



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 05:49 AM UTC

PDB ID : 3RDK / pdb_00003rdk
Title : Protein crystal structure of xylanase A1 of Paenibacillus sp. JDR-2
Authors : Pozharski, E.; St John, F.J.
Deposited on : 2011-04-01
Resolution : 1.49 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)
Xtrriage (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

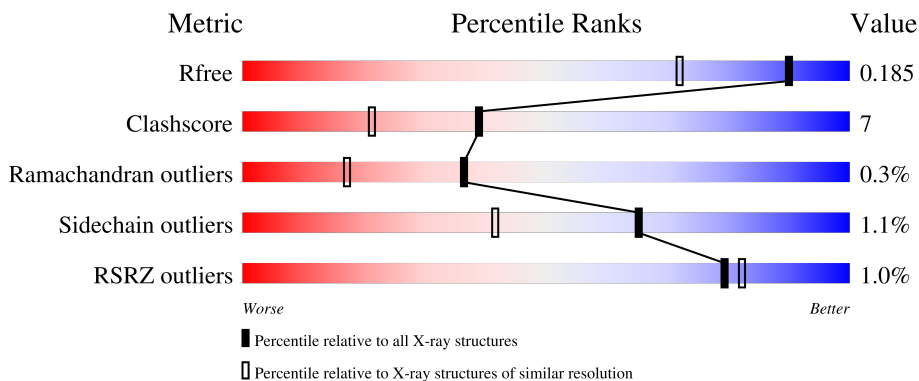
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.49 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	4037 (1.50-1.50)
Clashscore	190562	4235 (1.50-1.50)
Ramachandran outliers	187476	4153 (1.50-1.50)
Sidechain outliers	187428	4150 (1.50-1.50)
RSRZ outliers	180081	4039 (1.50-1.50)

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	341	 79% 17% ..
1	B	341	 84% 13% .
2	C	4	 100%
2	D	4	 75% 25%

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
3	GOL	A	347[A]	-	X	X	-
3	GOL	A	349	-	-	X	-
3	GOL	B	347[A]	-	X	X	-
3	GOL	B	347[B]	-	X	X	-
3	GOL	B	349	-	X	-	-

2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 6364 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 Endo-1,4-beta-xylanase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	333	2735	1737	467	519	12	0	14	0
1	B	334	2748	1736	470	529	13	0	13	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	GLY	-	expression tag	UNP C6CRV0
A	2	SER	-	expression tag	UNP C6CRV0
A	3	HIS	-	expression tag	UNP C6CRV0
A	4	MET	-	expression tag	UNP C6CRV0
A	339	ALA	-	expression tag	UNP C6CRV0
A	340	GLU	-	expression tag	UNP C6CRV0
A	341	GLN	-	expression tag	UNP C6CRV0
B	1	GLY	-	expression tag	UNP C6CRV0
B	2	SER	-	expression tag	UNP C6CRV0
B	3	HIS	-	expression tag	UNP C6CRV0
B	4	MET	-	expression tag	UNP C6CRV0
B	339	ALA	-	expression tag	UNP C6CRV0
B	340	GLU	-	expression tag	UNP C6CRV0
B	341	GLN	-	expression tag	UNP C6CRV0

- Molecule 2 is an oligosaccharide called 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-alpha-D-xylopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	4	Total	C	O	0	0	0
			41	22	19			
2	D	4	Total	C	O	0	0	0
			41	22	19			

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	1
			12	6	6		
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	1
			12	6	6		
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	1
			12	6	6		
3	B	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	3	Total Cl 3 3	0	0

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total Mg 1 1	0	0

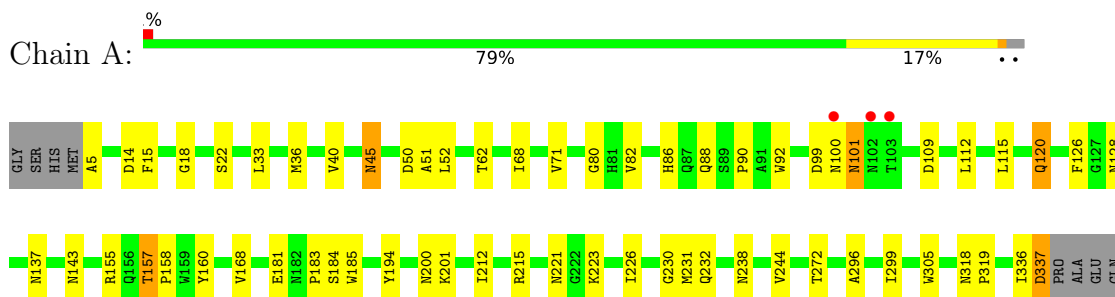
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	362	Total O 364 364	0	2
6	B	358	Total O 359 359	0	1

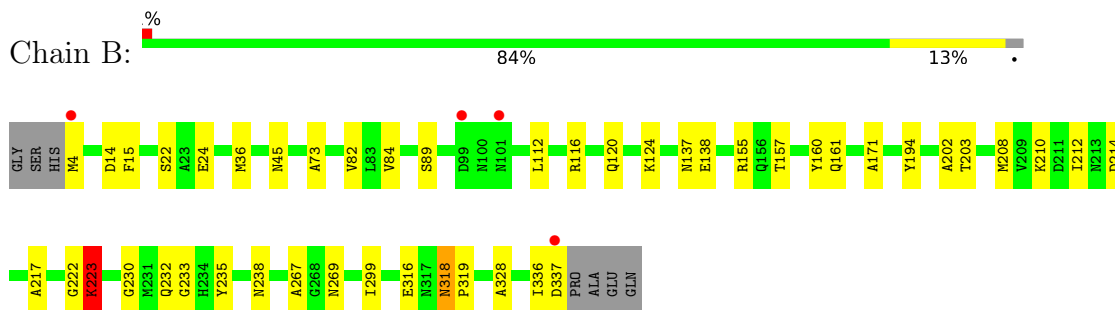
3 Residue-property plots [i](#)

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.

