



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 02:24 AM EDT

PDB ID : 6V44  
Title : The crystal structure of hemagglutinin from swine influenza virus A/swine/Missouri/A01727926/2015  
Authors : Yang, H.; Stevens, J.  
Deposited on : 2019-11-27  
Resolution : 2.20 Å (reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

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:

MolProbity : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : **FAILED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35.1

## 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 Å.

There are no overall percentile quality scores available for this entry.

MolProbity and EDS failed to run properly - the sequence quality summary graphics cannot be shown.

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 12422 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Hemagglutinin HA1 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	320	2487	1562	440	474	11	0	0	0
1	C	320	2487	1562	440	474	11	0	0	0
1	E	320	2487	1562	440	474	11	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	ALA	-	expression tag	UNP A0A140D8S6
A	-3	ASP	-	expression tag	UNP A0A140D8S6
A	-2	LEU	-	expression tag	UNP A0A140D8S6
A	-1	GLY	-	expression tag	UNP A0A140D8S6
C	-4	ALA	-	expression tag	UNP A0A140D8S6
C	-3	ASP	-	expression tag	UNP A0A140D8S6
C	-2	LEU	-	expression tag	UNP A0A140D8S6
C	-1	GLY	-	expression tag	UNP A0A140D8S6
E	-4	ALA	-	expression tag	UNP A0A140D8S6
E	-3	ASP	-	expression tag	UNP A0A140D8S6
E	-2	LEU	-	expression tag	UNP A0A140D8S6
E	-1	GLY	-	expression tag	UNP A0A140D8S6

- Molecule 2 is a protein called Hemagglutinin HA2 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	173	1415	878	251	282	4	0	0	0
2	D	173	1415	878	251	282	4	0	0	0
2	F	173	1415	878	251	282	4	0	0	0

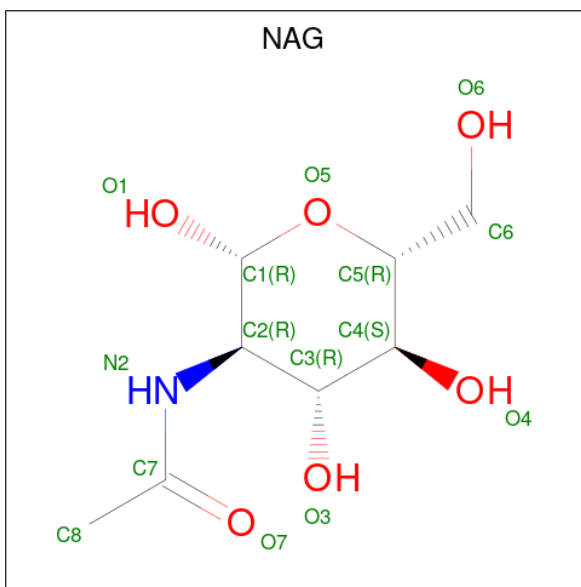
There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	175	SER	-	expression tag	UNP A0A140D8S6
B	176	GLY	-	expression tag	UNP A0A140D8S6
B	177	ARG	-	expression tag	UNP A0A140D8S6
B	178	SER	-	expression tag	UNP A0A140D8S6
B	179	GLY	-	expression tag	UNP A0A140D8S6
B	180	ARG	-	expression tag	UNP A0A140D8S6
B	181	LEU	-	expression tag	UNP A0A140D8S6
B	182	VAL	-	expression tag	UNP A0A140D8S6
B	183	PRO	-	expression tag	UNP A0A140D8S6
B	184	ARG	-	expression tag	UNP A0A140D8S6
B	185	GLY	-	expression tag	UNP A0A140D8S6
B	186	SER	-	expression tag	UNP A0A140D8S6
D	175	SER	-	expression tag	UNP A0A140D8S6
D	176	GLY	-	expression tag	UNP A0A140D8S6
D	177	ARG	-	expression tag	UNP A0A140D8S6
D	178	SER	-	expression tag	UNP A0A140D8S6
D	179	GLY	-	expression tag	UNP A0A140D8S6
D	180	ARG	-	expression tag	UNP A0A140D8S6
D	181	LEU	-	expression tag	UNP A0A140D8S6
D	182	VAL	-	expression tag	UNP A0A140D8S6
D	183	PRO	-	expression tag	UNP A0A140D8S6
D	184	ARG	-	expression tag	UNP A0A140D8S6
D	185	GLY	-	expression tag	UNP A0A140D8S6
D	186	SER	-	expression tag	UNP A0A140D8S6
F	175	SER	-	expression tag	UNP A0A140D8S6
F	176	GLY	-	expression tag	UNP A0A140D8S6
F	177	ARG	-	expression tag	UNP A0A140D8S6
F	178	SER	-	expression tag	UNP A0A140D8S6
F	179	GLY	-	expression tag	UNP A0A140D8S6
F	180	ARG	-	expression tag	UNP A0A140D8S6
F	181	LEU	-	expression tag	UNP A0A140D8S6
F	182	VAL	-	expression tag	UNP A0A140D8S6
F	183	PRO	-	expression tag	UNP A0A140D8S6
F	184	ARG	-	expression tag	UNP A0A140D8S6
F	185	GLY	-	expression tag	UNP A0A140D8S6
F	186	SER	-	expression tag	UNP A0A140D8S6

