WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Jul 16, 2025 – 11:36 AM JST

PDB ID	:	8ZW5 / pdb_00008zw5
EMDB ID	:	EMD-60516
Title	:	Structure of hemagglutinin from HN/4-10 H3N8 influenza virus G228 mutant complexed with avian receptor analog LSTa
Authors	:	Hao, T.J.; Xie, Y.F.; Chai, Y.; Song, H.; Gao, G.F.
Deposited on	:	2024-06-12
Resolution	:	2.09 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the (i) 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 (i)) were used in the production of this report:

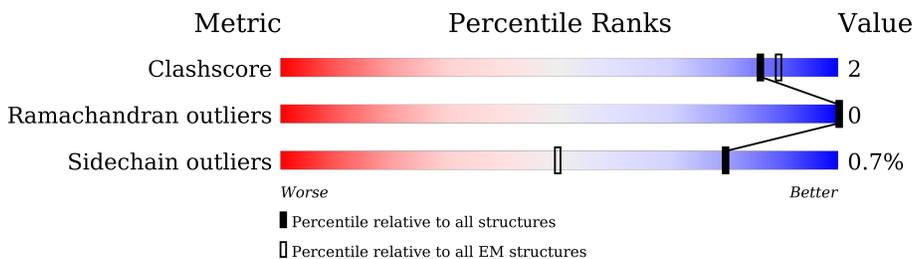|		
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

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 2.09 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	Percentile Ranks	Value
Clashscore		2
Ramachandran outliers		0
Sidechain outliers		0.7%

Worse ... *Better*

∎ Percentile relative to all structures
▯ Percentile relative to all EM structures

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 >=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 <=5%

Mol	Chain	Length	Quality of chain
1	A	509	90%　　5%　5%
1	B	509	88%　　7%　5%
1	C	509	90%　　5%　5%
2	D	5	60%　　40%
2	F	5	20%　　80%
2	H	5	60%　　40%
3	E	2	100%
3	G	2	100%
3	I	2	100%

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W O R L D W I D E
wwPDB
PROTEIN DATA BANK

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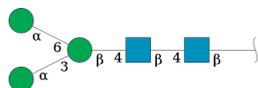| Mol	Chain	Length	Quality of chain
4	J	2	50%　　　　　　50%
4	K	2	50%　　　　　　50%
4	L	2	50%　　　　　　50%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 11828 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.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	482	Total	C	N	O	S	0	0
			3804	2371	672	742	19		
1	B	484	Total	C	N	O	S	0	0
			3816	2380	675	742	19		
1	C	482	Total	C	N	O	S	0	0
			3803	2371	672	741	19		

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[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.

Mol	Chain	Residues	Atoms				AltConf	Trace
2	D	5	Total	C	N	O	0	0
			61	34	2	25		
2	F	5	Total	C	N	O	0	0
			61	34	2	25		
2	H	5	Total	C	N	O	0	0
			61	34	2	25		

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.
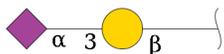

Mol	Chain	Residues	Atoms				AltConf	Trace
3	E	2	Total	C	N	O	0	0
			28	16	2	10		

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Mol	Chain	Residues	Atoms				AltConf	Trace
3	G	2	Total	C	N	O	0	0
			28	16	2	10		
3	I	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 4 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galacto pyranose.

Mol	Chain	Residues	Atoms				AltConf	Trace
4	J	2	Total	C	N	O	0	0
			32	17	1	14		
4	K	2	Total	C	N	O	0	0
			32	17	1	14		
4	L	2	Total	C	N	O	0	0
			32	17	1	14		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).
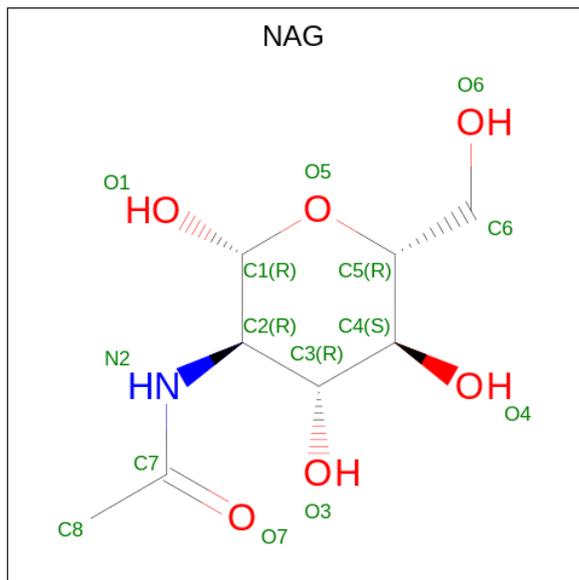
Mol	Chain	Residues	Atoms				AltConf
5	A	1	Total	C	N	O	0
			14	8	1	5	

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

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. 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. 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.
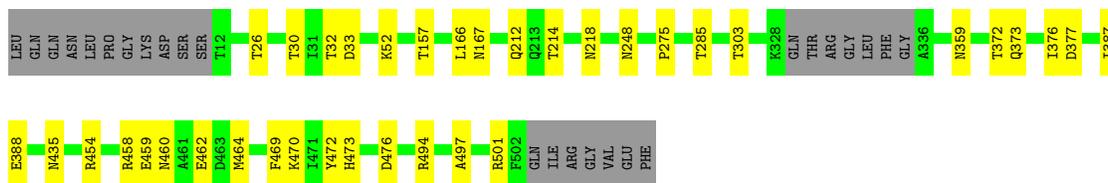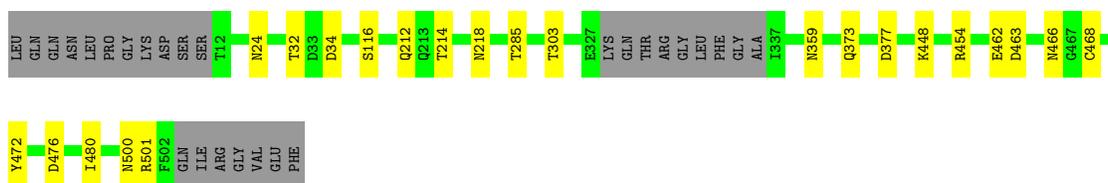
• Molecule 1: Hemagglutinin

Chain A:
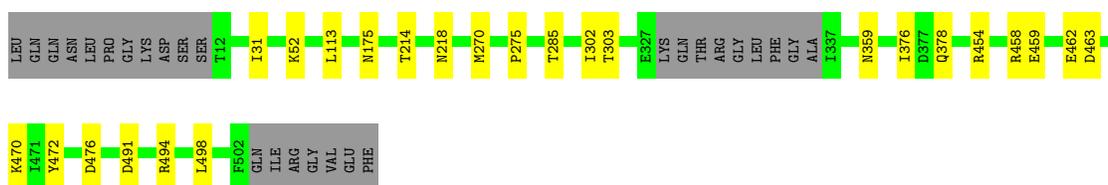
• Molecule 1: Hemagglutinin

Chain B:

