



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 31, 2023 – 01:20 PM EDT

PDB ID : 3U14
Title : Structure of D50A-fructofuranosidase from Schwanniomyces occidentalis complexed with inulin
Authors : Sainz-Polo, M.A.; Sanz-Aparicio, J.
Deposited on : 2011-09-29
Resolution : 2.24 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

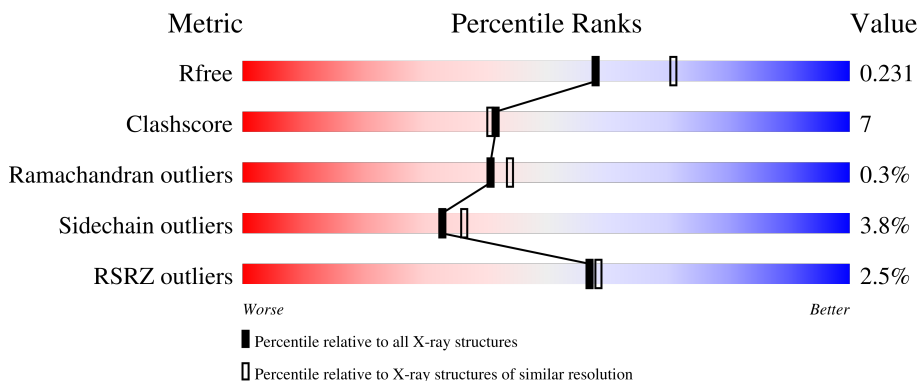
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


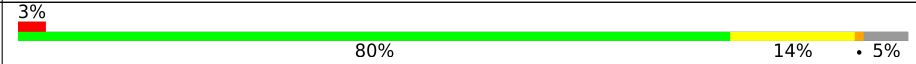


The reported resolution of this entry is 2.24 Å.

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}	130704	2391 (2.26-2.22)
Clashscore	141614	2539 (2.26-2.22)
Ramachandran outliers	138981	2489 (2.26-2.22)
Sidechain outliers	138945	2490 (2.26-2.22)
RSRZ outliers	127900	2353 (2.26-2.22)

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	535	
1	B	535	
2	C	6	
2	D	6	

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	FRU	C	1	X	-	-	-
2	FRU	D	1	X	-	-	X

2 Entry composition [i](#)

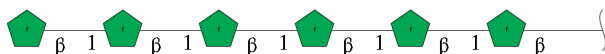
There are 4 unique types of molecules in this entry. The entry contains 9123 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Fructofuranosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	509	4131	2656	677	792	6	0	0	0
1	B	509	4131	2656	677	792	6	0	0	0

- Molecule 2 is an oligosaccharide called beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	C	6	66	36	30	0	0	0
2	D	6	66	36	30	0	0	0

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

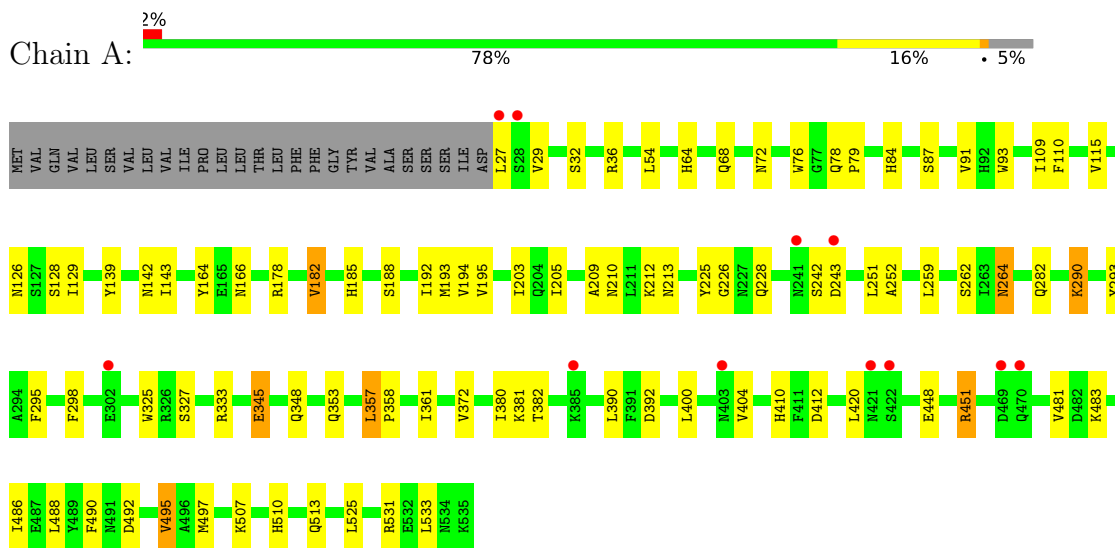
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	298	Total 298	O 298	0	0
4	B	319	Total 319	O 319	0	0

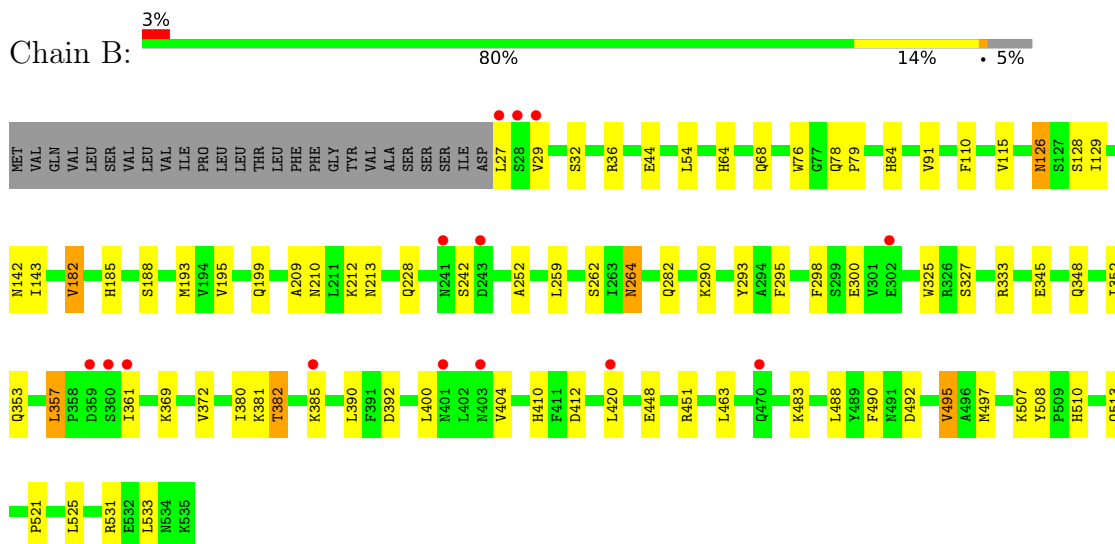
3 Residue-property plots [i](#)

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.

