Full wwPDB X-ray Structure Validation Report (i)

Mar 7, 2026 – 01:53 AM UTC

PDB ID	:	6TYO / pdb_00006tyo
Title	:	Salmonella Typhi PltB Homopentamer with Neu-5NAc-4OAc-alpha-2-3-Gal-beta-1-4-GlcNAc Glycans
Authors	:	Nguyen, T.; Milano, S.K.; Yang, Y.A.; Song, J.
Deposited on	:	2019-08-09
Resolution	:	2.04 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 (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

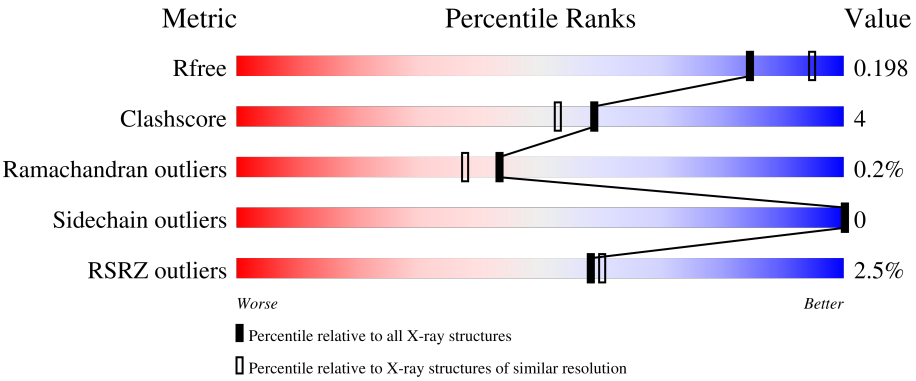
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry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

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.04 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	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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 <=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	114	2% 95% 5%
1	B	114	3% 89% 11%
1	C	114	7% 87% 13%
1	D	114	96% .
1	E	114	% 93% 7%

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Mol	Chain	Length	Quality of chain
2	F	3	33% 67%
2	G	3	100%
2	H	3	33% 67%
2	I	3	67% 33%
2	J	3	67% 33%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	GAL	H	2	-	-	X	-

2 Entry composition (i)

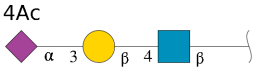
There are 3 unique types of molecules in this entry. The entry contains 5283 atoms, of which 215 are hydrogens and 0 are deuteriums.

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 Pertussis-like toxin subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	114	Total	C	N	O	S	0	0	0
			885	566	145	170	4			
1	B	114	Total	C	N	O	S	0	0	0
			885	566	145	170	4			
1	C	114	Total	C	N	O	S	0	0	0
			885	566	145	170	4			
1	D	114	Total	C	N	O	S	0	0	0
			885	566	145	170	4			
1	E	114	Total	C	N	O	S	0	0	0
			885	566	145	170	4			

- Molecule 2 is an oligosaccharide called 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	F	3	Total	C	H	N	O	0	0	0
			92	27	43	2	20			
2	G	3	Total	C	H	N	O	0	0	0
			92	27	43	2	20			
2	H	3	Total	C	H	N	O	0	0	0
			92	27	43	2	20			
2	I	3	Total	C	H	N	O	0	0	0
			92	27	43	2	20			
2	J	3	Total	C	H	N	O	0	0	0
			92	27	43	2	20			

- Molecule 3 is water.

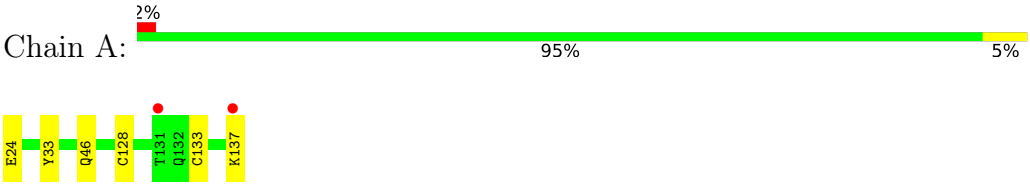
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	101	Total O 101 101	0	0
3	B	86	Total O 86 86	0	0
3	C	71	Total O 71 71	0	0
3	D	76	Total O 76 76	0	0
3	E	64	Total O 64 64	0	0

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.

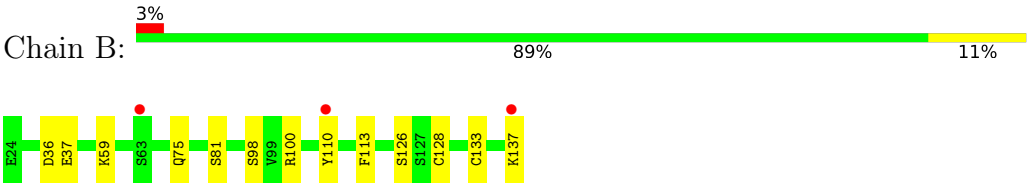
• Molecule 1: Pertussis-like toxin subunit

Chain A:



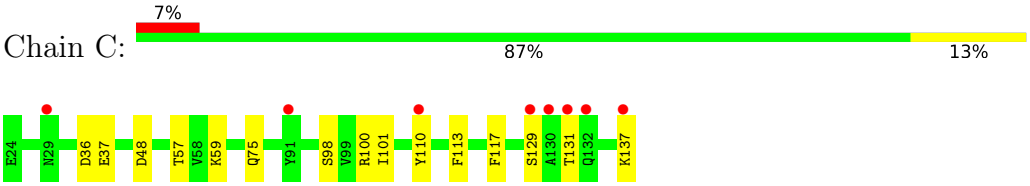
• Molecule 1: Pertussis-like toxin subunit

Chain B:



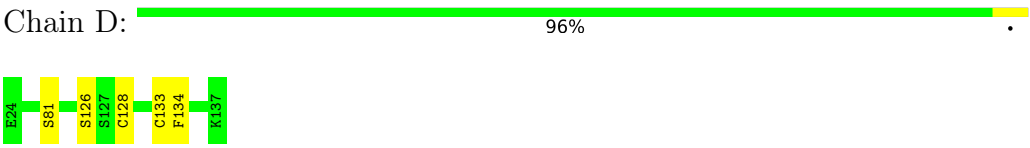
• Molecule 1: Pertussis-like toxin subunit

Chain C:



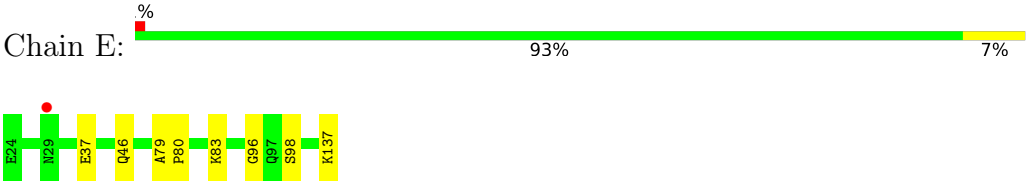
• Molecule 1: Pertussis-like toxin subunit

Chain D:



• Molecule 1: Pertussis-like toxin subunit

Chain E:



