



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 11:41 AM EDT

PDB ID : 2WKL / pdb_00002wkl
Title : Velaglucerase alfa
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Deposited on : 2009-06-15
Resolution : 2.70 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

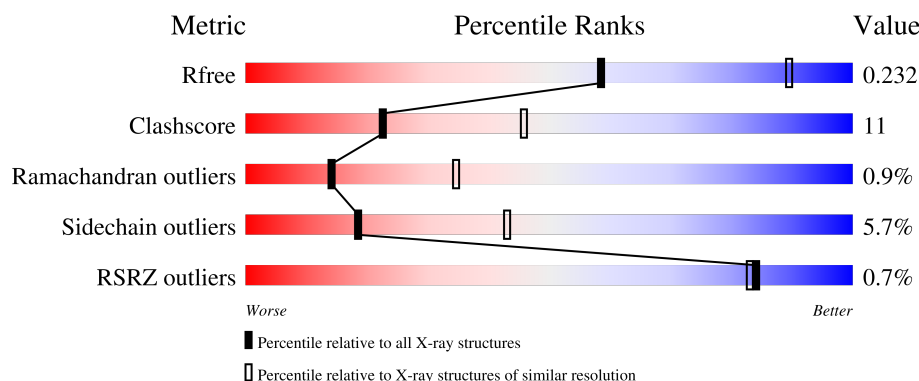
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	497	
1	B	497	
2	C	2	
2	D	2	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 8267 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 GLUCOSYLCERAMIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	495	Total	C	N	O	S	0	0	0
			3885	2503	663	703	16			
1	B	497	Total	C	N	O	S	0	0	0
			3896	2513	661	706	16			

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			

- 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		

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

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

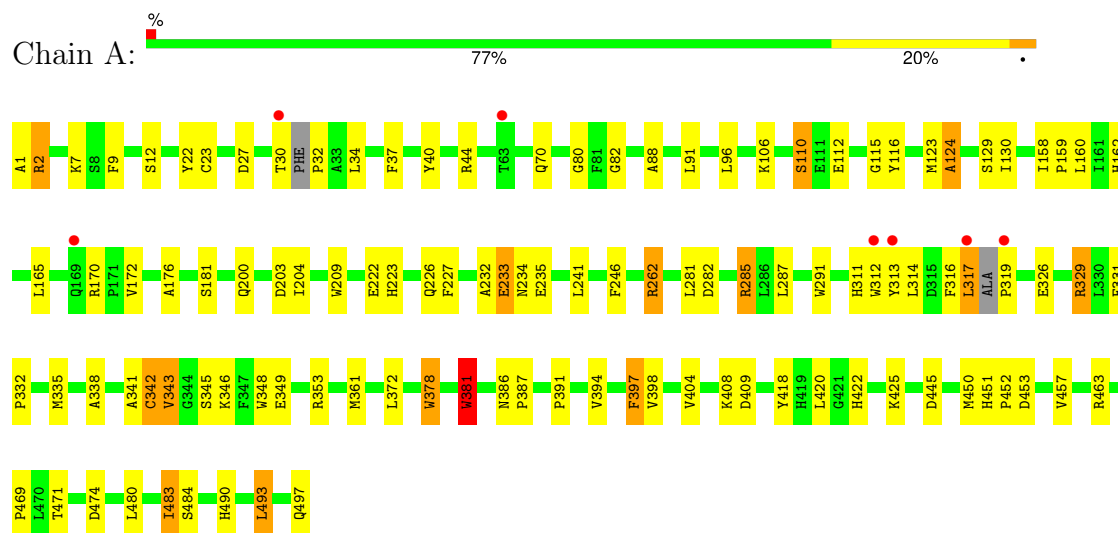
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	145	Total	O	0	0
			145	145		
5	B	181	Total	O	0	0
			181	181		

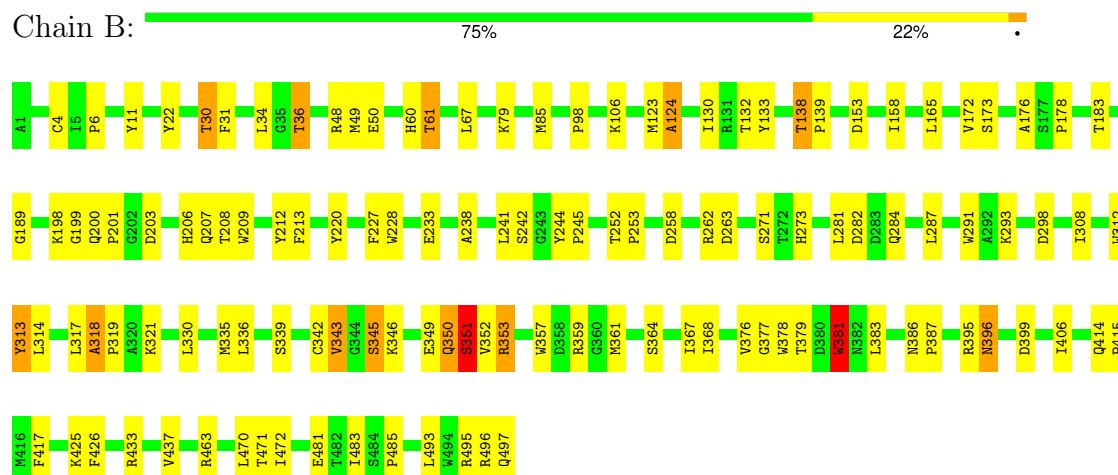
3 Residue-property plots

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: GLUCOSYLCERAMIDASE



• Molecule 1: GLUCOSYLCERAMIDASE



• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1
MAG2

- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

100%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	109.37Å 285.55Å 91.69Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.91 – 2.70 19.91 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.91-2.70) 99.7 (19.91-2.70)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.93 (at 2.71Å)	Xtriage
Refinement program	REFMAC 5.4.0067	Depositor
R, R_{free}	0.173 , 0.234 0.173 , 0.232	Depositor DCC
R_{free} test set	1995 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	22.6	Xtriage
Anisotropy	0.116	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 30.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8267	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.60% 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: NAG, SO4

