



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 25, 2023 – 03:49 AM EDT

PDB ID : 5W0D  
Title : Inferred precursor (UCA) of the human antibody lineage K03.12 in complex with influenza hemagglutinin H1 Solomon Islands/03/2006  
Authors : McCarthy, K.R.; Harrison, S.C.  
Deposited on : 2017-05-30  
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](mailto: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>.

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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 : 2.35.1  
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) : 2.35.1

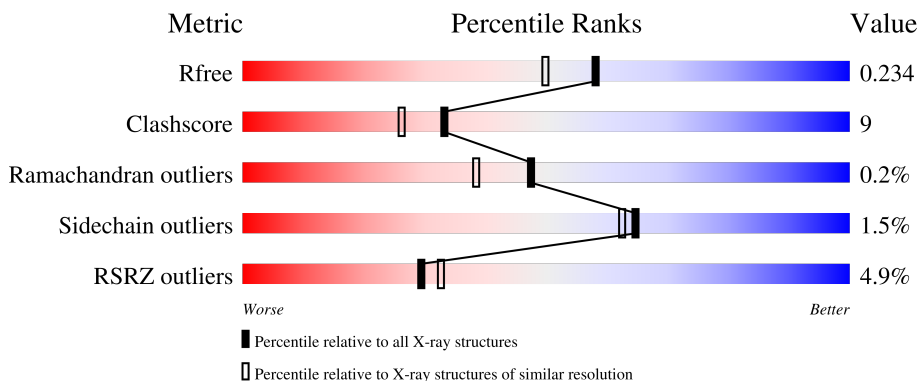
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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))
$R_{free}$	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (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  $\geq 3$ , 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	223	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 79%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 17%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 3%; height: 10px; background-color: grey;"></div> </div>
2	B	244	<div style="display: flex; align-items: center;"> <div style="width: 5%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 83%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 3%; height: 10px; background-color: grey;"></div> </div>
3	C	214	<div style="display: flex; align-items: center;"> <div style="width: 6%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 81%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 12%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 3%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: grey;"></div> </div>
4	D	2	<div style="display: flex; align-items: center;"> <div style="width: 50%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 50%; height: 10px; background-color: yellow;"></div> </div>
4	E	2	<div style="display: flex; align-items: center;"> <div style="width: 50%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 50%; height: 10px; background-color: yellow;"></div> </div>

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Mol	Chain	Length	Quality of chain
5	F	3	 67% 33%

## 2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 5350 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 Hemagglutinin HA1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	214	1710	1088	294	324	4	0	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	50	ALA	-	expression tag	UNP D1MPH2
A	51	SER	-	expression tag	UNP D1MPH2
A	268	LEU	-	expression tag	UNP D1MPH2
A	269	GLU	-	expression tag	UNP D1MPH2
A	270	VAL	-	expression tag	UNP D1MPH2
A	271	LEU	-	expression tag	UNP D1MPH2
A	272	PHE	-	expression tag	UNP D1MPH2

- Molecule 2 is a protein called Lineage K03.12 UCA antibody heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	235	1784	1126	302	346	10	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	239	HIS	-	expression tag	UNP S6B2A6
B	240	HIS	-	expression tag	UNP S6B2A6
B	241	HIS	-	expression tag	UNP S6B2A6
B	242	HIS	-	expression tag	UNP S6B2A6
B	243	HIS	-	expression tag	UNP S6B2A6
B	244	HIS	-	expression tag	UNP S6B2A6

- Molecule 3 is a protein called Lineage K03.12 UCA antibody light chain.

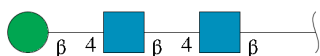
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	202	1485	927	249	303	6	0	0	0

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



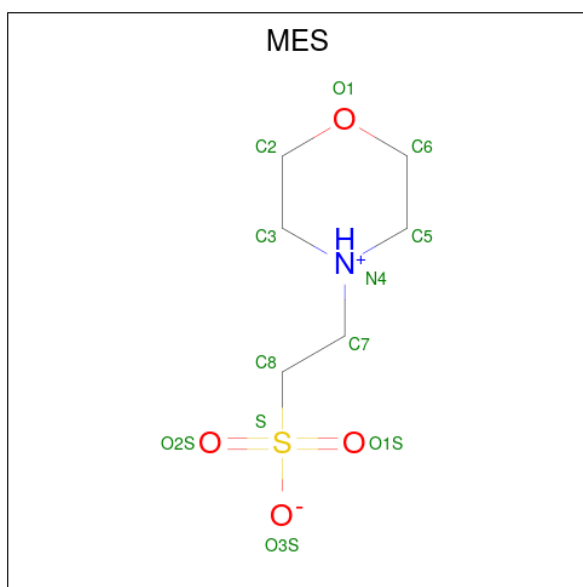
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	2	28	16	2	10		0	0	0
4	E	2	28	16	2	10		0	0	0

- Molecule 5 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.



