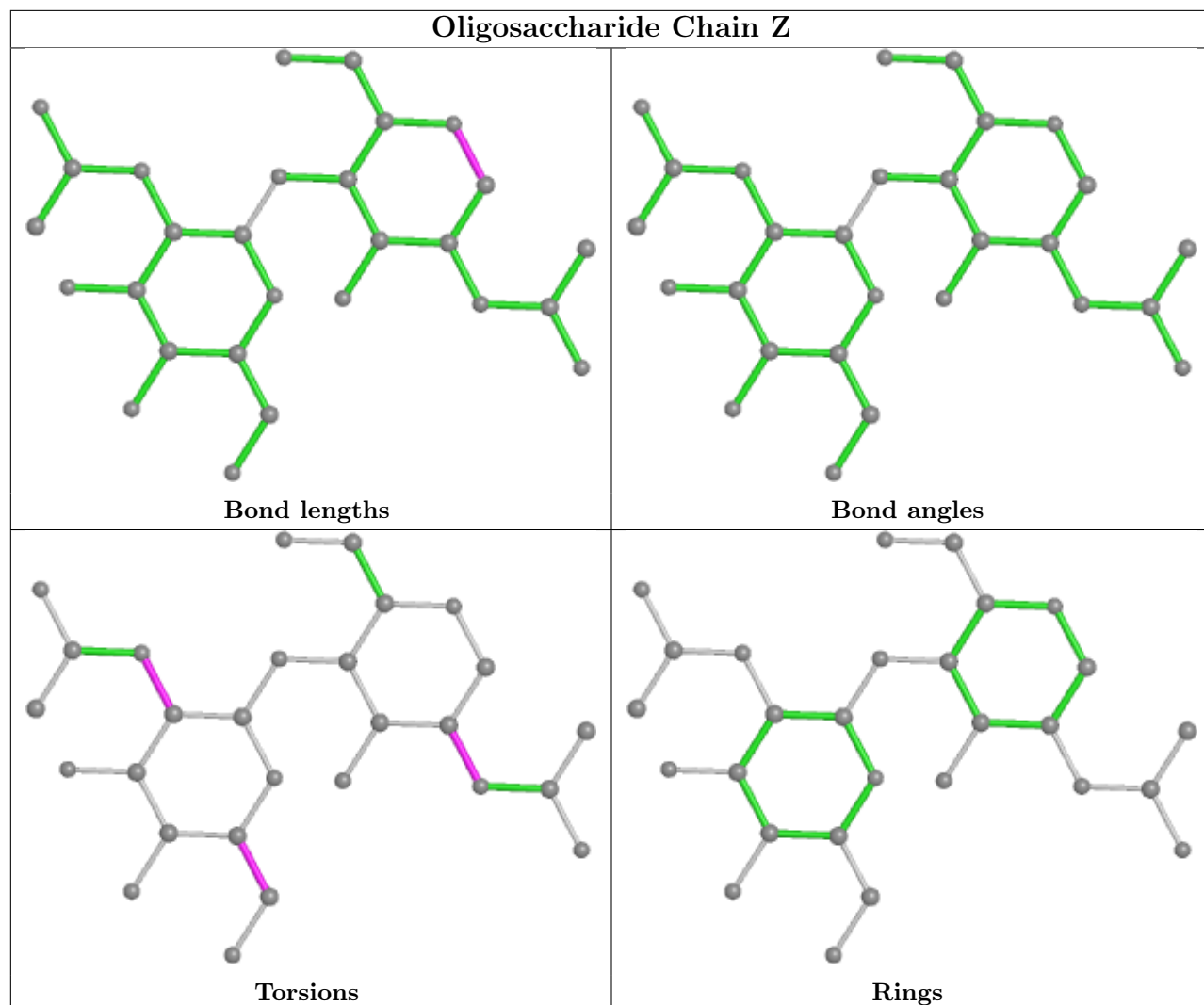
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