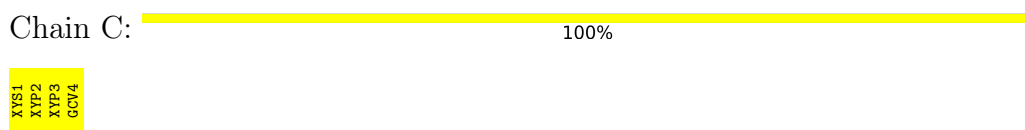
- Molecule 1: Endo-1,4-beta-xylanase



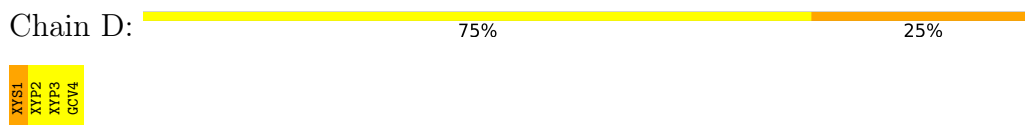
- Molecule 1: Endo-1,4-beta-xylanase



- Molecule 2: 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-alpha-D-xylopyranose



- Molecule 2: 4-O-methyl-alpha-D-glucopyranuronic acid-(1-2)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-alpha-D-xylopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	165.11Å 165.11Å 66.36Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	117.04 – 1.49 116.75 – 1.49	Depositor EDS
% Data completeness (in resolution range)	99.7 (117.04-1.49) 99.7 (116.75-1.49)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.38 (at 1.49Å)	Xtrriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.145 , 0.184 0.145 , 0.185	Depositor DCC
R_{free} test set	7447 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	25.8	Xtrriage
Anisotropy	0.032	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 44.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	6364	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.78% 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, XYS, CL, XYP, GCV, MG

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	1.60	18/2831 (0.6%)	1.35	13/3845 (0.3%)
1	B	1.59	16/2829 (0.6%)	1.29	4/3845 (0.1%)
All	All	1.59	34/5660 (0.6%)	1.32	17/7690 (0.2%)

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

All (34) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	318	ASN	CA-CB	9.05	1.59	1.52
1	A	143	ASN	C-O	7.97	1.27	1.23
1	A	86	HIS	N-CA	6.60	1.54	1.46
1	B	84	VAL	C-O	6.39	1.30	1.24
1	A	157	THR	CA-CB	6.34	1.60	1.53
1	A	244	VAL	CA-CB	6.26	1.61	1.54
1	A	238	ASN	N-CA	6.24	1.54	1.46
1	B	299	ILE	N-CA	6.15	1.53	1.46
1	B	223	LYS	CE-NZ	6.09	1.67	1.49
1	B	202	ALA	CA-CB	-6.02	1.43	1.53
1	A	120	GLN	CD-NE2	5.97	1.45	1.33
1	A	226	ILE	CA-CB	5.95	1.60	1.53
1	B	73	ALA	N-CA	5.77	1.53	1.46
1	B	171	ALA	CA-CB	5.64	1.62	1.53
1	B	212	ILE	CA-CB	5.62	1.61	1.54
1	A	272	THR	CA-CB	5.61	1.61	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	267	ALA	N-CA	5.50	1.53	1.46
1	B	269	ASN	CB-CG	-5.44	1.38	1.52
1	A	62	THR	C-O	5.41	1.30	1.24
1	B	203	THR	C-O	5.37	1.30	1.24
1	B	14	ASP	CA-C	5.31	1.57	1.52
1	A	128	ASN	CB-CG	5.29	1.65	1.52
1	A	45	ASN	C-O	5.29	1.29	1.24
1	B	238	ASN	N-CA	5.25	1.52	1.46
1	A	212	ILE	C-O	5.22	1.30	1.24
1	A	230	GLY	N-CA	5.22	1.51	1.44
1	A	80	GLY	C-O	5.12	1.29	1.23
1	A	51	ALA	CA-CB	5.12	1.62	1.53
1	B	223	LYS	CB-CG	5.11	1.67	1.52
1	B	208	MET	N-CA	5.07	1.52	1.46
1	B	336	ILE	CA-C	5.07	1.58	1.52
1	A	168	VAL	CA-CB	-5.06	1.48	1.54
1	A	223[A]	LYS	C-O	5.02	1.30	1.23
1	A	223[B]	LYS	C-O	5.02	1.30	1.23

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	168	VAL	N-CA-C	-9.06	102.01	110.53
1	A	5	ALA	CA-C-N	-7.36	112.40	119.76
1	A	5	ALA	C-N-CA	-7.36	112.40	119.76
1	A	337	ASP	N-CA-CB	6.53	121.61	110.50
1	B	161	GLN	N-CA-C	6.32	118.98	111.71
1	B	336	ILE	CA-C-N	6.21	132.88	121.70
1	B	336	ILE	C-N-CA	6.21	132.88	121.70
1	A	230	GLY	O-C-N	5.71	126.95	123.35
1	A	115	LEU	N-CA-C	-5.64	105.05	111.14
1	A	201	LYS	N-CA-C	-5.61	105.25	111.36
1	A	231	MET	N-CA-C	-5.45	99.64	108.41
1	A	200	ASN	N-CA-C	5.32	117.08	111.28
1	A	221	ASN	N-CA-C	5.29	118.74	111.54
1	A	52	LEU	CA-C-N	-5.20	117.53	122.37
1	A	52	LEU	C-N-CA	-5.20	117.53	122.37
1	A	71	VAL	N-CA-C	-5.18	105.45	110.42
1	B	230	GLY	O-C-N	5.01	126.50	123.35

