Full wwPDB X-ray Structure Validation Report (i)

Oct 12, 2026 – 06:26 PM EDT

PDB ID	:	9YO2 / pdb_00009yo2
Title	:	Crystal structure of integrin a4b1 headpiece in complex with Firategrast (Mn)
Authors	:	Monroy, M.F.; Lin, F.Y.; Qiao, Q.
Deposited on	:	2025-10-13
Resolution	:	1.95 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 (i) 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 (i)) were used in the production of this report:

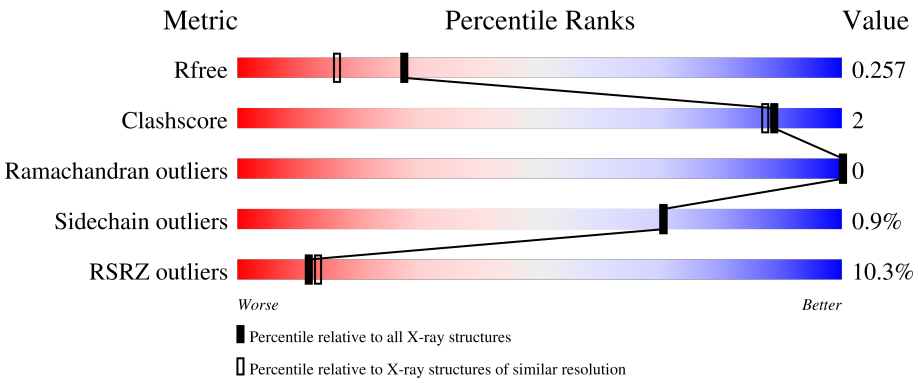
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 1.95 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	3494 (1.96-1.96)
Clashscore	190562	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)
RSRZ outliers	180081	3495 (1.96-1.96)

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 <=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	597	4% 94%
2	B	490	18% 88% 8%
3	C	3	33% 33% 33%
3	D	3	33% 33% 33%
4	E	4	50% 50%

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 16346 atoms, of which 7914 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 Integrin a4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	588	8969	2858	4438	785	866	22	0	0	0

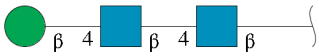
- Molecule 2 is a protein called Integrin beta-1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
2	B	449	6781	2155	3321	581	694	30	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	92	HIS	THR	conflict	UNP P05556
B	195	THR	SER	conflict	UNP P05556
B	482	GLY	-	expression tag	UNP P05556
B	483	GLY	-	expression tag	UNP P05556
B	484	SER	-	expression tag	UNP P05556
B	485	GLU	-	expression tag	UNP P05556
B	486	ASN	-	expression tag	UNP P05556
B	487	LEU	-	expression tag	UNP P05556
B	488	TYR	-	expression tag	UNP P05556
B	489	PHE	-	expression tag	UNP P05556
B	490	GLN	-	expression tag	UNP P05556

- Molecule 3 is an oligosaccharide called 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	H	N	O			
3	C	3	63	22	24	2	15	0	0	0
3	D	3	63	22	24	2	15	0	0	0

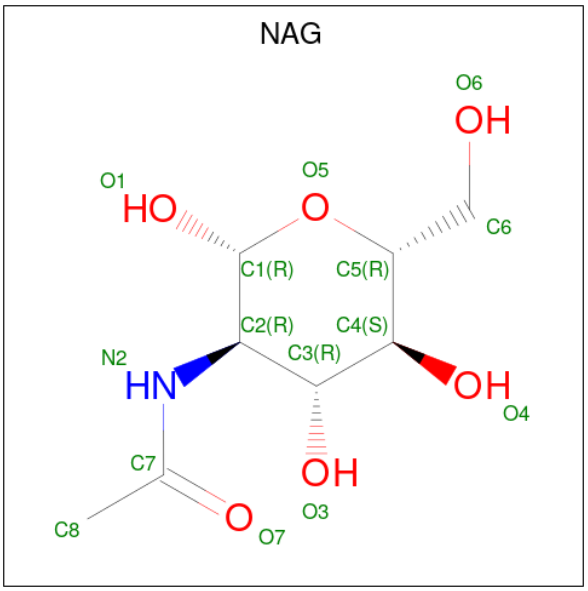
- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	H	N	O			
4	E	4	81	28	31	2	20	0	0	0

- Molecule 5 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

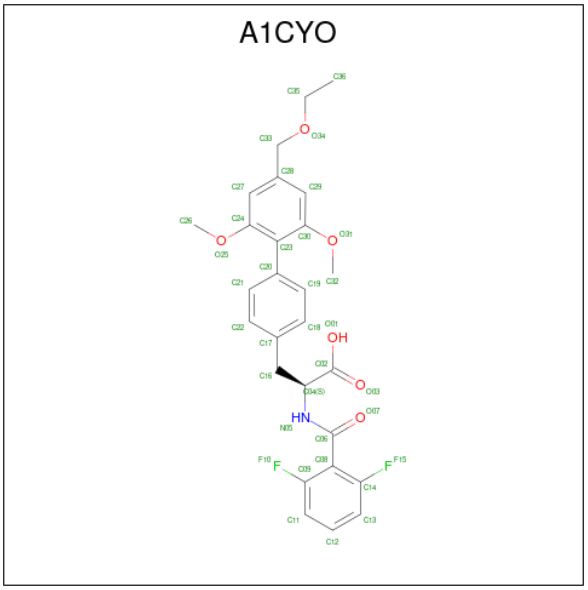
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mn		
5	A	3	3	3	0	0
5	B	3	3	3	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	H	N	O		
6	A	1	24	8	10	1	5	0	0
			Total	C	H	N	O		
6	A	1	24	8	10	1	5	0	0
			Total	C	H	N	O		
6	A	1	24	8	10	1	5	0	0
			Total	C	H	N	O		
6	A	1	24	8	10	1	5	0	0
			Total	C	H	N	O		
6	B	1	24	8	10	1	5	0	0

- Molecule 7 is N-(2,6-difluorobenzoyl)-4-[4-(ethoxymethyl)-2,6-dimethoxyphenyl]-L-phenylalanine (CCD ID: A1CYO) (formula: $C_{27}H_{27}F_2NO_6$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	F	H	N	O		
7	B	1	62	27	2	26	1	6	0	0

- Molecule 8 is water.