• Molecule 1: Hemagglutinin

Chain C:

• Molecule 2: alpha-D-mannopyranose-(1-3)-[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

Chain D:

• Molecule 2: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyrano se-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyra nose

Chain F:

20% 80%

NAG1 NAG2 BMA3 MAN4 MAN5

• Molecule 2: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyrano se-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyra nose

Chain H:

60% 40%

NAG1 NAG2 BMA3 MAN4 MAN5

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain E:

100%

NAG1 NAG2

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain G:

100%

NAG1 NAG2

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain I:

100%

NAG1 NAG2

• Molecule 4: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose

Chain J:

50% 50%

GAL1 SIA2

• Molecule 4: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose

Chain K:

50% 50%

GAL1 SIA2

• Molecule 4: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose

Chain L:

50%   50%

GAL1 SIA2

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	279549	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 $(e^-/\text{Å}^2)$	50.0	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor

5   Model quality ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: SIA, GAL, MAN, BMA, NAG

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$|Z|$ >5	RMSZ	#$|Z|$ >5
1	A	0.13	0/3884	0.30	0/5265
1	B	0.13	0/3896	0.31	0/5280
1	C	0.13	0/3883	0.31	0/5264
All	All	0.13	0/11663	0.31	0/15809

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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	3804	0	3660	16	0
1	B	3816	0	3677	21	0
1	C	3803	0	3657	16	0
2	D	61	0	52	0	0
2	F	61	0	52	0	0
2	H	61	0	52	0	0
3	E	28	0	25	0	0
3	G	28	0	25	0	0
3	I	28	0	25	0	0
4	J	32	0	28	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	K	32	0	28	0	0
4	L	32	0	28	0	0
5	A	14	0	13	0	0
5	B	14	0	13	0	0
5	C	14	0	13	0	0
All	All	11828	0	11348	46	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 2.

All (46) 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:B:359:ASN:HD21	1:B:476:ASP:HA	1.48	0.78
1:A:359:ASN:HD21	1:A:476:ASP:HA	1.49	0.76
1:C:359:ASN:HD21	1:C:476:ASP:HA	1.55	0.70
1:A:454:ARG:NH2	1:A:463:ASP:OD2	2.30	0.63
1:C:373:GLN:NE2	1:C:377:ASP:OD1	2.34	0.59
1:A:458:ARG:HH21	1:C:462:GLU:CD	2.11	0.59
1:B:373:GLN:NE2	1:B:377:ASP:OD1	2.36	0.58
1:B:462:GLU:OE1	1:B:472:TYR:OH	2.20	0.58
1:B:460:ASN:HD21	1:B:494:ARG:HA	1.71	0.55
1:A:270:MET:HE2	1:A:302:ILE:HG22	1.89	0.54
1:B:459:GLU:O	1:B:501:ARG:NH2	2.41	0.53
1:A:52:LYS:HD2	1:A:275:PRO:HG2	1.90	0.53
1:C:476:ASP:O	1:C:480:ILE:HG12	2.10	0.52
1:A:378:GLN:HG2	1:C:32:THR:HG23	1.93	0.51
1:B:52:LYS:HD2	1:B:275:PRO:HG2	1.94	0.50
1:C:472:TYR:O	1:C:500:ASN:ND2	2.45	0.50
1:A:462:GLU:CD	1:B:458:ARG:HH21	2.21	0.49
1:C:454:ARG:NH2	1:C:463:ASP:OD2	2.45	0.49
1:B:464:MET:SD	1:B:470:LYS:HB3	2.53	0.48
1:B:454:ARG:HB2	1:B:469:PHE:HZ	1.79	0.48
1:B:218:ASN:HB3	1:C:214:THR:HG21	1.97	0.47
1:A:285:THR:HG22	1:A:303:THR:HG22	1.97	0.47
1:B:470:LYS:HE3	1:B:472:TYR:CZ	2.50	0.46
1:A:214:THR:HG21	1:C:218:ASN:HB3	1.97	0.46
1:A:218:ASN:HB3	1:B:214:THR:HG21	1.98	0.46
1:C:466:ASN:OD1	1:C:468:CYS:HB2	2.15	0.46
1:B:285:THR:HG22	1:B:303:THR:HG22	1.98	0.45
1:B:460:ASN:HD22	1:B:497:ALA:HB3	1.81	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:459:GLU:HG2	1:C:462:GLU:OE2	2.17	0.45
1:C:448:LYS:HB3	1:C:448:LYS:HE2	1.86	0.45
1:A:175:ASN:OD1	1:A:175:ASN:N	2.51	0.43
1:B:32:THR:HG22	1:B:33:ASP:OD1	2.19	0.43
1:A:498:LEU:HD23	1:A:498:LEU:HA	1.83	0.43
1:B:388:GLU:H	1:B:388:GLU:CD	2.27	0.42
1:C:472:TYR:CZ	1:C:501:ARG:HD3	2.55	0.42
1:B:30:THR:HG22	1:B:435:ASN:HB3	2.02	0.41
1:B:166:LEU:O	1:B:248:ASN:HA	2.20	0.41
1:A:31:ILE:HD13	1:A:31:ILE:HA	1.96	0.41
1:B:473:HIS:CD2	1:B:473:HIS:C	2.99	0.41
1:A:470:LYS:HD2	1:A:472:TYR:CZ	2.55	0.41
1:B:372:THR:O	1:B:376:ILE:HG13	2.21	0.41
1:B:472:TYR:CE1	1:B:501:ARG:HD3	2.56	0.41
1:C:24:ASN:OD1	1:C:24:ASN:N	2.53	0.41
1:C:285:THR:HG22	1:C:303:THR:HG22	2.03	0.41
1:A:491:ASP:HA	1:A:494:ARG:HB2	2.03	0.40
1:C:34:ASP:OD1	1:C:34:ASP:N	2.55	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	478/509 (94%)	469 (98%)	9 (2%)	0	100	100
1	B	480/509 (94%)	473 (98%)	7 (2%)	0	100	100
1	C	478/509 (94%)	470 (98%)	8 (2%)	0	100	100
All	All	1436/1527 (94%)	1412 (98%)	24 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	422/444 (95%)	420 (100%)	2 (0%)	86	91
1	B	422/444 (95%)	417 (99%)	5 (1%)	67	74
1	C	421/444 (95%)	419 (100%)	2 (0%)	86	91
All	All	1265/1332 (95%)	1256 (99%)	9 (1%)	80	87