• Molecule 2: 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

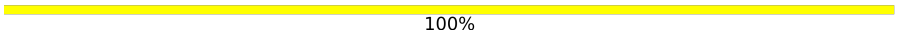
Chain F:





• Molecule 2: 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain G:





• Molecule 2: 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

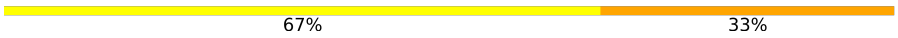
Chain H:





• Molecule 2: 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

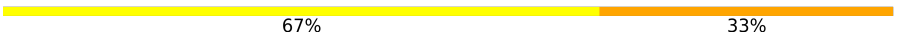
Chain I:





• Molecule 2: 4-O-acetyl-5-acetamido-3,5-dideoxy-D-glycero-alpha-D-galacto-non-2-ulopyranosonic acid-(2-3)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	68.58Å 98.21Å 104.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.00 – 2.04 40.00 – 2.04	Depositor EDS
% Data completeness (in resolution range)	99.8 (40.00-2.04) 99.8 (40.00-2.04)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	8.53 (at 2.05Å)	Xtriage
Refinement program	PHENIX (1.16_3549: ???)	Depositor
R, R_{free}	0.161 , 0.198 0.161 , 0.198	Depositor DCC
R_{free} test set	2003 reflections (4.38%)	wwPDB-VP
Wilson B-factor (Å^2)	14.6	Xtriage
Anisotropy	0.595	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 42.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5283	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.41% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PKM, GAL, 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	0.32	0/909	0.49	0/1240
1	B	0.36	0/909	0.53	0/1240
1	C	0.38	1/909 (0.1%)	0.51	0/1240
1	D	0.33	0/909	0.48	0/1240
1	E	0.32	0/909	0.49	0/1240
All	All	0.35	1/4545 (0.0%)	0.50	0/6200

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	117	PHE	CA-C	-5.55	1.49	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	885	0	846	4	0
1	B	885	0	846	10	0
1	C	885	0	846	9	0
1	D	885	0	846	3	0
1	E	885	0	846	6	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	49	43	23	2	0
2	G	49	43	23	0	0
2	H	49	43	23	6	0
2	I	49	43	23	1	0
2	J	49	43	23	1	0
3	A	101	0	0	1	0
3	B	86	0	0	0	1
3	C	71	0	0	0	1
3	D	76	0	0	2	0
3	E	64	0	0	2	0
All	All	5068	215	4345	40	1

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 (40) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:137:LYS:HD2	3:E:314:HOH:O	1.72	0.89
1:B:75:GLN:OE1	1:B:110:TYR:OH	1.96	0.83
2:H:2:GAL:O6	2:H:2:GAL:O4	2.09	0.69
1:C:75:GLN:OE1	1:C:110:TYR:OH	2.12	0.68
1:C:37:GLU:OE2	1:C:59:LYS:HE2	1.94	0.68
2:H:2:GAL:H2	2:H:2:GAL:H62	1.82	0.61
1:C:100:ARG:HH12	1:C:137:LYS:HB3	1.68	0.58
1:D:128:CYS:HA	1:D:133:CYS:HA	1.85	0.58
2:J:1:NAG:O1	2:J:1:NAG:H83	2.05	0.57
3:A:307:HOH:O	1:B:137:LYS:HD3	2.04	0.56
1:B:37:GLU:OE2	1:B:59:LYS:HE2	2.06	0.55
1:C:110:TYR:HB2	1:C:113:PHE:HB3	1.88	0.54
1:C:129:SER:HB2	3:D:302:HOH:O	2.06	0.53
1:A:33:TYR:OH	1:A:137:LYS:HG2	2.10	0.52
2:F:1:NAG:H5	2:F:2:GAL:O5	2.09	0.52
1:D:81:SER:OG	1:E:46:GLN:HB2	2.10	0.51
1:C:48:ASP:OD2	1:C:110:TYR:CE2	2.64	0.50
1:A:24:GLU:OE1	1:A:24:GLU:N	2.45	0.49
2:H:1:NAG:H82	2:H:2:GAL:H5	1.94	0.49
2:H:1:NAG:C3	2:H:2:GAL:O5	2.61	0.49
1:B:100:ARG:HB3	1:B:126:SER:HB2	1.94	0.49
1:C:57:THR:HG21	1:C:101:ILE:HG13	1.96	0.48
2:H:1:NAG:O3	2:H:2:GAL:O5	2.27	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:110:TYR:HB2	1:B:113:PHE:HB3	1.96	0.47
1:C:48:ASP:OD2	1:C:110:TYR:HE2	1.98	0.47
3:D:368:HOH:O	1:E:83:LYS:HE3	2.14	0.47
1:C:36:ASP:HA	1:C:98:SER:OG	2.16	0.46
1:B:36:ASP:HA	1:B:98:SER:OG	2.15	0.45
1:A:128:CYS:HA	1:A:133:CYS:HA	1.99	0.44
2:H:2:GAL:H62	2:H:2:GAL:C2	2.45	0.43
1:B:137:LYS:HD3	1:B:137:LYS:N	2.34	0.43
1:B:137:LYS:N	1:B:137:LYS:CD	2.83	0.42
1:E:37:GLU:O	1:E:98:SER:HA	2.19	0.42
1:B:128:CYS:HA	1:B:133:CYS:HA	2.01	0.42
1:D:126:SER:HB3	1:D:134:PHE:O	2.20	0.42
2:F:1:NAG:C5	2:F:2:GAL:O5	2.68	0.42
1:E:96:GLY:HA2	3:E:329:HOH:O	2.21	0.41
1:E:79:ALA:N	1:E:80:PRO:CD	2.84	0.40
2:I:2:GAL:O6	2:I:2:GAL:O4	2.25	0.40
1:A:46:GLN:HB2	1:B:81:SER:OG	2.21	0.40

All (1) 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)
3:B:280:HOH:O	3:C:354:HOH:O[3_755]	2.02	0.18

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	112/114 (98%)	109 (97%)	3 (3%)	0	100 100
1	B	112/114 (98%)	107 (96%)	5 (4%)	0	100 100
1	C	112/114 (98%)	105 (94%)	6 (5%)	1 (1%)	14 7

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	112/114 (98%)	108 (96%)	4 (4%)	0	100	100
1	E	112/114 (98%)	108 (96%)	4 (4%)	0	100	100
All	All	560/570 (98%)	537 (96%)	22 (4%)	1 (0%)	43	37

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	131	THR

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	98/98 (100%)	98 (100%)	0	100	100
1	B	98/98 (100%)	98 (100%)	0	100	100
1	C	98/98 (100%)	98 (100%)	0	100	100
1	D	98/98 (100%)	98 (100%)	0	100	100
1	E	98/98 (100%)	98 (100%)	0	100	100
All	All	490/490 (100%)	490 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	B	97	GLN
1	B	132	GLN
1	C	97	GLN
1	D	97	GLN
1	E	29	ASN