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	0.72	0/4001	1.02	7/5455 (0.1%)
1	B	0.72	0/4015	1.02	16/5481 (0.3%)
All	All	0.72	0/8016	1.02	23/10936 (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	B	0	1

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	B	343	VAL	N-CA-C	8.78	120.88	111.58
1	A	80	GLY	N-CA-C	7.17	119.77	110.45
1	A	342	CYS	N-CA-C	6.97	119.16	108.07
1	A	343	VAL	CB-CA-C	-6.79	100.23	110.55
1	B	318	ALA	CA-C-N	6.42	126.45	119.90
1	B	318	ALA	C-N-CA	6.42	126.45	119.90
1	B	30	THR	CA-C-N	-6.11	116.91	122.28
1	B	30	THR	C-N-CA	-6.11	116.91	122.28
1	B	158	ILE	CA-C-N	-6.06	112.32	119.05
1	B	158	ILE	C-N-CA	-6.06	112.32	119.05
1	B	98	PRO	CA-C-N	-6.01	112.82	119.19
1	B	98	PRO	C-N-CA	-6.01	112.82	119.19
1	B	352	VAL	CA-C-N	-6.00	114.34	122.86
1	B	352	VAL	C-N-CA	-6.00	114.34	122.86

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	350	GLN	N-CA-C	5.81	120.18	111.81
1	A	397	PHE	N-CA-C	5.76	117.73	110.24
1	A	115	GLY	N-CA-C	5.68	121.77	113.48
1	A	246	PHE	N-CA-C	5.52	115.57	108.34
1	A	129	SER	N-CA-C	-5.33	101.18	109.24
1	B	350	GLN	N-CA-CB	-5.31	102.29	110.25
1	B	351	SER	N-CA-C	5.29	122.07	110.80
1	B	367	ILE	N-CA-C	-5.20	105.31	110.62
1	B	350	GLN	CB-CA-C	-5.03	105.01	111.50

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	342	CYS	Peptide

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	3885	0	3779	88	0
1	B	3896	0	3777	78	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
3	A	14	0	13	0	0
4	A	45	0	0	2	0
4	B	45	0	0	0	0
5	A	145	0	0	4	0
5	B	181	0	0	3	0
All	All	8267	0	7619	164	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 11.

