



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 03:48 AM UTC

PDB ID : 5OYD / pdb_00005oyd
Title : GH5 endo-xyloglucanase from *Cellvibrio japonicus*
Authors : Attia, M.; Nelson, C.E.; Offen, W.A.; Jain, N.; Gardner, J.G.; Davies, G.J.; Brumer, H.
Deposited on : 2017-09-08
Resolution : 2.10 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

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

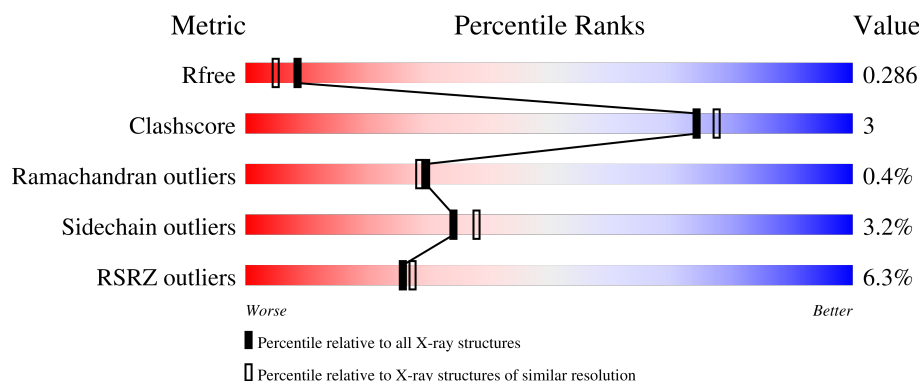
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

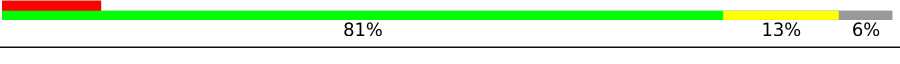
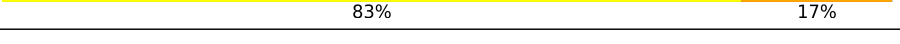
The reported resolution of this entry is 2.10 Å.

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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	396	 87% 6% • 7%
1	B	396	 11% 81% 13% 6%
2	C	6	 83% 17%
3	D	7	 29% 57% 14%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 6156 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 Cellulase, putative, cel5D.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	370	Total	C	N	O	S	0	0	0
			2915	1851	499	555	10			
1	B	371	Total	C	N	O	S	0	0	1
			2877	1826	491	550	10			

There are 46 discrepancies between the modelled and reference sequences:

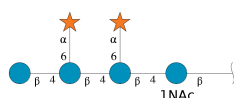
Chain	Residue	Modelled	Actual	Comment	Reference
A	73	MET	-	initiating methionine	UNP B3PD52
A	74	GLY	-	expression tag	UNP B3PD52
A	75	SER	-	expression tag	UNP B3PD52
A	76	SER	-	expression tag	UNP B3PD52
A	77	HIS	-	expression tag	UNP B3PD52
A	78	HIS	-	expression tag	UNP B3PD52
A	79	HIS	-	expression tag	UNP B3PD52
A	80	HIS	-	expression tag	UNP B3PD52
A	81	HIS	-	expression tag	UNP B3PD52
A	82	HIS	-	expression tag	UNP B3PD52
A	83	SER	-	expression tag	UNP B3PD52
A	84	SER	-	expression tag	UNP B3PD52
A	85	GLY	-	expression tag	UNP B3PD52
A	86	LEU	-	expression tag	UNP B3PD52
A	87	VAL	-	expression tag	UNP B3PD52
A	88	PRO	-	expression tag	UNP B3PD52
A	89	ARG	-	expression tag	UNP B3PD52
A	90	GLY	-	expression tag	UNP B3PD52
A	91	SER	-	expression tag	UNP B3PD52
A	92	HIS	-	expression tag	UNP B3PD52
A	93	MET	-	expression tag	UNP B3PD52
A	94	ALA	-	expression tag	UNP B3PD52
A	95	SER	-	expression tag	UNP B3PD52
B	73	MET	-	initiating methionine	UNP B3PD52
B	74	GLY	-	expression tag	UNP B3PD52

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Chain	Residue	Modelled	Actual	Comment	Reference
B	75	SER	-	expression tag	UNP B3PD52
B	76	SER	-	expression tag	UNP B3PD52
B	77	HIS	-	expression tag	UNP B3PD52
B	78	HIS	-	expression tag	UNP B3PD52
B	79	HIS	-	expression tag	UNP B3PD52
B	80	HIS	-	expression tag	UNP B3PD52
B	81	HIS	-	expression tag	UNP B3PD52
B	82	HIS	-	expression tag	UNP B3PD52
B	83	SER	-	expression tag	UNP B3PD52
B	84	SER	-	expression tag	UNP B3PD52
B	85	GLY	-	expression tag	UNP B3PD52
B	86	LEU	-	expression tag	UNP B3PD52
B	87	VAL	-	expression tag	UNP B3PD52
B	88	PRO	-	expression tag	UNP B3PD52
B	89	ARG	-	expression tag	UNP B3PD52
B	90	GLY	-	expression tag	UNP B3PD52
B	91	SER	-	expression tag	UNP B3PD52
B	92	HIS	-	expression tag	UNP B3PD52
B	93	MET	-	expression tag	UNP B3PD52
B	94	ALA	-	expression tag	UNP B3PD52
B	95	SER	-	expression tag	UNP B3PD52

- Molecule 2 is an oligosaccharide called beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-N-acetyl-beta-D-glucopyranosylamine.