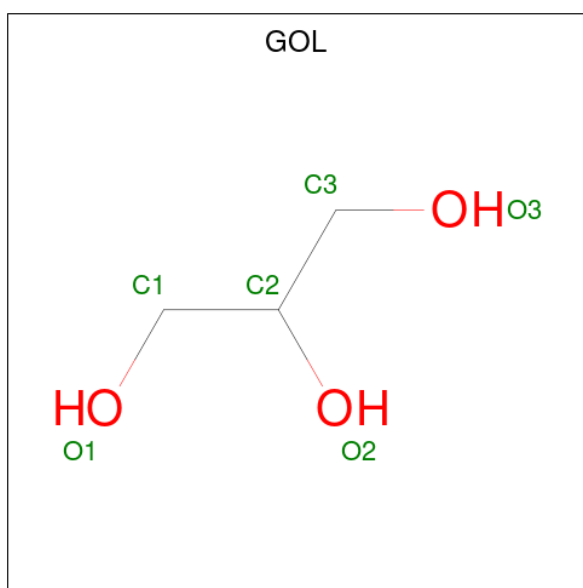
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
5	F	3	39	22	2	15		0	0	0

- Molecule 6 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			S
6	A	1	12	6	1	4	1	0	0
6	B	1	12	6	1	4	1	0	0

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



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

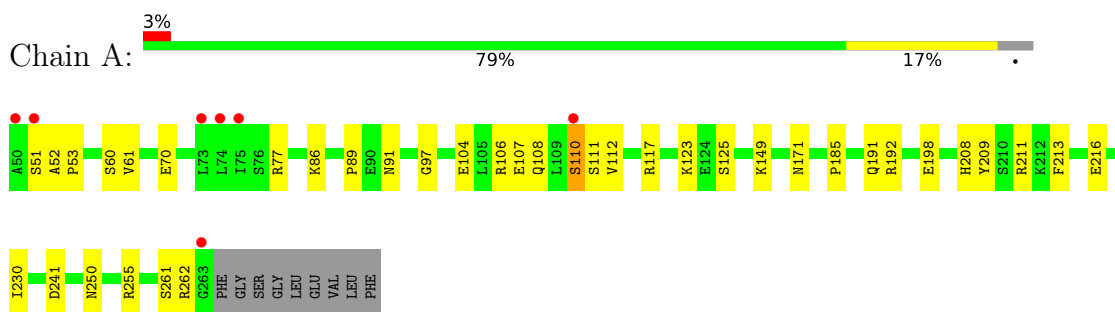
- Molecule 8 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
8	A	87	Total 87	O 87	0	0
8	B	108	Total 108	O 108	0	0
8	C	51	Total 51	O 51	0	0

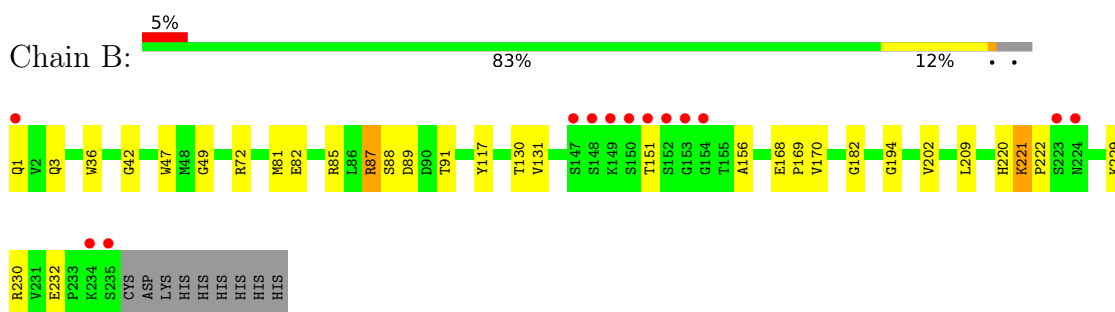
### 3 Residue-property plots [i](#)

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.

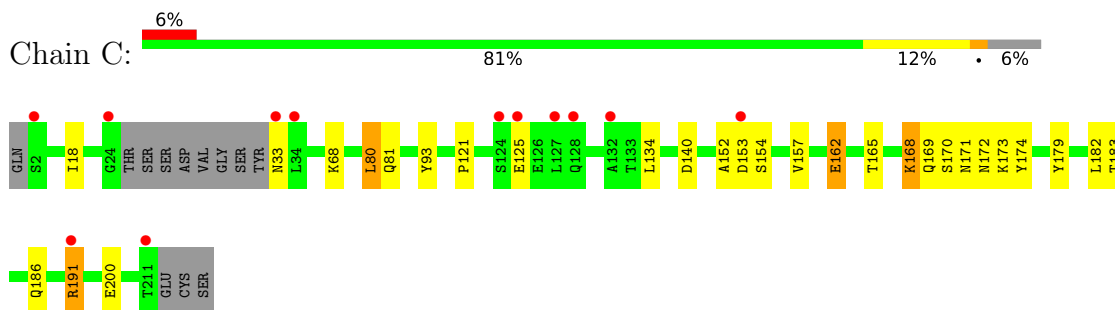
- Molecule 1: Hemagglutinin HA1



- Molecule 2: Lineage K03.12 UCA antibody heavy chain



- Molecule 3: Lineage K03.12 UCA antibody light chain



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





MAG1  
MAG2

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

Chain E:  50% 50%

MAG1  
MAG2

- Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  67% 33%

MAG1  
MAG2  
BMA3

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	40.62Å 61.66Å 83.86Å 106.57° 95.25° 106.70°	Depositor
Resolution (Å)	39.85 – 1.90 39.85 – 1.90	Depositor EDS
% Data completeness (in resolution range)	94.0 (39.85-1.90) 94.2 (39.85-1.90)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.06 (at 1.89Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, $R_{free}$	0.196 , 0.234 0.197 , 0.234	Depositor DCC
$R_{free}$ test set	2721 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.6	Xtrriage
Anisotropy	0.476	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 45.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5350	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.59% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: NAG, GOL, BMA, MES

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	0.44	0/1762	0.59	0/2399
2	B	0.48	0/1831	0.67	1/2494 (0.0%)
3	C	0.40	0/1519	0.58	1/2068 (0.0%)
All	All	0.44	0/5112	0.62	2/6961 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	87	ARG	NE-CZ-NH1	-8.75	115.93	120.30
3	C	80	LEU	CB-CG-CD1	-6.76	99.50	111.00

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	1710	0	1622	31	0
2	B	1784	0	1733	32	0
3	C	1485	0	1446	25	0
4	D	28	0	25	0	0
4	E	28	0	25	0	0
5	F	39	0	34	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	12	0	12	1	0
6	B	12	0	12	1	0
7	C	6	0	8	0	0
8	A	87	0	0	14	1
8	B	108	0	0	5	0
8	C	51	0	0	8	0
All	All	5350	0	4917	86	1

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 9.