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	336	ILE	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	2735	0	2681	36	0
1	B	2748	0	2654	29	0
2	C	41	0	18	0	0
2	D	41	0	18	1	0
3	A	42	0	53	19	0
3	B	30	0	38	15	0
4	A	3	0	0	0	1
5	A	1	0	0	0	0
6	A	364	0	0	10	0
6	B	359	0	0	15	1
All	All	6364	0	5462	76	2

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 (76) 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:223:LYS:CE	1:B:223:LYS:NZ	1.67	1.53
1:B:22:SER:HB2	3:B:347[B]:GOL:H12	1.19	1.12
1:A:22:SER:HB2	3:A:347[A]:GOL:H12	1.11	1.09
1:A:88:GLN:H	3:A:352[B]:GOL:H31	1.14	1.06
1:B:22:SER:HA	3:B:347[A]:GOL:H11	1.49	0.94
1:A:14:ASP:O	6:A:676[B]:HOH:O	1.86	0.93
1:A:22:SER:HB2	3:A:347[A]:GOL:C1	1.97	0.93
1:A:185:TRP:HE1	3:A:349:GOL:H12	1.34	0.92
3:A:347[A]:GOL:H11	6:A:708:HOH:O	1.74	0.88
1:B:22:SER:HB2	3:B:347[A]:GOL:H32	1.56	0.87
3:B:347[B]:GOL:H11	6:B:390:HOH:O	1.73	0.86
1:B:22:SER:HB2	3:B:347[B]:GOL:C1	2.08	0.80
1:A:82:VAL:HG21	1:A:137:ASN:HB2	1.66	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:88:GLN:N	3:A:352[B]:GOL:H31	1.97	0.76
1:A:22:SER:HB2	3:A:347[B]:GOL:H11	1.69	0.75
1:A:88:GLN:H	3:A:352[A]:GOL:H2	1.51	0.74
1:A:296:ALA:O	6:A:676[B]:HOH:O	2.06	0.72
1:A:185:TRP:NE1	3:A:349:GOL:H12	2.06	0.71
1:B:82:VAL:HG21	1:B:137:ASN:HB2	1.75	0.69
1:A:33[B]:LEU:HD23	1:A:36:MET:HE2	1.75	0.68
1:B:22:SER:CA	3:B:347[A]:GOL:H11	2.25	0.66
1:A:299:ILE:O	6:A:676[B]:HOH:O	2.14	0.65
3:B:347[B]:GOL:C1	6:B:390:HOH:O	2.39	0.65
1:B:22:SER:CB	3:B:347[A]:GOL:H32	2.30	0.62
1:B:210:LYS:HD2	6:B:447:HOH:O	2.01	0.60
3:A:347[B]:GOL:H31	6:A:708:HOH:O	2.01	0.60
1:A:68[B]:ILE:HD12	1:A:126:PHE:CE1	2.36	0.60
3:B:349:GOL:H11	6:B:683:HOH:O	2.03	0.59
1:A:45:ASN:HB2	3:A:347[A]:GOL:H31	1.84	0.58
1:B:120[B]:GLN:NE2	6:B:475:HOH:O	2.19	0.57
1:B:217:ALA:HB1	1:B:222:GLY:HA2	1.86	0.57
1:A:184:SER:OG	3:A:349:GOL:C3	2.54	0.56
1:A:337:ASP:HB3	6:A:593:HOH:O	2.05	0.56
1:B:4:MET:HB2	1:B:36:MET:HE1	1.88	0.55
1:B:155[A]:ARG:HD2	1:B:157:THR:CG2	2.37	0.55
1:A:109:ASP:HB2	3:A:353:GOL:H2	1.88	0.54
3:B:347[B]:GOL:C3	6:B:409:HOH:O	2.55	0.54
1:B:112[A]:LEU:HD21	6:B:663[A]:HOH:O	2.08	0.54
1:A:155[A]:ARG:HD2	1:A:157:THR:CG2	2.38	0.53
1:B:210:LYS:HE2	1:B:214:ASP:OD2	2.09	0.52
3:B:347[B]:GOL:H32	6:B:409:HOH:O	2.10	0.52
1:A:99:ASP:C	1:A:101:ASN:H	2.19	0.51
1:B:24[B]:GLU:OE2	6:B:359:HOH:O	2.19	0.50
1:A:184:SER:OG	3:A:349:GOL:H32	2.11	0.50
1:A:215:ARG:HG3	6:A:610:HOH:O	2.12	0.49
1:B:89:SER:H	3:B:349:GOL:H12	1.78	0.48
1:A:305:TRP:CD1	3:A:346:GOL:H12	2.48	0.48
1:A:33[B]:LEU:HD23	1:A:36:MET:CE	2.43	0.48
3:B:348:GOL:H32	6:B:713:HOH:O	2.14	0.48
1:B:116:ARG:HD2	6:B:663[A]:HOH:O	2.14	0.47
1:A:88:GLN:H	3:A:352[B]:GOL:C3	2.05	0.46
3:A:347[A]:GOL:H32	6:A:388:HOH:O	2.15	0.46
1:B:316:GLU:HG2	6:B:681:HOH:O	2.13	0.46
1:A:120:GLN:OE1	6:A:483:HOH:O	2.20	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:160:TYR:C	1:A:160:TYR:CD1	2.95	0.45
1:B:160:TYR:CD2	1:B:160:TYR:C	2.94	0.45
1:B:194:TYR:HB3	1:B:232:GLN:OE1	2.17	0.45
1:A:318:ASN:N	1:A:319:PRO:HD3	2.31	0.45
1:B:124:LYS:HE3	6:B:442:HOH:O	2.16	0.45
1:B:233:GLY:HA2	1:B:235:TYR:CZ	2.53	0.44
1:A:90:PRO:HB2	1:A:92:TRP:CD1	2.53	0.43
3:B:347[A]:GOL:H2	6:B:355:HOH:O	2.19	0.43
1:A:18:GLY:HA2	1:A:40:VAL:O	2.19	0.42
1:B:112[A]:LEU:CD2	6:B:663[A]:HOH:O	2.66	0.42
1:B:4:MET:HE1	1:B:328:ALA:HB2	1.99	0.42
1:A:50:ASP:HA	1:A:90:PRO:HD3	2.02	0.42
1:B:318:ASN:N	1:B:319:PRO:HD3	2.35	0.42
1:A:194:TYR:HB3	1:A:232:GLN:OE1	2.19	0.42
3:A:349:GOL:H11	6:A:500:HOH:O	2.20	0.42
1:A:181:GLU:C	1:A:183[B]:PRO:HD3	2.46	0.41
1:A:68[B]:ILE:HD12	1:A:126:PHE:CD1	2.56	0.41
1:B:155[B]:ARG:HG2	1:B:157:THR:HG23	2.02	0.41
1:A:185:TRP:HE1	3:A:349:GOL:C1	2.17	0.41
1:B:45:ASN:HB2	3:B:347[B]:GOL:H31	2.04	0.40
1:B:138:GLU:OE2	2:D:1:XYS:H1	2.22	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:351:CL:CL	4:A:351:CL:CL[7_555]	1.70	0.50
6:B:525:HOH:O	6:B:525:HOH:O[7_555]	2.09	0.11