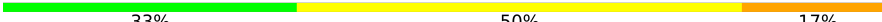
- Molecule 1: Fructofuranosidase



- Molecule 1: Fructofuranosidase



- Molecule 2: beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose

Chain C:  33% 50% 17%



- Molecule 2: beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose-(2-1)-beta-D-fructofuranose

Chain D:  33% 67%



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	66.98Å 107.67Å 96.46Å 90.00° 91.92° 90.00°	Depositor
Resolution (Å)	50.00 – 2.24 35.91 – 2.24	Depositor EDS
% Data completeness (in resolution range)	98.2 (50.00-2.24) 98.2 (35.91-2.24)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	0.14	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.89 (at 2.24Å)	Xtrriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.194 , 0.231 0.194 , 0.231	Depositor DCC
R_{free} test set	3263 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	17.9	Xtrriage
Anisotropy	0.037	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 36.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.040 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	9123	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.48% 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: FRU, 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	0.55	0/4252	0.67	4/5791 (0.1%)
1	B	0.54	0/4252	0.65	1/5791 (0.0%)
All	All	0.55	0/8504	0.66	5/11582 (0.0%)

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 (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	225	TYR	C-N-CA	-6.82	107.98	122.30
1	A	225	TYR	O-C-N	-5.62	113.64	123.20
1	A	226	GLY	N-CA-C	-5.41	99.57	113.10
1	A	225	TYR	CA-C-N	5.26	126.73	116.20
1	B	126	ASN	CB-CA-C	-5.01	100.38	110.40

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	209	ALA	Peptide

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Mol	Chain	Res	Type	Group
1	B	209	ALA	Peptide

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	4131	0	3919	60	0
1	B	4131	0	3918	54	0
2	C	66	0	59	2	0
2	D	66	0	59	1	0
3	A	56	0	52	3	0
3	B	56	0	51	0	0
4	A	298	0	0	7	0
4	B	319	0	0	6	0
All	All	9123	0	8058	116	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 7.

