



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 6, 2020 – 08:49 AM BST

PDB ID : 4DHL  
Title : Crystal structure of red kidney bean purple acid phosphatase in complex with Maybridge fragment MO07123  
Authors : Feder, D.; Clayton, D.J.; Hussein, W.M.; Schenk, G.; McGeary, R.; Guddat, L.W.  
Deposited on : 2012-01-29  
Resolution : 2.30 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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.

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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 : 2.13.1  
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) : 2.13.1

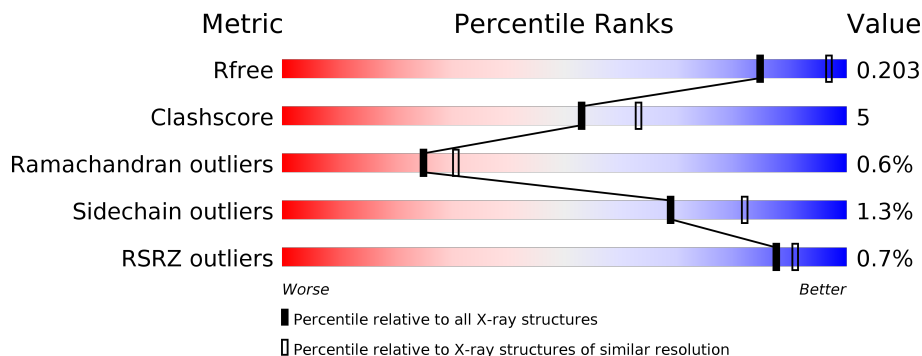
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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.




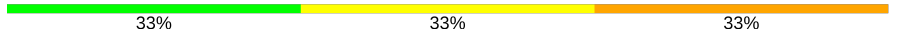
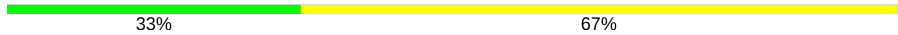
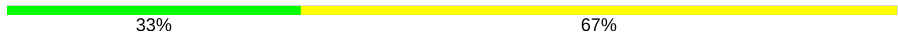



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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 on 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	426	 87% 12%
1	B	426	 85% 14%
1	C	426	 88% 11%
1	D	426	 86% 12%
2	E	3	 33% 67%
2	F	3	 33% 33% 33%

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Mol	Chain	Length	Quality of chain
2	G	3	 33% 67%
2	I	3	 33% 33% 33%
2	J	3	 33% 67%
2	M	3	 33% 67%
3	H	2	 50% 50%
3	K	2	 50% 50%
3	L	2	 50% 50%

## 2 Entry composition i

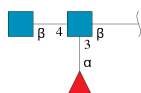
There are 11 unique types of molecules in this entry. The entry contains 16091 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Purple acid phosphatase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	424	Total 3502	C 2248	N 610	O 634	S 10	0	1	0
1	B	425	Total 3524	C 2260	N 612	O 641	S 11	0	3	0
1	D	423	Total 3495	C 2245	N 607	O 633	S 10	7	1	0
1	C	424	Total 3499	C 2248	N 606	O 634	S 11	0	1	0

- Molecule 2 is an oligosaccharide called alpha-L-fucopyranose-(1-3)-[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	E	3	Total 38	C 22	N 2	O 14	0	0	0
2	F	3	Total 38	C 22	N 2	O 14	0	0	0
2	G	3	Total 38	C 22	N 2	O 14	0	0	0
2	I	3	Total 38	C 22	N 2	O 14	0	0	0
2	J	3	Total 38	C 22	N 2	O 14	0	0	0
2	M	3	Total 38	C 22	N 2	O 14	0	0	0

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	H	2	Total	C	N	O	0	0	0
			24	14	1	9			
3	K	2	Total	C	N	O	0	0	0
			24	14	1	9			
3	L	2	Total	C	N	O	0	0	0
			24	14	1	9			