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)
3:C:171:ASN:N	8:C:403:HOH:O	1.81	1.13
1:A:112:VAL:N	8:A:401:HOH:O	1.83	1.09
1:A:111:SER:C	8:A:401:HOH:O	1.95	1.04
2:B:87:ARG:NH2	8:B:401:HOH:O	1.90	1.03
3:C:171:ASN:HA	8:C:403:HOH:O	1.57	1.02
3:C:171:ASN:CA	8:C:403:HOH:O	2.04	1.01
3:C:179:TYR:OH	8:C:401:HOH:O	1.81	0.97
3:C:162:GLU:OE2	8:C:404:HOH:O	1.82	0.96
3:C:168:LYS:HD3	3:C:172:ASN:HA	1.50	0.92
2:B:87:ARG:NE	2:B:88:SER:H	1.71	0.88
1:A:191:GLN:HE22	1:A:250:ASN:HD21	1.23	0.86
6:B:301:MES:O2S	8:B:402:HOH:O	1.94	0.85
3:C:170:SER:C	8:C:403:HOH:O	2.11	0.81
1:A:216:GLU:C	8:A:406:HOH:O	2.23	0.77
1:A:216:GLU:CB	8:A:406:HOH:O	2.33	0.76
1:A:110:SER:OG	8:A:402:HOH:O	2.04	0.75
1:A:216:GLU:HB2	8:A:406:HOH:O	1.87	0.74
3:C:174:TYR:OH	8:C:405:HOH:O	2.06	0.73
1:A:241:ASP:OD2	8:A:403:HOH:O	2.07	0.71
1:A:53:PRO:O	1:A:77:ARG:NH1	2.22	0.71
2:B:82:GLU:OE1	8:B:403:HOH:O	2.07	0.71
1:A:61:VAL:HG21	1:A:106:ARG:HG3	1.75	0.69
2:B:1:GLN:NE2	2:B:3:GLN:NE2	2.43	0.66
3:C:168:LYS:CD	3:C:172:ASN:HA	2.23	0.66
2:B:1:GLN:HE22	2:B:3:GLN:NE2	1.95	0.65
1:A:70:GLU:OE2	8:A:404:HOH:O	2.14	0.64
1:A:216:GLU:CA	8:A:406:HOH:O	2.44	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:194:GLY:O	8:B:404:HOH:O	2.15	0.63
2:B:230:ARG:HG2	2:B:232:GLU:OE1	2.00	0.62
3:C:33:ASN:HB2	3:C:68:LYS:HD3	1.82	0.60
1:A:117:ARG:HH12	1:A:149:LYS:HE3	1.67	0.58
2:B:151:THR:HG22	2:B:156:ALA:HB2	1.84	0.58
1:A:209:TYR:CE1	6:A:308:MES:H32	2.39	0.58
1:A:211:ARG:HG2	1:A:213:PHE:CZ	2.39	0.58
3:C:152:ALA:HB2	3:C:157:VAL:HG21	1.86	0.57
1:A:97:GLY:HA3	1:A:230:ILE:O	2.05	0.57
2:B:221:LYS:HD2	2:B:222:PRO:CD	2.34	0.57
1:A:208:HIS:HE1	8:A:403:HOH:O	1.89	0.56
3:C:140:ASP:OD1	3:C:171:ASN:ND2	2.39	0.55
2:B:1:GLN:HE22	2:B:3:GLN:HE22	1.54	0.55
3:C:18:ILE:HD11	3:C:80:LEU:HD11	1.88	0.55
3:C:18:ILE:HD11	3:C:80:LEU:CD1	2.36	0.55
3:C:169:GLN:HG2	3:C:173:LYS:O	2.07	0.54
2:B:87:ARG:HG3	2:B:89:ASP:H	1.73	0.54
1:A:125:SER:OG	8:A:405:HOH:O	2.19	0.53
3:C:81:GLN:NE2	8:C:402:HOH:O	1.81	0.52
2:B:1:GLN:OE1	2:B:3:GLN:NE2	2.43	0.50
2:B:221:LYS:HD2	2:B:222:PRO:N	2.26	0.50
2:B:87:ARG:HE	2:B:88:SER:H	1.57	0.50
2:B:182:GLY:O	2:B:202:VAL:HA	2.12	0.49
2:B:87:ARG:NE	2:B:88:SER:N	2.52	0.49
2:B:229:LYS:NZ	3:C:125:GLU:OE2	2.43	0.48
2:B:1:GLN:CD	2:B:3:GLN:NE2	2.67	0.48
1:A:192:ARG:HD3	1:A:198:GLU:OE1	2.13	0.48
3:C:153:ASP:OD2	3:C:191:ARG:HB3	2.14	0.47
3:C:18:ILE:CD1	3:C:80:LEU:HD11	2.44	0.47
1:A:60:SER:HB3	1:A:89:PRO:HG2	1.97	0.47
2:B:91:THR:HG23	2:B:130:THR:HA	1.96	0.47
3:C:121:PRO:HA	3:C:134:LEU:HD23	1.98	0.45
1:A:216:GLU:O	8:A:406:HOH:O	2.21	0.45
1:A:108:GLN:HA	1:A:262:ARG:HH11	1.82	0.45
1:A:123:LYS:HE3	1:A:255:ARG:CZ	2.46	0.45
2:B:168:GLU:CD	2:B:169:PRO:HA	2.37	0.45
2:B:88:SER:HA	2:B:131:VAL:HB	1.99	0.44
2:B:221:LYS:HD2	2:B:222:PRO:HD3	1.98	0.44
1:A:86:LYS:O	1:A:89:PRO:HD3	2.18	0.44
1:A:52:ALA:O	1:A:77:ARG:NH2	2.40	0.44
2:B:170:VAL:HG12	2:B:220:HIS:HB2	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:183:THR:OG1	3:C:186:GLN:HG3	2.18	0.43
3:C:134:LEU:HD12	3:C:182:LEU:HD11	2.00	0.43
2:B:42:GLY:HA3	3:C:165:THR:HG21	2.00	0.43
2:B:168:GLU:OE1	2:B:169:PRO:HA	2.19	0.43
1:A:208:HIS:CE1	8:A:403:HOH:O	2.67	0.43
2:B:117:TYR:HB3	3:C:93:TYR:CG	2.54	0.43
1:A:91:ASN:OD1	5:F:1:NAG:O5	2.36	0.42
2:B:47:TRP:CZ2	2:B:49:GLY:HA2	2.54	0.42
2:B:85:ARG:NE	8:B:405:HOH:O	2.24	0.42
3:C:200:GLU:O	3:C:200:GLU:HG3	2.18	0.42
1:A:185:PRO:HG2	1:A:191:GLN:NE2	2.35	0.42
2:B:87:ARG:HG3	2:B:88:SER:N	2.35	0.42
1:A:104:GLU:OE2	1:A:104:GLU:N	2.41	0.42
2:B:36:TRP:CE2	2:B:81:MET:HB2	2.54	0.42
2:B:87:ARG:CZ	2:B:88:SER:H	2.28	0.41
2:B:209:LEU:HD23	2:B:209:LEU:HA	1.88	0.41
1:A:107:GLU:O	1:A:110:SER:HB2	2.20	0.41
1:A:171:ASN:HB3	8:A:429:HOH:O	2.21	0.41