All (116) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:451:ARG:NH1	4:A:740:HOH:O	1.82	1.11
1:A:492:ASP:HB2	4:A:792:HOH:O	1.65	0.94
1:B:210:ASN:HD22	1:B:213:ASN:HD22	1.06	0.93
1:B:210:ASN:ND2	1:B:213:ASN:HD22	1.69	0.90
1:A:210:ASN:HD22	1:A:213:ASN:HD22	1.22	0.88
1:A:357:LEU:HD23	1:A:361:ILE:HD13	1.55	0.87
1:B:488:LEU:HD12	1:B:497:MET:HE2	1.58	0.85
1:B:78:GLN:HE22	1:B:142:ASN:HD22	1.22	0.84
1:B:488:LEU:HD12	1:B:497:MET:CE	2.07	0.84
1:A:210:ASN:ND2	1:A:213:ASN:HD22	1.76	0.84
1:B:357:LEU:HD23	1:B:361:ILE:HD13	1.60	0.82
1:A:78:GLN:HE22	1:A:142:ASN:HD22	1.24	0.82
1:A:488:LEU:HD12	1:A:497:MET:CE	2.10	0.81
1:A:259:LEU:O	1:A:290:LYS:HE3	1.82	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:64:HIS:HD2	1:A:84:HIS:NE2	1.80	0.78
1:B:64:HIS:HD2	1:B:84:HIS:NE2	1.82	0.77
1:B:68:GLN:HE22	1:B:110:PHE:HA	1.49	0.77
1:B:126:ASN:HB2	1:B:129:ILE:HG12	1.67	0.74
1:A:488:LEU:HD12	1:A:497:MET:HE2	1.69	0.74
3:A:1072:NAG:O7	3:A:1072:NAG:H3	1.87	0.74
1:A:490:PHE:HD1	1:A:495:VAL:HG22	1.55	0.70
1:B:210:ASN:HB3	1:B:212:LYS:H	1.57	0.70
1:B:300:GLU:OE2	4:B:847:HOH:O	2.11	0.69
1:A:410:HIS:HD2	1:A:412:ASP:OD1	1.75	0.69
1:B:492:ASP:HB2	4:B:612:HOH:O	1.93	0.69
1:B:490:PHE:HD1	1:B:495:VAL:HG22	1.56	0.68
1:B:78:GLN:NE2	1:B:142:ASN:HD22	1.92	0.67
1:B:282:GLN:HE22	1:B:348:GLN:HE21	1.42	0.67
1:B:410:HIS:HD2	1:B:412:ASP:OD1	1.78	0.66
1:B:210:ASN:ND2	1:B:213:ASN:ND2	2.42	0.66
1:A:210:ASN:HB3	1:A:212:LYS:H	1.62	0.64
1:B:282:GLN:HE22	1:B:348:GLN:NE2	1.96	0.62
1:A:126:ASN:HB2	1:A:129:ILE:HG12	1.81	0.62
1:A:252:ALA:HB1	1:A:293:TYR:CE1	2.35	0.61
1:A:68:GLN:HE22	1:A:110:PHE:HA	1.66	0.60
1:B:126:ASN:HB3	1:B:128:SER:H	1.66	0.60
1:B:259:LEU:O	1:B:290:LYS:HE3	2.03	0.58
1:B:262:SER:HB2	1:B:293:TYR:CD1	2.38	0.58
1:A:64:HIS:CD2	1:A:84:HIS:NE2	2.68	0.57
1:A:345:GLU:HB2	1:B:199:GLN:HE21	1.70	0.57
1:A:282:GLN:HE22	1:A:348:GLN:NE2	2.03	0.56
1:A:264:ASN:ND2	1:A:295:PHE:H	2.04	0.56
1:B:64:HIS:CD2	1:B:84:HIS:NE2	2.70	0.56
1:A:228:GLN:NE2	4:A:671:HOH:O	2.23	0.56
1:A:262:SER:HB2	1:A:293:TYR:CD1	2.41	0.56
1:A:282:GLN:HE22	1:A:348:GLN:HE21	1.54	0.55
1:A:488:LEU:HD12	1:A:497:MET:HE3	1.86	0.55
1:A:451:ARG:CZ	4:A:740:HOH:O	2.41	0.54
1:B:185:HIS:HD2	1:B:188:SER:OG	1.90	0.54
1:B:252:ALA:HB1	1:B:293:TYR:CE1	2.42	0.54
1:B:410:HIS:CD2	1:B:412:ASP:OD1	2.61	0.53
1:A:392:ASP:OD1	1:A:531:ARG:HD3	2.09	0.52
1:B:392:ASP:OD1	1:B:531:ARG:HD3	2.10	0.52
1:B:78:GLN:HE22	1:B:142:ASN:ND2	2.01	0.51
1:A:210:ASN:ND2	1:A:213:ASN:ND2	2.52	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:264:ASN:HD21	1:A:295:PHE:H	1.56	0.51
1:B:91:VAL:HG11	1:B:361:ILE:HD11	1.93	0.51
1:B:420:LEU:HB2	1:B:507:LYS:HE3	1.92	0.51
1:B:264:ASN:HD21	1:B:295:PHE:H	1.60	0.50
1:A:91:VAL:HG11	1:A:361:ILE:HD11	1.93	0.50
1:A:410:HIS:CD2	1:A:412:ASP:OD1	2.60	0.49
1:B:68:GLN:NE2	1:B:110:PHE:HA	2.24	0.49
1:B:210:ASN:HD22	1:B:213:ASN:ND2	1.90	0.49
1:A:193:MET:HE2	1:A:195:VAL:CG1	2.42	0.49
1:A:78:GLN:NE2	1:A:142:ASN:HD22	2.02	0.49
1:B:382:THR:HG22	4:B:786:HOH:O	2.14	0.48
1:A:372:VAL:HG22	1:A:525:LEU:HB2	1.96	0.48
1:A:72:ASN:OD1	3:A:1072:NAG:H2	2.14	0.47
1:B:54:LEU:HB3	1:B:298:PHE:CD2	2.49	0.47
1:A:126:ASN:ND2	4:A:562:HOH:O	2.48	0.47
2:C:5:FRU:H11	2:C:6:FRU:H12	1.68	0.47
1:A:32:SER:HA	1:A:36:ARG:HB2	1.97	0.47
1:A:185:HIS:HE1	4:A:748:HOH:O	1.98	0.46
1:A:126:ASN:HB3	1:A:128:SER:H	1.80	0.46
1:A:358:PRO:HD2	1:A:361:ILE:HD12	1.98	0.46
1:B:264:ASN:ND2	1:B:295:PHE:H	2.14	0.46
1:B:488:LEU:HD12	1:B:497:MET:HE3	1.93	0.46
1:A:193:MET:CE	1:A:195:VAL:HG11	2.46	0.46
1:B:115:VAL:HG11	1:B:182:VAL:HG22	1.97	0.46
1:B:76:TRP:HE1	2:D:6:FRU:HO6	1.64	0.45
1:B:463:LEU:HD21	1:B:495:VAL:HG13	1.98	0.45
1:B:78:GLN:HA	1:B:79:PRO:C	2.37	0.45
1:A:333:ARG:HH11	1:A:353:GLN:NE2	2.15	0.45
1:A:420:LEU:HB2	1:A:507:LYS:HE3	1.99	0.45
1:B:44:GLU:HG2	4:B:837:HOH:O	2.18	0.44
1:A:115:VAL:HG11	1:A:182:VAL:HG22	2.00	0.44
1:A:78:GLN:HA	1:A:79:PRO:C	2.38	0.44
1:A:510:HIS:HB3	4:A:729:HOH:O	2.18	0.44
1:B:228:GLN:NE2	4:B:672:HOH:O	2.27	0.43
1:B:369:LYS:HD2	1:B:380:ILE:HD12	2.01	0.43
1:A:486:ILE:HD11	1:A:488:LEU:HD21	2.01	0.43
3:A:1072:NAG:O7	3:A:1072:NAG:C3	2.61	0.43
1:A:54:LEU:HB3	1:A:298:PHE:CD2	2.54	0.43
1:A:182:VAL:HA	1:A:192:ILE:O	2.19	0.43
1:A:194:VAL:HG12	1:A:205:ILE:HG12	1.99	0.43
1:B:372:VAL:HG22	1:B:525:LEU:HB2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:390:LEU:HG	1:A:533:LEU:HB2	2.01	0.42
1:B:381:LYS:HG2	1:B:513:GLN:HG2	2.00	0.42
1:A:76:TRP:HE1	2:C:6:FRU:HO6	1.67	0.42
1:B:382:THR:CG2	4:B:786:HOH:O	2.67	0.42
1:A:87:SER:HB2	1:A:93:TRP:CE3	2.55	0.42
1:B:32:SER:HA	1:B:36:ARG:HB2	2.02	0.42
1:B:390:LEU:HG	1:B:533:LEU:HB2	2.02	0.42
1:A:178:ARG:HH22	1:A:228:GLN:NE2	2.17	0.42
1:B:372:VAL:HG21	1:B:380:ILE:HD11	2.02	0.42
1:A:381:LYS:HG2	1:A:513:GLN:HG2	2.01	0.41
1:B:508:TYR:O	1:B:510:HIS:HD2	2.03	0.41
1:B:193:MET:HE3	1:B:195:VAL:CG1	2.50	0.41
1:A:185:HIS:HD2	1:A:188:SER:OG	2.03	0.41
1:A:164:TYR:CE2	1:A:166:ASN:HB2	2.55	0.41
1:A:36:ARG:O	1:A:483:LYS:HD3	2.21	0.41
1:A:372:VAL:HG21	1:A:380:ILE:HD11	2.01	0.41
1:B:333:ARG:HH11	1:B:353:GLN:NE2	2.19	0.40
1:A:109:ILE:HG23	1:A:139:TYR:CD1	2.56	0.40
1:A:203:ILE:HD11	1:A:251:LEU:HD13	2.03	0.40
1:B:36:ARG:O	1:B:483:LYS:HD3	2.21	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	507/535 (95%)	477 (94%)	29 (6%)	1 (0%)	47	53
1	B	507/535 (95%)	475 (94%)	30 (6%)	2 (0%)	34	35
All	All	1014/1070 (95%)	952 (94%)	59 (6%)	3 (0%)	41	44

