



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 14, 2026 – 02:07 PM JST

PDB ID : 24AI / pdb_000024ai
Title : alpha-1,2-glucosidase from Arthrobacter humicola A8F5, kojibiose complex
Authors : Yasukochi, R.; Fushinobu, S.
Deposited on : 2026-02-26
Resolution : 1.79 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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

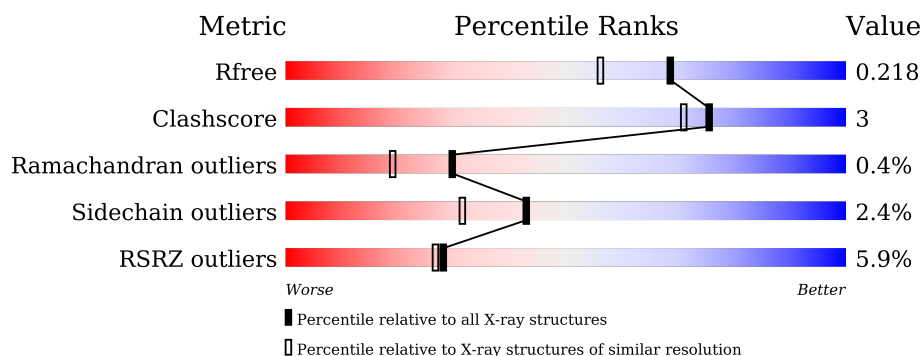
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.79 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	639	7% 85% 11% ..
1	B	639	5% 85% 8% 5%
2	C	2	100%
2	D	2	100%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 9708 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 alpha-1,2-glucosidase.

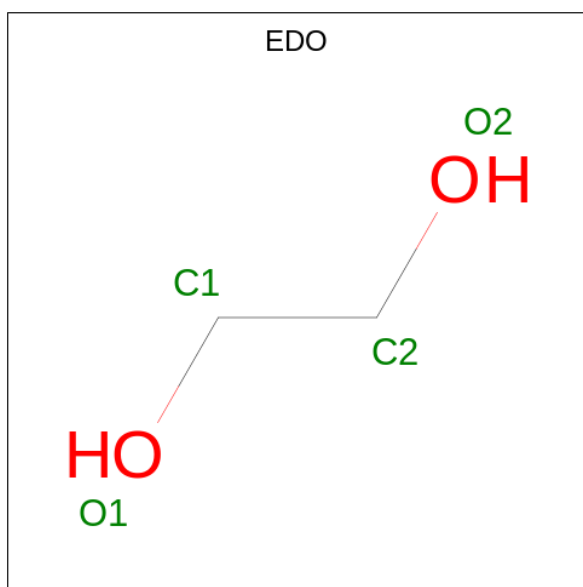
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	618	Total	C	N	O	S	0	0	0
			4638	2923	848	854	13			
1	B	609	Total	C	N	O	S	0	0	0
			4576	2887	835	841	13			

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



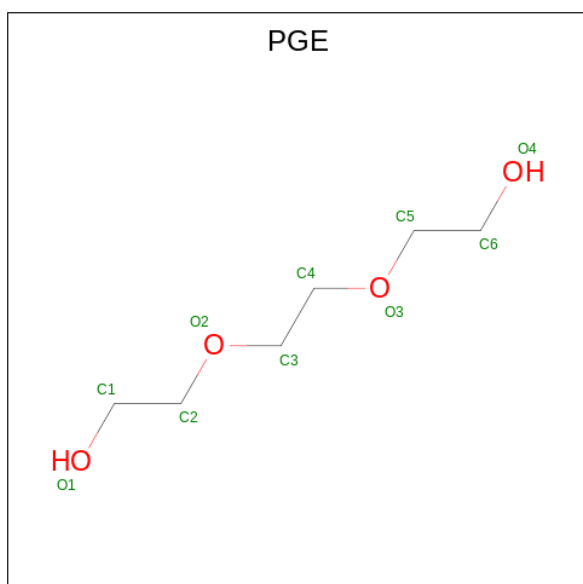
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	2	Total	C	O	0	0	0
			23	12	11			
2	D	2	Total	C	O	0	0	0
			23	12	11			

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



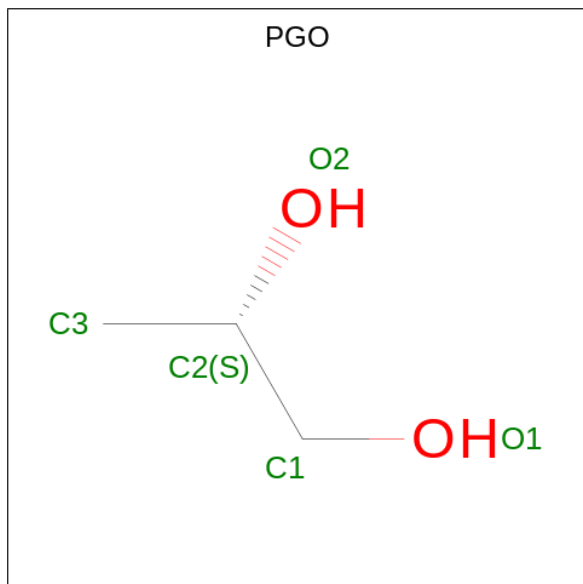
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is TRIETHYLENE GLYCOL (CCD ID: PGE) (formula: C₆H₁₄O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			10	6	4		
4	A	1	Total	C	O	0	0
			10	6	4		
4	B	1	Total	C	O	0	0
			10	6	4		

- Molecule 5 is S-1,2-PROPANEDIOL (CCD ID: PGO) (formula: $C_3H_8O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			5	3	2		
5	B	1	Total	C	O	0	0
			5	3	2		
5	B	1	Total	C	O	0	0
			5	3	2		