5.3.3 RNA

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

15 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	F	1	2	15,15,15	2.11	5 (33%)	21,21,21	3.19	10 (47%)
2	GAL	F	2	2	11,11,12	1.61	2 (18%)	15,15,17	1.42	2 (13%)
2	PKM	F	3	2	23,23,24	2.14	8 (34%)	25,32,35	1.65	5 (20%)
2	NAG	G	1	2	15,15,15	1.94	3 (20%)	21,21,21	2.28	3 (14%)
2	GAL	G	2	2	11,11,12	1.80	4 (36%)	15,15,17	0.85	0
2	PKM	G	3	2	23,23,24	2.23	9 (39%)	25,32,35	2.05	4 (16%)
2	NAG	H	1	2	15,15,15	1.96	3 (20%)	21,21,21	2.97	8 (38%)
2	GAL	H	2	2	11,11,12	1.68	2 (18%)	15,15,17	1.97	5 (33%)
2	PKM	H	3	2	23,23,24	2.21	8 (34%)	25,32,35	1.56	3 (12%)
2	NAG	I	1	2	15,15,15	1.73	3 (20%)	21,21,21	2.70	8 (38%)
2	GAL	I	2	2	11,11,12	1.75	3 (27%)	15,15,17	1.16	1 (6%)
2	PKM	I	3	2	23,23,24	2.24	9 (39%)	25,32,35	1.59	3 (12%)
2	NAG	J	1	2	15,15,15	1.88	3 (20%)	21,21,21	2.57	5 (23%)
2	GAL	J	2	2	11,11,12	1.74	3 (27%)	15,15,17	1.28	1 (6%)
2	PKM	J	3	2	23,23,24	2.09	8 (34%)	25,32,35	1.97	6 (24%)

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	F	1	2	-	5/6/26/26	0/1/1/1
2	GAL	F	2	2	-	2/2/19/22	0/1/1/1
2	PKM	F	3	2	-	0/22/38/42	0/1/1/1
2	NAG	G	1	2	-	4/6/26/26	0/1/1/1
2	GAL	G	2	2	-	1/2/19/22	0/1/1/1
2	PKM	G	3	2	-	2/22/38/42	0/1/1/1
2	NAG	H	1	2	-	5/6/26/26	0/1/1/1
2	GAL	H	2	2	-	1/2/19/22	0/1/1/1
2	PKM	H	3	2	-	1/22/38/42	0/1/1/1
2	NAG	I	1	2	-	4/6/26/26	0/1/1/1
2	GAL	I	2	2	-	2/2/19/22	0/1/1/1
2	PKM	I	3	2	-	0/22/38/42	0/1/1/1
2	NAG	J	1	2	-	4/6/26/26	0/1/1/1
2	GAL	J	2	2	-	1/2/19/22	0/1/1/1
2	PKM	J	3	2	-	2/22/38/42	0/1/1/1

All (73) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	3	PKM	O6-C6	5.49	1.52	1.44
2	G	3	PKM	O6-C6	5.47	1.52	1.44
2	H	3	PKM	O6-C6	5.42	1.52	1.44
2	F	3	PKM	O6-C6	4.97	1.51	1.44
2	J	3	PKM	O6-C6	4.89	1.51	1.44
2	H	1	NAG	C7-N2	4.50	1.48	1.34
2	J	1	NAG	C7-N2	4.37	1.48	1.34
2	G	1	NAG	C7-N2	4.24	1.48	1.34
2	F	1	NAG	C7-N2	4.24	1.48	1.34
2	H	3	PKM	C10-N5	4.23	1.48	1.34
2	I	1	NAG	C7-N2	4.02	1.47	1.34
2	F	3	PKM	C10-N5	3.97	1.47	1.34
2	F	1	NAG	O5-C1	3.97	1.52	1.42
2	I	3	PKM	C10-N5	3.89	1.46	1.34
2	F	3	PKM	C7-C6	-3.84	1.48	1.52
2	G	3	PKM	C10-N5	3.83	1.46	1.34
2	G	1	NAG	O5-C1	3.82	1.52	1.42
2	G	3	PKM	O4-C	3.81	1.43	1.35
2	G	2	GAL	O5-C1	3.79	1.50	1.43
2	J	3	PKM	C10-N5	3.70	1.46	1.34
2	H	3	PKM	O4-C	3.61	1.43	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	3	PKM	O4-C	3.53	1.43	1.35
2	I	3	PKM	O4-C	3.52	1.43	1.35
2	H	1	NAG	C2-N2	3.49	1.51	1.45
2	H	2	GAL	O5-C1	3.49	1.49	1.43
2	I	2	GAL	O5-C1	3.41	1.49	1.43
2	J	1	NAG	O5-C1	3.36	1.51	1.42
2	F	2	GAL	C2-C3	-3.25	1.47	1.52
2	J	2	GAL	O5-C1	3.17	1.49	1.43
2	H	3	PKM	C5-N5	3.14	1.50	1.45
2	I	2	GAL	C2-C3	-3.13	1.47	1.52
2	H	3	PKM	C7-C6	-3.08	1.49	1.52
2	J	1	NAG	C2-N2	3.06	1.50	1.45
2	F	1	NAG	C2-N2	3.02	1.50	1.45
2	I	3	PKM	C7-C6	-3.00	1.49	1.52
2	J	2	GAL	C2-C3	-2.98	1.47	1.52
2	H	2	GAL	O3-C3	2.98	1.50	1.43
2	H	1	NAG	O5-C1	2.95	1.50	1.42
2	G	3	PKM	C7-C6	-2.94	1.49	1.52
2	F	3	PKM	O4-C	2.92	1.41	1.35
2	J	3	PKM	C7-C6	-2.90	1.49	1.52
2	F	2	GAL	O3-C3	2.88	1.50	1.43
2	G	3	PKM	C4-C5	-2.83	1.47	1.52
2	J	3	PKM	C4-C5	-2.81	1.48	1.52
2	I	3	PKM	C4-C5	-2.80	1.48	1.52
2	I	3	PKM	C5-N5	2.80	1.50	1.45
2	G	2	GAL	O3-C3	2.75	1.49	1.43
2	G	3	PKM	C5-N5	2.75	1.50	1.45
2	J	2	GAL	O3-C3	2.72	1.49	1.43
2	G	1	NAG	C2-N2	2.72	1.50	1.45
2	I	1	NAG	O5-C1	2.71	1.49	1.42
2	F	3	PKM	C4-C5	-2.70	1.48	1.52
2	I	1	NAG	C2-N2	2.67	1.50	1.45
2	G	3	PKM	C8-C7	2.63	1.58	1.53
2	I	2	GAL	O3-C3	2.58	1.49	1.43
2	I	3	PKM	O6-C2	2.55	1.48	1.43
2	G	2	GAL	C2-C3	-2.49	1.48	1.52
2	J	3	PKM	C8-C7	2.44	1.57	1.53
2	F	1	NAG	C1-C2	2.43	1.55	1.52
2	I	3	PKM	C8-C7	2.38	1.57	1.53
2	G	3	PKM	O6-C2	2.35	1.48	1.43
2	I	3	PKM	C11-C10	2.32	1.55	1.50
2	J	3	PKM	C5-N5	2.30	1.49	1.45