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:A:407:HOH:O	8:A:409:HOH:O[1_655]	2.02	0.18

## 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	212/223 (95%)	205 (97%)	7 (3%)	0	100	100
2	B	233/244 (96%)	228 (98%)	5 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	198/214 (92%)	187 (94%)	10 (5%)	1 (0%)	29	18
All	All	643/681 (94%)	620 (96%)	22 (3%)	1 (0%)	47	38

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	154	SER

### 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	186/193 (96%)	183 (98%)	3 (2%)	62	60
2	B	197/206 (96%)	195 (99%)	2 (1%)	76	76
3	C	167/178 (94%)	164 (98%)	3 (2%)	59	55
All	All	550/577 (95%)	542 (98%)	8 (2%)	65	62

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

Mol	Chain	Res	Type
1	A	51	SER
1	A	110	SER
1	A	261	SER
2	B	72	ARG
2	B	221	LYS
3	C	162	GLU
3	C	168	LYS
3	C	191	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	191	GLN

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Mol	Chain	Res	Type
2	B	1	GLN
2	B	3	GLN
2	B	62	GLN
3	C	171	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](#)

7 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$
4	NAG	D	1	4,1	14,14,15	0.42	0	17,19,21	1.41	3 (17%)
4	NAG	D	2	4	14,14,15	0.29	0	17,19,21	0.55	0
4	NAG	E	1	4,1	14,14,15	0.60	0	17,19,21	0.69	1 (5%)
4	NAG	E	2	4	14,14,15	0.48	0	17,19,21	0.44	0
5	NAG	F	1	1,5	14,14,15	0.76	1 (7%)	17,19,21	0.49	0
5	NAG	F	2	5	14,14,15	0.93	1 (7%)	17,19,21	0.61	0
5	BMA	F	3	5	11,11,12	1.08	1 (9%)	15,15,17	1.48	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. '2' means no outliers of that kind were identified.



Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	D	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	NAG	E	1	4,1	-	1/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
5	NAG	F	1	1,5	-	0/6/23/26	0/1/1/1
5	NAG	F	2	5	-	1/6/23/26	0/1/1/1
5	BMA	F	3	5	-	2/2/19/22	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	3	BMA	C1-C2	2.82	1.58	1.52
5	F	2	NAG	O5-C1	-2.77	1.39	1.43
5	F	1	NAG	C1-C2	2.31	1.55	1.52

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	NAG	C1-O5-C5	4.05	117.68	112.19
5	F	3	BMA	C1-C2-C3	3.45	113.91	109.67
5	F	3	BMA	O5-C1-C2	3.00	115.39	110.77
4	D	1	NAG	O3-C3-C2	-2.66	103.97	109.47
4	E	1	NAG	C1-O5-C5	2.33	115.35	112.19
4	D	1	NAG	C3-C4-C5	-2.32	106.09	110.24

There are no chirality outliers.

