



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:14 PM UTC

PDB ID : 8TCS / pdb_00008tcs
Title : Structure of trehalose bound Alistipes sp. 3-Keto-beta-glucopyranoside-1,2-L yase AL1
Authors : Lazarski, A.C.; Worrall, L.J.; Strynadka, N.C.J.
Deposited on : 2023-07-02
Resolution : 1.50 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)
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

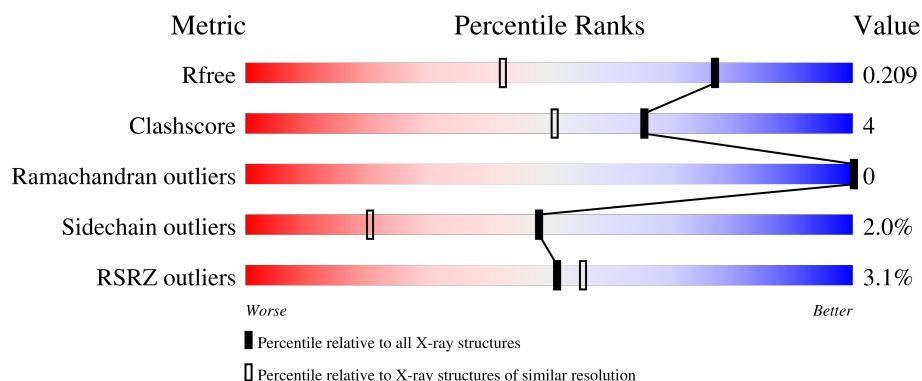
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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.



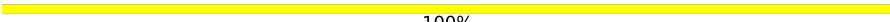
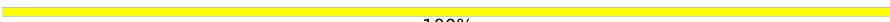
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4037 (1.50-1.50)
Clashscore	190562	4235 (1.50-1.50)
Ramachandran outliers	187476	4153 (1.50-1.50)
Sidechain outliers	187428	4150 (1.50-1.50)
RSRZ outliers	180081	4039 (1.50-1.50)

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 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	270	4% 90% 9%
1	B	270	2% 92% 7%
1	C	270	3% 91% 9%
1	D	270	3% 89% 10%
2	E	2	50% 50%

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

2 Entry composition [i](#)

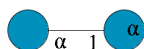
There are 5 unique types of molecules in this entry. The entry contains 9646 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Xylose isomerase-like TIM barrel domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	D	270	Total	C	N	O	S	0	3	0
			2171	1390	352	415	14			
1	C	270	Total	C	N	O	S	0	2	0
			2161	1383	350	414	14			
1	A	270	Total	C	N	O	S	0	3	0
			2174	1392	353	415	14			
1	B	270	Total	C	N	O	S	0	3	0
			2173	1391	355	413	14			

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



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	E	2	Total	C	O	0	0	0
			23	12	11			
2	F	2	Total	C	O	0	0	0
			23	12	11			
2	G	2	Total	C	O	0	0	0
			23	12	11			
2	H	2	Total	C	O	0	0	0
			23	12	11			

- Molecule 3 is COBALT (II) ION (CCD ID: CO) (formula: Co).

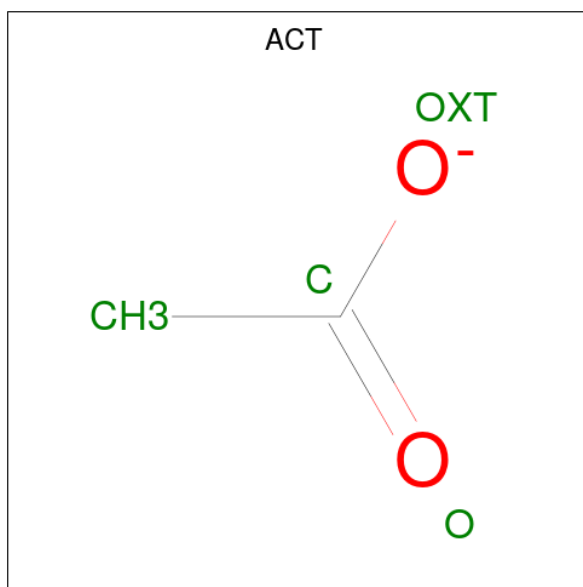
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	1	Total	Co	0	0
			1	1		
3	C	1	Total	Co	0	0
			1	1		

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

- Molecule 4 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



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

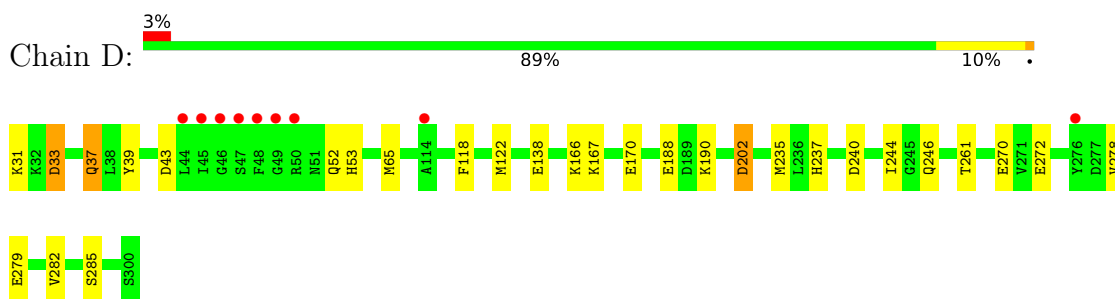
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	D	189	Total	O	0	0
			189	189		
5	C	241	Total	O	0	0
			241	241		
5	A	229	Total	O	0	0
			229	229		
5	B	208	Total	O	0	0
			208	208		

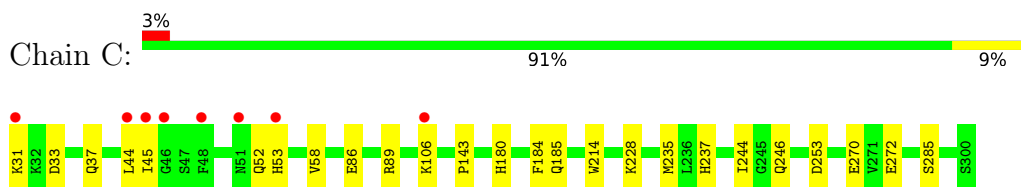
3 Residue-property plots

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.

