Full wwPDB X-ray Structure Validation Report ⓘ

Aug 8, 2020 – 03:51 PM BST

PDB ID	:	1OZN
Title	:	1.5A Crystal Structure of the Nogo Receptor Ligand Binding Domain Reveals a Convergent Recognition Scaffold Mediating Inhibition of Myelination
Authors	:	He, X.; Bazan, J.F.; Park, J.B.; McDermott, G.; He, Z.; Garcia, K.C.
Deposited on	:	2003-04-09
Resolution	:	1.52 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see references ⓘ) were used in the production of this report:

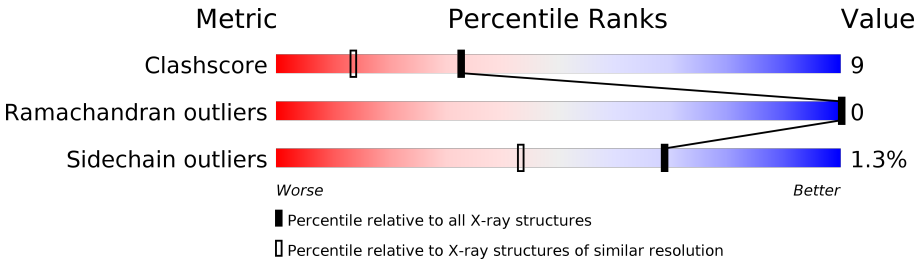
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.13.1

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 1.52 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)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	4249 (1.54-1.50)
Ramachandran outliers	138981	4148 (1.54-1.50)
Sidechain outliers	138945	4146 (1.54-1.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower 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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	285	88% 11%
2	B	4	75% 25%
3	C	3	67% 33%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NAG	B	1	X	-	-	-
4	ACY	A	3	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 2674 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.

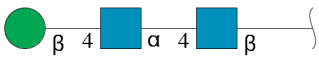
- Molecule 1 is a protein called Reticulon 4 receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	284	Total	C	N	O	S	0	0	0
			2219	1402	421	385	11			

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

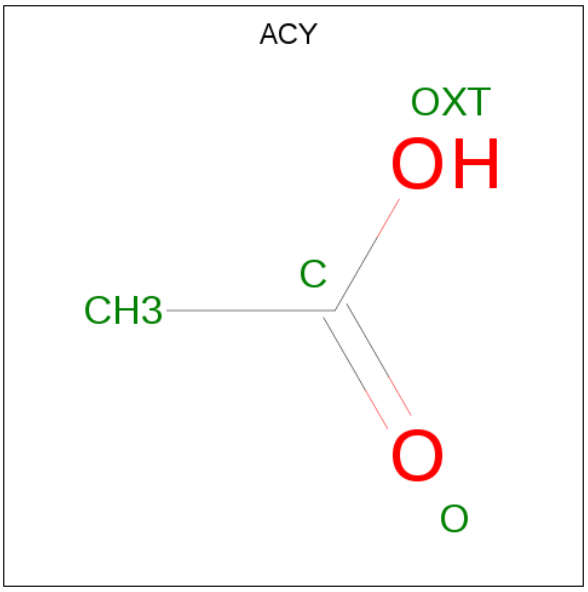
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	4	Total	C	N	O	0	0	0
			50	28	2	20			

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



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

- Molecule 4 is ACETIC ACID (three-letter code: ACY) (formula: $C_2H_4O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	354	Total O 354 354	0	0

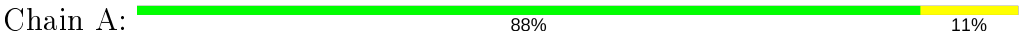
3 Residue-property plots (i)

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.

Note EDS was not executed.

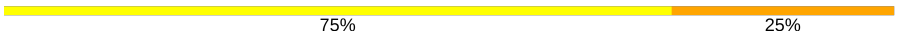
• Molecule 1: Reticulon 4 receptor

Chain A:



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

Chain B:



• Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-alpha-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	32.21Å 33.91Å 60.22Å 85.02° 75.91° 67.96°	Depositor
Resolution (Å)	50.00 – 1.52	Depositor
% Data completeness (in resolution range)	(Not available) (50.00-1.52)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.167 , 0.198	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2674	wwPDB-VP
Average B, all atoms (Å^2)	19.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.45	0/2273	0.71	0/3094

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	2219	0	2213	37	0
2	B	50	0	42	3	0
3	C	39	0	33	1	0
4	A	12	0	9	9	0
5	A	354	0	0	16	0
All	All	2674	0	2297	40	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 9.