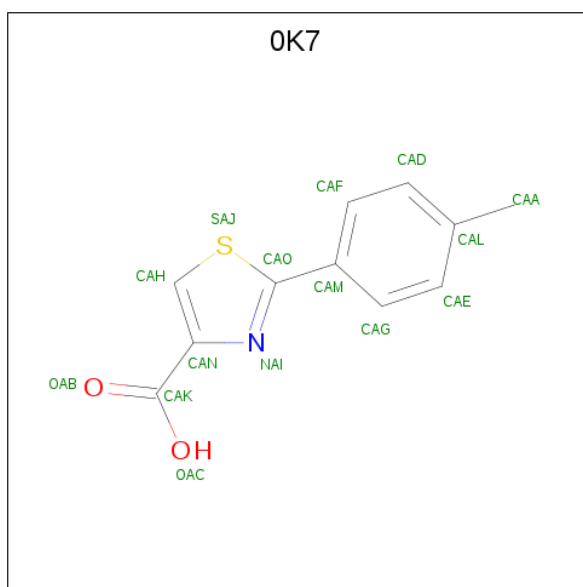
- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Zn	0	0
			1	1		
4	A	1	Total	Zn	0	0
			1	1		
4	D	1	Total	Zn	0	0
			1	1		
4	C	1	Total	Zn	0	0
			1	1		

- Molecule 5 is FE (III) ION (three-letter code: FE) (formula: Fe).

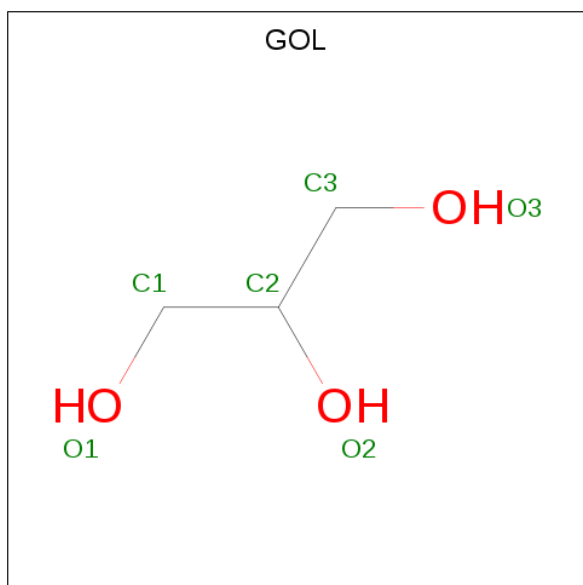
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	Fe	0	0
			1	1		
5	A	1	Total	Fe	0	0
			1	1		
5	D	1	Total	Fe	0	0
			1	1		
5	C	1	Total	Fe	0	0
			1	1		

- Molecule 6 is 2-(4-methylphenyl)-1,3-thiazole-4-carboxylic acid (three-letter code: 0K7) (formula: C<sub>11</sub>H<sub>9</sub>NO<sub>2</sub>S).



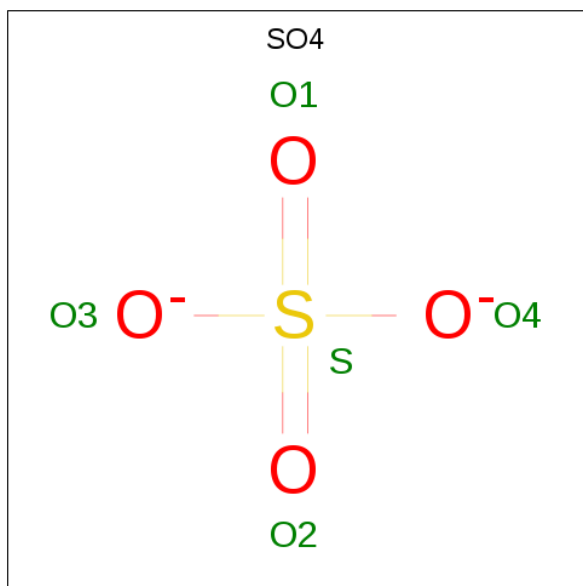
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	N	O	S			
6	A	1	Total	15	11	1	2	1	0	0
6	B	1	Total	15	11	1	2	1	0	0
6	D	1	Total	8	4	1	2	1	0	0
6	C	1	Total	15	11	1	2	1	0	0