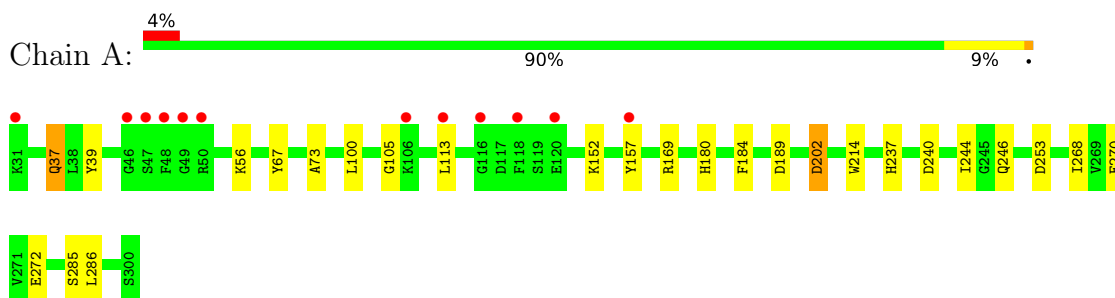
- Molecule 1: Xylose isomerase-like TIM barrel domain-containing protein



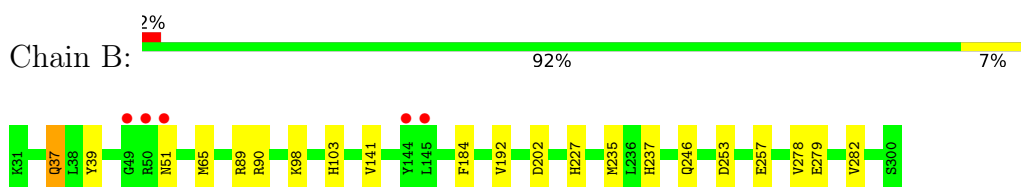
- Molecule 1: Xylose isomerase-like TIM barrel domain-containing protein



- Molecule 1: Xylose isomerase-like TIM barrel domain-containing protein



- Molecule 1: Xylose isomerase-like TIM barrel domain-containing protein



- Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose

Chain E:  50% 50%

GLC1
GLC2

- Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose

Chain F:  100%

GLC1
GLC2

- Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose

Chain G:  100%

GLC1
GLC2

- Molecule 2: alpha-D-glucopyranose-(1-1)-alpha-D-glucopyranose

Chain H:  50% 50%

GLC1
GLC2

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	47.99Å 113.55Å 212.44Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.34 – 1.50 44.34 – 1.50	Depositor EDS
% Data completeness (in resolution range)	99.8 (44.34-1.50) 99.1 (44.34-1.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.28 (at 1.50Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.173 , 0.205 0.181 , 0.209	Depositor DCC
R_{free} test set	9367 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	22.1	Xtriage
Anisotropy	0.296	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 30.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	9646	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.65% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CO, GLC, ACT

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	0/2229	1.14	4/3006 (0.1%)
1	B	0.69	0/2228	1.10	6/3005 (0.2%)
1	C	0.72	0/2216	1.11	7/2990 (0.2%)
1	D	0.67	0/2226	1.09	6/3003 (0.2%)
All	All	0.70	0/8899	1.11	23/12004 (0.2%)

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

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	235	MET	CG-SD-CE	-12.73	72.88	100.90
1	B	235	MET	CG-SD-CE	-12.70	72.96	100.90
1	D	235	MET	CG-SD-CE	-8.55	82.10	100.90
1	C	253	ASP	CA-CB-CG	7.23	119.83	112.60
1	B	89	ARG	CD-NE-CZ	6.79	133.90	124.40
1	B	253	ASP	CA-CB-CG	6.45	119.05	112.60
1	C	33	ASP	CA-CB-CG	6.35	118.95	112.60
1	A	184	PHE	CA-CB-CG	-6.04	107.75	113.80
1	D	240	ASP	CA-CB-CG	6.01	118.61	112.60
1	C	143	PRO	N-CA-CB	-5.84	98.03	103.46
1	D	43	ASP	CA-CB-CG	5.67	118.27	112.60
1	B	257	GLU	CB-CG-CD	5.66	122.22	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	89	ARG	CD-NE-CZ	5.56	132.19	124.40
1	D	33	ASP	CA-CB-CG	5.33	117.93	112.60
1	D	261	THR	CA-CB-OG1	-5.33	101.61	109.60
1	D	118	PHE	CB-CA-C	-5.32	101.20	110.09
1	B	184	PHE	CA-CB-CG	-5.26	108.54	113.80
1	C	184	PHE	CA-CB-CG	-5.14	108.66	113.80
1	A	253	ASP	CA-CB-CG	5.09	117.69	112.60
1	C	89	ARG	NE-CZ-NH1	-5.08	116.42	121.50
1	A	202	ASP	CA-CB-CG	5.05	117.65	112.60
1	B	227	HIS	CA-CB-CG	-5.04	108.76	113.80
1	A	240	ASP	CA-CB-CG	5.04	117.64	112.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	169	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	2174	0	2107	18	0
1	B	2173	0	2105	11	0
1	C	2161	0	2080	19	0
1	D	2171	0	2098	16	0
2	E	23	0	21	0	0
2	F	23	0	21	1	0
2	G	23	0	21	0	0
2	H	23	0	21	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	B	4	0	3	0	0
5	A	229	0	0	10	3
5	B	208	0	0	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	C	241	0	0	15	3
5	D	189	0	0	4	0
All	All	9646	0	8477	65	3

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 4.

