



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:11 PM UTC

PDB ID : 3DKH / pdb_00003dkh
Title : L559A mutant of Melanocarpus albomyces laccase
Authors : Hakulinen, N.; Rouvinen, J.
Deposited on : 2008-06-25
Resolution : 2.40 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 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)
Xtrriage (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

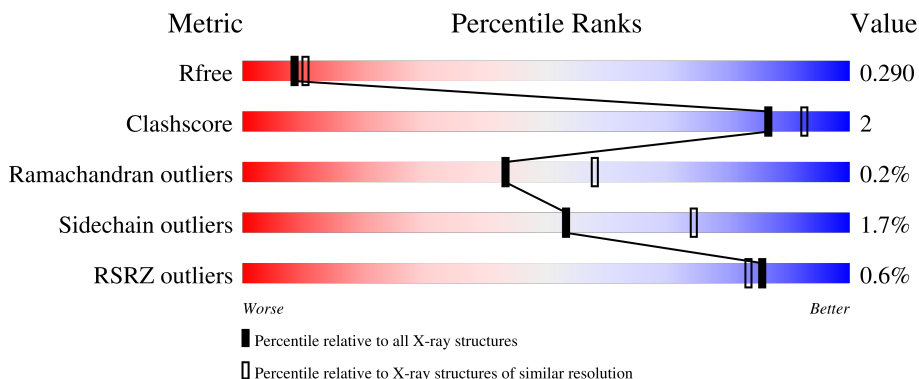
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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.



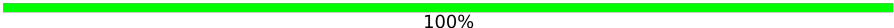



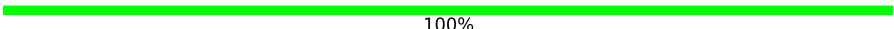

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	559	 90% 9%
1	B	559	 91% 9%
2	C	4	 75% 25%
3	D	2	 50% 50%
3	F	2	 100%

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Mol	Chain	Length	Quality of chain
3	G	2	 100%
3	K	2	 50% 50%
4	E	3	 67% 33%
4	H	3	 67% 33%
4	I	3	 100%
4	J	3	 67% 33%

2 Entry composition [i](#)

There are 11 unique types of molecules in this entry. The entry contains 9856 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 Laccase-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	558	4357	2756	758	828	15	0	0	0
1	B	558	4357	2756	758	828	15	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	559	ALA	LEU	engineered mutation	UNP Q70KY3
B	559	ALA	LEU	engineered mutation	UNP Q70KY3

- Molecule 2 is an oligosaccharide called 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.



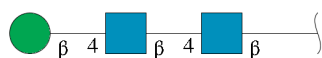
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	4	50	28	2	20	0	0	0

- 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				ZeroOcc	AltConf	Trace
3	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	F	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	K	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 4 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
4	E	3	Total	C	N	O	0	0	0
			39	22	2	15			
4	H	3	Total	C	N	O	0	0	0
			39	22	2	15			
4	I	3	Total	C	N	O	0	0	0
			39	22	2	15			
4	J	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

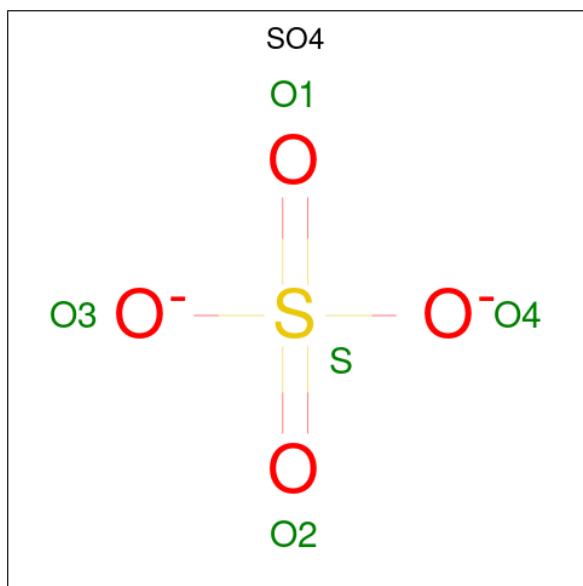
- Molecule 6 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	4	Total	Cu	0	0
			4	4		
6	B	4	Total	Cu	0	0
			4	4		

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

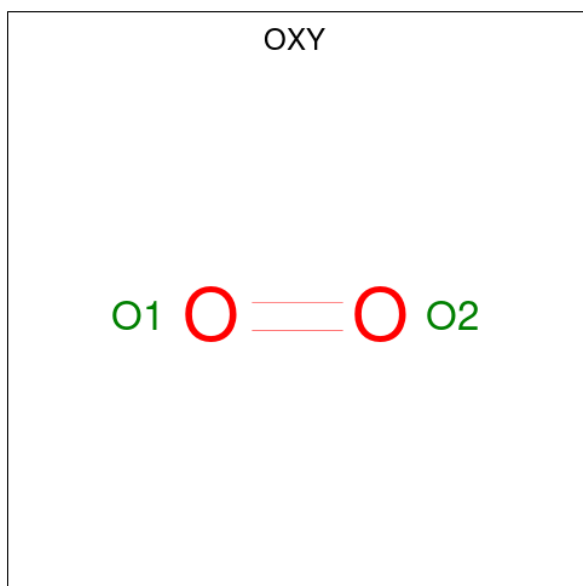
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Cl	0	0
			1	1		

- Molecule 8 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



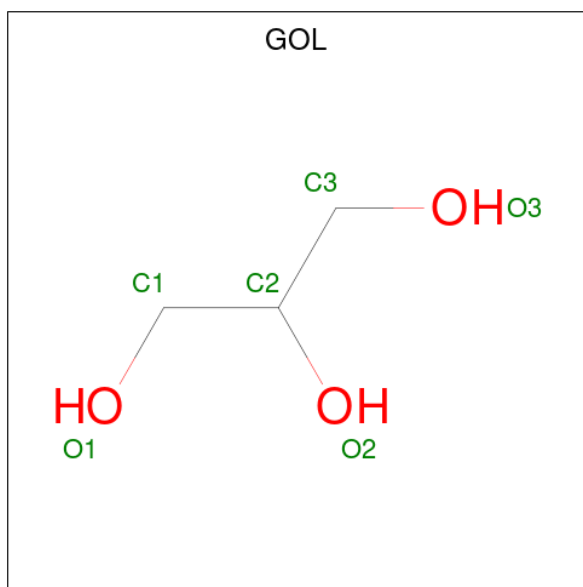
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	O	S	0	0
			5	4	1		
8	A	1	Total	O	S	0	0
			5	4	1		
8	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 9 is OXYGEN MOLECULE (CCD ID: OXY) (formula: O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total O 2 2	0	0
9	B	1	Total O 2 2	0	0

- Molecule 10 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



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

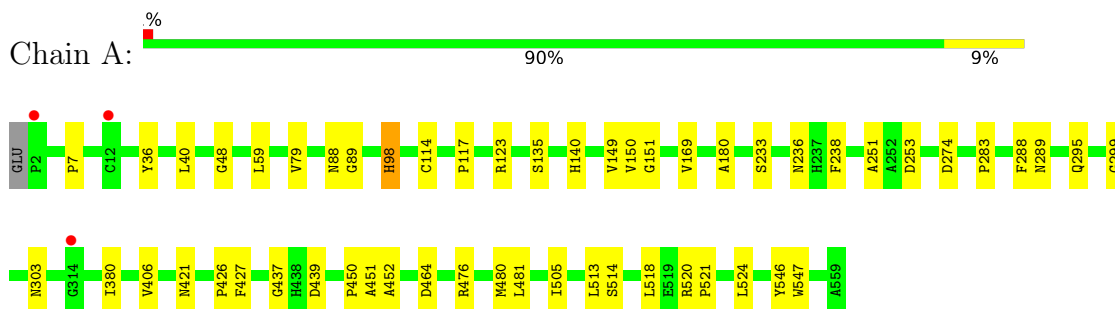
- Molecule 11 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	368	Total O 368 368	0	0
11	B	338	Total O 338 338	0	0

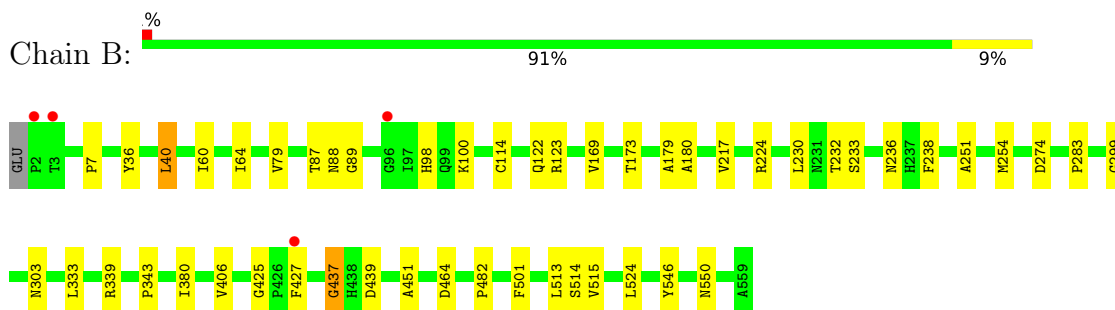
3 Residue-property plots [i](#)

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 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.