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	345/341 (101%)	338 (98%)	5 (1%)	2 (1%)	21	6
1	B	345/341 (101%)	340 (99%)	5 (1%)	0	100	100
All	All	690/682 (101%)	678 (98%)	10 (1%)	2 (0%)	36	17

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	100	ASN
1	A	101	ASN

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	296/288 (103%)	293 (99%)	3 (1%)	68	45
1	B	296/288 (103%)	293 (99%)	3 (1%)	68	45
All	All	592/576 (103%)	586 (99%)	6 (1%)	65	45

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	PHE
1	A	112	LEU
1	A	158	PRO
1	B	15	PHE
1	B	223	LYS
1	B	337	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	186	ASN
1	A	220	HIS
1	A	298	HIS

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Mol	Chain	Res	Type
1	A	317	ASN
1	A	327	GLN
1	B	101	ASN
1	B	161	GLN
1	B	220	HIS
1	B	298	HIS

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](#)

8 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	XYS	C	1	2	10,10,10	2.51	3 (30%)	14,14,14	2.45	5 (35%)
2	XYP	C	2	2	9,9,10	2.73	3 (33%)	10,12,14	2.34	3 (30%)
2	XYP	C	3	2	9,9,10	2.79	4 (44%)	10,12,14	3.64	9 (90%)
2	GCV	C	4	2	13,13,14	1.32	2 (15%)	14,18,20	2.23	4 (28%)
2	XYS	D	1	2	10,10,10	2.40	5 (50%)	14,14,14	3.06	5 (35%)
2	XYP	D	2	2	9,9,10	3.08	4 (44%)	10,12,14	2.90	4 (40%)
2	XYP	D	3	2	9,9,10	3.04	3 (33%)	10,12,14	2.99	4 (40%)
2	GCV	D	4	2	13,13,14	1.44	1 (7%)	14,18,20	1.24	2 (14%)

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	XYS	C	1	2	-	-	0/1/1/1
2	XYP	C	2	2	-	-	0/1/1/1
2	XYP	C	3	2	-	-	0/1/1/1
2	GCV	C	4	2	-	1/6/23/26	0/1/1/1
2	XYS	D	1	2	-	-	0/1/1/1
2	XYP	D	2	2	-	-	0/1/1/1
2	XYP	D	3	2	-	-	0/1/1/1
2	GCV	D	4	2	-	0/6/23/26	0/1/1/1

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	XYP	O4-C4	7.33	1.58	1.43
2	D	3	XYP	O2-C2	7.29	1.58	1.43
2	C	2	XYP	O4-C4	6.79	1.57	1.43
2	C	1	XYS	O5-C1	5.56	1.52	1.43
2	C	3	XYP	C4-C3	5.30	1.60	1.52
2	D	1	XYS	O4-C4	4.75	1.53	1.43
2	D	2	XYP	O5-C5	4.08	1.50	1.43
2	C	1	XYS	O5-C5	3.71	1.49	1.43
2	C	3	XYP	O5-C5	3.69	1.50	1.43
2	D	3	XYP	O5-C1	-3.66	1.36	1.43
2	C	3	XYP	C2-C3	-3.63	1.46	1.52
2	C	1	XYS	O4-C4	3.62	1.50	1.43
2	D	1	XYS	O5-C1	3.37	1.48	1.43
2	C	4	GCV	O4-C7	3.13	1.53	1.42
2	C	2	XYP	C4-C3	3.10	1.57	1.52
2	D	3	XYP	C1-C2	3.01	1.59	1.52
2	D	1	XYS	O5-C5	2.82	1.48	1.43
2	D	1	XYS	C4-C3	2.81	1.56	1.52
2	C	2	XYP	O5-C5	2.73	1.48	1.43
2	D	4	GCV	O6B-C6	-2.54	1.22	1.30
2	D	1	XYS	C1-C2	2.45	1.58	1.52
2	C	3	XYP	O3-C3	2.38	1.48	1.43
2	D	2	XYP	C4-C3	-2.35	1.48	1.52
2	C	4	GCV	O5-C1	2.33	1.47	1.43
2	D	2	XYP	C2-C3	2.27	1.56	1.52