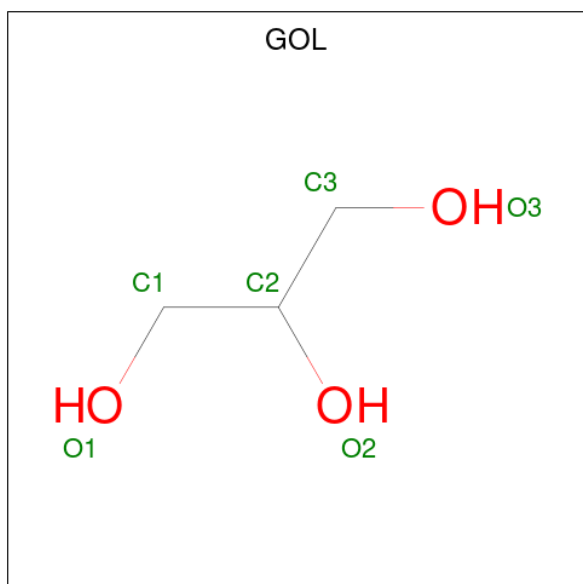
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	6	Total	C	N	O	0	0	0
			66	36	1	29			

- Molecule 3 is an oligosaccharide called alpha-D-xylopyranose-(1-6)-beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-N-acetyl-beta-D-glucopyranosylamine.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	7	Total	C	N	O	0	0	0
			75	41	1	33			

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	0
			1	1		
5	B	1	Total	Cl	0	0
			1	1		

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O_4S).



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

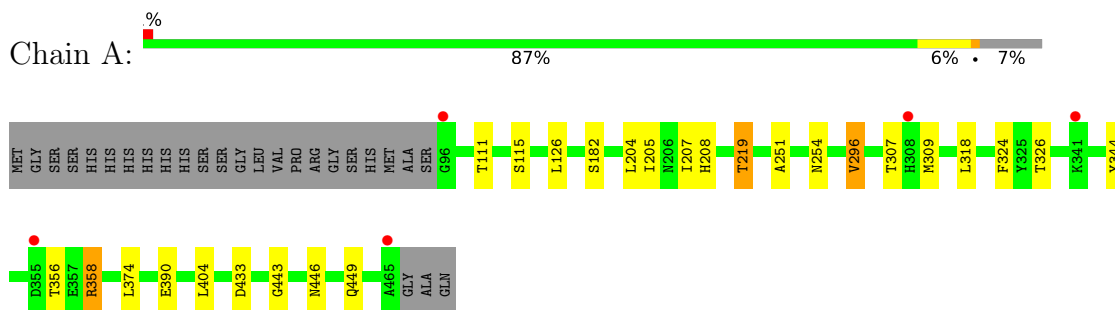
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	101	Total	O	0	0
			101	101		
7	B	85	Total	O	0	0
			85	85		

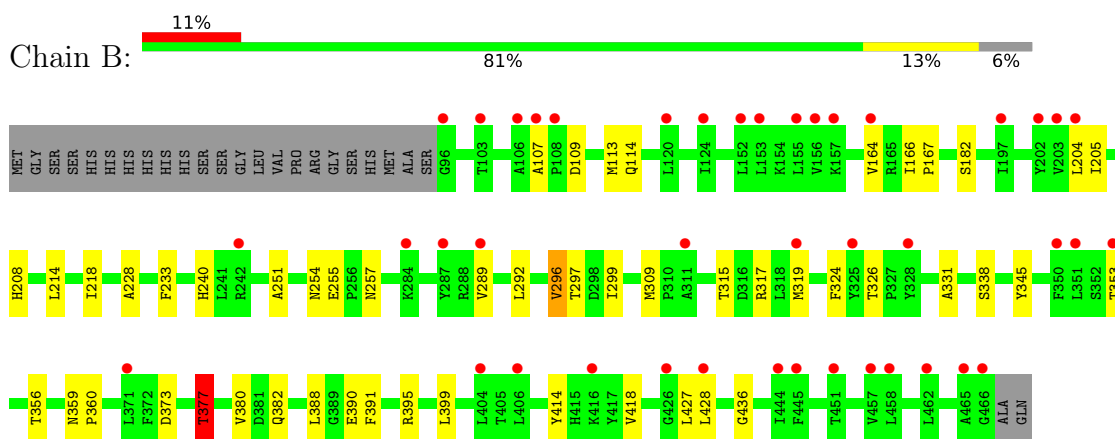
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

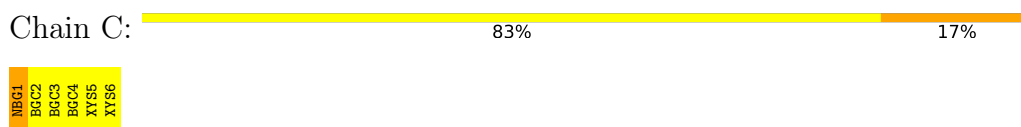
- Molecule 1: Cellulase, putative, cel5D