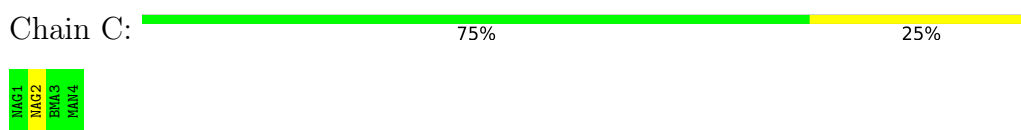
- Molecule 1: Laccase-1



- Molecule 1: Laccase-1



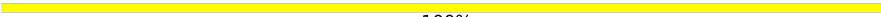
- Molecule 2: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



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



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

Chain F:  100%

MAG1
MAG2

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

Chain G:  100%

MAG1
MAG2

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

Chain K:  50% 50%

MAG1
MAG2

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

Chain E:  67% 33%

MAG1
MAG2
BWA3

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

Chain H:  67% 33%

MAG1
MAG2
BWA3

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

Chain I:  100%

MAG1
MAG2
BWA3

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

Chain J:  67% 33%



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	173.51Å 62.02Å 125.67Å 90.00° 99.92° 90.00°	Depositor
Resolution (Å)	19.82 – 2.40 19.82 – 2.40	Depositor EDS
% Data completeness (in resolution range)	97.7 (19.82-2.40) 97.5 (19.82-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.18 (at 2.41Å)	Xtrriage
Refinement program	CNS	Depositor
R, R_{free}	0.224 , 0.282 0.238 , 0.290	Depositor DCC
R_{free} test set	2532 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	20.7	Xtrriage
Anisotropy	0.775	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 37.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.42$, $\langle L^2 \rangle = 0.24$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	9856	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.11% 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: CU, BMA, SO4, CL, MAN, NAG, OXY, GOL

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	0.70	0/4494	1.05	28/6174 (0.5%)
1	B	0.70	0/4494	1.05	21/6174 (0.3%)
All	All	0.70	0/8988	1.05	49/12348 (0.4%)

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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	299	GLY	N-CA-C	8.65	120.86	112.04
1	B	464	ASP	N-CA-C	7.64	122.70	113.23
1	B	233	SER	N-CA-C	7.46	119.96	110.33
1	B	299	GLY	N-CA-C	7.04	119.22	112.04
1	B	425	GLY	CA-C-N	6.98	126.23	118.97
1	B	425	GLY	C-N-CA	6.98	126.23	118.97
1	A	114	CYS	N-CA-C	-6.83	100.87	110.29
1	A	89	GLY	N-CA-C	-6.81	102.18	112.60
1	A	451	ALA	N-CA-C	6.81	119.57	111.33
1	B	114	CYS	N-CA-C	-6.54	101.59	110.36
1	A	505	ILE	N-CA-C	-6.41	100.38	108.84
1	B	238	PHE	N-CA-C	6.38	120.09	109.95

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	180	ALA	N-CA-C	6.21	118.05	111.28
1	B	236	ASN	N-CA-C	6.19	119.33	110.24
1	B	89	GLY	N-CA-C	-6.18	103.14	112.60
1	B	524	LEU	N-CA-C	6.18	118.01	111.28
1	A	88	ASN	N-CA-C	6.15	119.15	110.23
1	A	238	PHE	N-CA-C	6.12	120.02	110.17
1	A	289	ASN	N-CA-C	6.06	119.70	109.76
1	A	464	ASP	N-CA-C	6.06	120.84	112.90
1	B	303	ASN	N-CA-C	-5.84	98.01	108.47
1	A	439	ASP	N-CA-C	-5.80	98.83	108.34
1	A	117	PRO	N-CA-C	5.73	115.97	110.47
1	A	520	ARG	CA-C-N	5.72	125.19	119.24
1	A	520	ARG	C-N-CA	5.72	125.19	119.24
1	B	88	ASN	N-CA-C	5.68	118.47	110.23
1	A	481	LEU	N-CA-C	-5.60	98.62	108.69
1	A	180	ALA	N-CA-C	5.56	117.34	111.28
1	B	451	ALA	N-CA-C	5.52	118.06	111.71
1	B	437	GLY	N-CA-C	5.51	122.69	115.47
1	A	524	LEU	N-CA-C	5.50	117.09	111.14
1	A	303	ASN	N-CA-C	-5.50	98.62	108.47
1	A	480	MET	N-CA-C	5.49	118.57	109.46
1	B	339	ARG	CA-C-N	5.43	125.43	119.89
1	B	339	ARG	C-N-CA	5.43	125.43	119.89
1	A	169	VAL	N-CA-C	5.41	116.56	109.21
1	B	439	ASP	N-CA-C	-5.39	99.72	108.52
1	A	233	SER	N-CA-C	5.38	117.27	110.33
1	A	48	GLY	CA-C-N	5.35	125.17	119.28
1	A	48	GLY	C-N-CA	5.35	125.17	119.28
1	B	343	PRO	N-CA-C	5.32	119.65	111.57
1	A	421	ASN	N-CA-C	5.31	117.20	109.71
1	A	59	LEU	N-CA-C	5.31	117.89	109.50
1	A	236	ASN	N-CA-C	5.21	117.89	110.24
1	B	122	GLN	N-CA-C	5.15	117.02	109.24
1	A	98	HIS	N-CA-C	5.14	117.62	111.71
1	B	169	VAL	N-CA-C	5.09	116.14	109.58
1	A	288	PHE	N-CA-C	-5.08	99.00	107.99
1	A	547	TRP	N-CA-C	5.07	121.01	109.81

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	546	TYR	Sidechain
1	B	546	TYR	Sidechain

5.2 Too-close contacts [i](#)

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	4357	0	4097	14	0
1	B	4357	0	4095	14	0
2	C	50	0	43	1	0
3	D	28	0	25	3	0
3	F	28	0	25	1	0
3	G	28	0	25	0	0
3	K	28	0	25	1	0
4	E	39	0	34	1	0
4	H	39	0	34	1	0
4	I	39	0	34	0	0
4	J	39	0	34	1	0
5	A	28	0	26	0	0
5	B	56	0	52	4	0
6	A	4	0	0	0	0
6	B	4	0	0	0	0
7	A	1	0	0	0	0
8	A	10	0	0	0	0
8	B	5	0	0	0	0
9	A	2	0	0	0	0
9	B	2	0	0	0	0
10	B	6	0	8	3	0
11	A	368	0	0	4	0
11	B	338	0	0	5	0
All	All	9856	0	8557	37	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 (37) 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)
11:A:1206:HOH:O	4:E:2:NAG:H3	1.89	0.71
5:B:770:NAG:H81	11:B:912:HOH:O	1.92	0.69
1:B:217:VAL:HG13	5:B:760:NAG:H81	1.77	0.66
1:A:295:GLN:HE21	1:A:452:ALA:H	1.41	0.66
5:B:700:NAG:H5	11:B:992:HOH:O	1.97	0.65
1:B:406:VAL:HG13	3:K:1:NAG:H81	1.80	0.62
1:B:380:ILE:HG21	1:B:514:SER:HB3	1.81	0.61
3:D:1:NAG:O6	3:D:2:NAG:H82	2.02	0.59
3:D:1:NAG:C6	3:D:2:NAG:H82	2.34	0.58
1:B:251:ALA:HB3	1:B:274:ASP:HB2	1.87	0.57
11:A:1068:HOH:O	2:C:2:NAG:H4	2.08	0.53
1:A:427:PHE:CE2	10:B:810:GOL:H2	2.44	0.52
1:A:253:ASP:OD2	1:A:476:ARG:HB2	2.10	0.51
1:A:427:PHE:CZ	10:B:810:GOL:H2	2.45	0.51
1:A:380:ILE:HG21	1:A:514:SER:HB3	1.93	0.51
1:B:87:THR:HB	1:B:550:ASN:HD21	1.78	0.49
1:B:36:TYR:HB2	1:B:79:VAL:HG22	1.95	0.48
5:B:770:NAG:H5	11:B:1050:HOH:O	2.13	0.48
11:B:1010:HOH:O	4:J:2:NAG:H3	2.14	0.48
1:B:173:THR:HB	1:B:232:THR:OG1	2.14	0.48
1:A:251:ALA:HB3	1:A:274:ASP:HB2	1.96	0.47
1:B:501:PHE:HB3	1:B:515:VAL:HG23	1.95	0.47
1:A:150:VAL:HG12	1:A:151:GLY:N	2.28	0.47
1:A:36:TYR:HB2	1:A:79:VAL:HG22	1.97	0.46
1:A:426:PRO:HD2	11:A:1160:HOH:O	2.14	0.46
1:A:518:LEU:HG	1:A:521:PRO:HG3	1.97	0.46
3:D:1:NAG:H62	3:D:2:NAG:H82	1.99	0.43
1:B:427:PHE:CE2	10:B:810:GOL:H32	2.53	0.43
1:B:230:LEU:HB3	11:B:1042:HOH:O	2.18	0.43
1:B:179:ALA:CB	4:H:2:NAG:H81	2.50	0.42
1:B:333:LEU:HD21	1:B:482:PRO:HB3	2.01	0.42
1:A:150:VAL:HG12	1:A:151:GLY:H	1.85	0.41
1:A:98:HIS:O	1:A:437:GLY:HA2	2.20	0.41
1:B:40:LEU:HD22	1:B:60:ILE:HG12	2.03	0.41
1:A:521:PRO:HD2	11:A:930:HOH:O	2.20	0.41
1:B:98:HIS:O	1:B:437:GLY:HA2	2.20	0.41
1:A:406:VAL:HG13	3:F:1:NAG:H81	2.03	0.40

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	556/559 (100%)	534 (96%)	21 (4%)	1 (0%)	43	58
1	B	556/559 (100%)	535 (96%)	20 (4%)	1 (0%)	43	58
All	All	1112/1118 (100%)	1069 (96%)	41 (4%)	2 (0%)	43	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	283	PRO
1	B	283	PRO

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	476/477 (100%)	468 (98%)	8 (2%)	53	74
1	B	476/477 (100%)	468 (98%)	8 (2%)	53	74
All	All	952/954 (100%)	936 (98%)	16 (2%)	53	74

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	PRO
1	A	40	LEU
1	A	123	ARG
1	A	135	SER

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Mol	Chain	Res	Type
1	A	140	HIS
1	A	149	VAL
1	A	450	PRO
1	A	513	LEU
1	B	7	PRO
1	B	40	LEU
1	B	64	ILE
1	B	100	LYS
1	B	123	ARG
1	B	224	ARG
1	B	254	MET
1	B	513	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	63	ASN
1	A	72	ASN
1	A	99	GLN
1	A	185	HIS
1	A	188	GLN
1	A	208	ASN
1	A	236	ASN
1	A	244	ASN
1	A	295	GLN
1	A	550	ASN
1	B	20	ASN
1	B	99	GLN
1	B	122	GLN
1	B	190	ASN
1	B	285	ASN
1	B	311	HIS
1	B	550	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

