wwPDB X-ray Structure Validation Summary Report (i)

Oct 2, 2023 – 03:48 AM EDT

PDB ID	:	6MXU
Title	:	Crystal structure of hemagglutinin from influenza virus A/Texas/1/1977 (H3N2)
Authors	:	Dai, Y.N.; Fremont, D.H.; Center for Structural Genomics of Infectious Diseases (CSGID)
Deposited on	:	2018-10-31
Resolution	:	1.85 Å(reported)

This is a wwPDB X-ray Structure 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/XrayValidationReportHelp
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:

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 (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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 13254 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.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	486	Total	C	N	O	S	0	0	0
			3831	2392	673	748	18			
1	B	488	Total	C	N	O	S	0	0	0
			3848	2402	677	751	18			
1	C	488	Total	C	N	O	S	0	0	0
			3843	2399	677	749	18			

- 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				ZeroOcc	AltConf	Trace
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	E	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	F	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	J	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	K	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	M	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 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				ZeroOcc	AltConf	Trace
3	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

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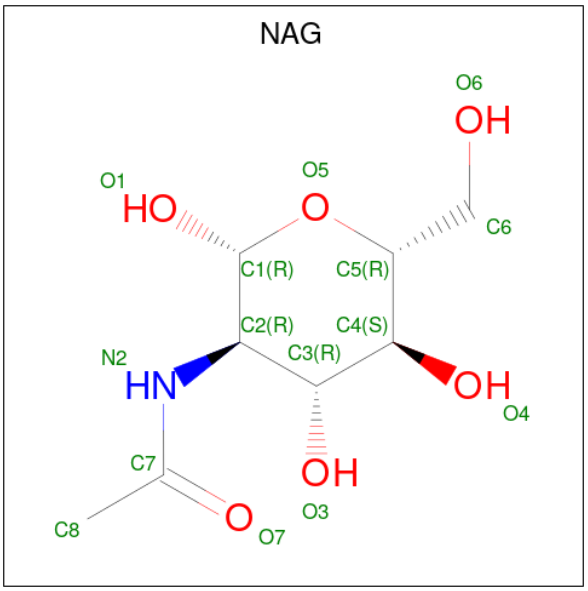
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
3	I	3	Total C N O 39 22 2 15	0	0	0
3	L	3	Total C N O 39 22 2 15	0	0	0

- 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	B	1	Total C N O 14 8 1 5	0	0
4	B	1	Total C N O 14 8 1 5	0	0
4	B	1	Total C N O 14 8 1 5	0	0
4	C	1	Total C N O 14 8 1 5	0	0
4	C	1	Total C N O 14 8 1 5	0	0
4	C	1	Total C N O 14 8 1 5	0	0
4	C	1	Total C N O 14 8 1 5	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	462	Total O 462 462	0	0
5	B	466	Total O 466 466	0	0
5	C	393	Total O 393 393	0	0

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

3 Data and refinement statistics (i)

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	197.89Å 186.24Å 106.96Å 90.00° 110.09° 90.00°	Depositor
Resolution (Å)	46.37 – 1.85	Depositor
% Data completeness (in resolution range)	99.3 (46.37-1.85)	Depositor
R_{merge}	0.27	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.69 (at 1.86Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, R_{free}	0.193 , 0.212	Depositor
Wilson B-factor (Å^2)	27.8	Xtriage
Anisotropy	0.444	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	13254	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.00% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality

4.1 Standard geometry

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

4.2 Too-close contacts

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

4.3 Torsion angles

4.3.1 Protein backbone

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

4.3.2 Protein sidechains

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

4.3.3 RNA

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

4.4 Non-standard residues in protein, DNA, RNA chains

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

4.5 Carbohydrates

23 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	0.48	0	17,19,21	0.87	1 (5%)
2	NAG	D	2	2	14,14,15	0.90	2 (14%)	17,19,21	1.03	1 (5%)
2	NAG	E	1	2,1	14,14,15	0.37	0	17,19,21	0.88	1 (5%)
2	NAG	E	2	2	14,14,15	0.66	0	17,19,21	0.43	0
2	NAG	F	1	2,1	14,14,15	2.46	1 (7%)	17,19,21	3.08	5 (29%)
2	NAG	F	2	2	14,14,15	1.08	2 (14%)	17,19,21	2.21	4 (23%)
3	NAG	G	1	3,1	14,14,15	0.34	0	17,19,21	0.93	1 (5%)
3	NAG	G	2	3	14,14,15	0.45	0	17,19,21	0.54	0
3	BMA	G	3	3	11,11,12	0.84	0	15,15,17	0.93	1 (6%)
2	NAG	H	1	2,1	14,14,15	0.94	1 (7%)	17,19,21	0.60	0
2	NAG	H	2	2	14,14,15	0.77	1 (7%)	17,19,21	1.05	1 (5%)
3	NAG	I	1	3,1	14,14,15	0.72	0	17,19,21	0.70	0
3	NAG	I	2	3	14,14,15	0.77	1 (7%)	17,19,21	0.70	0
3	BMA	I	3	3	11,11,12	1.17	1 (9%)	15,15,17	1.22	1 (6%)
2	NAG	J	1	2,1	14,14,15	0.61	0	17,19,21	0.63	0
2	NAG	J	2	2	14,14,15	0.78	1 (7%)	17,19,21	0.68	0
2	NAG	K	1	2,1	14,14,15	0.43	0	17,19,21	1.84	3 (17%)
2	NAG	K	2	2	14,14,15	0.69	0	17,19,21	0.77	1 (5%)
3	NAG	L	1	3,1	14,14,15	0.44	0	17,19,21	0.89	1 (5%)
3	NAG	L	2	3	14,14,15	0.21	0	17,19,21	0.59	0
3	BMA	L	3	3	11,11,12	0.86	1 (9%)	15,15,17	0.95	0
2	NAG	M	1	2,1	14,14,15	0.71	1 (7%)	17,19,21	0.56	0
2	NAG	M	2	2	14,14,15	0.70	1 (7%)	17,19,21	0.67	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
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	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	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	4/6/23/26	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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	BMA	G	3	3	-	1/2/19/22	0/1/1/1
2	NAG	H	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	H	2	2	-	2/6/23/26	0/1/1/1
3	NAG	I	1	3,1	-	1/6/23/26	0/1/1/1
3	NAG	I	2	3	-	2/6/23/26	0/1/1/1
3	BMA	I	3	3	-	2/2/19/22	0/1/1/1
2	NAG	J	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	J	2	2	-	2/6/23/26	0/1/1/1
2	NAG	K	1	2,1	-	3/6/23/26	0/1/1/1
2	NAG	K	2	2	-	2/6/23/26	0/1/1/1
3	NAG	L	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	L	2	3	-	2/6/23/26	0/1/1/1
3	BMA	L	3	3	-	2/2/19/22	0/1/1/1
2	NAG	M	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	M	2	2	-	2/6/23/26	0/1/1/1