All (164) 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:285:ARG:NH1	1:A:319:PRO:O	1.62	1.32
1:A:361:MET:HE3	1:A:463:ARG:HA	1.31	1.08
1:A:361:MET:CE	1:A:463:ARG:HB3	1.98	0.93
1:B:61:THR:HG22	1:B:481:GLU:HG3	1.50	0.91
1:A:361:MET:HE3	1:A:463:ARG:CA	2.03	0.87
1:A:361:MET:CE	1:A:463:ARG:HA	2.07	0.82
1:A:361:MET:HE2	1:A:463:ARG:HB3	1.60	0.82
1:B:346:LYS:HB2	1:B:349:GLU:CG	2.12	0.79
1:A:361:MET:CE	1:A:463:ARG:CB	2.63	0.77
1:A:341:ALA:O	1:A:342:CYS:HB3	1.83	0.76
1:A:262:ARG:HH11	1:A:262:ARG:CG	1.98	0.76
1:B:346:LYS:HB2	1:B:349:GLU:HG3	1.68	0.76
1:A:285:ARG:NE	1:A:312:TRP:CZ3	2.55	0.74
1:A:457:VAL:HG22	1:A:493:LEU:HD23	1.72	0.71
1:B:30:THR:HG22	1:B:31:PHE:H	1.59	0.68
1:A:285:ARG:CZ	1:A:319:PRO:O	2.42	0.68
1:A:361:MET:CE	1:A:463:ARG:CA	2.69	0.67
1:A:394:VAL:HG12	1:A:394:VAL:O	1.93	0.67
1:B:364:SER:O	1:B:368:ILE:HG13	1.94	0.67
1:B:361:MET:HE1	1:B:463:ARG:HA	1.78	0.65
1:B:209:TRP:HA	1:B:209:TRP:CE3	2.32	0.64
1:A:361:MET:HE3	1:A:463:ARG:CB	2.27	0.63
1:A:386:ASN:HB2	1:A:387:PRO:CD	2.30	0.61
1:A:316:PHE:O	1:A:317:LEU:HB3	1.99	0.60
1:A:469:PRO:HA	1:A:483:ILE:HB	1.83	0.60
1:B:61:THR:HG22	1:B:481:GLU:CG	2.26	0.60
1:A:463:ARG:HG3	5:A:2133:HOH:O	2.02	0.59
1:B:357:TRP:O	1:B:361:MET:HG3	2.01	0.59
1:A:262:ARG:NH1	1:A:262:ARG:HG2	2.17	0.59
1:B:346:LYS:HB2	1:B:349:GLU:HG2	1.83	0.59
1:A:82:GLY:HA2	1:A:116:TYR:CD1	2.37	0.59
1:A:262:ARG:HH11	1:A:262:ARG:HG3	1.66	0.59
1:B:377:GLY:C	1:B:378:TRP:CE3	2.81	0.59
1:A:285:ARG:CZ	1:A:312:TRP:HZ3	2.15	0.58
1:A:386:ASN:HB2	1:A:387:PRO:HD2	1.85	0.58
1:A:326:GLU:HG2	5:A:2103:HOH:O	2.03	0.58
1:A:262:ARG:CG	1:A:262:ARG:NH1	2.59	0.58
1:B:252:THR:HB	1:B:253:PRO:HD2	1.85	0.57
1:A:317:LEU:C	1:A:317:LEU:HD23	2.28	0.57
1:A:96:LEU:HD21	1:A:404:VAL:HG13	1.87	0.57
1:B:79:LYS:HE2	1:B:228:TRP:CE2	2.40	0.56
1:B:61:THR:CG2	1:B:481:GLU:HG3	2.32	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:361:MET:CE	1:B:463:ARG:HA	2.34	0.56
1:A:285:ARG:O	1:A:285:ARG:HG2	2.06	0.55
1:B:209:TRP:HA	1:B:209:TRP:HE3	1.71	0.55
1:A:329:ARG:O	1:A:332:PRO:HD3	2.07	0.55
1:A:445:ASP:OD2	1:A:463:ARG:NH1	2.40	0.55
1:B:207:GLN:NE2	1:B:263:ASP:OD1	2.35	0.55
1:B:378:TRP:CE3	1:B:378:TRP:N	2.75	0.54
1:A:234:ASN:ND2	1:A:235:GLU:HG3	2.22	0.54
1:A:453:ASP:OD1	1:A:453:ASP:C	2.51	0.54
1:A:285:ARG:NH2	1:A:312:TRP:CZ3	2.77	0.53
1:B:395:ARG:HG2	1:B:396:ASN:N	2.23	0.53
1:B:386:ASN:HB2	1:B:387:PRO:CD	2.38	0.53
1:A:418:TYR:O	1:A:422:HIS:HD2	1.91	0.53
1:A:394:VAL:O	1:A:394:VAL:CG1	2.57	0.53
1:A:471:THR:HA	1:A:480:LEU:O	2.09	0.53
1:B:483:ILE:O	1:B:485:PRO:HD3	2.08	0.53
1:A:285:ARG:NE	1:A:312:TRP:HZ3	2.01	0.52
1:B:203:ASP:OD1	1:B:203:ASP:C	2.52	0.52
1:A:313:TYR:HD1	1:A:313:TYR:N	2.06	0.52
1:B:176:ALA:HB2	1:B:227:PHE:CE2	2.44	0.52
1:B:238:ALA:HB1	1:B:244:TYR:CZ	2.45	0.52
1:B:132:THR:O	1:B:133:TYR:HB3	2.10	0.52
1:A:313:TYR:N	1:A:313:TYR:CD1	2.76	0.52
1:A:12:SER:OG	4:A:1502:SO4:O2	2.24	0.52
1:A:282:ASP:OD1	1:A:311:HIS:NE2	2.39	0.52
1:B:123:MET:O	1:B:124:ALA:HB3	2.10	0.51
1:A:483:ILE:C	1:A:483:ILE:HD13	2.35	0.51
1:B:31:PHE:HB3	1:B:495:ARG:HH21	1.75	0.51
1:B:284:GLN:HG3	1:B:314:LEU:HD12	1.92	0.51
1:A:262:ARG:HH11	1:A:262:ARG:HG2	1.74	0.51
1:B:209:TRP:O	1:B:212:TYR:HB3	2.10	0.51
1:B:298:ASP:C	1:B:298:ASP:OD1	2.54	0.51
1:B:357:TRP:HE1	1:B:361:MET:HE3	1.76	0.51
1:A:353:ARG:NH1	5:A:2110:HOH:O	2.40	0.50
1:A:483:ILE:HG12	1:A:484:SER:N	2.26	0.50
1:B:381:TRP:HA	1:B:381:TRP:CE3	2.46	0.50
1:A:285:ARG:CZ	1:A:312:TRP:CZ3	2.93	0.50
1:B:425:LYS:HD3	1:B:426:PHE:CZ	2.47	0.50
1:A:345:SER:O	1:A:346:LYS:C	2.54	0.50
1:B:381:TRP:HA	1:B:381:TRP:HE3	1.77	0.49
1:A:450:MET:HE2	5:A:2032:HOH:O	2.11	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:30:THR:HG22	1:B:31:PHE:N	2.28	0.48