24 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	0.45	0	17,19,21	0.72	0
2	NAG	C	2	2	14,14,15	0.48	0	17,19,21	0.60	0
2	BMA	C	3	2	11,11,12	0.60	0	15,15,17	0.40	0
2	MAN	C	4	2	11,11,12	0.58	0	15,15,17	0.62	0
3	NAG	D	1	3,1	14,14,15	0.46	0	17,19,21	0.91	1 (5%)
3	NAG	D	2	3	14,14,15	0.63	0	17,19,21	0.73	0
4	NAG	E	1	4,1	14,14,15	0.56	0	17,19,21	0.58	0
4	NAG	E	2	4	14,14,15	0.56	0	17,19,21	0.70	0
4	BMA	E	3	4	11,11,12	0.55	0	15,15,17	0.31	0
3	NAG	F	1	3,1	14,14,15	0.58	0	17,19,21	0.70	0
3	NAG	F	2	3	14,14,15	0.51	0	17,19,21	0.87	1 (5%)
3	NAG	G	1	3,1	14,14,15	0.47	0	17,19,21	0.71	0
3	NAG	G	2	3	14,14,15	0.55	0	17,19,21	0.63	0
4	NAG	H	1	4,1	14,14,15	0.42	0	17,19,21	0.80	0
4	NAG	H	2	4	14,14,15	0.42	0	17,19,21	0.60	0
4	BMA	H	3	4	11,11,12	0.59	0	15,15,17	0.25	0
4	NAG	I	1	4,1	14,14,15	0.56	0	17,19,21	0.82	0
4	NAG	I	2	4	14,14,15	0.57	0	17,19,21	0.67	0
4	BMA	I	3	4	11,11,12	0.55	0	15,15,17	0.28	0
4	NAG	J	1	4,1	14,14,15	0.53	0	17,19,21	0.66	0
4	NAG	J	2	4	14,14,15	0.59	0	17,19,21	0.70	0
4	BMA	J	3	4	11,11,12	0.55	0	15,15,17	0.24	0
3	NAG	K	1	3,1	14,14,15	0.55	0	17,19,21	0.90	1 (5%)
3	NAG	K	2	3	14,14,15	0.58	0	17,19,21	0.65	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	C	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	BMA	C	3	2	-	1/2/19/22	0/1/1/1
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
3	NAG	D	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	D	2	3	-	4/6/23/26	0/1/1/1
4	NAG	E	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	E	2	4	-	4/6/23/26	0/1/1/1
4	BMA	E	3	4	-	0/2/19/22	0/1/1/1
3	NAG	F	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	F	2	3	-	2/6/23/26	0/1/1/1
3	NAG	G	1	3,1	-	3/6/23/26	0/1/1/1
3	NAG	G	2	3	-	4/6/23/26	0/1/1/1
4	NAG	H	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	H	2	4	-	0/6/23/26	0/1/1/1
4	BMA	H	3	4	-	0/2/19/22	0/1/1/1
4	NAG	I	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	I	2	4	-	0/6/23/26	0/1/1/1
4	BMA	I	3	4	-	0/2/19/22	0/1/1/1
4	NAG	J	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	J	2	4	-	2/6/23/26	0/1/1/1
4	BMA	J	3	4	-	2/2/19/22	0/1/1/1
3	NAG	K	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	K	2	3	-	2/6/23/26	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(°)
3	F	2	NAG	C2-N2-C7	-2.46	119.61	122.90
3	D	1	NAG	C2-N2-C7	-2.14	120.03	122.90
3	K	1	NAG	C2-N2-C7	-2.08	120.11	122.90

There are no chirality outliers.

All (36) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	2	NAG	C8-C7-N2-C2
3	D	2	NAG	O7-C7-N2-C2
3	F	2	NAG	C8-C7-N2-C2
3	F	2	NAG	O7-C7-N2-C2
3	G	2	NAG	C8-C7-N2-C2
3	G	2	NAG	O7-C7-N2-C2
3	K	2	NAG	C8-C7-N2-C2
3	K	2	NAG	O7-C7-N2-C2
3	K	1	NAG	C8-C7-N2-C2
4	E	2	NAG	O5-C5-C6-O6
3	K	1	NAG	O7-C7-N2-C2
3	G	1	NAG	C8-C7-N2-C2
4	E	2	NAG	C4-C5-C6-O6
3	F	1	NAG	C8-C7-N2-C2
3	G	1	NAG	O7-C7-N2-C2
4	H	1	NAG	C8-C7-N2-C2
4	H	1	NAG	O7-C7-N2-C2
3	F	1	NAG	O7-C7-N2-C2
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
4	E	2	NAG	C8-C7-N2-C2
4	J	3	BMA	C4-C5-C6-O6
3	D	1	NAG	C4-C5-C6-O6
4	E	2	NAG	O7-C7-N2-C2
4	J	3	BMA	O5-C5-C6-O6
3	D	2	NAG	C4-C5-C6-O6
3	D	2	NAG	O5-C5-C6-O6
4	J	2	NAG	O5-C5-C6-O6
3	G	1	NAG	C4-C5-C6-O6
3	D	1	NAG	O5-C5-C6-O6
3	G	2	NAG	C4-C5-C6-O6
4	E	1	NAG	O7-C7-N2-C2
2	C	3	BMA	C4-C5-C6-O6
4	E	1	NAG	C8-C7-N2-C2
3	G	2	NAG	O5-C5-C6-O6
4	J	2	NAG	C8-C7-N2-C2

There are no ring outliers.

8 monomers are involved in 9 short contacts:

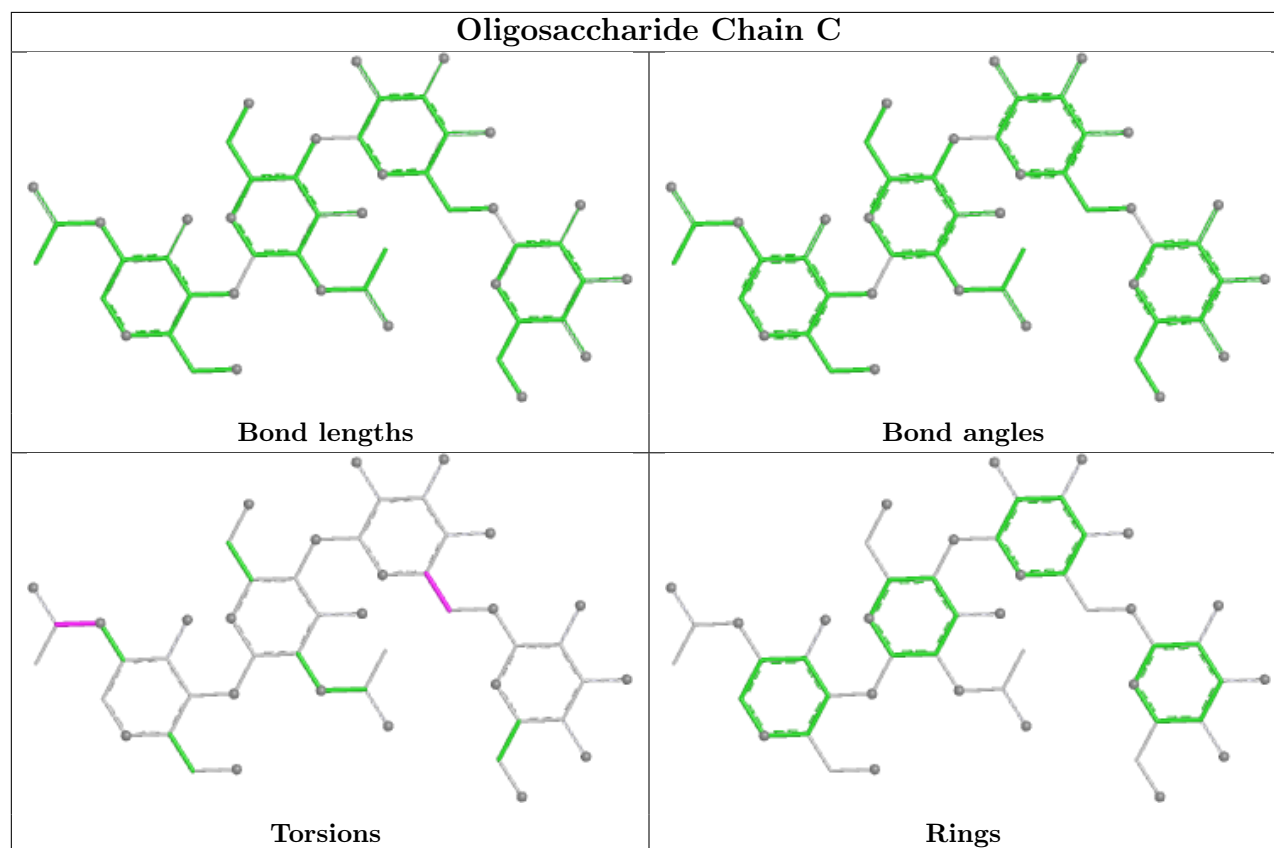
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	1	NAG	1	0
3	K	1	NAG	1	0