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	3	XYP	O2-C2-C3	8.03	126.79	110.15
2	D	1	XYS	C4-C3-C2	-7.00	98.55	110.86
2	C	2	XYP	C4-C3-C2	-6.09	103.68	110.92
2	D	1	XYS	O5-C5-C4	-5.78	96.99	110.79
2	D	2	XYP	C5-C4-C3	5.71	117.97	109.64
2	C	4	GCV	C1-C2-C3	-5.56	101.55	109.64
2	C	1	XYS	O5-C5-C4	-5.41	97.89	110.79
2	C	3	XYP	C1-C2-C3	-5.20	102.07	109.64
2	C	3	XYP	O2-C2-C3	4.94	120.37	110.15
2	D	2	XYP	C4-C3-C2	-4.49	105.59	110.92
2	C	1	XYS	C4-C3-C2	-4.38	103.16	110.86
2	D	2	XYP	O4-C4-C5	-4.38	99.19	109.22
2	C	3	XYP	O4-C4-C3	4.16	118.77	110.15
2	D	1	XYS	O4-C4-C3	-4.05	101.76	110.15
2	C	1	XYS	O1-C1-C2	3.71	119.76	108.98
2	C	4	GCV	C2-C3-C4	-3.69	103.06	110.51
2	D	1	XYS	C1-C2-C3	3.68	117.86	110.36
2	C	3	XYP	C5-O5-C1	-3.53	105.72	111.42
2	C	3	XYP	O4-C4-C5	-3.48	101.26	109.22
2	C	3	XYP	O2-C2-C1	3.39	116.98	109.22
2	C	4	GCV	C7-O4-C4	-3.32	105.95	114.47
2	C	3	XYP	O3-C3-C2	-3.15	103.63	110.05
2	C	3	XYP	C5-C4-C3	3.03	114.05	109.64
2	D	3	XYP	O3-C3-C2	-2.86	104.22	110.05
2	D	1	XYS	O3-C3-C4	-2.85	104.24	110.05
2	C	3	XYP	C4-C3-C2	-2.80	107.59	110.92
2	C	1	XYS	O3-C3-C4	-2.70	104.54	110.05
2	C	2	XYP	O4-C4-C5	-2.66	103.13	109.22
2	C	1	XYS	O4-C4-C3	-2.47	105.04	110.15
2	C	4	GCV	O3-C3-C2	2.41	114.97	110.05
2	D	3	XYP	C1-C2-C3	-2.35	106.22	109.64
2	D	4	GCV	O2-C2-C3	-2.32	105.35	110.15
2	D	2	XYP	C5-O5-C1	2.26	115.07	111.42
2	D	3	XYP	C5-O5-C1	-2.12	107.99	111.42
2	D	4	GCV	O6B-C6-C5	2.08	121.16	113.64
2	C	2	XYP	O3-C3-C4	-2.01	105.95	110.05

There are no chirality outliers.

All (1) torsion outliers are listed below:

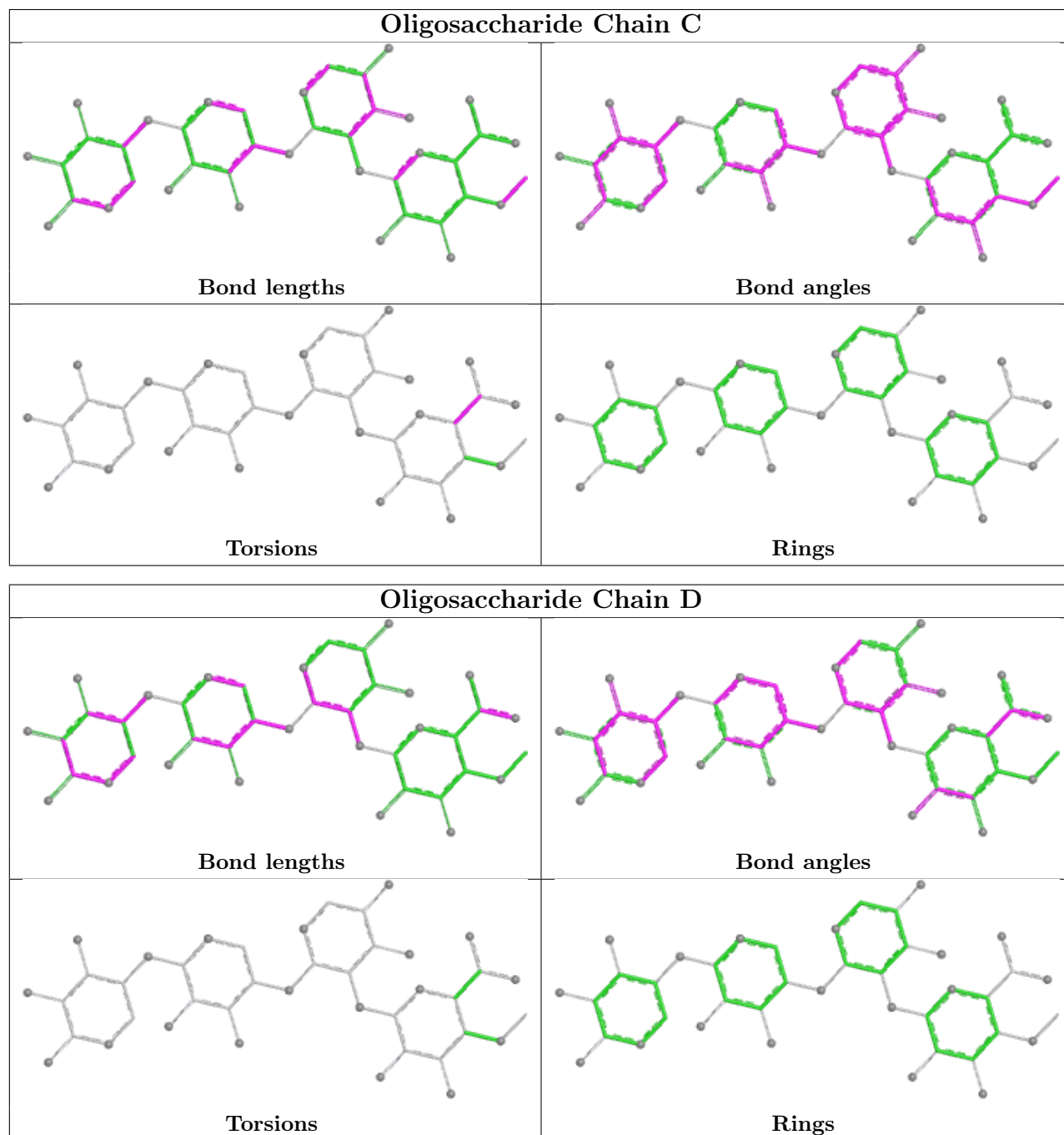
Mol	Chain	Res	Type	Atoms
2	C	4	GCV	O5-C5-C6-O6B