All (4) torsion outliers are listed below:

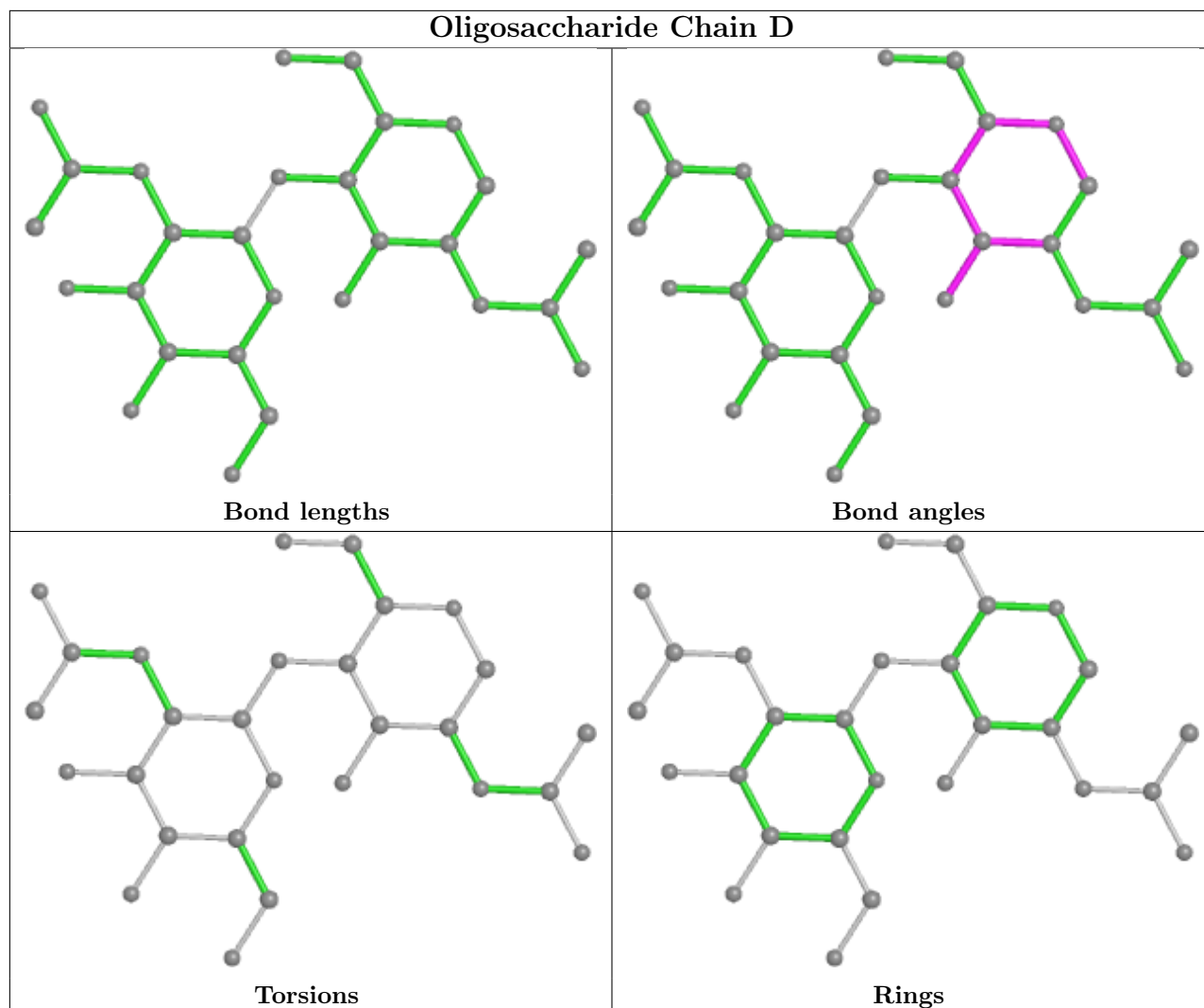
Mol	Chain	Res	Type	Atoms
5	F	2	NAG	C4-C5-C6-O6
5	F	3	BMA	C4-C5-C6-O6
5	F	3	BMA	O5-C5-C6-O6
4	E	1	NAG	C4-C5-C6-O6

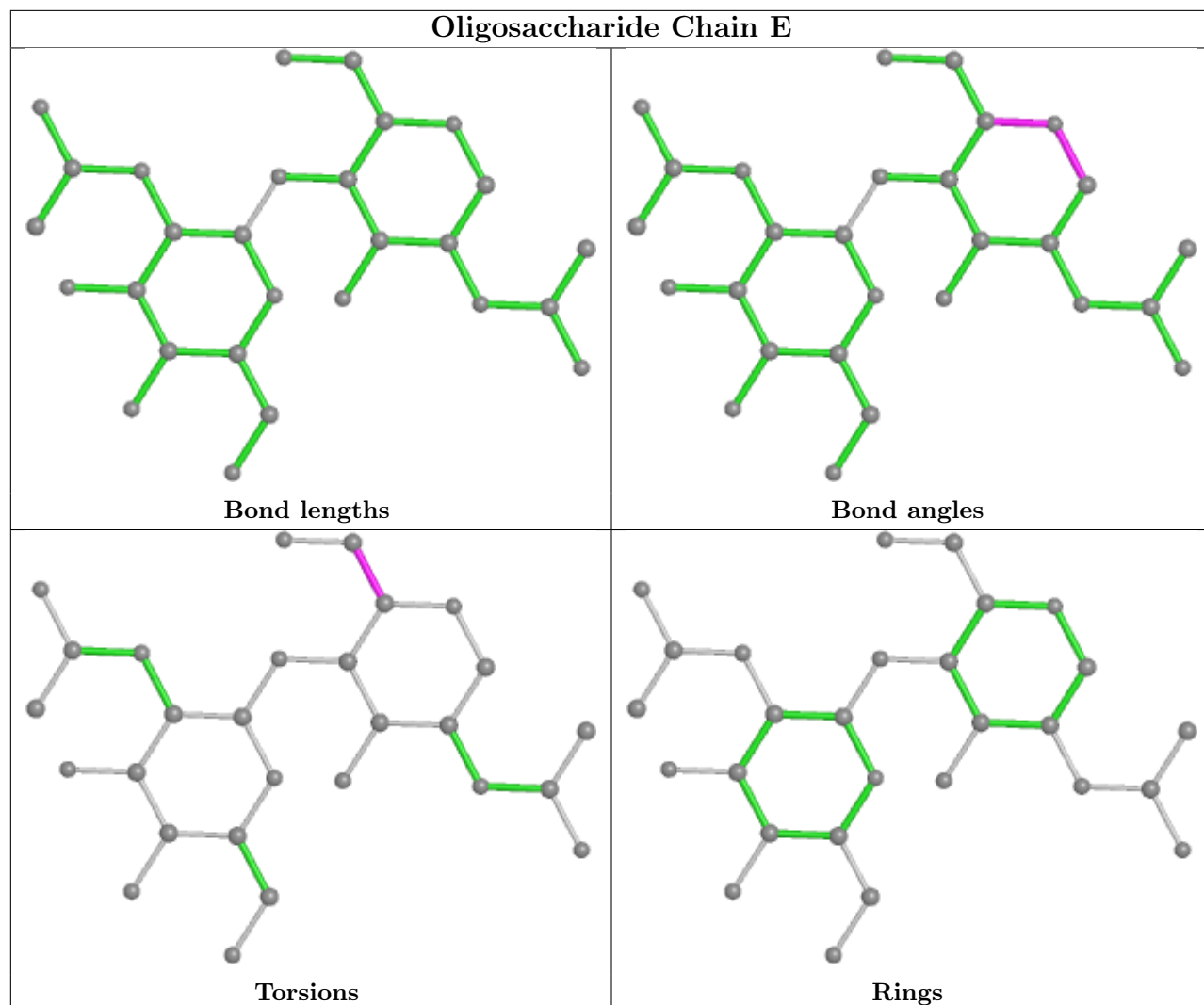
There are no ring outliers.