All (65) 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:C:44:LEU:HB3	5:C:503:HOH:O	1.45	1.15
5:C:577:HOH:O	2:F:2:GLC:O6	1.59	1.15
1:C:185:GLN:CD	5:C:502:HOH:O	1.94	1.11
1:C:44:LEU:CB	5:C:503:HOH:O	1.99	1.10
1:A:246[A]:GLN:HG3	5:A:512:HOH:O	1.57	1.02
1:A:157:TYR:CE2	5:A:516:HOH:O	2.25	0.88
1:C:44:LEU:C	5:C:503:HOH:O	2.21	0.83
1:C:106:LYS:HG2	5:C:637:HOH:O	1.80	0.82
1:C:44:LEU:CA	5:C:503:HOH:O	2.30	0.77
1:A:105:GLY:CA	5:A:535:HOH:O	2.34	0.76
1:A:105:GLY:C	5:A:535:HOH:O	2.32	0.73
1:A:202:ASP:HB3	5:A:632:HOH:O	1.91	0.70
1:A:37:GLN:HE21	1:A:39:TYR:H	1.40	0.68
1:C:185:GLN:NE2	5:C:502:HOH:O	2.15	0.65
1:A:37:GLN:NE2	1:A:39:TYR:H	1.96	0.63
1:D:37:GLN:HE21	1:D:39:TYR:H	1.47	0.62
1:C:44:LEU:O	5:C:501:HOH:O	2.15	0.62
1:C:45:ILE:HG21	1:C:58:VAL:HG11	1.82	0.60
1:D:138:GLU:OE1	5:D:501:HOH:O	2.16	0.60
1:D:202:ASP:HB3	5:D:518:HOH:O	2.01	0.59
1:B:90:ARG:HD2	5:B:666:HOH:O	2.02	0.58
1:D:37:GLN:NE2	1:D:39:TYR:H	2.01	0.58
1:C:45:ILE:HG21	1:C:58:VAL:CG1	2.34	0.58
1:B:37:GLN:HE21	1:B:39:TYR:H	1.50	0.58
1:B:246[B]:GLN:HG3	5:B:671:HOH:O	2.04	0.58
1:A:105:GLY:HA3	5:A:535:HOH:O	2.01	0.57
1:C:246[B]:GLN:HG3	5:C:689:HOH:O	2.06	0.56
1:D:246[B]:GLN:HG3	5:D:653:HOH:O	2.05	0.55
1:B:37:GLN:NE2	1:B:39:TYR:H	2.04	0.55
1:D:279:GLU:HB2	5:D:504:HOH:O	2.07	0.54
1:B:202:ASP:HB2	5:B:511:HOH:O	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:279:GLU:CD	5:B:504:HOH:O	2.51	0.53
1:C:228:LYS:HD3	5:C:577:HOH:O	2.11	0.50
1:A:100:LEU:HD23	1:A:268:ILE:HD11	1.93	0.50
1:C:53:HIS:HD2	5:C:501:HOH:O	1.95	0.49
1:C:31:LYS:HD2	5:C:697:HOH:O	2.13	0.48
1:B:279:GLU:HG2	5:B:667:HOH:O	2.16	0.46
1:D:166:LYS:NZ	1:D:170:GLU:OE1	2.48	0.46
1:A:37:GLN:HE22	1:A:73:ALA:HB2	1.81	0.46
1:B:279:GLU:CG	5:B:504:HOH:O	2.64	0.45
1:B:278:VAL:O	1:B:282[A]:VAL:HG13	2.16	0.45
1:C:228:LYS:NZ	5:C:505:HOH:O	2.41	0.45
1:A:180:HIS:C	1:A:214:TRP:HB3	2.42	0.44
1:D:65:MET:CE	1:D:279:GLU:HG3	2.48	0.43
1:B:103:HIS:HA	1:B:141:VAL:O	2.17	0.43
1:D:270:GLU:OE1	1:D:272:GLU:HG3	2.18	0.43
1:C:180:HIS:C	1:C:214:TRP:HB3	2.44	0.43
1:A:56:LYS:HE3	5:A:528:HOH:O	2.19	0.43
1:C:270:GLU:OE2	1:C:272:GLU:OE1	2.37	0.43
1:A:152:LYS:HD2	5:A:709:HOH:O	2.17	0.42
1:D:244:ILE:HG12	1:D:285:SER:HB3	2.01	0.42
1:A:67:TYR:CZ	1:A:286:LEU:HB2	2.55	0.41
1:A:244:ILE:HG12	1:A:285:SER:HB3	2.01	0.41
1:D:52:GLN:OE1	1:D:53:HIS:CD2	2.73	0.41
1:D:278:VAL:O	1:D:282[A]:VAL:HG13	2.19	0.41
1:C:185:GLN:CG	5:C:502:HOH:O	2.55	0.41
1:D:122:MET:CE	1:D:167:LYS:HD2	2.51	0.41
1:A:246[B]:GLN:HG3	5:A:693:HOH:O	2.20	0.41
1:D:270:GLU:CD	1:D:272:GLU:HG3	2.45	0.41
1:D:122:MET:HE3	1:D:167:LYS:HD2	2.03	0.41
1:A:270:GLU:OE1	1:A:272:GLU:HG3	2.21	0.41
1:B:65:MET:SD	1:B:282[A]:VAL:HG23	2.61	0.41
1:D:188:GLU:O	1:D:190:LYS:HG3	2.21	0.40
1:A:152:LYS:CD	5:A:709:HOH:O	2.69	0.40
1:C:244:ILE:HG12	1:C:285:SER:HB3	2.04	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:C:708:HOH:O	5:A:696:HOH:O[3_545]	2.04	0.16

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:C:691:HOH:O	5:A:714:HOH:O[3_545]	2.07	0.13
5:C:525:HOH:O	5:A:511:HOH:O[3_545]	2.14	0.06

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	271/270 (100%)	263 (97%)	8 (3%)	0	100	100
1	B	271/270 (100%)	262 (97%)	9 (3%)	0	100	100
1	C	270/270 (100%)	261 (97%)	9 (3%)	0	100	100
1	D	271/270 (100%)	264 (97%)	7 (3%)	0	100	100
All	All	1083/1080 (100%)	1050 (97%)	33 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	231/229 (101%)	227 (98%)	4 (2%)	53	26
1	B	230/229 (100%)	225 (98%)	5 (2%)	45	17
1	C	228/229 (100%)	224 (98%)	4 (2%)	51	24
1	D	230/229 (100%)	225 (98%)	5 (2%)	45	17
All	All	919/916 (100%)	901 (98%)	18 (2%)	48	20