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	1	XYS	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 16 ligands modelled in this entry, 4 are monoatomic - leaving 12 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
3	GOL	A	347[B]	5	5,5,5	1.54	1 (20%)	5,5,5	1.94	1 (20%)
3	GOL	B	347[B]	-	5,5,5	2.33	1 (20%)	5,5,5	1.47	1 (20%)
3	GOL	B	346	-	5,5,5	1.04	0	5,5,5	0.76	0
3	GOL	A	347[A]	5	5,5,5	1.60	2 (40%)	5,5,5	1.98	2 (40%)
3	GOL	B	348	-	5,5,5	0.74	0	5,5,5	1.11	0
3	GOL	B	349	-	5,5,5	1.05	0	5,5,5	1.84	2 (40%)
3	GOL	A	352[B]	-	5,5,5	0.62	0	5,5,5	0.48	0
3	GOL	A	353	-	5,5,5	1.19	0	5,5,5	0.47	0
3	GOL	B	347[A]	-	5,5,5	1.64	1 (20%)	5,5,5	2.00	2 (40%)
3	GOL	A	346	-	5,5,5	1.16	0	5,5,5	0.79	0
3	GOL	A	349	-	5,5,5	0.75	0	5,5,5	1.43	2 (40%)
3	GOL	A	352[A]	-	5,5,5	0.60	0	5,5,5	0.56	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	347[B]	5	-	3/4/4/4	-
3	GOL	B	347[B]	-	-	4/4/4/4	-
3	GOL	B	346	-	-	0/4/4/4	-
3	GOL	A	347[A]	5	-	4/4/4/4	-
3	GOL	B	348	-	-	2/4/4/4	-
3	GOL	B	349	-	-	4/4/4/4	-
3	GOL	A	352[B]	-	-	4/4/4/4	-
3	GOL	A	353	-	-	0/4/4/4	-
3	GOL	B	347[A]	-	-	3/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	A	346	-	-	0/4/4/4	-
3	GOL	A	349	-	-	0/4/4/4	-
3	GOL	A	352[A]	-	-	4/4/4/4	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	347[B]	GOL	O2-C2	-4.77	1.29	1.43
3	B	347[A]	GOL	O2-C2	-3.05	1.34	1.43
3	A	347[B]	GOL	O2-C2	-2.98	1.34	1.43
3	A	347[A]	GOL	O1-C1	2.58	1.53	1.42
3	A	347[A]	GOL	O2-C2	-2.31	1.36	1.43

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	347[A]	GOL	O2-C2-C3	3.35	123.07	109.18
3	B	349	GOL	O3-C3-C2	-3.23	95.86	110.38
3	A	347[B]	GOL	O2-C2-C1	-3.12	96.24	109.18
3	B	347[B]	GOL	O3-C3-C2	-3.11	96.37	110.38
3	B	347[A]	GOL	O1-C1-C2	2.75	122.77	110.38
3	B	347[A]	GOL	O3-C3-C2	-2.27	100.18	110.38
3	A	347[A]	GOL	O2-C2-C1	-2.22	99.97	109.18
3	A	349	GOL	O2-C2-C1	2.14	118.04	109.18
3	B	349	GOL	O2-C2-C1	2.05	117.66	109.18
3	A	349	GOL	O2-C2-C3	-2.01	100.86	109.18

There are no chirality outliers.