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	1	NAG	O5-C5	2.29	1.50	1.44
2	F	3	PKM	O6-C2	2.25	1.47	1.43
2	H	3	PKM	C11-C10	2.23	1.55	1.50
2	F	3	PKM	C8-C7	2.21	1.57	1.53
2	F	3	PKM	C11-C10	2.16	1.55	1.50
2	H	3	PKM	C4-C5	-2.15	1.49	1.52
2	H	3	PKM	C8-C7	2.15	1.57	1.53
2	G	2	GAL	O5-C5	2.14	1.47	1.43
2	J	3	PKM	C11-C10	2.04	1.54	1.50
2	G	3	PKM	C11-C10	2.01	1.54	1.50

All (64) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	H	1	NAG	C4-C3-C2	10.16	125.19	110.40
2	J	1	NAG	O5-C1-C2	8.83	118.39	109.52
2	F	1	NAG	O5-C1-C2	8.44	118.00	109.52
2	G	1	NAG	O5-C1-C2	8.15	117.70	109.52
2	F	1	NAG	C1-C2-N2	-7.64	101.87	110.73
2	I	1	NAG	O5-C1-C2	6.07	115.61	109.52
2	I	1	NAG	C4-C3-C2	5.86	118.94	110.40
2	G	3	PKM	C8-C7-C6	-5.03	103.59	113.05
2	I	1	NAG	C1-C2-C3	4.95	117.30	110.54
2	F	1	NAG	C3-C2-N2	4.77	119.40	110.62
2	H	3	PKM	O4-C-CH3	4.60	119.29	111.09
2	H	2	GAL	O5-C5-C6	4.46	116.34	107.66
2	J	3	PKM	C6-C5-N5	-4.40	103.89	110.91
2	G	3	PKM	O4-C-CH3	4.22	118.62	111.09
2	G	1	NAG	C1-C2-N2	-4.18	105.88	110.73
2	I	3	PKM	O4-C-CH3	4.13	118.46	111.09
2	J	1	NAG	C1-C2-N2	-4.00	106.09	110.73
2	G	3	PKM	C6-C5-N5	-3.94	104.62	110.91
2	J	3	PKM	O4-C-CH3	3.87	118.00	111.09
2	F	3	PKM	O4-C-CH3	3.81	117.89	111.09
2	J	3	PKM	C8-C7-C6	-3.73	106.05	113.05
2	I	1	NAG	C3-C2-N2	-3.73	103.75	110.62
2	H	2	GAL	C2-C3-C4	3.72	117.40	110.86
2	H	1	NAG	O3-C3-C2	-3.69	102.25	109.58
2	H	1	NAG	C1-C2-C3	3.60	115.45	110.54
2	F	2	GAL	C1-C2-C3	3.55	114.81	109.64
2	H	1	NAG	C8-C7-N2	3.53	121.97	116.12
2	I	2	GAL	C3-C4-C5	3.53	116.62	110.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	1	NAG	C8-C7-N2	3.44	121.82	116.12
2	J	2	GAL	C1-C2-C3	3.42	114.63	109.64
2	H	1	NAG	O5-C1-C2	3.41	112.95	109.52
2	I	3	PKM	C8-C7-C6	-3.34	106.77	113.05
2	J	1	NAG	C1-C2-C3	3.30	115.05	110.54
2	G	1	NAG	C8-C7-N2	3.17	121.37	116.12
2	I	1	NAG	C3-C4-C5	3.15	115.95	110.23
2	J	1	NAG	C8-C7-N2	3.14	121.32	116.12
2	I	1	NAG	O1-C1-C2	-3.13	102.71	109.22
2	H	3	PKM	C8-C7-C6	-3.10	107.23	113.05
2	F	1	NAG	C1-O5-C5	3.03	119.52	113.65
2	G	3	PKM	O1B-C1-C2	3.00	120.52	112.71
2	F	3	PKM	O1B-C1-C2	2.96	120.42	112.71
2	F	1	NAG	C6-C5-C4	2.96	120.28	113.02
2	F	1	NAG	O4-C4-C5	2.88	116.42	109.32
2	F	3	PKM	C8-C7-C6	-2.87	107.66	113.05
2	I	3	PKM	O1B-C1-C2	2.84	120.10	112.71
2	J	3	PKM	O1B-C1-C2	2.83	120.07	112.71
2	H	2	GAL	O3-C3-C4	-2.70	104.00	110.38
2	H	3	PKM	O1B-C1-C2	2.63	119.56	112.71
2	J	1	NAG	C3-C4-C5	-2.60	105.51	110.23
2	J	3	PKM	C4-C5-N5	-2.54	105.43	110.77
2	H	1	NAG	C1-C2-N2	-2.53	107.80	110.73
2	F	1	NAG	O5-C5-C4	-2.51	105.18	109.70
2	H	2	GAL	C1-O5-C5	2.44	115.46	112.19
2	F	3	PKM	C6-C5-N5	-2.35	107.15	110.91
2	F	3	PKM	C9-C8-C7	-2.32	107.43	112.17
2	I	1	NAG	C6-C5-C4	-2.24	107.52	113.02
2	H	1	NAG	O7-C7-C8	-2.22	118.10	122.05
2	F	1	NAG	C1-C2-C3	-2.21	107.53	110.54
2	H	1	NAG	C6-C5-C4	-2.18	107.67	113.02
2	I	1	NAG	C8-C7-N2	2.13	119.65	116.12
2	F	1	NAG	O7-C7-N2	-2.12	118.23	121.98
2	F	2	GAL	C1-O5-C5	-2.03	109.46	112.19
2	J	3	PKM	C3-C4-C5	2.02	115.12	111.46
2	H	2	GAL	O5-C5-C4	-2.00	105.95	110.83

There are no chirality outliers.

All (34) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	H	1	NAG	C1-C2-N2-C7

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Mol	Chain	Res	Type	Atoms
2	F	1	NAG	C4-C5-C6-O6
2	I	2	GAL	C4-C5-C6-O6
2	F	1	NAG	O5-C5-C6-O6
2	I	2	GAL	O5-C5-C6-O6
2	F	1	NAG	C8-C7-N2-C2
2	F	1	NAG	O7-C7-N2-C2
2	G	1	NAG	C8-C7-N2-C2
2	G	1	NAG	O7-C7-N2-C2
2	H	1	NAG	C8-C7-N2-C2
2	H	1	NAG	O7-C7-N2-C2
2	I	1	NAG	C8-C7-N2-C2
2	I	1	NAG	O7-C7-N2-C2
2	J	1	NAG	C8-C7-N2-C2
2	J	1	NAG	O7-C7-N2-C2
2	H	2	GAL	O5-C5-C6-O6
2	J	1	NAG	C3-C2-N2-C7
2	G	1	NAG	O5-C5-C6-O6
2	I	1	NAG	O5-C5-C6-O6
2	J	3	PKM	C7-C8-C9-O9
2	J	2	GAL	O5-C5-C6-O6
2	G	2	GAL	O5-C5-C6-O6
2	F	2	GAL	C4-C5-C6-O6
2	H	1	NAG	O5-C5-C6-O6
2	J	3	PKM	O8-C8-C9-O9
2	H	3	PKM	O8-C8-C9-O9
2	G	3	PKM	C7-C8-C9-O9
2	H	1	NAG	C3-C2-N2-C7
2	F	1	NAG	C1-C2-N2-C7
2	F	2	GAL	O5-C5-C6-O6
2	G	3	PKM	O8-C8-C9-O9
2	G	1	NAG	C1-C2-N2-C7
2	J	1	NAG	C1-C2-N2-C7
2	I	1	NAG	C4-C5-C6-O6

There are no ring outliers.