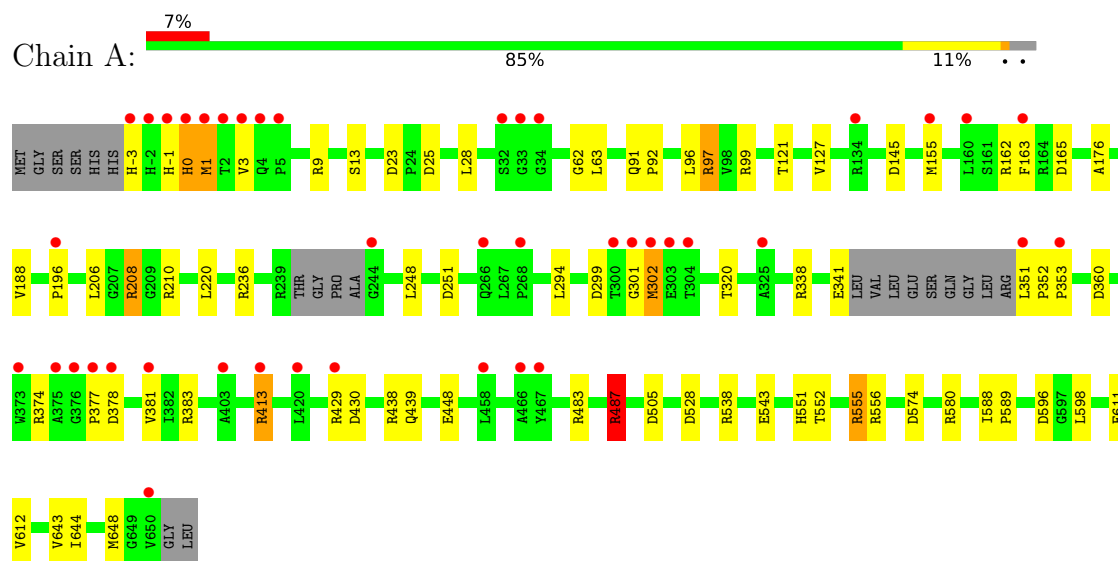
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	194	Total	O	0	0
			194	194		
6	B	189	Total	O	0	0
			189	189		

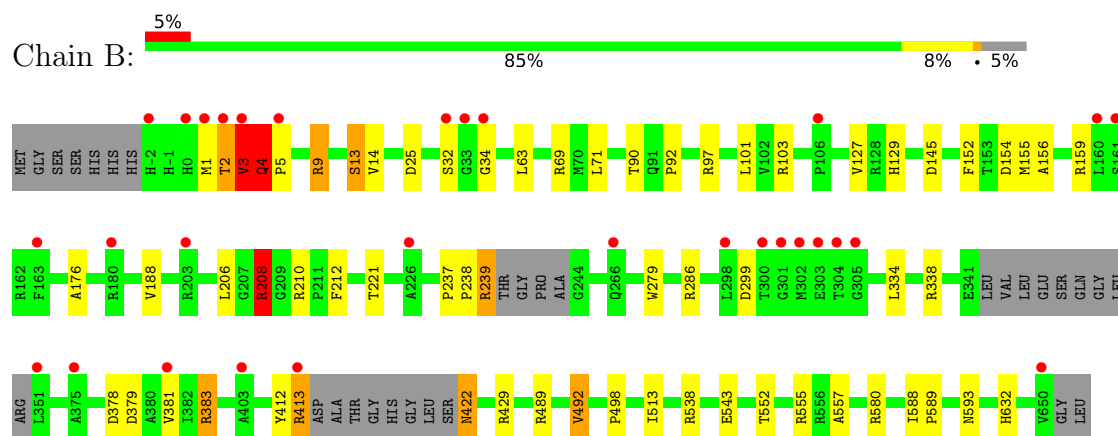
3 Residue-property plots [i](#)

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.

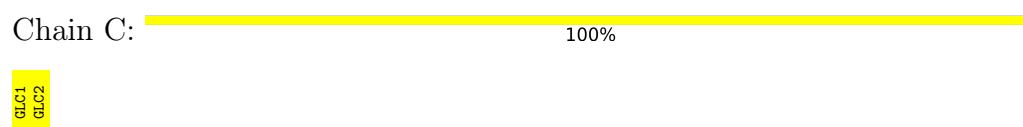
• Molecule 1: alpha-1,2-glucosidase



• Molecule 1: alpha-1,2-glucosidase



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



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

Chain D:

100%

GLC1
GLC2

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.78Å 109.46Å 105.37Å 90.00° 93.27° 90.00°	Depositor
Resolution (Å)	48.60 – 1.79 48.60 – 1.79	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.60-1.79) 100.0 (48.60-1.79)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.23 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.168 , 0.210 0.181 , 0.218	Depositor DCC
R_{free} test set	5850 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	23.2	Xtriage
Anisotropy	0.013	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 37.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	9708	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PGO, PGE, EDO, 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	0.98	2/4758 (0.0%)	1.37	32/6491 (0.5%)
1	B	0.99	5/4693 (0.1%)	1.35	21/6401 (0.3%)
All	All	0.99	7/9451 (0.1%)	1.36	53/12892 (0.4%)

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	7
1	B	0	7
All	All	0	14

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	92	PRO	CA-CB	6.56	1.63	1.53
1	A	580	ARG	CZ-NH2	-6.12	1.25	1.33
1	B	632	HIS	CE1-NE2	5.87	1.38	1.32
1	B	632	HIS	ND1-CE1	5.83	1.38	1.32
1	A	551	HIS	CE1-NE2	5.75	1.38	1.32
1	B	129	HIS	CE1-NE2	5.65	1.38	1.32
1	B	580	ARG	CZ-NH2	-5.48	1.26	1.33