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	113	LEU
1	A	376	ILE
1	B	26	THR
1	B	157	THR
1	B	167	ASN
1	B	212	GLN
1	B	387	ILE
1	C	116	SER
1	C	212	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	199	GLN
1	A	228	GLN
1	A	359	ASN
1	A	436	GLN
1	B	199	GLN
1	B	359	ASN
1	B	396	GLN
1	B	460	ASN
1	B	473	HIS
1	C	58	HIS
1	C	199	GLN
1	C	228	GLN

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Mol	Chain	Res	Type
1	C	343	ASN
1	C	359	ASN
1	C	396	GLN
1	C	447	ASN

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 ⓘ

27 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	0.24	0	17,19,21	0.46	0
2	NAG	D	2	2	14,14,15	0.34	0	17,19,21	0.42	0
2	BMA	D	3	2	11,11,12	0.65	0	15,15,17	0.88	0
2	MAN	D	4	2	11,11,12	0.75	0	15,15,17	0.92	1 (6%)
2	MAN	D	5	2	11,11,12	0.55	0	15,15,17	1.05	2 (13%)
3	NAG	E	1	3,1	14,14,15	0.35	0	17,19,21	0.39	0
3	NAG	E	2	3	14,14,15	0.24	0	17,19,21	0.42	0
2	NAG	F	1	2,1	14,14,15	0.71	1 (7%)	17,19,21	0.72	0
2	NAG	F	2	2	14,14,15	0.38	0	17,19,21	0.42	0
2	BMA	F	3	2	11,11,12	0.63	0	15,15,17	0.96	1 (6%)
2	MAN	F	4	2	11,11,12	0.72	0	15,15,17	0.94	1 (6%)
2	MAN	F	5	2	11,11,12	0.59	0	15,15,17	1.05	2 (13%)
3	NAG	G	1	3,1	14,14,15	0.33	0	17,19,21	0.38	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
3	NAG	G	2	3	14,14,15	0.24	0	17,19,21	0.41	0
2	NAG	H	1	2,1	14,14,15	0.22	0	17,19,21	0.49	0
2	NAG	H	2	2	14,14,15	0.40	0	17,19,21	0.39	0
2	BMA	H	3	2	11,11,12	0.65	0	15,15,17	0.87	0
2	MAN	H	4	2	11,11,12	0.73	0	15,15,17	0.94	1 (6%)
2	MAN	H	5	2	11,11,12	0.57	0	15,15,17	1.05	2 (13%)
3	NAG	I	1	3,1	14,14,15	0.31	0	17,19,21	0.40	0
3	NAG	I	2	3	14,14,15	0.27	0	17,19,21	0.41	0
4	GAL	J	1	4	12,12,12	0.36	0	17,17,17	0.72	0
4	SIA	J	2	4	20,20,21	2.03	2 (10%)	24,28,31	1.57	4 (16%)
4	GAL	K	1	4	12,12,12	0.38	0	17,17,17	0.72	0
4	SIA	K	2	4	20,20,21	2.04	2 (10%)	24,28,31	1.54	3 (12%)
4	GAL	L	1	4	12,12,12	0.36	0	17,17,17	0.72	0
4	SIA	L	2	4	20,20,21	2.03	2 (10%)	24,28,31	1.57	4 (16%)

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	-	0/6/23/26	0/1/1/1
2	BMA	D	3	2	-	0/2/19/22	0/1/1/1
2	MAN	D	4	2	-	1/2/19/22	0/1/1/1
2	MAN	D	5	2	-	2/2/19/22	0/1/1/1
3	NAG	E	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	E	2	3	-	0/6/23/26	0/1/1/1
2	NAG	F	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	0/6/23/26	0/1/1/1
2	BMA	F	3	2	-	0/2/19/22	0/1/1/1
2	MAN	F	4	2	-	1/2/19/22	0/1/1/1
2	MAN	F	5	2	-	2/2/19/22	0/1/1/1
3	NAG	G	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	G	2	3	-	0/6/23/26	0/1/1/1
2	NAG	H	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	H	2	2	-	0/6/23/26	0/1/1/1
2	BMA	H	3	2	-	0/2/19/22	0/1/1/1
2	MAN	H	4	2	-	1/2/19/22	0/1/1/1
2	MAN	H	5	2	-	2/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	I	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	I	2	3	-	0/6/23/26	0/1/1/1
4	GAL	J	1	4	-	0/2/22/22	0/1/1/1
4	SIA	J	2	4	-	0/18/34/38	0/1/1/1
4	GAL	K	1	4	-	0/2/22/22	0/1/1/1
4	SIA	K	2	4	-	0/18/34/38	0/1/1/1
4	GAL	L	1	4	-	0/2/22/22	0/1/1/1
4	SIA	L	2	4	-	0/18/34/38	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	K	2	SIA	C2-C1	7.78	1.59	1.52
4	J	2	SIA	C2-C1	7.70	1.59	1.52
4	L	2	SIA	C2-C1	7.70	1.59	1.52
4	L	2	SIA	O6-C2	2.82	1.47	1.43
4	K	2	SIA	O6-C2	2.78	1.47	1.43
4	J	2	SIA	O6-C2	2.77	1.47	1.43
2	F	1	NAG	O5-C1	-2.46	1.39	1.43

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	J	2	SIA	O1A-C1-C2	-3.89	113.38	122.57
4	L	2	SIA	O1A-C1-C2	-3.89	113.38	122.57
4	K	2	SIA	O1A-C1-C2	-3.79	113.62	122.57
4	L	2	SIA	C6-O6-C2	3.53	118.89	111.34
4	K	2	SIA	C6-O6-C2	3.53	118.89	111.34
4	J	2	SIA	C6-O6-C2	3.52	118.88	111.34
2	D	5	MAN	C1-O5-C5	2.64	115.77	112.19
2	F	5	MAN	C1-O5-C5	2.63	115.76	112.19
2	H	5	MAN	C1-O5-C5	2.62	115.75	112.19
2	H	5	MAN	O2-C2-C3	-2.31	105.50	110.14
2	D	5	MAN	O2-C2-C3	-2.30	105.53	110.14
2	F	5	MAN	O2-C2-C3	-2.28	105.58	110.14
2	H	4	MAN	O2-C2-C3	-2.21	105.72	110.14
2	F	4	MAN	O2-C2-C3	-2.19	105.75	110.14
2	D	4	MAN	O2-C2-C3	-2.16	105.82	110.14
4	J	2	SIA	O1B-C1-O1A	2.13	128.93	124.09
4	L	2	SIA	O1B-C1-O1A	2.13	128.93	124.09
4	K	2	SIA	O1B-C1-O1A	2.11	128.89	124.09
4	L	2	SIA	O6-C2-C3	-2.03	107.66	110.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	J	2	SIA	O6-C2-C3	-2.03	107.67	110.46
2	F	3	BMA	C1-O5-C5	2.02	114.92	112.19

There are no chirality outliers.

