



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:52 PM UTC

PDB ID : 1QJW / pdb_00001qjw
Title : CEL6A (Y169F) WITH A NON-HYDROLYSABLE CELLOTETRAOSE
Authors : Zou, J.-Y.; Jones, T.A.
Deposited on : 1999-07-06
Resolution : 1.90 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

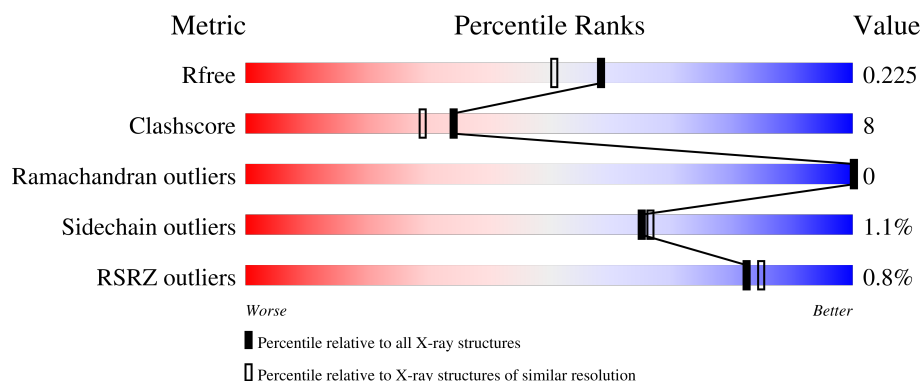
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	365	79% 19% ..
1	B	365	82% 16% ..
2	C	4	75% 25%
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
2	GLC	C	3	X	-	-	-
2	GLC	C	4	X	-	-	-
2	GLC	D	3	X	-	-	-
2	GLC	D	4	X	-	-	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 6528 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 CELLOBIOHYDROLASE CEL6A (FORMERLY CALLED CBH II).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	362	Total	C	N	O	S	0	0	0
			2739	1739	462	528	10			
1	B	362	Total	C	N	O	S	0	0	0
			2739	1739	462	528	10			

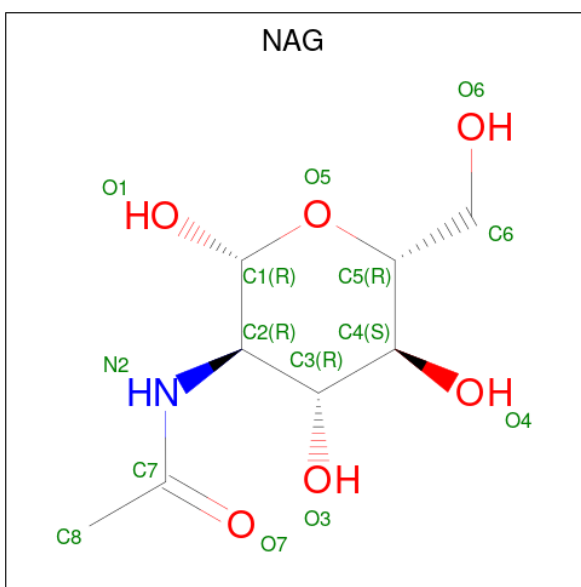
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	169	PHE	TYR	engineered mutation	UNP P07987
B	169	PHE	TYR	engineered mutation	UNP P07987

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-4-thio-beta-D-glucopyranose-(1-4)-methyl beta-D-glucopyranoside.

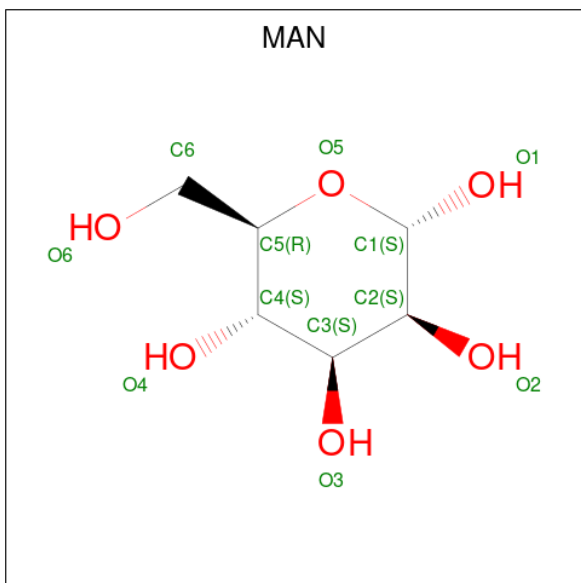
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	4	Total	C	O	S	0	0	0
			46	25	20	1			
2	D	4	Total	C	O	S	0	0	0
			46	25	20	1			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 4 is alpha-D-mannopyranose (CCD ID: MAN) (formula: $C_6H_{12}O_6$).