6 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	I	2	GAL	1	0
2	F	2	GAL	2	0
2	H	1	NAG	3	0
2	F	1	NAG	2	0

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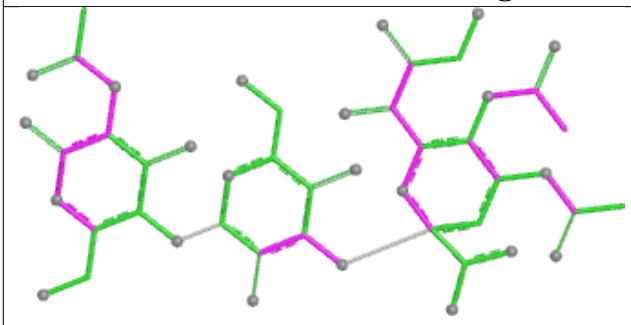
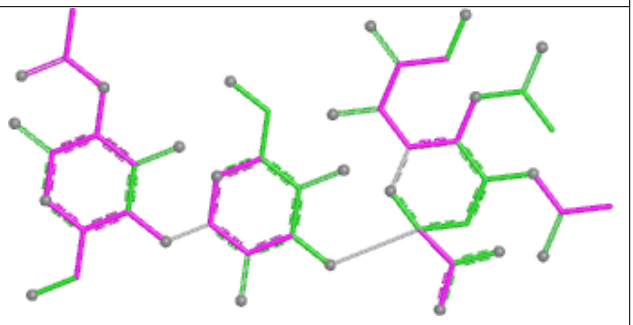
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	2	GAL	6	0
2	J	1	NAG	1	0

