



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 2, 2024 – 01:41 PM JST

PDB ID : 8K7G
Title : Crystal structure of human lysosomal alpha-galactosidase A in complex with (2R,3S,4R,5R)-2,5-bis(hydroxymethyl)pyrrolidine-3,4-diol
Authors : Li, H.Y.; Huang, K.F.; Ko, T.P.; Cheng, W.C.
Deposited on : 2023-07-26
Resolution : 2.32 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

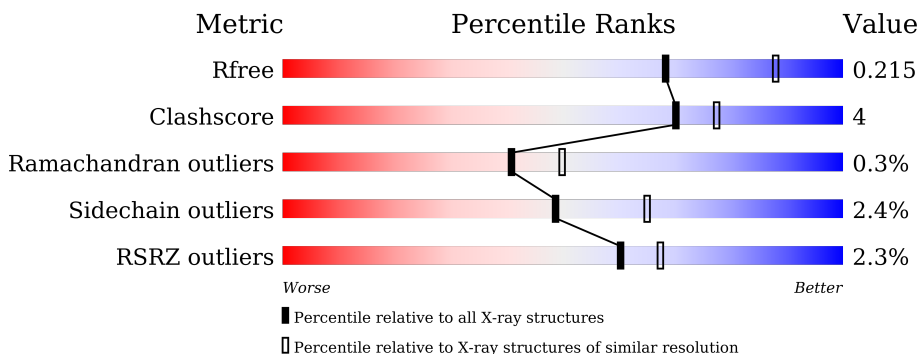
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.32 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}	130704	5974 (2.34-2.30)
Clashscore	141614	6604 (2.34-2.30)
Ramachandran outliers	138981	6523 (2.34-2.30)
Sidechain outliers	138945	6523 (2.34-2.30)
RSRZ outliers	127900	5855 (2.34-2.30)

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	398	<div style="display: flex; align-items: center;"> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 9%, green 89%, grey 9%);"></div> <div style="margin-left: 10px;"> <p>89%</p> <p>9%</p> </div> </div>
1	B	398	<div style="display: flex; align-items: center;"> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 4%, orange 4%, yellow 11%, green 87%, grey 11%);"></div> <div style="margin-left: 10px;"> <p>87%</p> <p>11%</p> </div> </div>
2	C	4	<div style="display: flex; align-items: center;"> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green 75%, yellow 25%);"></div> <div style="margin-left: 10px;"> <p>75%</p> <p>25%</p> </div> </div>
2	E	4	<div style="display: flex; align-items: center;"> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green 25%, yellow 75%);"></div> <div style="margin-left: 10px;"> <p>25%</p> <p>75%</p> </div> </div>
3	D	2	<div style="display: flex; align-items: center;"> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green 50%, orange 50%);"></div> <div style="margin-left: 10px;"> <p>50%</p> <p>50%</p> </div> </div>

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	NAG	D	2	-	-	-	X
6	SO4	A	503	-	-	X	-
6	SO4	B	503	-	-	X	-

2 Entry composition [i](#)

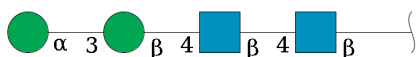
There are 7 unique types of molecules in this entry. The entry contains 7000 atoms, of which 0 are hydrogens and 0 are deuteriums.

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-galactosidase A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	390	Total 3122	C 1988	N 534	O 574	S 26	0	0	0
1	B	392	Total 3139	C 1998	N 537	O 577	S 27	0	0	0

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	4	Total 50	C 28	N 2	O 20	0	0	0
2	E	4	Total 50	C 28	N 2	O 20	0	0	0

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



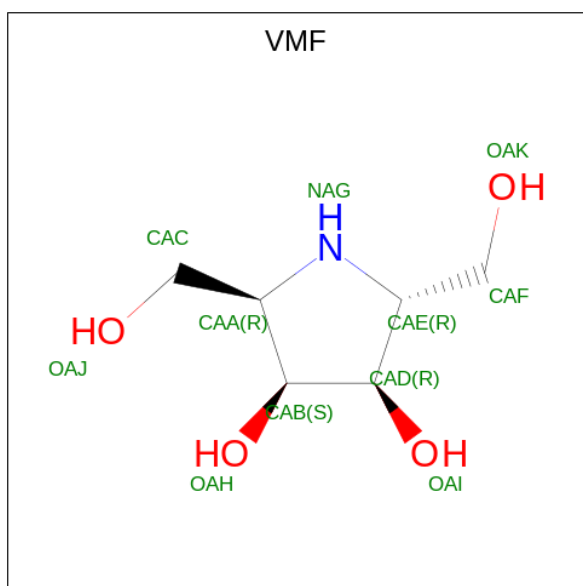
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	D	2	Total 28	C 16	N 2	O 10	0	0	0

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 5 is (2 {R},3 {R},4 {S},5 {R})-2,5-bis(hydroxymethyl)pyrrolidine-3,4-diol (three-letter code: VMF) (formula: C₆H₁₃NO₄).