- Molecule 1: Cellulase, putative, cel5D



- Molecule 2: beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-N-acetyl-beta-D-glucopyranosylamine



- Molecule 3: alpha-D-xylopyranose-(1-6)-beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-[alpha-D-xylopyranose-(1-6)]beta-D-glucopyranose-(1-4)-N-acetyl-beta-D-glucopyranosylamine



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	55.45Å 97.60Å 157.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	83.05 – 2.10 82.92 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.8 (83.05-2.10) 99.8 (82.92-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.86 (at 2.10Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.218 , 0.283 0.223 , 0.286	Depositor DCC
R_{free} test set	2525 reflections (2.98%)	wwPDB-VP
Wilson B-factor (Å ²)	43.5	Xtriage
Anisotropy	0.591	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 52.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6156	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% 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: GOL, SO4, BGC, CL, NBG, XYX

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	1.13	0/2988	1.09	6/4070 (0.1%)
1	B	1.12	0/2950	1.10	6/4026 (0.1%)
All	All	1.12	0/5938	1.10	12/8096 (0.1%)

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	126	LEU	CA-C-N	6.18	126.37	121.61
1	A	126	LEU	C-N-CA	6.18	126.37	121.61
1	A	115	SER	N-CA-C	5.87	118.78	110.50
1	A	296	VAL	CB-CA-C	5.64	120.54	111.29
1	B	299	ILE	N-CA-C	5.59	115.78	110.42
1	B	228	ALA	N-CA-C	-5.57	105.13	111.14
1	B	164	VAL	CB-CA-C	5.56	117.92	110.42
1	A	219	THR	CB-CA-C	5.55	117.50	109.45
1	B	331	ALA	N-CA-C	5.21	117.86	111.82
1	B	377	THR	N-CA-CB	5.12	117.49	110.07
1	A	207	ILE	N-CA-C	-5.07	100.44	107.80
1	B	233	PHE	N-CA-C	5.05	116.47	111.07

There are no chirality outliers.

There are no planarity outliers.

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	2915	0	2765	8	0
1	B	2877	0	2662	28	0
2	C	66	0	55	1	0
3	D	75	0	62	1	0
4	A	18	0	24	0	0
4	B	12	0	16	1	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	B	5	0	0	0	0
7	A	101	0	0	0	0
7	B	85	0	0	4	0
All	All	6156	0	5584	36	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 3.

All (36) 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:B:240:HIS:ND1	7:B:604:HOH:O	2.15	0.79
1:B:380:VAL:O	7:B:602:HOH:O	2.10	0.70
1:B:315:THR:O	7:B:603:HOH:O	2.10	0.68
1:B:107:ALA:O	7:B:605:HOH:O	2.16	0.61
1:B:113:MET:O	1:B:317:ARG:NH2	2.34	0.58
1:B:255:GLU:HG2	1:B:255:GLU:O	2.05	0.57
1:A:390:GLU:OE1	2:C:1:NBG:H1	2.06	0.55
1:B:326:THR:O	1:B:414:TYR:OH	2.16	0.55
1:B:289:VAL:HG11	1:B:319:MET:HE3	1.90	0.51
1:B:208:HIS:HA	1:B:254:ASN:HB2	1.92	0.50
1:B:324:PHE:CZ	1:B:326:THR:HB	2.46	0.50
1:A:446:ASN:C	1:A:446:ASN:OD1	2.54	0.49
1:A:324:PHE:CZ	1:A:326:THR:HB	2.48	0.48
1:B:395:ARG:NH1	1:B:436:GLY:O	2.48	0.47
1:B:214:LEU:C	1:B:214:LEU:HD23	2.39	0.47
1:B:373:ASP:O	1:B:377:THR:HG23	2.15	0.46
1:B:204:LEU:HD11	1:B:251:ALA:HB2	1.98	0.46
1:A:433:ASP:OD1	1:A:443:GLY:HA2	2.17	0.45
1:B:324:PHE:HB2	1:B:388:LEU:HD11	1.98	0.45
1:B:166:ILE:HB	1:B:205:ILE:HD13	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:292:LEU:HD13	1:B:309:MET:HE2	2.00	0.44
1:B:427:LEU:HD12	1:B:427:LEU:N	2.32	0.44
1:B:292:LEU:HD13	1:B:309:MET:CE	2.46	0.43
1:B:391:PHE:CD2	1:B:418:VAL:HG11	2.53	0.43
1:A:309:MET:HG3	1:A:318:LEU:HD13	1.99	0.43
1:A:204:LEU:HD11	1:A:251:ALA:HB2	2.00	0.43
1:A:344:TYR:CD2	1:A:358:ARG:CG	3.02	0.42
1:B:167:PRO:HB3	1:B:208:HIS:ND1	2.35	0.42
1:A:208:HIS:HA	1:A:254:ASN:HB2	2.02	0.42
1:B:390:GLU:OE1	3:D:1:NBG:H1	2.18	0.42
1:B:309:MET:HA	1:B:309:MET:HE3	2.02	0.42
1:B:114:GLN:HG2	4:B:509:GOL:H31	2.02	0.41
1:B:257:ASN:HD22	1:B:257:ASN:N	2.18	0.41
1:B:109:ASP:OD1	1:B:109:ASP:C	2.63	0.41
1:B:356:THR:HA	1:B:359:ASN:ND2	2.36	0.40
1:B:345:TYR:O	1:B:360:PRO:HD3	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	368/396 (93%)	350 (95%)	18 (5%)	0	100	100
1	B	369/396 (93%)	345 (94%)	21 (6%)	3 (1%)	16	12
All	All	737/792 (93%)	695 (94%)	39 (5%)	3 (0%)	30	28