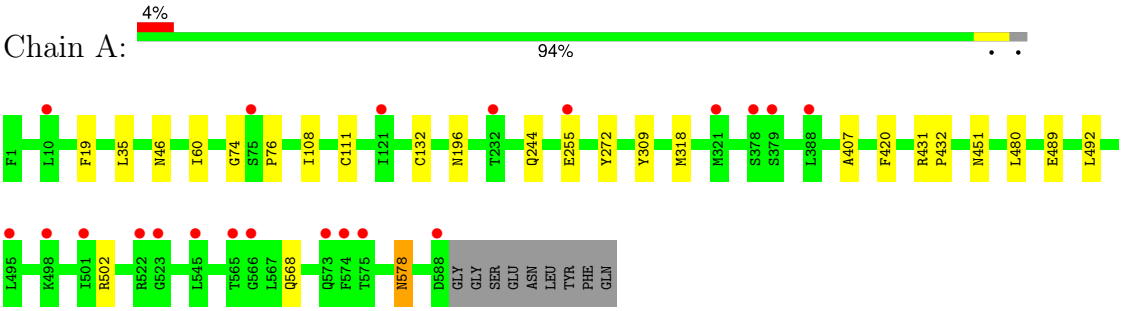
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
8	A	147	147	147	0	0
			Total	O		
8	B	54	54	54	0	0

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.

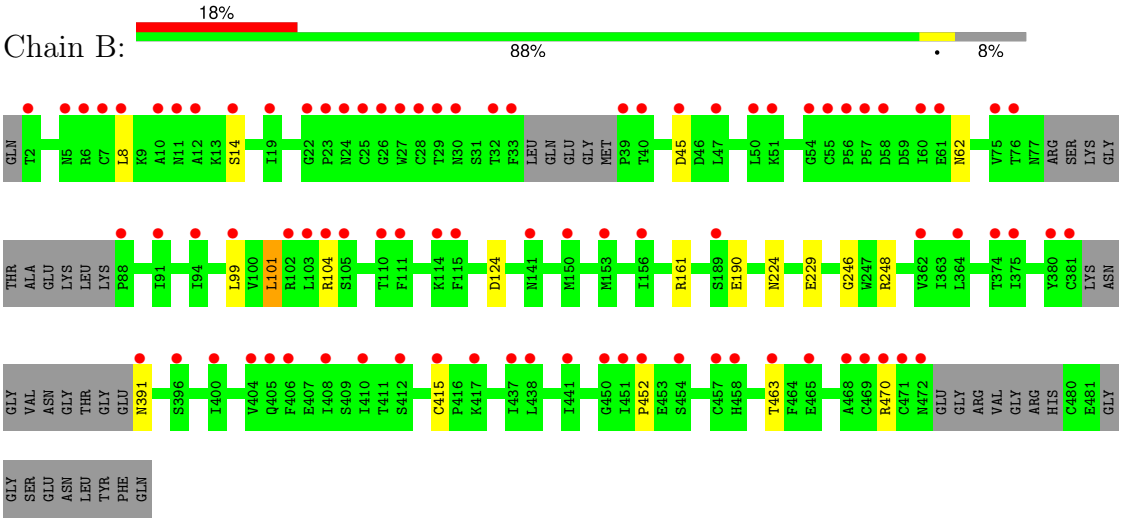
• Molecule 1: Integrin a4

Chain A:



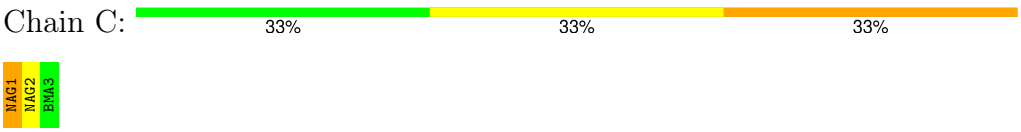
• Molecule 2: Integrin beta-1

Chain B:

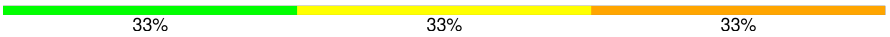


• Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:



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

Chain D: 

• Molecule 4: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	82.81Å 110.49Å 124.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.95 – 1.95 45.95 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.5 (45.95-1.95) 99.7 (45.95-1.95)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.41 (at 1.95Å)	Xtriage
Refinement program	PHENIX (1.19.2_4158)	Depositor
R, R_{free}	0.206 , 0.250 0.213 , 0.257	Depositor DCC
R_{free} test set	4321 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å^2)	35.5	Xtriage
Anisotropy	0.342	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.40 , 53.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	16346	wwPDB-VP
Average B, all atoms (Å^2)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.73% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: A1CYO, BMA, MN, MAN, NAG

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	0.26	0/4624	0.45	0/6259
2	B	0.20	0/3520	0.37	0/4756
All	All	0.24	0/8144	0.42	0/11015

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	4531	4438	4437	20	0
2	B	3460	3321	3320	9	0
3	C	39	24	34	5	0
3	D	39	24	34	1	0
4	E	50	31	43	3	0
5	A	3	0	0	0	0
5	B	3	0	0	0	0
6	A	56	40	52	2	0
6	B	14	10	13	0	0
7	B	36	26	0	0	0
8	A	147	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	B	54	0	0	0	0
All	All	8432	7914	7933	31	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 2.

