Full wwPDB X-ray Structure Validation Report ⓘ

May 28, 2025 – 10:13 PM JST

PDB ID	:	9JLT / pdb_00009jlt
Title	:	GH57 family amylopullulanase D352N mutant from Aquifex aeolicus complex with alpha-cyclodextrin
Authors	:	Zhu, Z.M.; Wang, W.W.; Li, M.J.; Xu, Q.; Zhou, H.; Huang, L.Q.; Wang, Q.S.; Yu, F.
Deposited on	:	2024-09-19
Resolution	:	1.56 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:

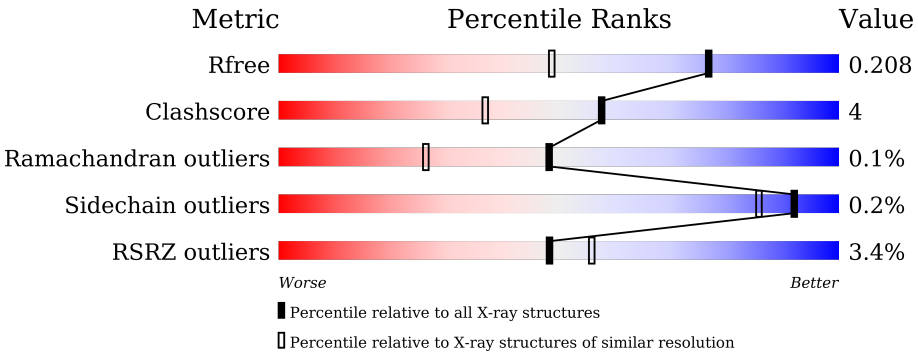
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

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 1.56 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}	164625	1935 (1.56-1.56)
Clashscore	180529	2073 (1.56-1.56)
Ramachandran outliers	177936	2037 (1.56-1.56)
Sidechain outliers	177891	2034 (1.56-1.56)
RSRZ outliers	164620	1935 (1.56-1.56)

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	477	3% 89% 10%
1	B	477	4% 90% 10%
2	C	6	17% 67% 17%
2	D	6	17% 33% 50%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 8737 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.

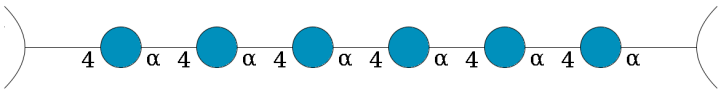
- Molecule 1 is a protein called Glycoside hydrolase family 57 N-terminal domain-containing protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	476	Total	C	N	O	S	0	0	0
			4036	2641	647	739	9			
1	B	475	Total	C	N	O	S	0	0	0
			4035	2641	647	738	9			

There are 2 discrepancies between the modelled and reference sequences:

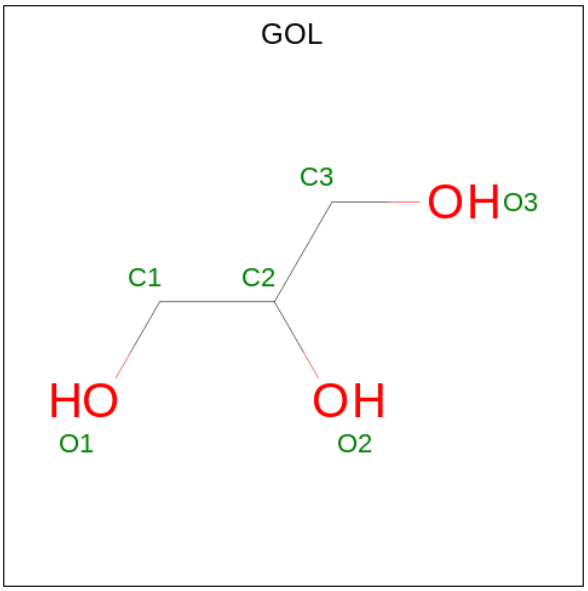
Chain	Residue	Modelled	Actual	Comment	Reference
A	352	ASN	ASP	engineered mutation	UNP O66934
B	352	ASN	ASP	engineered mutation	UNP O66934

- Molecule 2 is an oligosaccharide called Cyclohexakis-(1-4)-(alpha-D-glucopyranose).



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

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 4 is water.

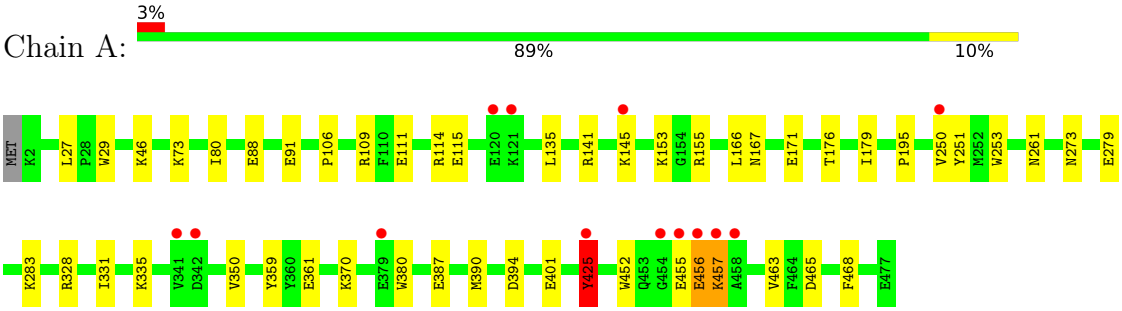
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	295	Total O 295 295	0	0
4	B	191	Total O 191 191	0	0

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.