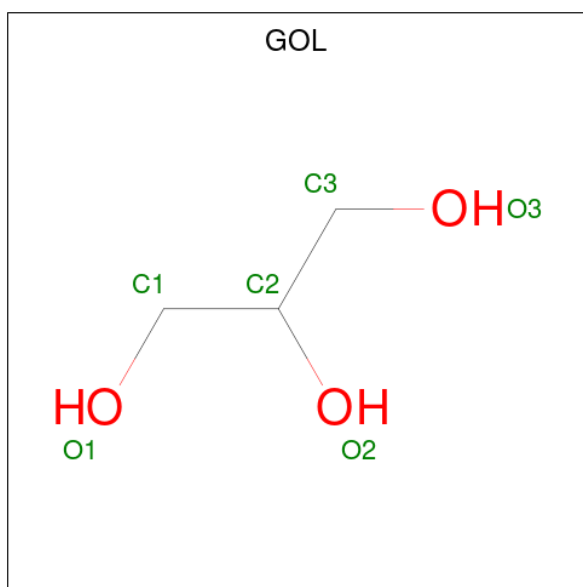


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	A	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0
4	B	1	Total C O 11 6 5	0	0

- Molecule 5 is CADMIUM ION (CCD ID: CD) (formula: Cd).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	2	Total Cd 2 2	0	0
5	B	2	Total Cd 2 2	0	0

- Molecule 6 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



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

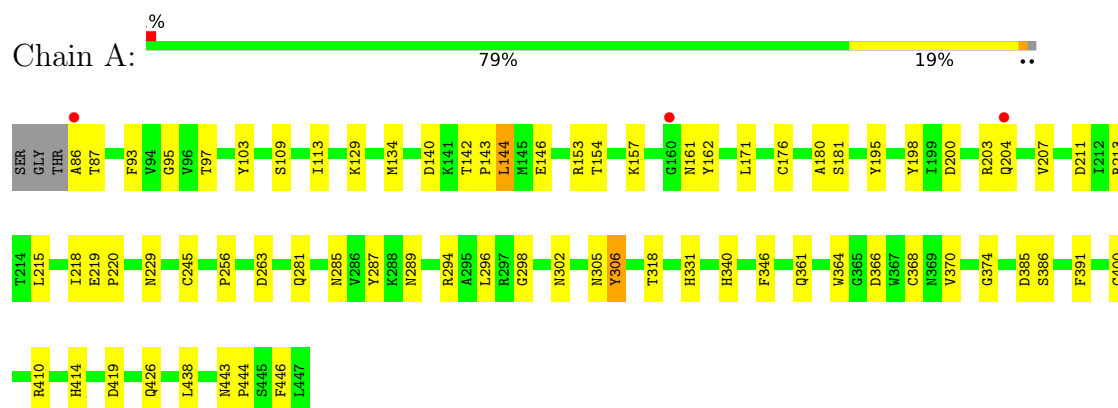
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	373	Total	O	0	0
			373	373		
7	B	359	Total	O	0	0
			359	359		

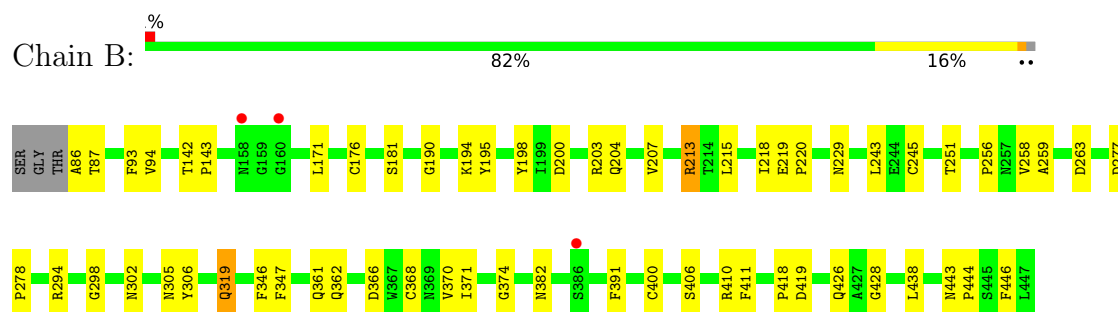
3 Residue-property plots

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.

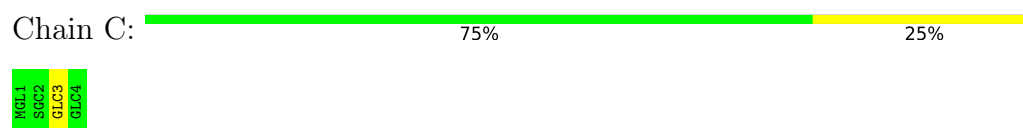
• Molecule 1: CELLOBIOHYDROLASE CEL6A (FORMERLY CALLED CBH II)



• Molecule 1: CELLOBIOHYDROLASE CEL6A (FORMERLY CALLED CBH II)



• Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-4-thio-beta-D-glucopyranose-(1-4)-methyl beta-D-glucopyranoside



• Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-4-thio-beta-D-glucopyranose-(1-4)-methyl beta-D-glucopyranoside





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	48.49Å 74.31Å 90.71Å 90.00° 103.82° 90.00°	Depositor
Resolution (Å)	20.00 – 1.90 20.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	90.1 (20.00-1.90) 90.2 (20.00-1.90)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.18 (at 1.91Å)	Xtriage
Refinement program	CNS 0.5	Depositor
R, R_{free}	0.179 , 0.208 0.199 , 0.225	Depositor DCC
R_{free} test set	1321 reflections (2.98%)	wwPDB-VP
Wilson B-factor (Å ²)	11.6	Xtriage
Anisotropy	0.226	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 55.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6528	wwPDB-VP
Average B, all atoms (Å ²)	11.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.34 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.5607e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: MGL, GLC, NAG, GOL, SGC, MAN, CD