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

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	G	6	Total	C	N	O	0	0	0
			72	40	2	30			
3	H	6	Total	C	N	O	0	0	0
			72	40	2	30			
3	I	6	Total	C	N	O	0	0	0
			72	40	2	30			

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



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	83	Total	O	0	0
			83	83		
5	B	61	Total	O	0	0
			61	61		
5	C	99	Total	O	0	0
			99	99		

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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
5	D	55	Total 55	O 55	0	0
5	E	94	Total 94	O 94	0	0
5	F	66	Total 66	O 66	0	0

MolProbity and EDS failed to run properly - this section is therefore empty.

### 3 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	68.97Å 240.00Å 68.95Å 90.00° 119.86° 90.00°	Depositor
Resolution (Å)	33.21 – 2.20	Depositor
% Data completeness (in resolution range)	97.2 (33.21-2.20)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.94 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.14_3260	Depositor
R, $R_{free}$	0.203 , 0.244	Depositor
Wilson B-factor (Å <sup>2</sup> )	45.7	Xtrriage
Anisotropy	0.369	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.357 for l,k,-h-l 0.357 for -h-l,k,h 0.028 for -h-l,-k,l 0.021 for h,-k,-h-l 0.019 for l,-k,h	Xtrriage
Total number of atoms	12422	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.64% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 4 Model quality [i](#)

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

MolProbity failed to run properly - this section is therefore empty.

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

MolProbity failed to run properly - this section is therefore empty.

### 4.3 Torsion angles [i](#)

#### 4.3.1 Protein backbone [i](#)

MolProbity failed to run properly - this section is therefore empty.