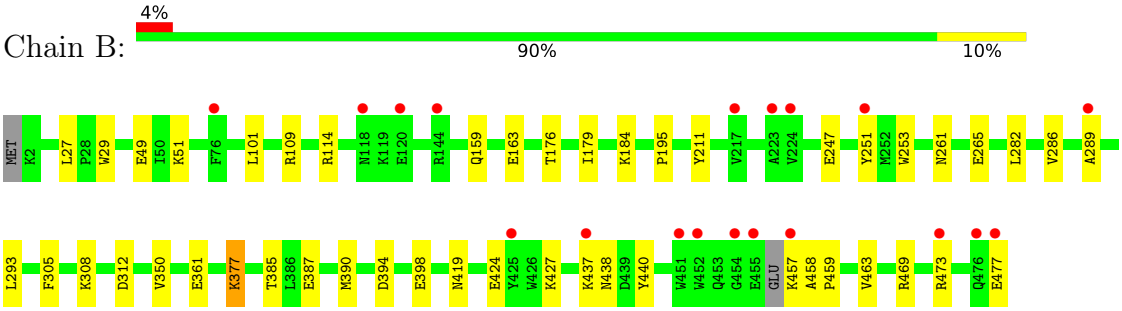
• Molecule 1: Glycoside hydrolase family 57 N-terminal domain-containing protein

Chain A:



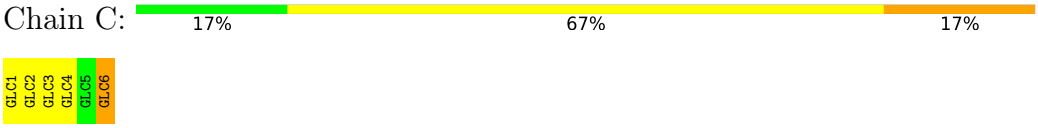
• Molecule 1: Glycoside hydrolase family 57 N-terminal domain-containing protein

Chain B:



• Molecule 2: Cyclohexakis-(1-4)-(alpha-D-glucopyranose)

Chain C:



• Molecule 2: Cyclohexakis-(1-4)-(alpha-D-glucopyranose)

Chain D:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	61.45Å 41.50Å 195.49Å 90.00° 96.46° 90.00°	Depositor
Resolution (Å)	60.22 – 1.56 60.22 – 1.56	Depositor EDS
% Data completeness (in resolution range)	99.7 (60.22-1.56) 99.7 (60.22-1.56)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.66 (at 1.55Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, R_{free}	0.184 , 0.212 0.181 , 0.208	Depositor DCC
R_{free} test set	6824 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å^2)	16.2	Xtriage
Anisotropy	0.498	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 41.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.016 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	8737	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.69% 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: GOL, GLC

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	0.38	2/4149 (0.0%)	0.57	1/5614 (0.0%)
1	B	0.29	1/4147 (0.0%)	0.48	0/5608
All	All	0.34	3/8296 (0.0%)	0.53	1/11222 (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

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	468	PHE	C-O	-5.31	1.18	1.24
1	B	377	LYS	CE-NZ	-5.04	1.34	1.49
1	A	425	TYR	C-O	-5.02	1.18	1.24

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	456	GLU	N-CA-C	-6.12	101.61	110.24

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	195	PRO	Peptide
1	B	195	PRO	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	4036	0	3962	40	0
1	B	4035	0	3970	32	0
2	C	66	0	54	2	0
2	D	66	0	54	4	0
3	A	30	0	40	3	0
3	B	18	0	24	0	0
4	A	295	0	0	3	0
4	B	191	0	0	2	0
All	All	8737	0	8104	72	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 4.