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	31	LYS
1	D	33	ASP
1	D	37	GLN
1	D	202	ASP
1	D	237	HIS
1	C	37	GLN
1	C	52	GLN
1	C	86	GLU
1	C	237	HIS
1	A	37	GLN
1	A	113	LEU
1	A	189	ASP
1	A	237	HIS
1	B	37	GLN
1	B	51	ASN
1	B	98	LYS
1	B	192	VAL
1	B	237	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	37	GLN
1	C	53	HIS
1	C	155	GLN
1	A	37	GLN
1	B	37	GLN

5.3.3 RNA [i](#)

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](#)

8 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	GLC	E	1	2	11,11,12	0.65	0	15,15,17	0.66	0
2	GLC	E	2	2	12,12,12	0.80	0	17,17,17	1.02	1 (5%)
2	GLC	F	1	2	11,11,12	0.52	0	15,15,17	1.21	2 (13%)
2	GLC	F	2	2	12,12,12	0.67	0	17,17,17	0.79	0
2	GLC	G	1	2	11,11,12	0.76	0	15,15,17	1.02	1 (6%)
2	GLC	G	2	2	12,12,12	0.73	0	17,17,17	0.74	1 (5%)
2	GLC	H	1	2	11,11,12	0.56	0	15,15,17	0.62	0
2	GLC	H	2	2	12,12,12	0.71	0	17,17,17	0.96	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
2	GLC	E	1	2	-	2/2/19/22	0/1/1/1
2	GLC	E	2	2	-	0/2/22/22	0/1/1/1
2	GLC	F	1	2	-	0/2/19/22	0/1/1/1
2	GLC	F	2	2	-	0/2/22/22	0/1/1/1
2	GLC	G	1	2	-	0/2/19/22	0/1/1/1
2	GLC	G	2	2	-	0/2/22/22	0/1/1/1
2	GLC	H	1	2	-	0/2/19/22	0/1/1/1
2	GLC	H	2	2	-	0/2/22/22	0/1/1/1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	2	GLC	O2-C2-C1	2.60	115.25	109.25
2	G	1	GLC	C3-C4-C5	2.28	114.37	110.23
2	F	1	GLC	O3-C3-C2	-2.22	105.53	110.05
2	H	2	GLC	O2-C2-C3	-2.13	105.35	110.38
2	G	2	GLC	O2-C2-C1	2.07	114.02	109.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	1	GLC	C3-C4-C5	2.05	113.94	110.23

There are no chirality outliers.

All (2) torsion outliers are listed below:

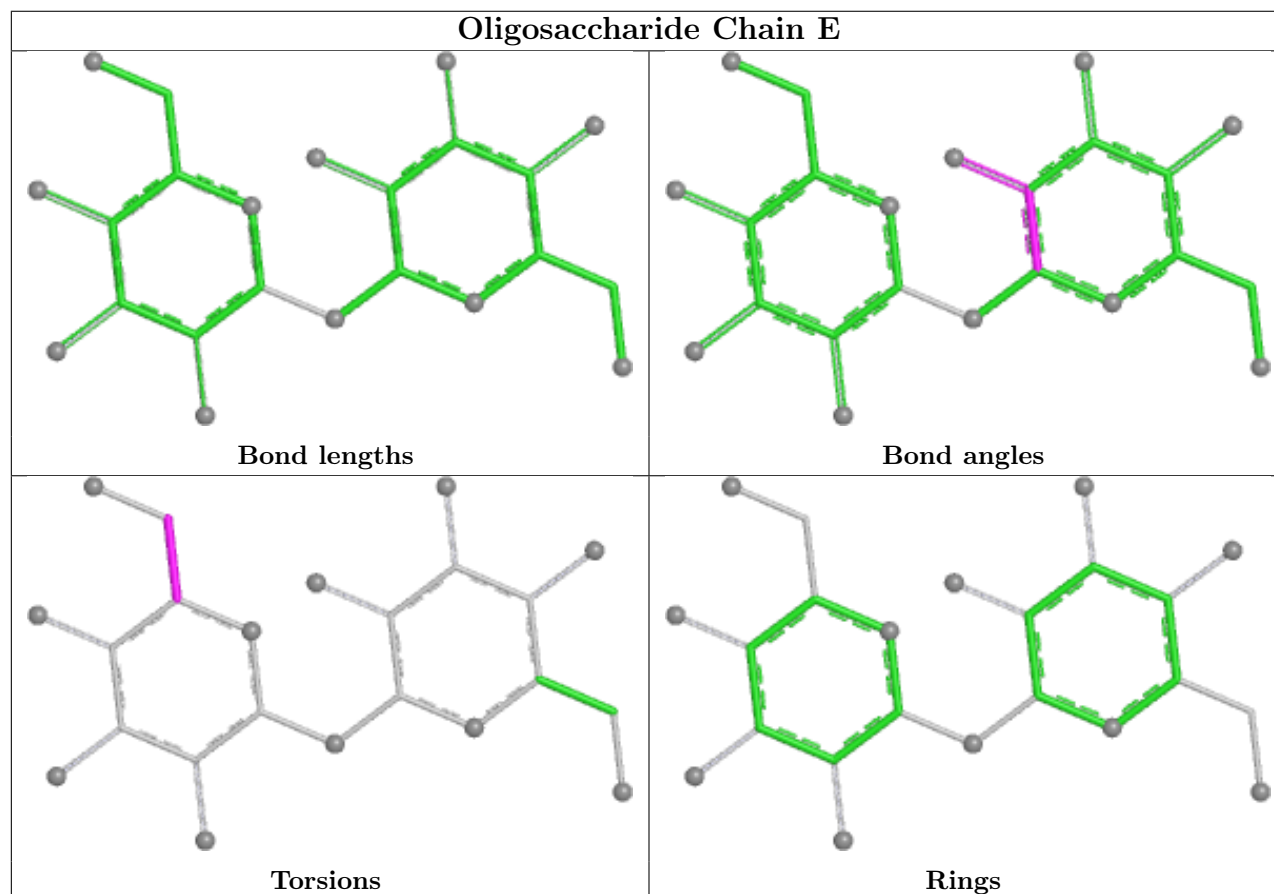
Mol	Chain	Res	Type	Atoms
2	E	1	GLC	C4-C5-C6-O6
2	E	1	GLC	O5-C5-C6-O6