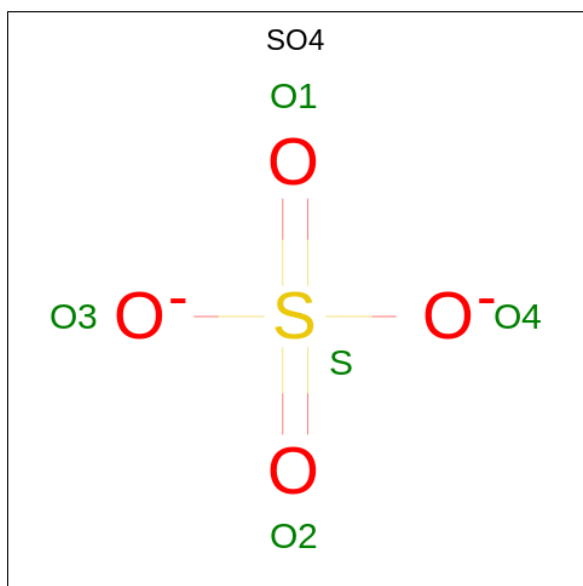
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	11	6	1	4	0	0

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

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

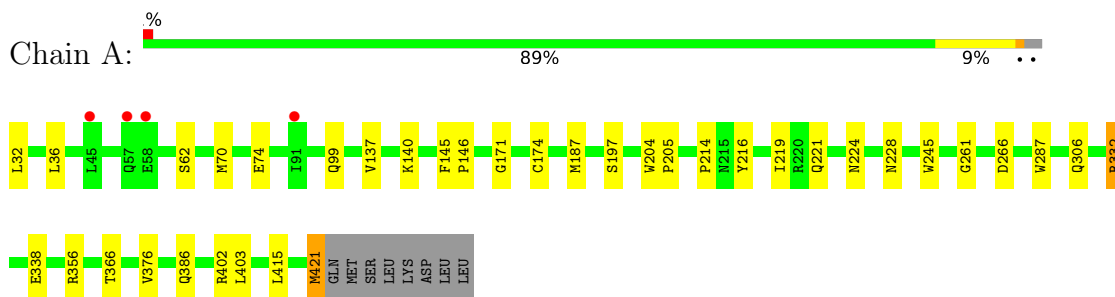
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	A	302	302	302	0	0
7	B	239	239	239	0	0

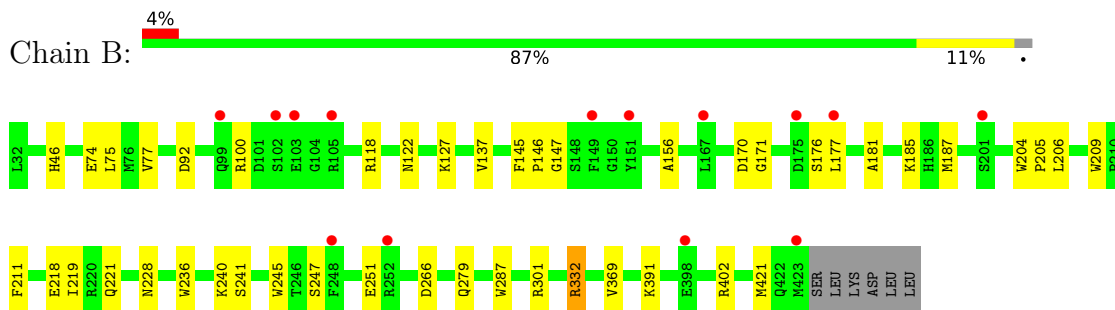
3 Residue-property plots [i](#)

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.