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



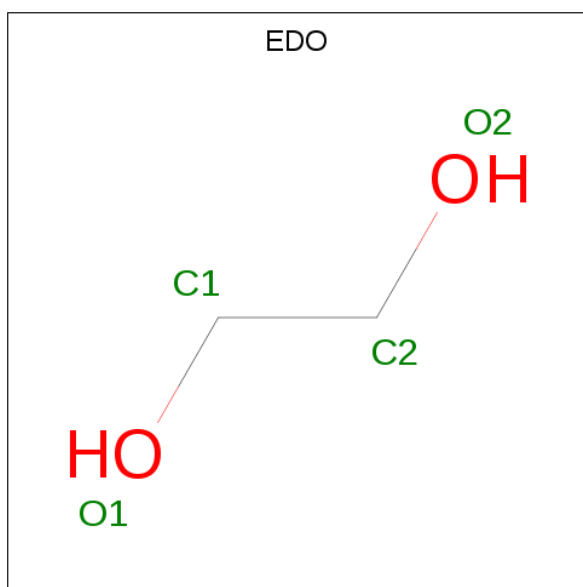
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			6	3	3		
7	D	1	Total	C	O	0	0
			6	3	3		
7	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 8 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

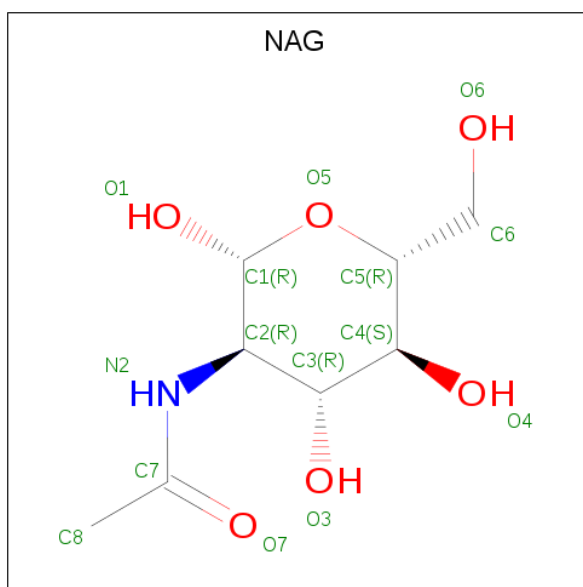
- Molecule 9 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total C O 4 2 2	0	0
9	D	1	Total C O 4 2 2	0	0
9	D	1	Total C O 4 2 2	0	0
9	D	1	Total C O 4 2 2	0	0
9	D	1	Total C O 4 2 2	0	0
9	D	1	Total C O 4 2 2	0	0

- Molecule 10 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



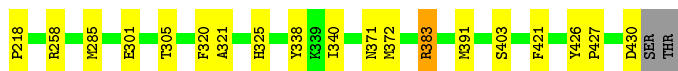


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
10	A	1	14	8	1	5	0	0
10	B	1	14	8	1	5	0	0
10	B	1	14	8	1	5	0	0
10	D	1	14	8	1	5	0	0
10	D	1	14	8	1	5	0	0
10	C	1	14	8	1	5	0	0
10	C	1	14	8	1	5	0	0

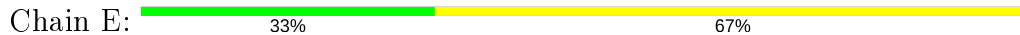
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	403	Total 403	O 403	0	0
11	B	378	Total 378	O 378	0	0
11	D	380	Total 380	O 380	0	0
11	C	384	Total 384	O 384	0	0

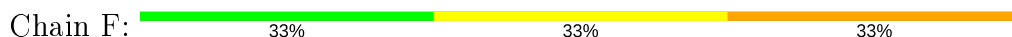




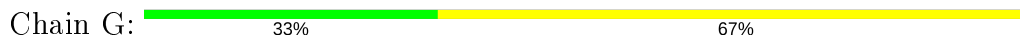
- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