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	1	NAG	C1-C2	8.20	1.64	1.52
2	H	1	NAG	C1-C2	3.15	1.57	1.52
2	H	2	NAG	O5-C1	-2.68	1.39	1.43
2	F	2	NAG	O5-C1	-2.53	1.39	1.43
2	D	2	NAG	C1-C2	2.49	1.56	1.52

The worst 5 of 21 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	1	NAG	C1-C2-N2	-10.22	93.02	110.49
2	K	1	NAG	C2-N2-C7	4.71	129.61	122.90
2	F	2	NAG	C2-N2-C7	-4.65	116.28	122.90
2	F	2	NAG	C4-C3-C2	-4.14	104.95	111.02
2	F	2	NAG	O5-C1-C2	-4.03	104.93	111.29

There are no chirality outliers.

5 of 31 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	L	3	BMA	O5-C5-C6-O6

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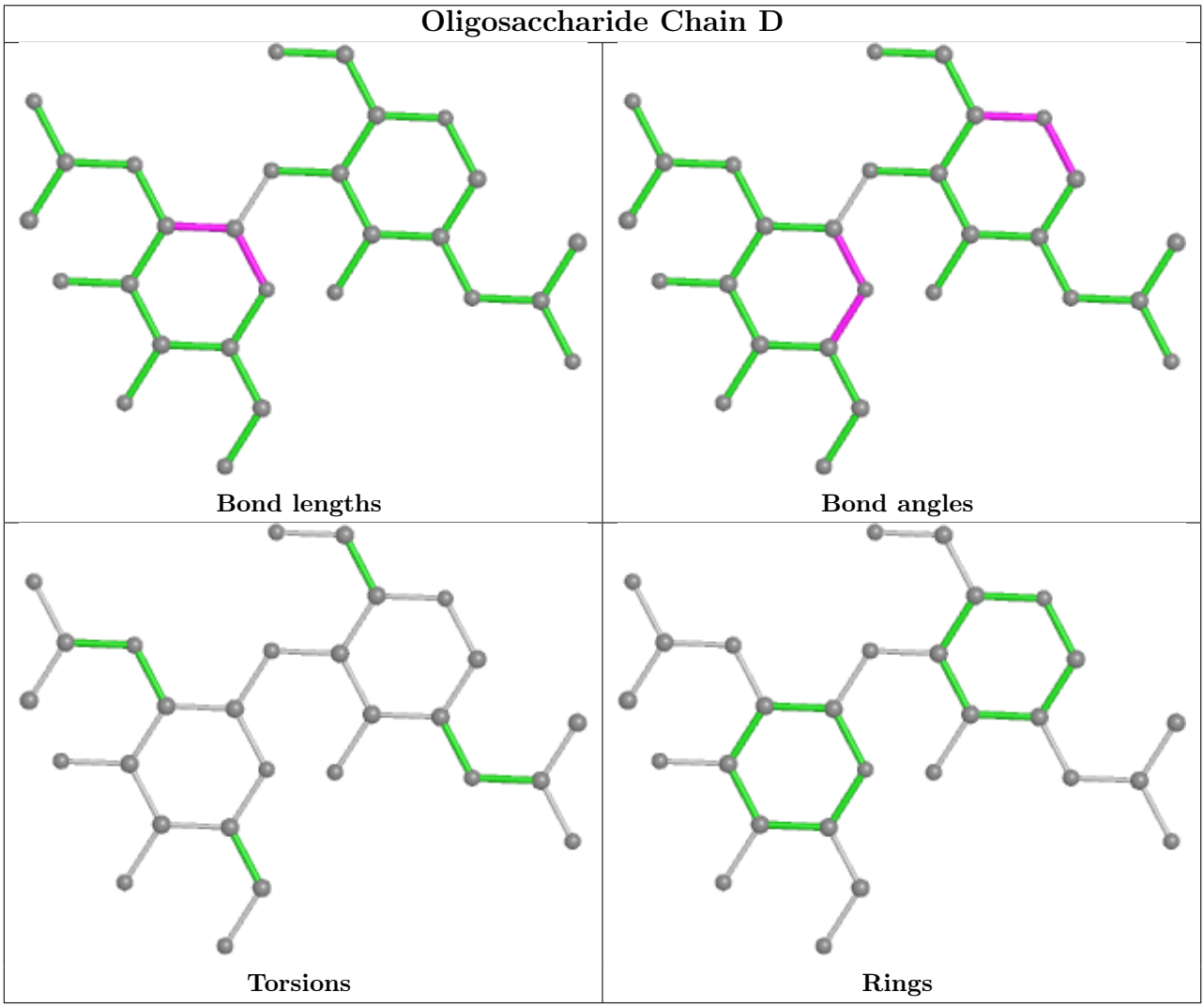
Mol	Chain	Res	Type	Atoms
3	I	3	BMA	O5-C5-C6-O6
3	I	3	BMA	C4-C5-C6-O6
2	M	2	NAG	O5-C5-C6-O6
2	J	2	NAG	O5-C5-C6-O6

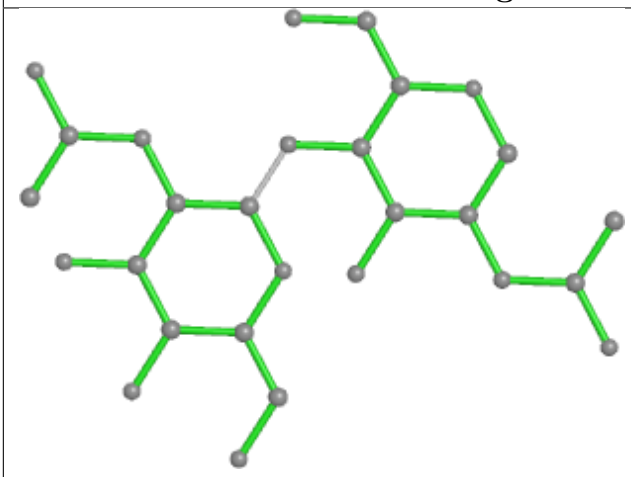
There are no ring outliers.