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	297	THR
1	B	382	GLN

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Mol	Chain	Res	Type
1	B	296	VAL

5.3.2 Protein sidechains ⓘ

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	299/327 (91%)	288 (96%)	11 (4%)	30	33
1	B	286/327 (88%)	278 (97%)	8 (3%)	38	43
All	All	585/654 (89%)	566 (97%)	19 (3%)	34	38

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	111	THR
1	A	182	SER
1	A	205	ILE
1	A	219	THR
1	A	296	VAL
1	A	307	THR
1	A	356	THR
1	A	358	ARG
1	A	374	LEU
1	A	404	LEU
1	A	449	GLN
1	B	182	SER
1	B	218	ILE
1	B	296	VAL
1	B	338	SER
1	B	353	THR
1	B	377	THR
1	B	399	LEU
1	B	428	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	194	GLN
1	A	199	ASN
1	A	217	ASN
1	A	449	GLN
1	B	150	ASN
1	B	199	ASN
1	B	217	ASN
1	B	268	ASN
1	B	308	HIS
1	B	421	GLN

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 ⓘ

13 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	NBG	C	1	1,2	15,15,15	0.77	0	21,21,21	2.56	3 (14%)
2	BGC	C	2	2	11,11,12	0.93	0	15,15,17	1.53	2 (13%)
2	BGC	C	3	2	11,11,12	0.52	0	15,15,17	1.45	3 (20%)
2	BGC	C	4	2	11,11,12	0.68	0	15,15,17	1.37	3 (20%)
2	XYS	C	5	2	9,9,10	0.87	1 (11%)	10,12,14	1.35	1 (10%)
2	XYS	C	6	2	9,9,10	0.56	0	10,12,14	1.58	2 (20%)
3	NBG	D	1	1,3	15,15,15	1.33	2 (13%)	21,21,21	2.11	7 (33%)
3	BGC	D	2	3	11,11,12	0.91	0	15,15,17	1.34	2 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	BGC	D	3	3	11,11,12	0.84	0	15,15,17	0.93	0
3	BGC	D	4	3	11,11,12	0.68	0	15,15,17	1.50	4 (26%)
3	XYS	D	5	3	9,9,10	0.83	0	10,12,14	1.50	2 (20%)
3	XYS	D	6	3	9,9,10	0.60	0	10,12,14	1.77	2 (20%)
3	XYS	D	7	3	9,9,10	0.75	0	10,12,14	1.10	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	NBG	C	1	1,2	-	0/6/26/26	0/1/1/1
2	BGC	C	2	2	-	0/2/19/22	0/1/1/1
2	BGC	C	3	2	-	0/2/19/22	0/1/1/1
2	BGC	C	4	2	-	2/2/19/22	0/1/1/1
2	XYS	C	5	2	-	-	0/1/1/1
2	XYS	C	6	2	-	-	0/1/1/1
3	NBG	D	1	1,3	-	0/6/26/26	0/1/1/1
3	BGC	D	2	3	-	1/2/19/22	0/1/1/1
3	BGC	D	3	3	-	0/2/19/22	0/1/1/1
3	BGC	D	4	3	-	0/2/19/22	0/1/1/1
3	XYS	D	5	3	-	-	0/1/1/1
3	XYS	D	6	3	-	-	0/1/1/1
3	XYS	D	7	3	-	-	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	1	NBG	C1-N1	2.95	1.47	1.43
3	D	1	NBG	C2-C1	2.87	1.56	1.53
2	C	5	XYS	C2-C3	2.08	1.55	1.52

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	NBG	C2-C1-N1	8.56	122.28	111.25
3	D	1	NBG	C2-C1-N1	6.02	119.00	111.25
2	C	1	NBG	O5-C1-N1	-5.63	97.82	108.12
3	D	1	NBG	O5-C1-C2	4.03	114.26	109.72
3	D	6	XYS	C5-O5-C1	3.86	117.65	111.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	5	XYS	C5-O5-C1	3.53	117.11	111.42
2	C	6	XYS	O3-C3-C2	-3.31	103.31	110.05
3	D	5	XYS	C4-C3-C2	-3.22	107.09	110.92
3	D	4	BGC	O5-C1-C2	3.01	117.97	110.79
2	C	1	NBG	O5-C1-C2	2.87	112.95	109.72
2	C	3	BGC	O3-C3-C4	-2.74	103.93	110.38
3	D	2	BGC	C2-C3-C4	-2.71	106.09	110.86
3	D	1	NBG	C5-O5-C1	2.70	116.22	112.47
2	C	4	BGC	O3-C3-C4	2.69	116.72	110.38
2	C	3	BGC	O5-C5-C6	2.69	112.90	107.66
3	D	6	XYS	C4-C3-C2	-2.52	107.92	110.92
3	D	4	BGC	C2-C3-C4	-2.51	106.44	110.86
3	D	1	NBG	O7-C7-C8	-2.48	117.64	122.05
3	D	1	NBG	O5-C1-N1	-2.45	103.64	108.12
2	C	4	BGC	O2-C2-C3	-2.45	105.08	110.15
2	C	3	BGC	C3-C4-C5	2.39	114.57	110.23
2	C	6	XYS	C5-C4-C3	-2.37	106.20	109.64
2	C	2	BGC	O6-C6-C5	-2.30	103.49	111.33
3	D	1	NBG	C3-C2-C1	2.25	113.17	109.86
3	D	4	BGC	O5-C5-C4	-2.22	105.44	110.83
2	C	4	BGC	O4-C4-C3	-2.19	105.22	110.38
2	C	2	BGC	C1-O5-C5	2.17	115.09	112.19
3	D	2	BGC	C1-C2-C3	2.13	112.74	109.64
3	D	5	XYS	C5-O5-C1	2.05	114.72	111.42
3	D	4	BGC	O2-C2-C3	-2.03	105.94	110.15
3	D	1	NBG	O5-C5-C4	-2.02	106.06	109.70

