



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 11:23 PM UTC

PDB ID : 5YOT / pdb_00005yot
Title : Isoprimeverose-producing enzyme from *Aspergillus oryzae* in complex with isoprimeverose
Authors : Matsuzawa, T.; Watanabe, M.; Nakamichi, Y.; Yaoi, K.
Deposited on : 2017-10-31
Resolution : 1.98 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

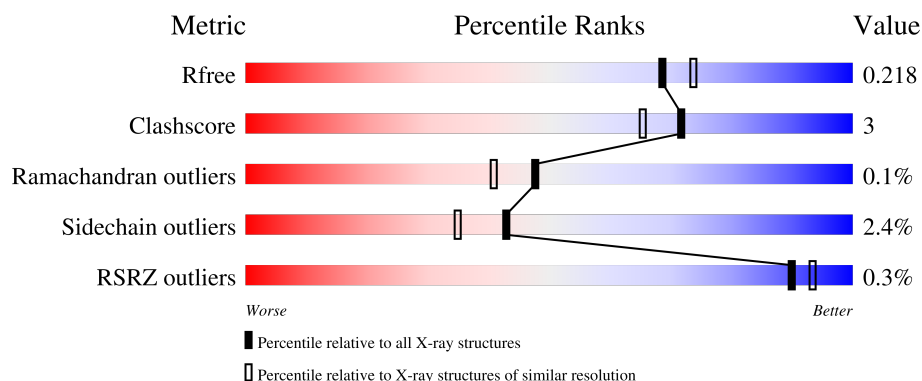
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.98 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))
R_{free}	180053	1506 (1.98-1.98)
Clashscore	190562	1534 (1.98-1.98)
Ramachandran outliers	187476	1518 (1.98-1.98)
Sidechain outliers	187428	1518 (1.98-1.98)
RSRZ outliers	180081	1506 (1.98-1.98)

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 of 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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	765	90% 8% 2%
1	B	765	89% 9% 2%
2	C	2	100%
2	D	2	100%
2	E	2	100%

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Mol	Chain	Length	Quality of chain
2	F	2	 50% 50%
2	G	2	 100%
2	H	2	 100%
2	I	2	 100%

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
5	GOL	B	816	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 12902 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 Isoprimeverose-producing enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	754	Total	C	N	O	S	0	3	0
			5852	3728	974	1131	19			
1	B	754	Total	C	N	O	S	0	3	0
			5850	3728	973	1130	19			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	780	VAL	-	expression tag	UNP Q2U8V9
A	781	ASP	-	expression tag	UNP Q2U8V9
A	782	HIS	-	expression tag	UNP Q2U8V9
A	783	HIS	-	expression tag	UNP Q2U8V9
A	784	HIS	-	expression tag	UNP Q2U8V9
A	785	HIS	-	expression tag	UNP Q2U8V9
A	786	HIS	-	expression tag	UNP Q2U8V9
A	787	HIS	-	expression tag	UNP Q2U8V9
B	780	VAL	-	expression tag	UNP Q2U8V9
B	781	ASP	-	expression tag	UNP Q2U8V9
B	782	HIS	-	expression tag	UNP Q2U8V9
B	783	HIS	-	expression tag	UNP Q2U8V9
B	784	HIS	-	expression tag	UNP Q2U8V9
B	785	HIS	-	expression tag	UNP Q2U8V9
B	786	HIS	-	expression tag	UNP Q2U8V9
B	787	HIS	-	expression tag	UNP Q2U8V9

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

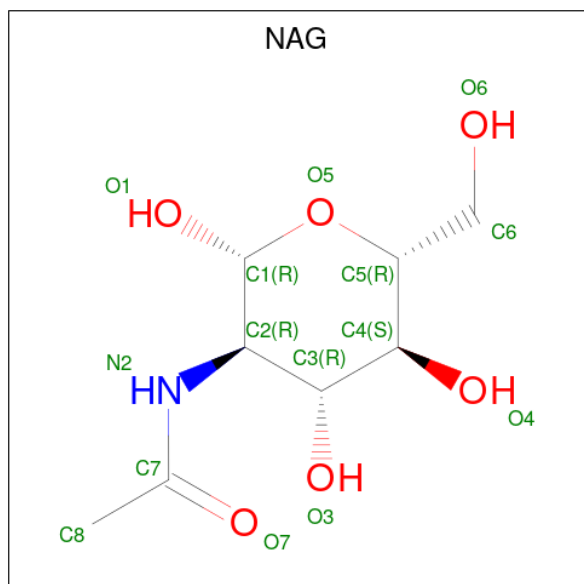


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	E	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	F	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	I	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

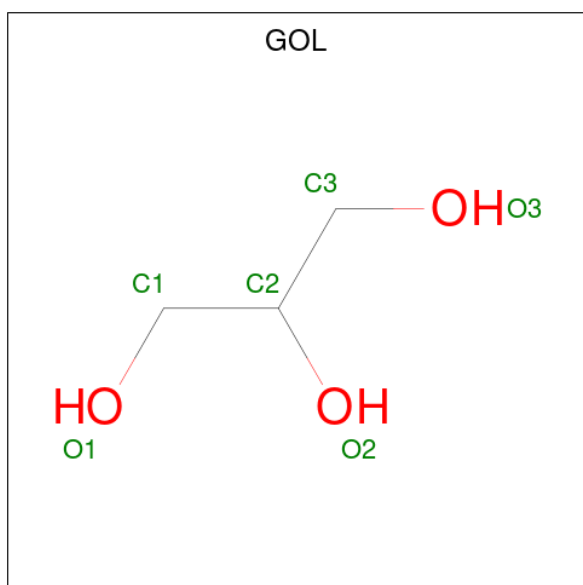
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		
3	B	1	Total	Ca	0	0
			1	1		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 6 3 3	0	0
5	A	1	Total C O 6 3 3	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 6	C 3	O 3	0	0
5	A	1	Total 6	C 3	O 3	0	0
5	B	1	Total 6	C 3	O 3	0	0
5	B	1	Total 6	C 3	O 3	0	0
5	B	1	Total 6	C 3	O 3	0	0
5	B	1	Total 6	C 3	O 3	0	0

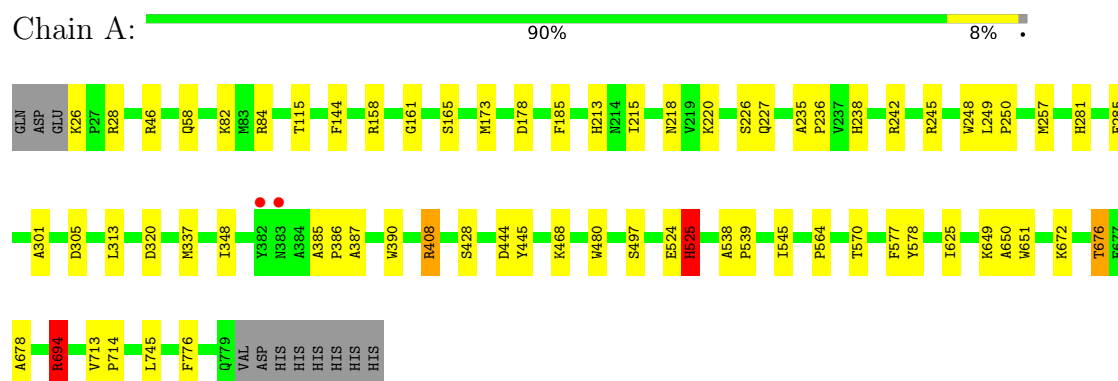
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	412	Total 412	O 412	0	0
6	B	402	Total 402	O 402	0	0

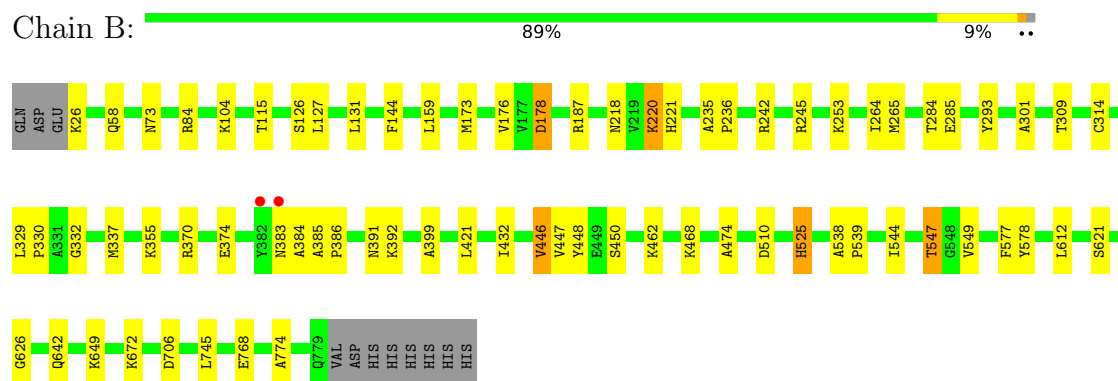
3 Residue-property plots

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 electron 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 dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