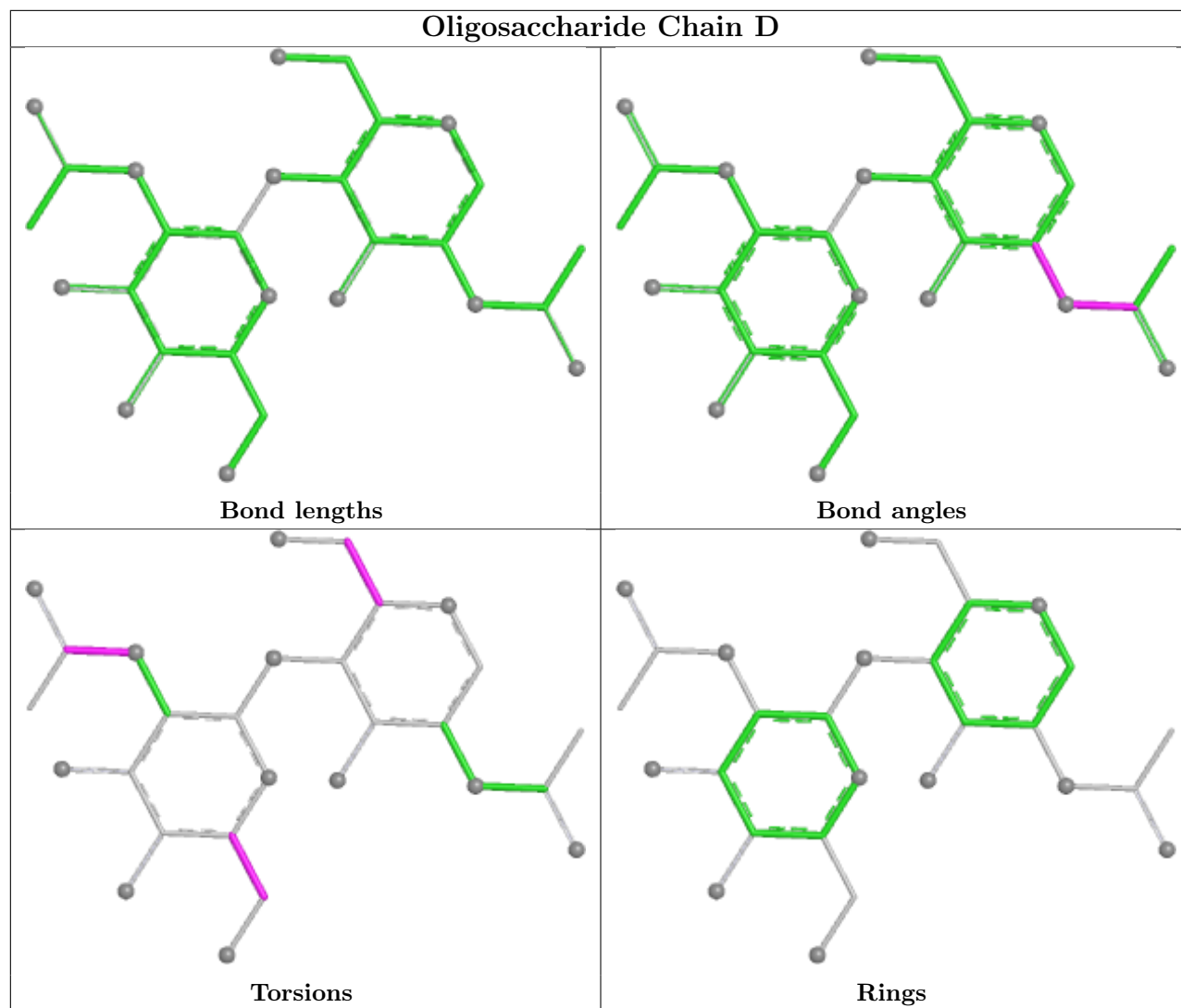
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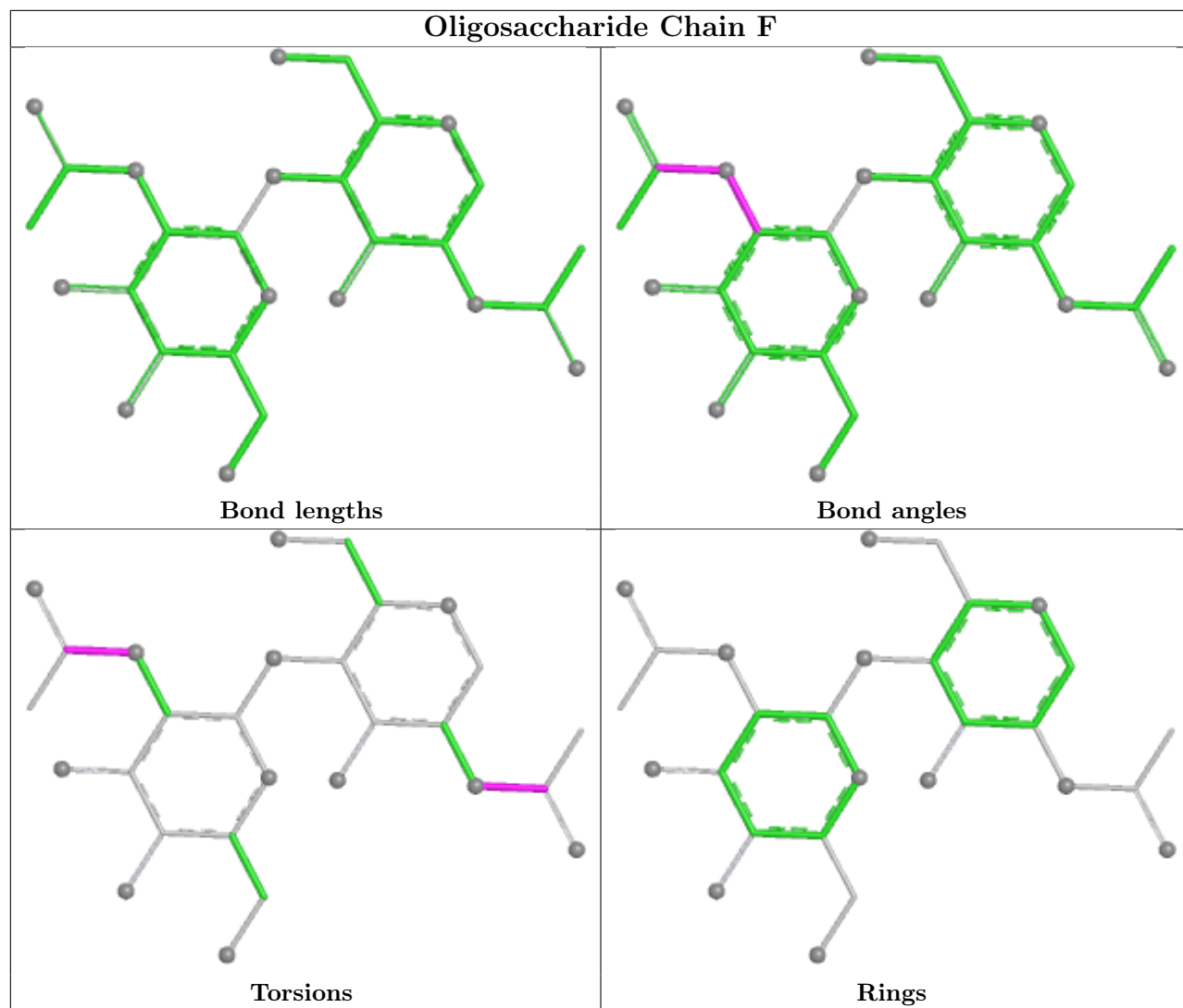
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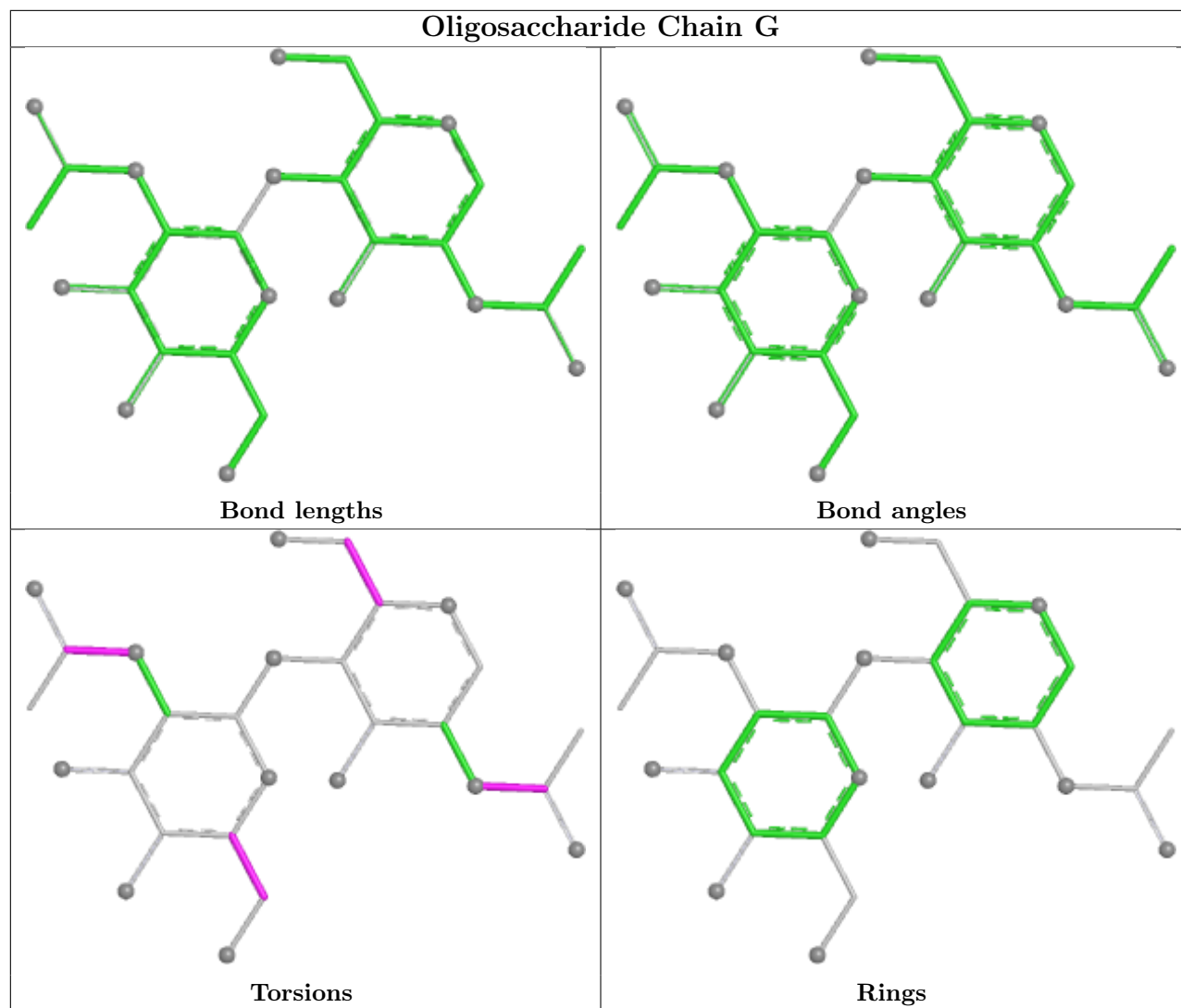
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	J	2	NAG	1	0
3	D	1	NAG	3	0
4	H	2	NAG	1	0
3	D	2	NAG	3	0
2	C	2	NAG	1	0
4	E	2	NAG	1	0