#### 4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

#### 4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

### 4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 4.5 Carbohydrates [i](#)

18 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
3	NAG	G	1	1,3	14,14,15	0.35	0	17,19,21	0.49	0
3	NAG	G	2	3	14,14,15	0.63	0	17,19,21	0.60	0
3	BMA	G	3	3	11,11,12	1.00	1 (9%)	15,15,17	1.13	2 (13%)
3	MAN	G	4	3	11,11,12	1.19	1 (9%)	15,15,17	1.79	3 (20%)
3	MAN	G	5	3	11,11,12	1.72	3 (27%)	15,15,17	2.80	6 (40%)
3	MAN	G	6	3	11,11,12	1.99	2 (18%)	15,15,17	1.95	2 (13%)
3	NAG	H	1	1,3	14,14,15	0.36	0	17,19,21	0.52	0
3	NAG	H	2	3	14,14,15	0.56	0	17,19,21	0.59	0
3	BMA	H	3	3	11,11,12	0.95	1 (9%)	15,15,17	1.14	2 (13%)
3	MAN	H	4	3	11,11,12	1.10	1 (9%)	15,15,17	1.63	4 (26%)
3	MAN	H	5	3	11,11,12	1.77	2 (18%)	15,15,17	2.68	5 (33%)
3	MAN	H	6	3	11,11,12	1.89	2 (18%)	15,15,17	1.96	3 (20%)
3	NAG	I	1	1,3	14,14,15	0.30	0	17,19,21	0.74	0
3	NAG	I	2	3	14,14,15	0.51	0	17,19,21	0.63	0
3	BMA	I	3	3	11,11,12	1.46	2 (18%)	15,15,17	1.11	2 (13%)
3	MAN	I	4	3	11,11,12	0.94	0	15,15,17	2.10	3 (20%)
3	MAN	I	5	3	11,11,12	1.68	3 (27%)	15,15,17	2.78	5 (33%)
3	MAN	I	6	3	11,11,12	2.17	3 (27%)	15,15,17	1.70	2 (13%)

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	BMA	I	3	3	-	2/2/19/22	0/1/1/1
3	MAN	I	4	3	-	0/2/19/22	0/1/1/1
3	MAN	I	5	3	-	2/2/19/22	0/1/1/1
3	MAN	I	6	3	-	0/2/19/22	0/1/1/1

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	I	6	MAN	C1-C2	4.61	1.62	1.52
3	H	6	MAN	C2-C3	4.49	1.59	1.52
3	G	6	MAN	C2-C3	4.32	1.58	1.52
3	G	6	MAN	C1-C2	4.18	1.61	1.52
3	I	6	MAN	O5-C1	3.98	1.50	1.43
3	I	5	MAN	C2-C3	3.97	1.58	1.52
3	H	5	MAN	C2-C3	3.92	1.58	1.52
3	H	6	MAN	C1-C2	3.69	1.60	1.52
3	I	3	BMA	O5-C5	3.38	1.50	1.43
3	G	5	MAN	O5-C1	-3.14	1.38	1.43
3	G	5	MAN	C1-C2	3.12	1.59	1.52
3	I	6	MAN	C2-C3	3.10	1.57	1.52
3	H	5	MAN	O5-C1	-2.91	1.39	1.43
3	I	5	MAN	C1-C2	2.50	1.57	1.52
3	G	4	MAN	C2-C3	2.34	1.56	1.52
3	G	5	MAN	C2-C3	2.30	1.55	1.52
3	I	5	MAN	C4-C3	2.27	1.58	1.52
3	H	4	MAN	C4-C3	2.23	1.58	1.52
3	H	3	BMA	C6-C5	2.12	1.59	1.51
3	G	3	BMA	C6-C5	2.09	1.58	1.51
3	I	3	BMA	C6-C5	2.09	1.58	1.51

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	5	MAN	C1-O5-C5	6.57	121.10	112.19
3	I	4	MAN	O2-C2-C3	-6.44	97.24	110.14
3	G	5	MAN	C1-C2-C3	6.12	117.19	109.67
3	I	5	MAN	C1-C2-C3	6.10	117.17	109.67
3	H	5	MAN	C1-C2-C3	5.88	116.89	109.67
3	H	5	MAN	C1-O5-C5	5.31	119.39	112.19
3	G	5	MAN	C1-O5-C5	5.17	119.19	112.19
3	G	6	MAN	C1-C2-C3	5.14	115.99	109.67
3	H	6	MAN	C1-C2-C3	4.97	115.78	109.67