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	0.35	0/2815	0.92	9/3858 (0.2%)
1	B	0.35	0/2815	0.91	7/3858 (0.2%)
All	All	0.35	0/5630	0.91	16/7716 (0.2%)

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	391	PHE	N-CA-C	-7.02	98.17	109.96
1	A	391	PHE	N-CA-C	-6.79	98.55	109.96
1	B	176	CYS	N-CA-C	6.66	119.36	111.71
1	A	368	CYS	N-CA-C	6.43	119.19	108.96
1	B	368	CYS	N-CA-C	6.04	118.56	108.96
1	A	180	ALA	N-CA-C	5.94	117.76	111.28
1	B	229	ASN	N-CA-C	5.83	119.95	112.26
1	B	400	CYS	N-CA-C	5.82	118.26	110.35
1	B	446	PHE	N-CA-C	-5.74	106.44	113.50
1	A	400	CYS	N-CA-C	5.62	118.00	110.35
1	A	176	CYS	N-CA-C	5.62	118.94	111.75
1	A	229	ASN	N-CA-C	5.38	119.36	112.26
1	A	446	PHE	N-CA-C	-5.26	107.03	113.50
1	A	218	ILE	N-CA-C	5.12	115.46	107.99
1	A	386	SER	N-CA-C	5.08	117.55	111.71
1	B	218	ILE	N-CA-C	5.06	115.38	107.99

There are no chirality outliers.

There are no planarity outliers.

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	2739	0	2599	42	0
1	B	2739	0	2599	44	0
2	C	46	0	41	0	0
2	D	46	0	41	0	0
3	A	28	0	26	0	0
3	B	28	0	26	1	0
4	A	77	0	70	1	0
4	B	77	0	70	1	0
5	A	2	0	0	0	0
5	B	2	0	0	0	0
6	A	6	0	8	0	0
6	B	6	0	8	1	0
7	A	373	0	0	6	0
7	B	359	0	0	5	0
All	All	6528	0	5488	86	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 8.