1:A:37:PHE:C	1:A:37:PHE:CD1	2.90	0.48
1:B:396:ASN:N	1:B:396:ASN:OD1	2.46	0.48
1:A:165:LEU:HD22	1:A:172:VAL:HB	1.96	0.48
1:A:329:ARG:NH2	4:A:1503:SO4:O3	2.46	0.48
1:B:22:TYR:C	1:B:22:TYR:CD2	2.92	0.48
1:B:287:LEU:HB3	1:B:291:TRP:CD1	2.49	0.48
1:B:199:GLY:HA3	1:B:203:ASP:OD2	2.13	0.48
1:B:183:THR:O	1:B:189:GLY:HA2	2.13	0.47
1:A:12:SER:HB2	1:A:44:ARG:HD2	1.97	0.47
1:A:474:ASP:OD1	1:A:474:ASP:C	2.57	0.47
1:B:165:LEU:HD22	1:B:172:VAL:HB	1.96	0.47
1:A:1:ALA:N	1:A:27:ASP:OD1	2.39	0.47
1:B:312:TRP:O	1:B:313:TYR:C	2.57	0.47
1:B:282:ASP:OD1	1:B:339:SER:OG	2.31	0.47
1:A:88:ALA:HB1	1:A:391:PRO:HD2	1.97	0.46
1:B:359:ARG:NH1	1:B:399:ASP:OD2	2.47	0.46
1:B:178:PRO:HG2	1:B:233:GLU:HA	1.98	0.46
1:B:206:HIS:HB3	1:B:263:ASP:OD2	2.14	0.46
1:B:417:PHE:CD2	1:B:417:PHE:C	2.94	0.46
1:A:287:LEU:HB3	1:A:291:TRP:CD1	2.51	0.46
1:B:85:MET:HE2	1:B:383:LEU:CD1	2.46	0.46
1:B:293:LYS:HE2	1:B:330:LEU:CD1	2.45	0.46
1:B:201:PRO:HB2	1:B:262:ARG:HD2	1.98	0.46
1:A:106:LYS:NZ	1:A:112:GLU:OE2	2.48	0.46
1:A:7:LYS:HE2	1:A:9:PHE:CZ	2.51	0.46
1:B:153:ASP:OD1	1:B:220:TYR:OH	2.25	0.45
1:A:123:MET:O	1:A:124:ALA:HB3	2.16	0.45
1:A:348:TRP:HB3	1:B:245:PRO:HG3	1.99	0.45
1:A:203:ASP:OD1	1:A:203:ASP:C	2.58	0.45
1:B:60:HIS:CE1	1:B:471:THR:HG21	2.52	0.45
1:B:138:THR:HA	1:B:139:PRO:HD3	1.75	0.45
1:A:2:ARG:HG2	1:A:22:TYR:CE1	2.52	0.45
1:A:451:HIS:ND1	1:A:452:PRO:HD2	2.32	0.45
1:B:496:ARG:HD3	5:B:2161:HOH:O	2.17	0.45
1:B:308:ILE:HB	1:B:336:LEU:HD23	1.99	0.44
1:A:160:LEU:HD23	1:A:160:LEU:HA	1.86	0.44
1:B:209:TRP:CZ3	1:B:212:TYR:CD2	3.05	0.44
1:A:30:THR:O	1:A:32:PRO:HD3	2.17	0.44
1:A:316:PHE:HB3	1:B:317:LEU:HD11	2.00	0.44
1:B:173:SER:HB3	1:B:228:TRP:CB	2.48	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:110:SER:OG	1:A:112:GLU:N	2.40	0.43
1:A:158:ILE:HB	1:A:159:PRO:HD3	2.00	0.43
1:B:201:PRO:HG2	1:B:258:ASP:HB2	2.00	0.43
1:B:4:CYS:O	1:B:6:PRO:HD3	2.19	0.43
1:B:48:ARG:O	1:B:49:MET:C	2.61	0.43
1:B:497:GLN:HG2	5:B:2073:HOH:O	2.19	0.43
1:A:110:SER:HG	1:A:112:GLU:H	1.65	0.43
1:A:285:ARG:NH2	1:A:312:TRP:HZ3	2.14	0.43
1:B:208:THR:O	1:B:209:TRP:C	2.62	0.43
1:A:22:TYR:CD2	1:A:23:CYS:N	2.87	0.42
1:B:312:TRP:CZ2	1:B:378:TRP:CD1	3.07	0.42
1:B:318:ALA:HA	1:B:319:PRO:HD2	1.68	0.42
1:B:335:MET:HE2	1:B:376:VAL:HG21	2.00	0.42
1:A:22:TYR:CD2	1:A:22:TYR:C	2.97	0.42
1:A:341:ALA:O	1:A:342:CYS:CB	2.56	0.42
1:A:181:SER:HA	1:A:209:TRP:CH2	2.54	0.42
1:A:232:ALA:O	1:A:233:GLU:HB2	2.19	0.42
1:B:11:TYR:CZ	1:B:353:ARG:HB2	2.54	0.42
1:B:406:ILE:H	1:B:406:ILE:HG13	1.61	0.42
1:A:397:PHE:O	1:A:398:VAL:HG13	2.20	0.41
1:B:178:PRO:HG3	1:B:213:PHE:CZ	2.55	0.41
1:A:331:PHE:N	1:A:332:PRO:CD	2.83	0.41
1:B:414:GLN:O	1:B:415:PRO:C	2.61	0.41
1:A:40:TYR:O	1:A:490:HIS:HA	2.21	0.41
1:A:381:TRP:HA	1:A:381:TRP:CE3	2.56	0.41
1:A:408:LYS:O	1:A:409:ASP:C	2.62	0.41
1:A:381:TRP:HA	1:A:381:TRP:HE3	1.86	0.41
1:A:234:ASN:OD1	1:A:311:HIS:HE1	2.04	0.41
1:A:162:HIS:CE1	1:A:223:HIS:O	2.74	0.41
1:B:36:THR:CG2	5:B:2017:HOH:O	2.68	0.41
1:B:67:LEU:O	1:B:472:ILE:HA	2.21	0.41
1:B:200:GLN:O	1:B:201:PRO:C	2.64	0.41
1:B:312:TRP:CE3	1:B:343:VAL:CG1	3.04	0.41
1:B:351:SER:O	1:B:359:ARG:NH1	2.51	0.40
1:B:317:LEU:HD23	1:B:317:LEU:HA	1.78	0.40
1:A:170:ARG:NH2	1:A:425:LYS:O	2.50	0.40
1:A:372:LEU:HD23	1:A:372:LEU:HA	1.91	0.40
1:B:271:SER:C	1:B:273:HIS:H	2.29	0.40
1:A:176:ALA:HB2	1:A:227:PHE:CE2	2.56	0.40
1:A:338:ALA:HB3	1:A:378:TRP:CD1	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	489/497 (98%)	459 (94%)	26 (5%)	4 (1%)	16	37
1	B	495/497 (100%)	461 (93%)	29 (6%)	5 (1%)	12	32
All	All	984/994 (99%)	920 (94%)	55 (6%)	9 (1%)	14	35