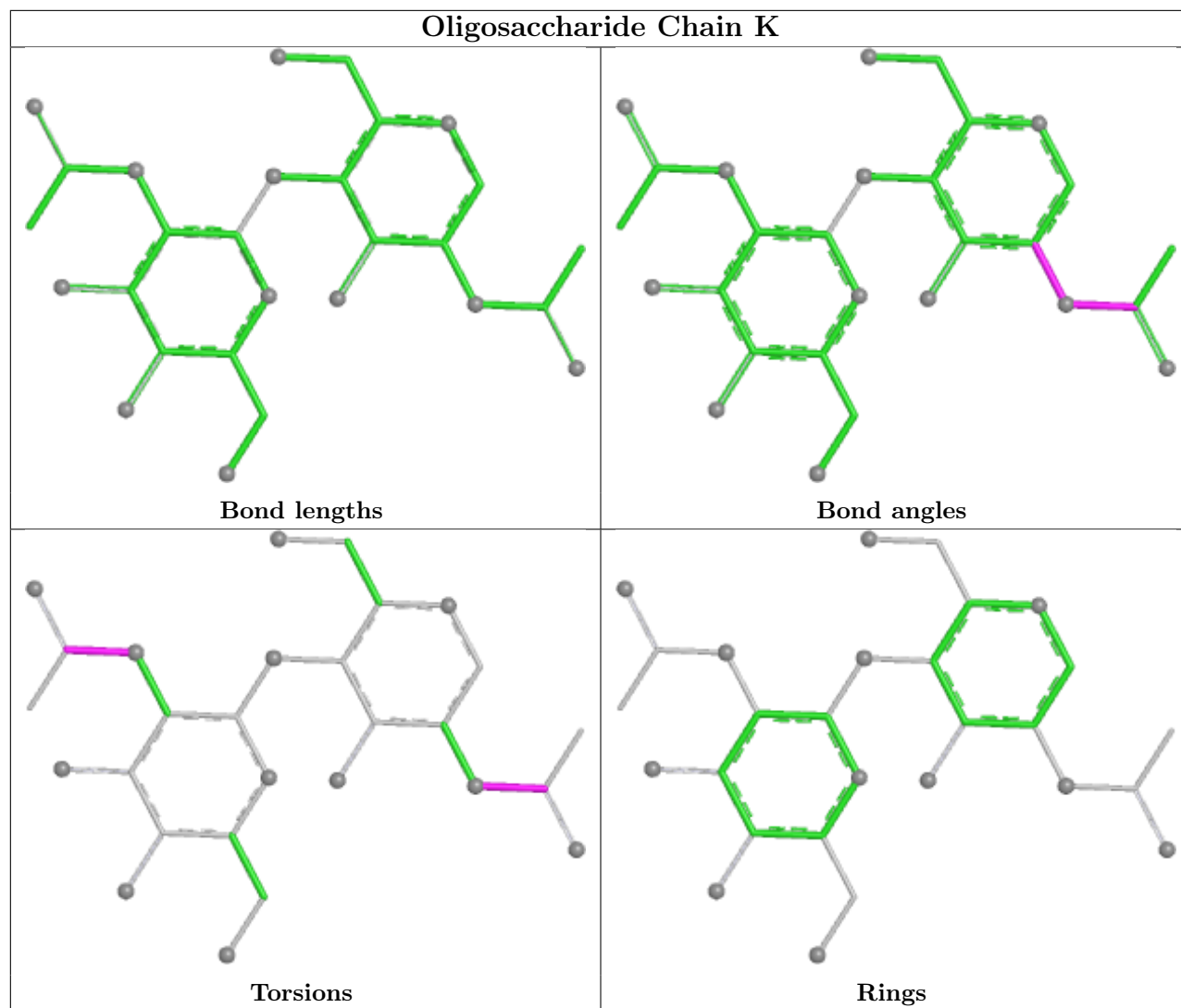
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

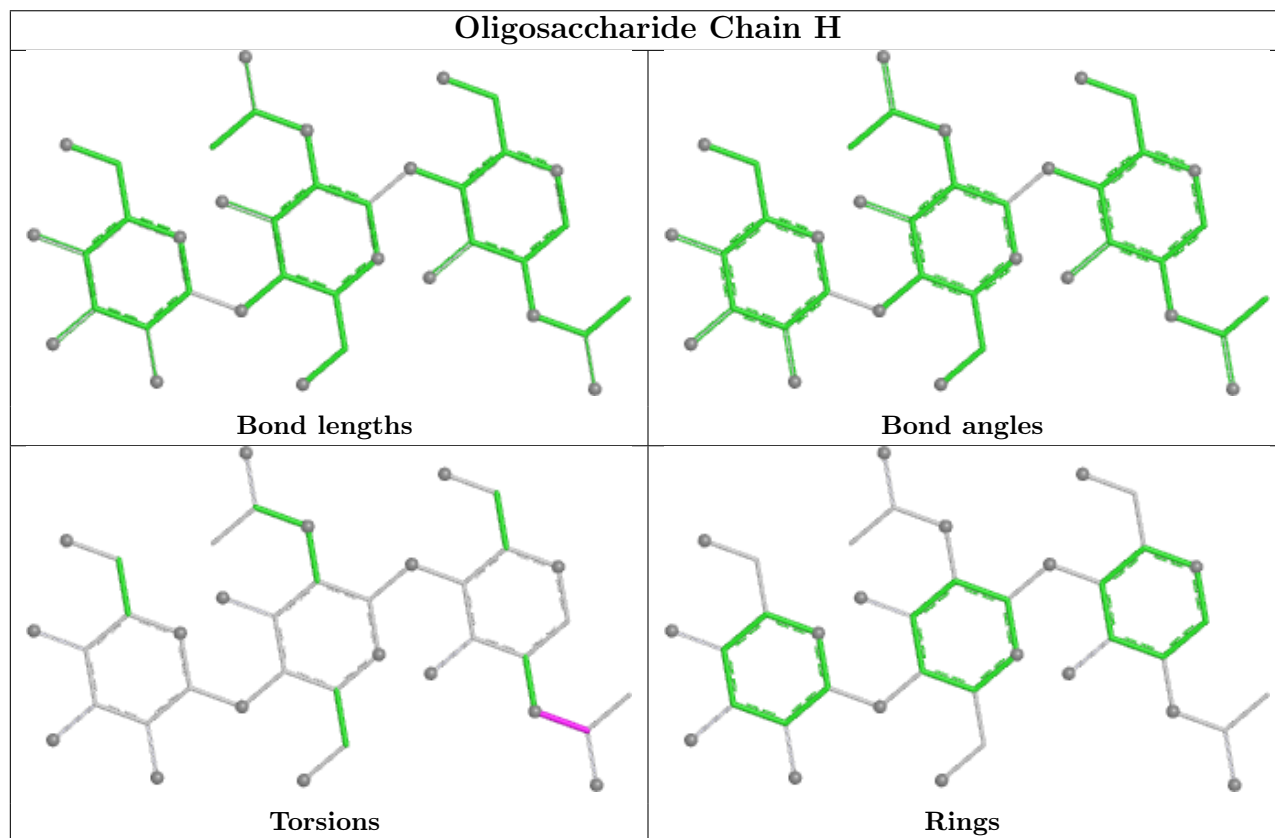
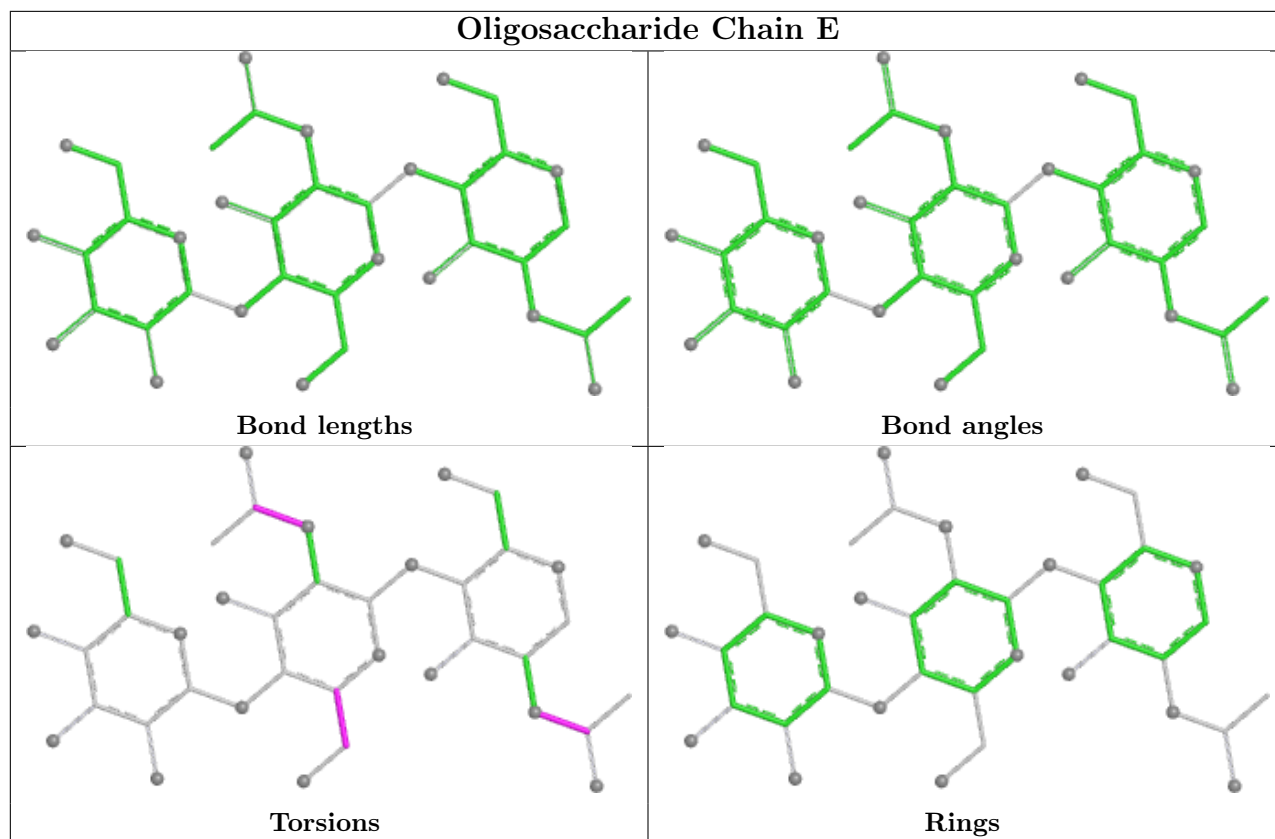