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	239	ARG	NE-CZ-NH2	11.58	129.62	119.20
1	B	580	ARG	CD-NE-CZ	-10.65	109.49	124.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	430	ASP	CA-CB-CG	8.61	121.21	112.60
1	B	239	ARG	CD-NE-CZ	8.52	136.33	124.40
1	B	239	ARG	NE-CZ-NH1	-8.32	113.18	121.50
1	A	538	ARG	CG-CD-NE	-6.89	96.84	112.00
1	B	97	ARG	CD-NE-CZ	-6.58	115.19	124.40
1	A	487	ARG	NE-CZ-NH2	6.45	125.00	119.20
1	A	574	ASP	CA-CB-CG	6.44	119.04	112.60
1	B	299	ASP	CA-CB-CG	6.38	118.98	112.60
1	A	611	GLU	CG-CD-OE2	6.26	132.80	118.40
1	A	299	ASP	CA-CB-CG	6.18	118.78	112.60
1	B	4	GLN	O-C-N	-6.17	114.23	121.32
1	B	538	ARG	NE-CZ-NH1	-6.14	115.36	121.50
1	A	430	ASP	CB-CA-C	-6.11	100.24	110.56
1	A	580	ARG	CD-NE-CZ	-6.04	115.95	124.40
1	B	221	THR	OG1-CB-CG2	-6.03	97.24	109.30
1	A	528	ASP	CA-CB-CG	6.00	118.60	112.60
1	A	538	ARG	NE-CZ-NH1	-6.00	115.50	121.50
1	A	611	GLU	CG-CD-OE1	-5.89	104.86	118.40
1	A	97	ARG	CD-NE-CZ	5.82	132.55	124.40
1	B	422	ASN	CA-CB-CG	5.80	118.40	112.60
1	A	210	ARG	N-CA-CB	5.77	119.69	111.21
1	A	99	ARG	NE-CZ-NH2	-5.71	114.06	119.20
1	A	483	ARG	NE-CZ-NH1	-5.69	115.81	121.50
1	B	239	ARG	CB-CG-CD	5.66	124.31	111.30
1	B	145	ASP	CA-CB-CG	5.65	118.25	112.60
1	A	23	ASP	CA-CB-CG	5.61	118.21	112.60
1	A	448	GLU	N-CA-CB	5.61	118.46	110.16
1	B	71	LEU	N-CA-CB	-5.50	101.44	110.68
1	A	580	ARG	NE-CZ-NH1	5.48	126.98	121.50
1	A	210	ARG	CA-CB-CG	5.47	125.04	114.10
1	A	338	ARG	NE-CZ-NH2	5.46	124.11	119.20
1	A	320	THR	CA-CB-OG1	-5.40	101.50	109.60
1	A	438	ARG	CA-CB-CG	5.35	124.80	114.10
1	B	538	ARG	CG-CD-NE	-5.35	100.24	112.00
1	B	538	ARG	NE-CZ-NH2	5.33	124.00	119.20
1	A	374	ARG	CD-NE-CZ	5.32	131.84	124.40
1	A	429	ARG	N-CA-CB	5.29	118.48	110.28
1	B	593	ASN	CB-CA-C	-5.29	102.58	110.88
1	B	429	ARG	CB-CG-CD	-5.29	99.14	111.30
1	B	13	SER	N-CA-CB	5.27	120.56	111.13
1	A	505	ASP	CA-CB-CG	5.26	117.86	112.60
1	A	163	PHE	CA-CB-CG	-5.17	108.63	113.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	593	ASN	CA-CB-CG	5.16	117.76	112.60
1	B	286	ARG	CD-NE-CZ	5.16	131.62	124.40
1	B	208	ARG	NE-CZ-NH1	-5.16	116.34	121.50
1	A	251	ASP	CA-CB-CG	5.15	117.75	112.60
1	A	302	MET	CA-C-N	5.12	127.65	120.28
1	A	302	MET	C-N-CA	5.12	127.65	120.28
1	A	360	ASP	CA-CB-CG	5.03	117.62	112.60
1	A	580	ARG	NE-CZ-NH2	-5.02	114.68	119.20
1	A	429	ARG	CA-CB-CG	5.02	124.14	114.10

There are no chirality outliers.

All (14) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	162	ARG	Sidechain
1	A	208	ARG	Sidechain
1	A	236	ARG	Sidechain
1	A	383	ARG	Sidechain
1	A	487	ARG	Sidechain
1	A	556	ARG	Sidechain
1	A	97	ARG	Sidechain
1	B	103	ARG	Sidechain
1	B	208	ARG	Sidechain
1	B	239	ARG	Sidechain
1	B	34	GLY	Peptide
1	B	383	ARG	Sidechain
1	B	413	ARG	Sidechain
1	B	9	ARG	Sidechain