All (72) 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:153:LYS:NZ	1:A:155:ARG:O	1.88	1.06
1:A:279:GLU:HG2	1:A:283:LYS:HE2	1.62	0.81
1:A:115:GLU:OE1	1:A:155:ARG:NH1	2.16	0.78
1:B:251:TYR:OH	1:B:387:GLU:OE1	2.03	0.75
1:A:452:TRP:HA	1:A:455:GLU:HG3	1.75	0.68
1:A:251:TYR:OH	1:A:387:GLU:OE1	2.11	0.67
1:B:469:ARG:O	1:B:473:ARG:HG2	1.95	0.67
1:A:261:ASN:HD22	3:A:505:GOL:H32	1.62	0.63
1:B:101:LEU:HD13	1:B:459:PRO:HB3	1.81	0.62
1:B:51:LYS:HD2	1:B:385:THR:HG23	1.86	0.58
2:D:4:GLC:O5	2:D:3:GLC:H61	2.03	0.57
1:A:88:GLU:HB2	1:A:91:GLU:HG3	1.85	0.57
1:A:251:TYR:HE1	1:A:390:MET:SD	2.27	0.57
1:A:111:GLU:OE2	1:A:114:ARG:NH1	2.38	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:469:ARG:HH11	1:B:473:ARG:HH22	1.54	0.56
1:A:145:LYS:N	1:A:145:LYS:HD2	2.21	0.56
1:A:279:GLU:CG	1:A:283:LYS:HE2	2.35	0.55
1:A:135:LEU:HD11	1:A:166:LEU:HG	1.88	0.55
3:A:505:GOL:H12	4:A:632:HOH:O	2.06	0.55
1:A:80:ILE:HG21	1:A:135:LEU:HG	1.88	0.55
1:B:424:GLU:HA	1:B:427:LYS:HD2	1.89	0.54
1:A:331:ILE:O	1:A:335:LYS:HG3	2.09	0.53
1:B:438:ASN:ND2	1:B:477:GLU:O	2.43	0.52
1:B:211:TYR:OH	4:B:601:HOH:O	2.14	0.52
1:B:308:LYS:HE2	4:B:612:HOH:O	2.09	0.51
1:A:261:ASN:ND2	3:A:505:GOL:H32	2.27	0.50
2:D:4:GLC:C1	2:D:3:GLC:H61	2.41	0.50
1:A:251:TYR:OH	1:A:387:GLU:HA	2.12	0.49
1:A:455:GLU:O	1:A:456:GLU:C	2.52	0.49
1:A:328:ARG:HD2	1:B:49:GLU:OE2	2.13	0.49
1:B:282:LEU:HB2	1:B:305:PHE:CD2	2.47	0.49
1:B:293:LEU:HD23	1:B:398:GLU:HB2	1.95	0.48
1:A:27:LEU:HG	1:A:463:VAL:HG11	1.95	0.48
1:B:159:GLN:HG3	1:B:163:GLU:OE1	2.14	0.48
1:A:250:VAL:HG13	1:A:251:TYR:CE2	2.49	0.47
1:B:109:ARG:NH2	1:B:361:GLU:OE2	2.47	0.47
1:A:425:TYR:OH	1:A:465:ASP:HA	2.14	0.47
1:A:279:GLU:O	1:A:283:LYS:HD2	2.15	0.47
1:A:141:ARG:O	1:A:145:LYS:HD3	2.15	0.47
1:A:401:GLU:OE2	4:A:601:HOH:O	2.20	0.46
1:A:456:GLU:O	1:A:457:LYS:CB	2.63	0.46
1:B:251:TYR:HE1	1:B:390:MET:SD	2.39	0.45
1:A:380:TRP:H	1:A:380:TRP:CD1	2.35	0.45
1:B:29:TRP:CD2	2:D:6:GLC:H2	2.52	0.44
1:A:109:ARG:NH1	1:A:361:GLU:OE1	2.50	0.44
1:B:114:ARG:HB2	1:B:114:ARG:NH1	2.33	0.44
1:A:176:THR:O	1:A:179:ILE:HG22	2.17	0.44
1:A:29:TRP:CD2	2:C:6:GLC:H2	2.53	0.44
1:B:261:ASN:O	1:B:265:GLU:HG3	2.18	0.44
1:A:394:ASP:OD1	1:A:394:ASP:N	2.47	0.43
1:B:184:LYS:HZ1	1:B:247:GLU:CD	2.27	0.43
1:B:286:VAL:HB	1:B:289:ALA:HB2	1.99	0.43
1:A:370:LYS:HA	1:A:370:LYS:HD2	1.78	0.43
1:B:27:LEU:HG	1:B:463:VAL:HG11	2.00	0.42
1:B:394:ASP:OD1	1:B:394:ASP:N	2.49	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:438:ASN:OD1	1:B:440:TYR:HB2	2.19	0.42
1:B:176:THR:O	1:B:179:ILE:HG22	2.19	0.42
1:A:46:LYS:HE2	4:A:648:HOH:O	2.19	0.42
1:A:73:LYS:C	1:A:73:LYS:HD3	2.44	0.42
1:B:253:TRP:CZ3	1:B:350:VAL:HG11	2.55	0.42
1:A:29:TRP:CE2	2:C:6:GLC:H2	2.55	0.41
1:B:437:LYS:O	1:B:437:LYS:HG3	2.20	0.41
1:A:328:ARG:NH2	1:B:377:LYS:NZ	2.68	0.41
1:B:458:ALA:HA	1:B:459:PRO:HD3	1.94	0.41
1:B:29:TRP:CE2	2:D:6:GLC:H2	2.55	0.41
1:A:106:PRO:HD2	1:A:359:TYR:HA	2.02	0.41
1:A:250:VAL:HG23	1:A:273:ASN:HB2	2.02	0.41
1:A:253:TRP:CZ3	1:A:350:VAL:HG11	2.56	0.41
1:A:167:ASN:O	1:A:171:GLU:HG3	2.21	0.41
1:A:328:ARG:NH2	1:B:377:LYS:HZ3	2.20	0.40
1:B:308:LYS:NZ	1:B:312:ASP:OD2	2.51	0.40
1:B:419:ASN:OD1	1:B:419:ASN:C	2.65	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	474/477 (99%)	468 (99%)	5 (1%)	1 (0%)	44 24
1	B	471/477 (99%)	467 (99%)	4 (1%)	0	100 100
All	All	945/954 (99%)	935 (99%)	9 (1%)	1 (0%)	48 26