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	233	GLU
1	A	381	TRP
1	B	313	TYR
1	B	381	TRP
1	A	281	LEU
1	B	124	ALA
1	B	281	LEU
1	B	345	SER
1	A	124	ALA

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	414/424 (98%)	389 (94%)	25 (6%)	17	41
1	B	413/424 (97%)	391 (95%)	22 (5%)	20	46
All	All	827/848 (98%)	780 (94%)	47 (6%)	18	43

All (47) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	ARG
1	A	34	LEU
1	A	70	GLN
1	A	91	LEU
1	A	110	SER
1	A	130	ILE
1	A	200	GLN
1	A	204	ILE
1	A	222	GLU
1	A	226	GLN
1	A	241	LEU
1	A	262	ARG
1	A	285	ARG
1	A	314	LEU
1	A	317	LEU
1	A	329	ARG
1	A	335	MET
1	A	343	VAL
1	A	349	GLU
1	A	378	TRP
1	A	381	TRP
1	A	420	LEU
1	A	483	ILE
1	A	493	LEU
1	A	497	GLN
1	B	34	LEU
1	B	36	THR
1	B	50	GLU
1	B	61	THR
1	B	106	LYS
1	B	130	ILE
1	B	138	THR
1	B	198	LYS
1	B	241	LEU
1	B	242	SER
1	B	321	LYS
1	B	345	SER
1	B	350	GLN
1	B	351	SER
1	B	353	ARG
1	B	379	THR
1	B	381	TRP

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Mol	Chain	Res	Type
1	B	396	ASN
1	B	433	ARG
1	B	437	VAL
1	B	470	LEU
1	B	493	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	145	HIS
1	A	169	GLN
1	A	284	GLN
1	A	362	GLN
1	A	365	HIS
1	B	60	HIS
1	B	146	ASN
1	B	200	GLN
1	B	274	HIS
1	B	328	HIS
1	B	333	ASN
1	B	365	HIS
1	B	432	GLN

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](#)

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	NAG	C	1	1,2	14,14,15	0.68	0	17,19,21	1.78	2 (11%)
2	NAG	C	2	2	14,14,15	0.54	0	17,19,21	1.96	2 (11%)
2	NAG	D	1	1,2	14,14,15	0.71	0	17,19,21	1.55	3 (17%)
2	NAG	D	2	2	14,14,15	0.47	0	17,19,21	1.65	4 (23%)

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	NAG	C	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	NAG	D	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	NAG	C2-N2-C7	-5.53	115.49	122.90
2	C	1	NAG	O5-C1-C2	-5.03	103.51	111.29
2	C	2	NAG	C1-O5-C5	4.58	118.32	112.19
2	C	1	NAG	C2-N2-C7	-4.16	117.33	122.90
2	D	1	NAG	O5-C1-C2	-3.61	105.71	111.29
2	D	1	NAG	C2-N2-C7	-3.49	118.22	122.90
2	D	2	NAG	C2-N2-C7	-3.12	118.72	122.90
2	D	2	NAG	O5-C5-C6	3.10	113.69	107.66
2	D	2	NAG	C4-C3-C2	-2.86	106.83	111.02
2	D	1	NAG	C6-C5-C4	-2.52	106.84	113.02
2	D	2	NAG	C3-C4-C5	-2.51	105.69	110.23

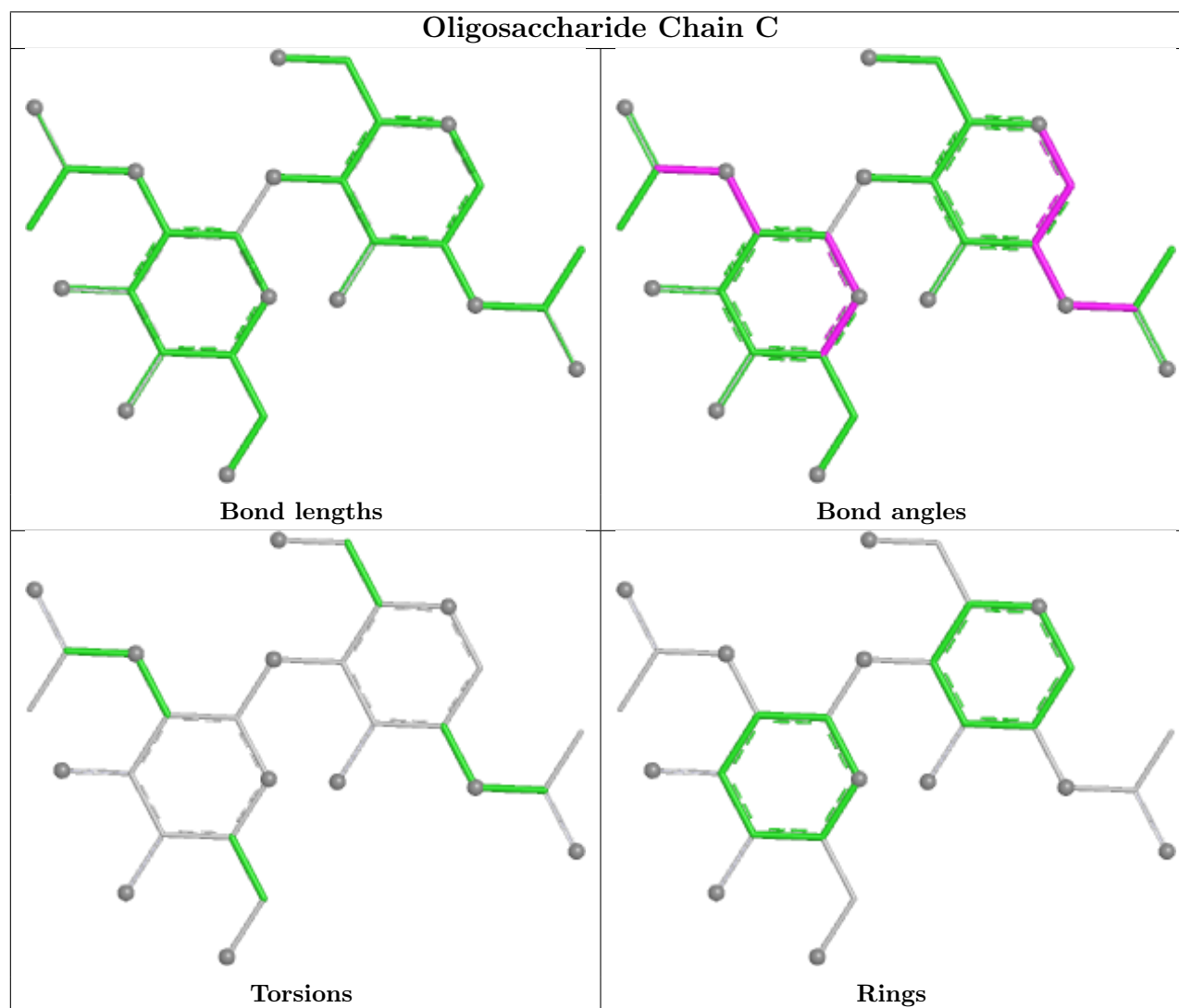
There are no chirality outliers.