There are no chirality outliers.

All (3) torsion outliers are listed below:

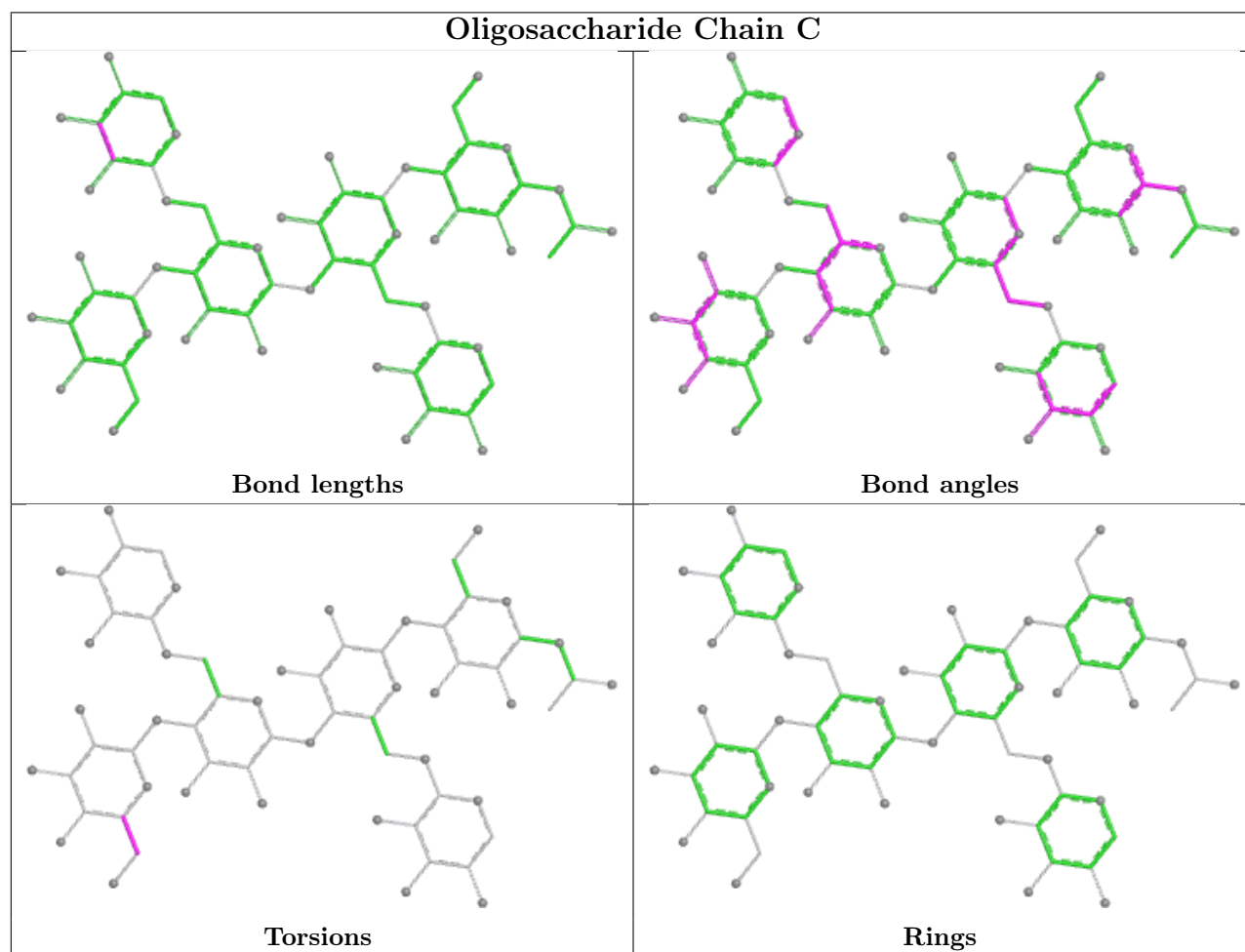
Mol	Chain	Res	Type	Atoms
2	C	4	BGC	C4-C5-C6-O6
2	C	4	BGC	O5-C5-C6-O6
3	D	2	BGC	C4-C5-C6-O6