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

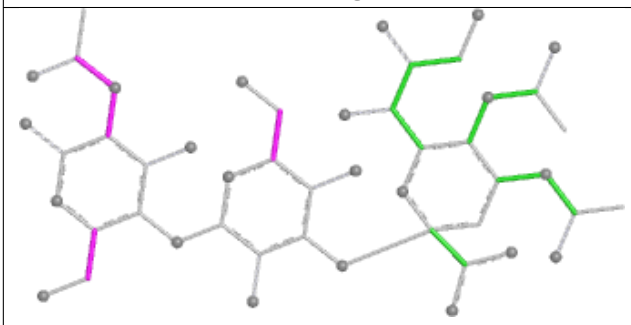
Oligosaccharide Chain F



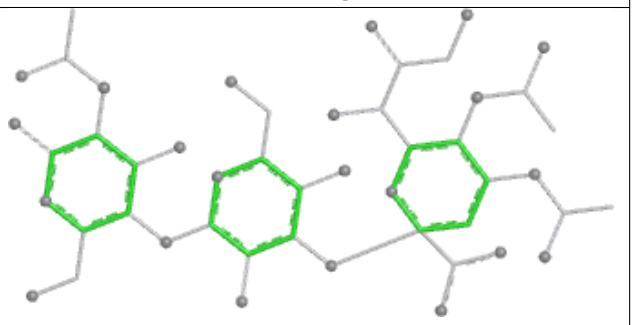
Bond lengths



Bond angles

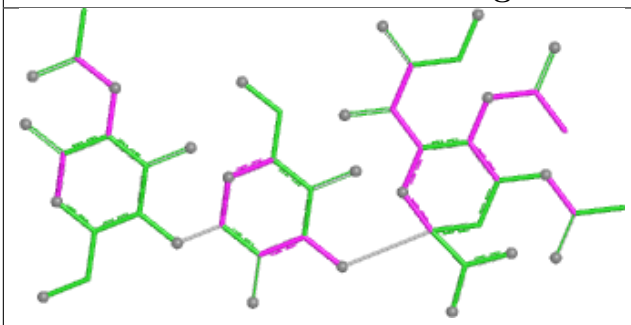


Torsions

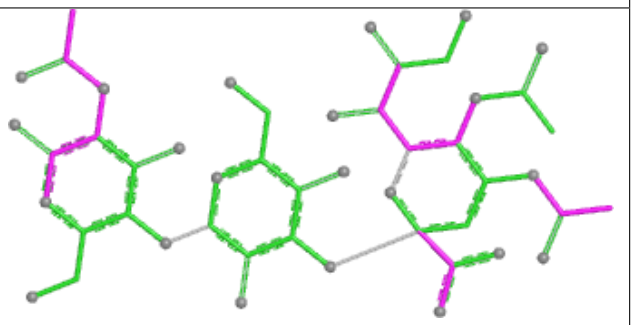


Rings

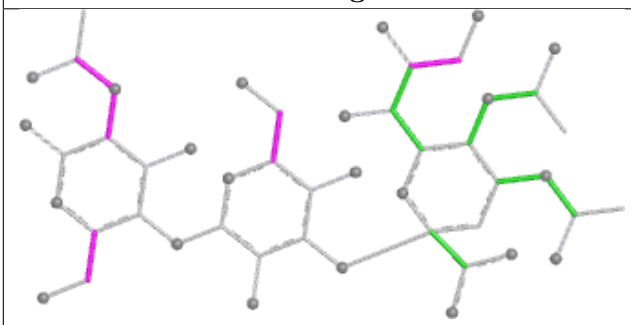
Oligosaccharide Chain G



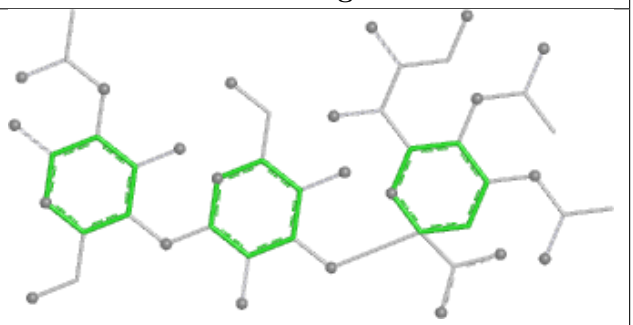
Bond lengths



Bond angles

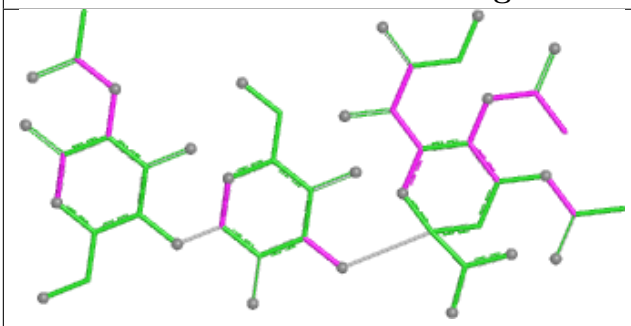


Torsions

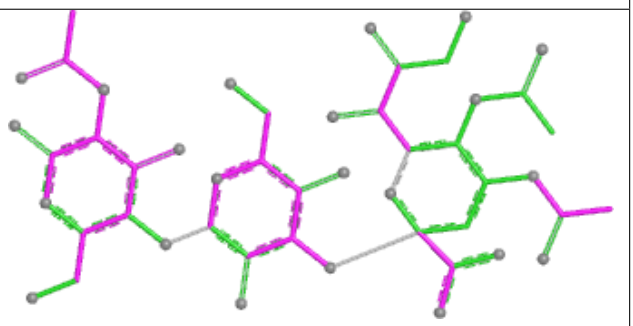


Rings

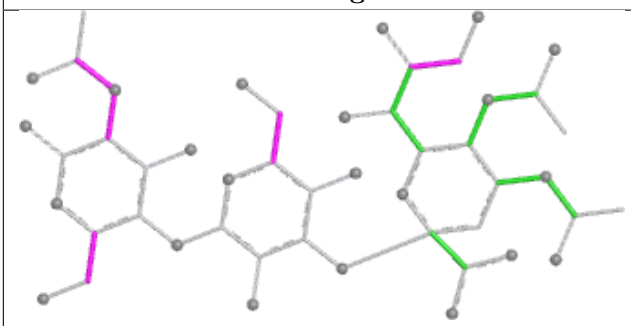
Oligosaccharide Chain H



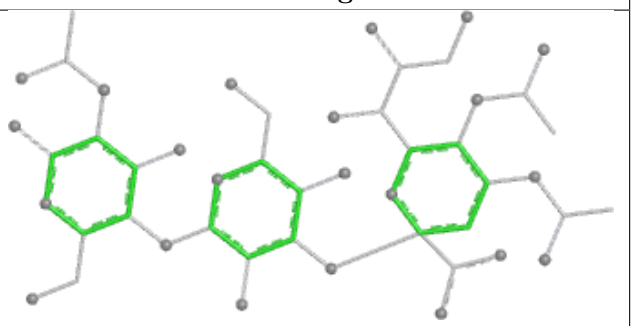
Bond lengths



Bond angles

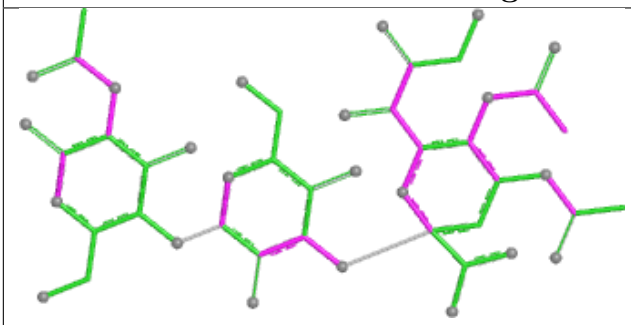


Torsions

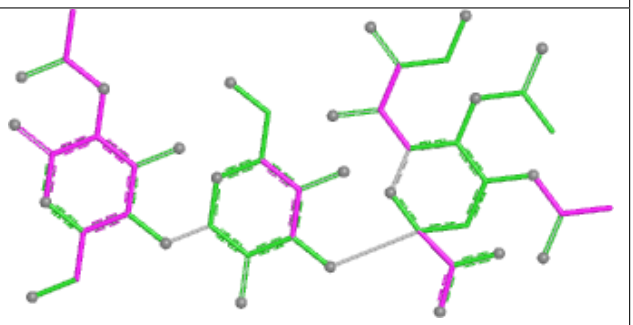


Rings

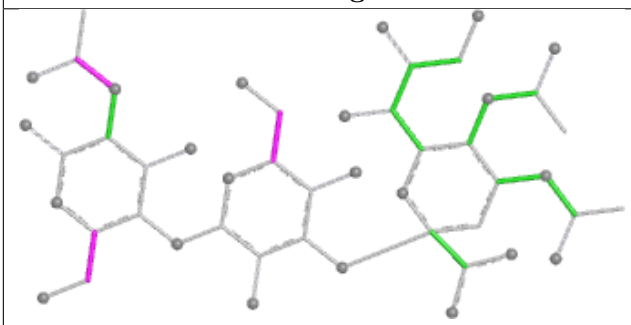
Oligosaccharide Chain I



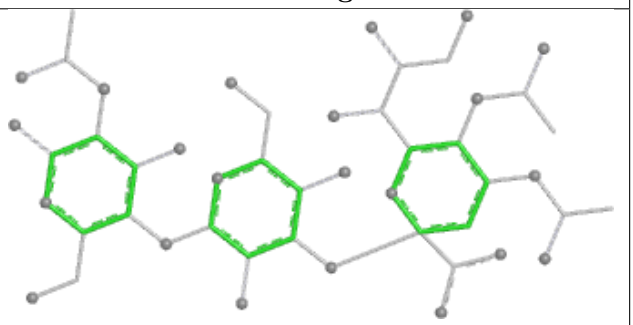
Bond lengths



Bond angles

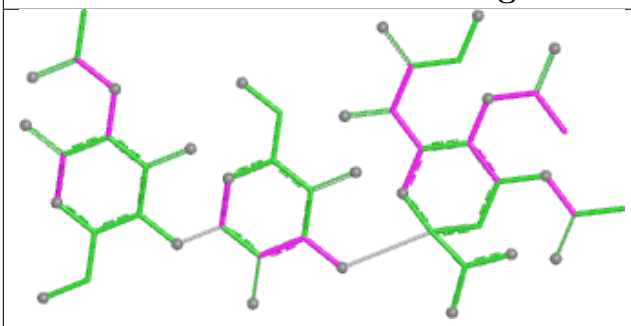


Torsions

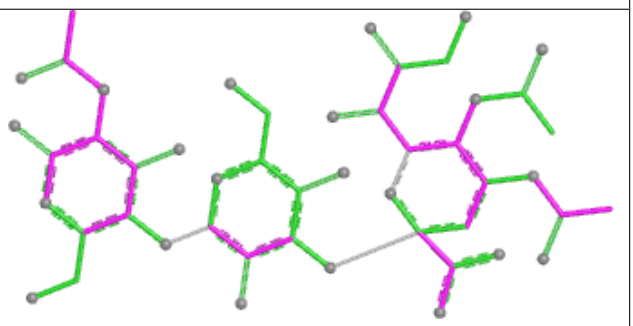


Rings

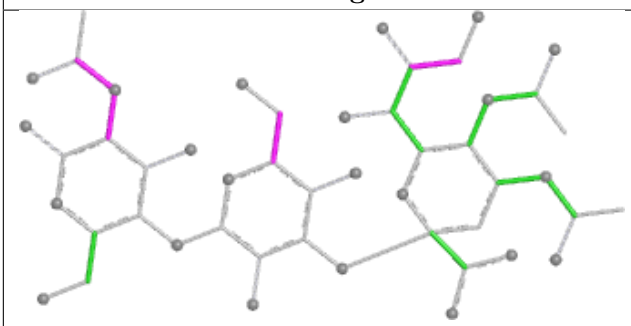
Oligosaccharide Chain J



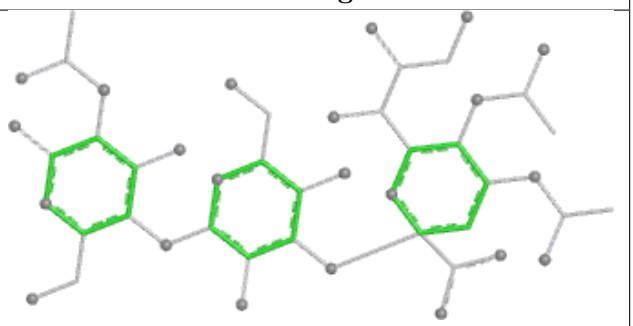
Bond lengths



Bond angles



Torsions



Rings

5.6 Ligand geometry (i)

There are no ligands in this entry.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	114/114 (100%)	-0.65	2 (1%) 67 69	7, 12, 21, 37	0
1	B	114/114 (100%)	-0.50	3 (2%) 57 59	7, 13, 31, 46	0
1	C	114/114 (100%)	-0.28	8 (7%) 22 22	8, 14, 32, 57	0
1	D	114/114 (100%)	-0.50	0 100 100	8, 15, 25, 34	0