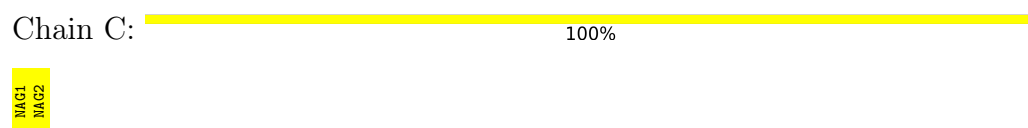
• Molecule 1: Isoprimeverose-producing enzyme



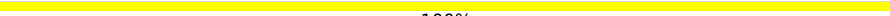
• Molecule 1: Isoprimeverose-producing enzyme



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

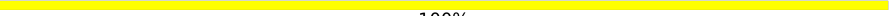


• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:  100%

MAG1
MAG2

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

Chain E:  100%

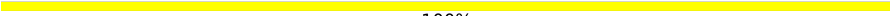
MAG1
MAG2

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

Chain F:  50% 50%

MAG1
MAG2

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

Chain G:  100%

MAG1
MAG2

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

Chain H:  100%

MAG1
MAG2

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

Chain I:  100%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	70.14Å 130.45Å 94.84Å 90.00° 94.46° 90.00°	Depositor
Resolution (Å)	30.00 – 1.98 30.00 – 1.98	Depositor EDS
% Data completeness (in resolution range)	92.7 (30.00-1.98) 92.7 (30.00-1.98)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.08 (at 1.98Å)	Xtriage
Refinement program	REFMAC 5.8.0222	Depositor
R, R_{free}	0.167 , 0.211 0.178 , 0.218	Depositor DCC
R_{free} test set	5439 reflections (4.62%)	wwPDB-VP
Wilson B-factor (Å ²)	25.2	Xtriage
Anisotropy	0.067	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 35.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	12902	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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.

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: CA, GOL, 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	0.99	3/5992 (0.1%)	1.04	8/8156 (0.1%)
1	B	0.98	2/5994 (0.0%)	1.04	4/8161 (0.0%)
All	All	0.98	5/11986 (0.0%)	1.04	12/16317 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	6
1	B	0	3
All	All	0	9

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	650	ALA	C-O	-6.26	1.16	1.23
1	B	309	THR	C-O	-5.72	1.17	1.24
1	A	625	ILE	N-CA	-5.24	1.41	1.46
1	A	305	ASP	N-CA	5.17	1.52	1.46
1	B	284	THR	N-CA	5.01	1.52	1.46

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	144	PHE	CA-CB-CG	7.95	121.75	113.80
1	A	444	ASP	CA-CB-CG	6.08	118.68	112.60
1	A	144	PHE	CA-CB-CG	5.93	119.73	113.80
1	B	285	GLU	CB-CG-CD	5.65	122.20	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	185	PHE	CA-CB-CG	5.58	119.38	113.80

There are no chirality outliers.

5 of 9 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	158	ARG	Sidechain
1	A	242	ARG	Sidechain
1	A	245	ARG	Sidechain
1	A	408	ARG	Sidechain
1	A	46	ARG	Sidechain

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	5852	0	5696	33	0
1	B	5850	0	5701	42	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
2	E	28	0	25	0	0
2	F	28	0	25	1	0
2	G	28	0	25	0	0
2	H	28	0	25	0	0
2	I	28	0	25	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	84	0	78	0	0
4	B	56	0	52	1	0
5	A	24	0	32	4	0
5	B	24	0	32	10	0
6	A	412	0	0	7	0
6	B	402	0	0	6	0
All	All	12902	0	11766	78	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 3.

The worst 5 of 78 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:480:TRP:CA	1:A:480:TRP:CG	2.55	0.89
5:A:814:GOL:H11	1:B:612:LEU:HB2	1.63	0.81
1:A:285[B]:GLU:CD	6:A:928:HOH:O	2.29	0.75
1:B:301:ALA:HB2	1:B:337[A]:MET:HE2	1.71	0.72
1:B:544:ILE:O	1:B:547:THR:HB	1.90	0.72

There are no symmetry-related clashes.

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 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	755/765 (99%)	735 (97%)	20 (3%)	0	100	100
1	B	755/765 (99%)	733 (97%)	21 (3%)	1 (0%)	48	41
All	All	1510/1530 (99%)	1468 (97%)	41 (3%)	1 (0%)	48	41

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	621	SER

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 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	622/631 (99%)	609 (98%)	13 (2%)	47	40
1	B	623/631 (99%)	606 (97%)	17 (3%)	39	31
All	All	1245/1262 (99%)	1215 (98%)	30 (2%)	43	35

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	84	ARG
1	B	649	LYS
1	B	253	LYS
1	B	768	GLU
1	B	468	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	218	ASN
1	B	221	HIS
1	B	585	ASN
1	B	575	GLN
1	B	582	GLN

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 ⓘ

14 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	C	1	2,1	14,14,15	0.67	0	17,19,21	2.59	5 (29%)
2	NAG	C	2	2	14,14,15	0.90	0	17,19,21	1.82	4 (23%)
2	NAG	D	1	2,1	14,14,15	0.82	1 (7%)	17,19,21	0.88	0
2	NAG	D	2	2	14,14,15	1.08	2 (14%)	17,19,21	2.16	6 (35%)
2	NAG	E	1	2,1	14,14,15	0.91	0	17,19,21	2.39	4 (23%)
2	NAG	E	2	2	14,14,15	1.77	4 (28%)	17,19,21	2.27	4 (23%)
2	NAG	F	1	2,1	14,14,15	1.29	1 (7%)	17,19,21	2.51	9 (52%)
2	NAG	F	2	2	14,14,15	0.69	0	17,19,21	1.83	5 (29%)
2	NAG	G	1	2,1	14,14,15	0.87	0	17,19,21	1.54	3 (17%)
2	NAG	G	2	2	14,14,15	0.83	0	17,19,21	1.68	3 (17%)
2	NAG	H	1	2,1	14,14,15	0.54	0	17,19,21	1.47	4 (23%)
2	NAG	H	2	2	14,14,15	1.11	2 (14%)	17,19,21	2.34	5 (29%)
2	NAG	I	1	2,1	14,14,15	0.59	0	17,19,21	1.31	2 (11%)
2	NAG	I	2	2	14,14,15	0.93	1 (7%)	17,19,21	1.71	3 (17%)

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	C	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	C	2	2	-	3/6/23/26	0/1/1/1
2	NAG	D	1	2,1	-	1/6/23/26	0/1/1/1
2	NAG	D	2	2	-	1/6/23/26	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	-	4/6/23/26	0/1/1/1
2	NAG	F	2	2	-	4/6/23/26	0/1/1/1
2	NAG	G	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	G	2	2	-	1/6/23/26	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	NAG	I	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	I	2	2	-	2/6/23/26	0/1/1/1

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	2	NAG	O5-C5	-4.02	1.35	1.43
2	F	1	NAG	O5-C1	-3.85	1.37	1.43
2	E	2	NAG	C1-C2	-3.03	1.48	1.52
2	E	2	NAG	O4-C4	2.43	1.49	1.43
2	H	2	NAG	O5-C1	-2.35	1.39	1.43

The worst 5 of 57 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	NAG	C1-O5-C5	8.68	123.82	112.19
2	E	1	NAG	C1-O5-C5	8.02	122.93	112.19
2	E	2	NAG	C1-O5-C5	-6.79	103.08	112.19
2	H	2	NAG	C1-O5-C5	-6.68	103.23	112.19
2	D	2	NAG	C1-O5-C5	6.30	120.63	112.19