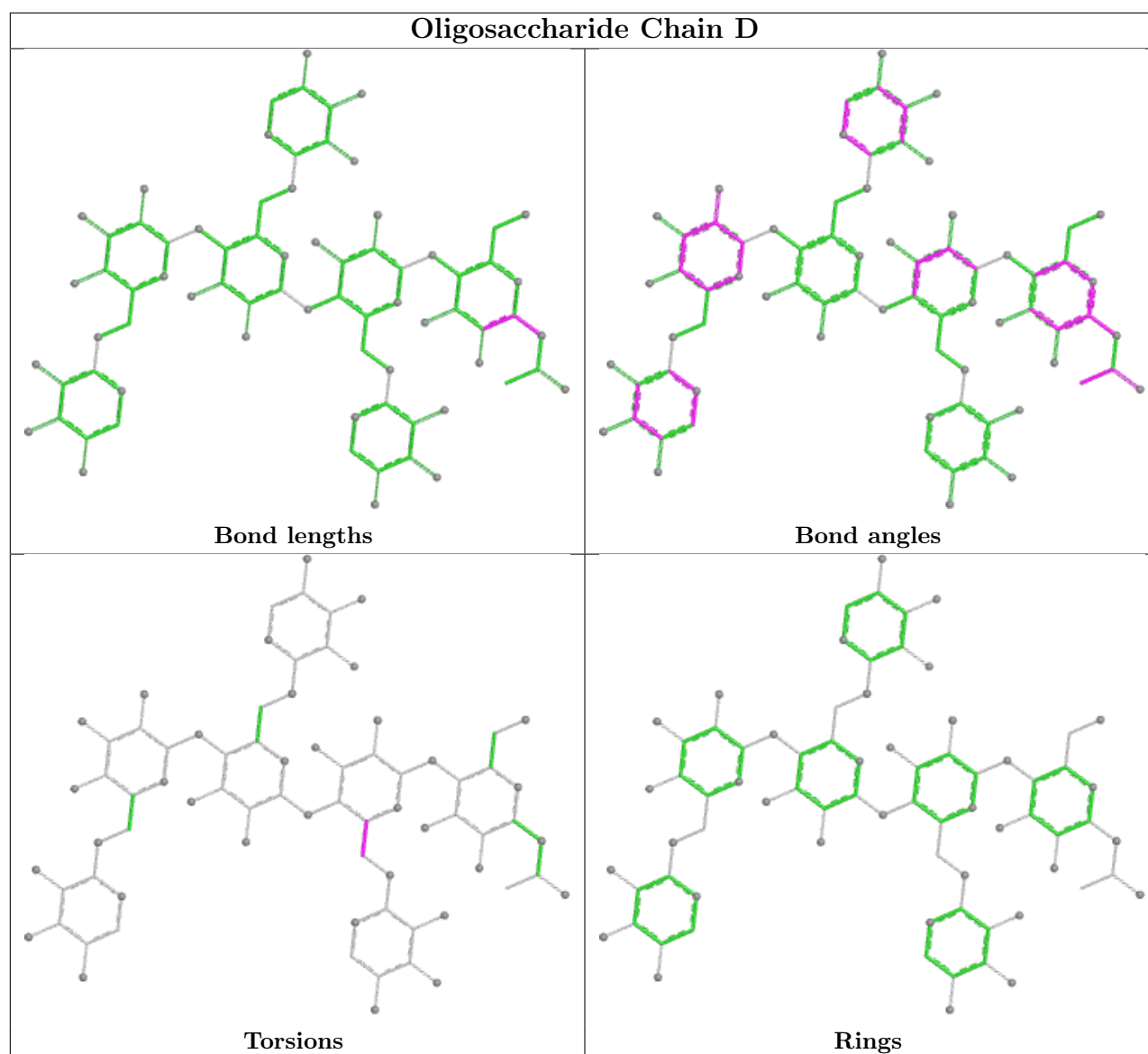
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	1	NBG	1	0
3	D	1	NBG	1	0

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





5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	GOL	A	508	-	5,5,5	0.31	0	5,5,5	0.52	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	GOL	A	507	-	5,5,5	0.39	0	5,5,5	0.41	0
4	GOL	A	509	-	5,5,5	0.57	0	5,5,5	0.66	0
4	GOL	B	509	-	5,5,5	0.42	0	5,5,5	0.28	0
6	SO4	B	511	-	4,4,4	0.38	0	6,6,6	0.38	0
4	GOL	B	508	-	5,5,5	0.67	0	5,5,5	0.35	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
4	GOL	A	508	-	-	2/4/4/4	-
4	GOL	A	507	-	-	0/4/4/4	-
4	GOL	A	509	-	-	2/4/4/4	-
4	GOL	B	509	-	-	2/4/4/4	-
4	GOL	B	508	-	-	4/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	508	GOL	O1-C1-C2-C3
4	A	509	GOL	C1-C2-C3-O3
4	A	509	GOL	O2-C2-C3-O3
4	B	508	GOL	O1-C1-C2-C3
4	B	508	GOL	C1-C2-C3-O3
4	B	509	GOL	O1-C1-C2-C3
4	B	508	GOL	O2-C2-C3-O3
4	A	508	GOL	O1-C1-C2-O2
4	B	508	GOL	O1-C1-C2-O2
4	B	509	GOL	O1-C1-C2-O2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	509	GOL	1	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	370/396 (93%)	0.34	5 (1%) 73 75	23, 46, 59, 75	15 (4%)
1	B	371/396 (93%)	1.04	42 (11%) 10 10	28, 53, 70, 83	46 (12%)
All	All	741/792 (93%)	0.69	47 (6%) 26 27	23, 49, 65, 83	61 (8%)