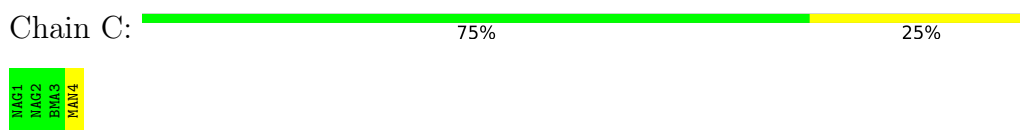
- Molecule 1: Alpha-galactosidase A



- Molecule 1: Alpha-galactosidase A



- Molecule 2: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucofuranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D: 


MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	90.64Å 90.64Å 216.11Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	29.67 – 2.32 29.67 – 2.32	Depositor EDS
% Data completeness (in resolution range)	89.0 (29.67-2.32) 82.0 (29.67-2.32)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.06 (at 2.31Å)	Xtrriage
Refinement program	PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.166 , 0.217 0.166 , 0.215	Depositor DCC
R_{free} test set	1920 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	29.1	Xtrriage
Anisotropy	0.045	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 51.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.033 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7000	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.64% 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: SO4, VMF, MAN, NAG, BMA

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	0.39	0/3209	0.60	0/4358
1	B	0.36	0/3226	0.59	0/4380
All	All	0.38	0/6435	0.60	0/8738

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3122	0	2981	19	0
1	B	3139	0	2999	25	0
2	C	50	0	43	0	0
2	E	50	0	43	0	0
3	D	28	0	25	1	0
4	A	14	0	13	2	0
4	B	14	0	13	0	0
5	A	11	0	0	0	0
5	B	11	0	0	1	0
6	A	10	0	0	2	0
6	B	10	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	302	0	0	3	0
7	B	239	0	0	2	0
All	All	7000	0	6117	45	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 4.

All (45) 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:205:PRO:HG3	1:B:219:ILE:HD13	1.67	0.77
1:A:205:PRO:HG3	1:A:219:ILE:HD13	1.69	0.74
1:A:140:LYS:NZ	7:A:605:HOH:O	2.22	0.72
4:A:501:NAG:O6	7:A:602:HOH:O	2.17	0.59
1:B:228:ASN:HB3	1:B:245:TRP:CH2	2.40	0.57
1:A:228:ASN:HB3	1:A:245:TRP:CH2	2.40	0.57
1:B:118:ARG:CZ	1:B:122:ASN:HD21	2.17	0.56
1:B:170:ASP:OD2	5:B:502:VMF:NAG	2.39	0.55
1:B:118:ARG:NH1	1:B:122:ASN:HD21	2.05	0.54
1:A:70:MET:O	1:A:74:GLU:HG3	2.08	0.54
1:B:332:ARG:NH2	6:B:503:SO4:O4	2.42	0.53
1:B:100:ARG:NH2	1:B:147:GLY:O	2.39	0.52
1:B:137:VAL:HG12	1:B:171:GLY:HA2	1.91	0.51
1:A:36:LEU:HD11	1:A:197:SER:HB3	1.93	0.51
1:A:221:GLN:HE21	3:D:2:NAG:H82	1.76	0.51
1:B:218:GLU:O	1:B:221:GLN:HB2	2.11	0.49
1:B:77:VAL:HG21	1:B:127:LYS:HB3	1.94	0.49
1:B:245:TRP:HB2	7:B:720:HOH:O	2.13	0.48
1:B:177:LEU:HD11	1:B:211:PHE:CG	2.47	0.48
1:A:137:VAL:HG12	1:A:171:GLY:HA2	1.96	0.47
1:B:156:ALA:HB2	1:B:187:MET:HE3	1.97	0.47
1:B:251:GLU:HB2	7:B:661:HOH:O	2.14	0.47
1:A:402:ARG:NH1	6:A:503:SO4:O1	2.48	0.47
1:A:32:LEU:HB3	1:A:224:ASN:ND2	2.30	0.46
1:B:204:TRP:HB3	1:B:205:PRO:HD3	1.96	0.46
1:A:204:TRP:HB3	1:A:205:PRO:HD3	1.99	0.45
1:B:236:TRP:CD1	1:B:240:LYS:HE2	2.52	0.45
1:B:145:PHE:HB3	1:B:146:PRO:HD2	1.98	0.44
1:A:386:GLN:HA	1:A:415:LEU:HD23	1.99	0.44
1:A:145:PHE:HB3	1:A:146:PRO:HD2	1.99	0.44
1:A:332:ARG:NH2	6:A:503:SO4:O2	2.51	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:75:LEU:CD1	1:B:301:ARG:HG2	2.48	0.43
1:A:214:PRO:HG2	1:A:216:TYR:CE2	2.54	0.43
1:A:421:MET:O	7:A:604:HOH:O	2.21	0.43
1:B:206:LEU:HA	1:B:209:TRP:HD1	1.83	0.43
1:B:46:HIS:CE1	1:B:92:ASP:H	2.37	0.42
1:A:338:GLU:OE2	1:A:356:ARG:NH1	2.53	0.42
1:B:402:ARG:NH2	6:B:503:SO4:O2	2.52	0.42
1:B:177:LEU:H	1:B:177:LEU:HD12	1.84	0.42
1:B:181:ALA:O	1:B:185:LYS:HG3	2.19	0.42
1:A:224:ASN:O	1:A:261:GLY:HA2	2.21	0.41
1:B:236:TRP:CE3	1:B:279:GLN:HG2	2.56	0.41
1:B:74:GLU:HG2	1:B:127:LYS:HE3	2.03	0.41
1:A:366:THR:HA	1:A:403:LEU:O	2.22	0.40
1:A:174:CYS:HA	4:A:501:NAG:H81	2.03	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	388/398 (98%)	379 (98%)	8 (2%)	1 (0%)	41	50
1	B	390/398 (98%)	381 (98%)	8 (2%)	1 (0%)	41	50
All	All	778/796 (98%)	760 (98%)	16 (2%)	2 (0%)	41	50