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

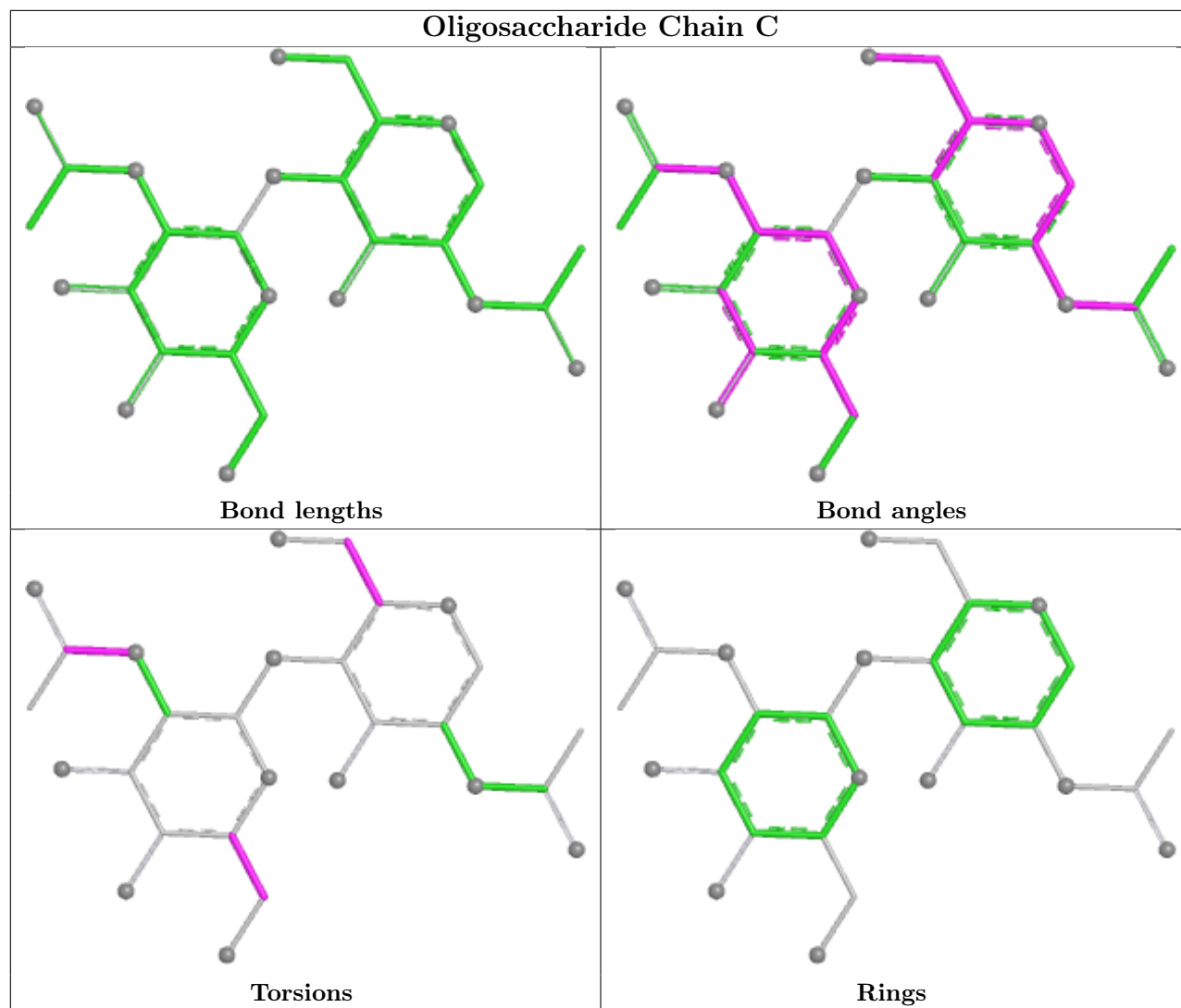
Mol	Chain	Res	Type	Atoms
2	F	1	NAG	C8-C7-N2-C2
2	C	2	NAG	O5-C5-C6-O6
2	I	2	NAG	O5-C5-C6-O6
2	F	1	NAG	O7-C7-N2-C2
2	F	2	NAG	O5-C5-C6-O6

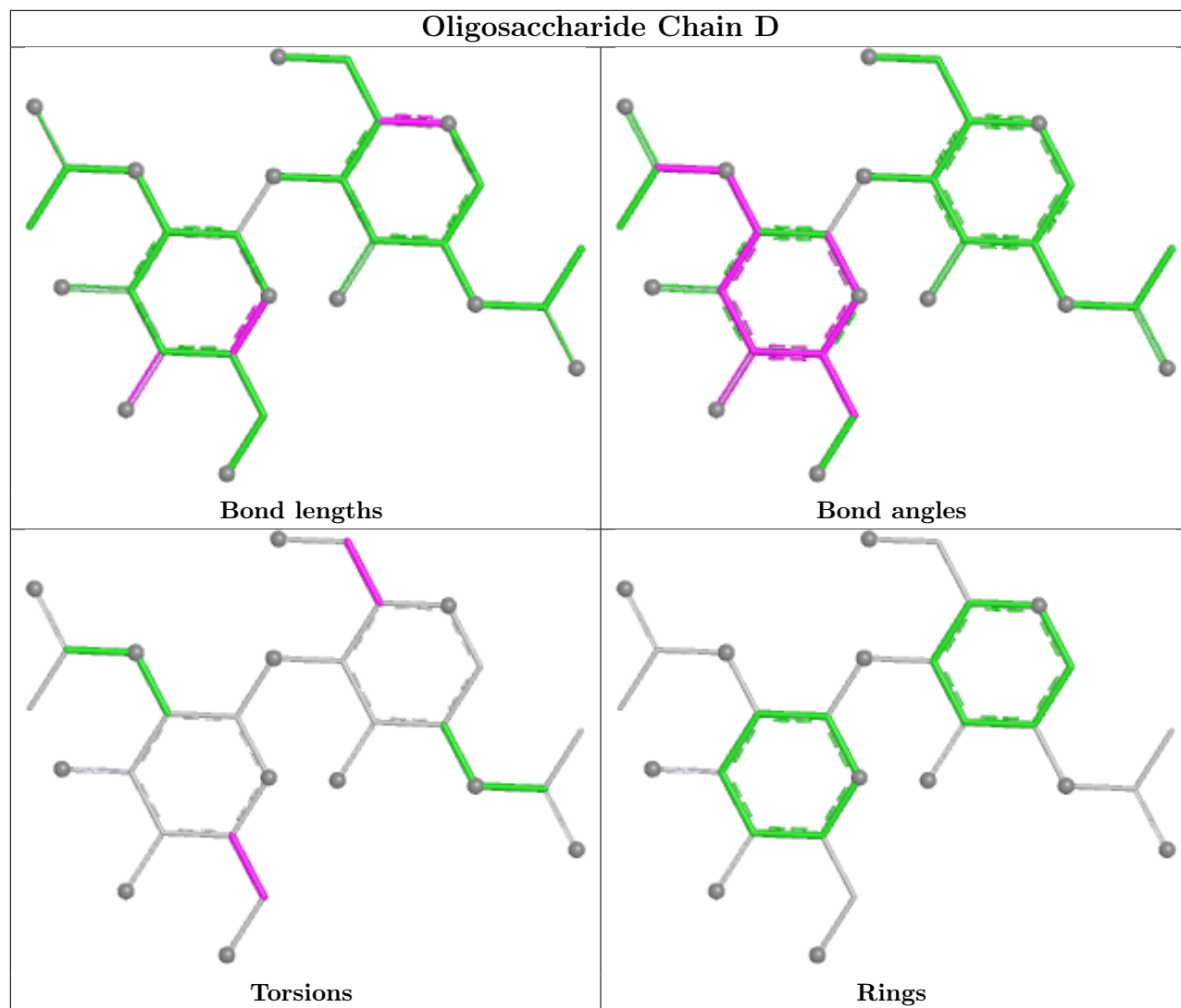
There are no ring outliers.