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	106	ALA	6.7
1	B	103	THR	6.6
1	A	96	GLY	5.1
1	B	466	GLY	4.6
1	B	197	ILE	4.3
1	B	96	GLY	3.9
1	B	445	PHE	3.9
1	B	155	LEU	3.9
1	B	202	TYR	3.7
1	B	287	TYR	3.7
1	B	328	TYR	3.5
1	B	153	LEU	3.5
1	B	353	THR	3.4
1	B	289	VAL	3.2
1	B	124	ILE	3.2
1	B	426	GLY	3.0
1	B	406	LEU	2.9
1	A	355	ASP	2.8
1	B	156	VAL	2.8
1	A	341	LYS	2.8
1	B	371	LEU	2.8
1	B	451	THR	2.8
1	B	462	LEU	2.8
1	A	465	ALA	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	120	LEU	2.7
1	B	152	LEU	2.7
1	B	242	ARG	2.7
1	A	308	HIS	2.7
1	B	457	VAL	2.7
1	B	416	LYS	2.7
1	B	164	VAL	2.6
1	B	444	ILE	2.6
1	B	351	LEU	2.6
1	B	107	ALA	2.6
1	B	458	LEU	2.6
1	B	157	LYS	2.6
1	B	203	VAL	2.4
1	B	108	PRO	2.4
1	B	350	PHE	2.3
1	B	284	LYS	2.3
1	B	325	TYR	2.3
1	B	204	LEU	2.2
1	B	319	MET	2.2
1	B	311	ALA	2.1
1	B	465	ALA	2.1
1	B	404	LEU	2.1
1	B	428	LEU	2.1

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

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

6.3 Carbohydrates [i](#)

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

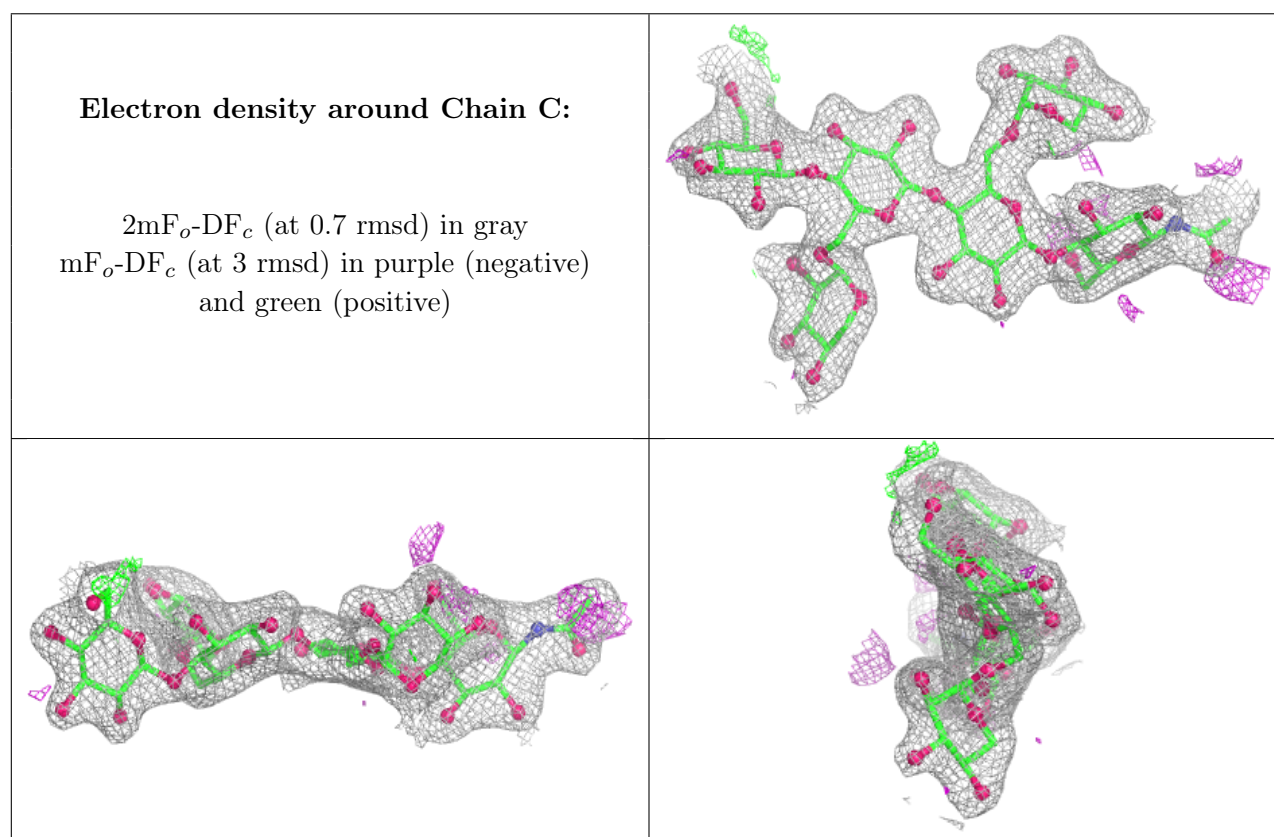
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	XYS	D	5	9/10	0.71	0.19	46,49,53,53	9
2	BGC	C	4	11/12	0.78	0.10	45,50,55,74	0
3	XYS	D	6	9/10	0.80	0.22	33,37,38,41	9
2	XYS	C	5	9/10	0.85	0.11	49,51,53,53	0
3	BGC	D	4	11/12	0.85	0.10	47,58,63,64	0