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	266	ASP
1	B	266	ASP

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	331/339 (98%)	323 (98%)	8 (2%)	49	65
1	B	333/339 (98%)	325 (98%)	8 (2%)	49	65
All	All	664/678 (98%)	648 (98%)	16 (2%)	49	65

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	SER
1	A	99	GLN
1	A	187	MET
1	A	287	TRP
1	A	306	GLN
1	A	332	ARG
1	A	376	VAL
1	A	421	MET
1	B	176	SER
1	B	241	SER
1	B	247	SER
1	B	287	TRP
1	B	332	ARG
1	B	369	VAL
1	B	391	LYS
1	B	421	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	221	GLN
1	A	249	ASN
1	A	416	GLN
1	B	122	ASN

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](#)

10 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	0.29	0	17,19,21	0.46	0
2	NAG	C	2	2	14,14,15	0.44	0	17,19,21	0.61	0
2	BMA	C	3	2	11,11,12	0.68	0	15,15,17	0.83	0
2	MAN	C	4	2	11,11,12	1.49	2 (18%)	15,15,17	1.07	0
3	NAG	D	1	1,3	14,14,15	0.46	0	17,19,21	0.60	0
3	NAG	D	2	3	14,14,15	0.63	1 (7%)	17,19,21	0.39	0
2	NAG	E	1	1,2	14,14,15	0.22	0	17,19,21	0.71	0
2	NAG	E	2	2	14,14,15	1.04	1 (7%)	17,19,21	1.62	1 (5%)
2	BMA	E	3	2	11,11,12	1.14	1 (9%)	15,15,17	0.84	1 (6%)
2	MAN	E	4	2	11,11,12	0.92	0	15,15,17	1.22	1 (6%)

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. '2' 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	-	2/6/23/26	0/1/1/1
2	BMA	C	3	2	-	2/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
3	NAG	D	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	D	2	3	-	0/6/23/26	0/1/1/1
2	NAG	E	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	E	2	2	-	4/6/23/26	0/1/1/1
2	BMA	E	3	2	-	1/2/19/22	0/1/1/1
2	MAN	E	4	2	-	2/2/19/22	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	2	NAG	O5-C1	3.63	1.49	1.43
2	C	4	MAN	C2-C3	3.05	1.57	1.52
2	C	4	MAN	O5-C1	-2.90	1.39	1.43
2	E	3	BMA	O5-C1	-2.31	1.40	1.43
3	D	2	NAG	O5-C1	-2.21	1.40	1.43

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	2	NAG	C1-O5-C5	6.12	120.48	112.19
2	E	4	MAN	C1-O5-C5	2.77	115.94	112.19
2	E	3	BMA	O2-C2-C3	-2.04	106.05	110.14

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	3	BMA	O5-C5-C6-O6
2	E	1	NAG	O5-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
2	E	2	NAG	O5-C5-C6-O6
2	E	4	MAN	C4-C5-C6-O6
2	E	1	NAG	C4-C5-C6-O6
2	E	2	NAG	C8-C7-N2-C2
2	E	2	NAG	O7-C7-N2-C2
2	C	2	NAG	C4-C5-C6-O6
3	D	1	NAG	O5-C5-C6-O6
2	E	2	NAG	C4-C5-C6-O6
2	E	4	MAN	O5-C5-C6-O6