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	457	LYS

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	434/437 (99%)	433 (100%)	1 (0%)	92	86
1	B	435/437 (100%)	434 (100%)	1 (0%)	92	86
All	All	869/874 (99%)	867 (100%)	2 (0%)	92	86

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	425	TYR
1	B	457	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	352	ASN

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	GLC	C	1	2	11,11,12	0.38	0	15,15,17	1.23	2 (13%)
2	GLC	C	2	2	11,11,12	0.26	0	15,15,17	0.94	1 (6%)
2	GLC	C	3	2	11,11,12	0.40	0	15,15,17	1.35	3 (20%)
2	GLC	C	4	2	11,11,12	0.41	0	15,15,17	0.96	1 (6%)
2	GLC	C	5	2	11,11,12	0.51	0	15,15,17	0.79	0
2	GLC	C	6	2	11,11,12	0.29	0	15,15,17	1.11	1 (6%)
2	GLC	D	1	2	11,11,12	0.37	0	15,15,17	1.11	1 (6%)
2	GLC	D	2	2	11,11,12	0.23	0	15,15,17	0.88	0
2	GLC	D	3	2	11,11,12	0.37	0	15,15,17	1.15	1 (6%)
2	GLC	D	4	2	11,11,12	0.47	0	15,15,17	1.06	1 (6%)
2	GLC	D	5	2	11,11,12	0.34	0	15,15,17	0.79	1 (6%)
2	GLC	D	6	2	11,11,12	0.31	0	15,15,17	1.12	1 (6%)

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	C	1	2	-	0/2/19/22	0/1/1/1
2	GLC	C	2	2	-	0/2/19/22	0/1/1/1
2	GLC	C	3	2	-	0/2/19/22	0/1/1/1
2	GLC	C	4	2	-	0/2/19/22	0/1/1/1
2	GLC	C	5	2	-	0/2/19/22	0/1/1/1
2	GLC	C	6	2	-	0/2/19/22	0/1/1/1
2	GLC	D	1	2	-	0/2/19/22	0/1/1/1
2	GLC	D	2	2	-	0/2/19/22	0/1/1/1
2	GLC	D	3	2	-	0/2/19/22	0/1/1/1
2	GLC	D	4	2	-	0/2/19/22	0/1/1/1
2	GLC	D	5	2	-	0/2/19/22	0/1/1/1
2	GLC	D	6	2	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	1	GLC	O5-C1-C2	-3.75	104.98	110.77

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	4	GLC	O5-C1-C2	-3.44	105.47	110.77
2	D	1	GLC	O5-C1-C2	-3.40	105.52	110.77
2	C	3	GLC	O4-C4-C3	-3.18	103.00	110.35
2	D	6	GLC	O5-C1-C2	-3.01	106.12	110.77
2	C	4	GLC	O5-C1-C2	-2.98	106.16	110.77
2	D	3	GLC	C1-O5-C5	2.93	116.17	112.19
2	C	2	GLC	O5-C1-C2	-2.77	106.50	110.77
2	C	6	GLC	O5-C1-C2	-2.53	106.86	110.77
2	C	3	GLC	O5-C1-C2	-2.42	107.03	110.77
2	D	5	GLC	O5-C1-C2	-2.29	107.23	110.77
2	C	1	GLC	O4-C4-C3	-2.12	105.45	110.35
2	C	3	GLC	O4-C4-C5	2.05	114.39	109.30

There are no chirality outliers.

There are no torsion outliers.

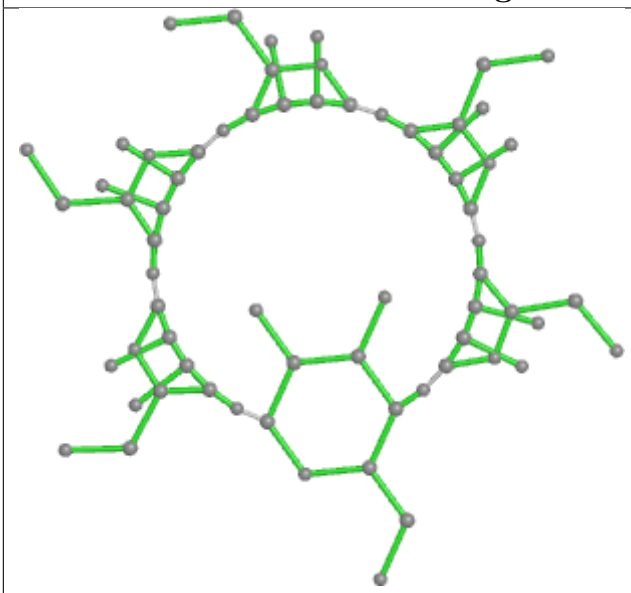
There are no ring outliers.