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	327	SER
1	B	327	SER
1	B	521	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	460/484 (95%)	442 (96%)	18 (4%)	32	35
1	B	460/484 (95%)	443 (96%)	17 (4%)	34	38
All	All	920/968 (95%)	885 (96%)	35 (4%)	33	36

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	27	LEU
1	A	29	VAL
1	A	143	ILE
1	A	182	VAL
1	A	242	SER
1	A	243	ASP
1	A	264	ASN
1	A	290	LYS
1	A	325	TRP
1	A	345	GLU
1	A	357	LEU
1	A	382	THR
1	A	400	LEU
1	A	404	VAL
1	A	448	GLU
1	A	451	ARG
1	A	481	VAL
1	A	495	VAL
1	B	27	LEU
1	B	29	VAL
1	B	143	ILE

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Mol	Chain	Res	Type
1	B	182	VAL
1	B	242	SER
1	B	264	ASN
1	B	325	TRP
1	B	345	GLU
1	B	352	ILE
1	B	357	LEU
1	B	382	THR
1	B	385	LYS
1	B	400	LEU
1	B	404	VAL
1	B	448	GLU
1	B	451	ARG
1	B	495	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (34) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	52	ASN
1	A	64	HIS
1	A	68	GLN
1	A	78	GLN
1	A	126	ASN
1	A	185	HIS
1	A	199	GLN
1	A	210	ASN
1	A	264	ASN
1	A	296	GLN
1	A	348	GLN
1	A	353	GLN
1	A	362	ASN
1	A	410	HIS
1	A	513	GLN
1	B	52	ASN
1	B	64	HIS
1	B	68	GLN
1	B	78	GLN
1	B	118	HIS
1	B	133	GLN
1	B	185	HIS
1	B	199	GLN
1	B	213	ASN

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Mol	Chain	Res	Type
1	B	227	ASN
1	B	264	ASN
1	B	296	GLN
1	B	348	GLN
1	B	353	GLN
1	B	362	ASN
1	B	401	ASN
1	B	410	HIS
1	B	421	ASN
1	B	513	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](#)

12 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	FRU	C	1	2	11,11,12	2.91	2 (18%)	15,15,18	5.29	5 (33%)
2	FRU	C	2	2	11,11,12	0.40	0	15,15,18	0.69	0
2	FRU	C	3	2	11,11,12	0.29	0	15,15,18	0.76	0
2	FRU	C	4	2	11,11,12	0.46	0	15,15,18	1.27	1 (6%)
2	FRU	C	5	2	11,11,12	0.29	0	15,15,18	0.77	0
2	FRU	C	6	2	11,11,12	0.38	0	15,15,18	0.93	1 (6%)
2	FRU	D	1	2	11,11,12	2.76	2 (18%)	15,15,18	5.42	5 (33%)
2	FRU	D	2	2	11,11,12	0.31	0	15,15,18	0.78	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	FRU	D	3	2	11,11,12	0.38	0	15,15,18	0.68	0
2	FRU	D	4	2	11,11,12	0.42	0	15,15,18	1.32	1 (6%)
2	FRU	D	5	2	11,11,12	0.34	0	15,15,18	0.95	1 (6%)
2	FRU	D	6	2	11,11,12	0.31	0	15,15,18	0.80	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	FRU	C	1	2	1/1/4/4	1/4/20/24	0/1/1/1
2	FRU	C	2	2	-	2/4/20/24	0/1/1/1
2	FRU	C	3	2	-	0/4/20/24	0/1/1/1
2	FRU	C	4	2	-	0/4/20/24	0/1/1/1
2	FRU	C	5	2	-	2/4/20/24	0/1/1/1
2	FRU	C	6	2	-	2/4/20/24	0/1/1/1
2	FRU	D	1	2	1/1/4/4	3/4/20/24	0/1/1/1
2	FRU	D	2	2	-	2/4/20/24	0/1/1/1
2	FRU	D	3	2	-	0/4/20/24	0/1/1/1
2	FRU	D	4	2	-	2/4/20/24	0/1/1/1
2	FRU	D	5	2	-	4/4/20/24	0/1/1/1
2	FRU	D	6	2	-	0/4/20/24	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	FRU	C1-C2	-8.06	1.24	1.51
2	D	1	FRU	C1-C2	-7.70	1.26	1.51
2	C	1	FRU	O1-C1	-4.92	1.21	1.42
2	D	1	FRU	O1-C1	-4.59	1.23	1.42

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	FRU	O1-C1-C2	18.83	175.90	111.29
2	C	1	FRU	O1-C1-C2	18.13	173.48	111.29
2	C	1	FRU	O5-C2-C1	6.31	122.86	109.21
2	D	1	FRU	O5-C2-C1	6.24	122.71	109.21
2	C	1	FRU	O5-C2-C3	5.22	115.45	105.11