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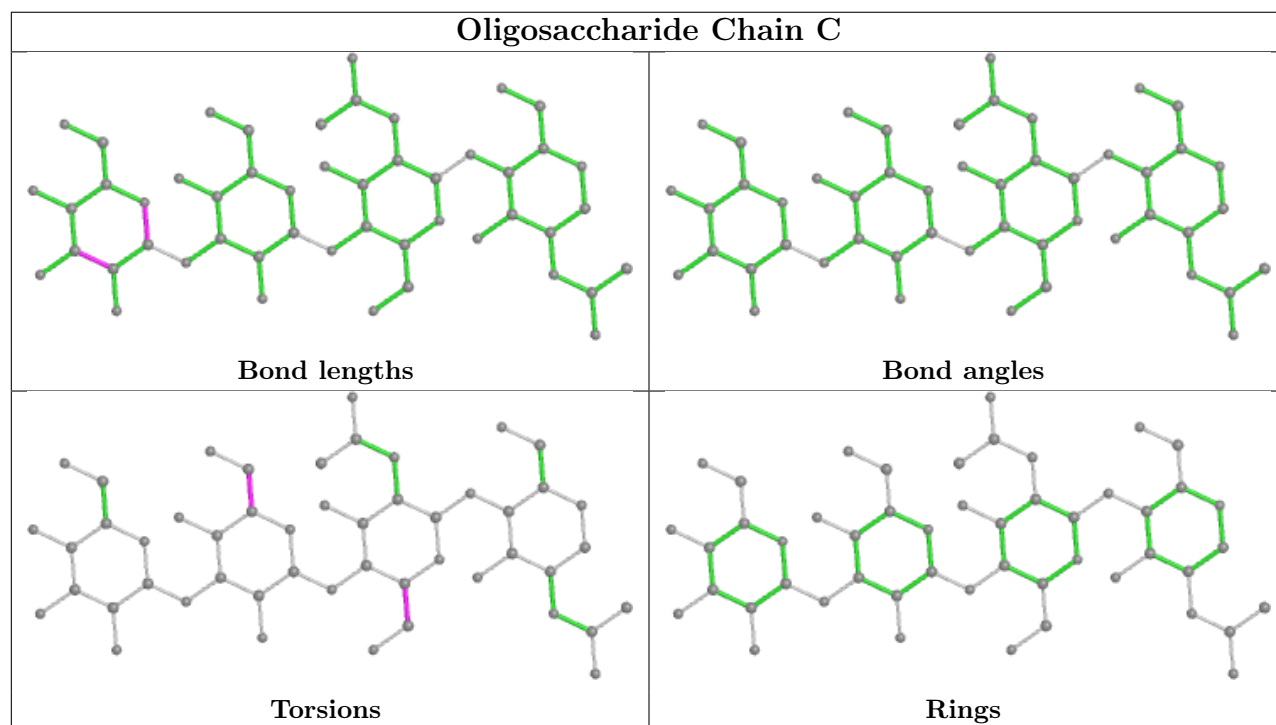
Mol	Chain	Res	Type	Atoms
3	D	1	NAG	C4-C5-C6-O6
2	C	3	BMA	C4-C5-C6-O6
2	E	3	BMA	O5-C5-C6-O6