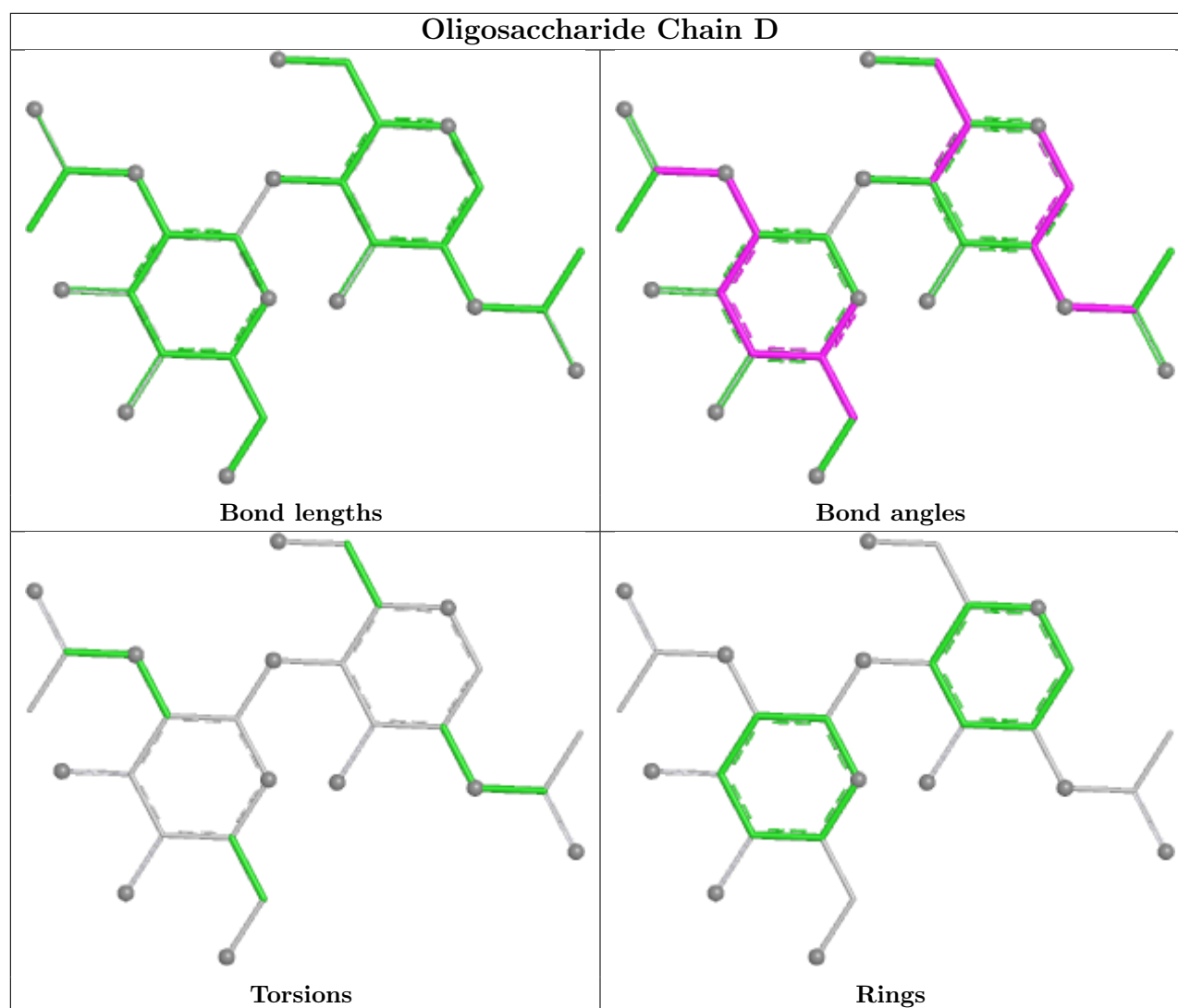
There are no torsion outliers.