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	FRU	O5-C2-C3	4.79	114.59	105.11
2	D	1	FRU	C1-C2-C3	3.15	122.68	115.09
2	C	1	FRU	C3-C4-C5	2.94	108.36	102.64
2	D	4	FRU	C6-C5-C4	-2.91	108.07	115.09
2	C	1	FRU	C1-C2-C3	2.70	121.59	115.09
2	D	1	FRU	C3-C4-C5	2.65	107.79	102.64
2	C	4	FRU	C6-C5-C4	-2.39	109.32	115.09
2	D	5	FRU	C6-C5-C4	-2.24	109.69	115.09
2	C	6	FRU	O5-C2-C1	2.11	113.76	109.21

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	C	1	FRU	C2
2	D	1	FRU	C2

All (18) torsion outliers are listed below:

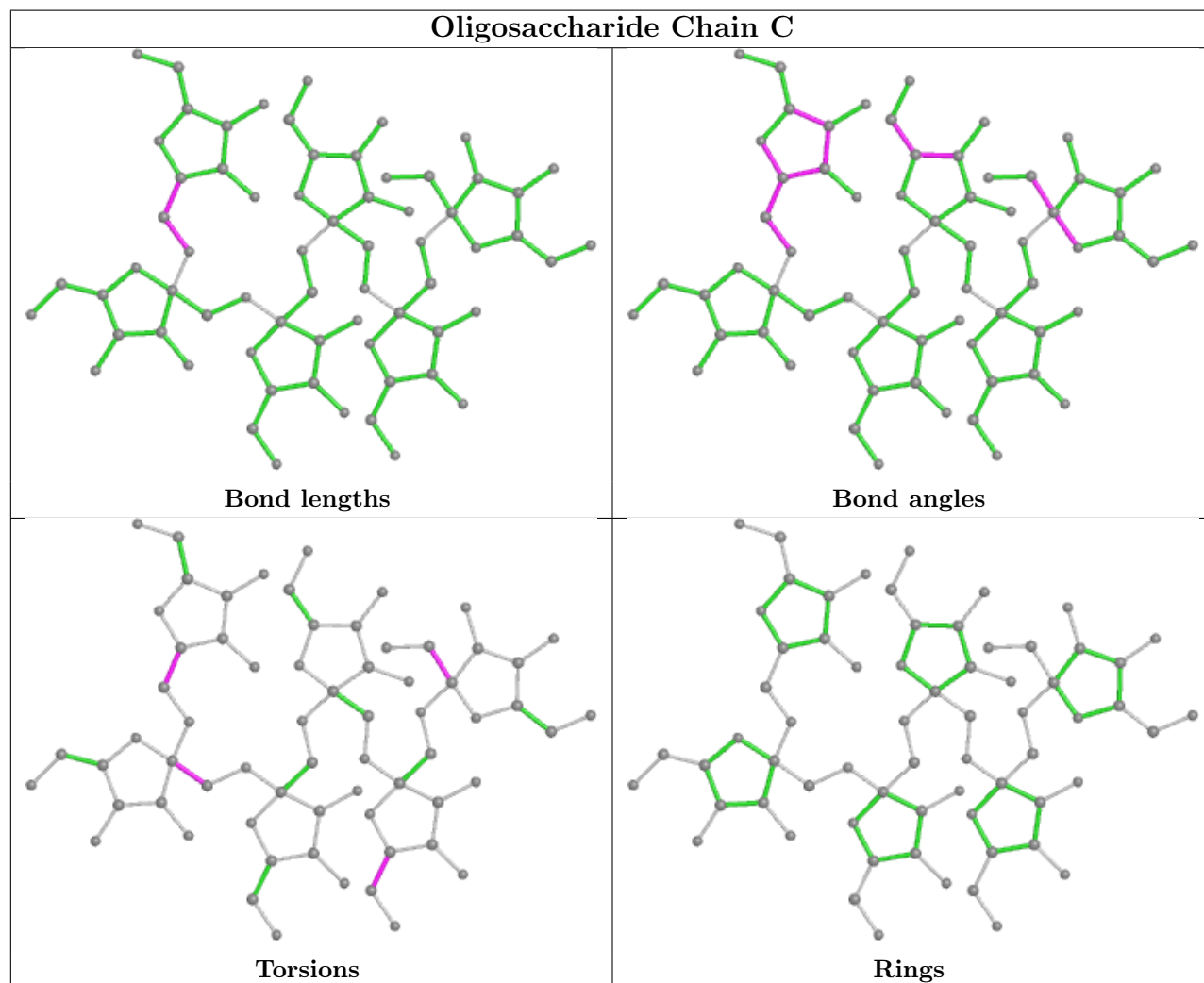
Mol	Chain	Res	Type	Atoms
2	D	1	FRU	O5-C5-C6-O6
2	D	2	FRU	O5-C5-C6-O6
2	C	1	FRU	O1-C1-C2-C3
2	D	1	FRU	O1-C1-C2-C3
2	D	1	FRU	C4-C5-C6-O6
2	D	2	FRU	C4-C5-C6-O6
2	C	5	FRU	O5-C5-C6-O6
2	D	5	FRU	O5-C5-C6-O6
2	D	5	FRU	C4-C5-C6-O6
2	C	5	FRU	C4-C5-C6-O6
2	C	6	FRU	O1-C1-C2-O5
2	D	4	FRU	C4-C5-C6-O6
2	C	6	FRU	O1-C1-C2-C3
2	D	5	FRU	O1-C1-C2-C3
2	D	5	FRU	O1-C1-C2-O5
2	C	2	FRU	O1-C1-C2-O5
2	C	2	FRU	O1-C1-C2-C3
2	D	4	FRU	O5-C5-C6-O6