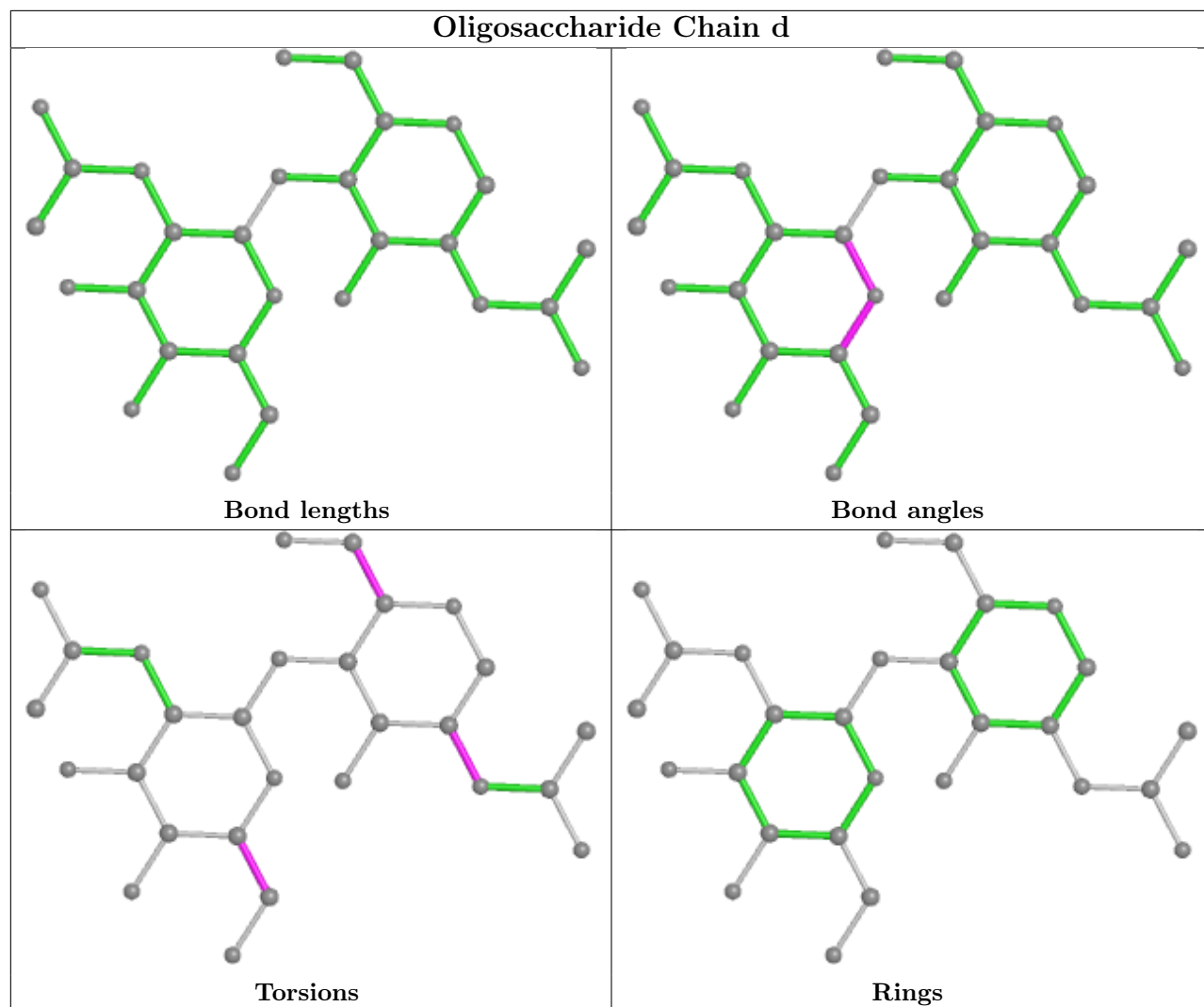


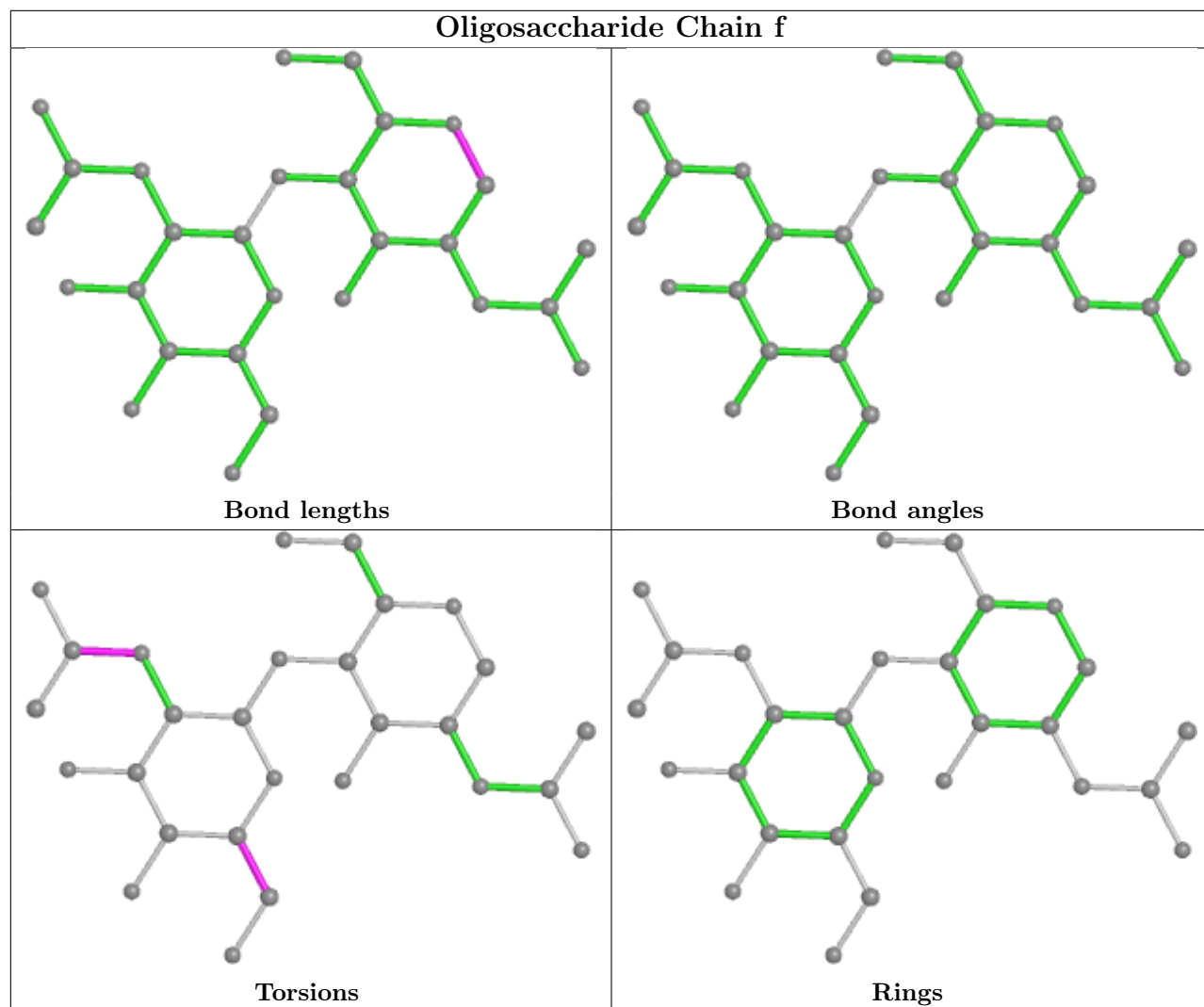