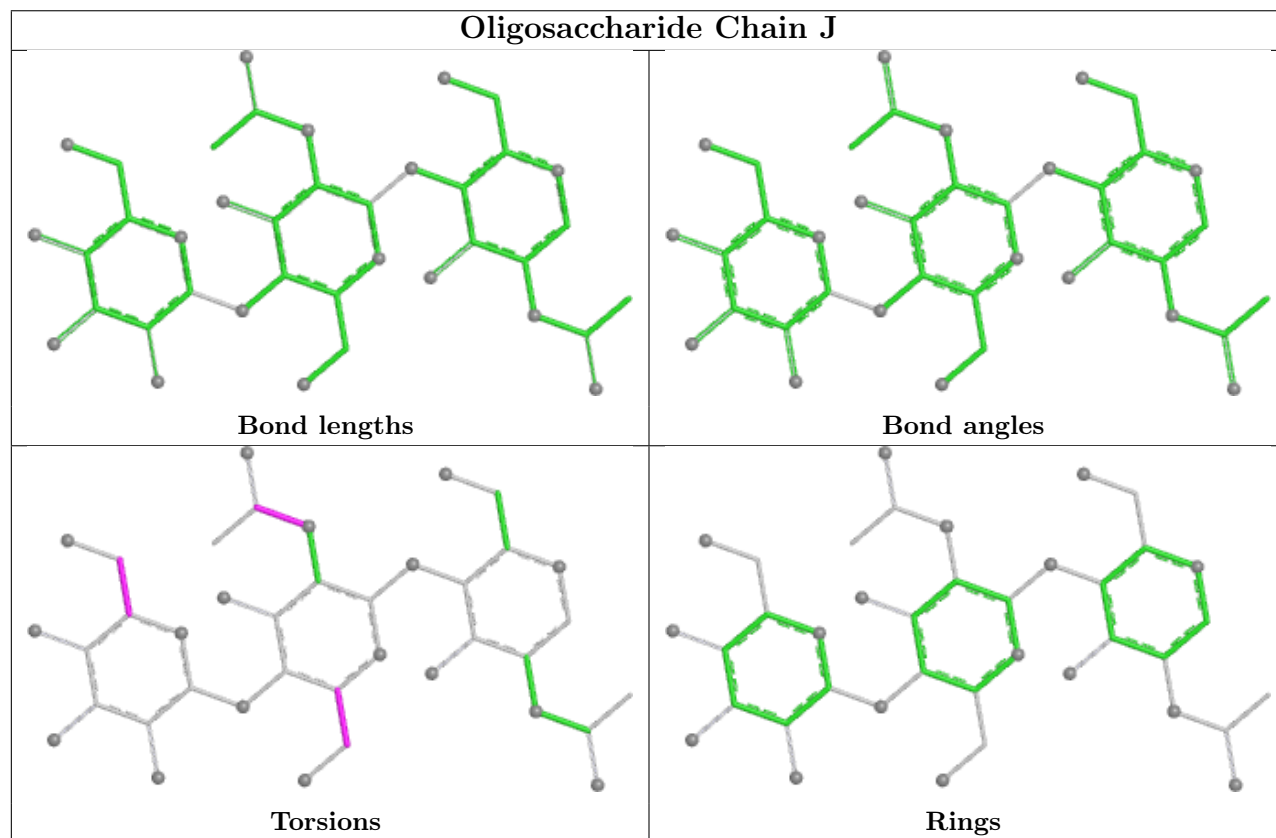
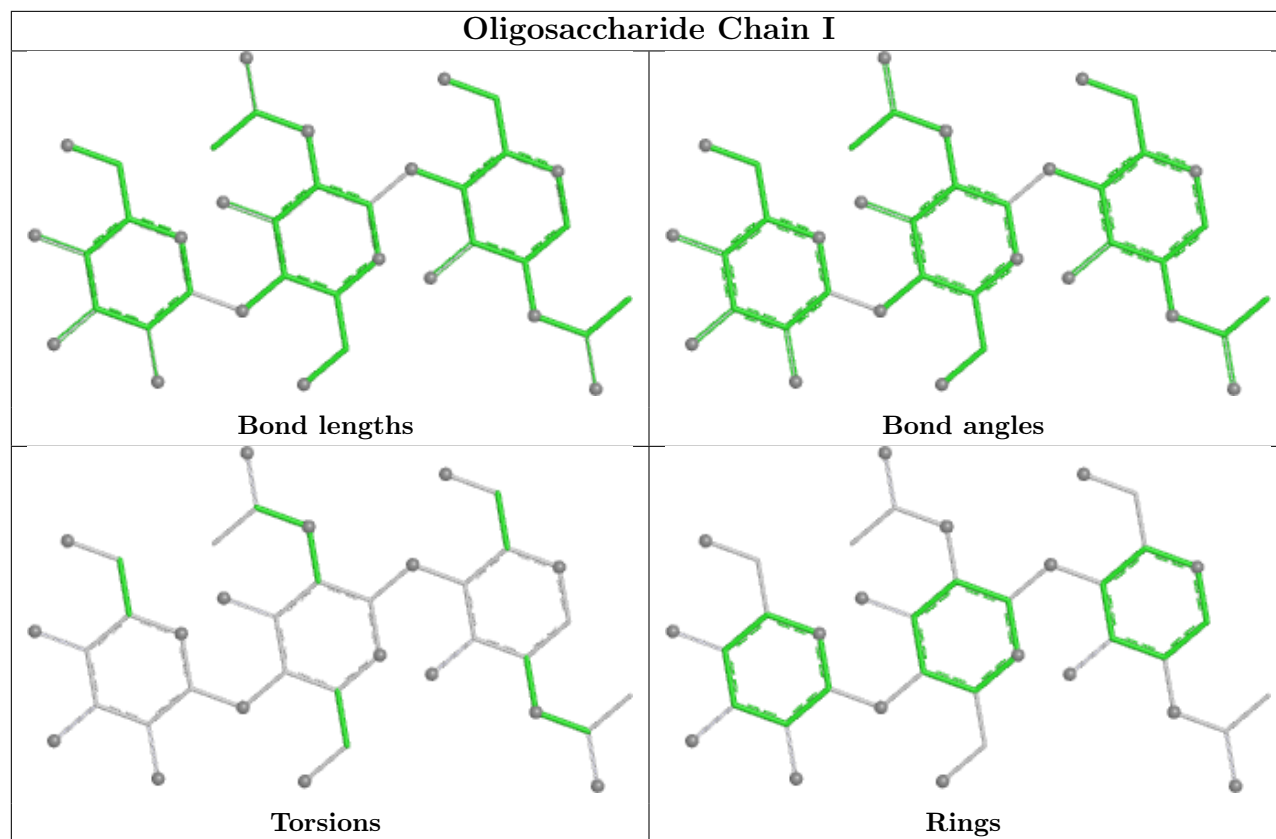












5.6 Ligand geometry

Of 21 ligands modelled in this entry, 9 are monoatomic - leaving 12 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	NAG	B	700	1	14,14,15	0.46	0	17,19,21	0.69	0
8	SO4	A	800	-	4,4,4	0.35	0	6,6,6	0.07	0
8	SO4	A	802	-	4,4,4	0.33	0	6,6,6	0.11	0
5	NAG	A	750	1	14,14,15	0.55	0	17,19,21	0.65	0
9	OXY	A	900	6	1,1,1	0.22	0	-		
5	NAG	A	700	1	14,14,15	0.51	0	17,19,21	0.75	1 (5%)
5	NAG	B	760	1	14,14,15	0.69	0	17,19,21	0.70	1 (5%)
9	OXY	B	901	6	1,1,1	0.22	0	-		
10	GOL	B	810	-	5,5,5	0.25	0	5,5,5	0.37	0
5	NAG	B	750	1	14,14,15	0.64	0	17,19,21	0.60	0
8	SO4	B	801	-	4,4,4	0.38	0	6,6,6	0.08	0
5	NAG	B	770	1	14,14,15	0.79	1 (7%)	17,19,21	0.71	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	B	700	1	-	2/6/23/26	0/1/1/1
5	NAG	A	750	1	-	2/6/23/26	0/1/1/1
5	NAG	A	700	1	-	2/6/23/26	0/1/1/1
5	NAG	B	760	1	-	4/6/23/26	0/1/1/1
10	GOL	B	810	-	-	0/4/4/4	-
5	NAG	B	750	1	-	2/6/23/26	0/1/1/1
5	NAG	B	770	1	-	3/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	770	NAG	C1-C2	2.36	1.55	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	A	700	NAG	C2-N2-C7	-2.30	119.82	122.90
5	B	760	NAG	C2-N2-C7	-2.06	120.15	122.90

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	760	NAG	C8-C7-N2-C2
5	B	760	NAG	O7-C7-N2-C2
5	B	770	NAG	C8-C7-N2-C2
5	B	770	NAG	O7-C7-N2-C2
5	A	750	NAG	C8-C7-N2-C2
5	A	750	NAG	O7-C7-N2-C2
5	B	760	NAG	O5-C5-C6-O6
5	B	760	NAG	C4-C5-C6-O6
5	A	700	NAG	C8-C7-N2-C2
5	B	700	NAG	C8-C7-N2-C2
5	A	700	NAG	O7-C7-N2-C2
5	B	700	NAG	O7-C7-N2-C2
5	B	750	NAG	C8-C7-N2-C2
5	B	750	NAG	O7-C7-N2-C2
5	B	770	NAG	C4-C5-C6-O6

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	700	NAG	1	0
5	B	760	NAG	1	0
10	B	810	GOL	3	0
5	B	770	NAG	2	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

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	558/559 (99%)	0.02	3 (0%) 87 85	3, 18, 36, 60	0
1	B	558/559 (99%)	0.06	4 (0%) 84 81	4, 20, 36, 63	0
All	All	1116/1118 (99%)	0.04	7 (0%) 85 83	3, 19, 36, 63	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2	PRO	2.8
1	B	2	PRO	2.3
1	A	12	CYS	2.3
1	B	427	PHE	2.3
1	A	314	GLY	2.2
1	B	3	THR	2.2
1	B	96	GLY	2.0

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.