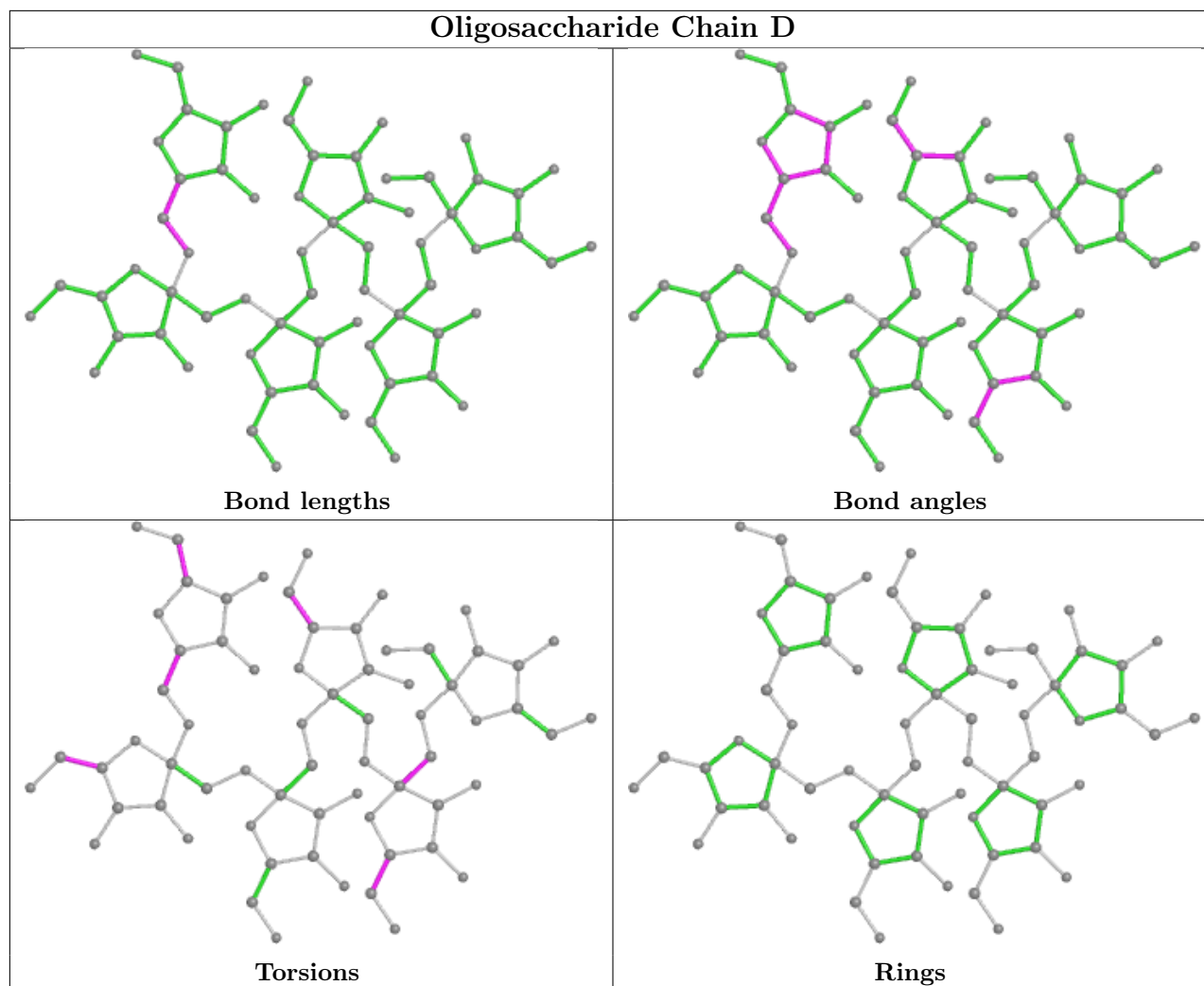
There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	5	FRU	1	0
2	D	6	FRU	1	0
2	C	6	FRU	2	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](#)

8 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	NAG	A	1219	1	14,14,15	0.58	0	17,19,21	1.62	2 (11%)
3	NAG	B	1126	1	14,14,15	1.80	6 (42%)	17,19,21	2.07	4 (23%)
3	NAG	B	1219	1	14,14,15	1.74	2 (14%)	17,19,21	2.78	6 (35%)
3	NAG	A	1072	1	14,14,15	0.57	0	17,19,21	0.67	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	A	1334	1	14,14,15	1.85	1 (7%)	17,19,21	2.63	7 (41%)
3	NAG	B	1334	1	14,14,15	1.90	1 (7%)	17,19,21	2.07	4 (23%)
3	NAG	B	1394	1	14,14,15	0.79	1 (7%)	17,19,21	1.70	5 (29%)
3	NAG	A	1394	1	14,14,15	0.79	1 (7%)	17,19,21	2.87	3 (17%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	A	1219	1	-	2/6/23/26	0/1/1/1
3	NAG	B	1126	1	-	1/6/23/26	0/1/1/1
3	NAG	B	1219	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1072	1	-	3/6/23/26	0/1/1/1
3	NAG	A	1334	1	-	2/6/23/26	0/1/1/1
3	NAG	B	1334	1	-	2/6/23/26	0/1/1/1
3	NAG	B	1394	1	-	1/6/23/26	0/1/1/1
3	NAG	A	1394	1	-	2/6/23/26	0/1/1/1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1334	NAG	O5-C1	-6.87	1.32	1.43
3	A	1334	NAG	O5-C1	-6.42	1.33	1.43
3	B	1219	NAG	O5-C1	-5.36	1.35	1.43
3	B	1219	NAG	C1-C2	3.28	1.57	1.52
3	B	1126	NAG	O5-C1	-3.05	1.38	1.43
3	B	1126	NAG	C2-N2	-2.58	1.41	1.46
3	A	1394	NAG	C1-C2	2.57	1.56	1.52
3	B	1126	NAG	O7-C7	-2.44	1.17	1.23
3	B	1394	NAG	C1-C2	2.33	1.55	1.52
3	B	1126	NAG	O4-C4	-2.21	1.37	1.43
3	B	1126	NAG	C1-C2	2.16	1.55	1.52
3	B	1126	NAG	C7-N2	-2.05	1.27	1.34