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 [i](#)

19 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	NAG	A	1498	1	14,14,15	0.59	0	17,19,21	1.98	2 (11%)
4	SO4	B	1505	-	4,4,4	0.26	0	6,6,6	0.19	0
4	SO4	B	1506	-	4,4,4	0.26	0	6,6,6	0.29	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	SO4	B	1508	-	4,4,4	0.25	0	6,6,6	0.17	0
4	SO4	A	1509	-	4,4,4	0.24	0	6,6,6	0.11	0
4	SO4	B	1501	-	4,4,4	0.22	0	6,6,6	0.19	0
4	SO4	A	1505	-	4,4,4	0.24	0	6,6,6	0.25	0
4	SO4	B	1507	-	4,4,4	0.23	0	6,6,6	0.19	0
4	SO4	A	1508	-	4,4,4	0.27	0	6,6,6	0.13	0
4	SO4	B	1504	-	4,4,4	0.32	0	6,6,6	0.10	0
4	SO4	B	1503	-	4,4,4	0.26	0	6,6,6	0.39	0
4	SO4	A	1504	-	4,4,4	0.21	0	6,6,6	0.33	0
4	SO4	A	1502	-	4,4,4	0.19	0	6,6,6	0.43	0
4	SO4	B	1502	-	4,4,4	0.22	0	6,6,6	0.45	0
4	SO4	A	1503	-	4,4,4	0.24	0	6,6,6	0.12	0
4	SO4	B	1500	-	4,4,4	0.19	0	6,6,6	0.40	0
4	SO4	A	1506	-	4,4,4	0.25	0	6,6,6	0.28	0
4	SO4	A	1507	-	4,4,4	0.29	0	6,6,6	0.23	0
4	SO4	A	1501	-	4,4,4	0.22	0	6,6,6	0.26	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	1498	1	-	2/6/23/26	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(°)
3	A	1498	NAG	C2-N2-C7	-5.87	115.04	122.90
3	A	1498	NAG	O4-C4-C5	2.91	116.48	109.32

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1498	NAG	O5-C5-C6-O6
3	A	1498	NAG	C4-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1502	SO4	1	0
4	A	1503	SO4	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	495/497 (99%)	-0.63	7 (1%) 73 72	6, 15, 30, 55	0
1	B	497/497 (100%)	-0.69	0 100 100	6, 15, 27, 39	0
All	All	992/994 (99%)	-0.66	7 (0%) 84 83	6, 15, 29, 55	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	63	THR	3.1
1	A	319	PRO	3.1
1	A	30	THR	2.3
1	A	312	TRP	2.3
1	A	317	LEU	2.1
1	A	313	TYR	2.1
1	A	169	GLN	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.

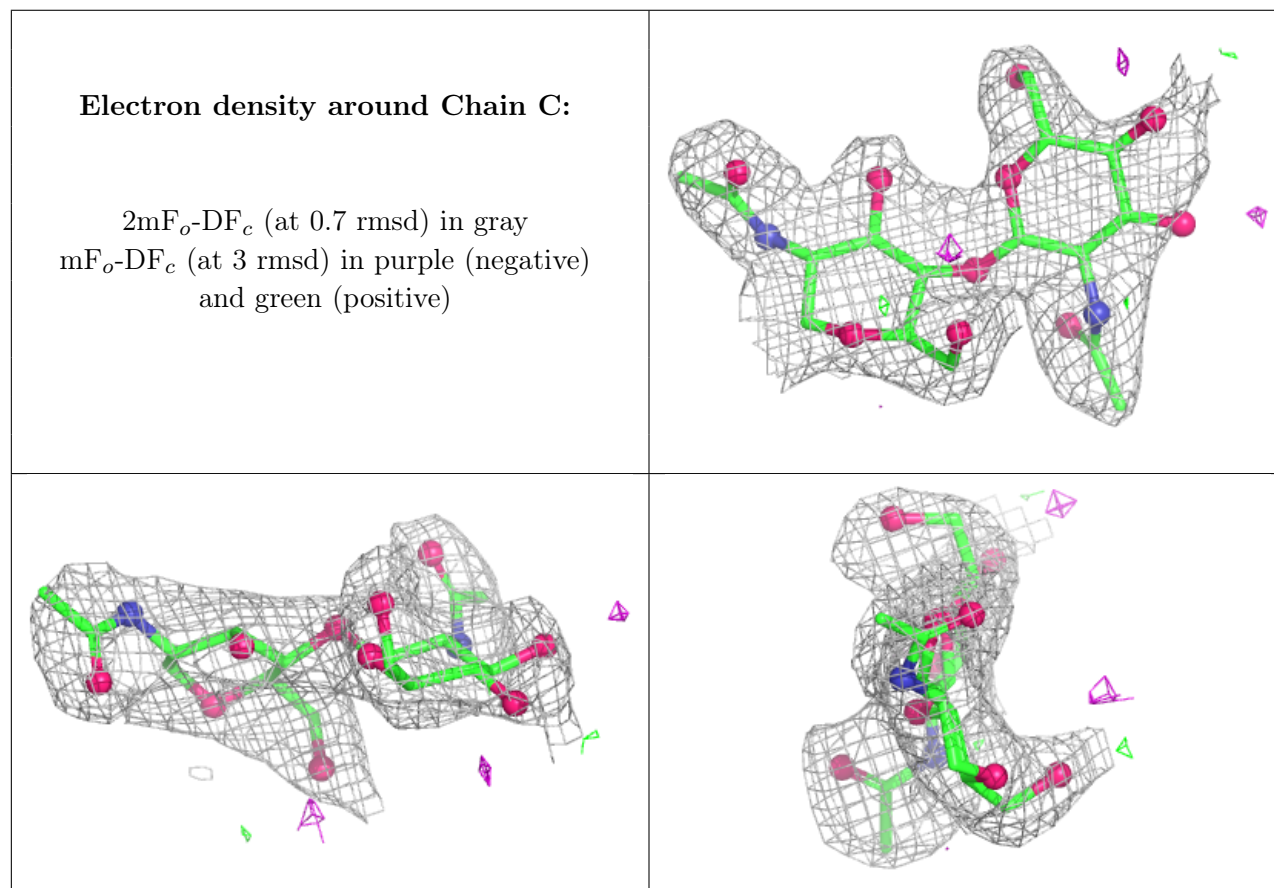
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	C	2	14/15	0.83	0.12	37,42,45,45	0
2	NAG	D	2	14/15	0.88	0.11	38,42,45,46	0