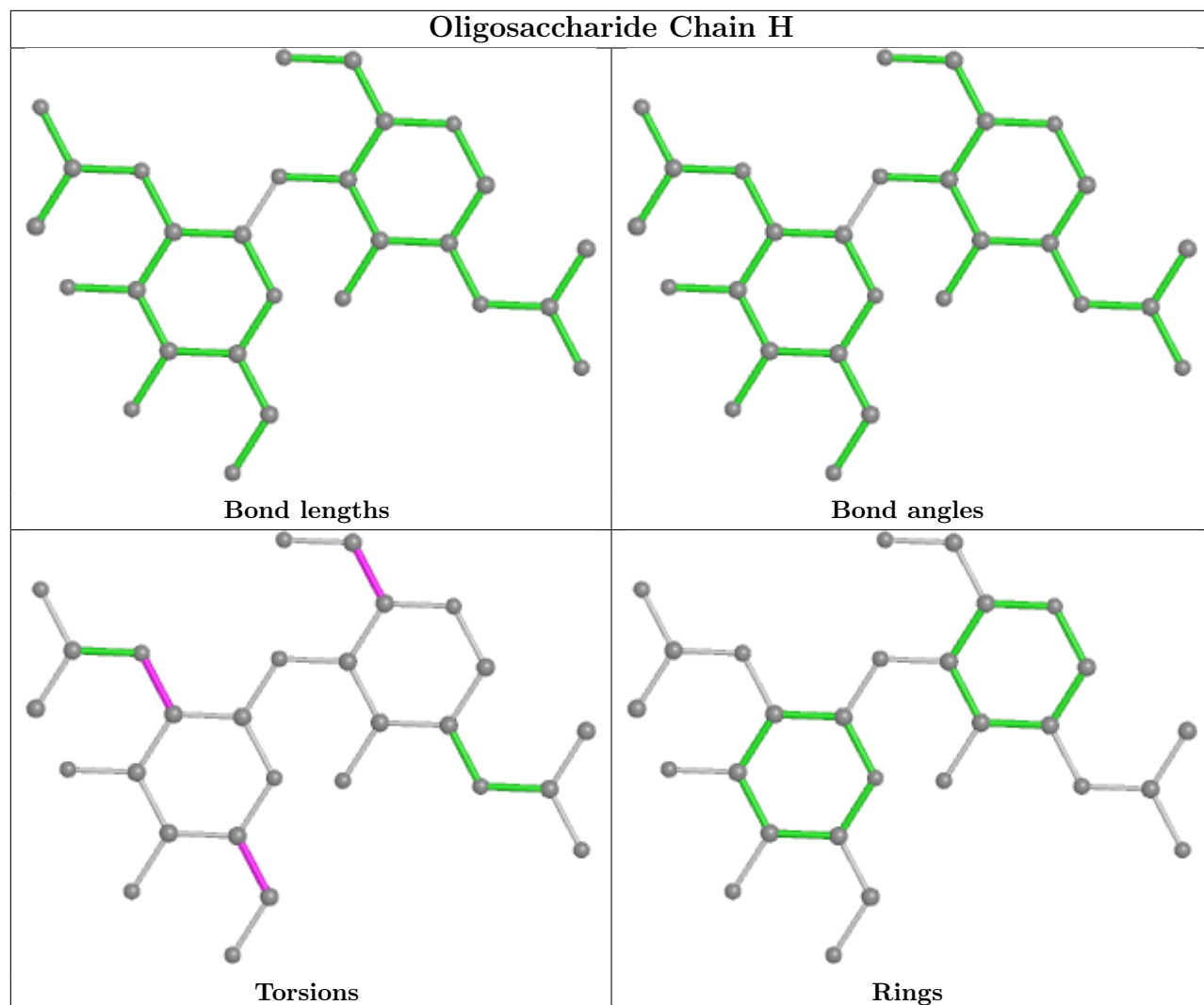


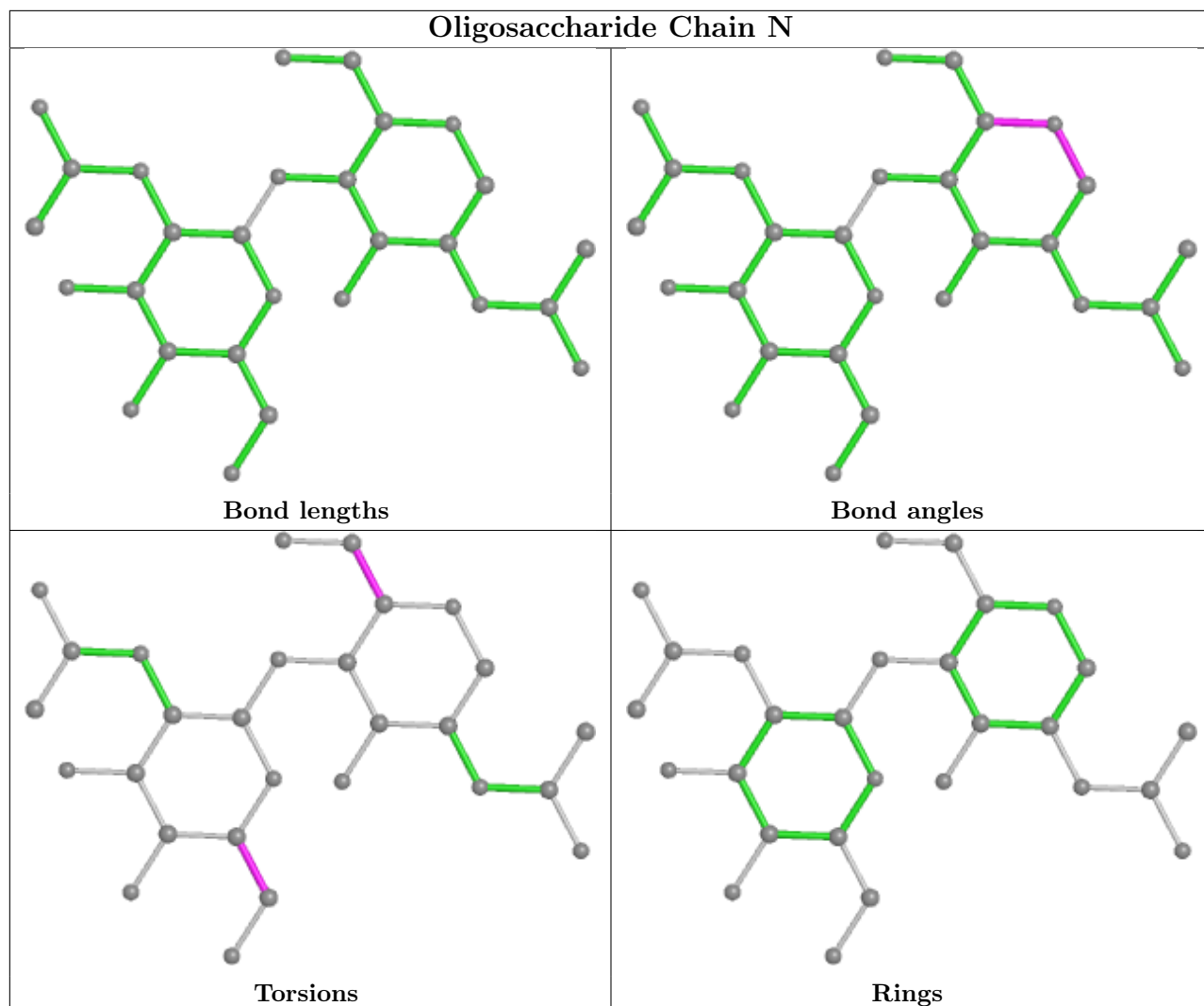


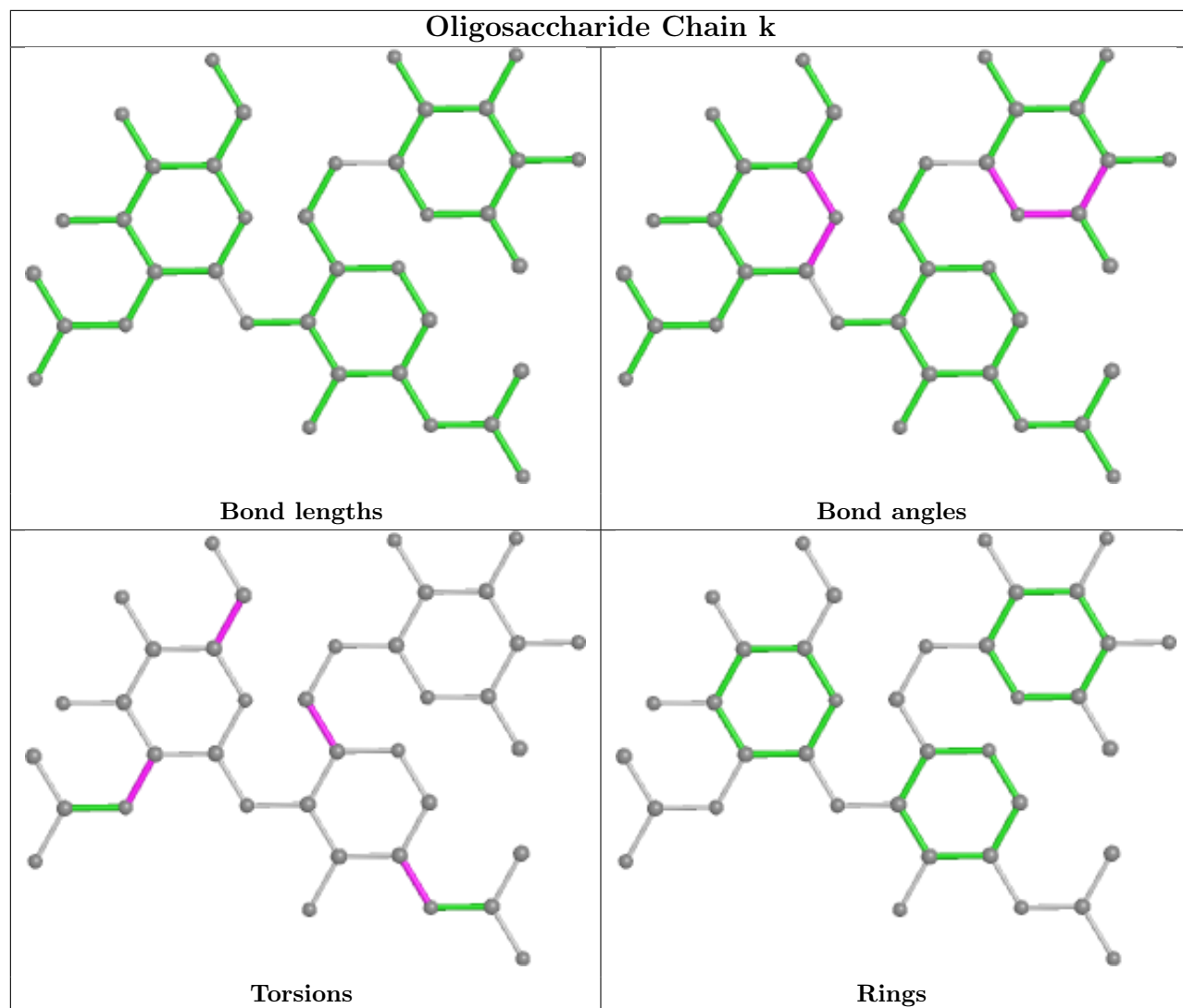