All (86) 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:200:ASP:O	1:B:204:GLN:HG2	1.76	0.86
1:B:410:ARG:HD2	7:B:2314:HOH:O	1.81	0.79
1:B:319:GLN:HE21	1:B:319:GLN:HA	1.50	0.76
1:A:129:LYS:NZ	7:A:2037:HOH:O	2.17	0.75
1:A:200:ASP:O	1:A:204:GLN:HG3	1.92	0.69
1:B:371:ILE:HD11	7:B:2260:HOH:O	1.93	0.67
1:B:305:ASN:ND2	1:B:306:TYR:H	1.93	0.66
1:B:319:GLN:HE21	1:B:319:GLN:CA	2.08	0.65
1:A:305:ASN:ND2	1:A:306:TYR:H	1.97	0.62
1:B:298:GLY:HA3	1:B:346:PHE:O	2.01	0.60
1:B:305:ASN:HD22	1:B:306:TYR:H	1.50	0.57
1:B:294:ARG:HD3	1:B:294:ARG:C	2.31	0.55
1:B:374:GLY:HA2	1:B:438:LEU:HA	1.88	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:181:SER:HA	1:A:410:ARG:HH21	1.73	0.54
1:B:181:SER:HA	1:B:410:ARG:NH2	2.23	0.53
1:B:86:ALA:N	7:B:2003:HOH:O	2.41	0.53
1:B:410:ARG:HD3	1:B:426:GLN:HE22	1.74	0.52
1:A:410:ARG:HD3	1:A:426:GLN:HE22	1.74	0.52
1:B:195:TYR:O	1:B:198:TYR:HB3	2.10	0.51
1:A:305:ASN:HD22	1:A:306:TYR:H	1.58	0.51
1:B:220:PRO:HA	1:B:263:ASP:CG	2.36	0.51
1:A:220:PRO:HA	1:A:263:ASP:CG	2.35	0.51
1:A:181:SER:HA	1:A:410:ARG:NH2	2.25	0.51
1:A:298:GLY:HA3	1:A:346:PHE:O	2.11	0.51
1:B:195:TYR:CD2	1:B:245:CYS:HB3	2.45	0.50
1:A:281:GLN:HG2	1:A:340:HIS:CE1	2.47	0.50
1:B:142:THR:OG1	1:B:143:PRO:HD3	2.13	0.49
1:B:86:ALA:O	1:B:213:ARG:HD3	2.12	0.48
1:A:195:TYR:O	1:A:198:TYR:HB3	2.14	0.48
1:A:171:LEU:HG	1:A:219:GLU:CD	2.39	0.48
1:A:220:PRO:HA	1:A:263:ASP:CB	2.44	0.48
1:B:220:PRO:HA	1:B:263:ASP:CB	2.43	0.48
1:B:319:GLN:HA	1:B:319:GLN:NE2	2.22	0.48
1:B:443:ASN:HA	1:B:444:PRO:C	2.37	0.48
1:A:204:GLN:NE2	7:A:2136:HOH:O	2.46	0.47
1:B:361:GLN:HG3	1:B:370:VAL:HG11	1.96	0.47
1:A:294:ARG:C	1:A:294:ARG:HD3	2.40	0.47
1:A:95:GLY:O	1:A:161:ASN:ND2	2.42	0.47
1:A:109:SER:HA	1:A:113:ILE:HD12	1.96	0.47
1:A:86:ALA:N	7:A:2001:HOH:O	2.47	0.47
1:A:318:THR:HA	1:A:364:TRP:CE3	2.49	0.47
1:B:277:ASP:N	1:B:278:PRO:HD2	2.29	0.47
1:B:171:LEU:HG	1:B:219:GLU:CD	2.40	0.47
1:B:251:THR:HG21	7:B:2170:HOH:O	2.15	0.47
1:A:134:MET:HE1	1:A:144:LEU:HD22	1.97	0.46
1:B:190:GLY:O	1:B:194:LYS:HG2	2.15	0.46
1:A:443:ASN:HA	1:A:444:PRO:C	2.41	0.45
1:A:195:TYR:CD2	1:A:245:CYS:HB3	2.51	0.45
1:A:374:GLY:HA2	1:A:438:LEU:HA	1.97	0.45
1:A:285:ASN:O	1:A:289:ASN:HB2	2.17	0.44
1:B:410:ARG:HD3	1:B:426:GLN:NE2	2.32	0.44
1:B:203:ARG:O	1:B:207:VAL:HG23	2.18	0.44
1:A:153:ARG:HD3	1:A:211:ASP:OD2	2.18	0.44
1:B:410:ARG:CD	7:B:2314:HOH:O	2.55	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:87:THR:HG22	1:A:256:PRO:HB2	2.00	0.44
1:A:142:THR:OG1	1:A:143:PRO:HD3	2.18	0.44
1:A:361:GLN:HG3	1:A:370:VAL:HG11	2.00	0.43
1:A:103:TYR:CD1	1:A:144:LEU:HD11	2.53	0.43
1:A:331:HIS:HE2	1:A:385:ASP:CG	2.26	0.43
1:A:97:THR:O	1:A:162:TYR:HA	2.19	0.43
1:A:87:THR:HB	4:A:503:MAN:H2	1.88	0.43
1:B:87:THR:HB	4:B:503:MAN:H2	1.88	0.43
1:B:406:SER:HA	1:B:411:PHE:CG	2.54	0.43
1:A:302:ASN:OD1	1:A:305:ASN:HB3	2.18	0.42
1:B:258:VAL:HG12	1:B:259:ALA:N	2.35	0.42
1:B:347:PHE:CD1	1:B:347:PHE:N	2.87	0.42
1:A:93:PHE:CE2	1:A:215:LEU:HD13	2.54	0.42
1:B:94:VAL:O	1:B:213:ARG:NH2	2.53	0.42
1:B:366:ASP:OD2	1:B:419:ASP:OD2	2.38	0.42
1:A:287:TYR:HD1	1:A:296:LEU:HD23	1.85	0.41
1:B:87:THR:HG22	1:B:256:PRO:HB2	2.02	0.41
1:B:195:TYR:CE2	1:B:245:CYS:HB3	2.55	0.41
1:B:302:ASN:OD1	1:B:305:ASN:HB3	2.20	0.41
1:A:140:ASP:O	1:A:143:PRO:HD2	2.20	0.41
1:A:146:GLU:HG2	7:A:2066:HOH:O	2.20	0.41
1:A:154:THR:O	1:A:157:LYS:HB3	2.20	0.41
1:A:157:LYS:HD3	7:A:2082:HOH:O	2.19	0.41
1:A:414:HIS:CE1	7:A:2324:HOH:O	2.73	0.41
1:B:319:GLN:CA	1:B:319:GLN:NE2	2.81	0.41
1:B:428:GLY:HA3	6:B:910:GOL:C3	2.50	0.41
1:B:258:VAL:CG1	1:B:259:ALA:N	2.84	0.41
1:A:203:ARG:O	1:A:207:VAL:HG23	2.21	0.41
1:B:93:PHE:CE2	1:B:215:LEU:HD13	2.55	0.41
1:B:243:LEU:HD13	3:B:501:NAG:H83	2.02	0.41
1:A:366:ASP:OD2	1:A:419:ASP:OD2	2.38	0.40
1:B:362:GLN:HE22	1:B:418:PRO:HG2	1.85	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	360/365 (99%)	346 (96%)	14 (4%)	0	100	100
1	B	360/365 (99%)	346 (96%)	14 (4%)	0	100	100
All	All	720/730 (99%)	692 (96%)	28 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	283/285 (99%)	280 (99%)	3 (1%)	65	67
1	B	283/285 (99%)	280 (99%)	3 (1%)	65	67
All	All	566/570 (99%)	560 (99%)	6 (1%)	65	67

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

Mol	Chain	Res	Type
1	A	144	LEU
1	A	213	ARG
1	A	306	TYR
1	B	213	ARG
1	B	319	GLN
1	B	382	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	ASN
1	A	165	GLN
1	A	204	GLN