All (31) 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:451:ASN:HD21	4:E:1:NAG:C1	2.01	0.72
1:A:196:ASN:HD21	3:C:1:NAG:C1	2.09	0.66
1:A:578:ASN:HD21	6:A:607:NAG:C1	2.14	0.60
2:B:14:SER:OG	2:B:470:ARG:NH2	2.34	0.60
1:A:46:ASN:ND2	1:A:76:PRO:O	2.36	0.58
1:A:46:ASN:HD21	6:A:604:NAG:C1	2.18	0.56
1:A:35:LEU:CD1	1:A:108:ILE:HD13	2.36	0.55
1:A:451:ASN:ND2	4:E:1:NAG:C1	2.69	0.54
1:A:431:ARG:HD2	1:A:568:GLN:O	2.07	0.54
2:B:62:ASN:OD1	2:B:104:ARG:NH2	2.44	0.50
1:A:196:ASN:HD21	3:C:1:NAG:C2	2.24	0.50
1:A:432:PRO:HB2	1:A:480:LEU:HD21	1.93	0.48
2:B:99:LEU:HD13	2:B:101:LEU:HD13	1.96	0.48
1:A:196:ASN:OD1	3:C:1:NAG:C1	2.62	0.47
1:A:196:ASN:HD21	3:C:1:NAG:H2	1.81	0.46
1:A:244:GLN:NE2	8:A:703:HOH:O	2.37	0.46
1:A:196:ASN:ND2	3:C:1:NAG:C1	2.78	0.45
2:B:124:ASP:OD2	2:B:248:ARG:HG2	2.17	0.45
1:A:60:ILE:HG21	1:A:407:ALA:HB1	2.00	0.44
3:D:2:NAG:H4	3:D:3:BMA:O2	2.18	0.44
1:A:309:TYR:HB3	1:A:318:MET:HB3	1.99	0.43
2:B:190:GLU:OE1	2:B:190:GLU:N	2.43	0.43
4:E:2:NAG:H4	4:E:3:BMA:H2	1.75	0.43
2:B:452:PRO:HA	2:B:463:THR:HG22	2.00	0.43
2:B:229:GLU:HA	2:B:229:GLU:OE1	2.19	0.42
2:B:161:ARG:NH2	2:B:246:GLY:O	2.50	0.42
2:B:8:LEU:HD21	2:B:45:ASP:OD1	2.19	0.42
1:A:74:GLY:N	8:A:706:HOH:O	2.45	0.41
1:A:19:PHE:O	1:A:420:PHE:HA	2.21	0.41
1:A:111:CYS:HA	1:A:132:CYS:HA	2.03	0.40
1:A:492:LEU:O	1:A:502:ARG:HD3	2.21	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	586/597 (98%)	573 (98%)	13 (2%)	0	100	100
2	B	439/490 (90%)	423 (96%)	16 (4%)	0	100	100
All	All	1025/1087 (94%)	996 (97%)	29 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	487/496 (98%)	483 (99%)	4 (1%)	73	74
2	B	394/431 (91%)	390 (99%)	4 (1%)	68	67
All	All	881/927 (95%)	873 (99%)	8 (1%)	70	70

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	255	GLU
1	A	272	TYR
1	A	489	GLU
1	A	578	ASN
2	B	101	LEU

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Mol	Chain	Res	Type
2	B	224	ASN
2	B	391	ASN
2	B	415	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	123	ASN
1	A	161	ASN
1	A	209	GLN
2	B	77	ASN
2	B	92	HIS
2	B	141	ASN
2	B	249	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	$\#\|Z\| > 2$
3	NAG	C	1	3	14,14,15	0.96	1 (7%)	17,19,21	0.95	2 (11%)
3	NAG	C	2	3	14,14,15	0.77	1 (7%)	17,19,21	0.53	0
3	BMA	C	3	3	11,11,12	0.43	0	15,15,17	0.79	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	NAG	D	1	3,2	14,14,15	0.39	0	17,19,21	0.56	0
3	NAG	D	2	3	14,14,15	0.58	0	17,19,21	0.90	0
3	BMA	D	3	3	11,11,12	1.75	3 (27%)	15,15,17	1.30	3 (20%)
4	NAG	E	1	4	14,14,15	1.11	2 (14%)	17,19,21	0.98	1 (5%)
4	NAG	E	2	4	14,14,15	0.55	0	17,19,21	0.56	0
4	BMA	E	3	4	11,11,12	0.98	1 (9%)	15,15,17	1.55	2 (13%)
4	MAN	E	4	4	11,11,12	0.64	0	15,15,17	1.23	2 (13%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

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

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	3	BMA	C1-C2	3.85	1.61	1.52
3	D	3	BMA	C2-C3	3.42	1.57	1.52
3	C	1	NAG	O5-C1	-3.18	1.38	1.43
4	E	1	NAG	C1-C2	-3.06	1.48	1.52
3	C	2	NAG	O5-C1	-2.84	1.38	1.43
4	E	1	NAG	O5-C1	-2.64	1.39	1.43
3	D	3	BMA	C4-C3	2.34	1.58	1.52
4	E	3	BMA	C4-C5	2.26	1.57	1.53

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	E	3	BMA	C1-O5-C5	4.83	118.66	112.19
4	E	4	MAN	C1-O5-C5	3.94	117.47	112.19
3	D	3	BMA	C2-C3-C4	2.75	115.70	110.86
3	D	3	BMA	O2-C2-C1	2.35	114.61	109.22
3	C	1	NAG	C3-C4-C5	2.33	114.46	110.23
4	E	1	NAG	C3-C4-C5	2.22	114.25	110.23
3	D	3	BMA	C1-O5-C5	-2.17	109.28	112.19
3	C	1	NAG	O4-C4-C5	-2.12	104.11	109.32
4	E	3	BMA	C3-C4-C5	2.09	114.02	110.23
4	E	4	MAN	O2-C2-C3	-2.04	105.93	110.15

There are no chirality outliers.