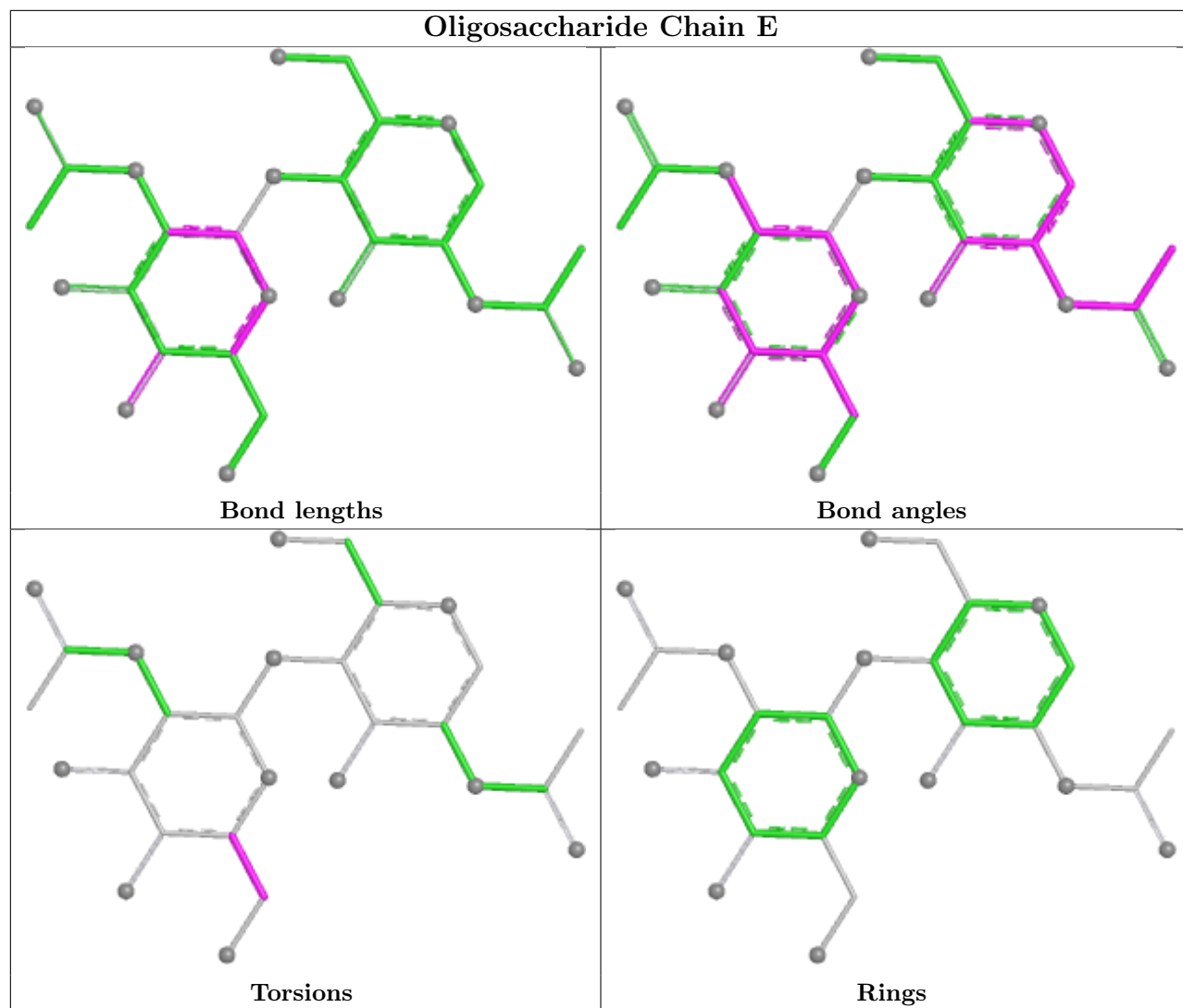
1 monomer is involved in 1 short contact:

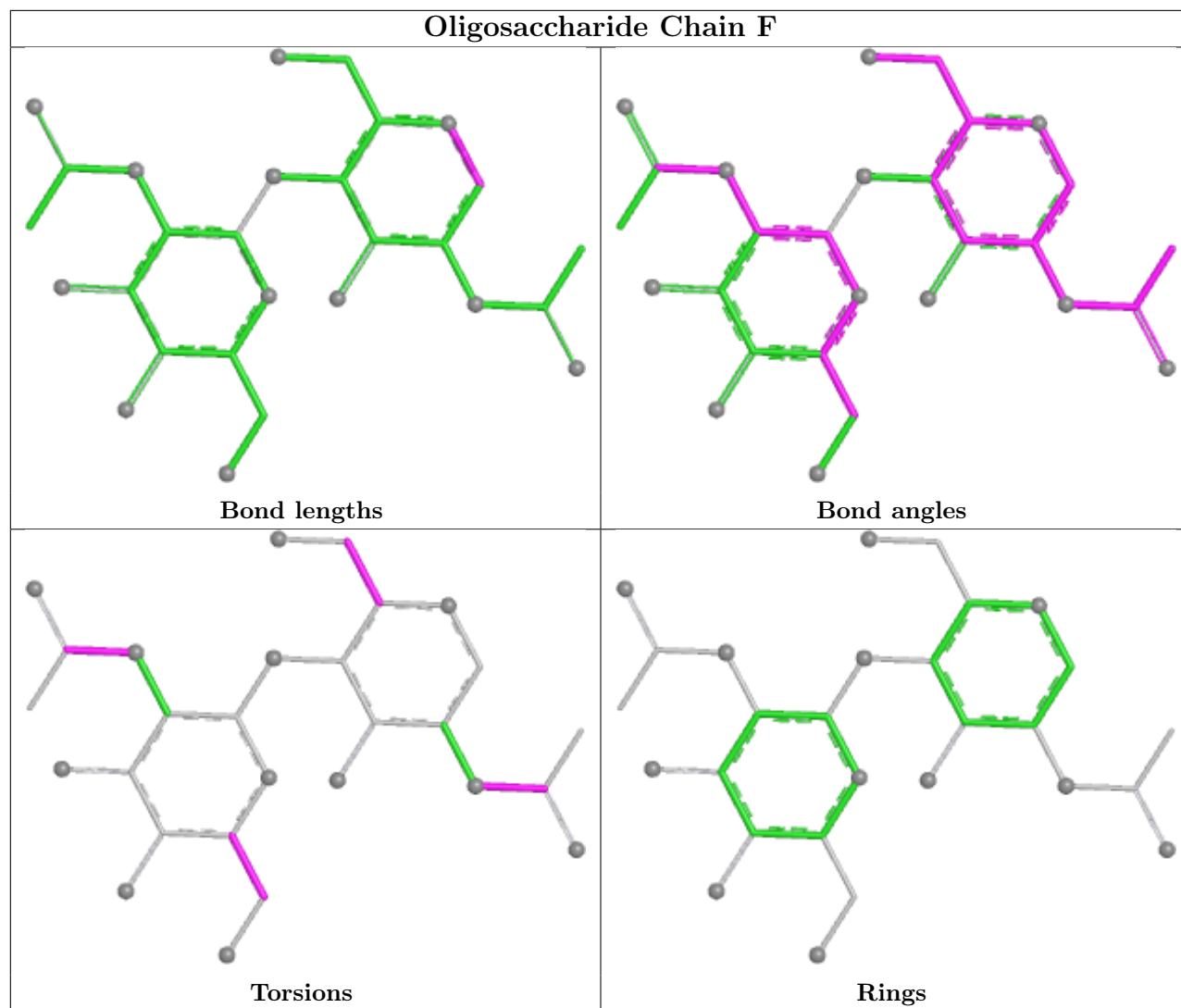
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1	NAG	1	0

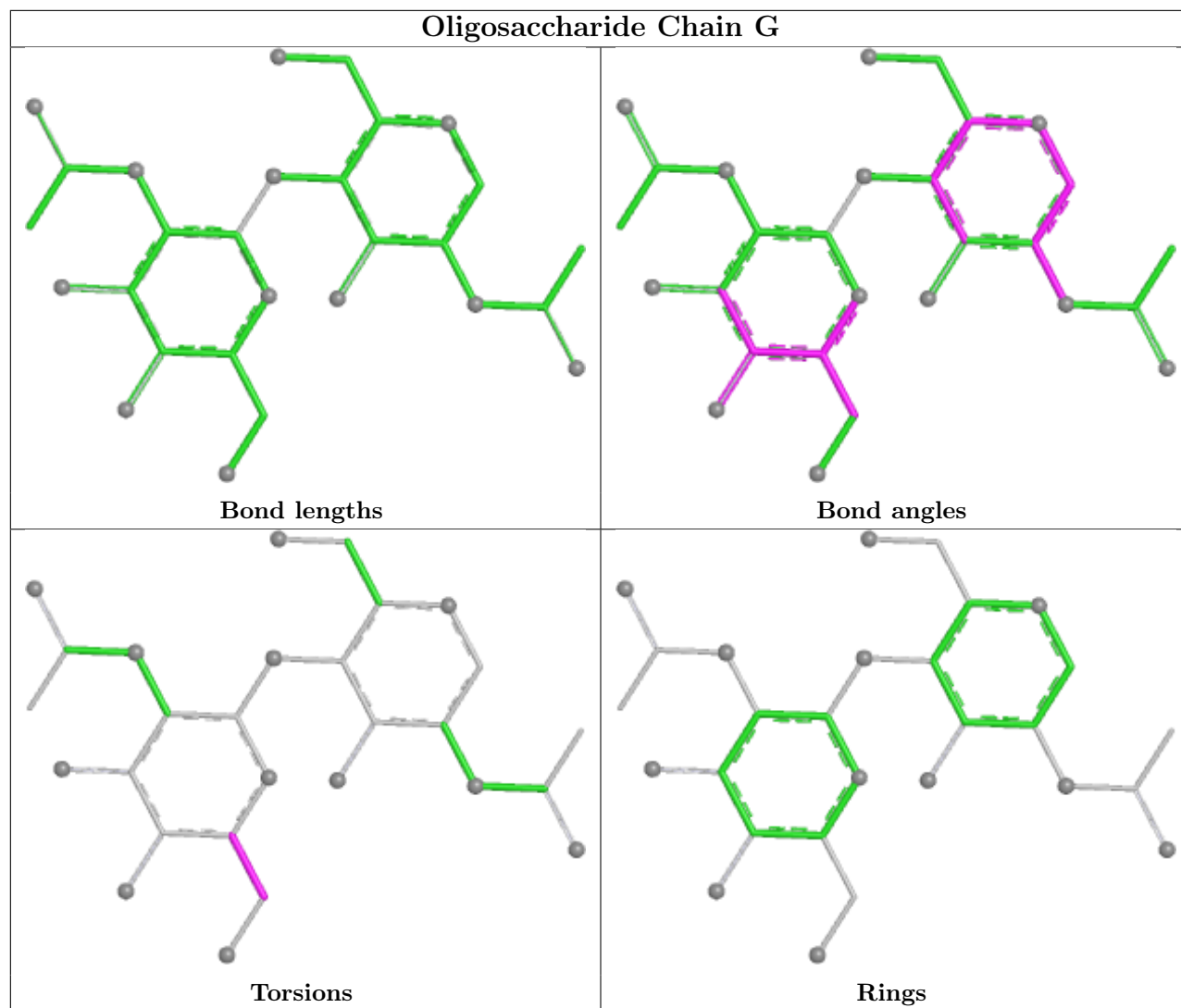
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