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Mol	Chain	Res	Type
1	A	281	GLN
1	A	305	ASN
1	A	319	GLN
1	A	340	HIS
1	A	361	GLN
1	A	362	GLN
1	A	426	GLN
1	B	147	GLN
1	B	158	ASN
1	B	165	GLN
1	B	204	GLN
1	B	225	ASN
1	B	229	ASN
1	B	252	GLN
1	B	276	GLN
1	B	305	ASN
1	B	319	GLN
1	B	361	GLN
1	B	362	GLN
1	B	426	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 ⓘ

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	MGL	C	1	2	13,13,13	0.64	0	18,18,18	0.59	0
2	SGC	C	2	2	10,11,12	0.69	0	12,15,17	0.59	0
2	GLC	C	3	2	11,11,12	0.57	0	15,15,17	1.25	1 (6%)
2	GLC	C	4	2	11,11,12	0.46	0	15,15,17	0.60	0
2	MGL	D	1	2	13,13,13	0.68	0	18,18,18	0.59	0
2	SGC	D	2	2	10,11,12	0.65	0	12,15,17	0.67	0
2	GLC	D	3	2	11,11,12	0.56	0	15,15,17	1.22	1 (6%)
2	GLC	D	4	2	11,11,12	0.48	0	15,15,17	0.66	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	MGL	C	1	2	-	0/4/24/24	0/1/1/1
2	SGC	C	2	2	-	0/2/19/22	0/1/1/1
2	GLC	C	3	2	1/1/4/5	0/2/19/22	0/1/1/1
2	GLC	C	4	2	1/1/4/5	0/2/19/22	0/1/1/1
2	MGL	D	1	2	-	0/4/24/24	0/1/1/1
2	SGC	D	2	2	-	0/2/19/22	0/1/1/1
2	GLC	D	3	2	1/1/4/5	0/2/19/22	0/1/1/1
2	GLC	D	4	2	1/1/4/5	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	3	GLC	C1-O5-C5	3.28	116.58	112.19
2	D	3	GLC	C1-O5-C5	3.09	116.33	112.19

All (4) chirality outliers are listed below:

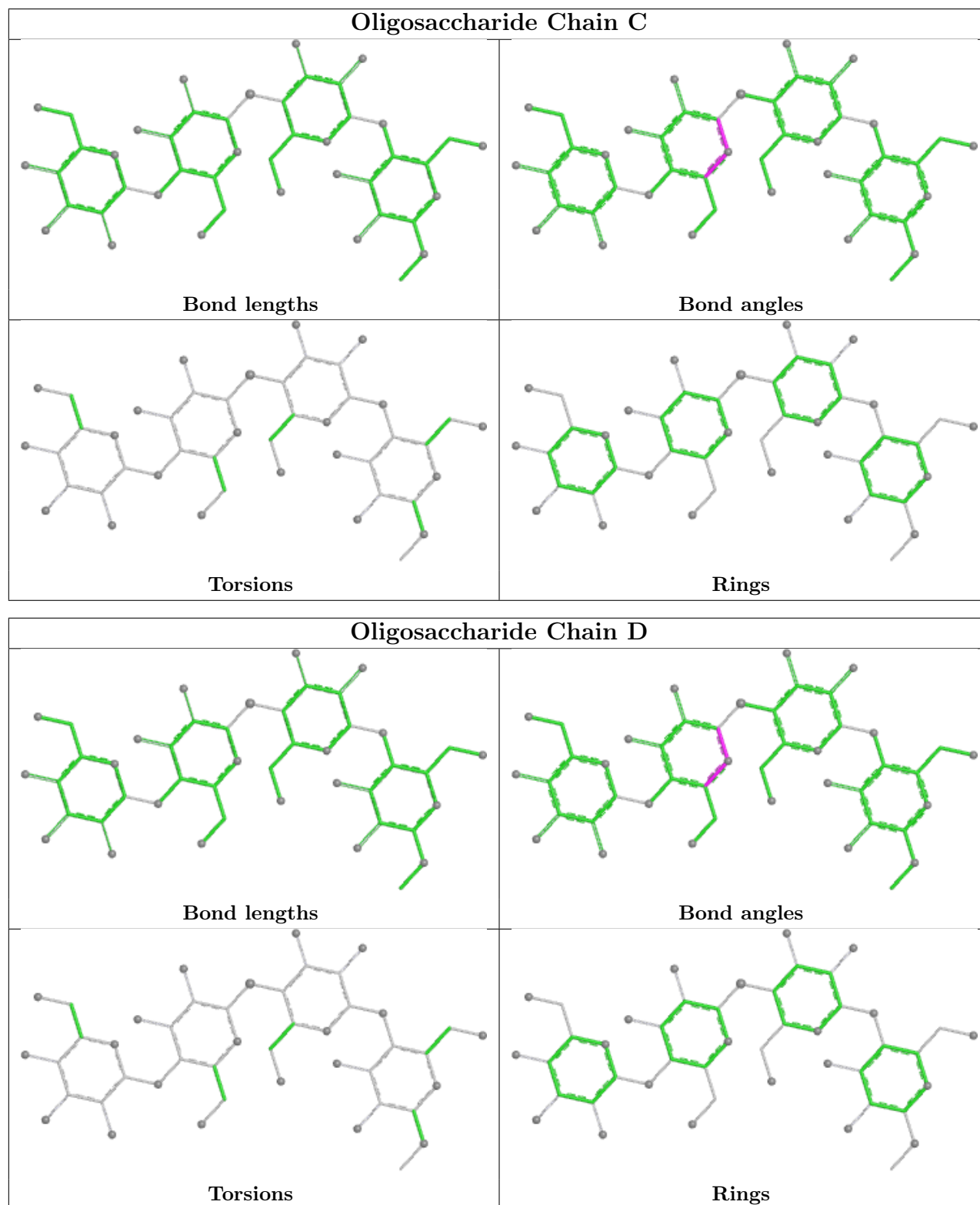
Mol	Chain	Res	Type	Atom
2	C	3	GLC	C1
2	C	4	GLC	C1
2	D	3	GLC	C1
2	D	4	GLC	C1

There are no torsion outliers.