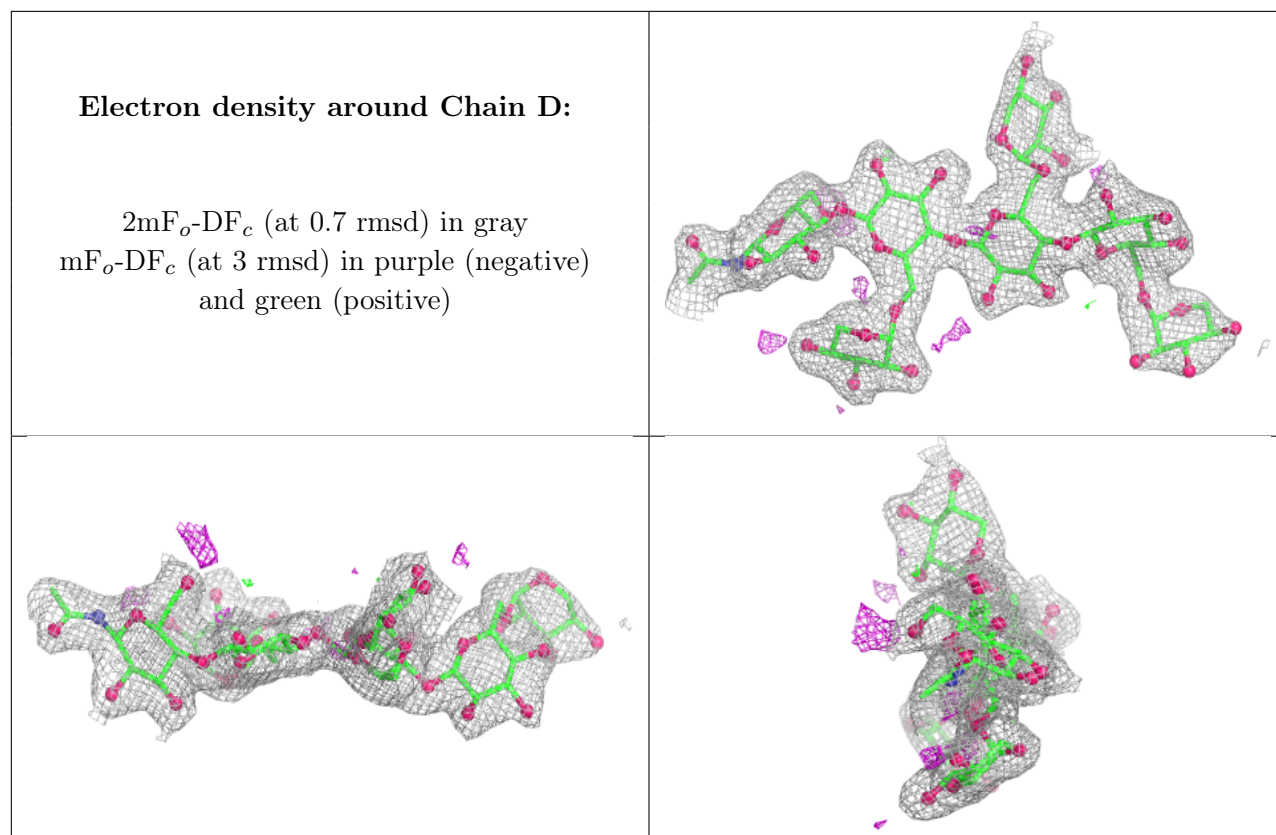
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	BGC	D	3	11/12	0.89	0.10	40,45,48,52	0
2	XYS	C	6	9/10	0.93	0.07	34,41,42,44	0
3	NBG	D	1	15/15	0.93	0.09	38,45,51,53	0
3	XYS	D	7	9/10	0.93	0.08	36,40,45,45	0
3	BGC	D	2	11/12	0.94	0.07	33,40,41,46	0
2	NBG	C	1	15/15	0.94	0.07	36,39,48,52	0
2	BGC	C	2	11/12	0.94	0.07	33,37,40,41	0
2	BGC	C	3	11/12	0.95	0.06	35,39,47,50	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.





6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	GOL	A	507	6/6	0.62	0.21	47,52,53,53	6
4	GOL	A	508	6/6	0.70	0.25	42,44,46,52	6
4	GOL	A	509	6/6	0.75	0.29	42,44,46,46	6
4	GOL	B	509	6/6	0.75	0.18	60,65,68,72	6
4	GOL	B	508	6/6	0.79	0.11	63,69,73,78	0
6	SO4	B	511	5/5	0.85	0.10	44,45,55,57	5
5	CL	B	510	1/1	0.87	0.10	76,76,76,76	0
5	CL	A	510	1/1	0.97	0.18	54,54,54,54	1

6.5 Other polymers [i](#)

There are no such residues in this entry.