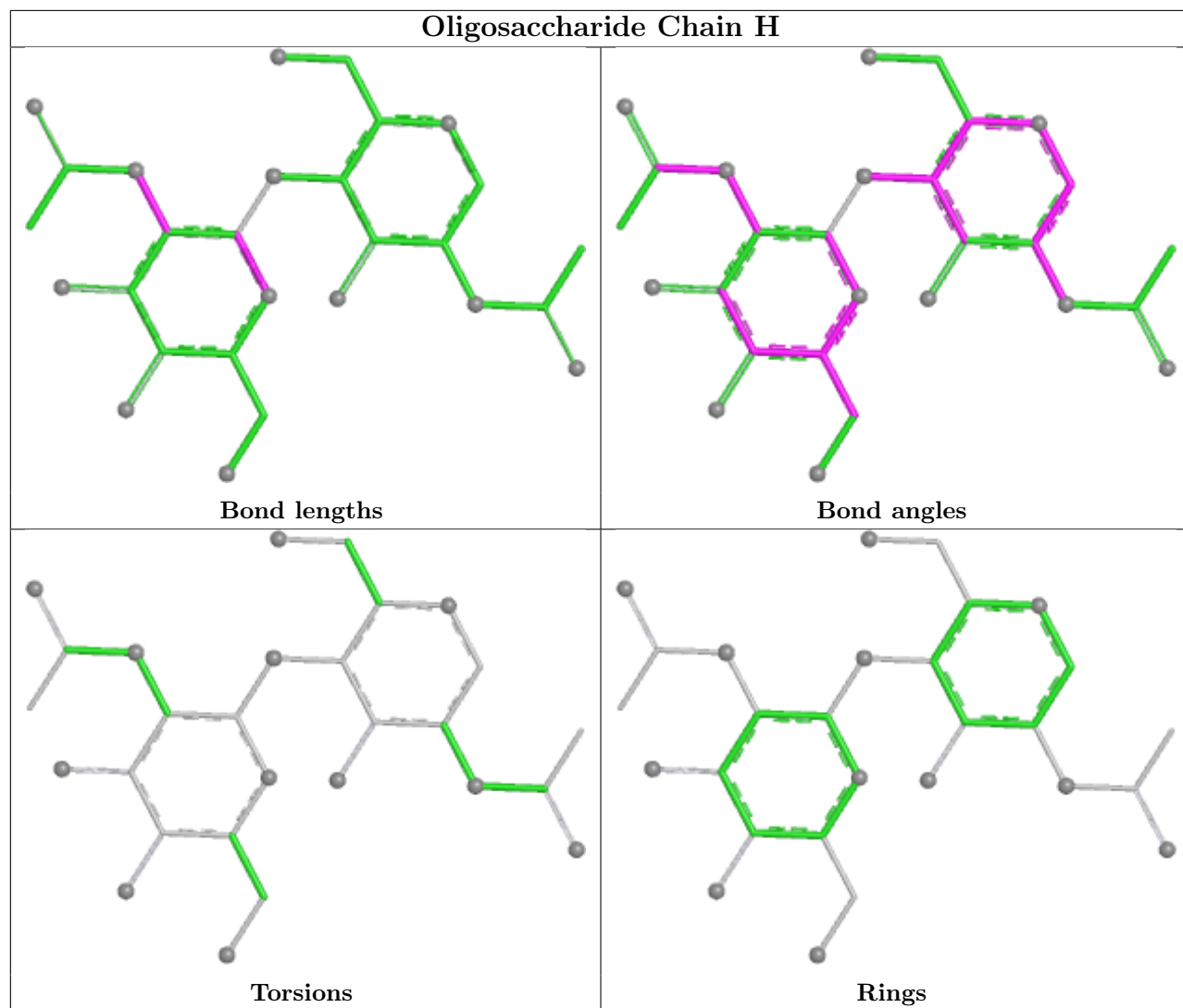


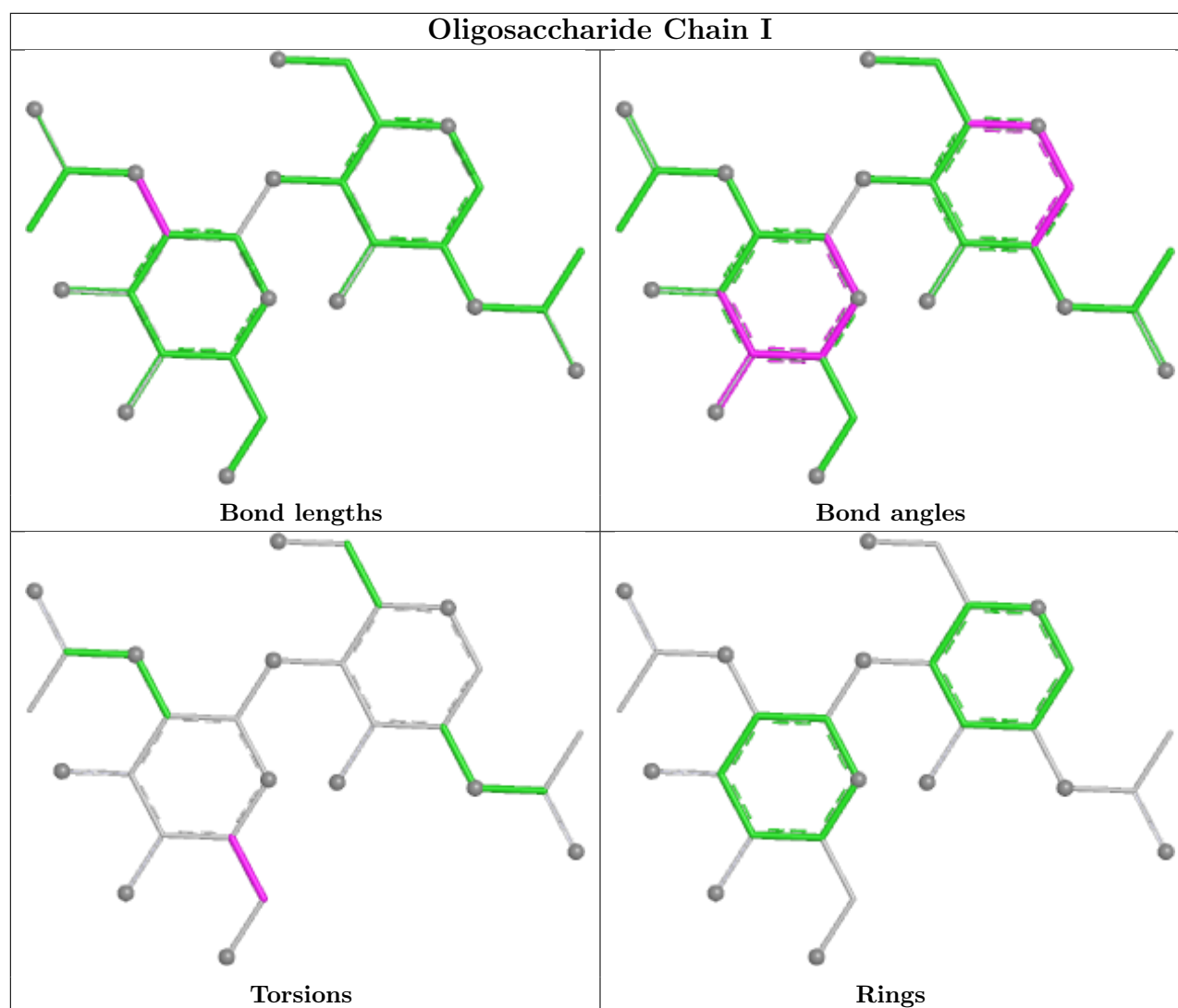












5.6 Ligand geometry [i](#)

Of 20 ligands modelled in this entry, 2 are monoatomic - leaving 18 for Mogul analysis.