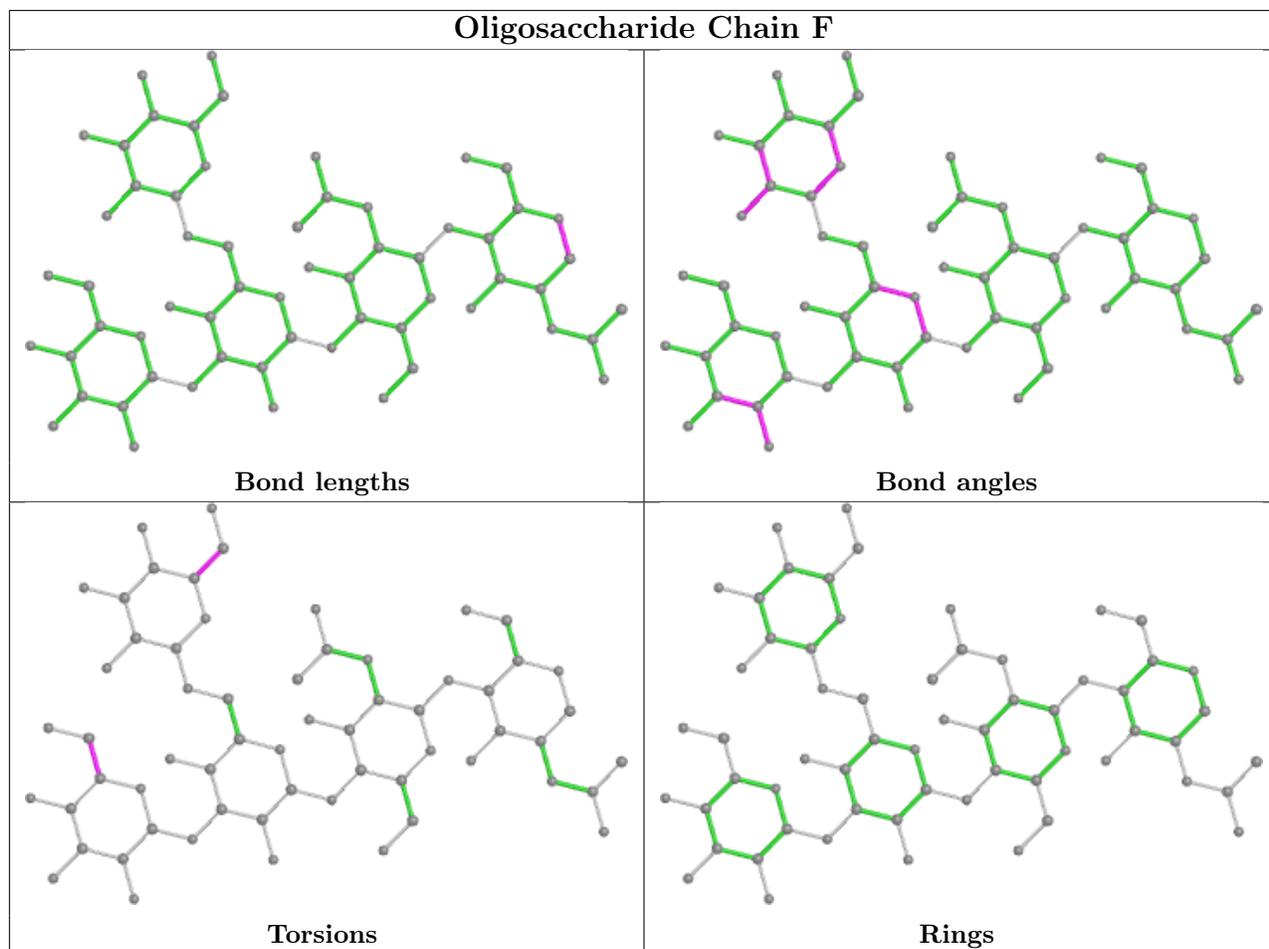All (15) torsion outliers are listed below:

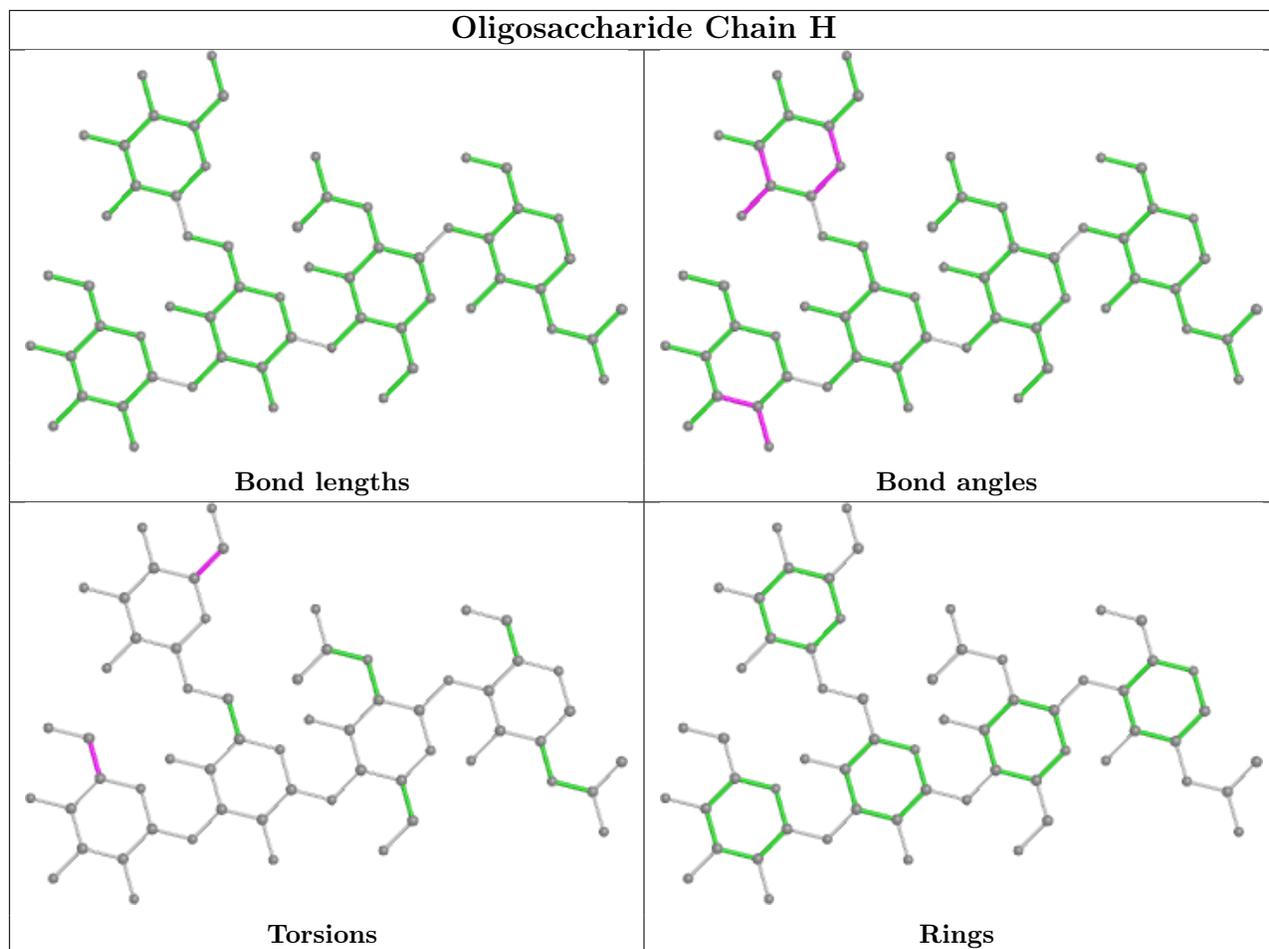| Mol	Chain	Res	Type	Atoms
2	D	5	MAN	O5-C5-C6-O6
2	H	5	MAN	O5-C5-C6-O6
3	I	1	NAG	O5-C5-C6-O6
2	F	5	MAN	O5-C5-C6-O6
3	G	1	NAG	O5-C5-C6-O6
3	E	1	NAG	O5-C5-C6-O6
2	D	5	MAN	C4-C5-C6-O6
2	H	5	MAN	C4-C5-C6-O6
3	E	1	NAG	C4-C5-C6-O6
2	F	5	MAN	C4-C5-C6-O6
3	I	1	NAG	C4-C5-C6-O6
3	G	1	NAG	C4-C5-C6-O6
2	H	4	MAN	O5-C5-C6-O6
2	D	4	MAN	O5-C5-C6-O6
2	F	4	MAN	O5-C5-C6-O6

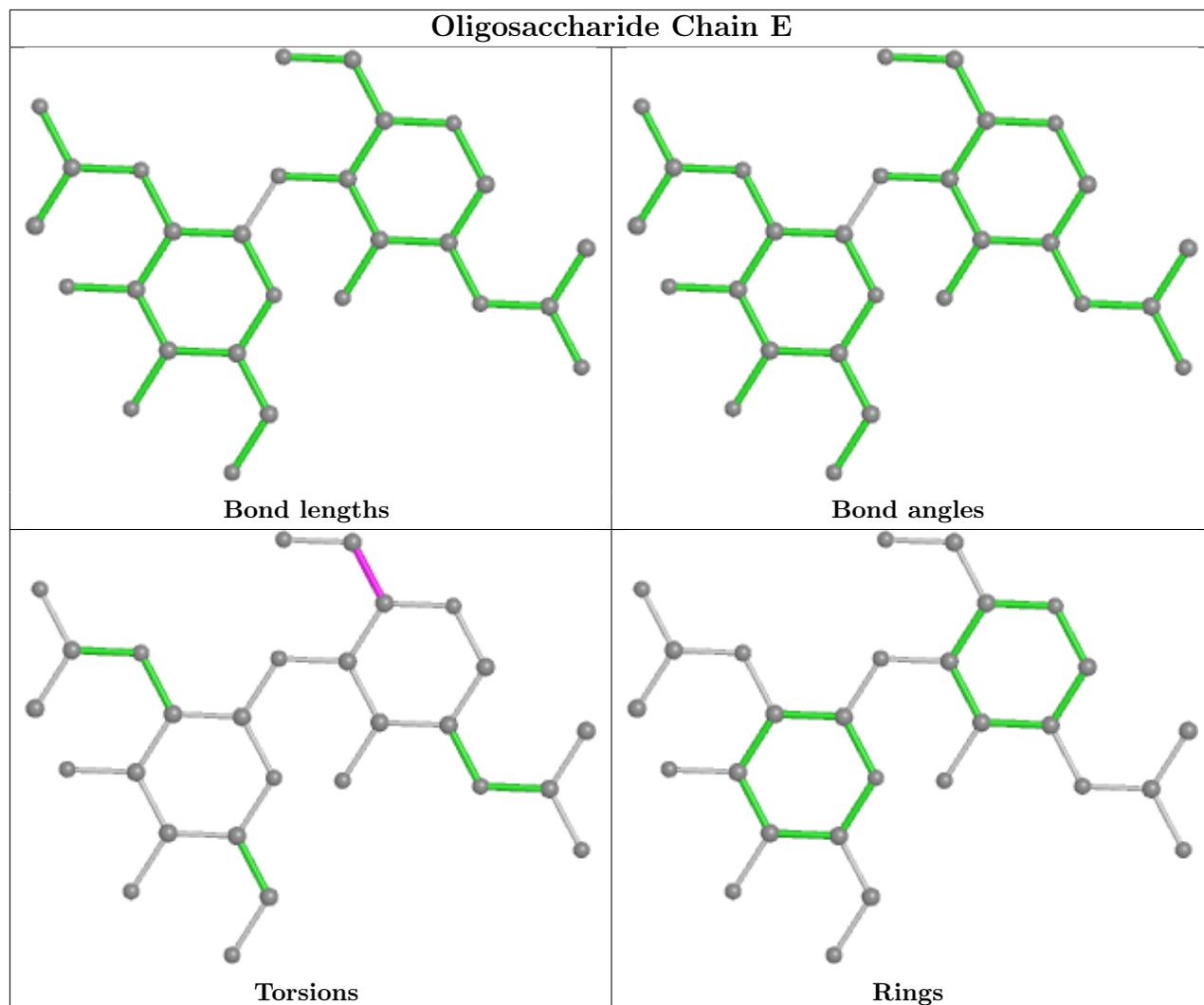There are no ring outliers.