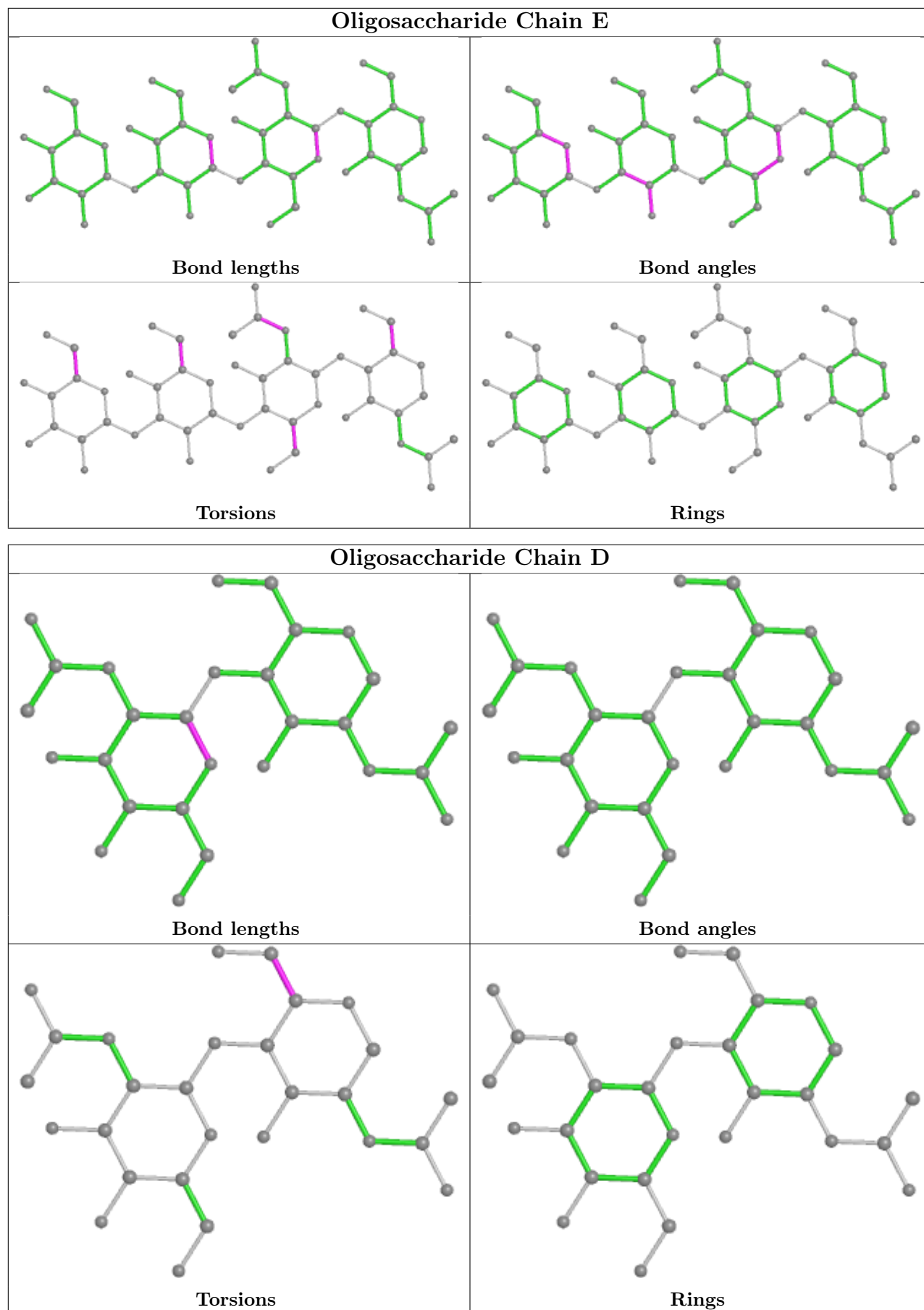
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	2	NAG	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

8 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
6	SO4	B	504	-	4,4,4	0.24	0	6,6,6	0.10	0
5	VMF	A	502	-	11,11,11	1.09	1 (9%)	12,15,15	1.39	2 (16%)
6	SO4	A	504	-	4,4,4	0.20	0	6,6,6	0.22	0
6	SO4	A	503	-	4,4,4	0.11	0	6,6,6	0.14	0
5	VMF	B	502	-	11,11,11	1.56	1 (9%)	12,15,15	1.36	3 (25%)
4	NAG	A	501	1	14,14,15	0.65	1 (7%)	17,19,21	0.48	0
6	SO4	B	503	-	4,4,4	0.13	0	6,6,6	0.10	0
4	NAG	B	501	1	14,14,15	0.33	0	17,19,21	0.51	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
5	VMF	B	502	-	-	0/4/20/20	0/1/1/1
4	NAG	A	501	1	-	2/6/23/26	0/1/1/1
5	VMF	A	502	-	-	0/4/20/20	0/1/1/1
4	NAG	B	501	1	-	0/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	502	VMF	CAB-CAA	-4.84	1.48	1.53
5	A	502	VMF	CAB-CAA	-2.88	1.50	1.53
4	A	501	NAG	O5-C1	2.24	1.47	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	502	VMF	CAC-CAA-CAB	-2.88	108.58	113.67
5	A	502	VMF	CAC-CAA-CAB	-2.65	109.00	113.67
5	B	502	VMF	CAD-CAB-CAA	-2.07	99.27	102.55
5	B	502	VMF	OAH-CAB-CAA	-2.06	107.42	112.92
5	A	502	VMF	CAF-CAE-NAG	-2.04	107.81	111.46

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	501	NAG	O5-C5-C6-O6
4	A	501	NAG	C4-C5-C6-O6

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	503	SO4	2	0
5	B	502	VMF	1	0
4	A	501	NAG	2	0
6	B	503	SO4	2	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	390/398 (97%)	-0.39	4 (1%) 82 86	19, 31, 49, 77	0
1	B	392/398 (98%)	-0.05	14 (3%) 42 49	20, 40, 74, 114	0
All	All	782/796 (98%)	-0.22	18 (2%) 60 67	19, 34, 65, 114	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	102	SER	4.4
1	B	99	GLN	4.4
1	B	423	MET	4.0
1	B	175	ASP	3.3
1	B	103	GLU	3.2
1	B	105	ARG	2.9
1	A	58	GLU	2.9
1	B	398	GLU	2.7
1	B	201	SER	2.6
1	A	57	GLN	2.5
1	A	45	LEU	2.3
1	B	177	LEU	2.3
1	B	149	PHE	2.3
1	B	167	LEU	2.3
1	B	151	TYR	2.2
1	A	91	ILE	2.1
1	B	252	ARG	2.1
1	B	248	PHE	2.0