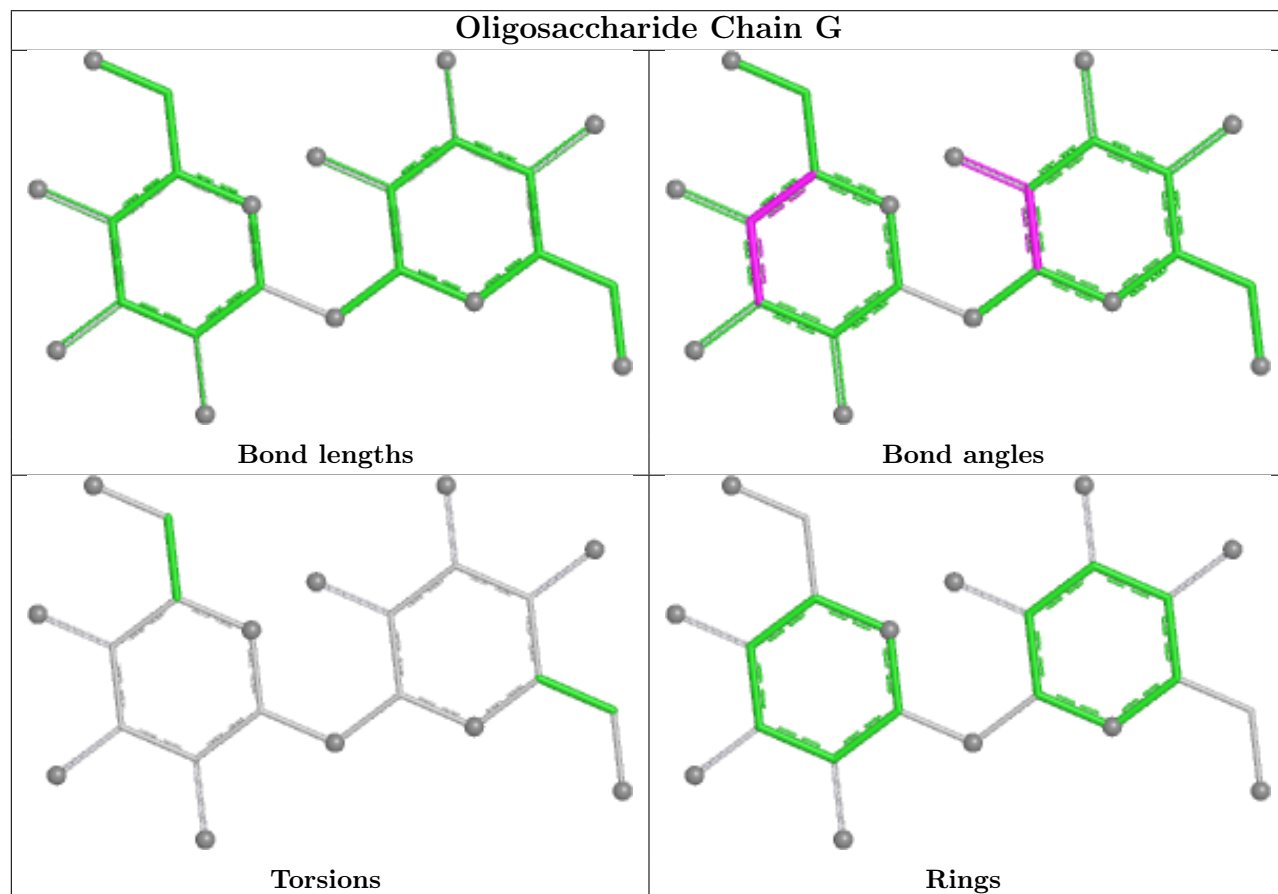
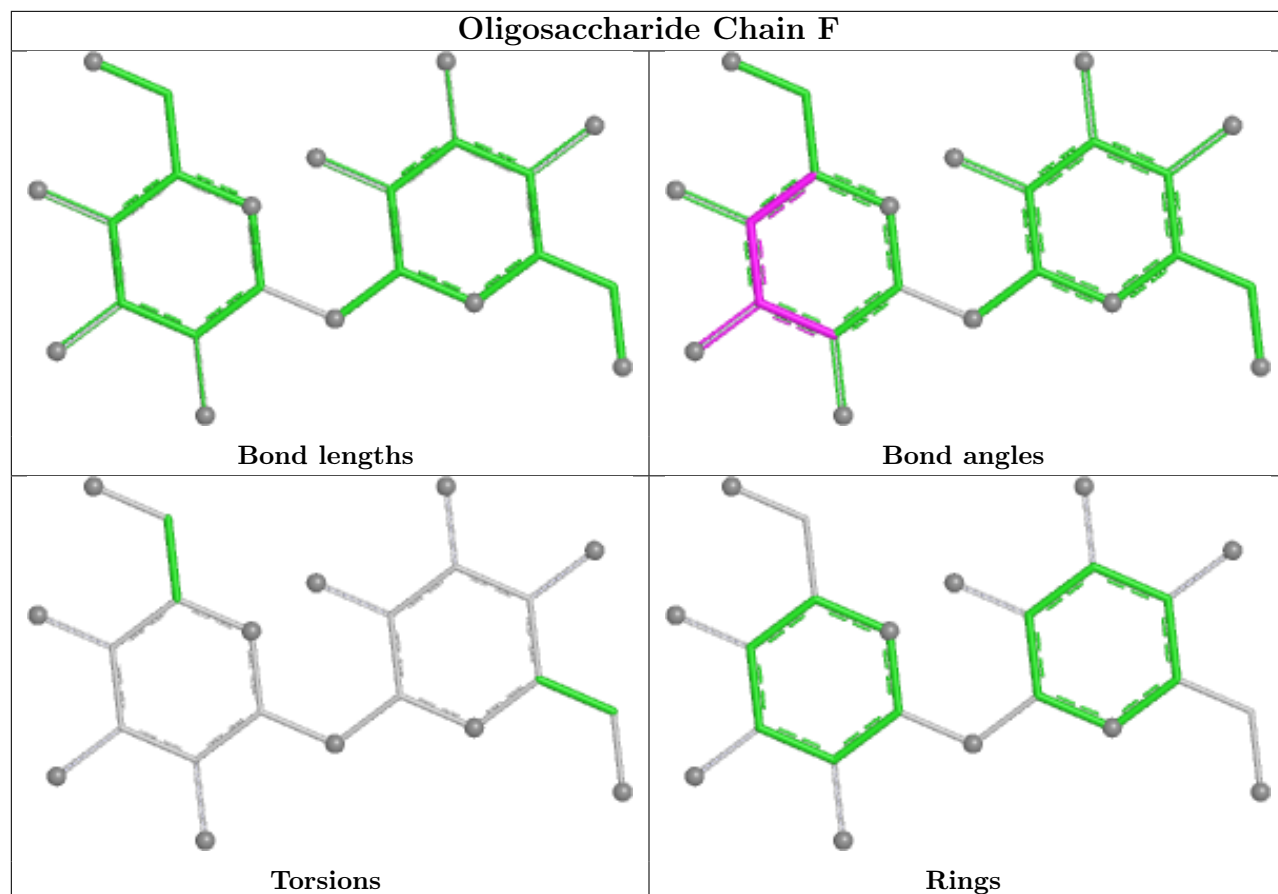
There are no ring outliers.