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	GOL	B	814	-	5,5,5	0.96	0	5,5,5	2.04	3 (60%)
5	GOL	B	817	-	5,5,5	0.42	0	5,5,5	1.12	0
5	GOL	A	815	-	5,5,5	0.96	0	5,5,5	1.24	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NAG	A	811	1	14,14,15	1.10	2 (14%)	17,19,21	1.70	4 (23%)
4	NAG	A	809	1	14,14,15	0.81	0	17,19,21	2.42	7 (41%)
5	GOL	B	815	-	5,5,5	1.01	0	5,5,5	1.06	0
4	NAG	A	810	1	14,14,15	1.19	1 (7%)	17,19,21	1.95	6 (35%)
4	NAG	B	813	1	14,14,15	0.92	1 (7%)	17,19,21	1.39	2 (11%)
5	GOL	A	814	-	5,5,5	0.44	0	5,5,5	1.17	0
5	GOL	A	817	-	5,5,5	0.36	0	5,5,5	0.51	0
4	NAG	A	808	1	14,14,15	1.32	2 (14%)	17,19,21	2.44	5 (29%)
4	NAG	A	813	1	14,14,15	1.10	1 (7%)	17,19,21	2.20	2 (11%)
4	NAG	B	812	1	14,14,15	1.55	3 (21%)	17,19,21	2.80	5 (29%)
5	GOL	B	816	-	5,5,5	0.66	0	5,5,5	1.68	2 (40%)
5	GOL	A	816	-	5,5,5	0.34	0	5,5,5	0.50	0
4	NAG	B	810	1	14,14,15	0.74	1 (7%)	17,19,21	1.45	3 (17%)
4	NAG	A	812	1	14,14,15	0.96	2 (14%)	17,19,21	1.72	4 (23%)
4	NAG	B	811	1	14,14,15	0.60	0	17,19,21	1.34	2 (11%)

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	GOL	B	814	-	-	0/4/4/4	-
5	GOL	B	817	-	-	4/4/4/4	-
5	GOL	A	815	-	-	2/4/4/4	-
4	NAG	A	811	1	-	2/6/23/26	0/1/1/1
4	NAG	A	809	1	-	0/6/23/26	0/1/1/1
5	GOL	B	815	-	-	4/4/4/4	-
4	NAG	A	810	1	-	0/6/23/26	0/1/1/1
4	NAG	B	813	1	-	2/6/23/26	0/1/1/1
5	GOL	A	814	-	-	4/4/4/4	-
5	GOL	A	817	-	-	2/4/4/4	-
4	NAG	A	808	1	-	2/6/23/26	0/1/1/1
4	NAG	A	813	1	-	0/6/23/26	0/1/1/1
4	NAG	B	812	1	-	4/6/23/26	0/1/1/1
5	GOL	B	816	-	-	1/4/4/4	-
5	GOL	A	816	-	-	1/4/4/4	-
4	NAG	B	810	1	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	A	812	1	-	1/6/23/26	0/1/1/1
4	NAG	B	811	1	-	0/6/23/26	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)
4	B	812	NAG	C1-C2	-3.49	1.47	1.52
4	A	808	NAG	C1-C2	3.43	1.57	1.52
4	A	813	NAG	C1-C2	3.35	1.56	1.52
4	B	812	NAG	O5-C1	-3.16	1.38	1.43
4	A	808	NAG	C2-N2	2.58	1.50	1.46

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	813	NAG	C1-O5-C5	7.91	122.79	112.19
4	B	812	NAG	O7-C7-N2	-6.06	111.27	121.98
4	A	808	NAG	C1-C2-N2	6.04	119.96	110.43
4	B	812	NAG	C2-N2-C7	-5.71	115.25	122.90
4	A	809	NAG	C6-C5-C4	-5.63	99.19	113.02

There are no chirality outliers.

5 of 31 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	812	NAG	C8-C7-N2-C2
4	B	812	NAG	O7-C7-N2-C2
5	A	815	GOL	O1-C1-C2-C3
5	A	817	GOL	O1-C1-C2-O2
5	A	817	GOL	O1-C1-C2-C3

There are no ring outliers.

7 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	814	GOL	3	0
5	B	817	GOL	1	0
5	A	815	GOL	2	0
5	B	815	GOL	2	0
5	A	814	GOL	2	0
4	B	812	NAG	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	816	GOL	4	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	754/765 (98%)	-0.16	2 (0%) 90 93	11, 25, 40, 65	3 (0%)
1	B	754/765 (98%)	-0.12	2 (0%) 90 93	13, 26, 41, 73	3 (0%)
All	All	1508/1530 (98%)	-0.14	4 (0%) 90 93	11, 26, 40, 73	6 (0%)

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	382	TYR	3.5
1	B	383	ASN	2.7
1	A	382	TYR	2.7
1	A	383	ASN	2.5

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

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

6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q < 0.9’ lists the number of atoms with occupancy less than 0.9.

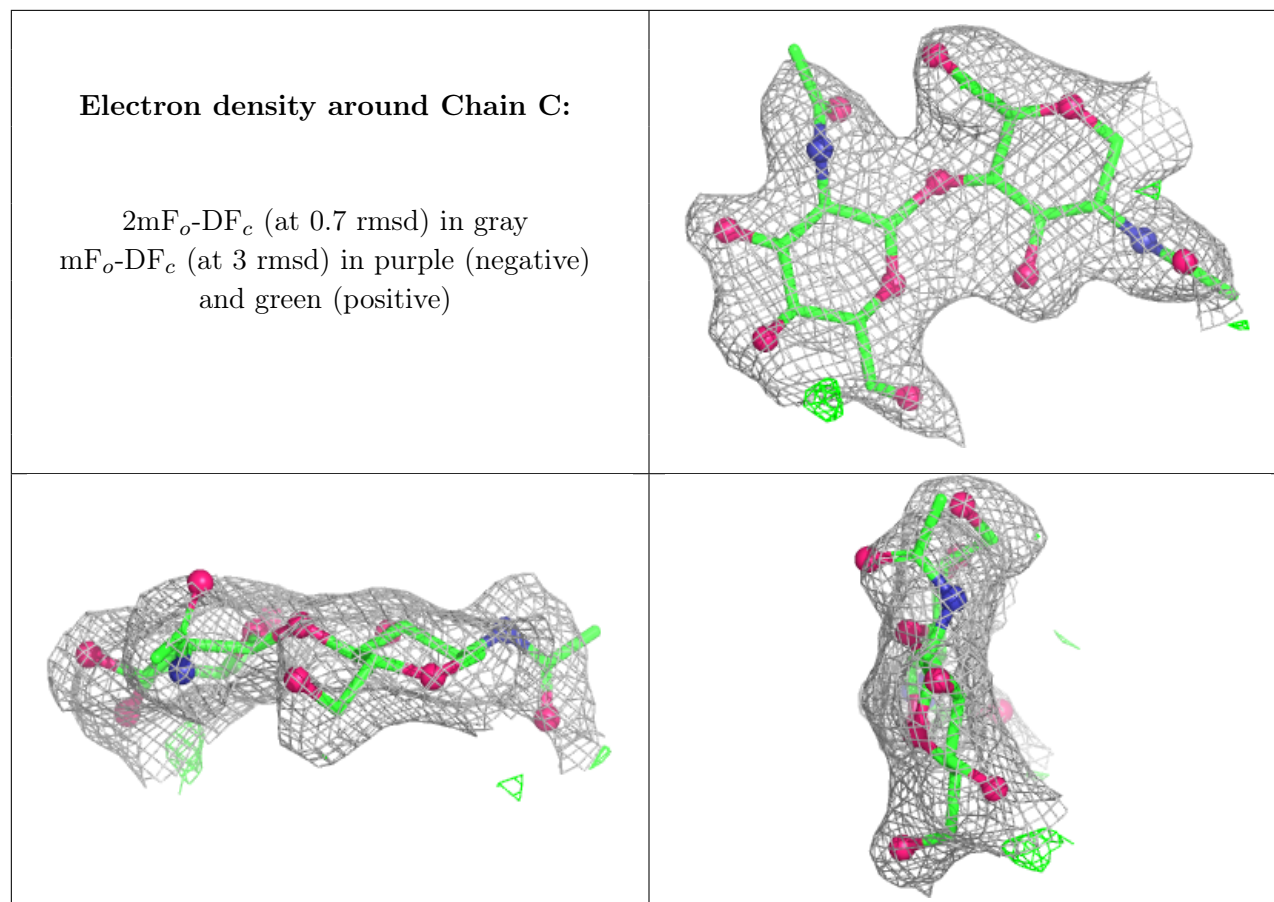
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	I	2	14/15	0.64	0.14	68,73,76,77	0
2	NAG	H	2	14/15	0.65	0.15	50,59,65,68	0
2	NAG	G	2	14/15	0.70	0.13	58,62,65,69	0
2	NAG	E	2	14/15	0.71	0.12	55,63,75,80	0
2	NAG	D	2	14/15	0.76	0.13	41,46,52,58	0