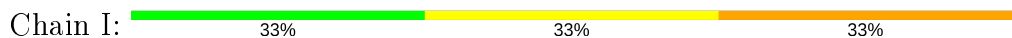
- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



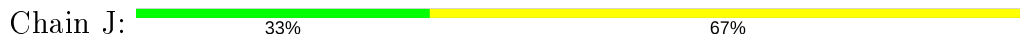
- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



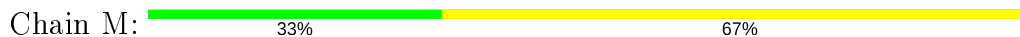
- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: alpha-L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:  50% 50%

MAG1  
FUC2

- Molecule 3: alpha-L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain K:  50% 50%

MAG1  
FUC2

- Molecule 3: alpha-L-fucopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:  50% 50%

MAG1  
FUC2

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	126.10Å 126.10Å 297.98Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.82 – 2.30 19.82 – 2.30	Depositor EDS
% Data completeness (in resolution range)	94.1 (19.82-2.30) 94.1 (19.82-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.36 (at 2.30Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.7_650)	Depositor
R, $R_{free}$	0.158 , 0.206 0.154 , 0.203	Depositor DCC
$R_{free}$ test set	5774 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.5	Xtrriage
Anisotropy	0.009	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 56.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	0.038 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	16091	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.30% 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: GOL, ZN, NAG, EDO, FUC, FE, 0K7, SO4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.38	0/3624	0.54	1/4927 (0.0%)
1	B	0.37	0/3643	0.52	2/4953 (0.0%)
1	C	0.38	0/3618	0.52	0/4919
1	D	0.38	0/3614	0.53	1/4915 (0.0%)
All	All	0.38	0/14499	0.53	4/19714 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	132	LEU	CA-CB-CG	-6.12	101.22	115.30
1	B	132	LEU	CA-CB-CG	-5.68	102.24	115.30
1	B	383	ARG	NE-CZ-NH1	5.32	122.96	120.30
1	D	275	ARG	NE-CZ-NH2	-5.26	117.67	120.30

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	3502	0	3321	38	0
1	B	3524	0	3334	42	0
1	C	3499	0	3312	35	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	3495	0	3310	36	0
2	E	38	0	34	0	0
2	F	38	0	34	2	0
2	G	38	0	34	0	0
2	I	38	0	34	1	0
2	J	38	0	34	0	0
2	M	38	0	34	0	0
3	H	24	0	22	0	0
3	K	24	0	22	0	0
3	L	24	0	22	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	15	0	8	3	0
6	B	15	0	8	5	0
6	C	15	0	8	2	0
6	D	8	0	1	1	0
7	A	6	0	8	0	0
7	C	6	0	8	0	0
7	D	6	0	8	1	0
8	A	10	0	0	1	0
8	B	5	0	0	0	0
8	C	5	0	0	0	0
8	D	5	0	0	0	0
9	A	4	0	6	0	0
9	D	20	0	30	4	0
10	A	14	0	13	0	0
10	B	28	0	26	1	0
10	C	28	0	26	0	0
10	D	28	0	26	0	0
11	A	403	0	0	3	0
11	B	378	0	0	3	0
11	C	384	0	0	2	0
11	D	380	0	0	4	0
All	All	16091	0	13723	153	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 5.

The worst 5 of 153 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:D:173:ASN:H	9:D:510:EDO:H22	1.43	0.83
1:D:124:LEU:HD12	1:D:279:PRO:HG3	1.60	0.81
1:B:408[A]:GLN:HE21	1:B:408[A]:GLN:H	1.27	0.81
1:B:325:HIS:HE1	6:B:503:OK7:H8	1.50	0.77
1:A:217:LYS:HB3	1:A:218:PRO:HD3	1.67	0.75

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	423/426 (99%)	402 (95%)	19 (4%)	2 (0%)	29	35
1	B	426/426 (100%)	402 (94%)	19 (4%)	5 (1%)	13	14
1	C	423/426 (99%)	395 (93%)	26 (6%)	2 (0%)	29	35
1	D	422/426 (99%)	401 (95%)	20 (5%)	1 (0%)	47	58
All	All	1694/1704 (99%)	1600 (94%)	84 (5%)	10 (1%)	25	31