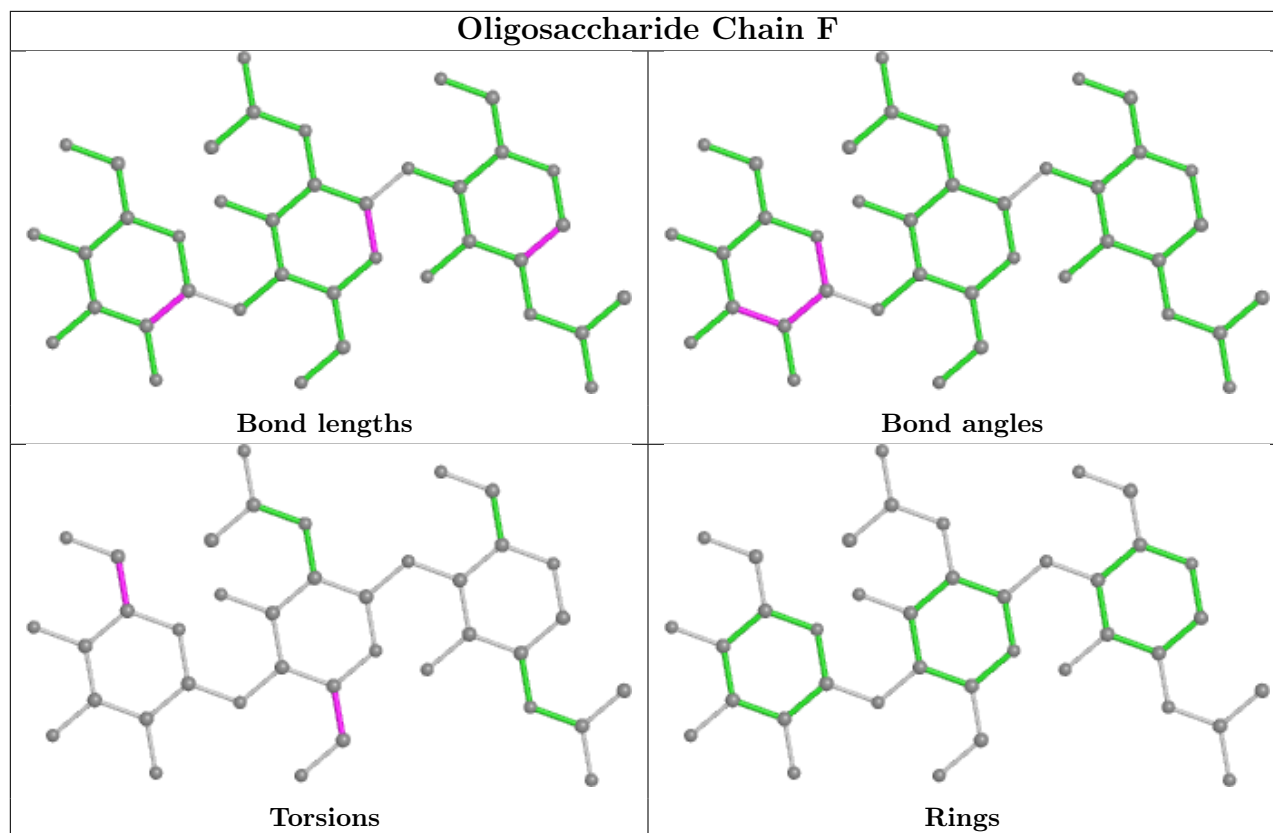
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	F	1	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 [i](#)

3 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	$\# Z  > 2$
7	GOL	C	301	-	5,5,5	0.35	0	5,5,5	0.48	0
6	MES	A	308	-	12,12,12	2.15	1 (8%)	14,16,16	2.19	5 (35%)
6	MES	B	301	-	12,12,12	1.91	1 (8%)	14,16,16	2.20	5 (35%)