All (10) torsion outliers are listed below:

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

All (1) ring outliers are listed below:

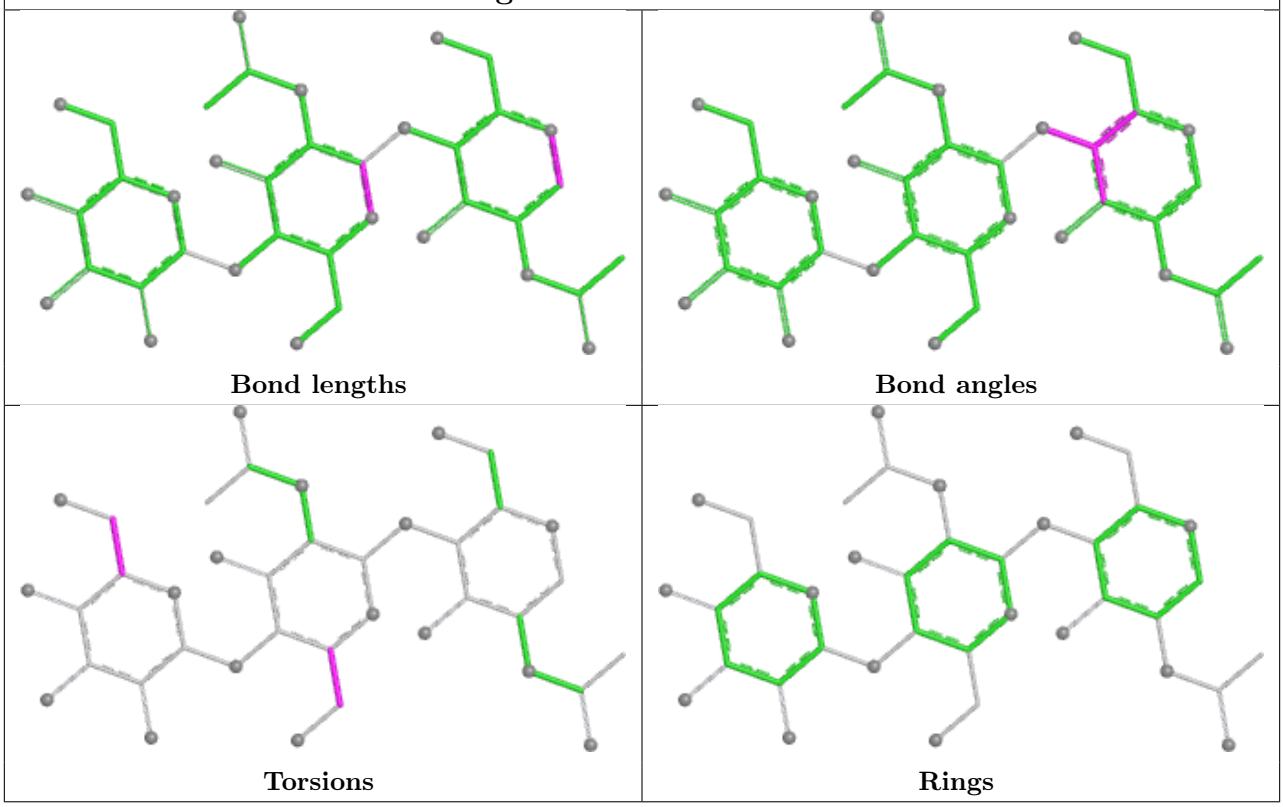
Mol	Chain	Res	Type	Atoms
4	E	4	MAN	C1-C2-C3-C4-C5-O5

6 monomers are involved in 9 short contacts:

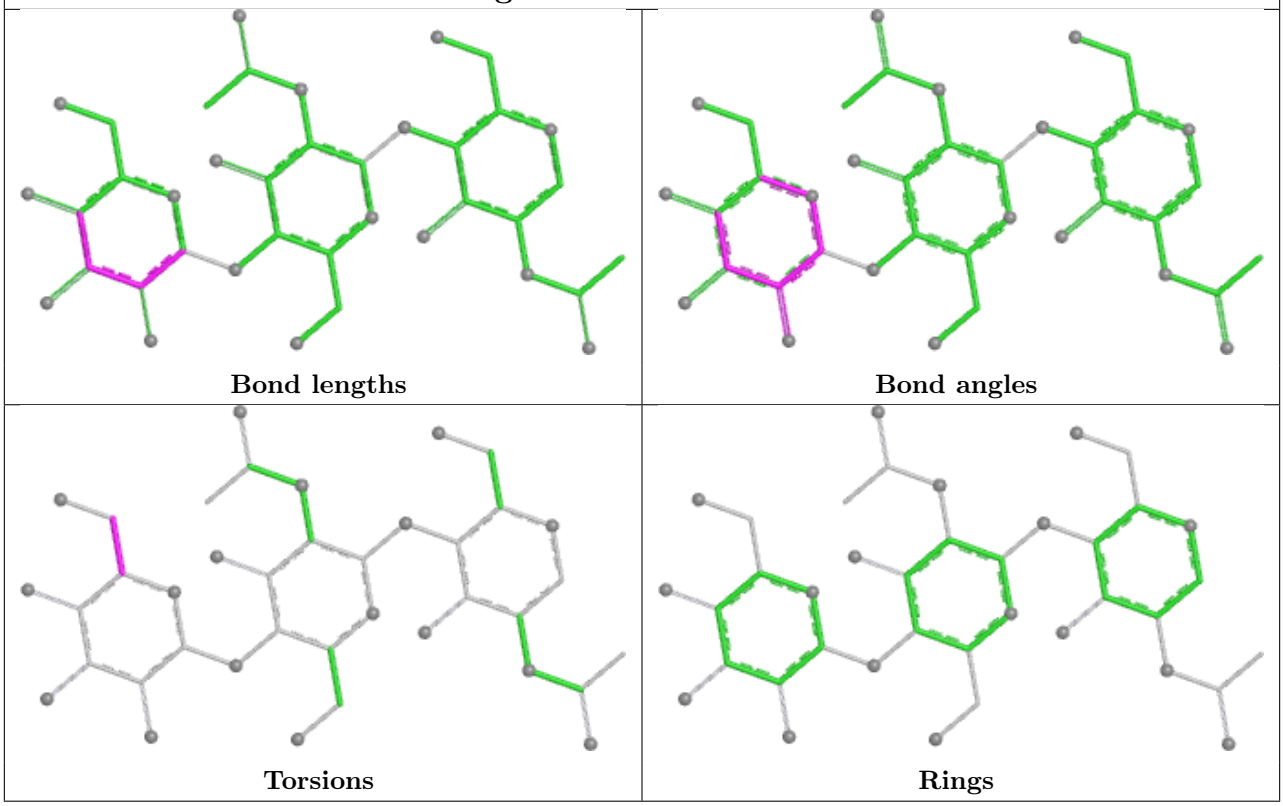
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	3	BMA	1	0
4	E	2	NAG	1	0
4	E	3	BMA	1	0
3	D	2	NAG	1	0
3	C	1	NAG	5	0
4	E	1	NAG	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