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

Of 24 ligands modelled in this entry, 4 are monoatomic - leaving 20 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	NAG	A	502	1	14,14,15	0.45	0	17,19,21	0.84	1 (5%)
4	MAN	A	507	1	11,11,12	0.47	0	15,15,17	0.65	0
6	GOL	B	910	-	5,5,5	0.19	0	5,5,5	0.40	0
4	MAN	B	504	1	11,11,12	0.45	0	15,15,17	0.63	0
3	NAG	B	501	1	14,14,15	0.43	0	17,19,21	0.81	0
4	MAN	A	508	1	11,11,12	0.44	0	15,15,17	0.64	0
4	MAN	B	508	1	11,11,12	0.47	0	15,15,17	0.61	0
4	MAN	A	509	1	11,11,12	0.54	0	15,15,17	0.73	1 (6%)
4	MAN	B	503	1	11,11,12	0.48	0	15,15,17	0.66	0
6	GOL	A	910	-	5,5,5	0.32	0	5,5,5	0.21	0
4	MAN	B	509	1	11,11,12	0.50	0	15,15,17	0.57	0
4	MAN	B	507	1	11,11,12	0.45	0	15,15,17	0.60	0
3	NAG	B	502	1	14,14,15	0.43	0	17,19,21	0.80	1 (5%)
4	MAN	A	504	1	11,11,12	0.49	0	15,15,17	0.67	0
3	NAG	A	501	1	14,14,15	0.44	0	17,19,21	0.84	1 (5%)
4	MAN	B	506	1	11,11,12	0.50	0	15,15,17	0.70	1 (6%)
4	MAN	B	505	1	11,11,12	0.45	0	15,15,17	0.78	1 (6%)
4	MAN	A	505	1	11,11,12	0.45	0	15,15,17	0.73	1 (6%)
4	MAN	A	506	1	11,11,12	0.53	0	15,15,17	0.64	0
4	MAN	A	503	1	11,11,12	0.43	0	15,15,17	0.64	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	NAG	A	502	1	-	0/6/23/26	0/1/1/1
4	MAN	A	507	1	-	0/2/19/22	0/1/1/1
6	GOL	B	910	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	MAN	B	504	1	-	2/2/19/22	0/1/1/1
3	NAG	B	501	1	-	2/6/23/26	0/1/1/1
4	MAN	A	508	1	-	0/2/19/22	0/1/1/1
4	MAN	B	508	1	-	0/2/19/22	0/1/1/1
4	MAN	A	509	1	-	0/2/19/22	0/1/1/1
4	MAN	B	503	1	-	1/2/19/22	0/1/1/1
6	GOL	A	910	-	-	4/4/4/4	-
4	MAN	B	509	1	-	1/2/19/22	0/1/1/1
4	MAN	B	507	1	-	0/2/19/22	0/1/1/1
3	NAG	B	502	1	-	0/6/23/26	0/1/1/1
4	MAN	A	504	1	-	2/2/19/22	0/1/1/1
3	NAG	A	501	1	-	1/6/23/26	0/1/1/1
4	MAN	B	506	1	-	0/2/19/22	0/1/1/1
4	MAN	B	505	1	-	0/2/19/22	0/1/1/1
4	MAN	A	505	1	-	0/2/19/22	0/1/1/1
4	MAN	A	506	1	-	0/2/19/22	0/1/1/1
4	MAN	A	503	1	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	505	MAN	C1-O5-C5	2.56	115.61	112.19
4	A	505	MAN	C1-O5-C5	2.32	115.30	112.19
4	A	509	MAN	C1-O5-C5	2.30	115.27	112.19
3	A	501	NAG	C1-O5-C5	2.27	115.23	112.19
3	A	502	NAG	C2-N2-C7	-2.08	120.11	122.90
3	B	502	NAG	C2-N2-C7	-2.05	120.16	122.90
4	B	506	MAN	C1-O5-C5	2.03	114.90	112.19

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	910	GOL	C1-C2-C3-O3
6	B	910	GOL	C1-C2-C3-O3
4	A	504	MAN	O5-C5-C6-O6
4	A	504	MAN	C4-C5-C6-O6
4	B	504	MAN	O5-C5-C6-O6
4	B	504	MAN	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
6	B	910	GOL	O2-C2-C3-O3
6	A	910	GOL	O1-C1-C2-C3
6	A	910	GOL	O2-C2-C3-O3
3	B	501	NAG	O5-C5-C6-O6
3	A	501	NAG	O5-C5-C6-O6
6	A	910	GOL	O1-C1-C2-O2
4	B	503	MAN	C4-C5-C6-O6
3	B	501	NAG	C4-C5-C6-O6
4	B	509	MAN	C4-C5-C6-O6

There are no ring outliers.