No monomer is involved in short contacts.

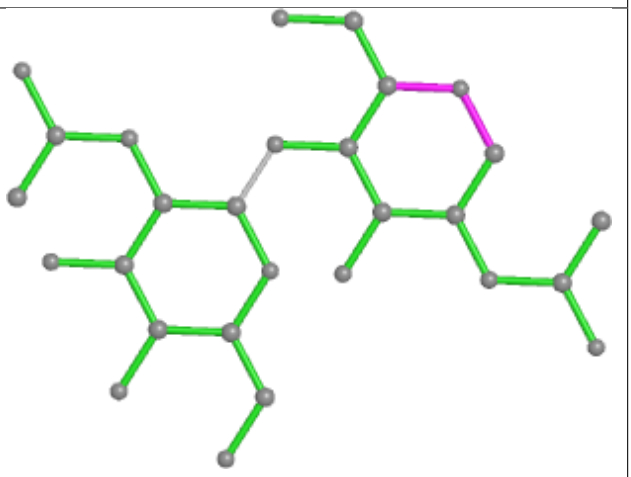
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



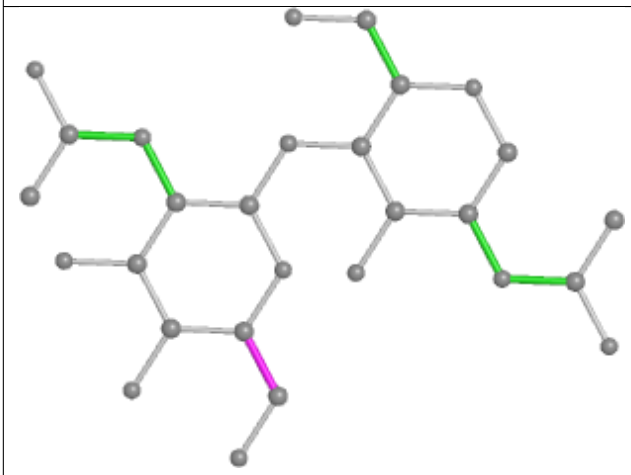
Oligosaccharide Chain E



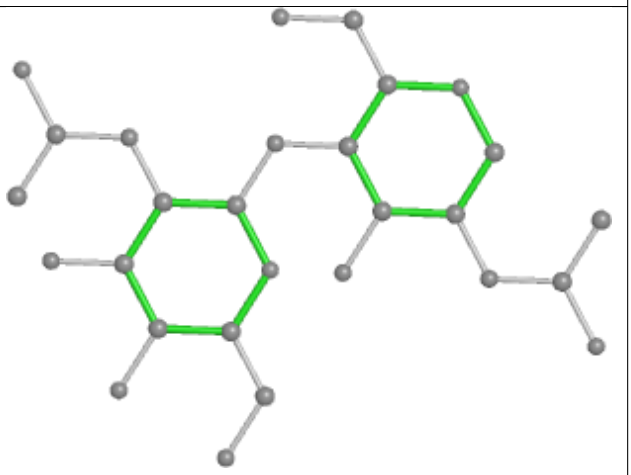
Bond lengths



Bond angles

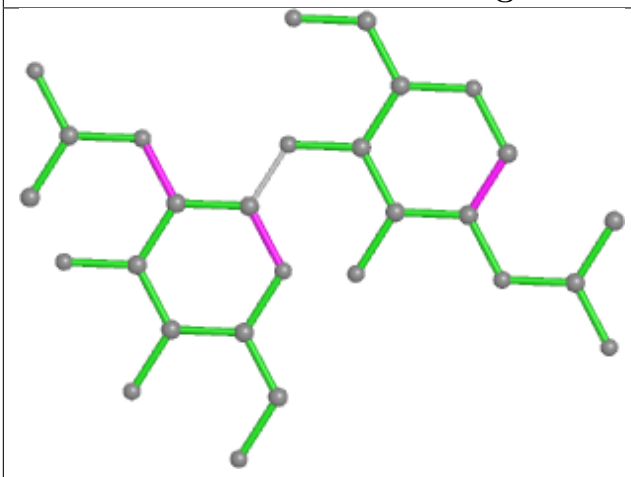


Torsions

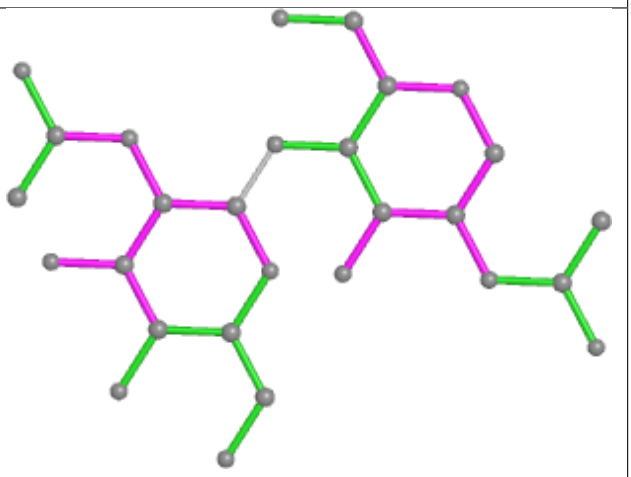


Rings

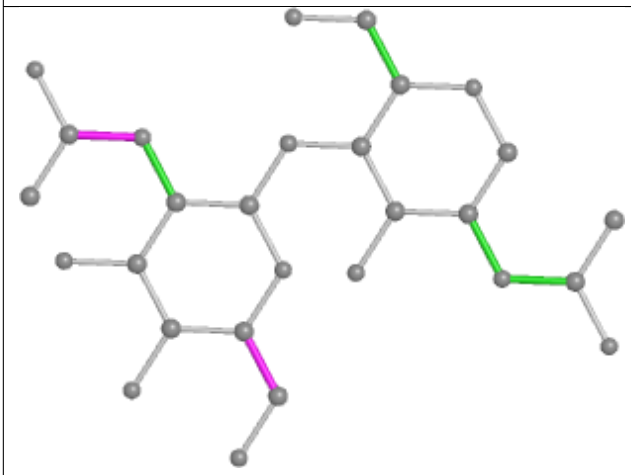
Oligosaccharide Chain F



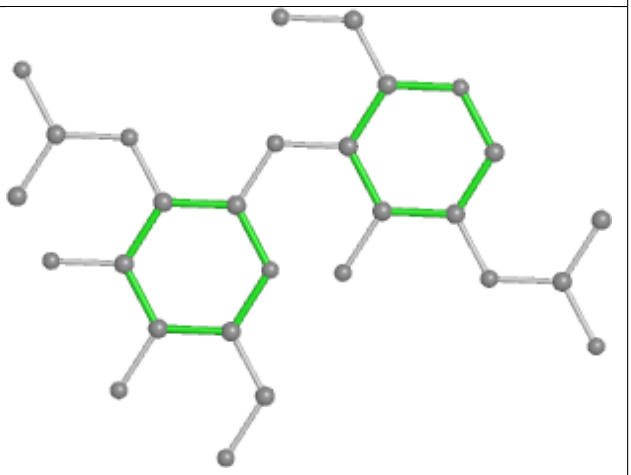
Bond lengths



Bond angles

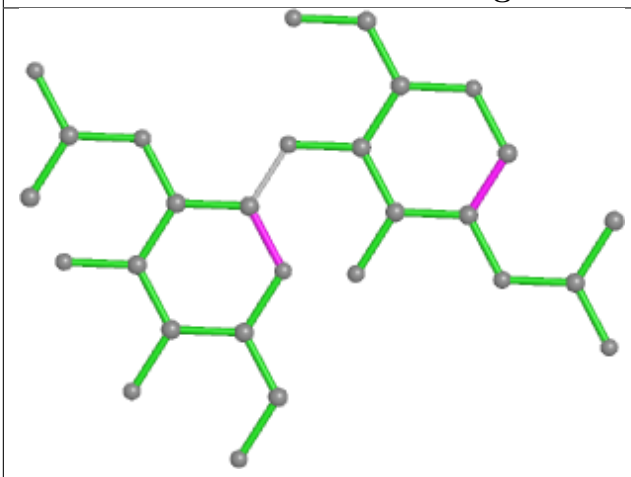


Torsions