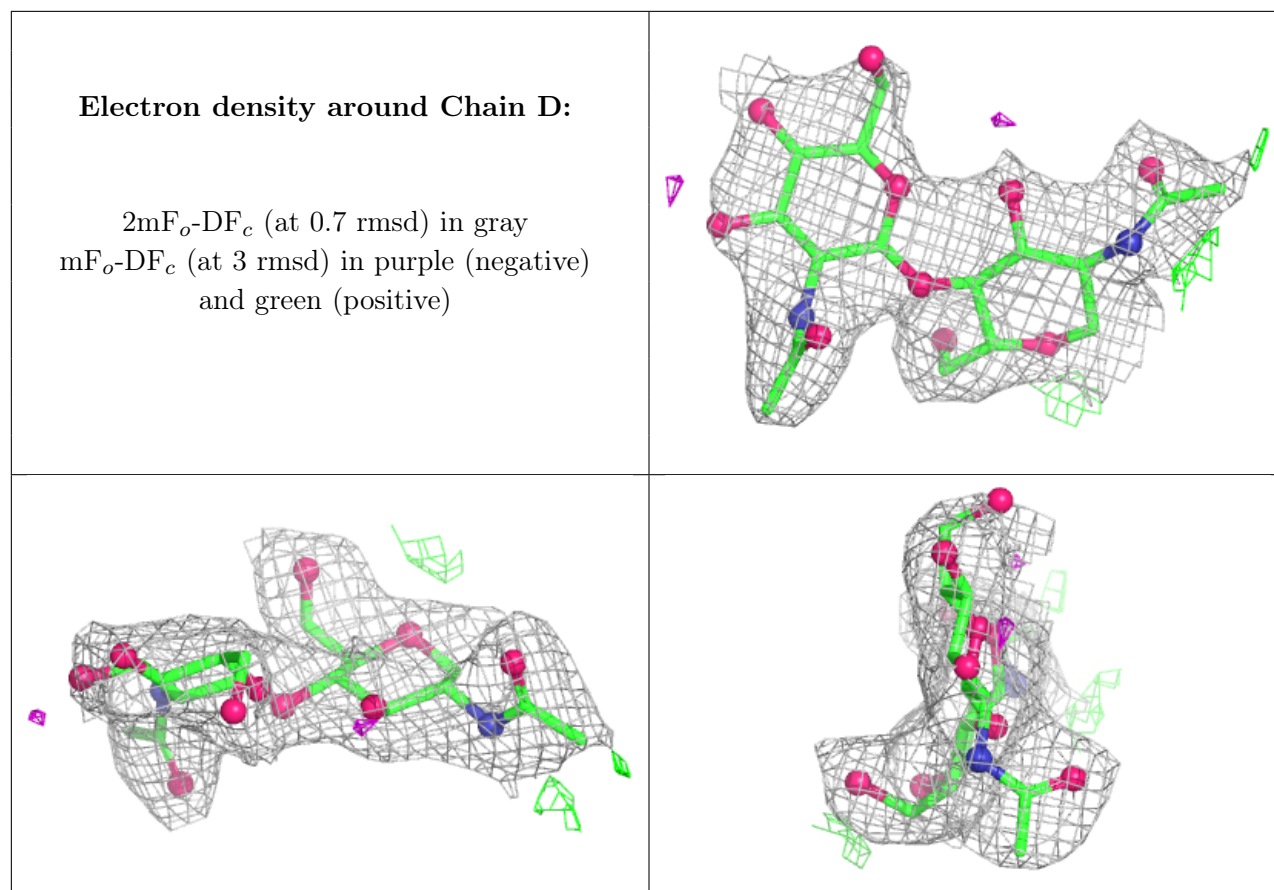
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	D	1	14/15	0.91	0.09	21,30,32,36	0
2	NAG	C	1	14/15	0.94	0.07	25,28,31,36	0

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 ⓘ

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	SO4	A	1507	5/5	0.75	0.16	76,76,76,77	0
4	SO4	B	1508	5/5	0.75	0.15	92,93,93,93	0
4	SO4	A	1506	5/5	0.79	0.22	69,70,70,71	0
3	NAG	A	1498	14/15	0.80	0.13	43,47,50,51	0
4	SO4	B	1507	5/5	0.81	0.14	81,82,82,83	0
4	SO4	A	1508	5/5	0.84	0.20	85,85,85,85	0
4	SO4	A	1509	5/5	0.85	0.15	97,97,97,97	0
4	SO4	B	1506	5/5	0.85	0.14	73,73,73,74	0
4	SO4	B	1505	5/5	0.91	0.14	57,57,58,58	0
4	SO4	B	1503	5/5	0.91	0.12	54,54,55,55	0
4	SO4	A	1503	5/5	0.95	0.08	43,44,44,45	0
4	SO4	A	1504	5/5	0.95	0.08	39,40,40,40	0
4	SO4	A	1505	5/5	0.95	0.08	53,53,54,55	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	SO4	A	1501	5/5	0.96	0.07	35,35,36,37	0
4	SO4	B	1504	5/5	0.96	0.09	40,41,42,42	0
4	SO4	B	1502	5/5	0.98	0.08	30,30,30,31	0
4	SO4	B	1500	5/5	0.99	0.05	15,16,17,17	0
4	SO4	B	1501	5/5	0.99	0.06	26,27,28,28	0
4	SO4	A	1502	5/5	0.99	0.04	22,23,23,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.