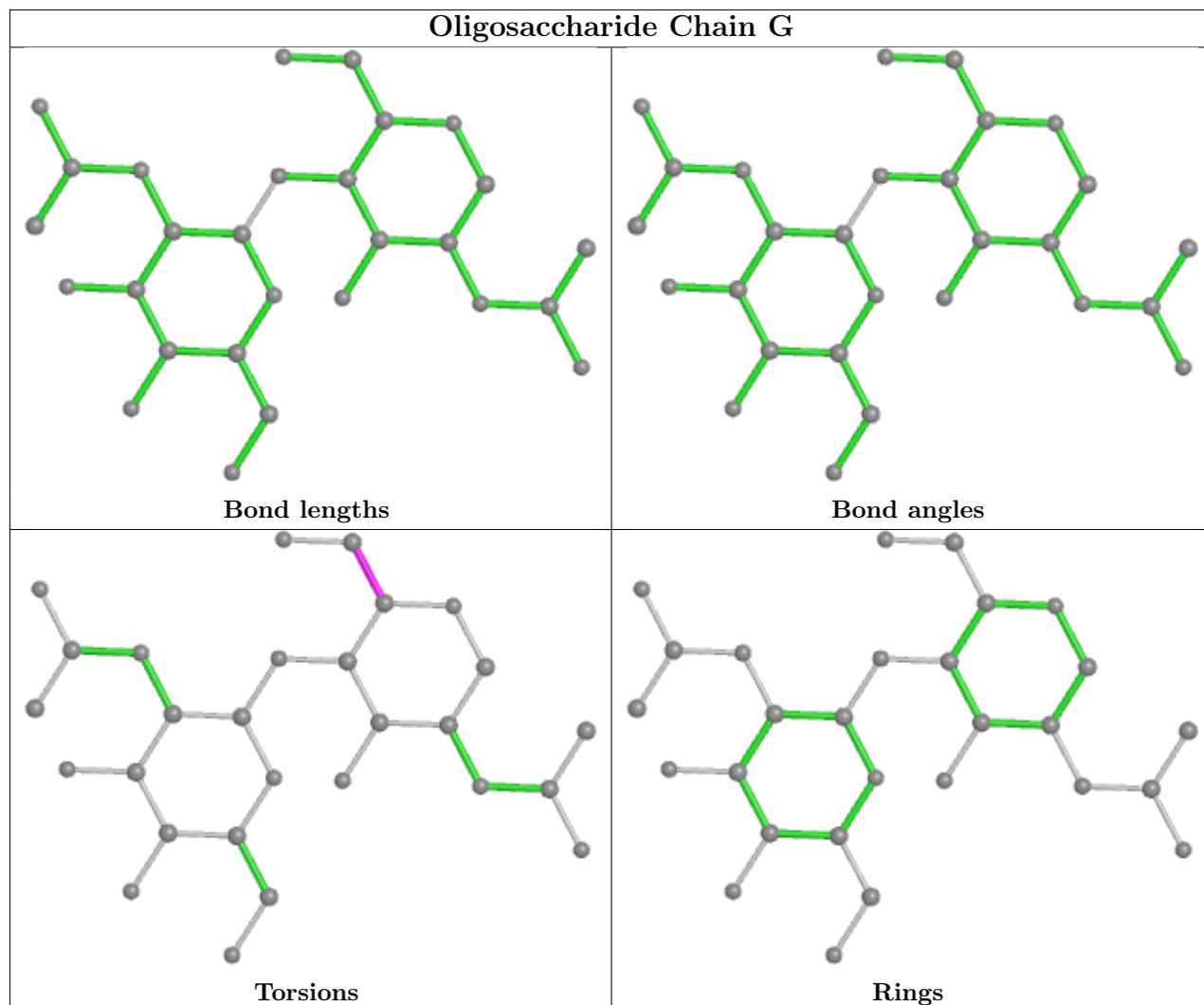No monomer is involved in short contacts.