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	6	MAN	C1-C2-C3	4.68	115.42	109.67
3	G	5	MAN	O5-C1-C2	4.42	117.59	110.77
3	G	4	MAN	O2-C2-C1	4.36	118.06	109.15
3	H	6	MAN	C1-O5-C5	4.17	117.85	112.19
3	G	6	MAN	C1-O5-C5	3.81	117.35	112.19
3	H	5	MAN	O5-C1-C2	3.73	116.53	110.77
3	I	5	MAN	C2-C3-C4	3.63	117.18	110.89
3	H	4	MAN	O2-C2-C3	-3.61	102.91	110.14
3	G	4	MAN	C1-C2-C3	-3.48	105.38	109.67
3	H	5	MAN	C2-C3-C4	3.44	116.85	110.89
3	G	5	MAN	O2-C2-C3	-3.22	103.68	110.14
3	H	3	BMA	C1-O5-C5	3.19	116.51	112.19
3	H	4	MAN	O2-C2-C1	3.17	115.64	109.15
3	I	5	MAN	O5-C1-C2	3.12	115.58	110.77
3	I	4	MAN	O2-C2-C1	3.05	115.39	109.15
3	G	3	BMA	C1-O5-C5	2.98	116.22	112.19
3	G	5	MAN	C2-C3-C4	2.84	115.81	110.89
3	I	3	BMA	O5-C5-C6	2.80	111.60	107.20
3	G	3	BMA	O5-C5-C6	2.61	111.29	107.20
3	H	5	MAN	O2-C2-C3	-2.47	105.20	110.14
3	H	3	BMA	O5-C5-C6	2.45	111.05	107.20
3	H	4	MAN	C1-C2-C3	-2.40	106.72	109.67
3	H	4	MAN	C1-O5-C5	2.39	115.43	112.19
3	I	4	MAN	C1-O5-C5	2.37	115.41	112.19
3	I	6	MAN	C1-O5-C5	2.27	115.27	112.19
3	I	3	BMA	C1-O5-C5	2.26	115.25	112.19
3	G	5	MAN	O5-C5-C6	-2.24	103.69	107.20
3	H	6	MAN	O3-C3-C2	2.15	114.11	109.99
3	I	5	MAN	O2-C2-C3	-2.14	105.86	110.14
3	G	4	MAN	C1-O5-C5	2.01	114.92	112.19

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	H	5	MAN	O5-C5-C6-O6
3	I	5	MAN	O5-C5-C6-O6
3	G	5	MAN	O5-C5-C6-O6
3	H	5	MAN	C4-C5-C6-O6
3	I	2	NAG	O5-C5-C6-O6
3	I	5	MAN	C4-C5-C6-O6
3	G	5	MAN	C4-C5-C6-O6