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

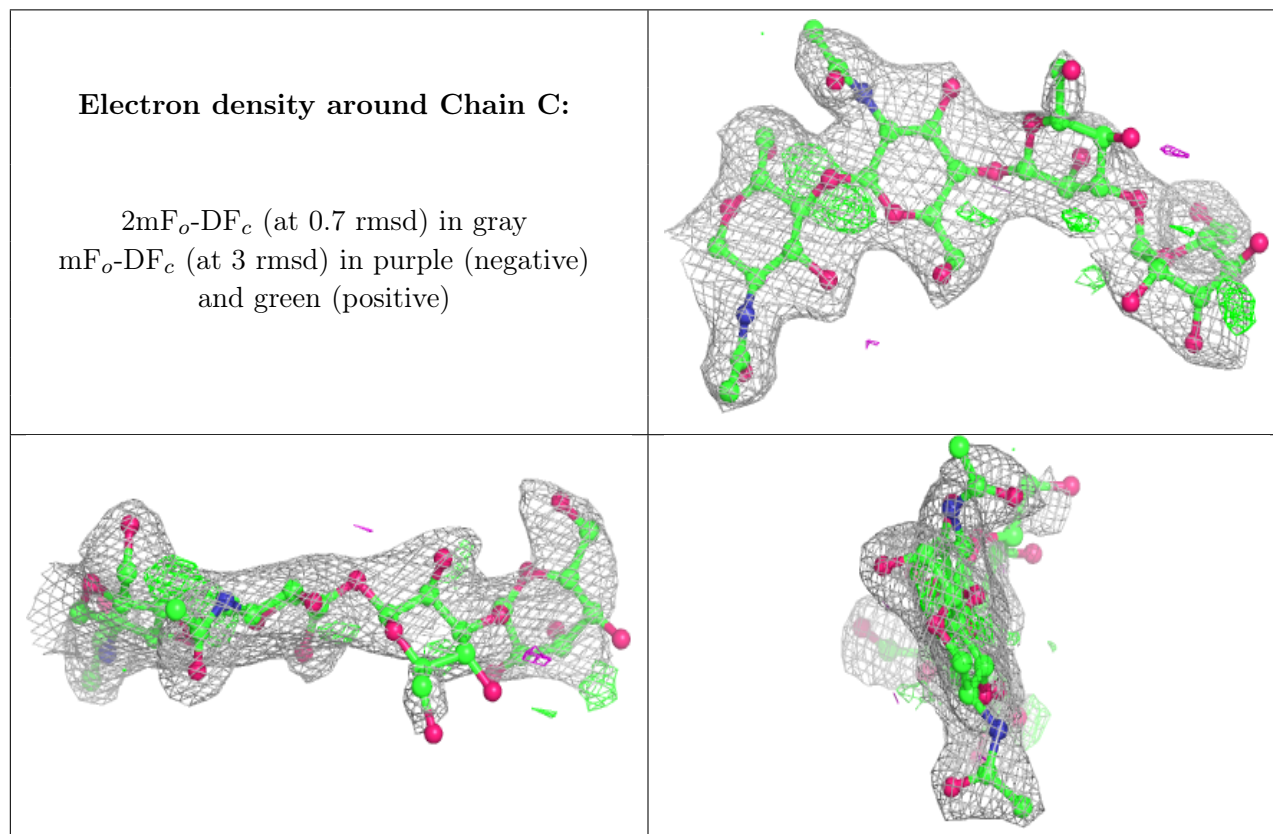
There are no non-standard protein/DNA/RNA residues in this entry.

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.