4 monomers are involved in 6 short contacts:

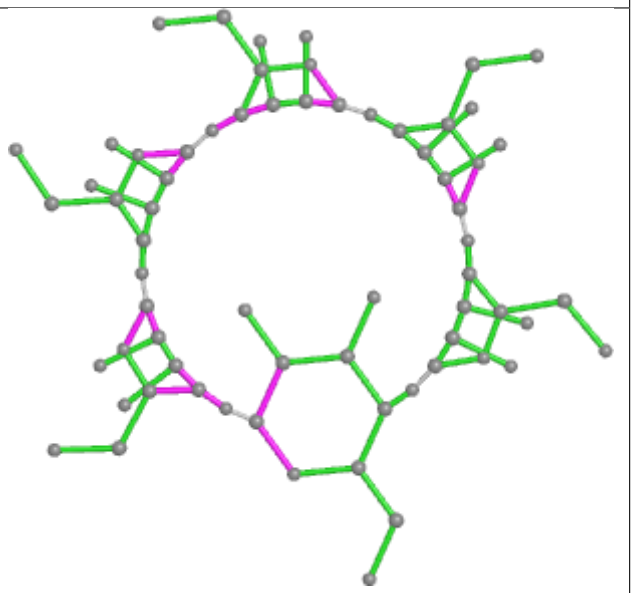
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	4	GLC	2	0
2	C	6	GLC	2	0
2	D	3	GLC	2	0
2	D	6	GLC	2	0