All (28) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	347[A]	GOL	O1-C1-C2-C3
3	A	347[B]	GOL	O1-C1-C2-C3
3	A	352[A]	GOL	O1-C1-C2-C3
3	A	352[A]	GOL	C1-C2-C3-O3
3	A	352[B]	GOL	C1-C2-C3-O3
3	A	352[B]	GOL	O2-C2-C3-O3
3	B	347[B]	GOL	O1-C1-C2-C3
3	B	349	GOL	O1-C1-C2-C3
3	B	349	GOL	C1-C2-C3-O3
3	A	347[A]	GOL	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
3	B	347[B]	GOL	O1-C1-C2-O2
3	A	347[A]	GOL	C1-C2-C3-O3
3	A	352[B]	GOL	O1-C1-C2-C3
3	B	347[A]	GOL	O1-C1-C2-C3
3	B	347[A]	GOL	C1-C2-C3-O3
3	B	347[B]	GOL	C1-C2-C3-O3
3	B	348	GOL	C1-C2-C3-O3
3	A	347[A]	GOL	O2-C2-C3-O3
3	A	352[A]	GOL	O1-C1-C2-O2
3	A	352[A]	GOL	O2-C2-C3-O3
3	B	347[A]	GOL	O2-C2-C3-O3
3	B	347[B]	GOL	O2-C2-C3-O3
3	B	349	GOL	O2-C2-C3-O3
3	A	347[B]	GOL	O1-C1-C2-O2
3	B	349	GOL	O1-C1-C2-O2
3	A	352[B]	GOL	O1-C1-C2-O2
3	B	348	GOL	O2-C2-C3-O3
3	A	347[B]	GOL	O2-C2-C3-O3

There are no ring outliers.

11 monomers are involved in 34 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	347[B]	GOL	2	0
3	B	347[B]	GOL	7	0
3	A	347[A]	GOL	5	0
3	B	348	GOL	1	0
3	B	349	GOL	2	0
3	A	352[B]	GOL	3	0
3	A	353	GOL	1	0
3	B	347[A]	GOL	5	0
3	A	346	GOL	1	0
3	A	349	GOL	6	0
3	A	352[A]	GOL	1	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	333/341 (97%)	-0.25	3 (0%) 81 84	12, 26, 39, 77	14 (4%)
1	B	334/341 (97%)	-0.19	4 (1%) 76 80	14, 28, 40, 72	14 (4%)
All	All	667/682 (97%)	-0.22	7 (1%) 79 82	12, 27, 40, 77	28 (4%)

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	337	ASP	3.2
1	B	4	MET	2.7
1	B	99	ASP	2.2
1	A	102	ASN	2.1
1	B	101	ASN	2.1
1	A	100	ASN	2.1
1	A	103	THR	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.

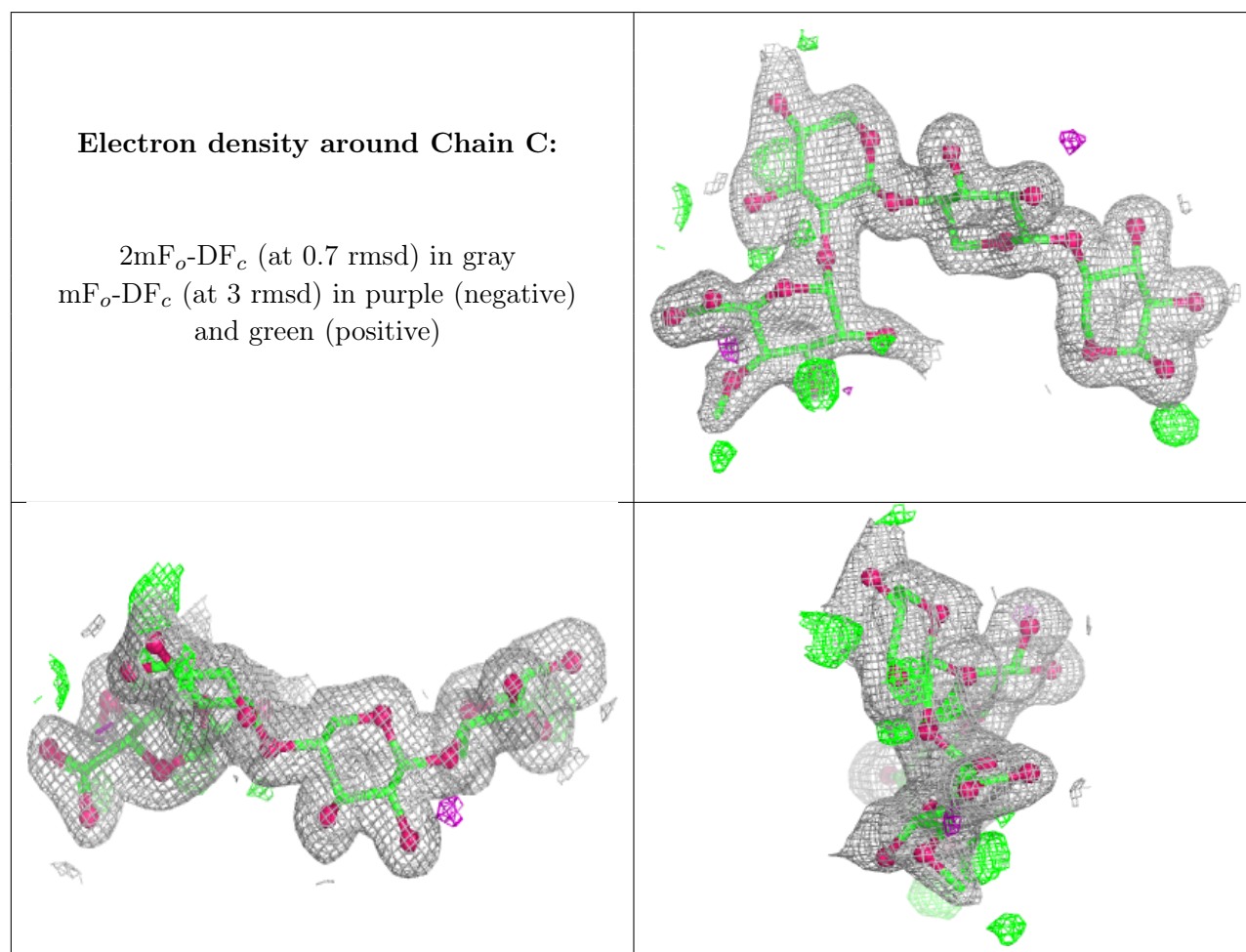
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	GCV	C	4	13/14	0.89	0.12	35,44,51,53	0
2	GCV	D	4	13/14	0.89	0.12	39,45,59,60	0