4 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	910	GOL	1	0
3	B	501	NAG	1	0
4	B	503	MAN	1	0
4	A	503	MAN	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 [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	362/365 (99%)	-0.32	3 (0%) 82 85	5, 10, 16, 22	0
1	B	362/365 (99%)	-0.27	3 (0%) 82 85	5, 10, 17, 33	0
All	All	724/730 (99%)	-0.29	6 (0%) 82 85	5, 10, 17, 33	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	160	GLY	4.0
1	B	158	ASN	3.7
1	B	160	GLY	3.2
1	A	86	ALA	2.4
1	B	386	SER	2.2
1	A	204	GLN	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.

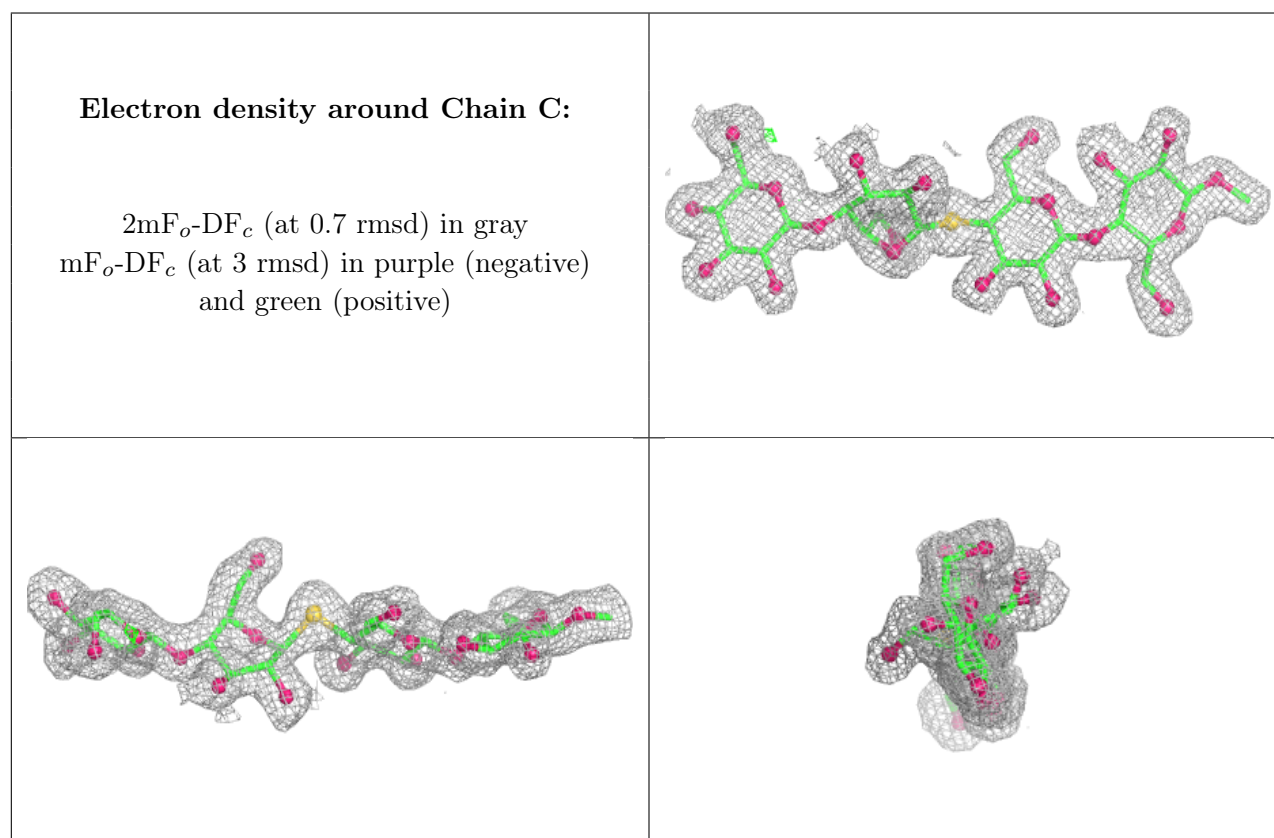
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	MGL	C	1	13/13	0.94	0.07	8,10,11,12	0
2	GLC	D	3	11/12	0.95	0.06	6,8,10,13	0
2	MGL	D	1	13/13	0.96	0.06	8,10,13,13	0