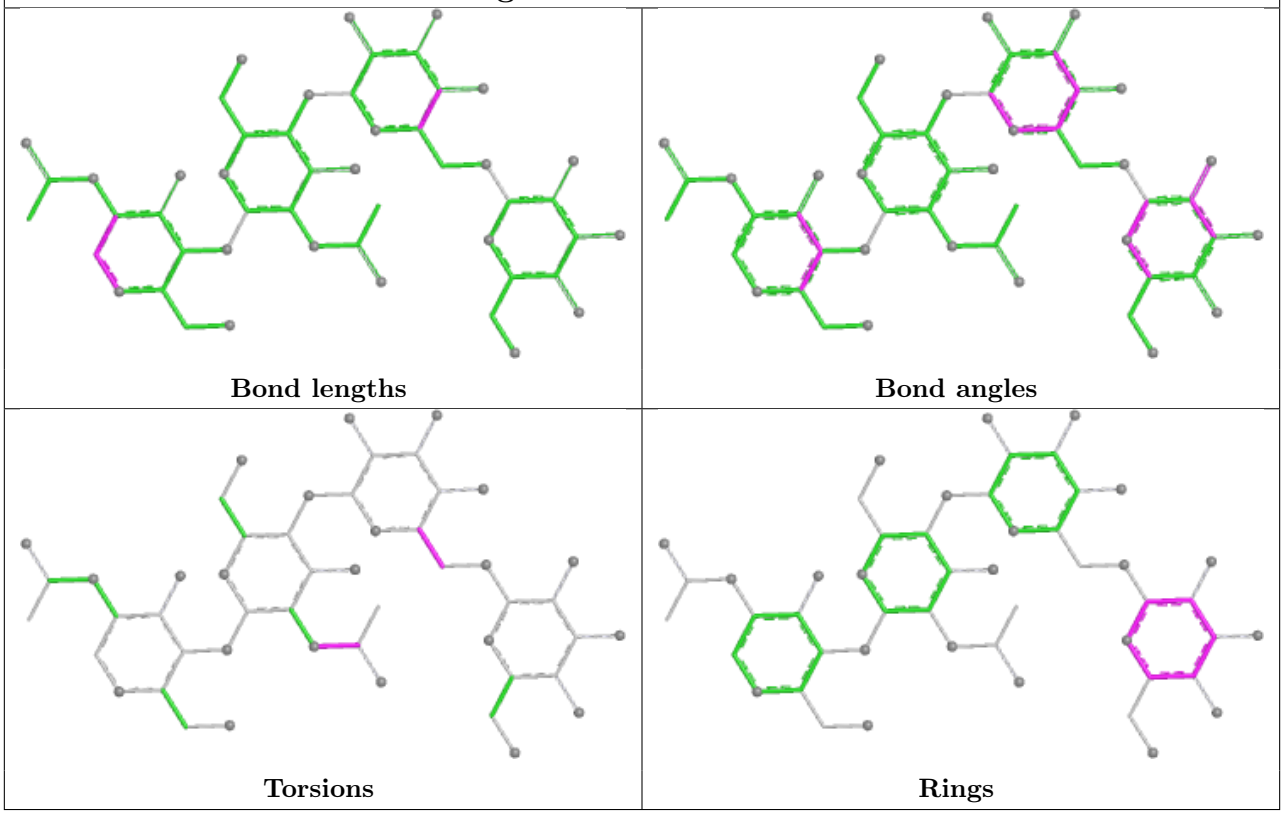
Oligosaccharide Chain C



Oligosaccharide Chain D



Oligosaccharide Chain E



5.6 Ligand geometry (i)

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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	$\#\|Z\| > 2$
6	NAG	A	604	-	14,14,15	0.75	1 (7%)	17,19,21	0.67	0
6	NAG	A	607	-	14,14,15	1.03	2 (14%)	17,19,21	0.85	1 (5%)
7	A1CYO	B	2005	5	38,38,38	1.31	4 (10%)	52,52,52	1.59	7 (13%)
6	NAG	A	606	1	14,14,15	0.36	0	17,19,21	0.45	0
6	NAG	B	2004	-	14,14,15	0.61	1 (7%)	17,19,21	0.46	0
6	NAG	A	605	1	14,14,15	0.49	0	17,19,21	0.54	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
6	NAG	A	604	-	-	2/6/23/26	0/1/1/1
6	NAG	A	607	-	-	2/6/23/26	0/1/1/1
7	A1CYO	B	2005	5	-	1/28/28/28	0/3/3/3
6	NAG	A	606	1	-	0/6/23/26	0/1/1/1
6	NAG	B	2004	-	-	4/6/23/26	0/1/1/1
6	NAG	A	605	1	-	1/6/23/26	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	2005	A1CYO	C06-N05	5.31	1.46	1.34
6	A	607	NAG	O5-C1	-2.97	1.38	1.43
7	B	2005	A1CYO	C23-C20	2.66	1.54	1.50
7	B	2005	A1CYO	C08-C06	2.50	1.54	1.51
6	A	604	NAG	O5-C1	-2.48	1.39	1.43
6	A	607	NAG	C1-C2	-2.27	1.49	1.52
7	B	2005	A1CYO	O31-C30	2.20	1.40	1.37
6	B	2004	NAG	O5-C1	-2.11	1.40	1.43

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	B	2005	A1CYO	O25-C24-C23	4.81	121.69	115.45
7	B	2005	A1CYO	C32-O31-C30	3.75	123.01	117.51
7	B	2005	A1CYO	O25-C24-C27	-3.18	118.59	124.08
7	B	2005	A1CYO	O31-C30-C23	3.18	119.58	115.45
7	B	2005	A1CYO	C26-O25-C24	3.13	122.10	117.51
7	B	2005	A1CYO	C33-O34-C35	2.35	118.67	112.82
7	B	2005	A1CYO	C09-C08-C14	2.33	118.94	114.93
6	A	607	NAG	C1-O5-C5	2.06	114.95	112.19