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1394	NAG	C1-O5-C5	10.00	125.75	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1219	NAG	O5-C1-C2	-7.36	99.67	111.29
3	A	1334	NAG	C1-O5-C5	-6.68	103.15	112.19
3	B	1126	NAG	O5-C5-C6	6.29	117.06	107.20
3	B	1219	NAG	O5-C5-C6	5.74	116.20	107.20
3	B	1334	NAG	C1-O5-C5	-5.52	104.71	112.19
3	A	1219	NAG	C1-O5-C5	5.11	119.11	112.19
3	A	1334	NAG	O5-C5-C6	4.77	114.69	107.20
3	A	1334	NAG	C2-N2-C7	-4.27	116.83	122.90
3	A	1394	NAG	O5-C5-C6	3.59	112.83	107.20
3	B	1126	NAG	O3-C3-C2	3.53	116.78	109.47
3	A	1394	NAG	C1-C2-N2	3.30	116.12	110.49
3	B	1394	NAG	C3-C4-C5	-3.26	104.42	110.24
3	B	1219	NAG	C1-C2-N2	3.24	116.02	110.49
3	B	1334	NAG	C4-C3-C2	-3.18	106.36	111.02
3	B	1334	NAG	C2-N2-C7	-2.92	118.74	122.90
3	B	1394	NAG	O5-C5-C6	2.91	111.77	107.20
3	B	1126	NAG	O5-C1-C2	-2.88	106.74	111.29
3	B	1219	NAG	C1-O5-C5	-2.76	108.45	112.19
3	B	1394	NAG	C2-N2-C7	2.65	126.67	122.90
3	B	1219	NAG	C3-C4-C5	-2.33	106.09	110.24
3	A	1334	NAG	C4-C3-C2	-2.31	107.64	111.02
3	B	1219	NAG	O3-C3-C2	2.29	114.20	109.47
3	A	1334	NAG	C3-C4-C5	2.28	114.30	110.24
3	A	1334	NAG	O5-C5-C4	2.25	116.31	110.83
3	B	1394	NAG	C1-O5-C5	2.24	115.22	112.19
3	B	1126	NAG	C1-C2-N2	-2.17	106.78	110.49
3	B	1394	NAG	C4-C3-C2	2.16	114.18	111.02
3	A	1219	NAG	O5-C1-C2	2.14	114.67	111.29
3	A	1334	NAG	O4-C4-C3	-2.06	105.58	110.35
3	B	1334	NAG	O3-C3-C2	2.03	113.67	109.47

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1072	NAG	C3-C2-N2-C7
3	A	1334	NAG	O5-C5-C6-O6
3	A	1219	NAG	C4-C5-C6-O6
3	B	1334	NAG	O5-C5-C6-O6
3	A	1219	NAG	O5-C5-C6-O6
3	B	1334	NAG	C4-C5-C6-O6
3	A	1334	NAG	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
3	A	1394	NAG	O5-C5-C6-O6
3	A	1394	NAG	C4-C5-C6-O6
3	A	1072	NAG	C4-C5-C6-O6
3	A	1072	NAG	O5-C5-C6-O6
3	B	1394	NAG	C4-C5-C6-O6
3	B	1126	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1072	NAG	3	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	509/535 (95%)	-0.29	11 (2%) 62 63	6, 14, 31, 46	0
1	B	509/535 (95%)	-0.31	14 (2%) 53 53	6, 14, 31, 46	0
All	All	1018/1070 (95%)	-0.30	25 (2%) 57 58	6, 14, 31, 46	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	27	LEU	6.9
1	B	27	LEU	5.8
1	A	422	SER	5.5
1	A	421	ASN	4.2
1	A	470	GLN	3.8
1	B	243	ASP	3.7
1	A	302	GLU	3.4
1	B	470	GLN	3.3
1	B	360	SER	3.2
1	A	385	LYS	3.2
1	B	359	ASP	3.1
1	B	401	ASN	2.9
1	B	29	VAL	2.8
1	A	243	ASP	2.8
1	B	385	LYS	2.8
1	B	28	SER	2.7
1	B	241	ASN	2.3
1	B	361	ILE	2.2
1	A	241	ASN	2.2
1	A	469	ASP	2.2
1	B	302	GLU	2.2
1	B	420	LEU	2.1
1	A	403	ASN	2.1
1	A	28	SER	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	403	ASN	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](#)

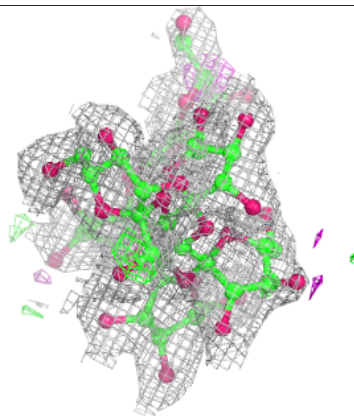
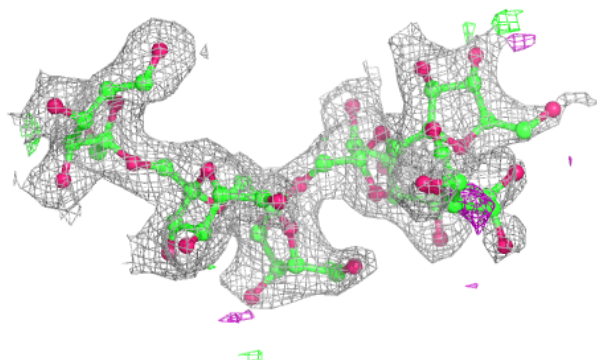
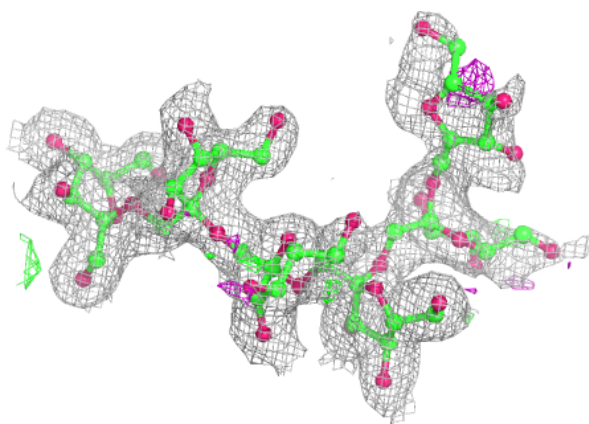
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