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

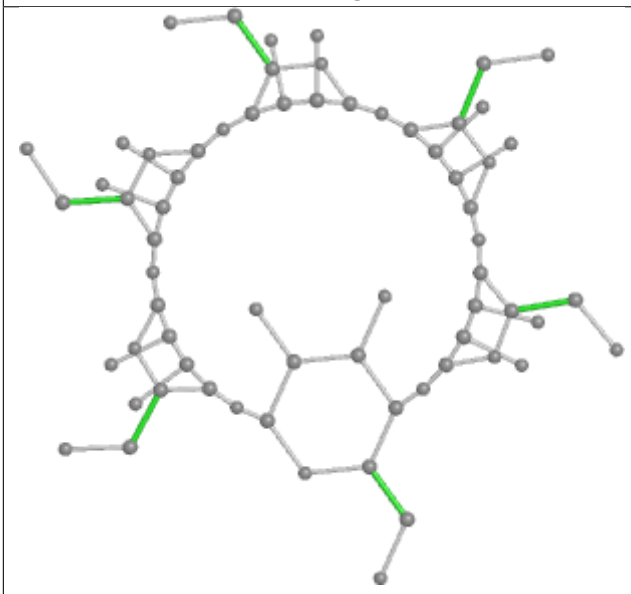
Oligosaccharide Chain C



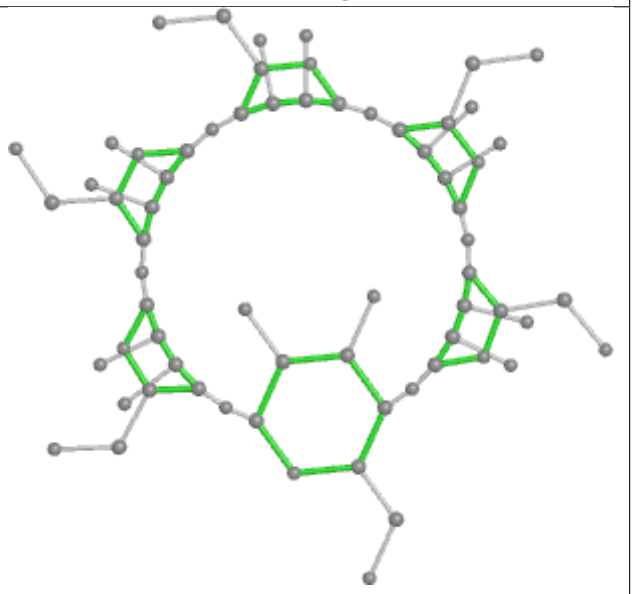
Bond lengths



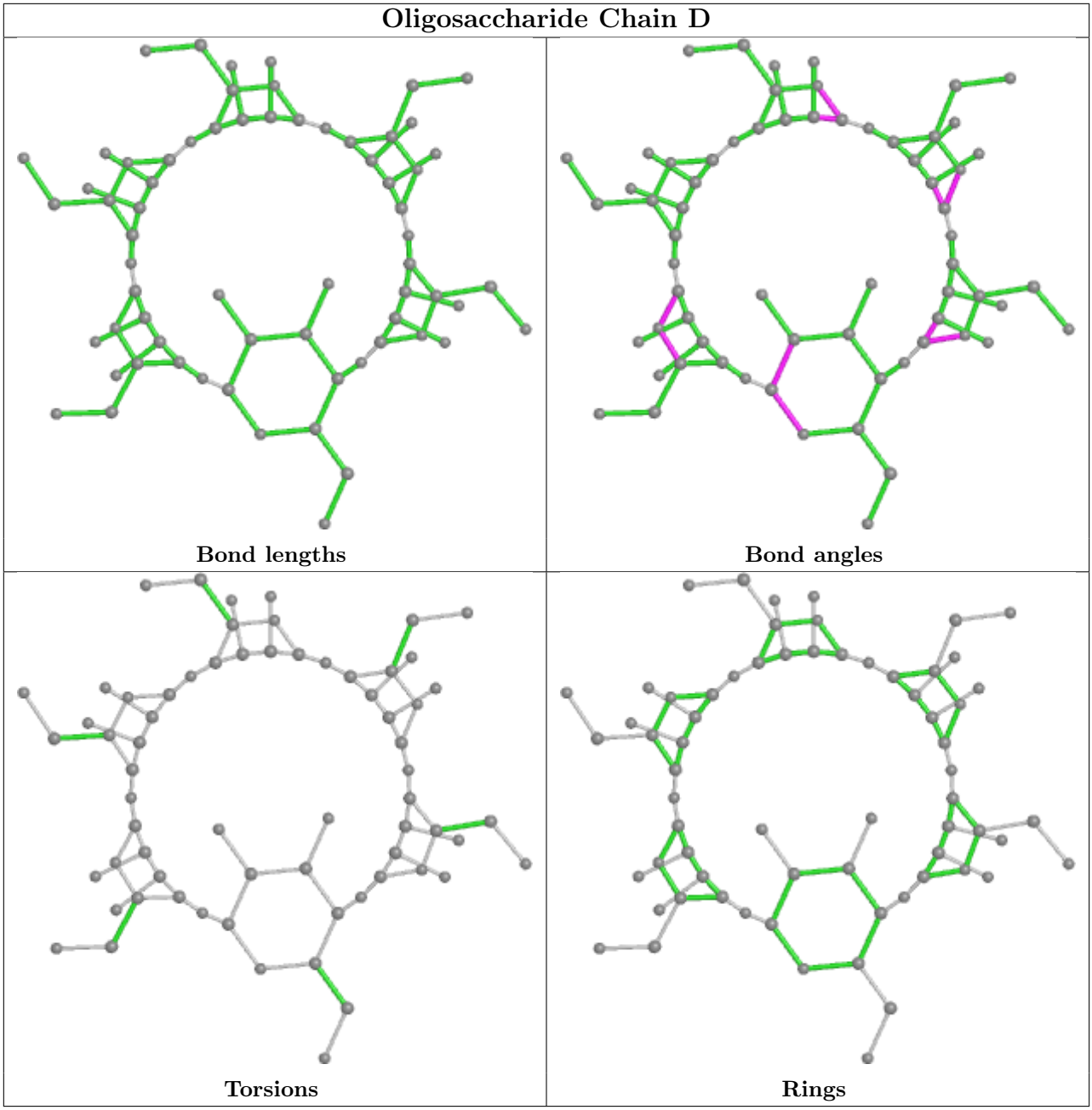
Bond angles



Torsions



Rings



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	GOL	A	504	-	5,5,5	0.81	0	5,5,5	0.81	0
3	GOL	A	503	-	5,5,5	0.72	0	5,5,5	1.05	0
3	GOL	B	503	-	5,5,5	0.91	0	5,5,5	0.99	0
3	GOL	A	502	-	5,5,5	0.73	0	5,5,5	1.02	0
3	GOL	B	501	-	5,5,5	0.98	0	5,5,5	0.94	0
3	GOL	B	502	-	5,5,5	0.85	0	5,5,5	0.94	0
3	GOL	A	505	-	5,5,5	0.96	0	5,5,5	0.85	0
3	GOL	A	501	-	5,5,5	0.99	0	5,5,5	0.76	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
3	GOL	A	504	-	-	3/4/4/4	-
3	GOL	A	503	-	-	0/4/4/4	-
3	GOL	B	503	-	-	2/4/4/4	-
3	GOL	A	502	-	-	0/4/4/4	-
3	GOL	B	501	-	-	0/4/4/4	-
3	GOL	B	502	-	-	0/4/4/4	-
3	GOL	A	505	-	-	4/4/4/4	-
3	GOL	A	501	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	504	GOL	C1-C2-C3-O3
3	B	503	GOL	C1-C2-C3-O3
3	B	503	GOL	O2-C2-C3-O3
3	A	505	GOL	O1-C1-C2-C3
3	A	505	GOL	C1-C2-C3-O3
3	A	504	GOL	O2-C2-C3-O3
3	A	504	GOL	O1-C1-C2-O2
3	A	505	GOL	O1-C1-C2-O2
3	A	505	GOL	O2-C2-C3-O3