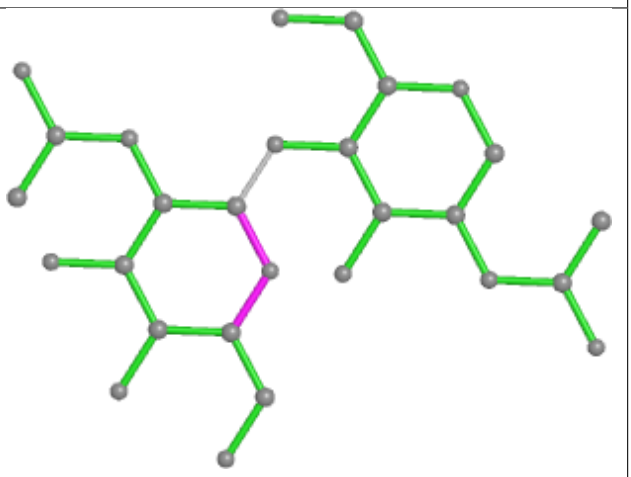


Rings

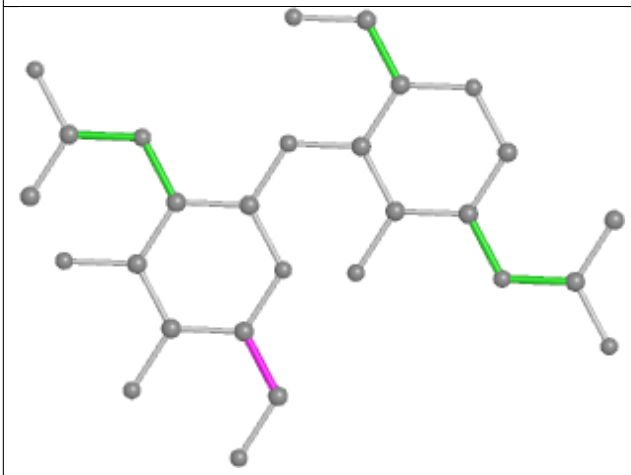
Oligosaccharide Chain H



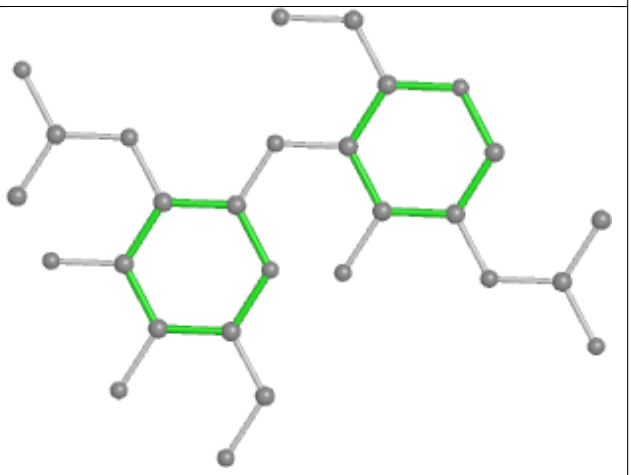
Bond lengths



Bond angles

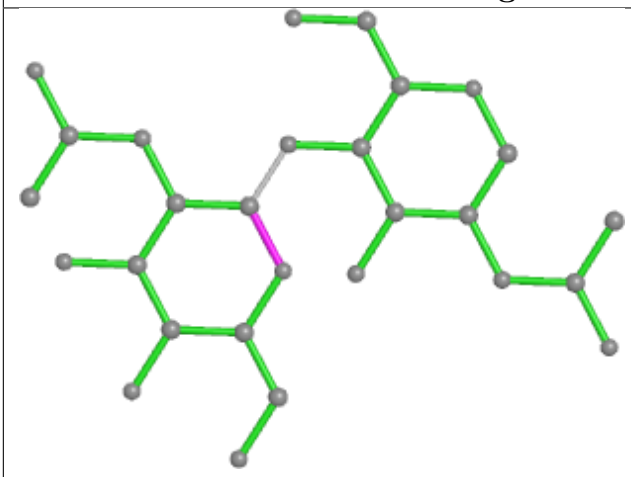


Torsions

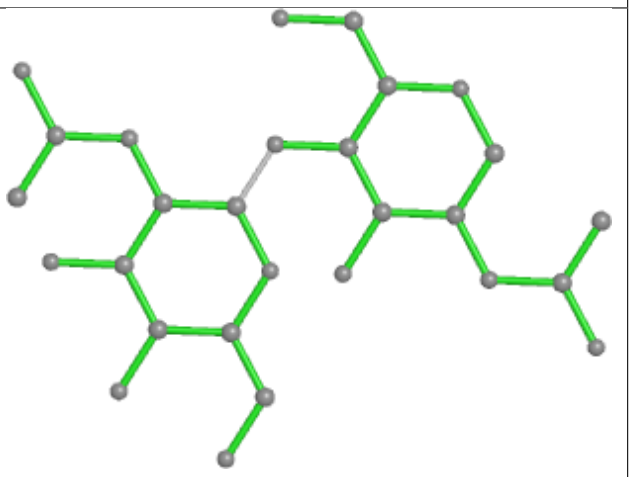


Rings

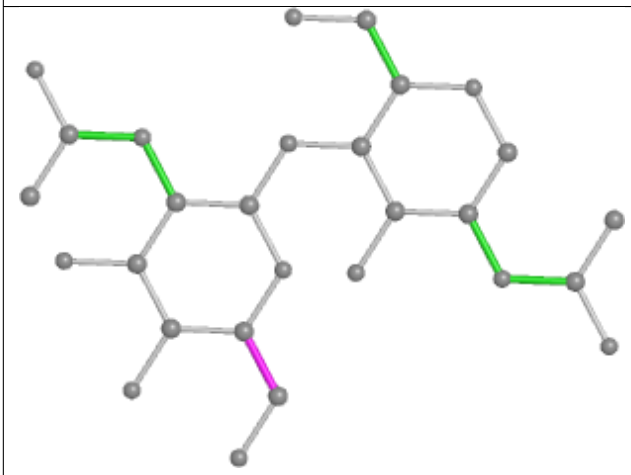
Oligosaccharide Chain J



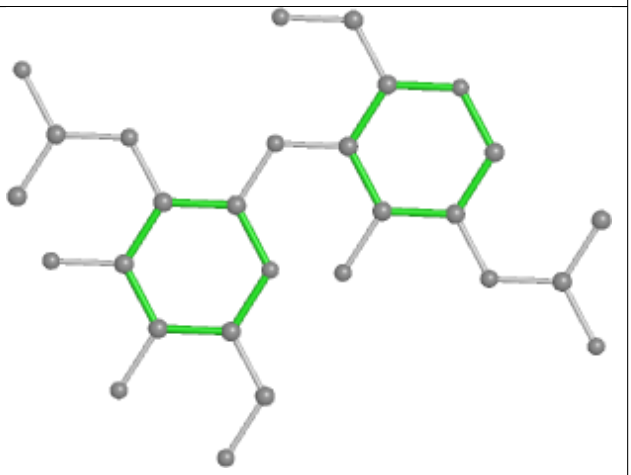
Bond lengths



Bond angles

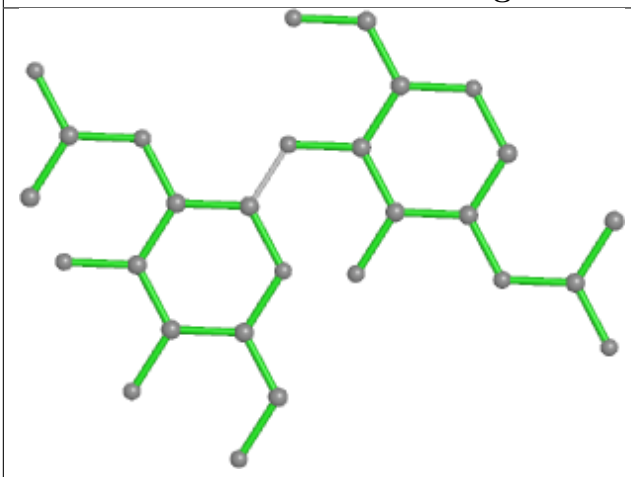


Torsions

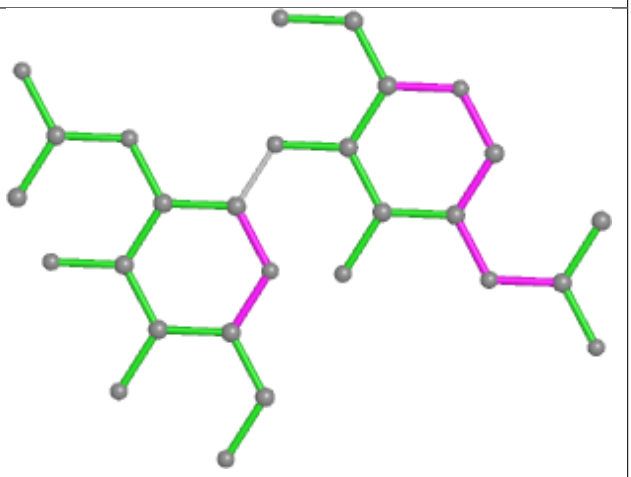


Rings

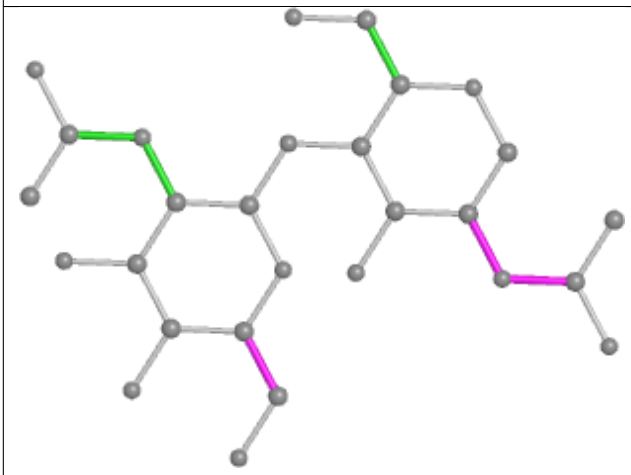