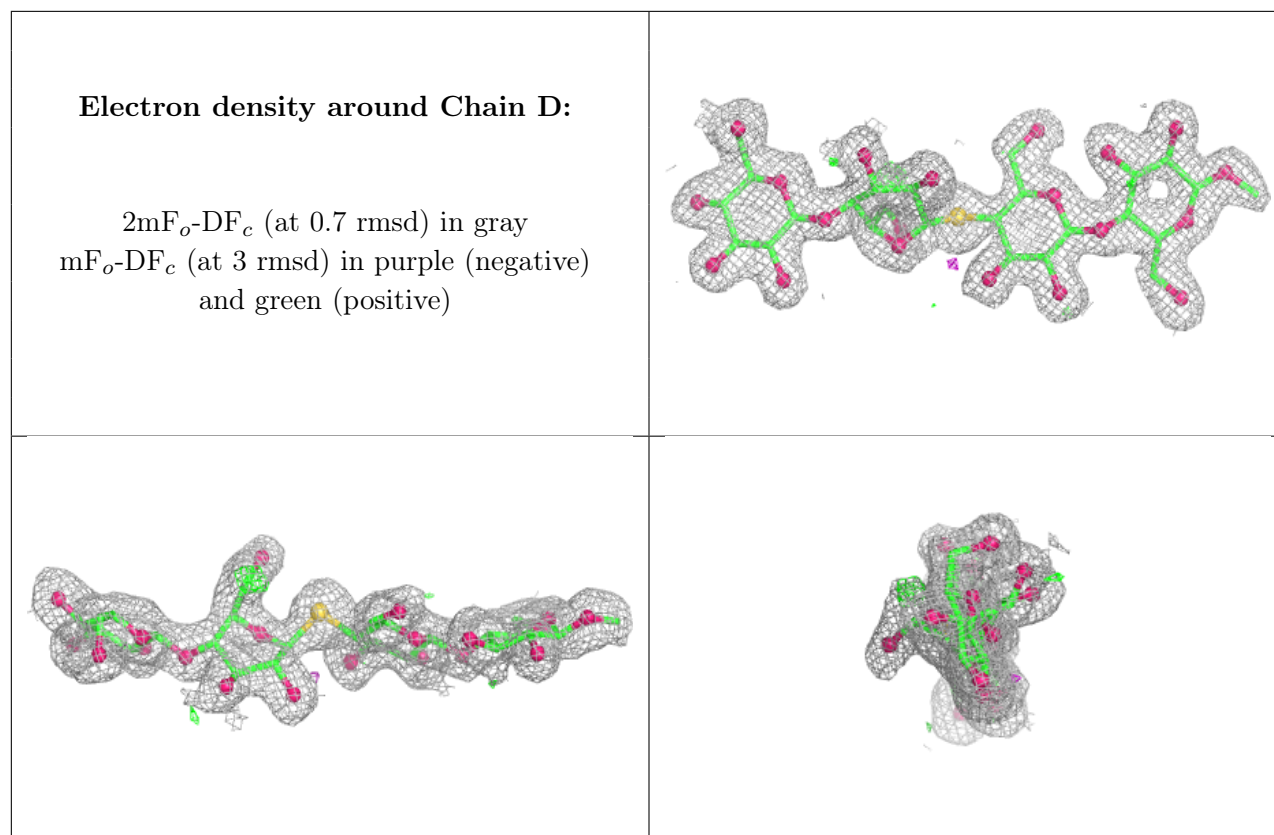
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GLC	C	3	11/12	0.97	0.05	7,7,8,9	0
2	GLC	C	4	11/12	0.97	0.05	6,8,8,8	0
2	GLC	D	4	11/12	0.97	0.04	5,6,7,7	0
2	SGC	C	2	11/12	0.98	0.04	6,7,8,11	0
2	SGC	D	2	11/12	0.98	0.05	5,8,9,12	0

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($\text{\AA}^2$)	Q<0.9
4	MAN	A	503	11/12	0.28	0.22	32,35,36,37	0
4	MAN	B	503	11/12	0.37	0.18	31,34,36,37	0
3	NAG	B	501	14/15	0.56	0.18	31,34,35,35	0
4	MAN	B	504	11/12	0.58	0.16	24,28,29,31	0
3	NAG	A	501	14/15	0.61	0.17	33,35,36,37	0
4	MAN	B	509	11/12	0.67	0.13	27,30,31,32	0
4	MAN	A	504	11/12	0.75	0.12	23,26,27,29	0
6	GOL	B	910	6/6	0.77	0.20	20,21,23,26	0
6	GOL	A	910	6/6	0.82	0.12	16,18,20,23	0
4	MAN	B	506	11/12	0.84	0.10	14,16,18,20	0
4	MAN	A	507	11/12	0.86	0.09	17,19,20,20	0
4	MAN	B	507	11/12	0.87	0.08	16,18,19,20	0
4	MAN	A	509	11/12	0.91	0.08	18,19,20,21	0
3	NAG	B	502	14/15	0.92	0.07	13,15,16,16	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	MAN	A	505	11/12	0.93	0.08	16,18,19,19	0
4	MAN	A	506	11/12	0.93	0.07	14,16,17,19	0
4	MAN	B	508	11/12	0.93	0.07	10,11,11,11	0
3	NAG	A	502	14/15	0.94	0.06	13,14,15,15	0
4	MAN	B	505	11/12	0.94	0.06	14,15,16,16	0
4	MAN	A	508	11/12	0.95	0.06	9,10,10,11	0
5	CD	B	895	1/1	0.99	0.03	21,21,21,21	0
5	CD	A	895	1/1	0.99	0.02	20,20,20,20	0
5	CD	A	896	1/1	0.99	0.08	32,32,32,32	0
5	CD	B	896	1/1	1.00	0.06	25,25,25,25	0

6.5 Other polymers [i](#)

There are no such residues in this entry.