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	505	GOL	3	0

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, 95^{th} 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	476/477 (99%)	-0.20	13 (2%) 56 63	7, 15, 35, 74	0
1	B	475/477 (99%)	0.16	19 (4%) 43 50	10, 22, 44, 83	0
All	All	951/954 (99%)	-0.02	32 (3%) 48 56	7, 18, 41, 83	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	452	TRP	4.2
1	B	476	GLN	3.8
1	B	454	GLY	3.7
1	B	455	GLU	3.6
1	B	223	ALA	3.6
1	B	477	GLU	3.5
1	A	342	ASP	3.5
1	B	437	LYS	3.3
1	A	457	LYS	3.2
1	A	455	GLU	3.2
1	B	451	TRP	3.1
1	A	456	GLU	2.8
1	A	145	LYS	2.8
1	A	454	GLY	2.8
1	A	379	GLU	2.7
1	B	457	LYS	2.6
1	A	425	TYR	2.6
1	B	224	VAL	2.6
1	B	473	ARG	2.5
1	B	425	TYR	2.5
1	A	250	VAL	2.4
1	B	289	ALA	2.4
1	B	120	GLU	2.3
1	B	251	TYR	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	144	ARG	2.2
1	A	120	GLU	2.2
1	A	458	ALA	2.2
1	B	76	PHE	2.1
1	A	121	LYS	2.1
1	B	217	VAL	2.1
1	B	118	ASN	2.1
1	A	341	VAL	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)

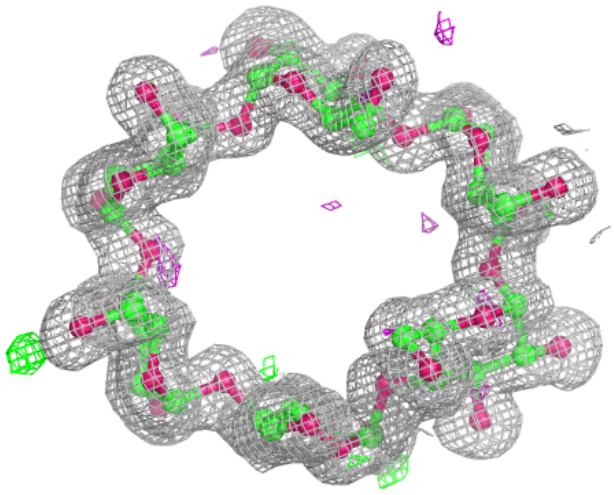
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

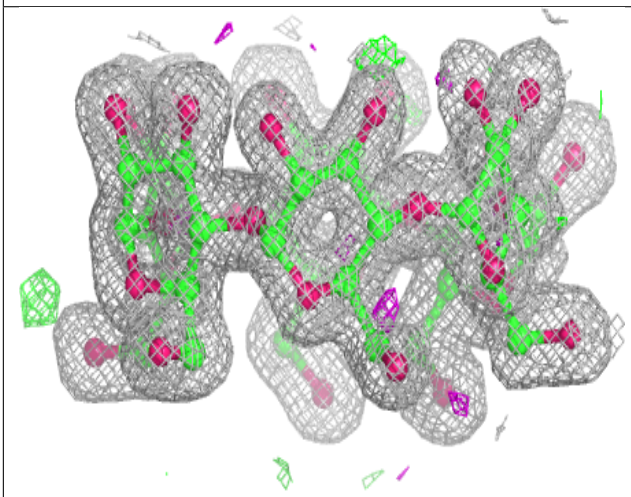
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	GLC	D	2	11/12	0.90	0.12	20,20,20,20	0
2	GLC	D	1	11/12	0.92	0.08	22,26,32,36	0
2	GLC	D	6	11/12	0.94	0.07	17,22,26,26	0
2	GLC	D	3	11/12	0.94	0.07	20,20,20,20	0
2	GLC	D	5	11/12	0.96	0.06	12,14,18,18	0
2	GLC	C	4	11/12	0.96	0.06	6,8,10,12	0
2	GLC	C	6	11/12	0.96	0.06	11,12,16,17	0
2	GLC	C	1	11/12	0.96	0.05	12,16,17,19	0
2	GLC	D	4	11/12	0.96	0.05	11,12,16,17	0
2	GLC	C	2	11/12	0.97	0.06	12,15,21,21	0
2	GLC	C	3	11/12	0.97	0.05	10,12,15,16	0
2	GLC	C	5	11/12	0.98	0.04	7,8,9,11	0

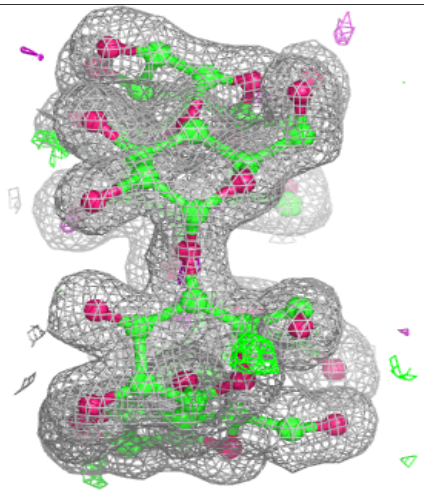
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