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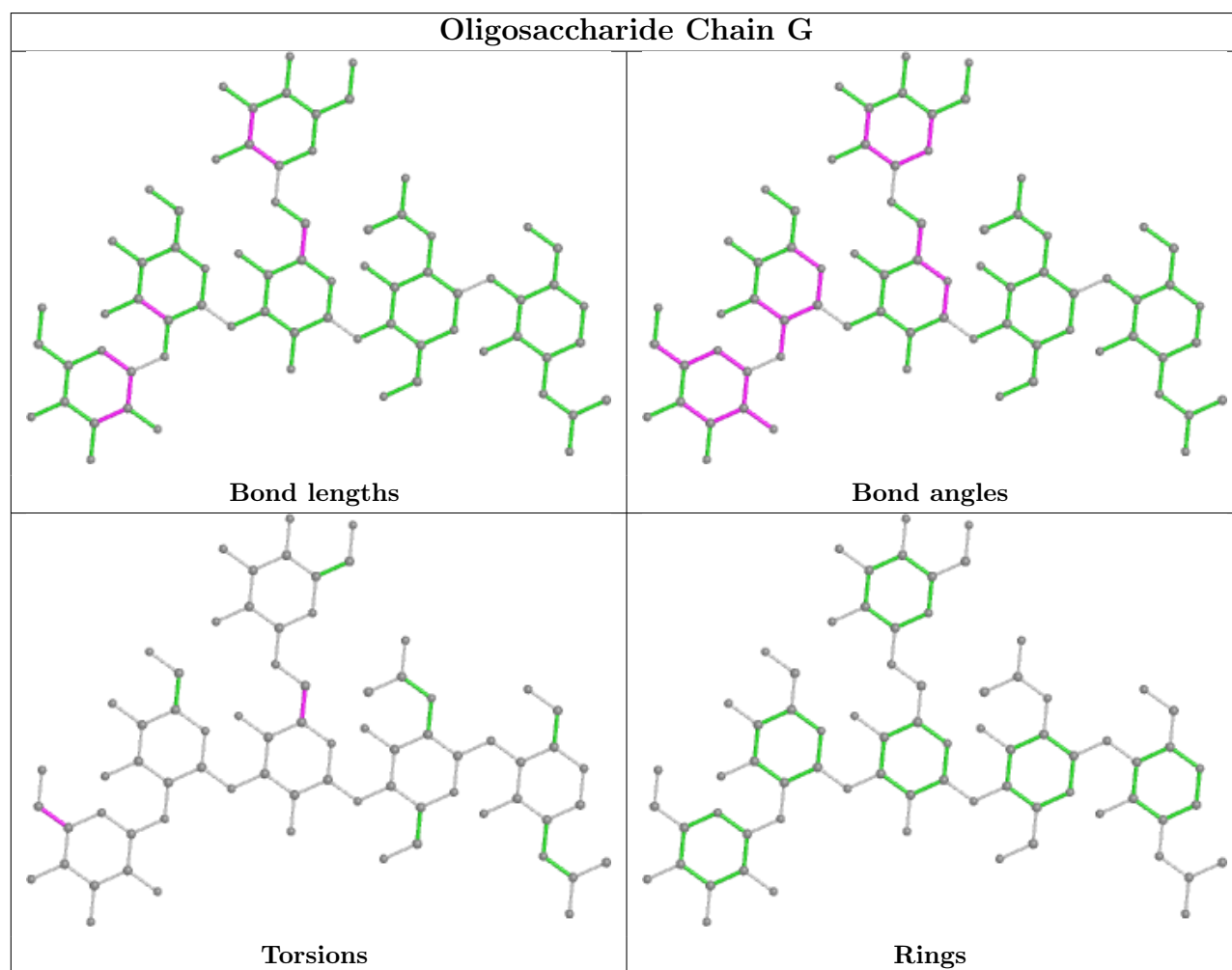
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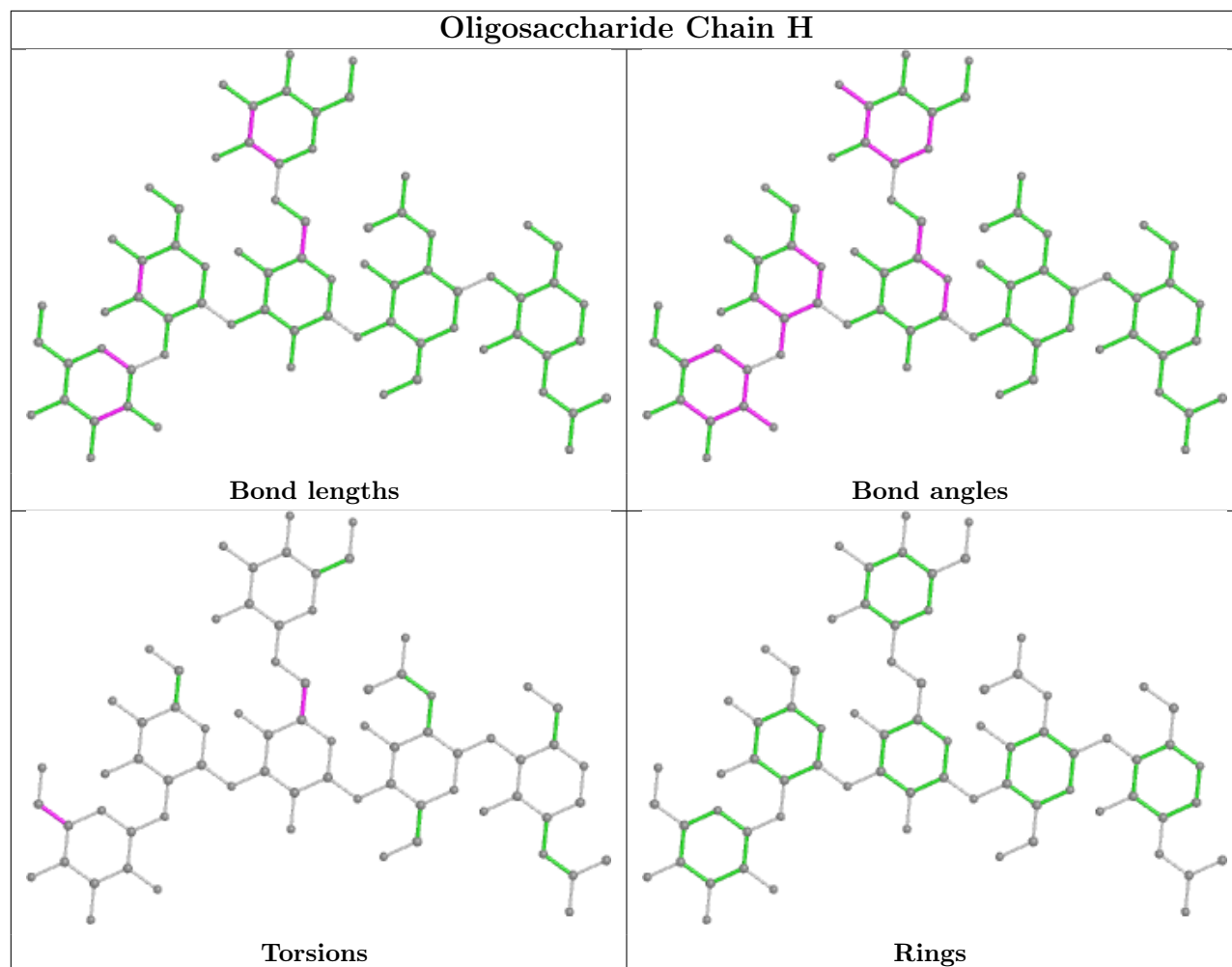
Mol	Chain	Res	Type	Atoms
3	G	3	BMA	C4-C5-C6-O6
3	I	2	NAG	C4-C5-C6-O6
3	I	3	BMA	C4-C5-C6-O6
3	I	3	BMA	O5-C5-C6-O6
3	G	3	BMA	O5-C5-C6-O6
3	H	3	BMA	O5-C5-C6-O6
3	H	3	BMA	C4-C5-C6-O6