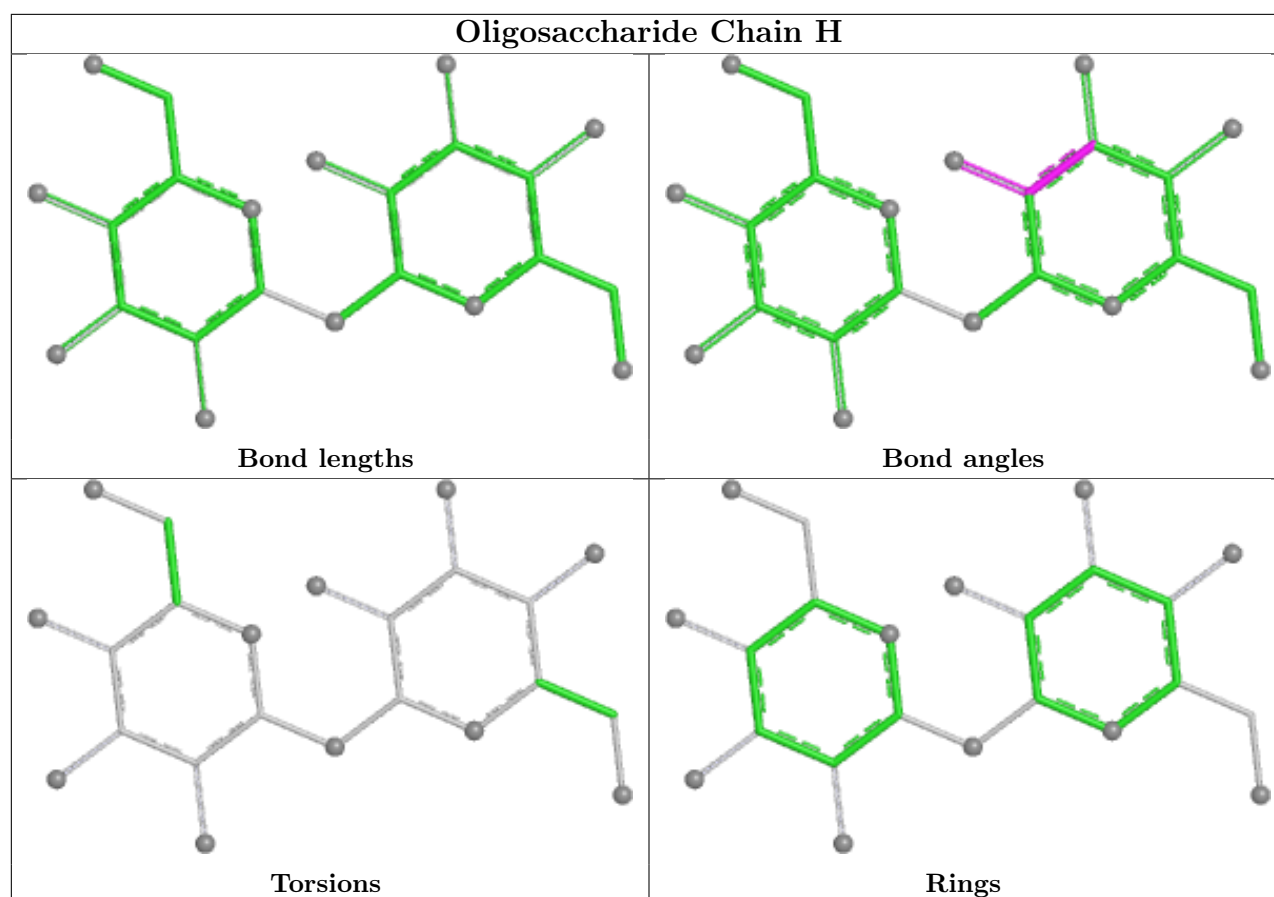
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	2	GLC	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 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 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	$\# Z > 2$
4	ACT	B	402	-	3,3,3	0.71	0	3,3,3	0.75	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers

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

6.1 Protein, DNA and RNA chains

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	270/270 (100%)	0.24	12 (4%) 39 43	11, 24, 45, 71	3 (1%)
1	B	270/270 (100%)	0.19	5 (1%) 66 70	11, 24, 42, 78	3 (1%)
1	C	270/270 (100%)	0.10	8 (2%) 52 56	12, 23, 40, 68	2 (0%)
1	D	270/270 (100%)	0.34	9 (3%) 49 53	12, 25, 45, 78	3 (1%)
All	All	1080/1080 (100%)	0.22	34 (3%) 51 55	11, 24, 43, 78	11 (1%)