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	604	NAG	O5-C5-C6-O6
6	B	2004	NAG	O5-C5-C6-O6
6	A	604	NAG	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
6	B	2004	NAG	C4-C5-C6-O6
6	B	2004	NAG	C8-C7-N2-C2
6	B	2004	NAG	O7-C7-N2-C2
6	A	607	NAG	O5-C5-C6-O6
6	A	605	NAG	O5-C5-C6-O6
7	B	2005	A1CYO	C36-C35-O34-C33
6	A	607	NAG	C4-C5-C6-O6

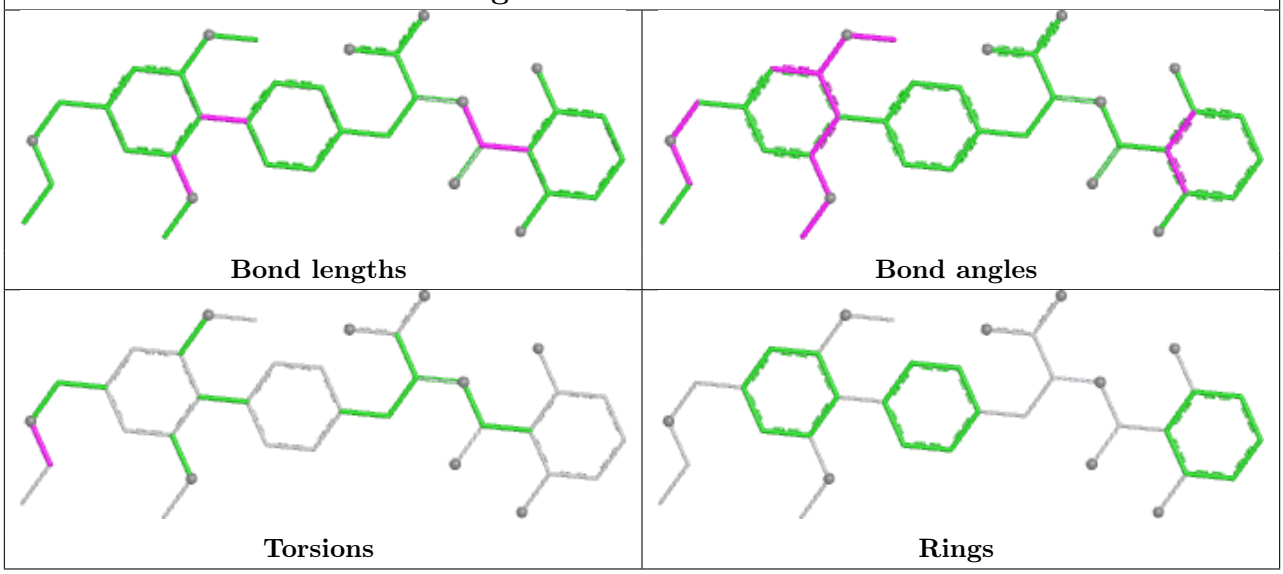
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	604	NAG	1	0
6	A	607	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 all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand A1CYO B 2005



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	588/597 (98%)	0.30	21 (3%) 46 53	27, 50, 94, 135	0
2	B	449/490 (91%)	1.00	86 (19%) 3 3	28, 79, 123, 157	0
All	All	1037/1087 (95%)	0.60	107 (10%) 12 13	27, 57, 115, 157	0

All (107) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	47	LEU	5.3
2	B	60	ILE	4.7
2	B	27	TRP	4.6
2	B	50	LEU	4.5
2	B	12	ALA	4.5
2	B	45	ASP	4.0
2	B	2	THR	4.0
1	A	574	PHE	3.8
2	B	25	CYS	3.7
2	B	417	LYS	3.7
2	B	103	LEU	3.6
2	B	33	PHE	3.5
2	B	6	ARG	3.3
1	A	495	LEU	3.3
2	B	11	ASN	3.3
2	B	88	PRO	3.3
1	A	379	SER	3.2
2	B	91	ILE	3.1
2	B	468	ALA	3.0
1	A	388	LEU	3.0
1	A	545	LEU	3.0
2	B	57	PRO	3.0
2	B	32	THR	2.9
2	B	364	LEU	2.9

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Mol	Chain	Res	Type	RSRZ
2	B	29	THR	2.9
2	B	452	PRO	2.9
2	B	40	THR	2.8
1	A	378	SER	2.8
2	B	7	CYS	2.8
2	B	111	PHE	2.7
2	B	404	VAL	2.7
2	B	58	ASP	2.7
2	B	76	THR	2.7
2	B	56	PRO	2.6
2	B	30	ASN	2.6
2	B	375	ILE	2.6
2	B	471	CYS	2.6
2	B	23	PRO	2.5
2	B	54	GLY	2.5
2	B	472	ASN	2.5
2	B	405	GLN	2.5
2	B	55	CYS	2.5
2	B	115	PHE	2.5
2	B	24	ASN	2.5
2	B	10	ALA	2.5
2	B	396	SER	2.5
2	B	153	MET	2.4
2	B	374	THR	2.4
2	B	381	CYS	2.4
2	B	469	CYS	2.4
2	B	51	LYS	2.4
2	B	463	THR	2.4
2	B	470	ARG	2.4
2	B	28	CYS	2.4
2	B	412	SER	2.4
2	B	110	THR	2.4
2	B	400	ILE	2.4
2	B	451	ILE	2.4
2	B	458	HIS	2.4
1	A	10	LEU	2.3
1	A	522	ARG	2.3
1	A	575	THR	2.3
2	B	465	GLU	2.3
2	B	5	ASN	2.3
1	A	121	ILE	2.3
2	B	437	ILE	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	450	GLY	2.3
1	A	498	LYS	2.3
2	B	406	PHE	2.3
2	B	380	TYR	2.2
1	A	588	ASP	2.2
2	B	94	ILE	2.2
1	A	321	MET	2.2
1	A	232	THR	2.2
2	B	39	PRO	2.2
1	A	255	GLU	2.2
1	A	573	GLN	2.2
1	A	566	GLY	2.2
2	B	26	GLY	2.2
2	B	19	ILE	2.2
2	B	156	ILE	2.2
2	B	102	ARG	2.2
2	B	150	MET	2.1
2	B	410	ILE	2.1
2	B	457	CYS	2.1
1	A	75	SER	2.1
2	B	362	VAL	2.1
2	B	61	GLU	2.1
2	B	99	LEU	2.1
2	B	438	LEU	2.1
1	A	501	ILE	2.1
2	B	189	SER	2.1
1	A	565	THR	2.1
2	B	22	GLY	2.1
2	B	141	ASN	2.1
2	B	8	LEU	2.1
2	B	104	ARG	2.1
2	B	408	ILE	2.0
2	B	441	ILE	2.0
1	A	523	GLY	2.0
2	B	391	ASN	2.0
2	B	75	VAL	2.0
2	B	415	CYS	2.0
2	B	114	LYS	2.0
2	B	14	SER	2.0
2	B	105	SER	2.0
2	B	454	SER	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)