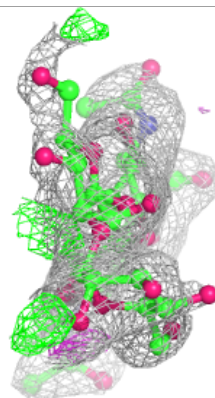
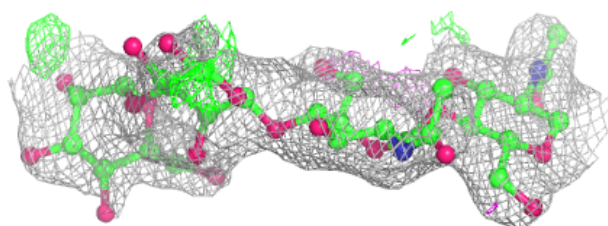
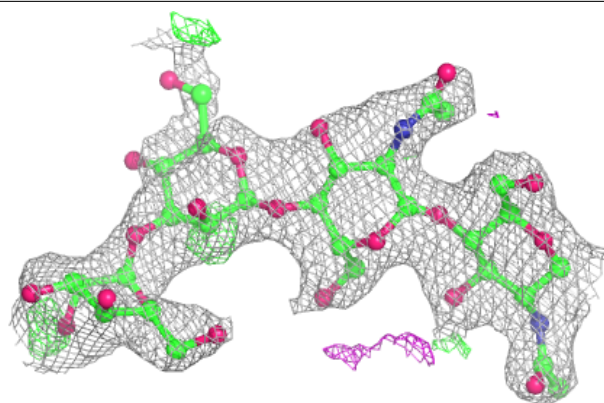
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NAG	D	2	14/15	0.75	0.46	79,89,92,96	0
2	MAN	C	4	11/12	0.76	0.39	85,101,105,106	0
2	BMA	E	3	11/12	0.81	0.38	86,99,104,108	0
2	MAN	E	4	11/12	0.81	0.32	75,88,97,98	0
2	BMA	C	3	11/12	0.81	0.41	73,89,100,108	0
3	NAG	D	1	14/15	0.86	0.24	55,68,77,81	0
2	NAG	E	2	14/15	0.89	0.32	66,75,85,87	0
2	NAG	C	2	14/15	0.94	0.22	43,55,62,70	0
2	NAG	C	1	14/15	0.94	0.13	29,44,50,52	0
2	NAG	E	1	14/15	0.95	0.20	49,58,67,70	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.

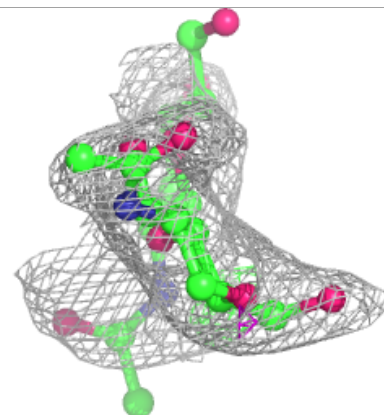
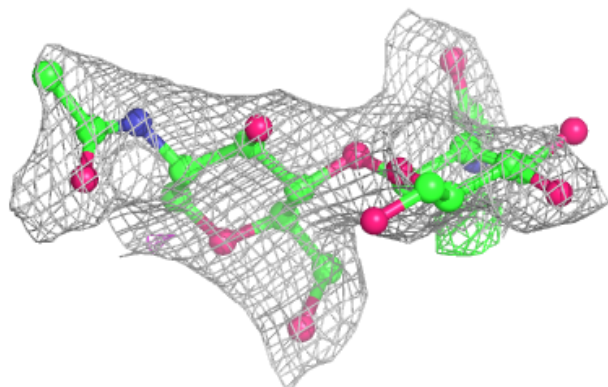
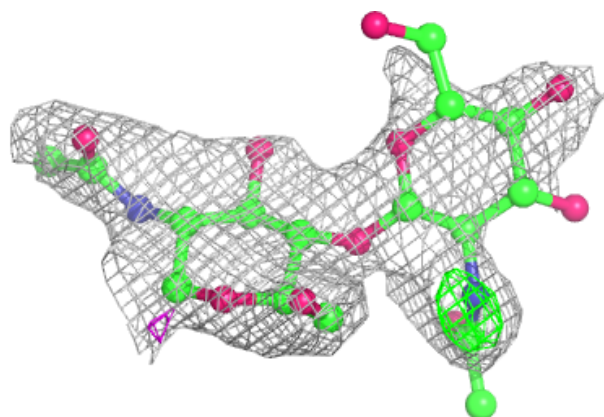


Electron density around Chain E:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around Chain D:**

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	B	501	14/15	0.78	0.33	79,91,99,100	0
4	NAG	A	501	14/15	0.86	0.22	43,55,60,62	0
5	VMF	B	502	11/11	0.91	0.17	38,46,52,57	0
6	SO4	B	504	5/5	0.92	0.37	70,72,86,113	0
6	SO4	A	504	5/5	0.94	0.36	59,64,72,90	0
5	VMF	A	502	11/11	0.94	0.12	26,34,41,44	0
6	SO4	B	503	5/5	0.98	0.10	54,56,62,68	0
6	SO4	A	503	5/5	0.99	0.10	40,50,62,62	0

6.5 Other polymers [i](#)

There are no such residues in this entry.