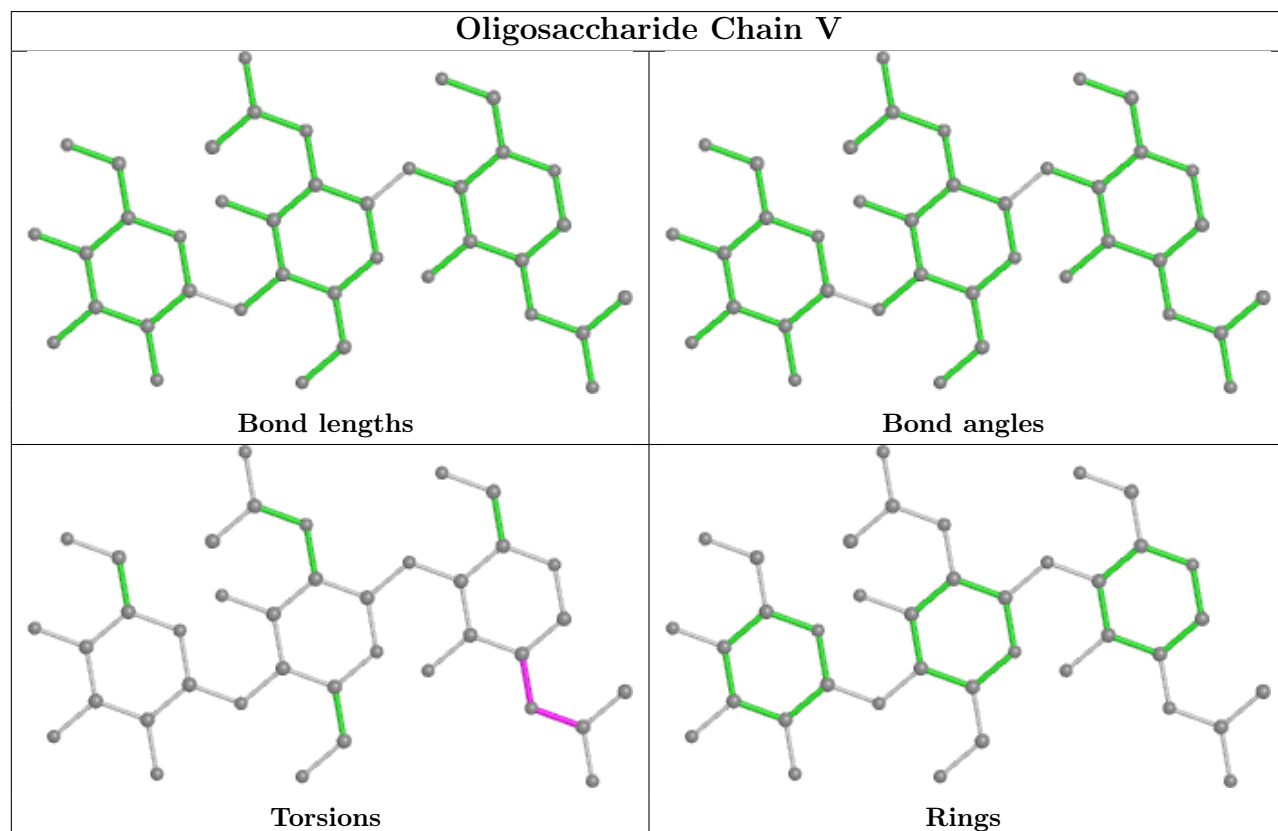
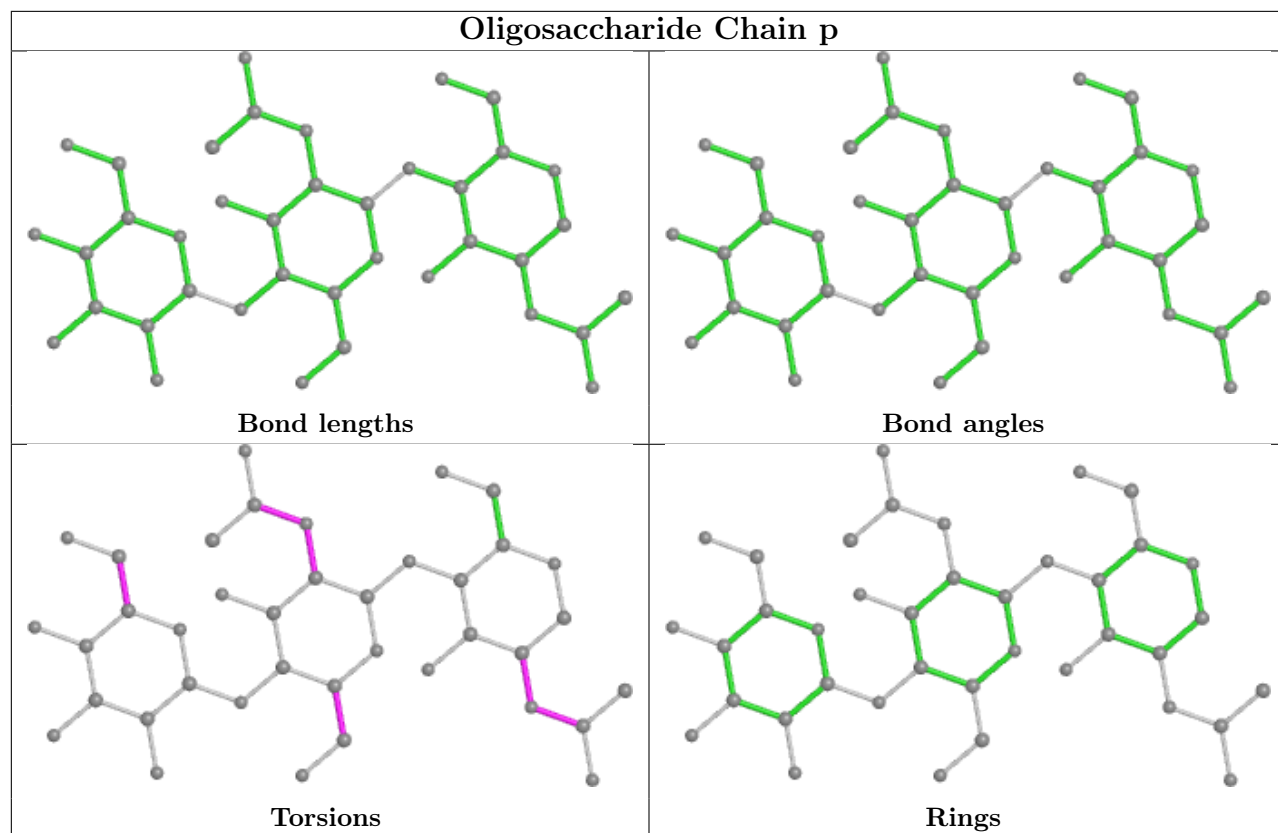