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
7	GOL	C	301	-	-	0/4/4/4	-
6	MES	A	308	-	-	2/6/14/14	0/1/1/1
6	MES	B	301	-	-	3/6/14/14	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	308	MES	C8-S	-7.12	1.67	1.77
6	B	301	MES	C8-S	-6.26	1.68	1.77

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	308	MES	C5-N4-C3	5.43	121.06	108.83
6	B	301	MES	C5-N4-C3	4.89	119.85	108.83
6	B	301	MES	C7-N4-C3	3.60	120.44	111.23
6	B	301	MES	O3S-S-C8	3.25	111.03	105.77
6	A	308	MES	O3S-S-C8	2.74	110.20	105.77
6	A	308	MES	C7-N4-C5	2.70	118.14	111.23
6	A	308	MES	C7-N4-C3	2.62	117.94	111.23
6	A	308	MES	O1S-S-C8	2.60	110.05	106.92
6	B	301	MES	C7-N4-C5	2.59	117.85	111.23
6	B	301	MES	C6-C5-N4	-2.44	106.41	110.10

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	308	MES	N4-C7-C8-S
6	B	301	MES	C8-C7-N4-C3
6	A	308	MES	C8-C7-N4-C3
6	B	301	MES	C7-C8-S-O3S
6	B	301	MES	C7-C8-S-O2S

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	308	MES	1	0
6	B	301	MES	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

### 6.1 Protein, DNA and RNA chains

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	214/223 (95%)	0.38	7 (3%) 46 49	24, 41, 76, 103	0
2	B	235/244 (96%)	0.59	13 (5%) 25 28	25, 47, 79, 134	0
3	C	202/214 (94%)	0.52	12 (5%) 22 25	26, 54, 85, 109	0
All	All	651/681 (95%)	0.50	32 (4%) 29 33	24, 48, 81, 134	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	149	LYS	7.9
2	B	151	THR	6.6
1	A	50	ALA	5.3
1	A	74	LEU	4.2
3	C	2	SER	4.1
1	A	73	LEU	4.0
1	A	75	ILE	3.9
2	B	154	GLY	3.6
3	C	153	ASP	3.5
2	B	152	SER	3.4
3	C	128	GLN	3.4
2	B	148	SER	3.3
2	B	147	SER	3.2
2	B	153	GLY	3.2
3	C	211	THR	3.1
2	B	235	SER	3.0
3	C	33	ASN	2.9
1	A	110	SER	2.9
3	C	191	ARG	2.7
2	B	234	LYS	2.6
2	B	224	ASN	2.6
3	C	124	SER	2.6
2	B	150	SER	2.5

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Mol	Chain	Res	Type	RSRZ
3	C	24	GLY	2.4
1	A	263	GLY	2.3
2	B	223	SER	2.2
1	A	51	SER	2.2
3	C	127	LEU	2.2
3	C	132	ALA	2.1
2	B	1	GLN	2.1
3	C	125	GLU	2.1
3	C	34	LEU	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, 95<sup>th</sup> 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.

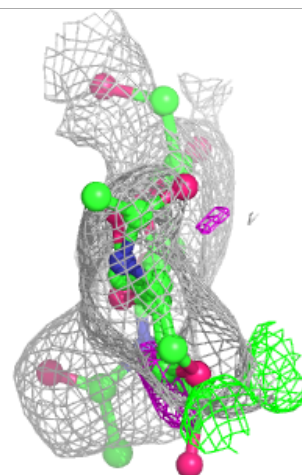
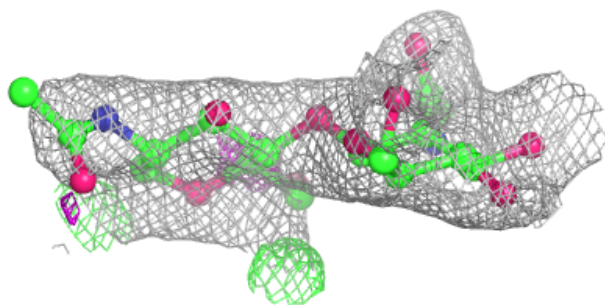
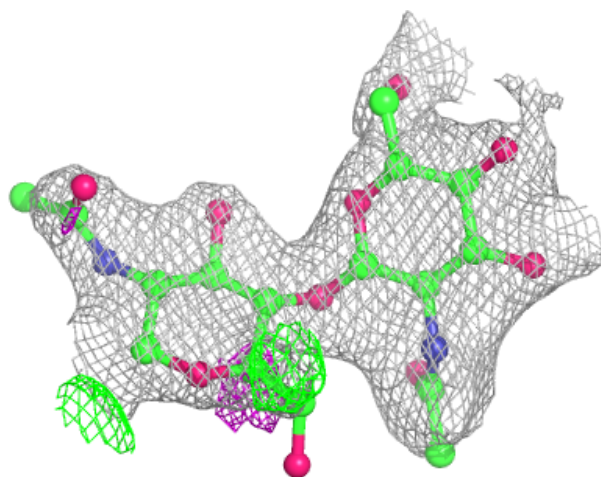
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	BMA	F	3	11/12	0.61	0.29	91,94,99,101	0
5	NAG	F	2	14/15	0.78	0.16	61,68,81,86	0
4	NAG	E	2	14/15	0.78	0.37	99,104,110,110	0
4	NAG	E	1	14/15	0.81	0.23	64,70,80,90	0
4	NAG	D	2	14/15	0.86	0.13	71,77,80,81	0
4	NAG	D	1	14/15	0.87	0.24	55,68,75,80	0
5	NAG	F	1	14/15	0.90	0.14	34,37,49,52	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.