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	48	PHE	5.5
1	A	48	PHE	5.0
1	D	49	GLY	4.1
1	B	49	GLY	4.1
1	D	45	ILE	3.3
1	A	118	PHE	3.2
1	D	50	ARG	3.2
1	A	47	SER	3.1
1	B	51	ASN	3.0
1	B	50	ARG	3.0
1	C	53	HIS	2.8
1	C	48	PHE	2.8
1	D	46	GLY	2.7
1	D	114	ALA	2.7
1	A	120	GLU	2.7
1	C	51	ASN	2.6
1	D	44	LEU	2.6
1	C	31	LYS	2.5
1	C	45	ILE	2.5
1	D	47	SER	2.5
1	C	44	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	46	GLY	2.4
1	A	113	LEU	2.3
1	A	49	GLY	2.3
1	A	116	GLY	2.3
1	A	106	LYS	2.2
1	A	157	TYR	2.2
1	D	276	TYR	2.1
1	A	31	LYS	2.1
1	C	106	LYS	2.1
1	A	50	ARG	2.1
1	C	46	GLY	2.1
1	B	144	TYR	2.1
1	B	145	LEU	2.0

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

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

6.3 Carbohydrates ⓘ

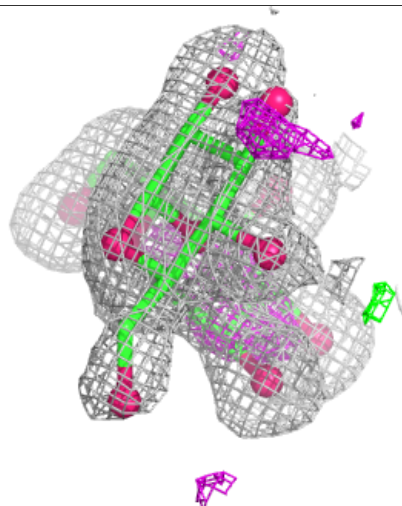
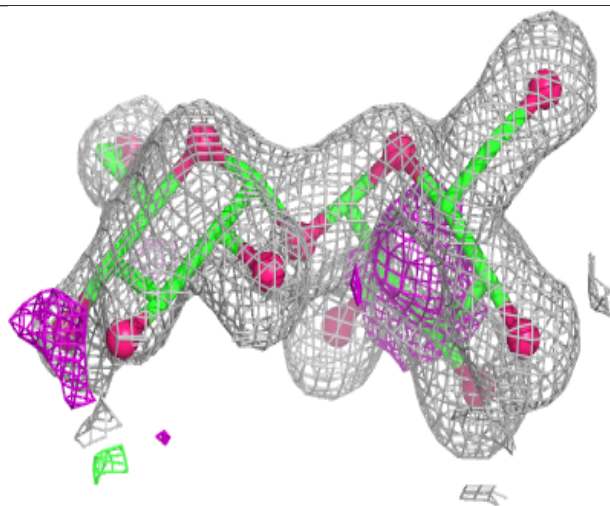
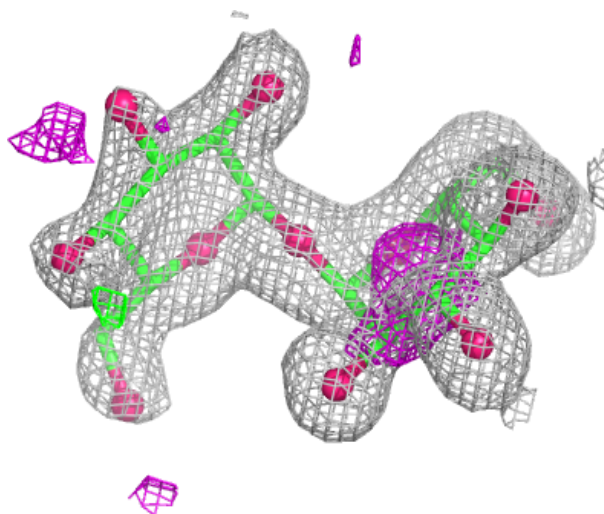
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	GLC	G	1	11/12	0.74	0.12	47,59,70,73	0
2	GLC	E	1	11/12	0.79	0.12	43,53,57,58	0
2	GLC	F	1	11/12	0.81	0.11	41,51,54,55	0
2	GLC	H	1	11/12	0.88	0.10	38,43,49,57	0
2	GLC	E	2	12/12	0.91	0.10	22,33,38,40	0
2	GLC	G	2	12/12	0.92	0.09	25,32,37,40	0
2	GLC	H	2	12/12	0.93	0.08	23,26,31,33	0
2	GLC	F	2	12/12	0.94	0.07	20,28,30,36	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.

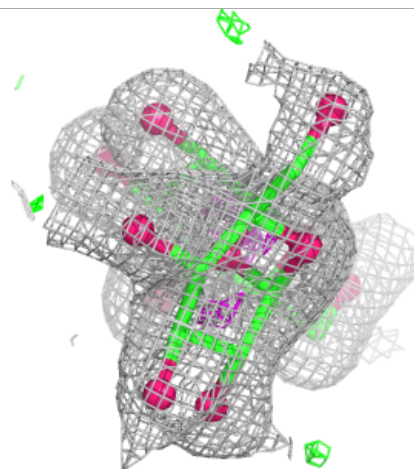
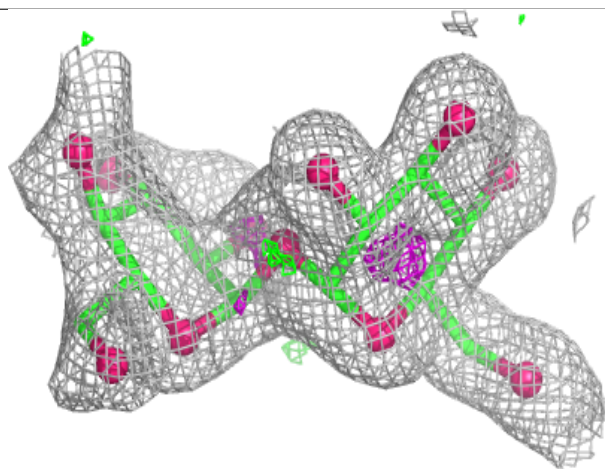
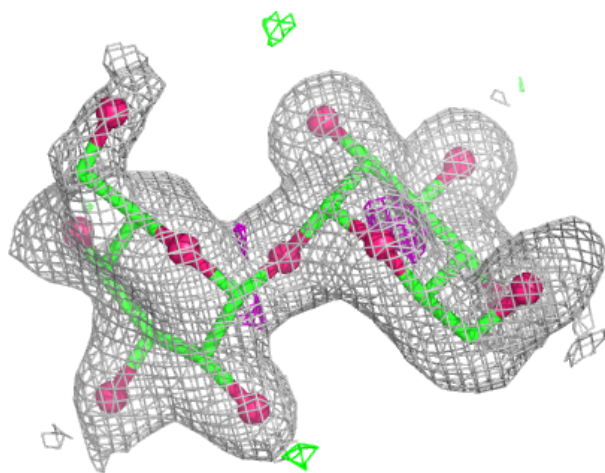
Electron density around Chain E:

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



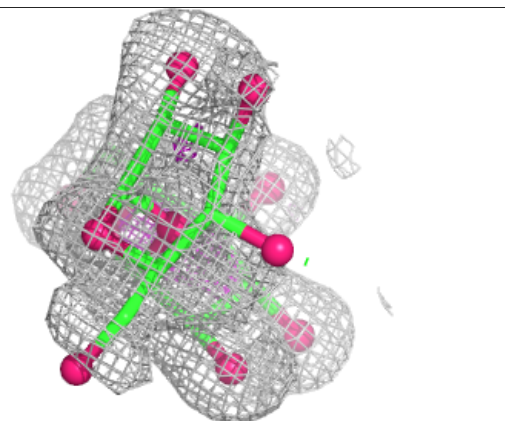
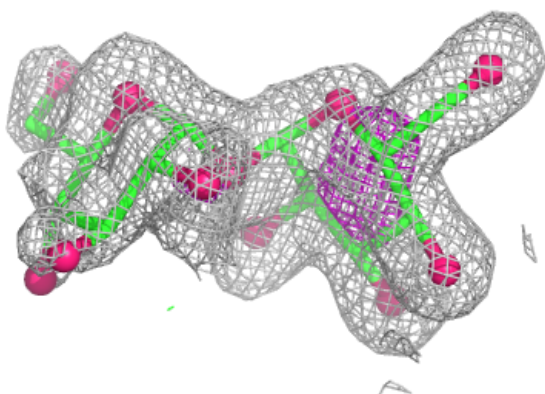
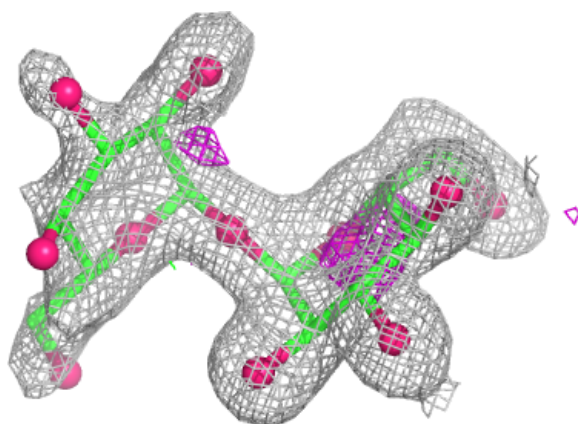
Electron density around Chain F:

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

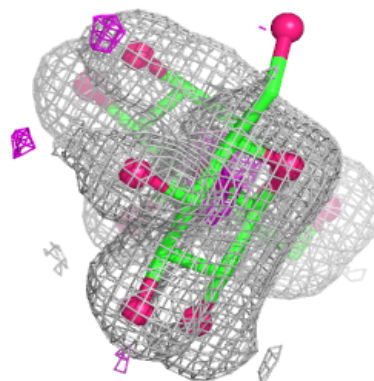
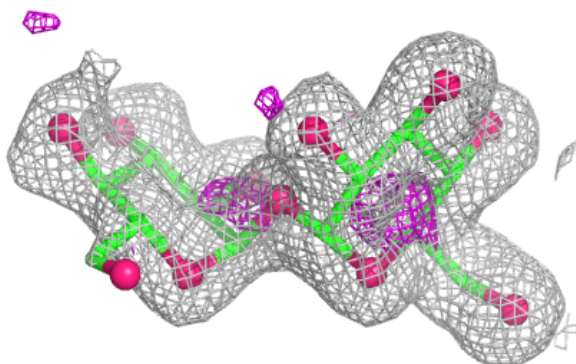
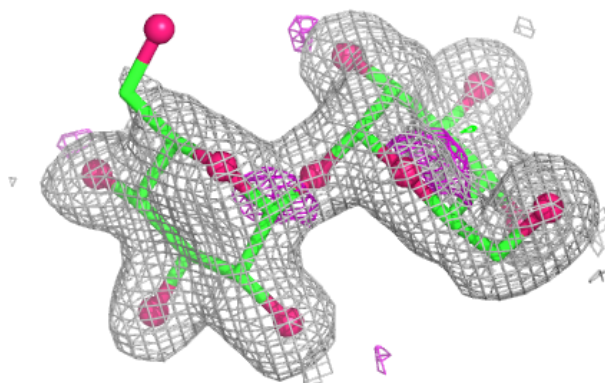


Electron density around Chain G:

$2mF_o-DF_c$ (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
3	CO	D	401	1/1	0.75	0.35	65,65,65,65	0
3	CO	B	401	1/1	0.85	0.39	58,58,58,58	0
3	CO	A	401	1/1	0.91	0.32	42,42,42,42	0
3	CO	C	401	1/1	0.92	0.34	44,44,44,44	0
4	ACT	B	402	4/4	0.93	0.09	26,32,33,37	0

6.5 Other polymers [i](#)

There are no such residues in this entry.