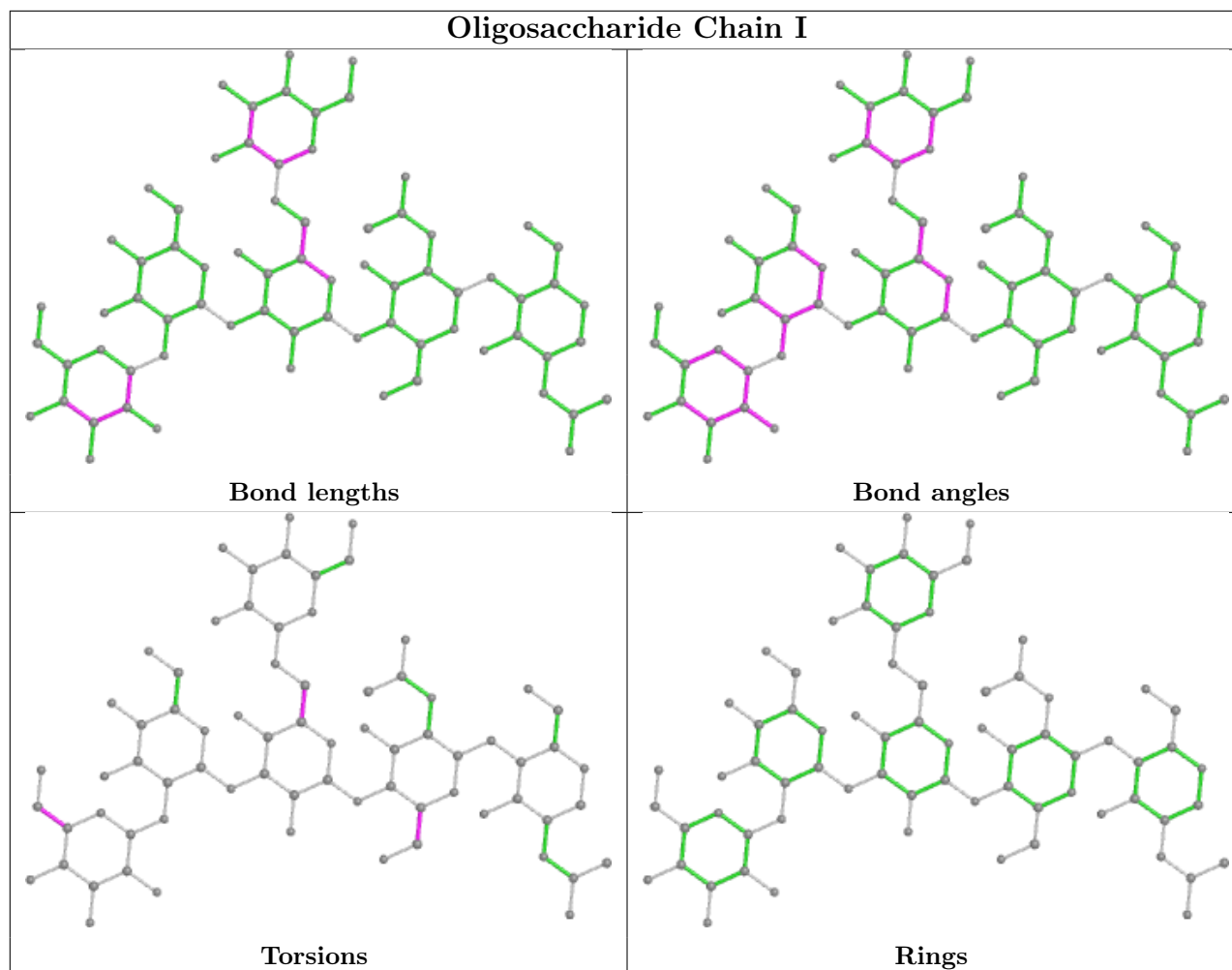
There are no ring outliers.

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.







## 4.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	NAG	A	407	1	14,14,15	0.36	0	17,19,21	0.67	1 (5%)
4	NAG	C	407	1	14,14,15	0.58	0	17,19,21	0.68	1 (5%)
4	NAG	E	407	1	14,14,15	0.21	0	17,19,21	0.66	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	A	407	1	-	0/6/23/26	0/1/1/1
4	NAG	C	407	1	-	0/6/23/26	0/1/1/1
4	NAG	E	407	1	-	1/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	407	NAG	C1-O5-C5	2.48	115.56	112.19
4	A	407	NAG	C1-O5-C5	2.40	115.44	112.19
4	E	407	NAG	C1-O5-C5	2.32	115.33	112.19

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	407	NAG	C4-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

## 4.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

## 5 Fit of model and data

### 5.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

### 5.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

### 5.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

### 5.4 Ligands

EDS failed to run properly - this section is therefore empty.

### 5.5 Other polymers

EDS failed to run properly - this section is therefore empty.