Oligosaccharide Chain K



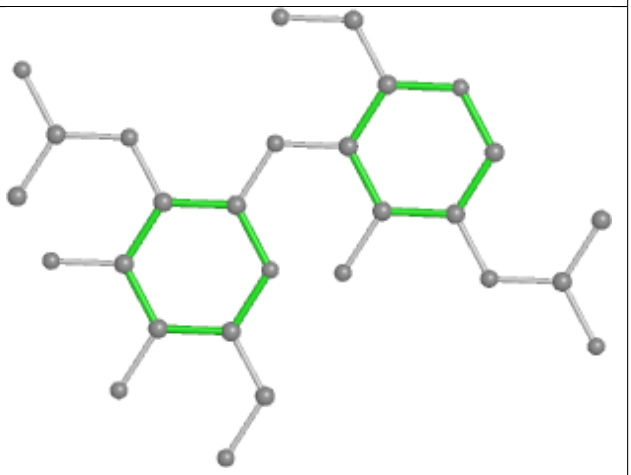
Bond lengths



Bond angles

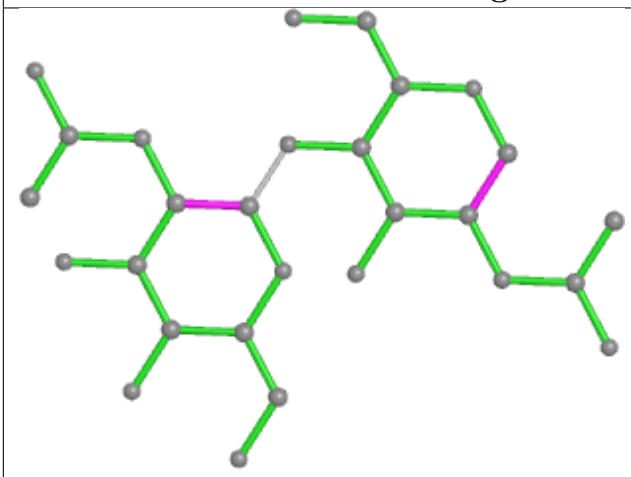


Torsions

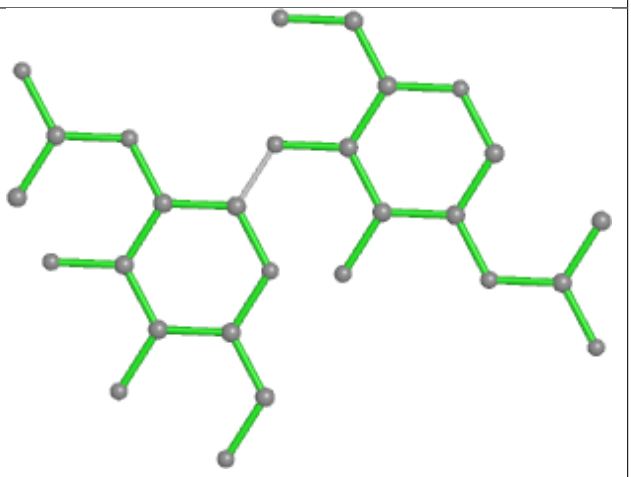


Rings

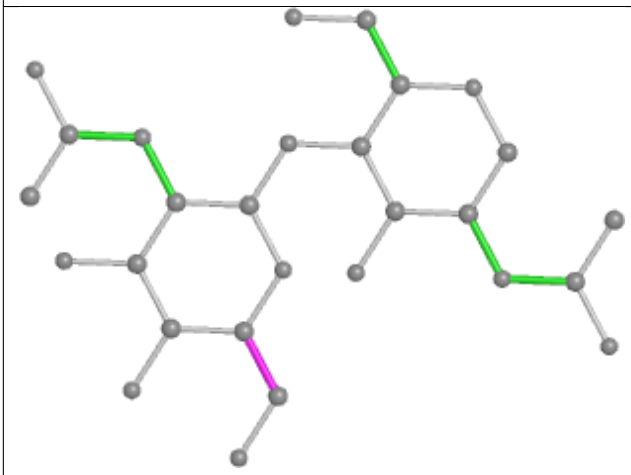
Oligosaccharide Chain M



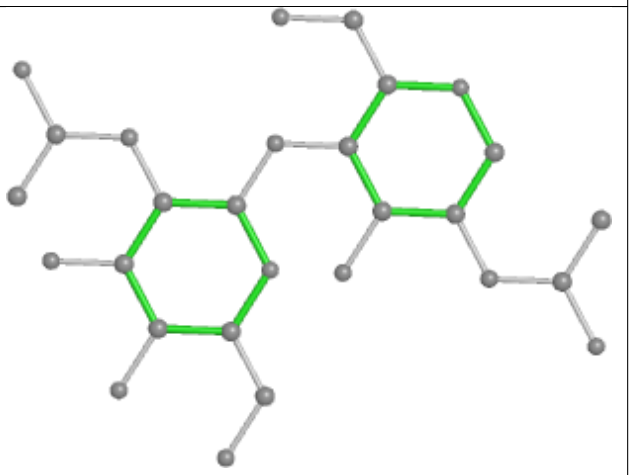
Bond lengths



Bond angles

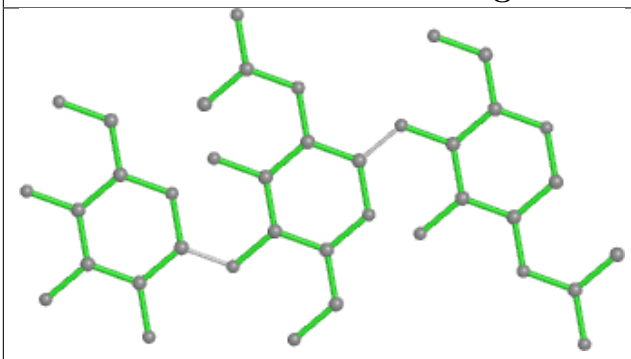


Torsions

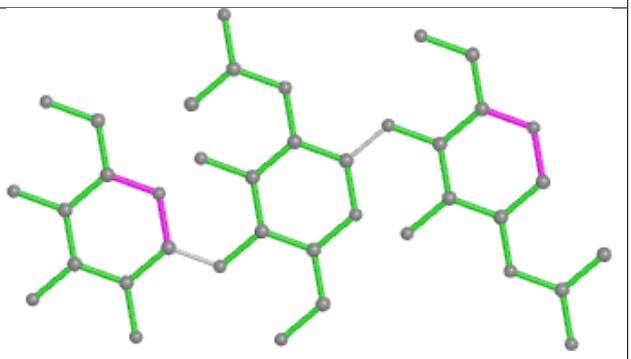


Rings

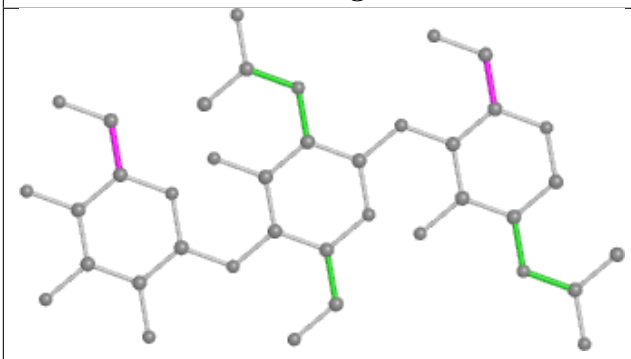
Oligosaccharide Chain G



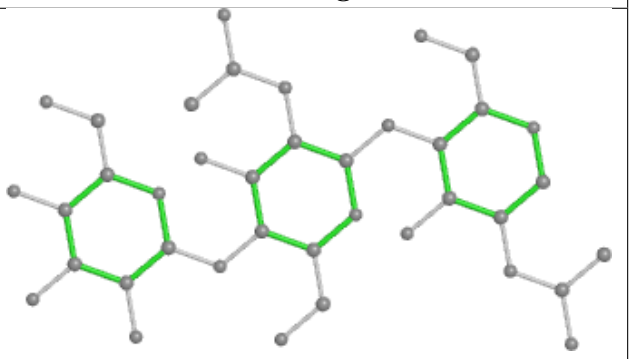
Bond lengths