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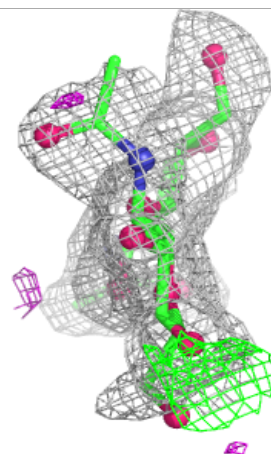
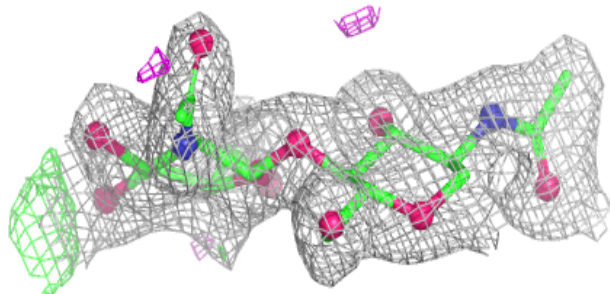
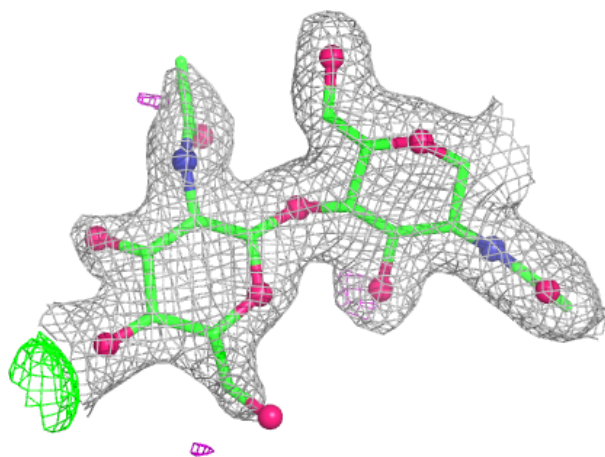
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	F	2	14/15	0.77	0.13	60,63,68,73	0
2	NAG	F	1	14/15	0.83	0.14	47,54,61,70	0
2	NAG	C	2	14/15	0.84	0.11	55,60,65,69	0
2	NAG	E	1	14/15	0.87	0.09	32,36,44,51	0
2	NAG	C	1	14/15	0.87	0.11	42,48,55,62	0
2	NAG	I	1	14/15	0.87	0.09	37,40,51,58	0
2	NAG	G	1	14/15	0.87	0.10	37,40,47,57	0
2	NAG	H	1	14/15	0.91	0.08	30,36,41,45	0
2	NAG	D	1	14/15	0.95	0.07	26,28,32,34	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



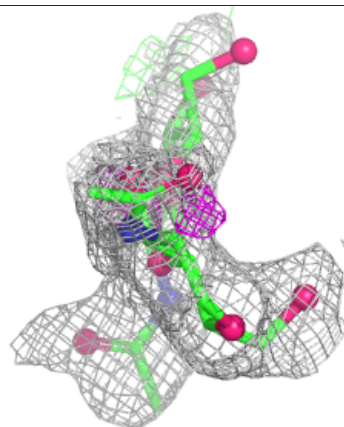
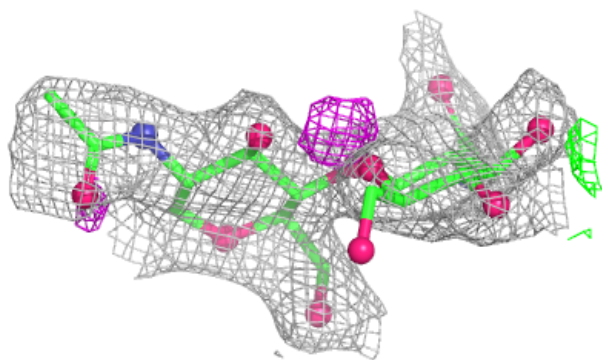
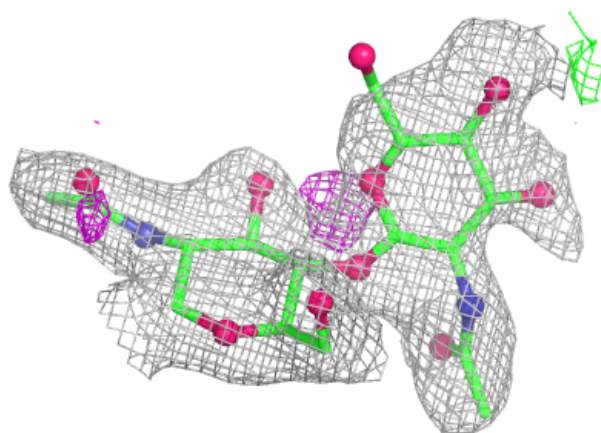
Electron density around Chain D:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



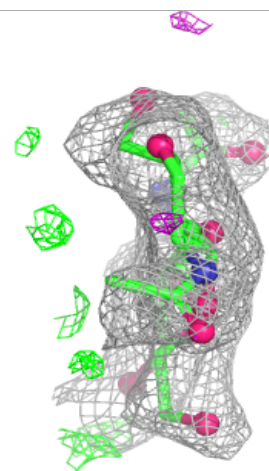
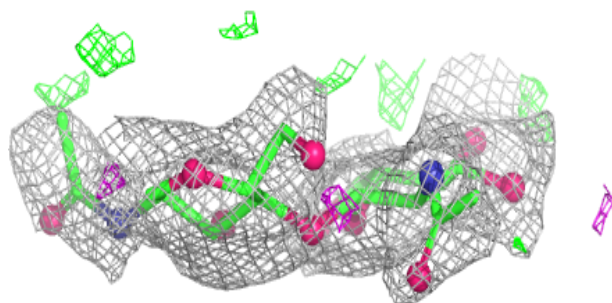
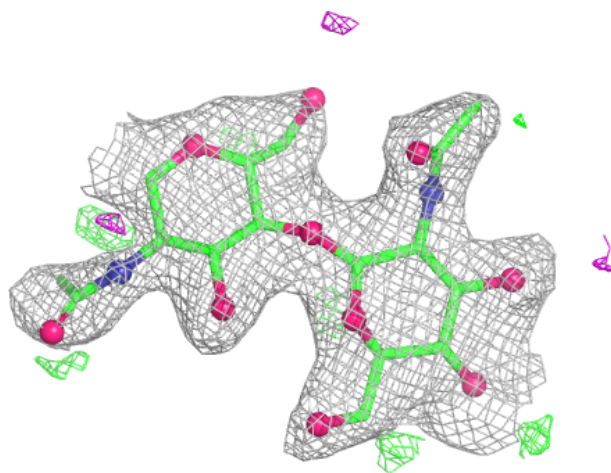
Electron density around Chain E:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
 $mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)