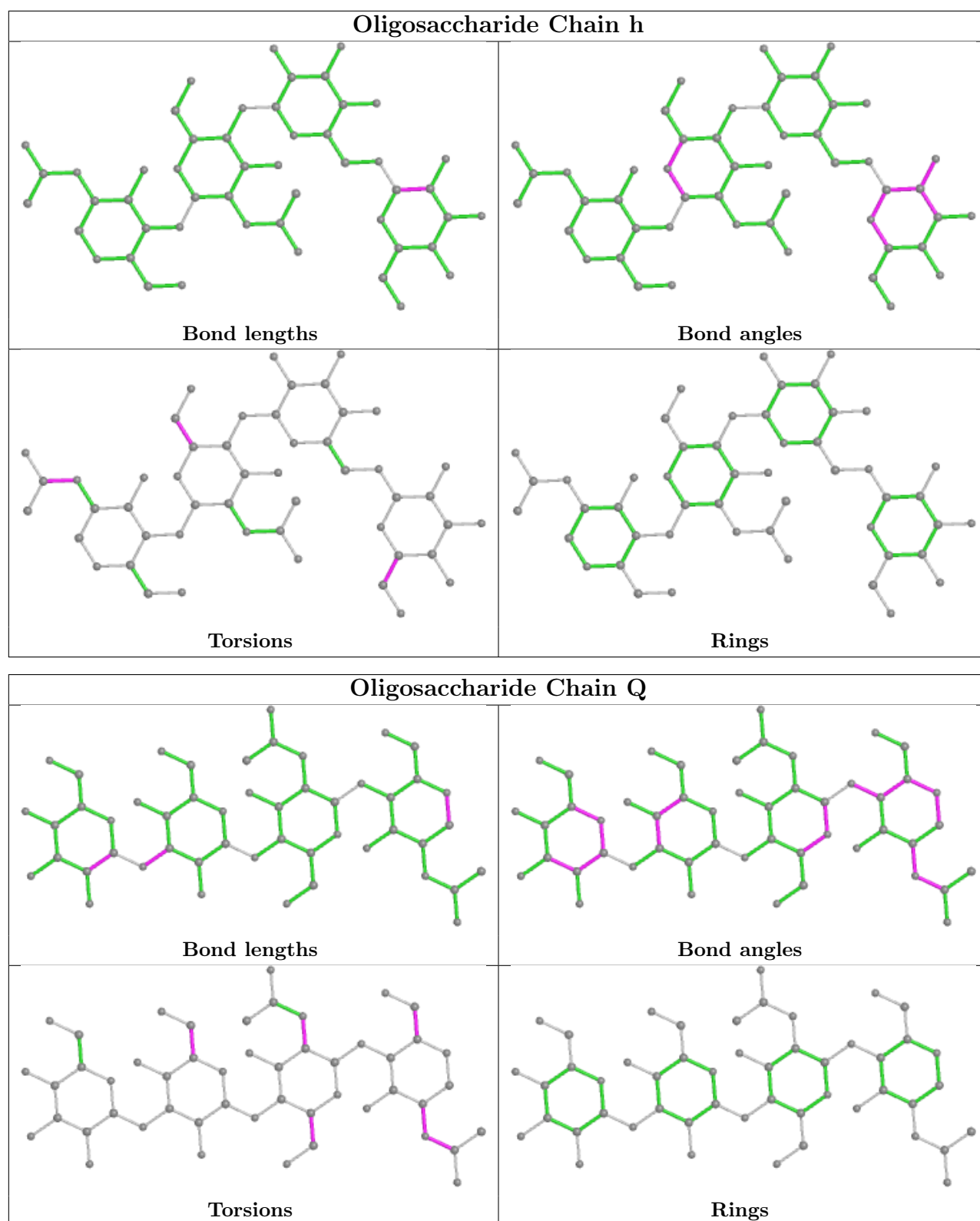












## 5.6 Ligand geometry [i](#)

23 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	1202	1	14,14,15	0.69	1 (7%)	17,19,21	1.25	2 (11%)
7	NAG	A	1202	1	14,14,15	0.20	0	17,19,21	0.55	0
7	NAG	B	1203	1	14,14,15	0.59	1 (7%)	17,19,21	0.54	0
7	NAG	B	1208	1	14,14,15	0.80	1 (7%)	17,19,21	0.52	0
7	NAG	B	1201	1	14,14,15	0.27	0	17,19,21	0.62	0
7	NAG	A	1205	1	14,14,15	0.40	0	17,19,21	1.41	2 (11%)
7	NAG	B	1202	1	14,14,15	0.39	0	17,19,21	0.61	0
7	NAG	B	1205	1	14,14,15	1.65	1 (7%)	17,19,21	0.97	1 (5%)
7	NAG	C	1203	1	14,14,15	0.38	0	17,19,21	0.45	0
7	NAG	C	1207	1	14,14,15	0.26	0	17,19,21	0.72	0
7	NAG	B	1209	1	14,14,15	0.27	0	17,19,21	0.69	0
7	NAG	B	1204	1	14,14,15	0.47	0	17,19,21	1.23	1 (5%)
7	NAG	A	1204	1	14,14,15	0.23	0	17,19,21	0.64	0
7	NAG	C	1201	1	14,14,15	0.22	0	17,19,21	0.55	0
7	NAG	C	1206	1	14,14,15	0.49	0	17,19,21	1.17	2 (11%)
7	NAG	A	1203	1	14,14,15	0.29	0	17,19,21	0.61	0
7	NAG	A	1201	1	14,14,15	0.59	0	17,19,21	0.80	0
7	NAG	A	1206	1	14,14,15	0.27	0	17,19,21	0.46	0
7	NAG	B	1206	1	14,14,15	0.21	0	17,19,21	0.70	1 (5%)
7	NAG	C	1204	-	14,14,15	0.33	0	17,19,21	0.79	1 (5%)
7	NAG	C	1205	1	14,14,15	0.30	0	17,19,21	0.58	0
7	NAG	A	1207	1	14,14,15	0.92	1 (7%)	17,19,21	1.41	2 (11%)
7	NAG	B	1207	1	14,14,15	0.29	0	17,19,21	0.40	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	1202	1	-	5/6/23/26	0/1/1/1
7	NAG	A	1202	1	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	B	1203	1	-	4/6/23/26	0/1/1/1
7	NAG	B	1208	1	-	2/6/23/26	0/1/1/1
7	NAG	B	1201	1	-	3/6/23/26	0/1/1/1
7	NAG	A	1205	1	-	3/6/23/26	0/1/1/1
7	NAG	B	1202	1	-	2/6/23/26	0/1/1/1
7	NAG	B	1205	1	-	4/6/23/26	0/1/1/1
7	NAG	C	1203	1	-	4/6/23/26	0/1/1/1
7	NAG	C	1207	1	-	0/6/23/26	0/1/1/1
7	NAG	B	1209	1	-	1/6/23/26	0/1/1/1
7	NAG	B	1204	1	-	5/6/23/26	0/1/1/1
7	NAG	A	1204	1	-	2/6/23/26	0/1/1/1
7	NAG	C	1201	1	-	2/6/23/26	0/1/1/1
7	NAG	C	1206	1	-	3/6/23/26	0/1/1/1
7	NAG	A	1203	1	-	0/6/23/26	0/1/1/1
7	NAG	A	1201	1	-	3/6/23/26	0/1/1/1
7	NAG	A	1206	1	-	1/6/23/26	0/1/1/1
7	NAG	B	1206	1	-	2/6/23/26	0/1/1/1
7	NAG	C	1204	-	-	1/6/23/26	0/1/1/1
7	NAG	C	1205	1	-	4/6/23/26	0/1/1/1
7	NAG	A	1207	1	-	4/6/23/26	0/1/1/1
7	NAG	B	1207	1	-	2/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	1205	NAG	O5-C1	-5.83	1.34	1.43
7	A	1207	NAG	C1-C2	3.03	1.56	1.52
7	B	1208	NAG	O5-C1	-2.58	1.39	1.43
7	C	1202	NAG	O5-C1	-2.36	1.40	1.43
7	B	1203	NAG	C1-C2	2.01	1.55	1.52

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	1205	NAG	C2-N2-C7	4.43	129.22	122.90
7	B	1204	NAG	C2-N2-C7	4.26	128.97	122.90
7	C	1202	NAG	C2-N2-C7	4.11	128.75	122.90
7	A	1207	NAG	C2-N2-C7	3.85	128.38	122.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	C	1206	NAG	C2-N2-C7	3.51	127.90	122.90

There are no chirality outliers.

5 of 59 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	1209	NAG	C3-C2-N2-C7
7	B	1208	NAG	O5-C5-C6-O6
7	A	1202	NAG	C4-C5-C6-O6
7	B	1204	NAG	O5-C5-C6-O6
7	B	1206	NAG	C4-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

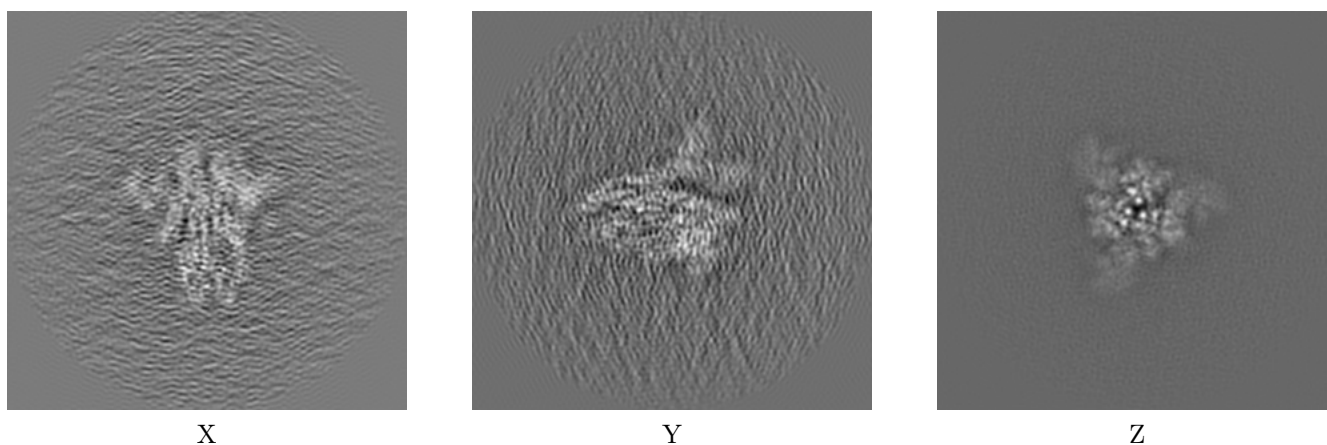
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-30419. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

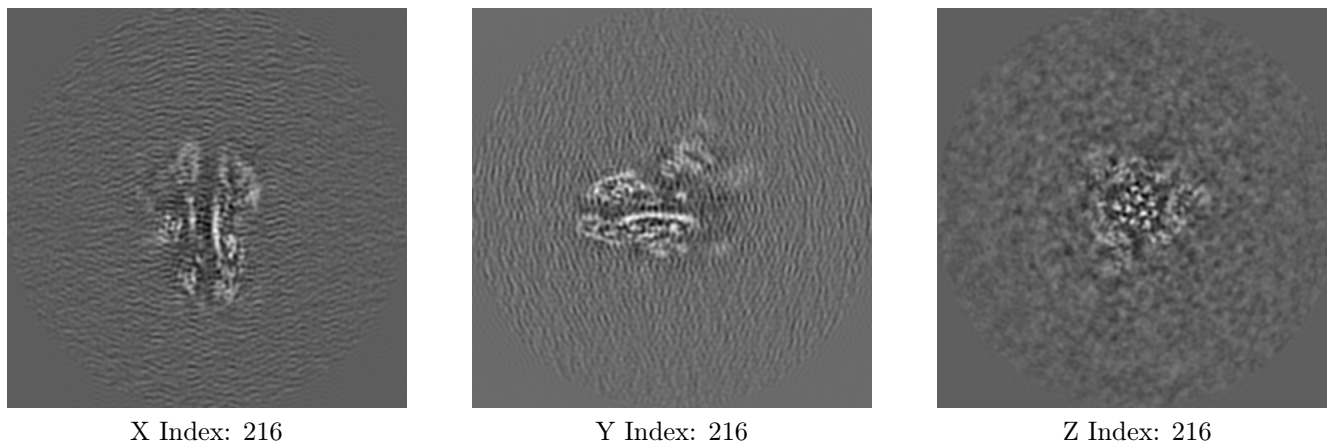
#### 6.1.1 Primary map



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

### 6.2 Central slices [i](#)

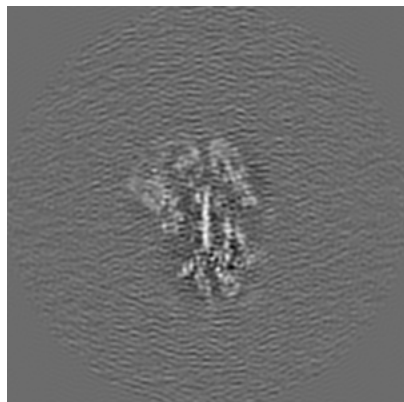
#### 6.2.1 Primary map



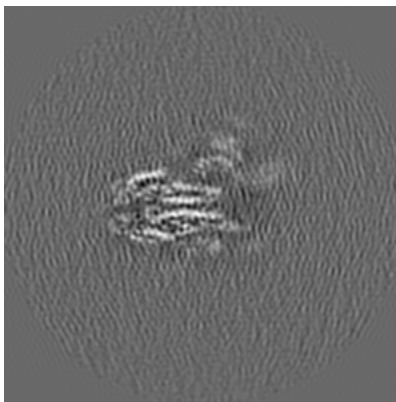
The images above show central slices of the map in three orthogonal directions.