Bond angles

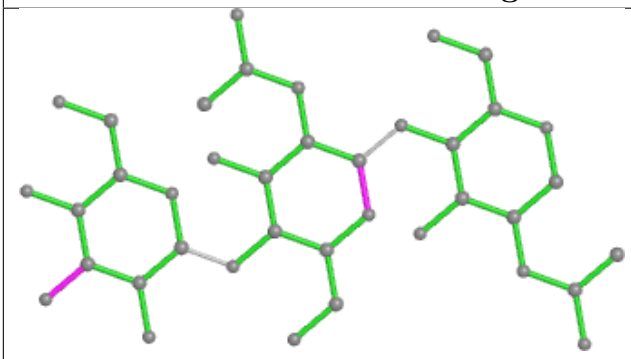


Torsions

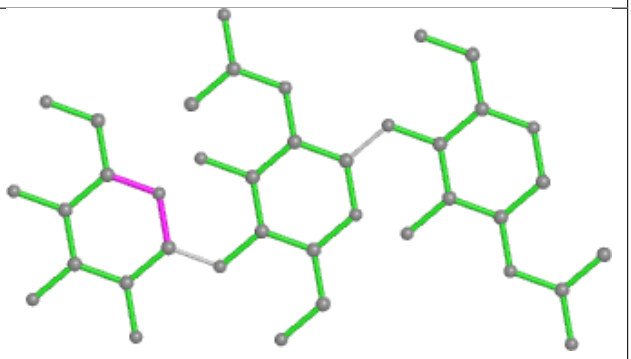


Rings

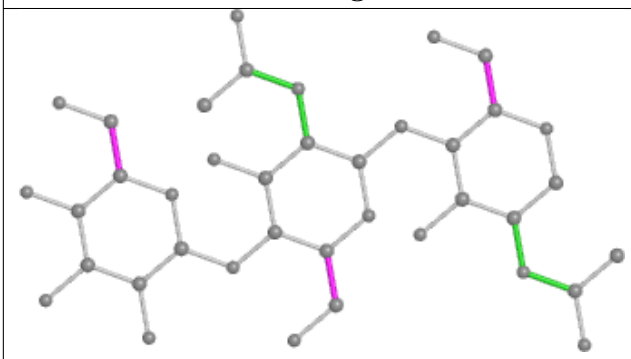
Oligosaccharide Chain I



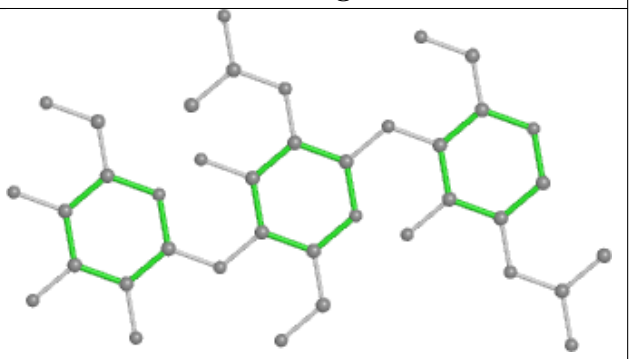
Bond lengths



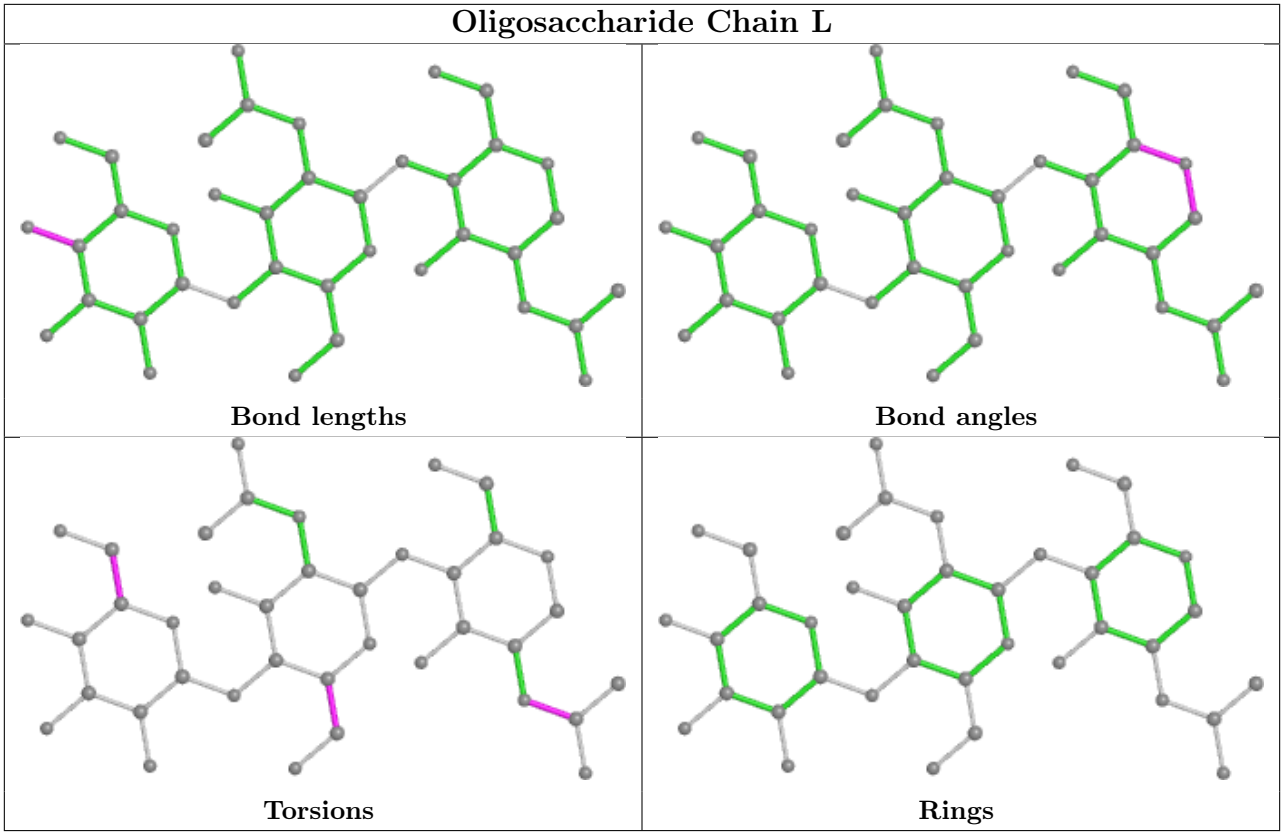
Bond angles



Torsions



Rings



4.6 Ligand geometry (i)

7 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	C	709	1	14,14,15	0.98	1 (7%)	17,19,21	0.88	1 (5%)
4	NAG	C	703	1	14,14,15	0.52	0	17,19,21	0.55	0
4	NAG	C	702	1	14,14,15	0.32	0	17,19,21	0.96	1 (5%)