All (40) 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:A:308:GLY:CA	4:A:3:ACY:H1	1.57	1.32
1:A:308:GLY:HA3	4:A:3:ACY:H1	1.17	1.16
1:A:308:GLY:HA3	4:A:3:ACY:CH3	1.83	1.09
1:A:308:GLY:N	4:A:3:ACY:H1	1.95	0.82
1:A:308:GLY:C	4:A:3:ACY:H1	2.11	0.71
1:A:308:GLY:HA3	4:A:3:ACY:C	2.21	0.70
1:A:308:GLY:CA	4:A:3:ACY:CH3	2.48	0.70
1:A:117:GLN:NE2	1:A:117:GLN:H	1.92	0.66
1:A:144:GLU:HG2	5:A:556:HOH:O	1.99	0.62
1:A:307:GLN:HG3	5:A:413:HOH:O	2.00	0.61
1:A:284:GLU:H	1:A:284:GLU:CD	2.06	0.58
1:A:38:LYS:HD2	1:A:61:ARG:HD3	1.86	0.58
1:A:29:GLY:O	1:A:30:ALA:HB3	2.04	0.58
1:A:151:ARG:HH11	1:A:151:ARG:HG3	1.72	0.55
1:A:117:GLN:CD	1:A:117:GLN:H	2.09	0.55
1:A:272:TRP:O	1:A:276:GLN:HG2	2.08	0.53
1:A:139:ARG:HD2	5:A:659:HOH:O	2.09	0.51
2:B:2:NDG:H8C2	2:B:4:MAN:O6	2.12	0.49
1:A:258:ASN:HB2	5:A:452:HOH:O	2.12	0.49
1:A:229:MET:HE2	5:A:721:HOH:O	2.12	0.48
5:A:720:HOH:O	2:B:3:MAN:H3	2.13	0.48
1:A:78:ARG:HG2	1:A:78:ARG:HH11	1.78	0.48
1:A:211:GLN:NE2	5:A:482:HOH:O	2.47	0.48
1:A:127:HIS:HD2	5:A:468:HOH:O	1.97	0.47
1:A:308:GLY:HA3	4:A:3:ACY:OXT	2.13	0.47
1:A:133:HIS:HE1	5:A:628:HOH:O	1.98	0.46
1:A:81:ARG:NH1	2:B:1:NAG:H82	2.30	0.46
1:A:250:ARG:HD3	5:A:680:HOH:O	2.16	0.45
1:A:220:HIS:HE1	5:A:622:HOH:O	2.00	0.45
5:A:695:HOH:O	3:C:2:NDG:H6C2	2.17	0.44
1:A:308:GLY:H	4:A:3:ACY:H1	1.77	0.44
1:A:196:ARG:HH11	1:A:196:ARG:HG3	1.82	0.44
1:A:302:ALA:HB1	1:A:304:ASN:HD22	1.83	0.44
1:A:43:CYS:N	1:A:44:PRO:CD	2.81	0.43
1:A:151:ARG:NE	5:A:599:HOH:O	2.47	0.43
1:A:284:GLU:C	1:A:286:PRO:HD3	2.38	0.43
1:A:105:ALA:O	1:A:131:ARG:HD3	2.18	0.42
1:A:229:MET:HE1	5:A:587:HOH:O	2.19	0.41
1:A:229:MET:CE	5:A:587:HOH:O	2.67	0.41
1:A:277:LYS:HE2	5:A:730:HOH:O	2.20	0.41

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 X-ray entries followed by that with respect to entries of similar resolution.

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	282/285 (99%)	268 (95%)	14 (5%)	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 X-ray entries followed by that with respect to entries of similar resolution.

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	235/235 (100%)	232 (99%)	3 (1%)	69 43

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	43	CYS
1	A	167	GLN
1	A	266	CYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	46	GLN
1	A	89	HIS
1	A	109	GLN
1	A	117	GLN
1	A	127	HIS

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Mol	Chain	Res	Type
1	A	133	HIS
1	A	157	GLN
1	A	167	GLN
1	A	211	GLN
1	A	220	HIS
1	A	304	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