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

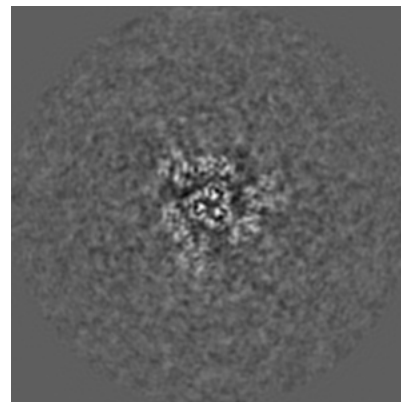
### 6.3.1 Primary map



X Index: 207



Y Index: 213

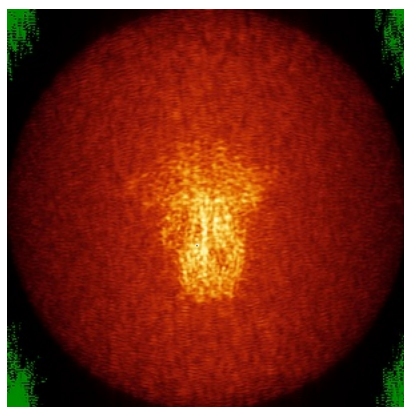


Z Index: 224

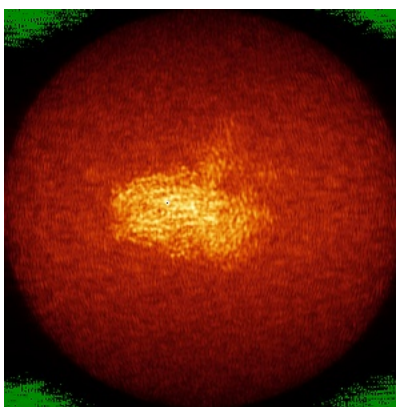
The images above show the largest variance slices of the map in three orthogonal directions.

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

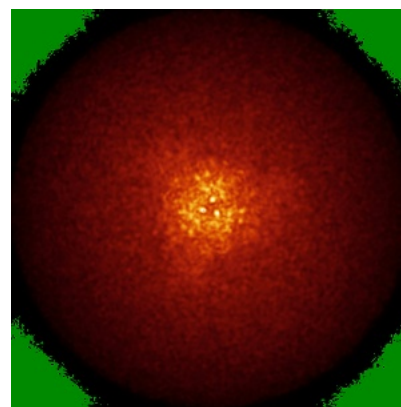
### 6.4.1 Primary map



X



Y

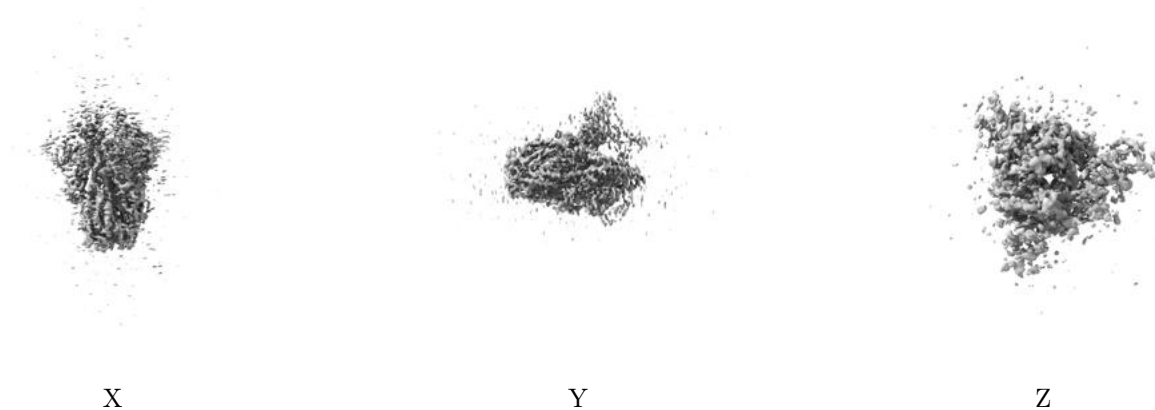


Z

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

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

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.00738. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

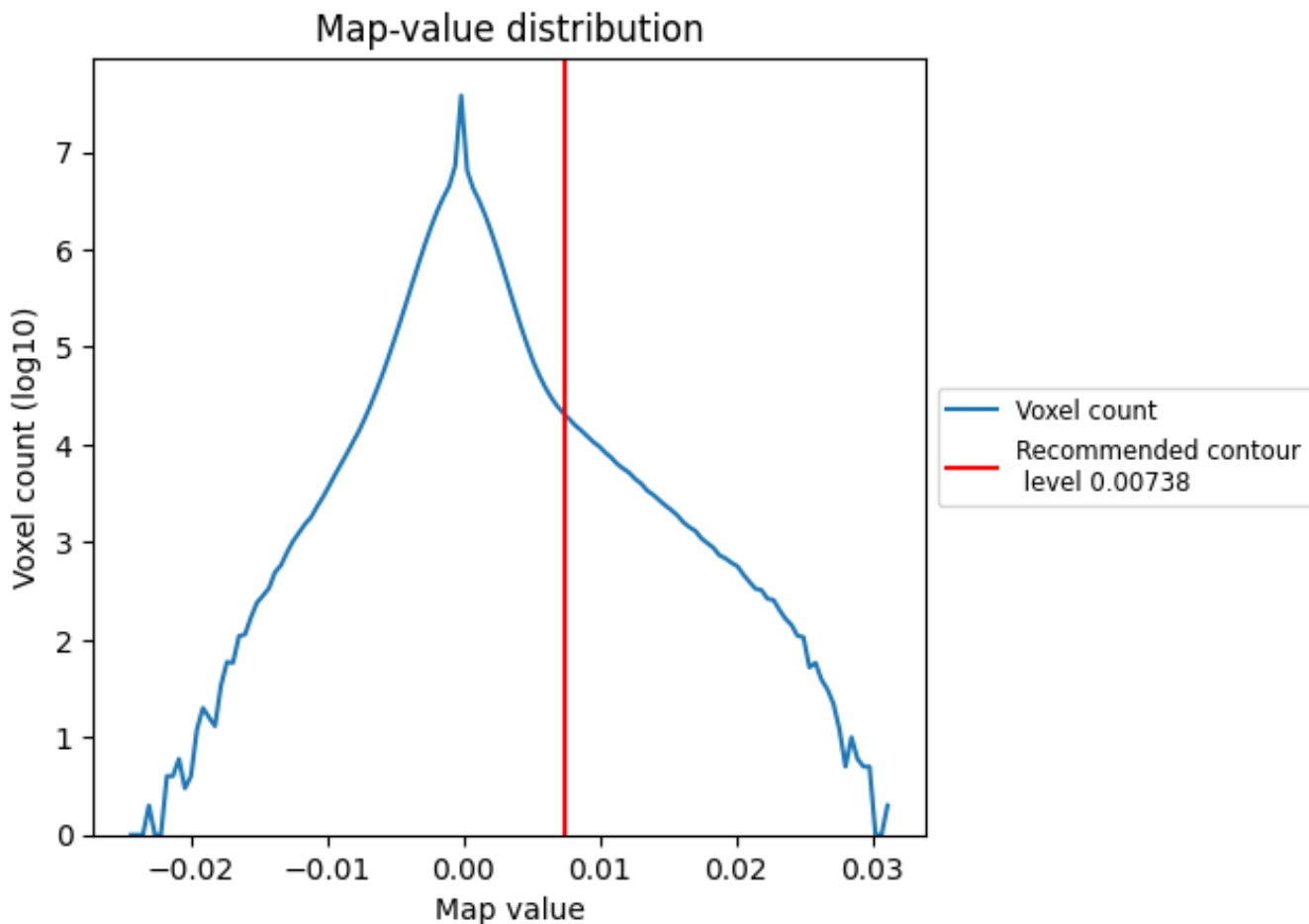
## 6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