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4638	0	4526	28	0
1	B	4576	0	4473	27	0
2	C	23	0	21	0	0
2	D	23	0	21	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	12	0	18	0	0
3	B	8	0	12	3	0
4	A	20	0	28	3	0
4	B	10	0	14	0	0
5	A	5	0	8	0	0
5	B	10	0	16	1	0
6	A	194	0	0	3	0
6	B	189	0	0	1	0
All	All	9708	0	9137	56	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 (56) 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:-1:HIS:NE2	1:A:165:ASP:OD1	2.09	0.84
1:B:63:LEU:HD11	1:B:127:VAL:HG21	1.67	0.77
1:A:63:LEU:HD11	1:A:127:VAL:HG21	1.77	0.66
1:B:379:ASP:OD2	1:B:383:ARG:NE	2.32	0.63
1:A:413:ARG:HH11	1:A:413:ARG:HG2	1.66	0.61
1:A:378:ASP:HB3	1:A:381:VAL:HG23	1.83	0.60
3:B:705:EDO:H22	6:B:903:HOH:O	2.03	0.59
1:B:543:GLU:HA	1:B:555:ARG:HG2	1.84	0.59
1:B:208:ARG:O	1:B:208:ARG:HG3	2.03	0.58
1:B:14:VAL:HG22	3:B:705:EDO:H11	1.86	0.57
1:A:301:GLY:O	1:A:302:MET:HB3	2.05	0.57
4:A:705:PGE:H5	6:A:986:HOH:O	2.06	0.55
1:B:1:MET:O	1:B:2:THR:HB	2.07	0.54
1:A:206:LEU:HD23	1:A:206:LEU:N	2.23	0.53
1:B:3:VAL:HG12	1:B:5:PRO:HD3	1.90	0.53
1:B:412:TYR:CE1	1:B:422:ASN:HA	2.45	0.51
1:A:487:ARG:HD2	6:A:838:HOH:O	2.11	0.51
1:A:121:THR:HG21	4:A:705:PGE:H42	1.93	0.50
1:A:598:LEU:HD13	1:A:644:ILE:HD11	1.92	0.50
1:A:25:ASP:OD1	1:B:9:ARG:NH2	2.38	0.49
1:A:341:GLU:HG3	1:A:351:LEU:O	2.12	0.49
1:A:-1:HIS:CD2	1:A:165:ASP:OD1	2.66	0.47
1:A:13:SER:HB2	1:A:96:LEU:HG	1.97	0.47
1:A:145:ASP:OD1	6:A:801:HOH:O	2.21	0.47
1:B:154:ASP:OD2	1:B:156:ALA:HB3	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:301:GLY:O	1:A:302:MET:CB	2.61	0.46
4:A:705:PGE:H52	4:A:705:PGE:H3	1.70	0.46
1:A:588:ILE:N	1:A:589:PRO:CD	2.79	0.46
1:B:69:ARG:O	1:B:152:PHE:HA	2.17	0.46
1:B:155:MET:HG3	1:B:279:TRP:CE3	2.52	0.45
1:B:378:ASP:HB3	1:B:381:VAL:HG23	1.99	0.45
1:A:91:GLN:OE1	1:A:92:PRO:HD2	2.17	0.44
1:B:176:ALA:HA	1:B:188:VAL:O	2.18	0.44
1:A:0:HIS:O	1:A:1:MET:HB2	2.18	0.44
1:A:352:PRO:HB2	1:A:353:PRO:HD2	2.00	0.44
1:B:101:LEU:HD22	1:B:101:LEU:N	2.33	0.43
1:A:176:ALA:HA	1:A:188:VAL:O	2.18	0.43
1:A:294:LEU:HD22	1:A:643:VAL:HG21	2.00	0.43
1:B:588:ILE:HB	1:B:589:PRO:HD3	2.01	0.43
1:A:543:GLU:HA	1:A:555:ARG:HG2	2.00	0.43
1:A:596:ASP:OD1	1:A:648:MET:HE2	2.19	0.43
1:B:489:ARG:HH11	5:B:702:PGO:H11	1.83	0.43
1:B:513:ILE:HG12	1:B:557:ALA:HB2	2.01	0.42
1:A:352:PRO:HB2	1:A:353:PRO:CD	2.48	0.42
1:B:90:THR:HG21	3:B:705:EDO:O2	2.19	0.42
1:B:206:LEU:HB3	1:B:212:PHE:HB2	2.00	0.42
1:B:4:GLN:H	1:B:5:PRO:HD3	1.84	0.42
1:B:334:LEU:C	1:B:334:LEU:HD12	2.45	0.41
1:A:352:PRO:CB	1:A:353:PRO:CD	2.98	0.41
1:A:28:LEU:HD21	1:A:62:GLY:HA2	2.02	0.41
1:B:338:ARG:HD3	1:B:338:ARG:HA	1.89	0.41
1:A:9:ARG:NH2	1:B:25:ASP:OD1	2.43	0.41
1:B:492:VAL:O	1:B:498:PRO:HA	2.21	0.41
1:B:1:MET:O	1:B:2:THR:CB	2.69	0.40
1:A:63:LEU:HG	1:A:220:LEU:HD21	2.02	0.40
1:B:237:PRO:HA	1:B:238:PRO:HD3	1.94	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	612/639 (96%)	590 (96%)	20 (3%)	2 (0%)	36	25
1	B	601/639 (94%)	586 (98%)	12 (2%)	3 (0%)	24	14
All	All	1213/1278 (95%)	1176 (97%)	32 (3%)	5 (0%)	30	19

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	B	3	VAL
1	B	4	GLN
1	B	2	THR
1	A	3	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	458/474 (97%)	446 (97%)	12 (3%)	40	28
1	B	452/474 (95%)	442 (98%)	10 (2%)	45	34
All	All	910/948 (96%)	888 (98%)	22 (2%)	43	31

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	-3	HIS
1	A	0	HIS
1	A	155	MET
1	A	196	PRO
1	A	208	ARG
1	A	248	LEU
1	A	377	PRO
1	A	413	ARG

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Mol	Chain	Res	Type
1	A	439	GLN
1	A	552	THR
1	A	555	ARG
1	A	612	VAL
1	B	3	VAL
1	B	4	GLN
1	B	13	SER
1	B	32	SER
1	B	159	ARG
1	B	208	ARG
1	B	210	ARG
1	B	413	ARG
1	B	492	VAL
1	B	552	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	B	269	HIS