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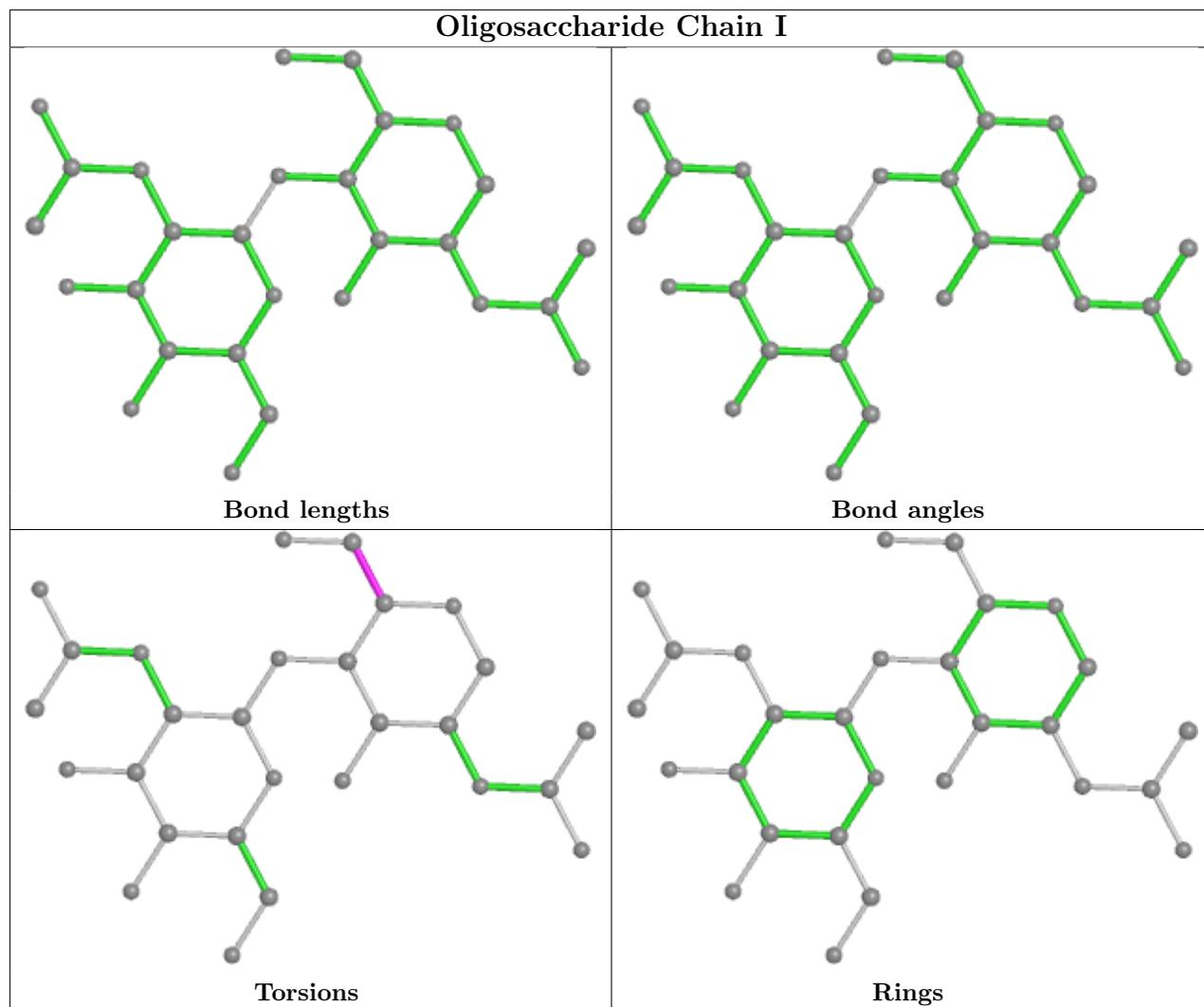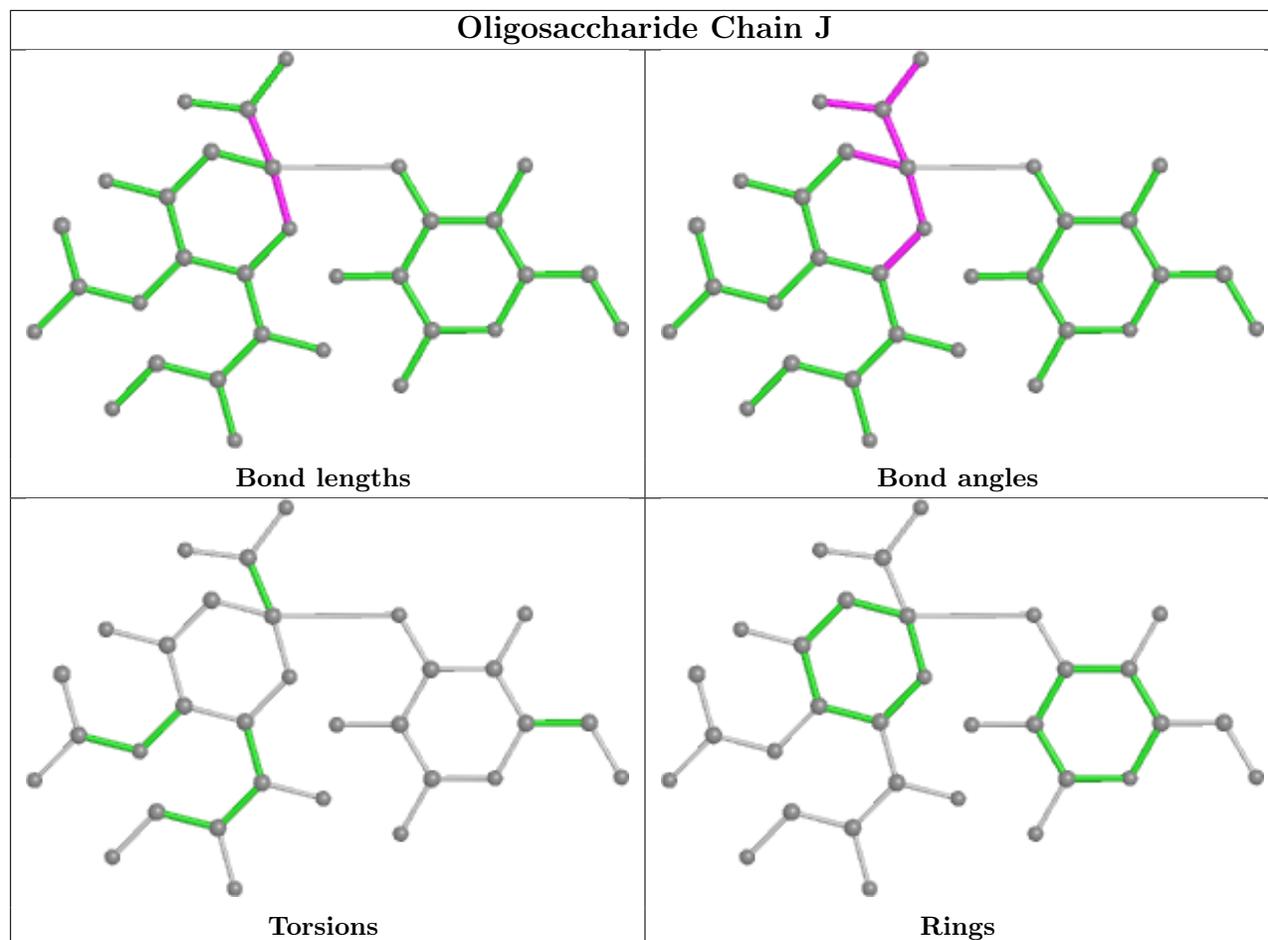
Oligosaccharide Chain D
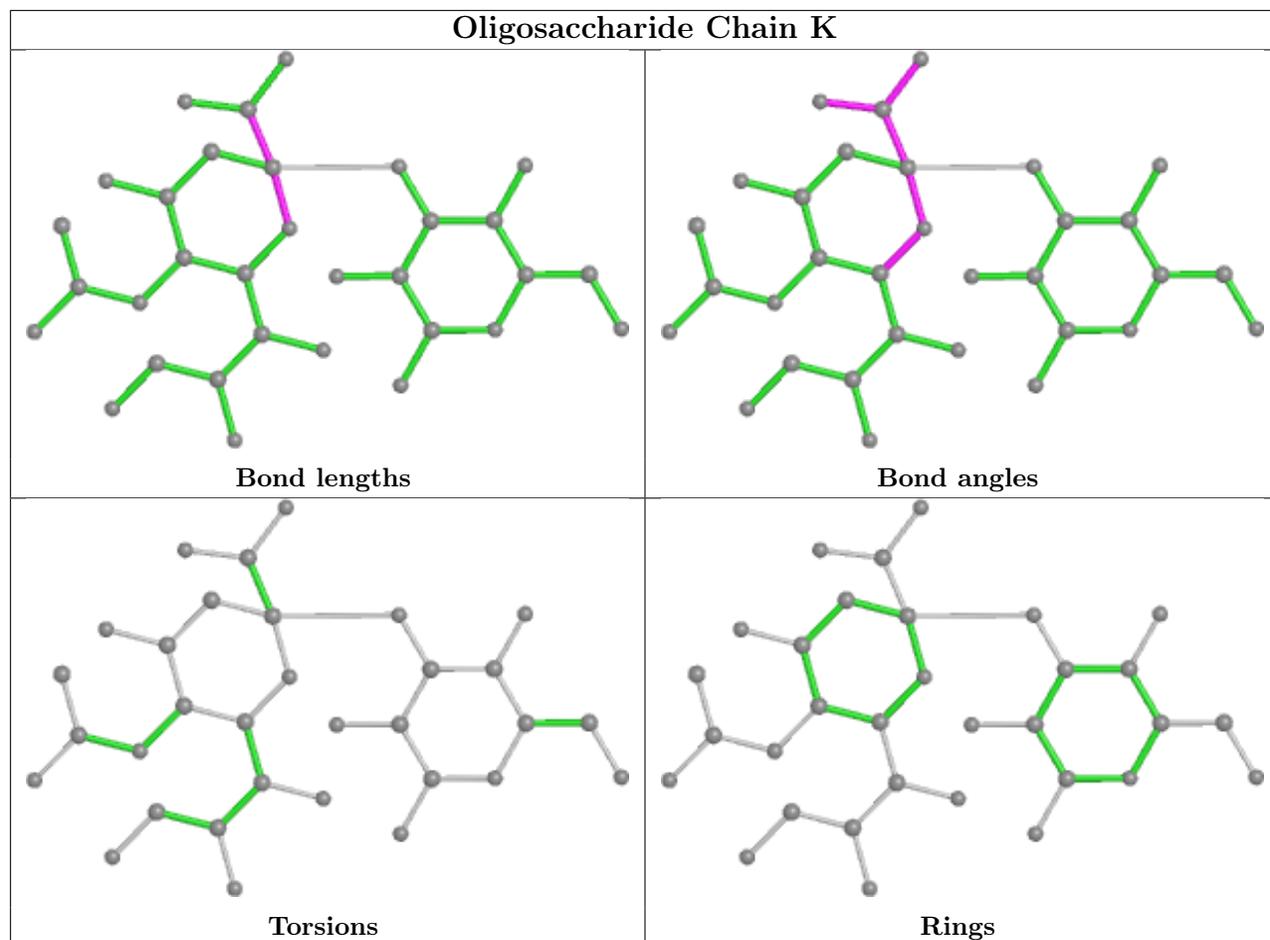