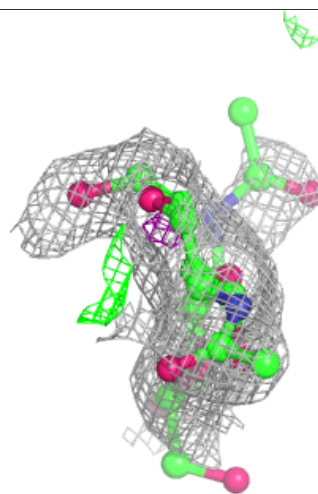
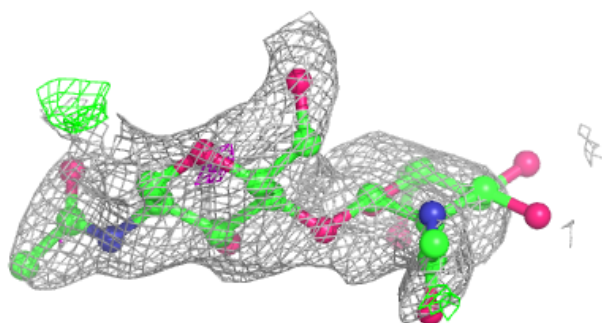
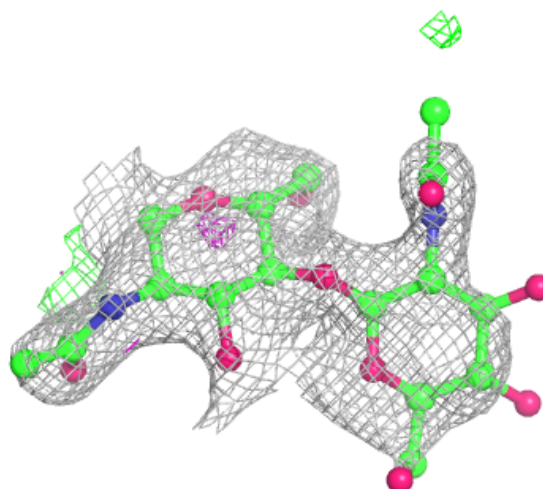
**Electron density around Chain D:**

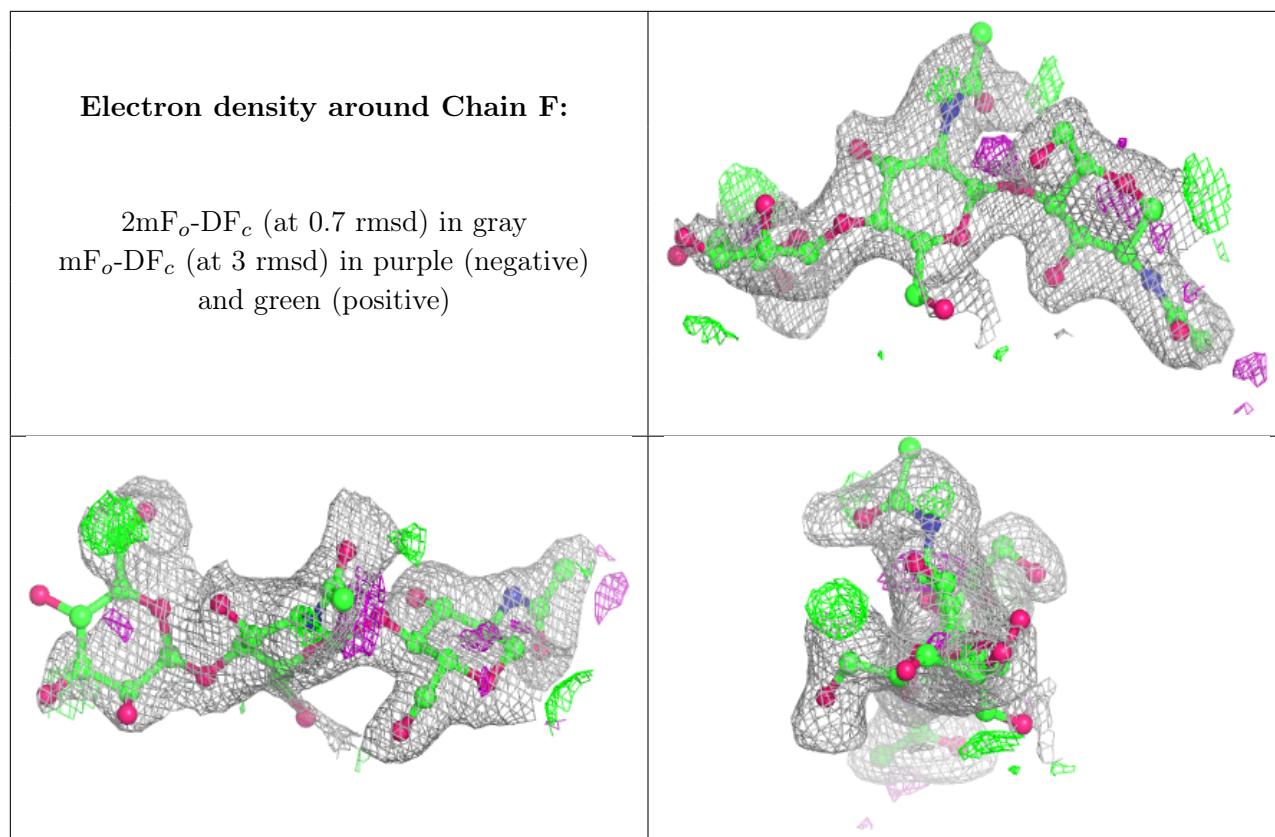
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**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, 95<sup>th</sup> 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
7	GOL	C	301	6/6	0.75	0.33	76,77,78,79	0
6	MES	A	308	12/12	0.78	0.29	80,89,104,105	0
6	MES	B	301	12/12	0.95	0.14	40,55,59,60	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.