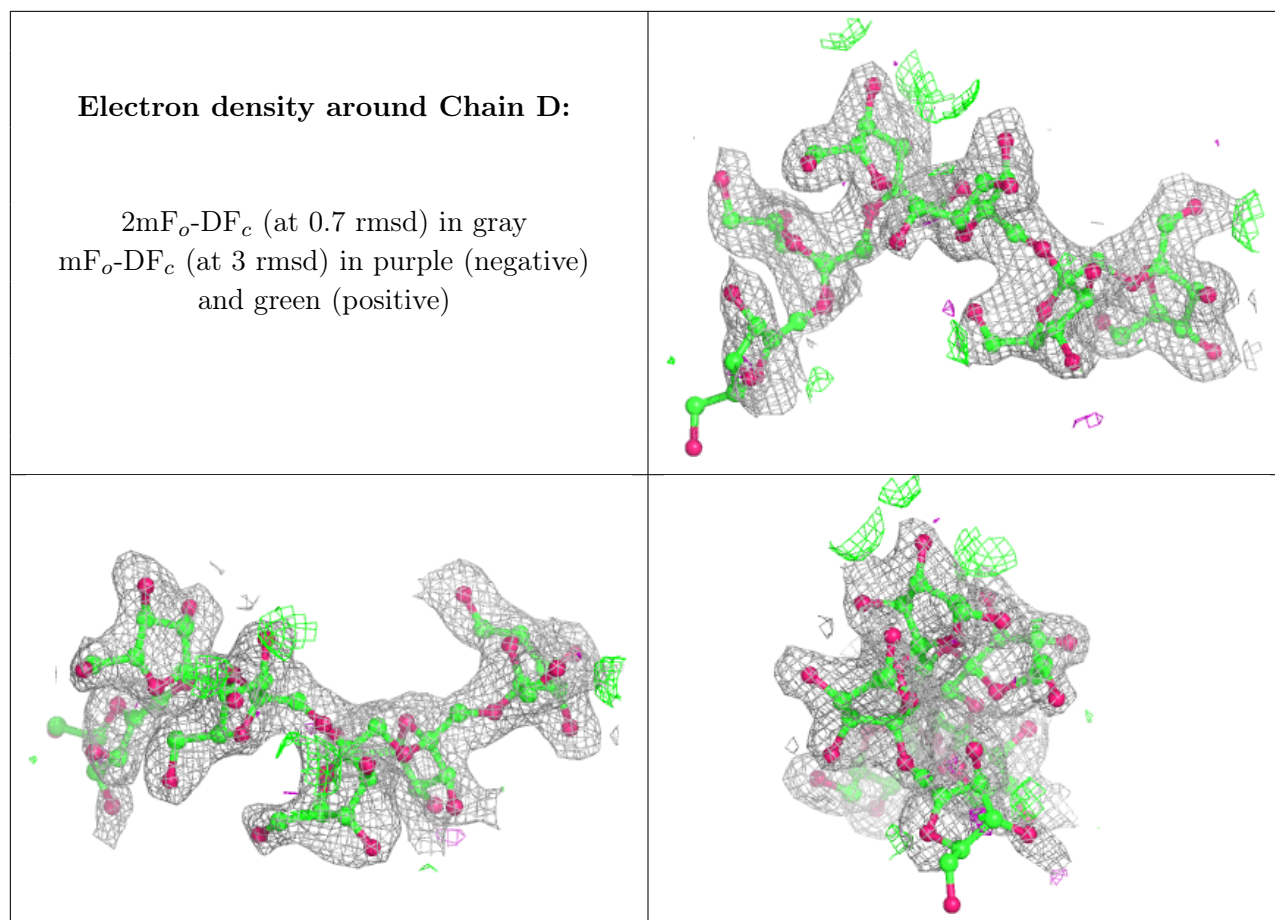
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	FRU	D	1	11/12	0.60	0.43	49,58,61,62	0
2	FRU	C	1	11/12	0.65	0.37	45,56,58,58	0
2	FRU	D	2	11/12	0.89	0.18	36,45,46,47	0
2	FRU	D	4	11/12	0.89	0.15	29,32,36,36	0
2	FRU	C	4	11/12	0.90	0.13	22,29,34,37	0
2	FRU	C	5	11/12	0.91	0.12	16,20,22,25	0
2	FRU	C	2	11/12	0.91	0.17	30,41,44,46	0
2	FRU	D	3	11/12	0.94	0.12	28,31,33,33	0
2	FRU	C	3	11/12	0.94	0.11	23,26,28,28	0
2	FRU	D	5	11/12	0.94	0.11	21,28,30,33	0
2	FRU	C	6	11/12	0.95	0.11	10,12,13,15	0
2	FRU	D	6	11/12	0.96	0.13	15,19,20,20	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 C:

$2mF_o-DF_c$ (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(\AA^2)	Q<0.9
3	NAG	A	1072	14/15	0.71	0.31	34,38,44,44	0
3	NAG	B	1126	14/15	0.78	0.30	20,20,20,20	0
3	NAG	A	1394	14/15	0.83	0.25	33,39,43,45	0
3	NAG	B	1394	14/15	0.88	0.17	32,36,37,38	0
3	NAG	A	1334	14/15	0.90	0.21	28,32,35,38	0
3	NAG	B	1219	14/15	0.91	0.15	19,21,25,25	0
3	NAG	B	1334	14/15	0.92	0.19	26,29,31,31	0
3	NAG	A	1219	14/15	0.92	0.16	23,26,32,32	0

6.5 Other polymers [i](#)

There are no such residues in this entry.