4	NAG	B	608	1	14,14,15	1.25	2 (14%)	17,19,21	0.98	1 (5%)
4	NAG	B	602	1	14,14,15	0.29	0	17,19,21	0.81	1 (5%)
4	NAG	B	601	1	14,14,15	0.75	1 (7%)	17,19,21	1.15	1 (5%)
4	NAG	C	701	1	14,14,15	0.97	1 (7%)	17,19,21	0.69	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	C	709	1	-	2/6/23/26	0/1/1/1
4	NAG	C	703	1	-	2/6/23/26	0/1/1/1
4	NAG	C	702	1	-	0/6/23/26	0/1/1/1
4	NAG	B	608	1	-	0/6/23/26	0/1/1/1
4	NAG	B	602	1	-	2/6/23/26	0/1/1/1
4	NAG	B	601	1	-	0/6/23/26	0/1/1/1
4	NAG	C	701	1	-	0/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	608	NAG	C1-C2	3.50	1.57	1.52
4	C	701	NAG	O5-C1	3.29	1.49	1.43
4	C	709	NAG	O5-C1	3.11	1.48	1.43
4	B	608	NAG	O5-C1	2.88	1.48	1.43
4	B	601	NAG	O5-C1	-2.57	1.39	1.43

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	601	NAG	C1-O5-C5	3.44	116.86	112.19
4	C	709	NAG	C1-O5-C5	3.13	116.43	112.19
4	C	702	NAG	C1-O5-C5	3.07	116.35	112.19
4	B	602	NAG	C1-O5-C5	2.95	116.19	112.19
4	B	608	NAG	C2-N2-C7	2.45	126.39	122.90

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	703	NAG	C4-C5-C6-O6
4	C	703	NAG	O5-C5-C6-O6
4	C	709	NAG	O5-C5-C6-O6
4	C	709	NAG	C4-C5-C6-O6
4	B	602	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.