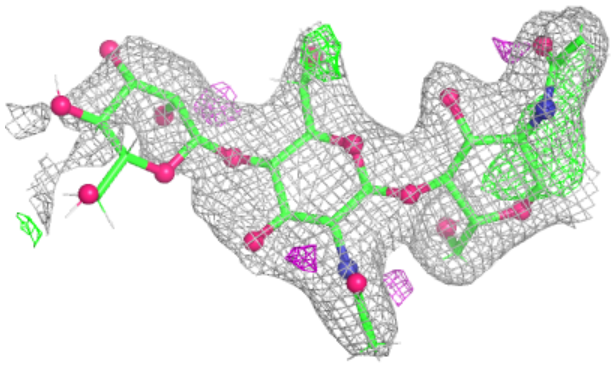
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

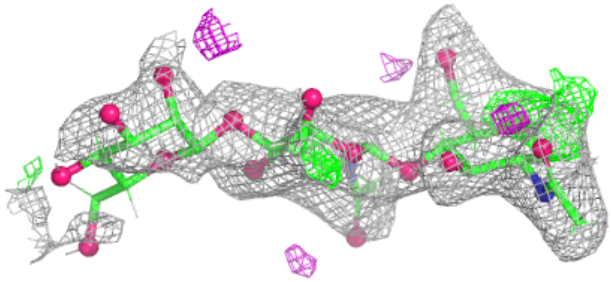
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	BMA	C	3	11/12	0.37	0.16	83,140,178,186	0
4	BMA	E	3	11/12	0.39	0.18	110,127,152,155	0
4	MAN	E	4	11/12	0.53	0.19	82,172,210,210	0
3	BMA	D	3	11/12	0.68	0.16	84,109,151,159	0
3	NAG	D	2	14/15	0.69	0.17	76,122,143,163	0
3	NAG	C	2	14/15	0.70	0.16	72,96,153,166	0
3	NAG	D	1	14/15	0.81	0.14	69,97,132,136	0
3	NAG	C	1	14/15	0.83	0.12	37,61,80,93	0
4	NAG	E	1	14/15	0.87	0.14	39,58,86,93	0
4	NAG	E	2	14/15	0.87	0.15	63,76,102,123	0

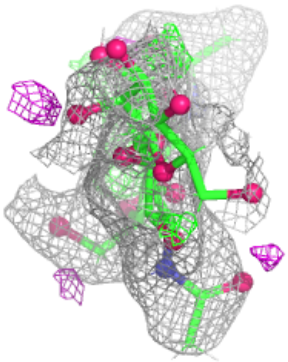
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain C:

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

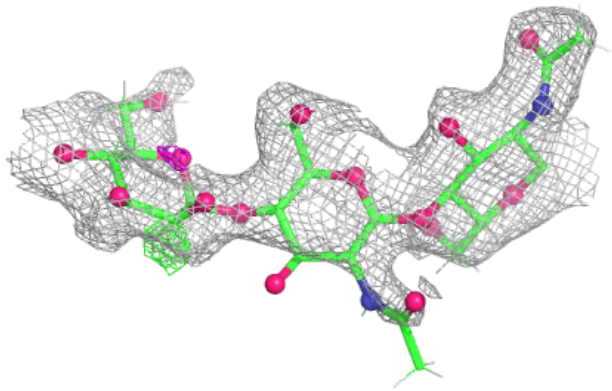


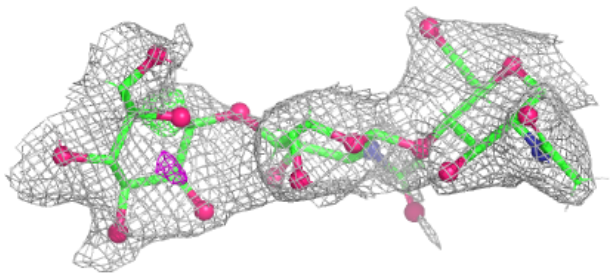


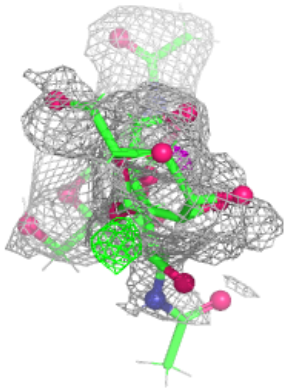


Electron density around Chain D:

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

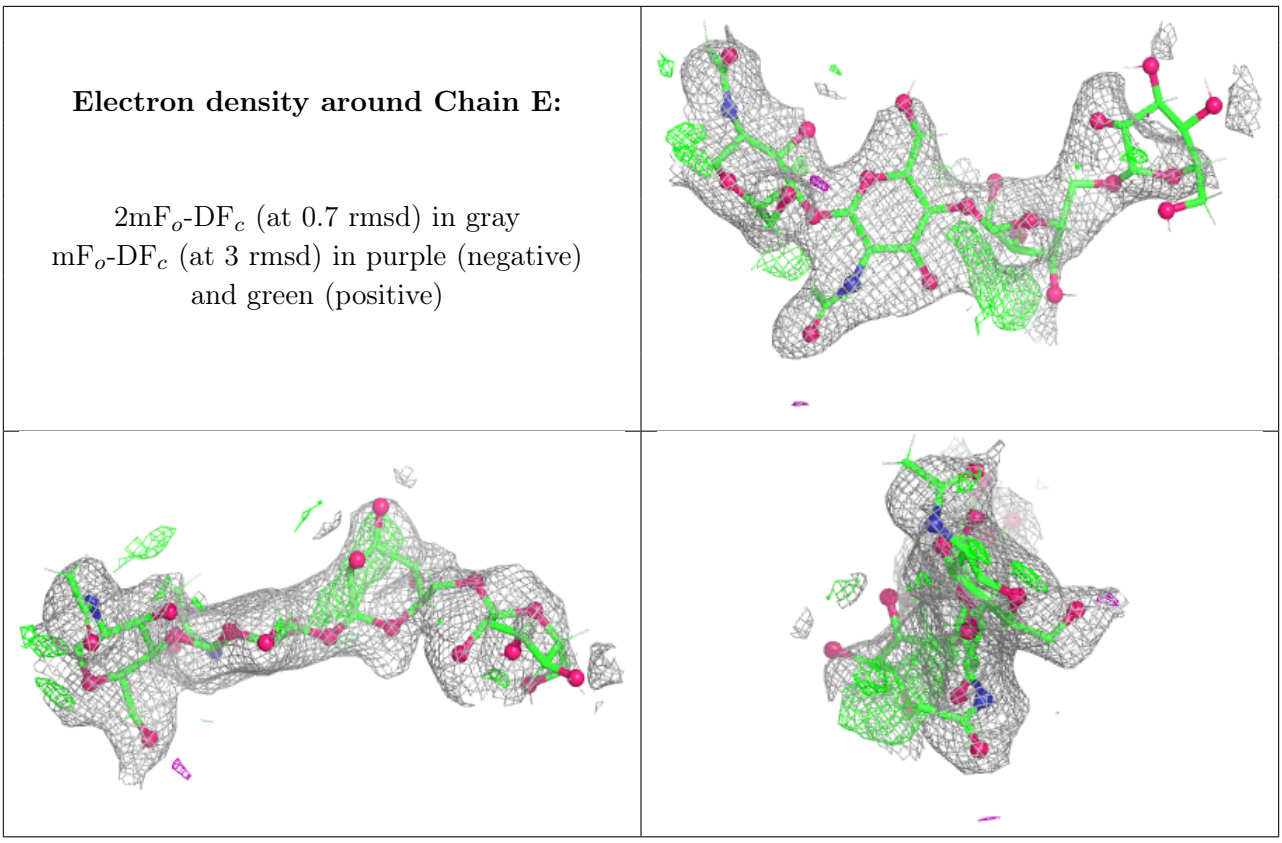






Electron density around Chain E:

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



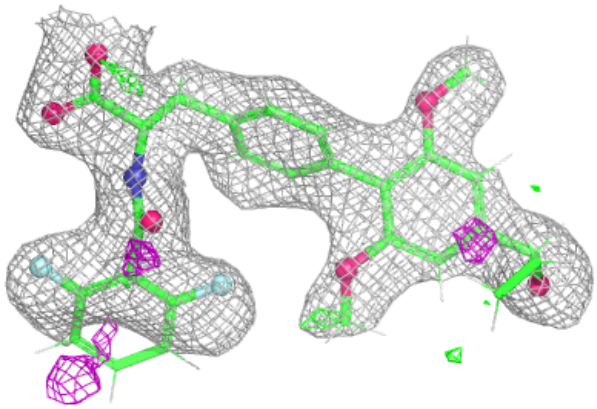
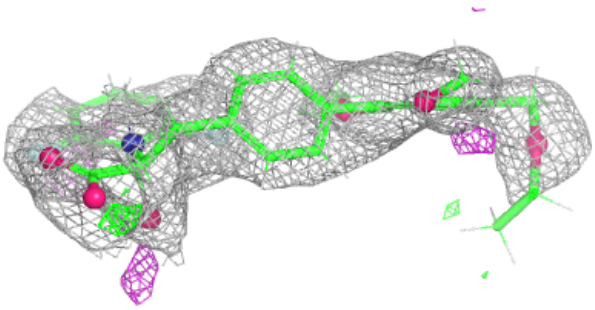
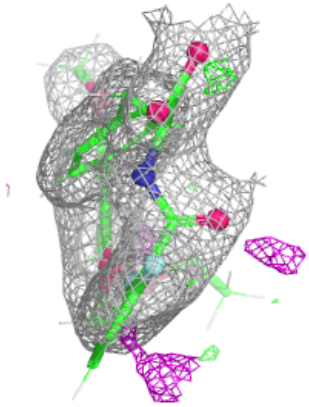
6.4 Ligands (i)

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
6	NAG	A	605	14/15	0.44	0.23	95,138,174,177	0
6	NAG	B	2004	14/15	0.49	0.19	100,144,161,184	0
6	NAG	A	607	14/15	0.66	0.15	91,120,148,149	0
6	NAG	A	606	14/15	0.77	0.14	69,98,121,125	0
6	NAG	A	604	14/15	0.84	0.16	63,104,145,145	0
7	A1CYO	B	2005	36/36	0.89	0.15	31,62,114,128	0
5	MN	A	601	1/1	0.96	0.07	50,50,50,50	0
5	MN	A	602	1/1	0.98	0.04	51,51,51,51	0
5	MN	A	603	1/1	0.98	0.06	59,59,59,59	0
5	MN	B	2003	1/1	0.98	0.06	71,71,71,71	0
5	MN	B	2002	1/1	0.99	0.07	36,36,36,36	0
5	MN	B	2001	1/1	1.00	0.02	35,35,35,35	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers

as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around A1CYO B 2005: 2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative) and green (positive)	
	

6.5 Other polymers (i)

There are no such residues in this entry.