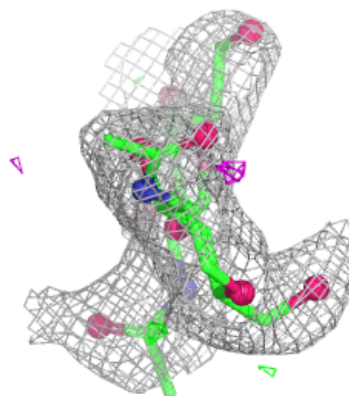
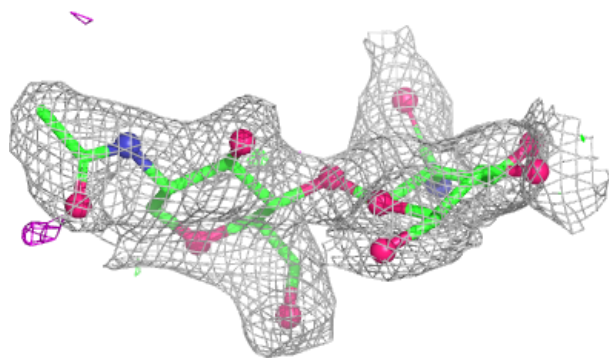
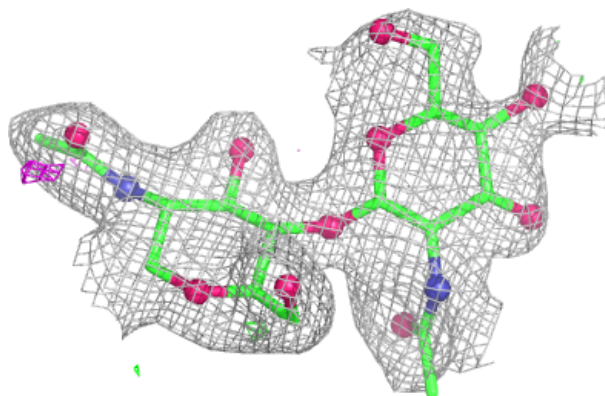
Electron density around Chain F:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



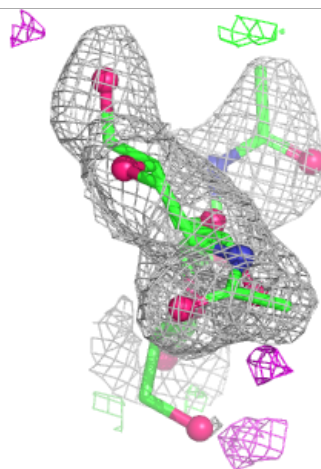
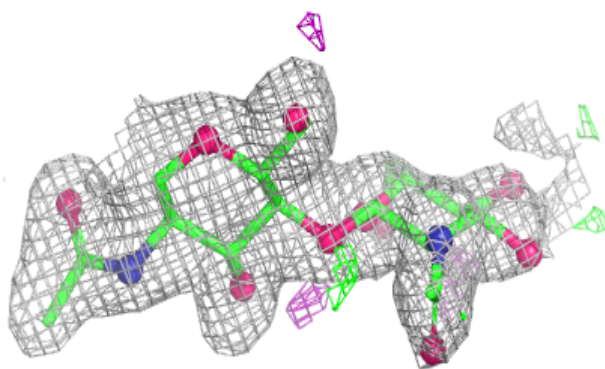
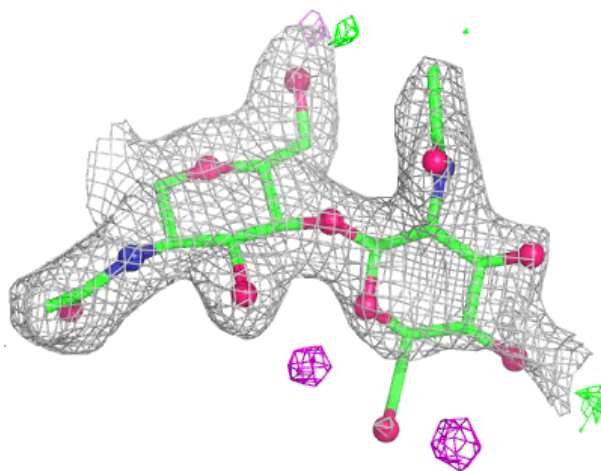
Electron density around Chain G:

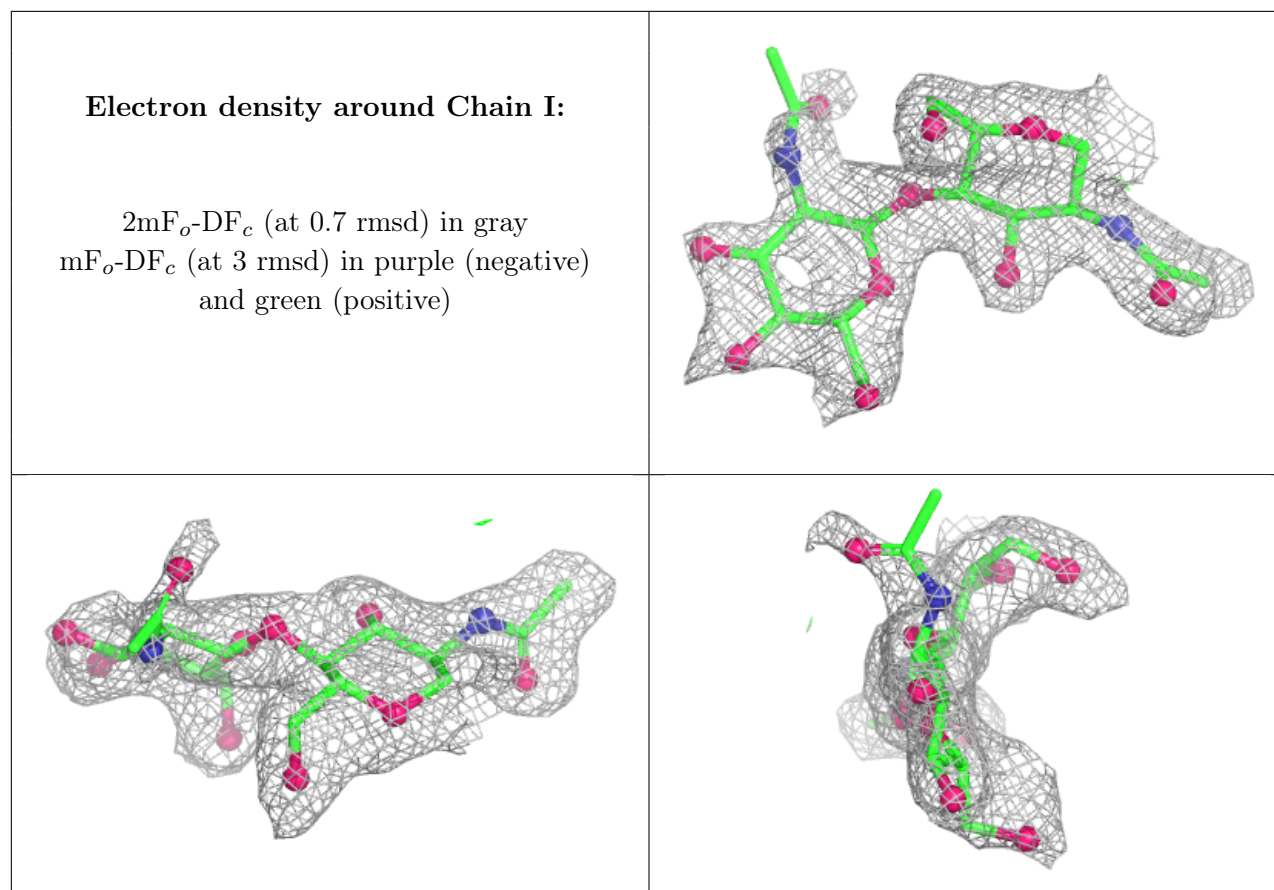
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain H:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	B	813	14/15	0.65	0.14	55,65,79,80	0
4	NAG	A	812	14/15	0.67	0.14	49,68,73,74	0
5	GOL	A	816	6/6	0.70	0.16	55,57,63,65	0
4	NAG	B	810	14/15	0.73	0.15	55,60,67,70	0
4	NAG	A	808	14/15	0.75	0.14	59,64,71,79	0
5	GOL	B	816	6/6	0.77	0.15	47,47,49,52	0
4	NAG	A	813	14/15	0.78	0.12	54,62,68,69	0
4	NAG	B	812	14/15	0.79	0.13	45,54,62,73	0
5	GOL	A	817	6/6	0.80	0.15	54,59,63,66	0
5	GOL	A	815	6/6	0.84	0.15	29,34,43,49	0
4	NAG	A	811	14/15	0.84	0.13	44,51,62,64	0
5	GOL	B	815	6/6	0.86	0.12	32,33,39,48	0
4	NAG	A	810	14/15	0.86	0.09	35,39,48,54	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	A	809	14/15	0.87	0.09	28,31,35,43	0
5	GOL	B	814	6/6	0.91	0.23	26,28,34,45	0
4	NAG	B	811	14/15	0.92	0.08	30,34,38,41	0
5	GOL	A	814	6/6	0.92	0.12	31,36,38,44	0
5	GOL	B	817	6/6	0.93	0.13	31,38,46,47	0
3	CA	A	801	1/1	0.99	0.02	25,25,25,25	0
3	CA	B	801	1/1	0.99	0.03	26,26,26,26	0

6.5 Other polymers [i](#)

There are no such residues in this entry.