1	E	114/114 (100%)	-0.43	1 (0%) 81 83	8, 13, 31, 41	0
All	All	570/570 (100%)	-0.47	14 (2%) 58 60	7, 13, 30, 57	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	130	ALA	11.2
1	C	131	THR	4.1
1	E	29	ASN	3.4
1	C	91	TYR	3.3
1	C	110	TYR	3.2
1	B	110	TYR	2.9
1	A	137	LYS	2.6
1	C	129	SER	2.6
1	B	63	SER	2.6
1	C	29	ASN	2.4
1	C	137	LYS	2.3
1	C	132	GLN	2.2
1	A	131	THR	2.1
1	B	137	LYS	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 (i)

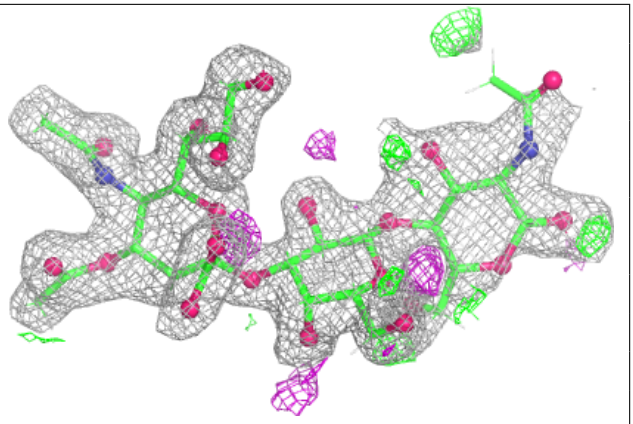
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

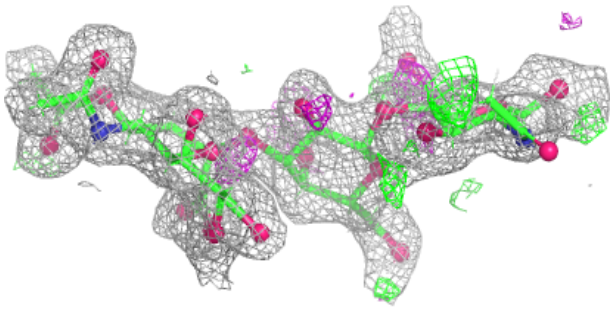
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NAG	H	1	15/15	0.38	0.19	84,104,123,126	0
2	NAG	I	1	15/15	0.45	0.20	69,92,108,114	0
2	NAG	J	1	15/15	0.49	0.17	61,87,105,107	0
2	NAG	G	1	15/15	0.56	0.18	53,73,90,100	0
2	GAL	I	2	11/12	0.65	0.16	42,65,84,86	0
2	NAG	F	1	15/15	0.73	0.17	36,53,69,69	0
2	GAL	H	2	11/12	0.79	0.14	34,64,88,91	0
2	GAL	G	2	11/12	0.87	0.09	26,44,51,53	0
2	GAL	J	2	11/12	0.88	0.10	20,40,48,54	0
2	GAL	F	2	11/12	0.89	0.09	20,32,44,50	0
2	PKM	G	3	23/24	0.91	0.08	20,30,37,45	0
2	PKM	J	3	23/24	0.94	0.08	15,22,32,46	0
2	PKM	I	3	23/24	0.95	0.07	17,24,34,38	0
2	PKM	H	3	23/24	0.95	0.06	17,24,31,32	0
2	PKM	F	3	23/24	0.96	0.06	12,18,26,30	0

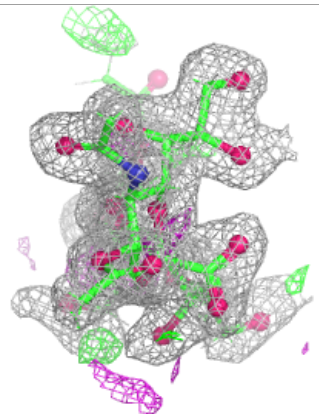
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain F:

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

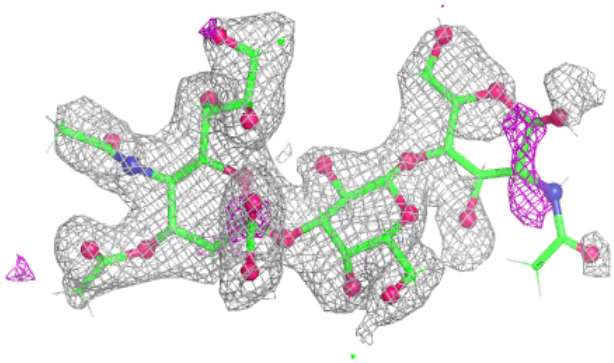


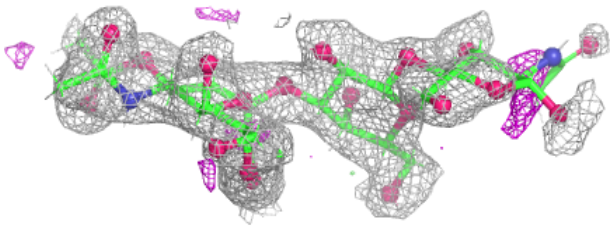


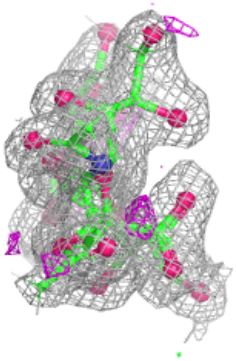


Electron density around Chain G:

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

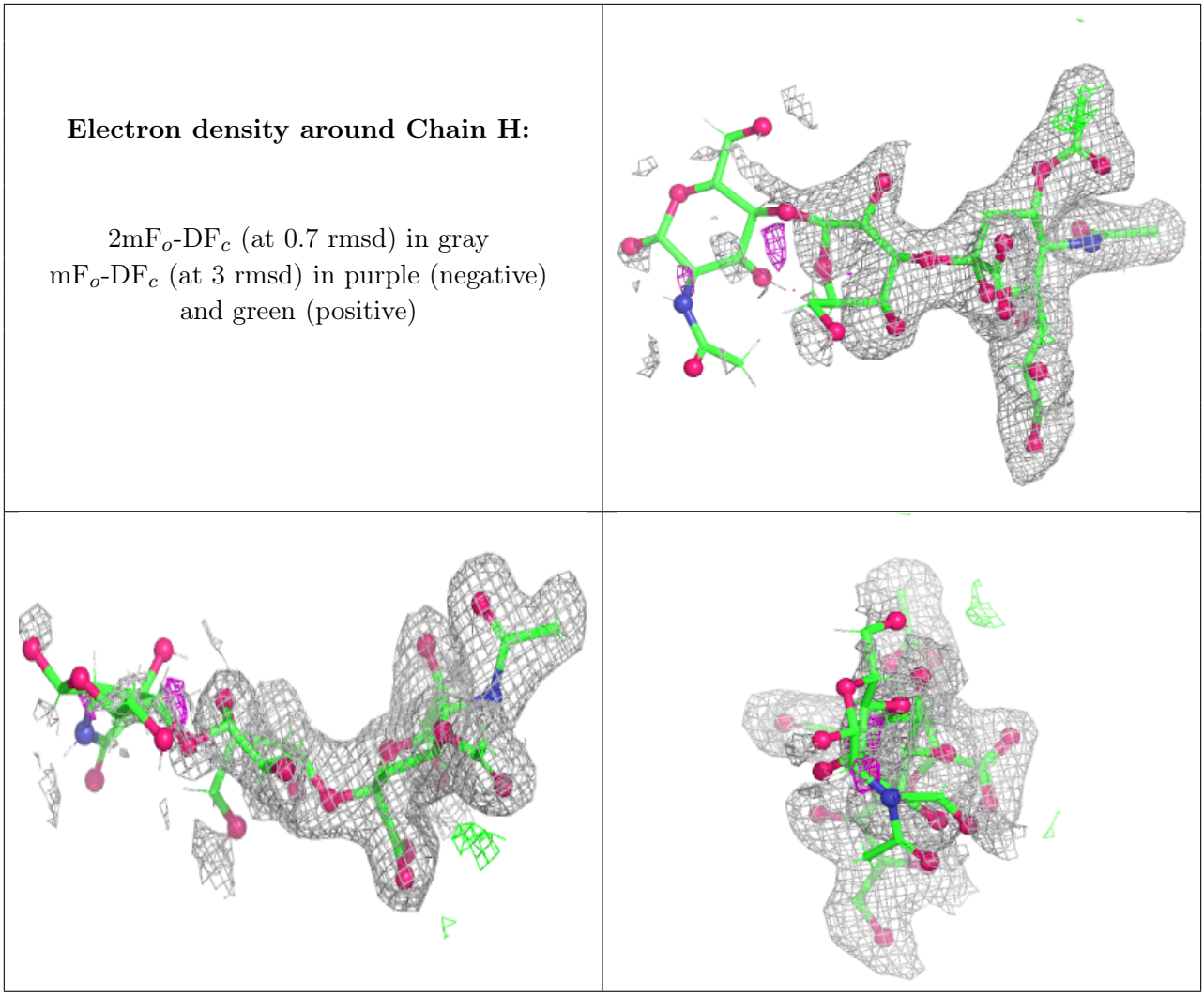






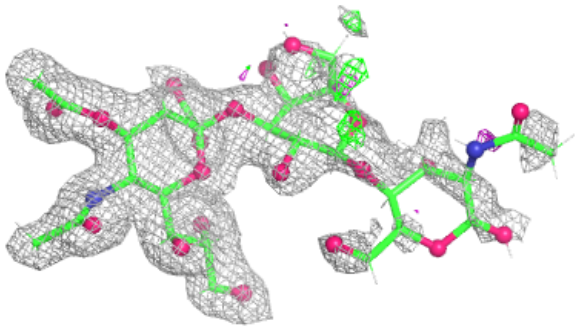
Electron density around Chain H:

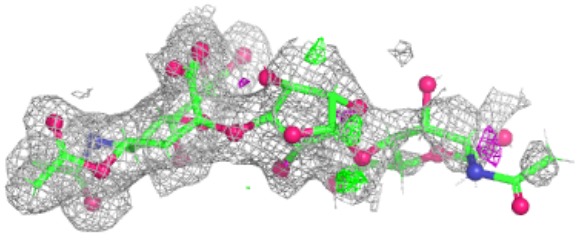
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

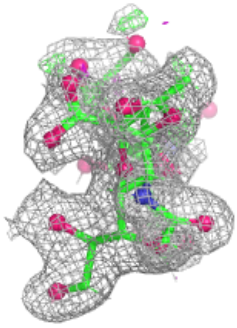


Electron density around Chain I:

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

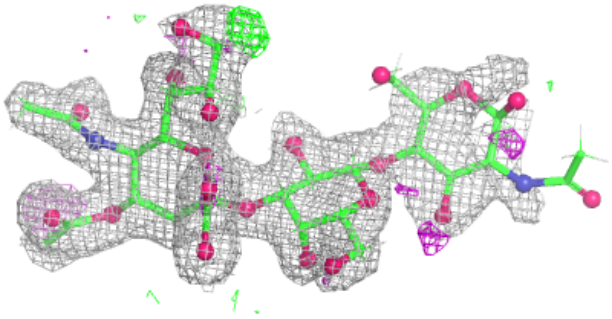


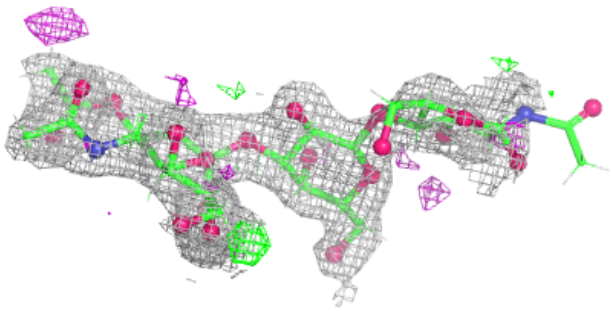


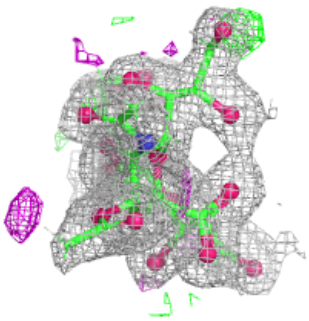


Electron density around Chain J:

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







6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.