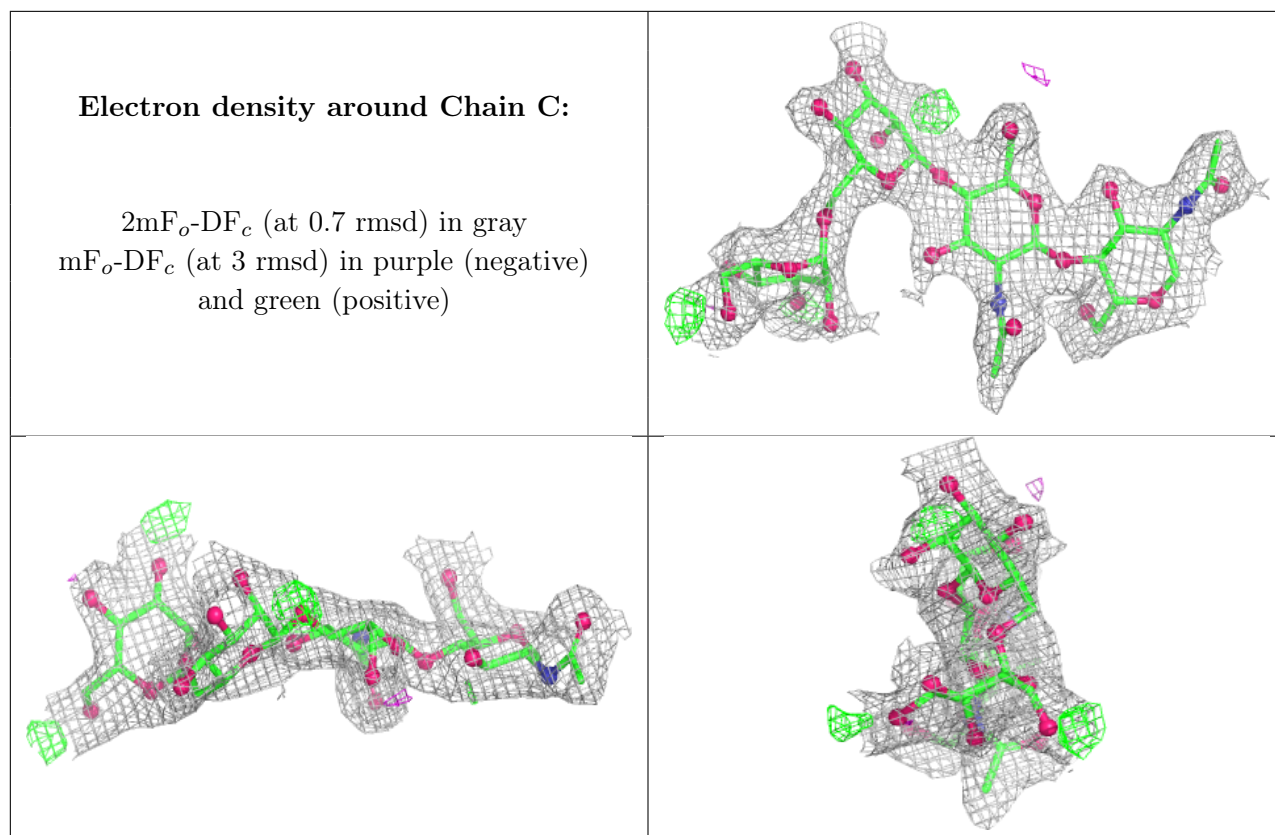
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NAG	G	2	14/15	0.62	0.16	60,62,66,68	0
4	BMA	I	3	11/12	0.62	0.13	62,65,66,66	0

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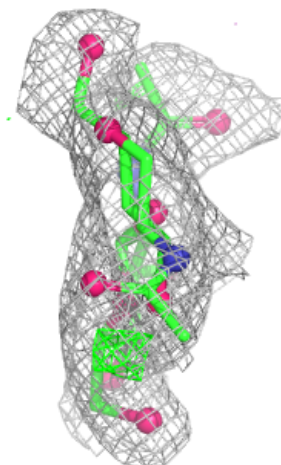
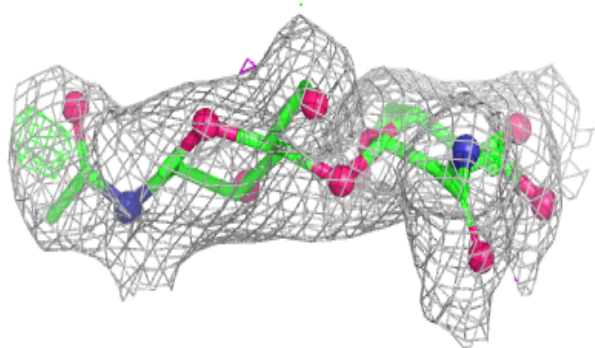
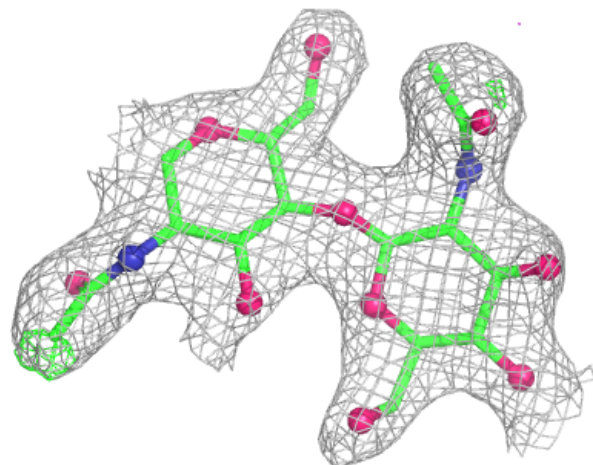
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	BMA	C	3	11/12	0.71	0.13	38,42,46,48	0
4	BMA	E	3	11/12	0.72	0.12	46,49,51,53	0
4	BMA	H	3	11/12	0.73	0.14	35,39,40,41	0
4	NAG	I	1	14/15	0.76	0.13	37,40,44,47	0
4	BMA	J	3	11/12	0.76	0.10	43,44,46,46	0
2	MAN	C	4	11/12	0.77	0.12	45,49,49,50	0
3	NAG	K	2	14/15	0.78	0.12	49,50,52,52	0
3	NAG	G	1	14/15	0.79	0.13	42,47,53,56	0
4	NAG	I	2	14/15	0.81	0.11	48,53,56,60	0
4	NAG	J	2	14/15	0.86	0.11	29,33,35,40	0
3	NAG	D	1	14/15	0.86	0.10	26,29,31,32	0
4	NAG	E	2	14/15	0.87	0.10	31,33,37,42	0
3	NAG	F	2	14/15	0.87	0.09	40,42,43,44	0
3	NAG	K	1	14/15	0.87	0.10	36,40,42,46	0
3	NAG	D	2	14/15	0.87	0.10	33,36,38,39	0
3	NAG	F	1	14/15	0.89	0.09	29,31,35,39	0
4	NAG	H	2	14/15	0.90	0.09	21,27,30,33	0
4	NAG	J	1	14/15	0.90	0.08	12,18,23,24	0
4	NAG	E	1	14/15	0.91	0.09	23,24,27,30	0
4	NAG	H	1	14/15	0.92	0.08	17,19,22,24	0
2	NAG	C	2	14/15	0.92	0.08	19,22,27,32	0
2	NAG	C	1	14/15	0.92	0.08	11,19,21,22	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.



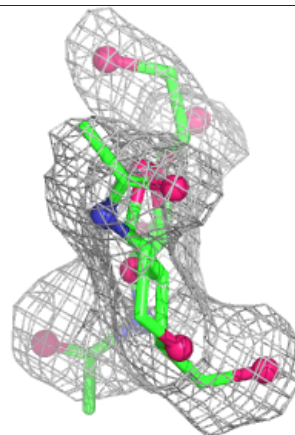
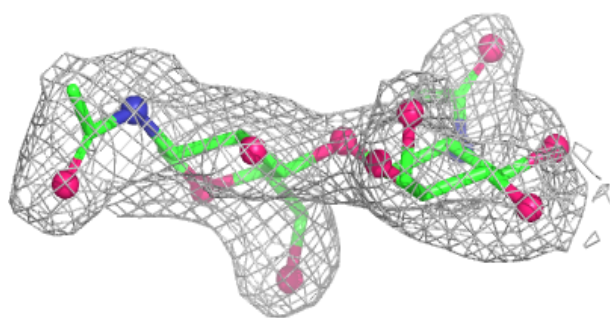
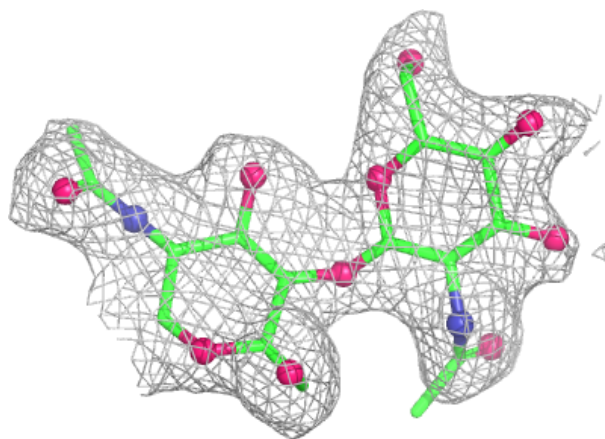
Electron density around Chain D:

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



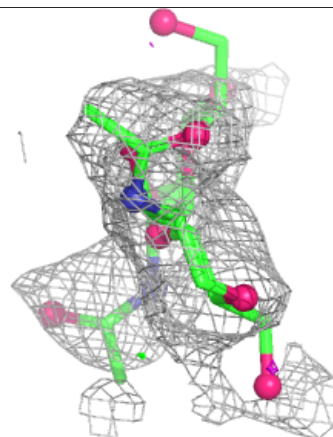
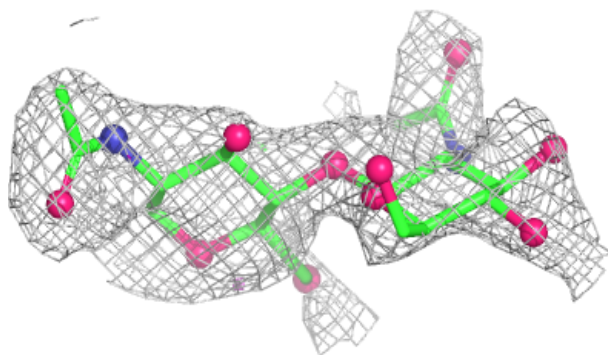
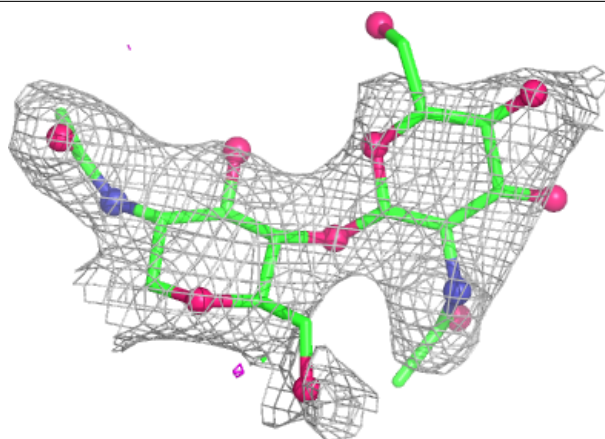
Electron density around Chain F:

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

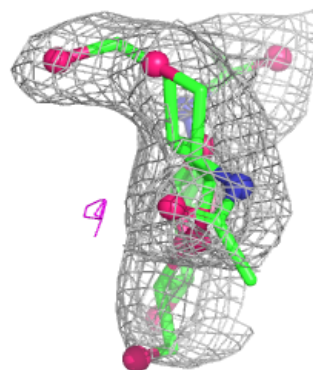
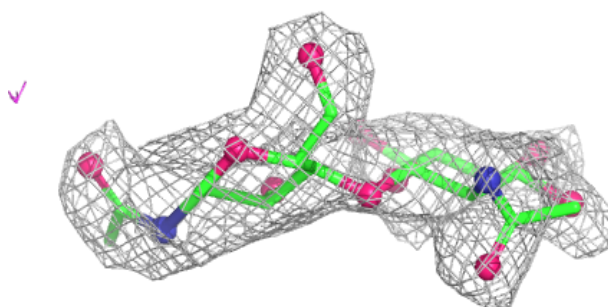
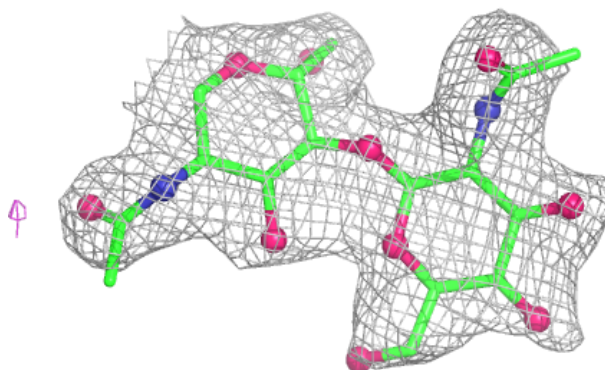


Electron density around Chain G:

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

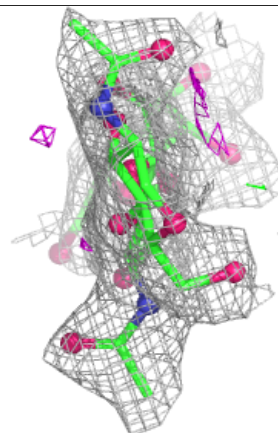
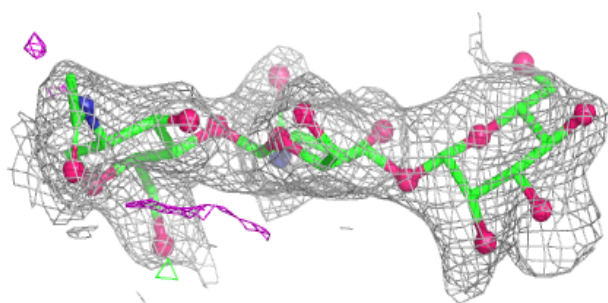
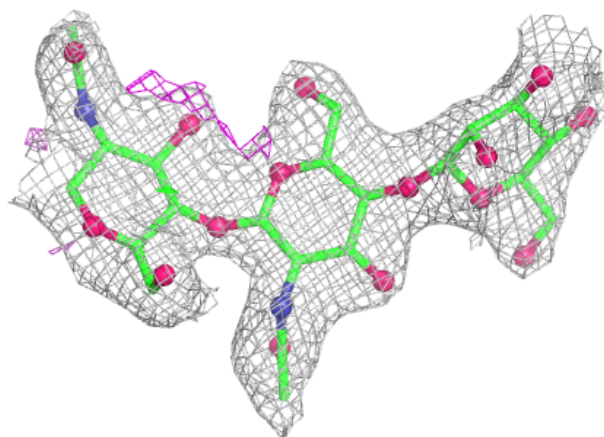
**Electron density around Chain K:**

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

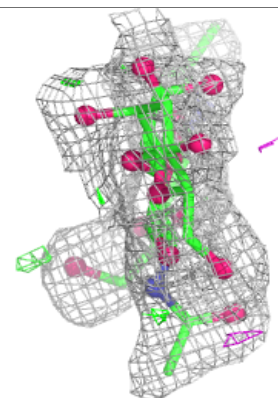
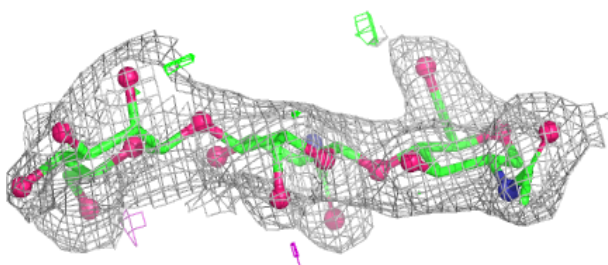
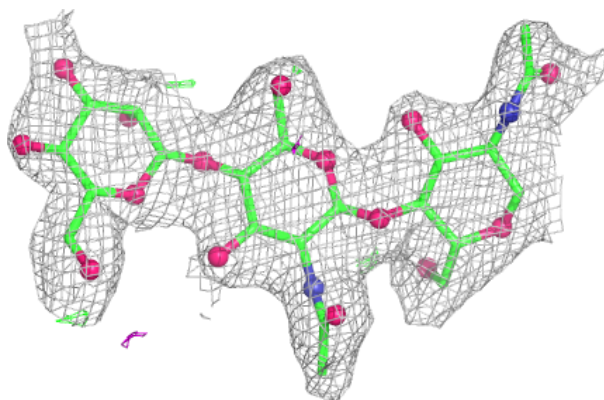


Electron density around Chain E:

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

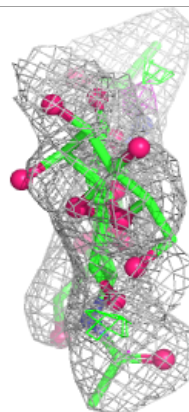
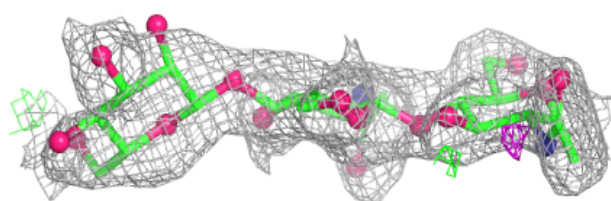
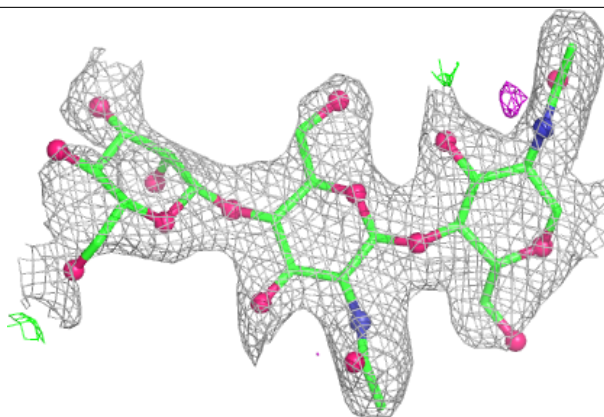
**Electron density around Chain H:**

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

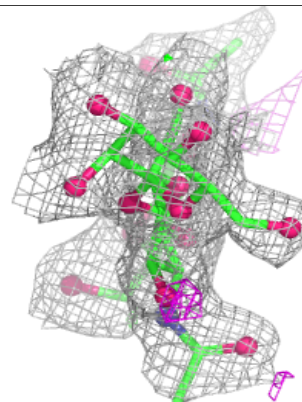
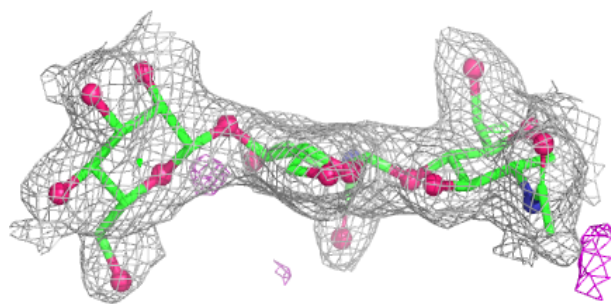
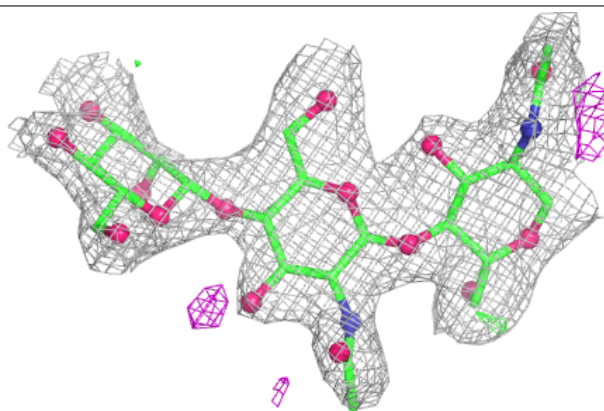


Electron density around Chain I:

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

**Electron density around Chain J:**

$2mF_o-DF_c$ (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
10	GOL	B	810	6/6	0.62	0.22	41,42,43,45	0
5	NAG	B	770	14/15	0.70	0.15	49,53,56,56	0
5	NAG	B	760	14/15	0.79	0.12	42,45,48,51	0
8	SO4	B	801	5/5	0.83	0.12	77,77,77,77	0
8	SO4	A	800	5/5	0.83	0.12	84,84,85,85	0
8	SO4	A	802	5/5	0.84	0.14	59,60,60,61	0
5	NAG	A	700	14/15	0.86	0.09	22,25,26,29	0
5	NAG	B	700	14/15	0.86	0.10	24,28,30,34	0
5	NAG	B	750	14/15	0.87	0.10	19,22,26,26	0
5	NAG	A	750	14/15	0.89	0.09	33,35,38,38	0
7	CL	A	610	1/1	0.91	0.12	49,49,49,49	0
6	CU	B	604	1/1	0.96	0.06	58,58,58,58	0
9	OXY	B	901	2/2	0.97	0.08	8,8,8,9	0
6	CU	A	602	1/1	0.97	0.04	26,26,26,26	0
9	OXY	A	900	2/2	0.98	0.10	1,1,1,1	0
6	CU	A	604	1/1	0.99	0.03	47,47,47,47	0
6	CU	B	601	1/1	0.99	0.04	14,14,14,14	0
6	CU	B	602	1/1	0.99	0.05	22,22,22,22	0
6	CU	B	603	1/1	0.99	0.07	25,25,25,25	0
6	CU	A	601	1/1	1.00	0.06	16,16,16,16	0
6	CU	A	603	1/1	1.00	0.02	15,15,15,15	0

6.5 Other polymers [i](#)

There are no such residues in this entry.