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 ⓘ

4 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	12,12,12	1.25	2 (16%)	17,17,17	1.16	2 (11%)
2	GLC	C	2	2	11,11,12	1.84	3 (27%)	15,15,17	1.66	3 (20%)
2	GLC	D	1	2	12,12,12	0.91	0	17,17,17	1.10	1 (5%)
2	GLC	D	2	2	11,11,12	1.37	3 (27%)	15,15,17	1.64	2 (13%)

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	-	2/2/22/22	0/1/1/1
2	GLC	C	2	2	-	0/2/19/22	0/1/1/1
2	GLC	D	1	2	-	2/2/22/22	0/1/1/1
2	GLC	D	2	2	-	0/2/19/22	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	2	GLC	C4-C5	2.99	1.59	1.53
2	C	2	GLC	C2-C3	2.87	1.56	1.52
2	D	2	GLC	O5-C1	2.43	1.47	1.43
2	C	1	GLC	O4-C4	2.23	1.48	1.43
2	C	1	GLC	C4-C5	2.19	1.57	1.53
2	D	2	GLC	O5-C5	2.07	1.47	1.43
2	D	2	GLC	O4-C4	2.05	1.47	1.43
2	C	2	GLC	O2-C2	2.03	1.47	1.43

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	2	GLC	C1-O5-C5	4.69	118.54	112.19
2	C	2	GLC	C1-O5-C5	4.23	117.93	112.19
2	C	2	GLC	O2-C2-C1	2.80	114.88	109.15
2	D	2	GLC	O5-C1-C2	2.55	114.70	110.77
2	C	2	GLC	O5-C5-C6	-2.35	103.53	107.20
2	C	1	GLC	C1-O5-C5	2.30	118.01	113.66
2	D	1	GLC	O5-C1-C2	-2.20	106.36	110.28
2	C	1	GLC	O4-C4-C5	2.02	114.31	109.30

There are no chirality outliers.

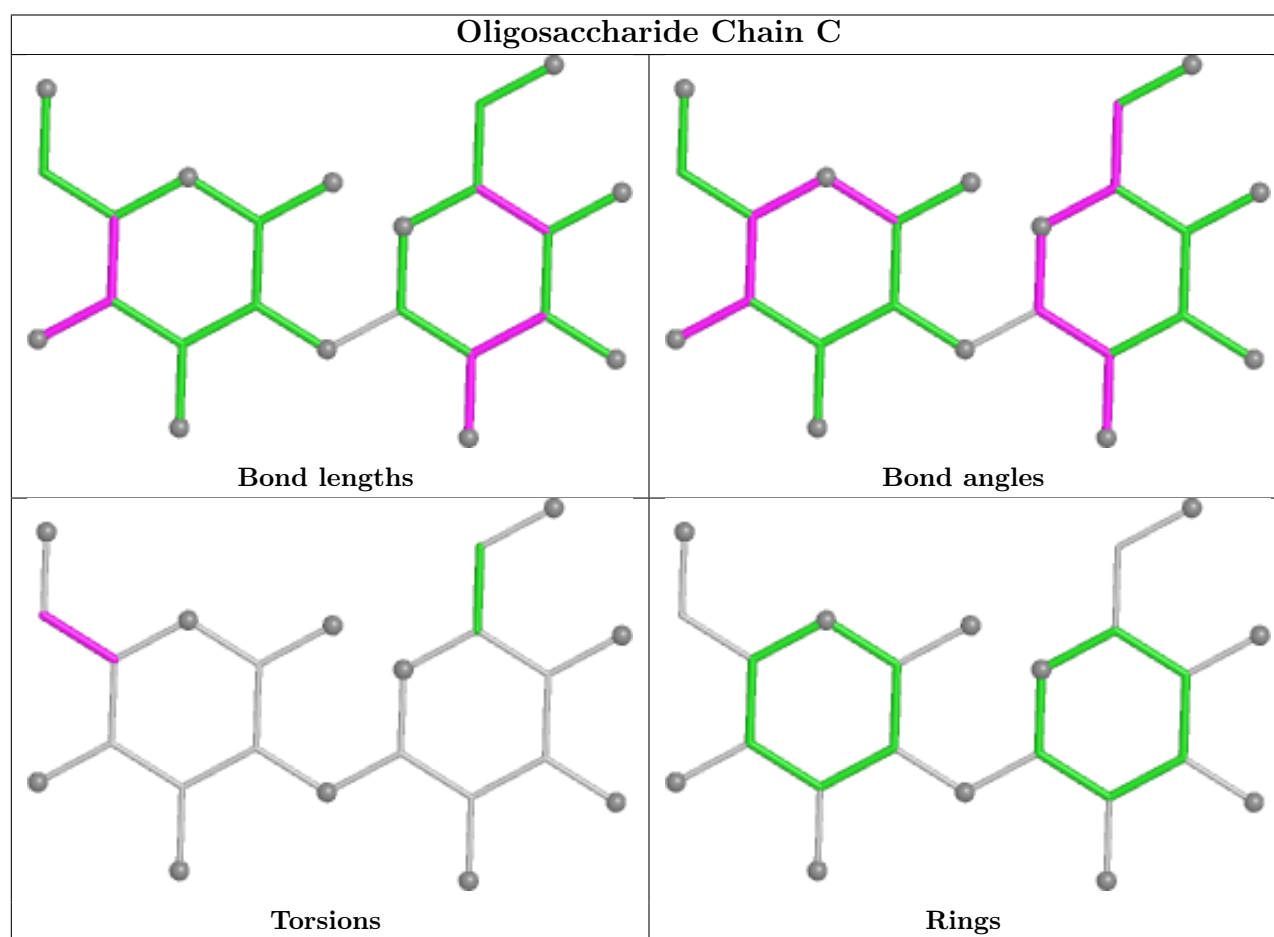
All (4) torsion outliers are listed below:

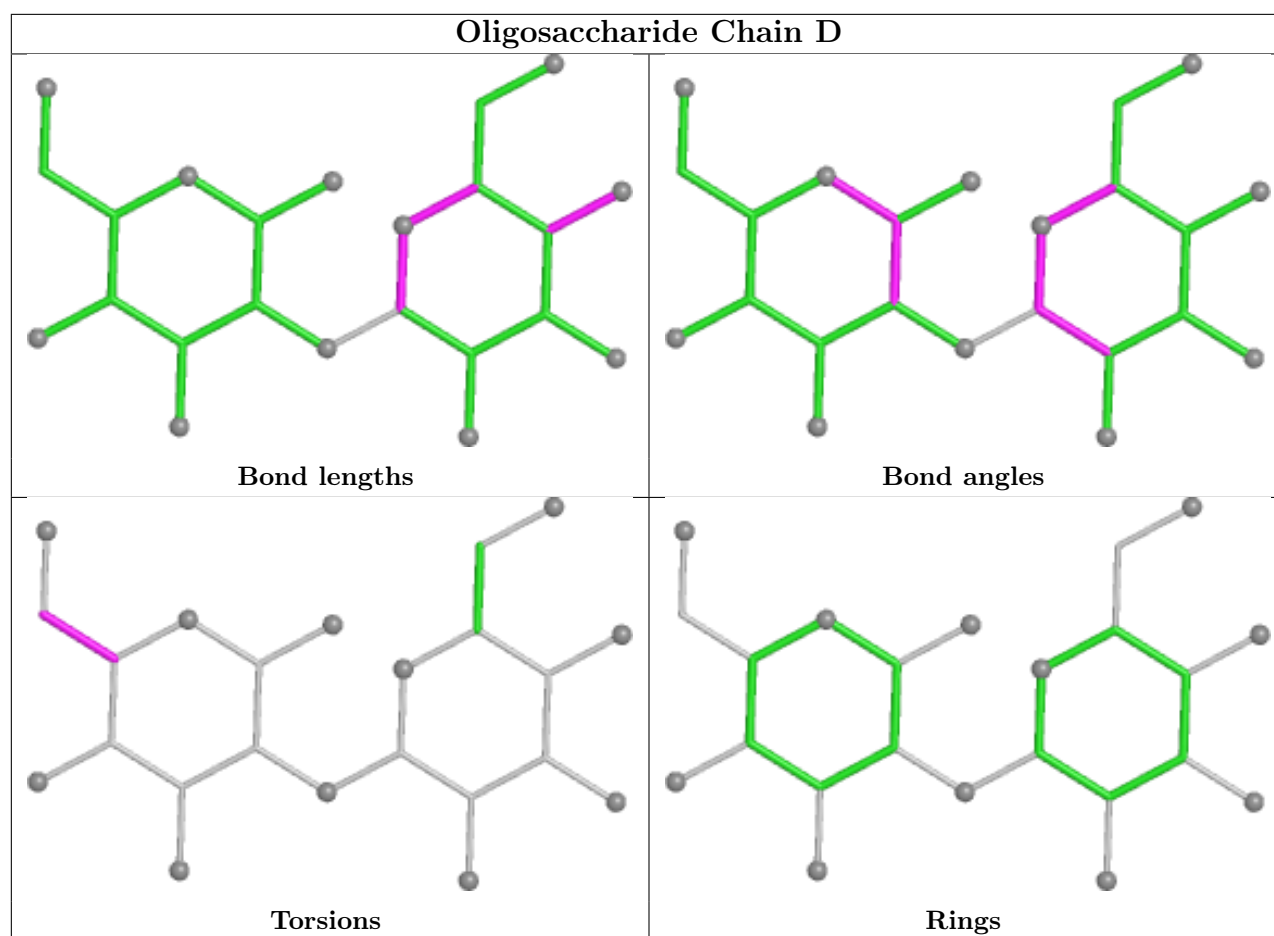
Mol	Chain	Res	Type	Atoms
2	C	1	GLC	C4-C5-C6-O6
2	C	1	GLC	O5-C5-C6-O6
2	D	1	GLC	C4-C5-C6-O6
2	D	1	GLC	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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](#)

11 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	EDO	B	704	-	3,3,3	0.54	0	2,2,2	0.96	0
3	EDO	A	706	-	3,3,3	0.70	0	2,2,2	0.74	0
4	PGE	A	705	-	9,9,9	0.50	0	8,8,8	0.65	0
3	EDO	B	705	-	3,3,3	0.54	0	2,2,2	0.35	0
4	PGE	A	702	-	9,9,9	0.48	0	8,8,8	0.43	0
3	EDO	A	701	-	3,3,3	0.32	0	2,2,2	0.44	0
5	PGO	A	703	-	3,4,4	0.51	0	1,4,4	1.21	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	PGO	B	702	-	3,4,4	1.04	0	1,4,4	0.31	0
3	EDO	A	704	-	3,3,3	0.25	0	2,2,2	0.08	0
4	PGE	B	703	-	9,9,9	0.26	0	8,8,8	0.45	0
5	PGO	B	701	-	3,4,4	1.04	0	1,4,4	2.00	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	EDO	B	704	-	-	1/1/1/1	-
3	EDO	A	706	-	-	1/1/1/1	-
4	PGE	A	705	-	-	4/7/7/7	-
3	EDO	B	705	-	-	0/1/1/1	-
4	PGE	A	702	-	-	4/7/7/7	-
3	EDO	A	701	-	-	1/1/1/1	-
5	PGO	A	703	-	-	2/2/2/2	-
5	PGO	B	702	-	-	0/2/2/2	-
3	EDO	A	704	-	-	0/1/1/1	-
4	PGE	B	703	-	-	3/7/7/7	-
5	PGO	B	701	-	-	0/2/2/2	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	703	PGO	O1-C1-C2-C3
5	A	703	PGO	O1-C1-C2-O2
4	A	705	PGE	C3-C4-O3-C5
4	A	702	PGE	O3-C5-C6-O4
4	A	705	PGE	O2-C3-C4-O3
4	A	705	PGE	O3-C5-C6-O4
4	A	702	PGE	C6-C5-O3-C4
3	B	704	EDO	O1-C1-C2-O2
4	B	703	PGE	C6-C5-O3-C4
4	A	705	PGE	C6-C5-O3-C4
3	A	706	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
4	B	703	PGE	O1-C1-C2-O2
4	A	702	PGE	O2-C3-C4-O3
4	A	702	PGE	O1-C1-C2-O2
4	B	703	PGE	O2-C3-C4-O3
3	A	701	EDO	O1-C1-C2-O2