7 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	B	1	1,2	14,14,15	0.79	0	17,19,21	0.76	0
2	NDG	B	2	2	14,14,15	0.94	1 (7%)	17,19,21	0.83	0
2	MAN	B	3	2	11,11,12	0.68	0	15,15,17	0.79	0
2	MAN	B	4	2	11,11,12	0.47	0	15,15,17	0.56	0
3	NAG	C	1	1,3	14,14,15	0.63	0	17,19,21	0.70	0
3	NDG	C	2	3	14,14,15	0.63	0	17,19,21	0.75	1 (5%)
3	BMA	C	3	3	11,11,12	0.57	0	15,15,17	0.43	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	B	1	1,2	1/1/5/7	4/6/23/26	0/1/1/1
2	NDG	B	2	2	-	1/6/23/26	0/1/1/1
2	MAN	B	3	2	-	0/2/19/22	1/1/1/1
2	MAN	B	4	2	-	1/2/19/22	1/1/1/1
3	NAG	C	1	1,3	-	0/6/23/26	0/1/1/1
3	NDG	C	2	3	-	4/6/23/26	0/1/1/1
3	BMA	C	3	3	-	2/2/19/22	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	NDG	C1-C2	2.21	1.55	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	2	NDG	C2-N2-C7	-2.04	120.00	122.90

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	B	1	NAG	C1

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	2	NDG	C8-C7-N2-C2
3	C	2	NDG	O7-C7-N2-C2
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	O7-C7-N2-C2
2	B	1	NAG	O5-C5-C6-O6
2	B	1	NAG	C4-C5-C6-O6
3	C	3	BMA	C4-C5-C6-O6
3	C	2	NDG	C4-C5-C6-O6
3	C	2	NDG	O5-C5-C6-O6
2	B	4	MAN	O5-C5-C6-O6
2	B	2	NDG	O5-C5-C6-O6
3	C	3	BMA	O5-C5-C6-O6

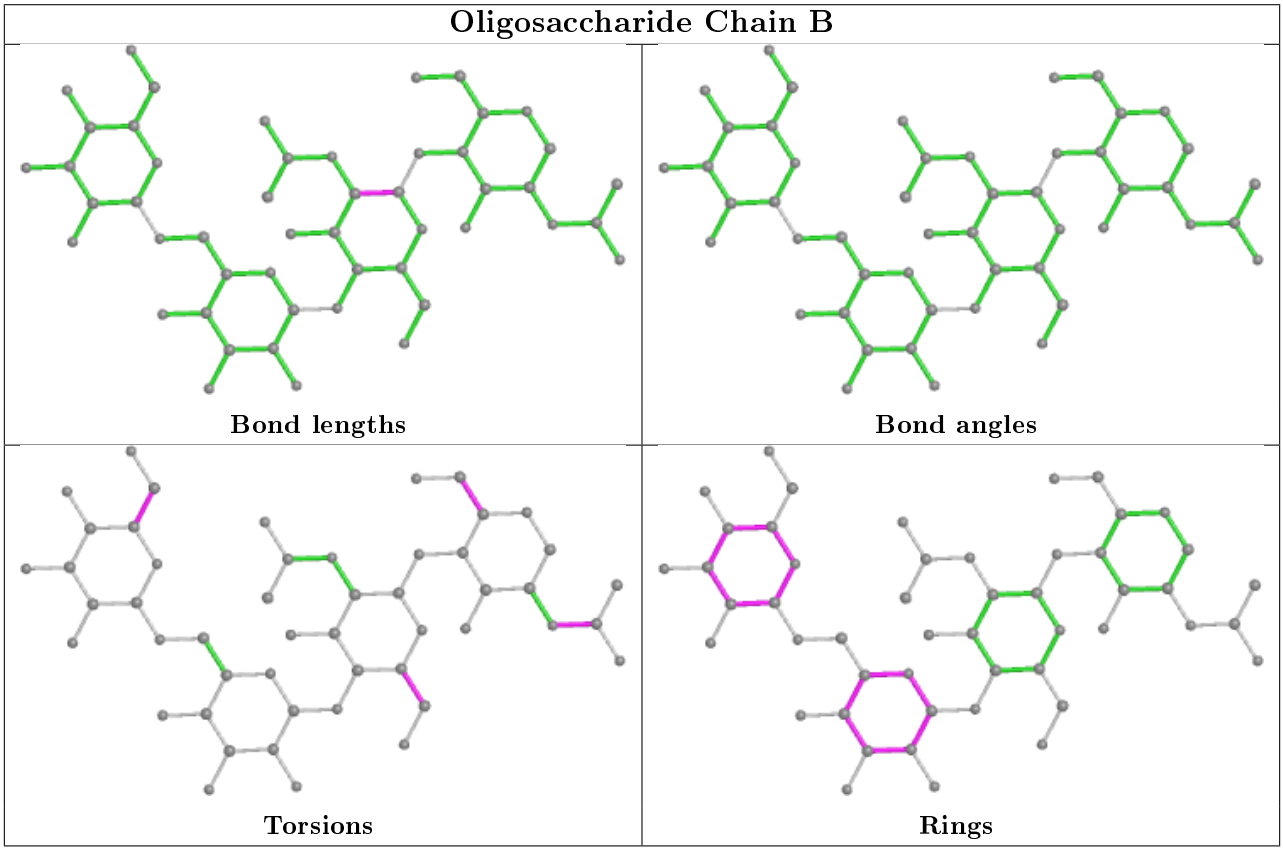
All (2) ring outliers are listed below:

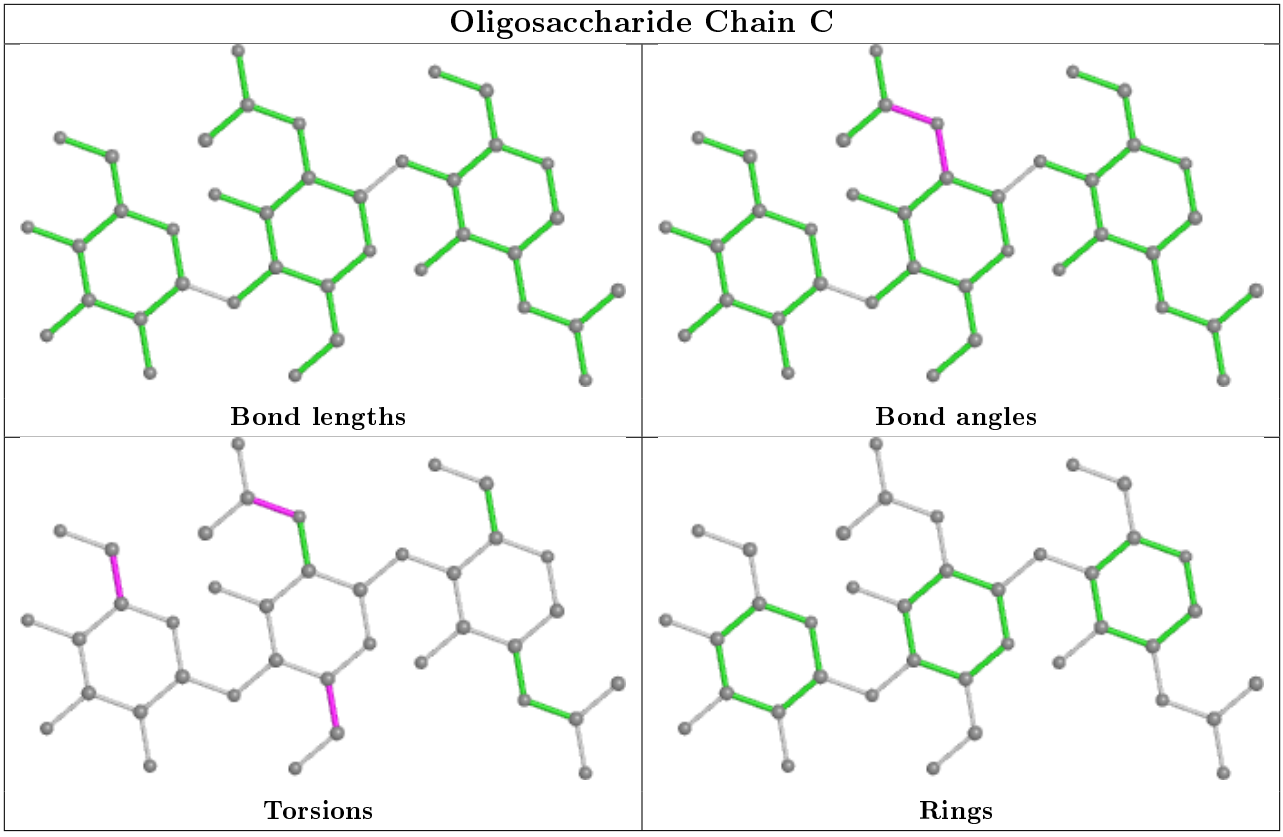
Mol	Chain	Res	Type	Atoms
2	B	4	MAN	C1-C2-C3-C4-C5-O5
2	B	3	MAN	C1-C2-C3-C4-C5-O5

5 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	3	MAN	1	0
3	C	2	NDG	1	0
2	B	1	NAG	1	0
2	B	2	NDG	1	0
2	B	4	MAN	1	0

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





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	$\#\|Z\| > 2$
4	ACY	A	3	-	1,3,3	0.76	0	0,3,3	0.00	-
4	ACY	A	1	-	1,3,3	2.70	1 (100%)	0,3,3	0.00	-
4	ACY	A	2	-	1,3,3	2.70	1 (100%)	0,3,3	0.00	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	2	ACY	CH3-C	2.70	1.52	1.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1	ACY	CH3-C	2.70	1.52	1.48

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	3	ACY	9	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.