## 7 Map analysis [i](#)

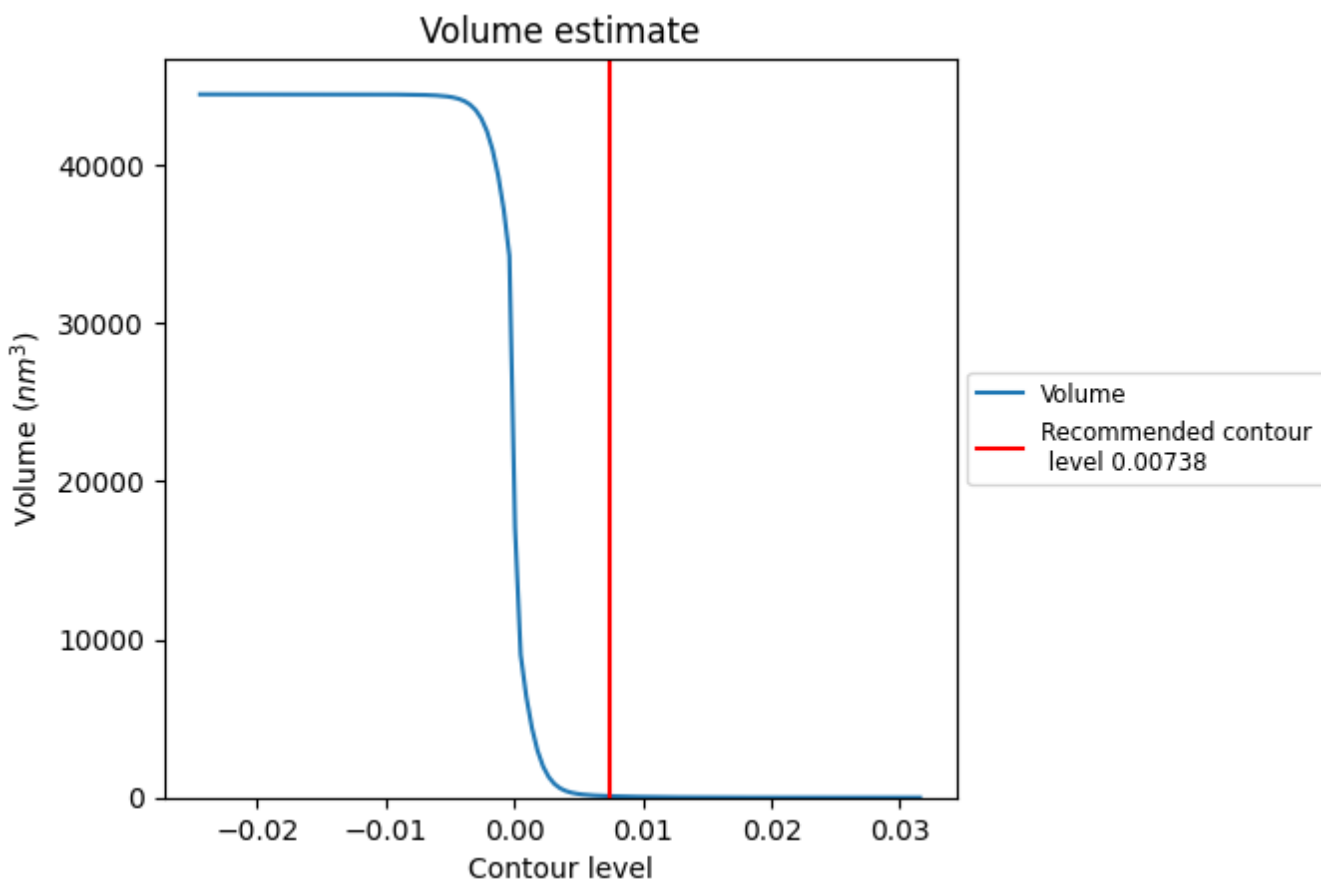
This section contains the results of statistical analysis of the map.

### 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](#)

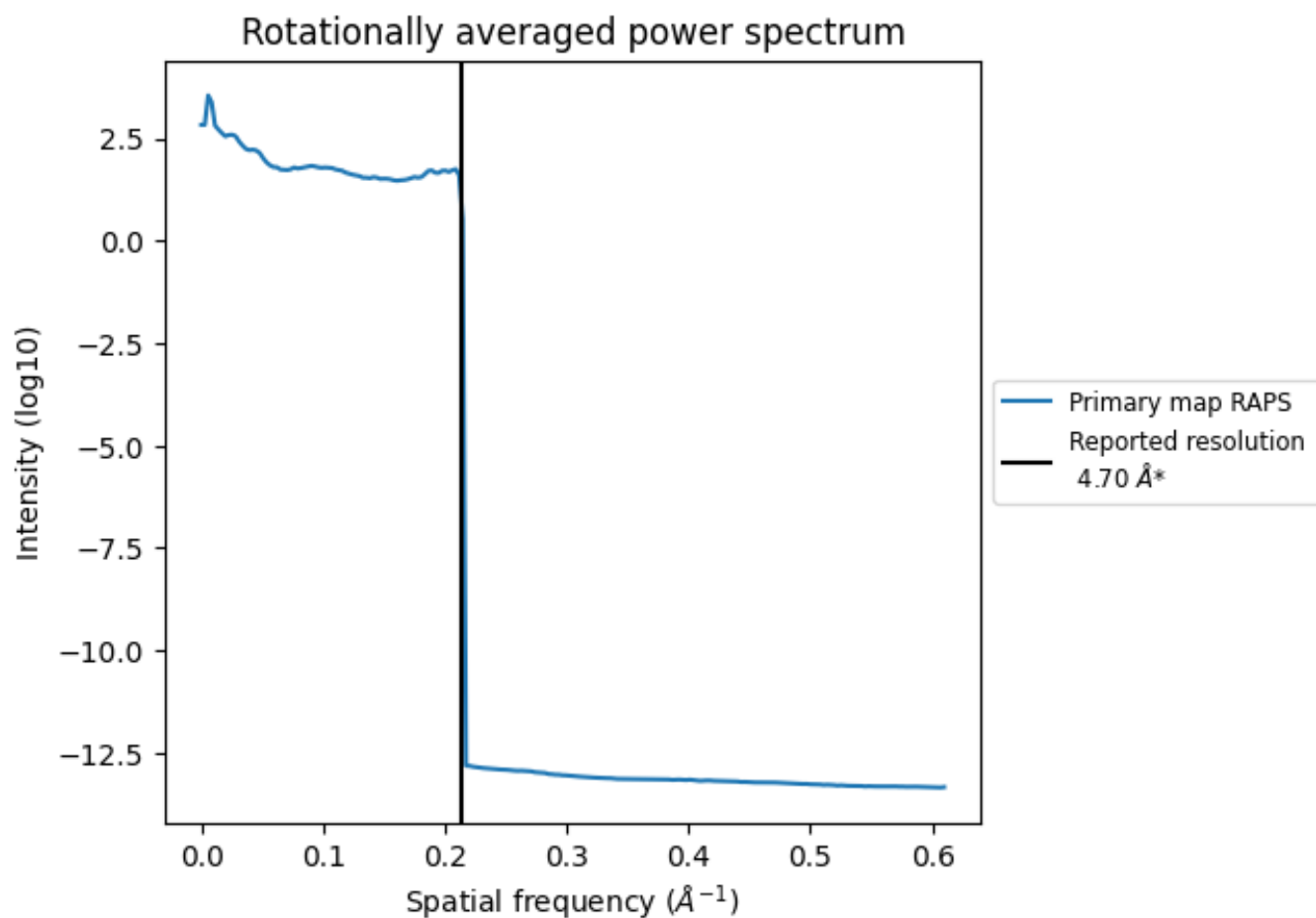


The volume at the recommended contour level is 92 nm<sup>3</sup>; this corresponds to an approximate mass of 84 kDa.

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 0.213 Å<sup>-1</sup>

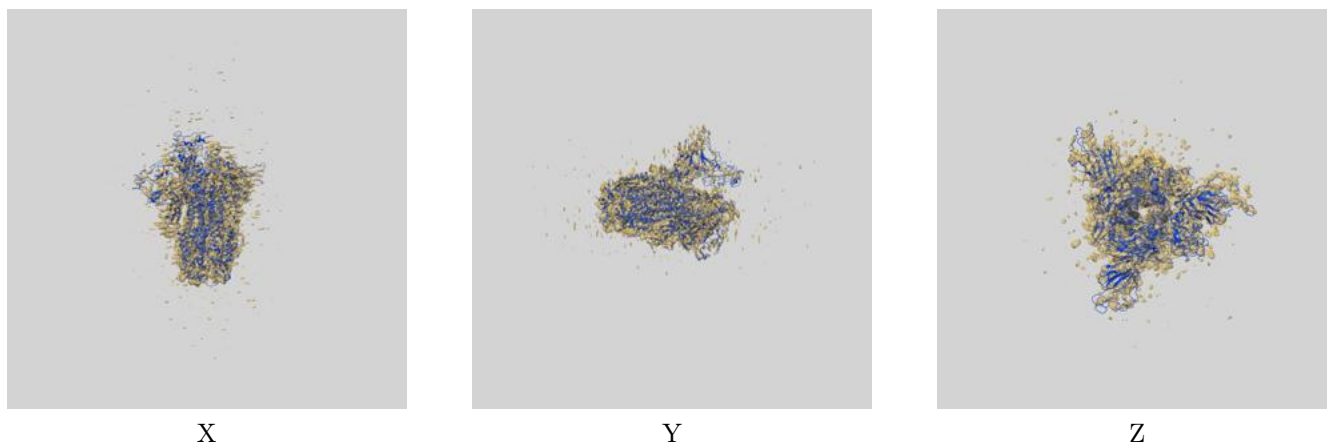
## 8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