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain F

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain H

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain E

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain G

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain I

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain J

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain K

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain L
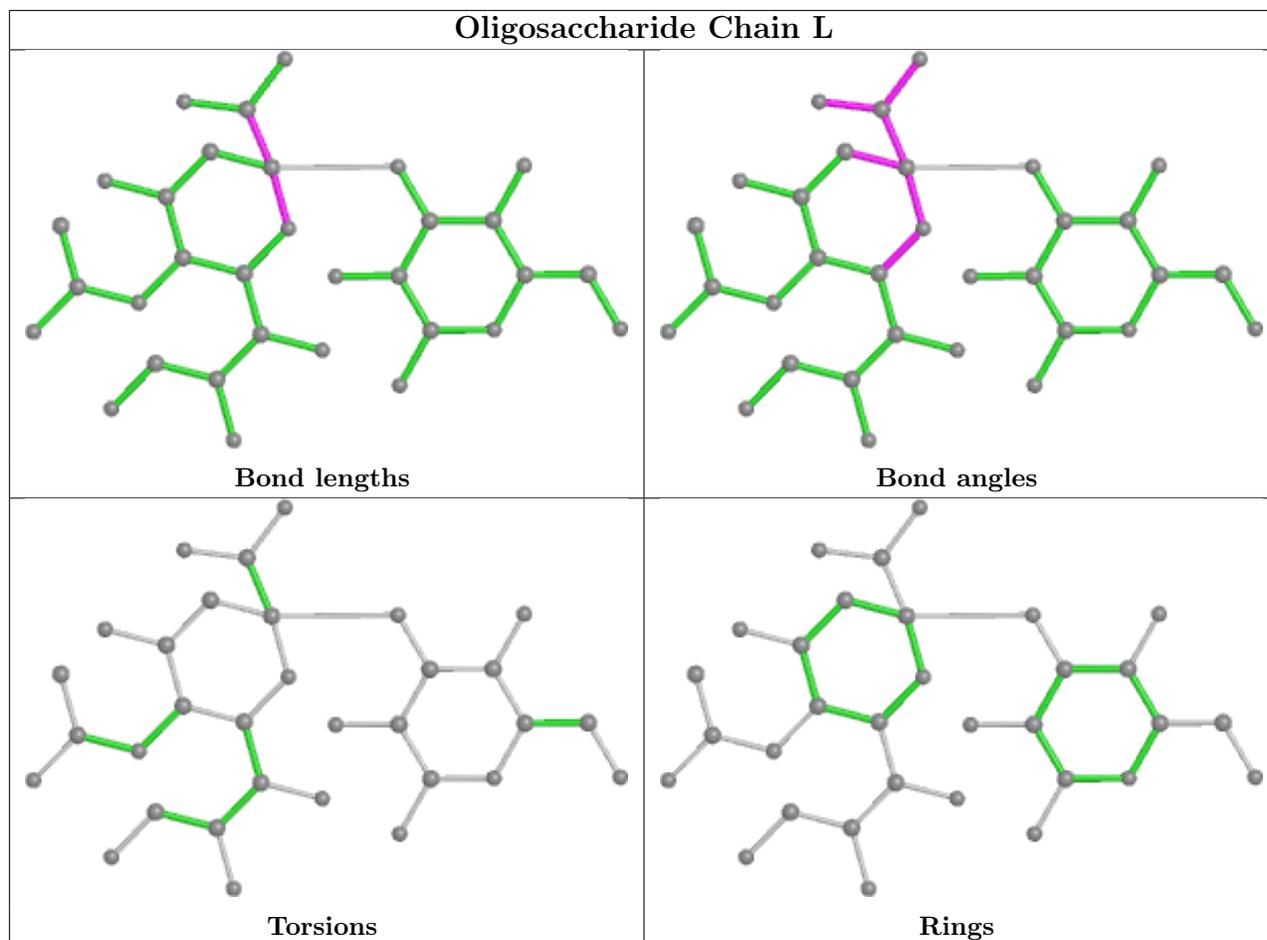

Bond lengths

Bond angles

Torsions

Rings

5.6 Ligand geometry ⓘ

3 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
5	NAG	C	601	1	14,14,15	0.19	0	17,19,21	0.55	0
5	NAG	A	601	1	14,14,15	0.23	0	17,19,21	0.50	0
5	NAG	B	601	1	14,14,15	0.24	0	17,19,21	0.50	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	C	601	1	-	2/6/23/26	0/1/1/1
5	NAG	A	601	1	-	0/6/23/26	0/1/1/1
5	NAG	B	601	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	601	NAG	C4-C5-C6-O6
5	C	601	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.