There are no ring outliers.

3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	705	PGE	3	0
3	B	705	EDO	3	0
5	B	702	PGO	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	618/639 (96%)	0.30	42 (6%) 23 22	12, 24, 52, 149	0
1	B	609/639 (95%)	0.27	30 (4%) 35 33	14, 23, 53, 101	0
All	All	1227/1278 (96%)	0.28	72 (5%) 28 27	12, 23, 53, 149	0

All (72) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	3	VAL	8.6
1	A	33	GLY	6.3
1	B	3	VAL	6.2
1	B	0	HIS	5.0
1	B	33	GLY	5.0
1	A	351	LEU	5.0
1	B	304	THR	4.9
1	B	34	GLY	4.7
1	A	-3	HIS	4.5
1	B	-2	HIS	4.3
1	B	2	THR	4.3
1	A	5	PRO	4.3
1	A	34	GLY	4.2
1	B	351	LEU	4.2
1	A	304	THR	4.1
1	A	0	HIS	4.0
1	B	106	PRO	4.0
1	A	2	THR	3.9
1	B	300	THR	3.9
1	A	420	LEU	3.8
1	B	413	ARG	3.6
1	A	4	GLN	3.5
1	A	302	MET	3.4
1	A	375	ALA	3.4

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Mol	Chain	Res	Type	RSRZ
1	B	163	PHE	3.3
1	B	650	VAL	3.3
1	B	1	MET	3.2
1	B	161	SER	3.2
1	B	301	GLY	3.1
1	B	302	MET	3.1
1	A	376	GLY	3.0
1	A	650	VAL	2.9
1	A	381	VAL	2.9
1	A	301	GLY	2.9
1	B	375	ALA	2.8
1	A	32	SER	2.8
1	B	160	LEU	2.8
1	A	303	GLU	2.8
1	B	303	GLU	2.8
1	A	266	GLN	2.7
1	B	403	ALA	2.7
1	A	-2	HIS	2.6
1	A	373	TRP	2.6
1	A	413	ARG	2.6
1	A	1	MET	2.5
1	A	377	PRO	2.5
1	A	300	THR	2.5
1	B	266	GLN	2.5
1	B	203	ARG	2.4
1	A	196	PRO	2.4
1	B	5	PRO	2.4
1	B	381	VAL	2.4
1	A	155	MET	2.3
1	A	378	ASP	2.3
1	A	160	LEU	2.3
1	A	467	TYR	2.3
1	B	180	ARG	2.3
1	A	429	ARG	2.3
1	A	244	GLY	2.3
1	A	466	ALA	2.2
1	B	226	ALA	2.2
1	A	458	LEU	2.2
1	A	353	PRO	2.2
1	A	-1	HIS	2.2
1	A	325	ALA	2.1
1	A	163	PHE	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	268	PRO	2.1
1	A	403	ALA	2.0
1	A	134	ARG	2.0
1	B	32	SER	2.0
1	B	298	LEU	2.0
1	B	305	GLY	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](#)

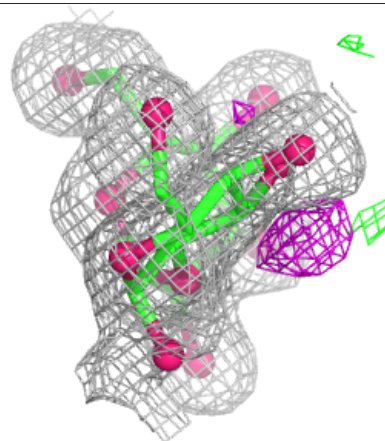
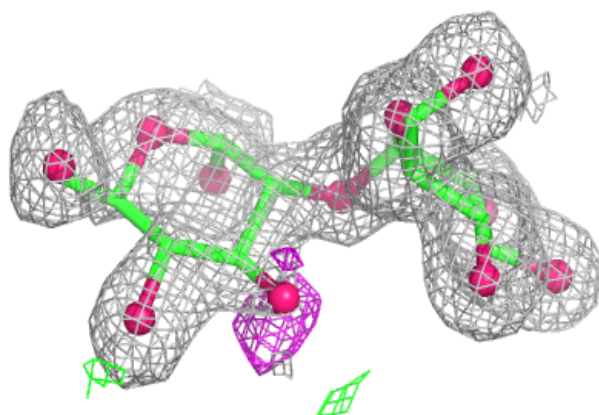
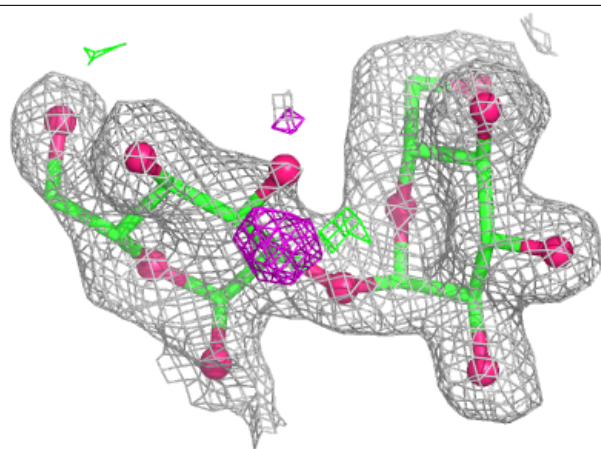
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