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

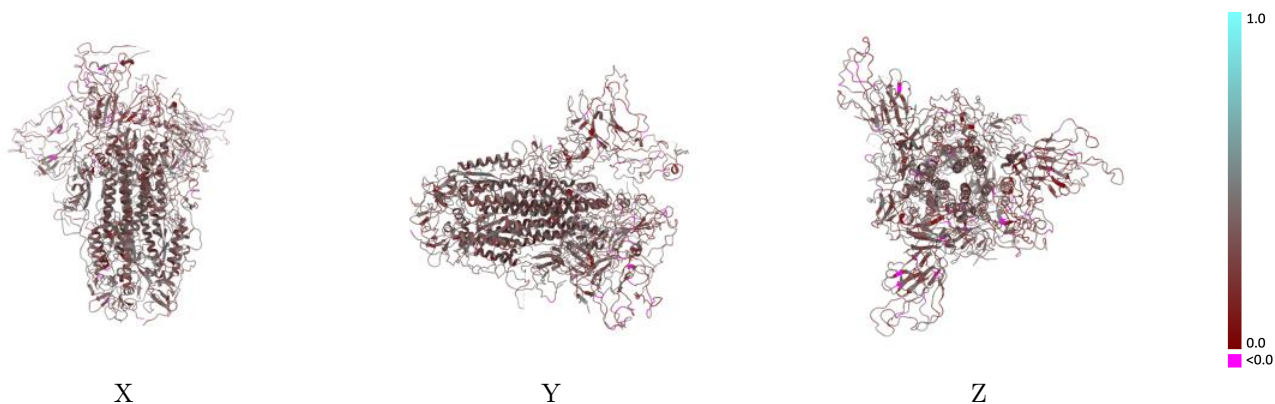
This section contains information regarding the fit between EMDB map EMD-30419 and PDB model 7CN9. Per-residue inclusion information can be found in section 3 on page 9.

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



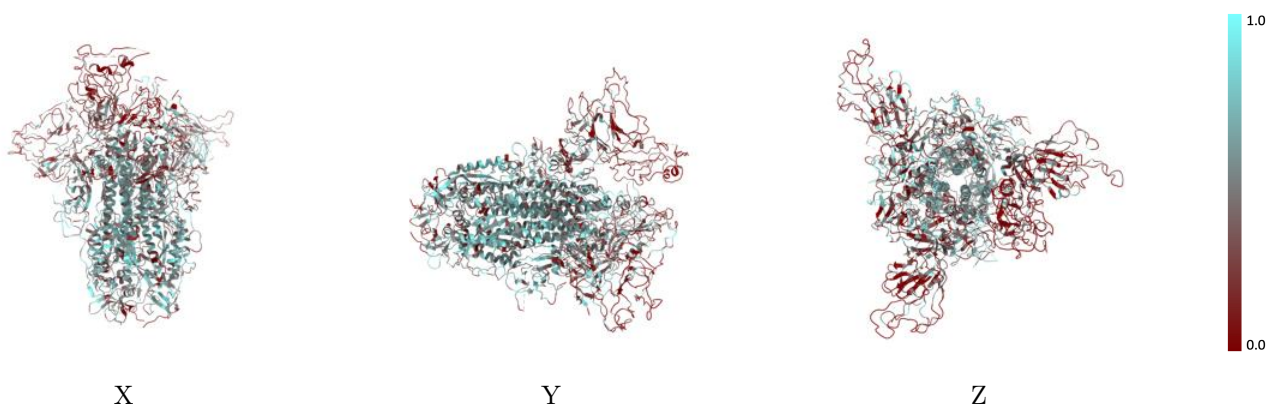
The images above show the 3D surface view of the map at the recommended contour level 0.00738 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



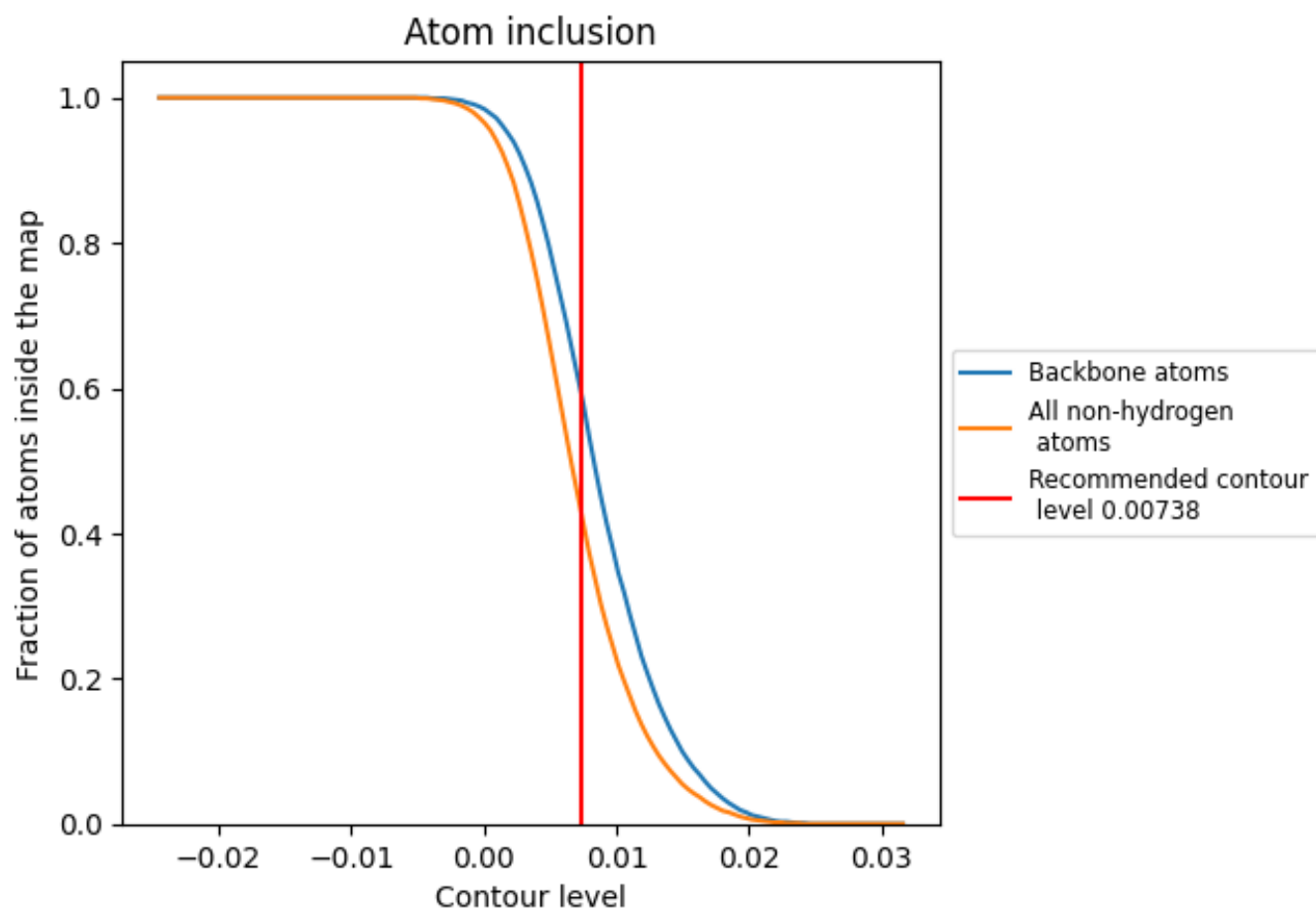
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.00738).



































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 59% of all backbone atoms, 42% 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 (0.00738) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4250	 0.3410
A	 0.3970	 0.3420
B	 0.4410	 0.3360
C	 0.4450	 0.3410
E	 0.1070	 0.4070
H	 0.3570	 0.3700
N	 0.0710	 0.4400
Q	 0.2200	 0.3940
V	 0.2310	 0.2700
W	 0.4640	 0.4550
X	 0.2860	 0.4050
Z	 0.0000	 0.4640
d	 0.3210	 0.4190
f	 0.5360	 0.4710
h	 0.0800	 0.4670
k	 0.3950	 0.4780
p	 0.4100	 0.3900