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)

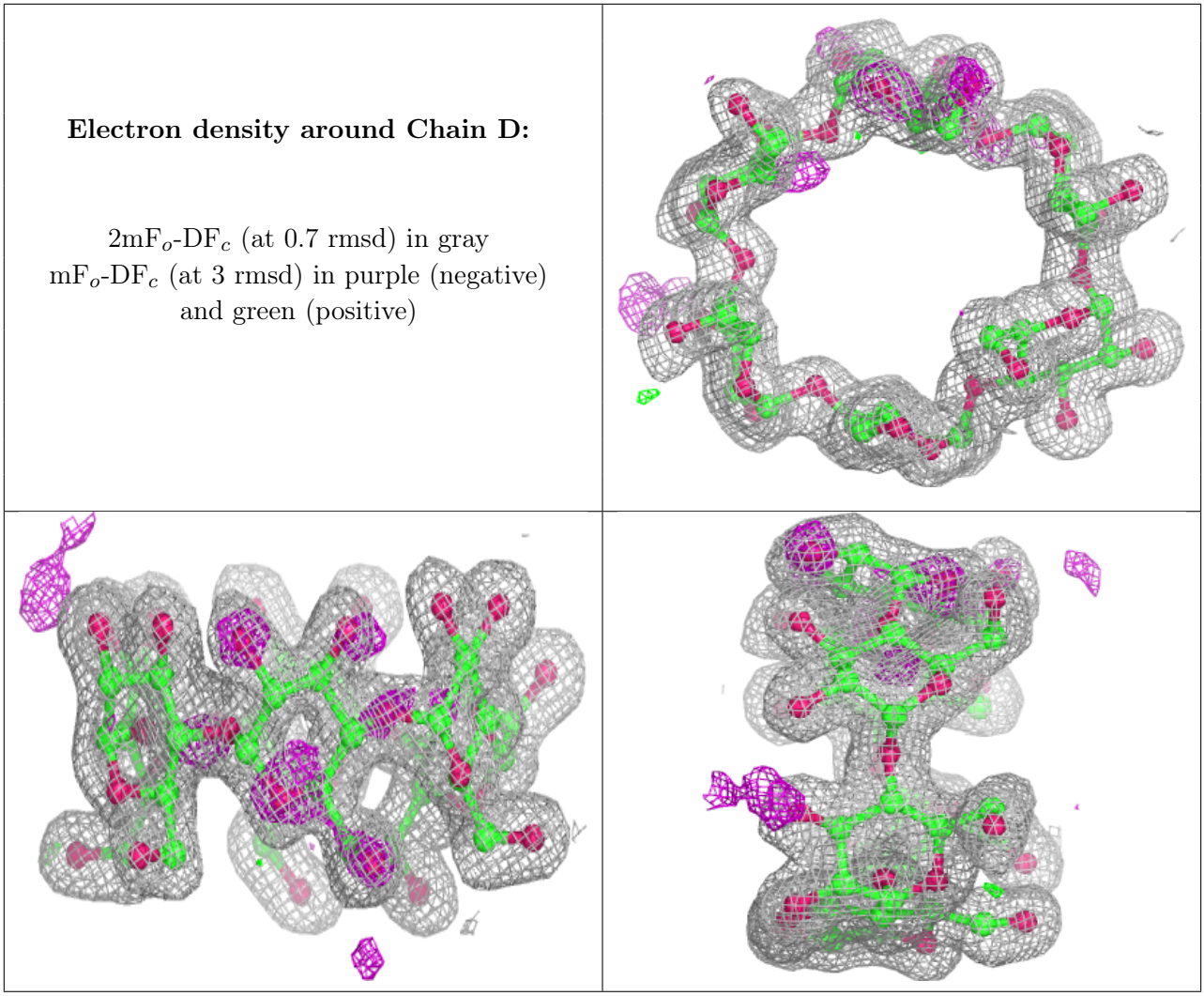






Electron density around Chain D:

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



6.4 Ligands

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, 95^{th} 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	GOL	A	505	6/6	0.81	0.17	19,36,39,40	0
3	GOL	B	502	6/6	0.88	0.11	32,33,35,36	0
3	GOL	A	504	6/6	0.91	0.12	18,36,37,40	0
3	GOL	B	503	6/6	0.91	0.10	27,34,37,39	0
3	GOL	A	502	6/6	0.93	0.08	21,22,24,26	0
3	GOL	A	503	6/6	0.93	0.08	18,22,25,27	0
3	GOL	B	501	6/6	0.97	0.04	11,13,14,15	0
3	GOL	A	501	6/6	0.99	0.03	7,9,11,12	0

6.5 Other polymers (i)

There are no such residues in this entry.