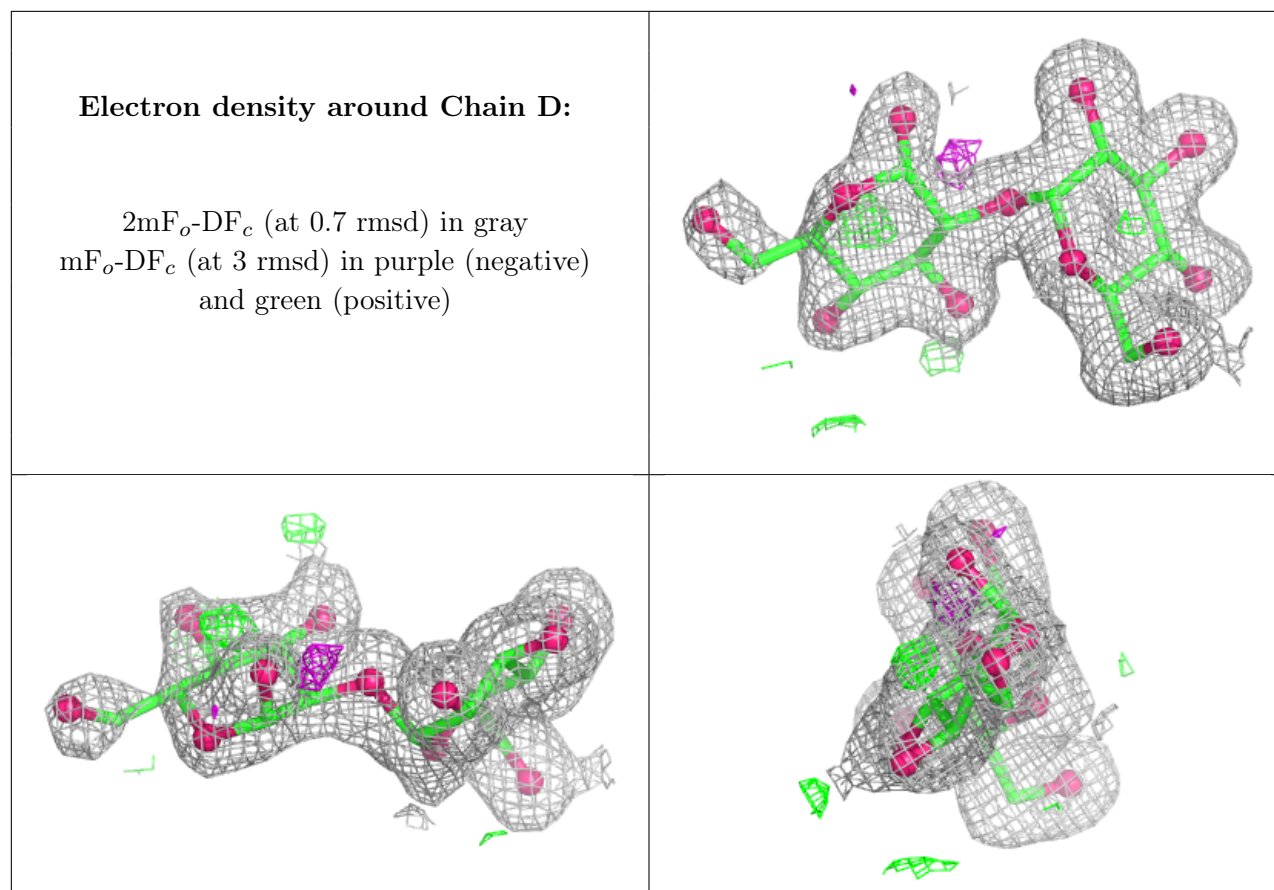
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GLC	C	1	12/12	0.77	0.16	39,57,63,65	0
2	GLC	D	1	12/12	0.89	0.12	23,42,54,55	0
2	GLC	C	2	11/12	0.93	0.09	19,27,32,36	0
2	GLC	D	2	11/12	0.96	0.06	19,20,23,23	0

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 ⓘ

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($\text{\AA}^2$)	Q<0.9
5	PGO	B	702	5/5	0.76	0.18	19,27,33,38	0
4	PGE	A	702	10/10	0.80	0.17	40,48,51,54	0
3	EDO	A	701	4/4	0.81	0.19	40,47,50,50	0
4	PGE	A	705	10/10	0.84	0.17	32,46,56,66	0
3	EDO	A	704	4/4	0.84	0.14	37,42,42,42	0
4	PGE	B	703	10/10	0.87	0.14	37,44,47,57	0
5	PGO	B	701	5/5	0.88	0.13	20,27,30,30	0
3	EDO	A	706	4/4	0.89	0.12	26,36,40,45	0
5	PGO	A	703	5/5	0.89	0.13	22,27,35,53	0
3	EDO	B	704	4/4	0.90	0.17	24,38,44,46	0
3	EDO	B	705	4/4	0.96	0.08	18,31,33,40	0

6.5 Other polymers [i](#)

There are no such residues in this entry.