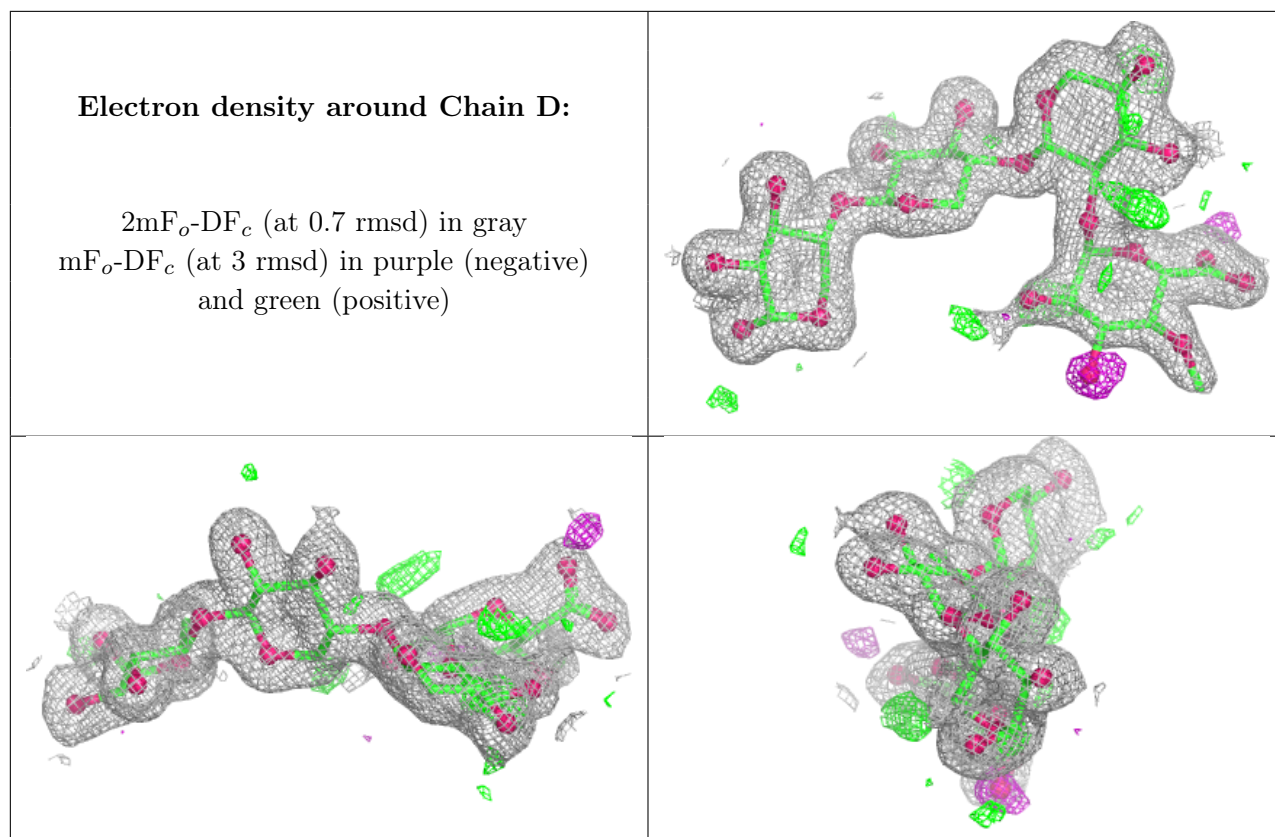
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	XYP	D	3	9/10	0.95	0.07	28,34,40,42	0
2	XYP	C	3	9/10	0.95	0.08	24,35,44,45	0
2	XYS	D	1	10/10	0.99	0.04	21,22,24,25	0
2	XYP	D	2	9/10	0.99	0.04	20,22,24,24	0
2	XYS	C	1	10/10	0.99	0.04	20,22,24,26	0
2	XYP	C	2	9/10	0.99	0.04	19,21,23,24	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
3	GOL	A	353	6/6	0.84	0.17	61,65,66,68	0
3	GOL	A	352[B]	6/6	0.87	0.14	26,38,40,41	6
3	GOL	A	352[A]	6/6	0.87	0.14	32,36,42,42	6
3	GOL	B	348	6/6	0.87	0.12	44,55,60,62	0
3	GOL	B	349	6/6	0.87	0.15	39,55,61,61	0
3	GOL	A	349	6/6	0.90	0.12	38,46,47,53	0
4	CL	A	350	1/1	0.96	0.19	72,72,72,72	0
3	GOL	B	347[B]	6/6	0.97	0.09	22,25,29,33	6
3	GOL	A	347[A]	6/6	0.97	0.06	19,23,25,27	6
3	GOL	A	347[B]	6/6	0.97	0.06	25,28,33,37	6
3	GOL	B	347[A]	6/6	0.97	0.09	26,29,32,33	6
3	GOL	B	346	6/6	0.98	0.04	23,26,28,30	0
3	GOL	A	346	6/6	0.98	0.05	22,24,26,26	0
4	CL	A	351	1/1	0.98	0.07	67,67,67,67	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	CL	A	348	1/1	0.99	0.08	37,37,37,37	0
5	MG	A	354	1/1	0.99	0.04	29,29,29,29	0

6.5 Other polymers [i](#)

There are no such residues in this entry.