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	175	ASP
1	B	64	ASN
1	B	175	ASP
1	D	175	ASP
1	C	175	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	374/375 (100%)	370 (99%)	4 (1%)	73	86
1	B	377/375 (100%)	370 (98%)	7 (2%)	57	73
1	C	373/375 (100%)	369 (99%)	4 (1%)	73	86
1	D	373/375 (100%)	366 (98%)	7 (2%)	57	73
All	All	1497/1500 (100%)	1475 (98%)	22 (2%)	69	79

5 of 22 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	408[A]	GLN
1	D	99	THR
1	C	176	ASN
1	B	408[B]	GLN
1	D	64	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	295	HIS
1	B	371	ASN
1	C	295	HIS
1	A	294	ASN
1	D	64	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

24 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	E	1	1,2	14,14,15	0.48	0	17,19,21	1.13	2 (11%)
2	FUC	E	2	2	10,10,11	0.66	0	14,14,16	0.60	0
2	NAG	E	3	2	14,14,15	0.49	0	17,19,21	1.12	2 (11%)
2	NAG	F	1	1,2	14,14,15	0.63	0	17,19,21	0.82	0
2	FUC	F	2	2	10,10,11	0.61	0	14,14,16	1.04	1 (7%)
2	NAG	F	3	2	14,14,15	0.53	0	17,19,21	0.80	0
2	NAG	G	1	1,2	14,14,15	0.58	0	17,19,21	1.14	2 (11%)
2	FUC	G	2	2	10,10,11	0.77	0	14,14,16	1.09	1 (7%)
2	NAG	G	3	2	14,14,15	0.58	0	17,19,21	0.83	0
3	NAG	H	1	1,3	14,14,15	0.55	0	17,19,21	0.96	1 (5%)
3	FUC	H	2	3	10,10,11	0.60	0	14,14,16	0.51	0
2	NAG	I	1	1,2	14,14,15	0.57	0	17,19,21	0.92	1 (5%)
2	FUC	I	2	2	10,10,11	0.77	0	14,14,16	0.84	0
2	NAG	I	3	2	14,14,15	0.52	0	17,19,21	0.70	0
2	NAG	J	1	1,2	14,14,15	0.65	0	17,19,21	0.79	1 (5%)
2	FUC	J	2	2	10,10,11	0.66	0	14,14,16	0.56	0
2	NAG	J	3	2	14,14,15	0.61	0	17,19,21	1.04	1 (5%)
3	NAG	K	1	1,3	14,14,15	0.51	0	17,19,21	0.96	1 (5%)
3	FUC	K	2	3	10,10,11	0.68	0	14,14,16	0.89	0
3	NAG	L	1	1,3	14,14,15	0.51	0	17,19,21	1.16	1 (5%)
3	FUC	L	2	3	10,10,11	0.65	0	14,14,16	0.57	0
2	NAG	M	1	1,2	14,14,15	0.61	0	17,19,21	1.23	2 (11%)
2	FUC	M	2	2	10,10,11	0.68	0	14,14,16	0.58	0
2	NAG	M	3	2	14,14,15	0.58	0	17,19,21	0.94	1 (5%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	E	1	1,2	-	1/6/23/26	0/1/1/1
2	FUC	E	2	2	-	-	0/1/1/1
2	NAG	E	3	2	-	0/6/23/26	0/1/1/1
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	F	2	2	-	-	0/1/1/1
2	NAG	F	3	2	-	4/6/23/26	0/1/1/1
2	NAG	G	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	G	2	2	-	-	0/1/1/1
2	NAG	G	3	2	-	0/6/23/26	0/1/1/1
3	NAG	H	1	1,3	-	0/6/23/26	0/1/1/1
3	FUC	H	2	3	-	-	0/1/1/1
2	NAG	I	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	I	2	2	-	-	0/1/1/1
2	NAG	I	3	2	-	0/6/23/26	0/1/1/1
2	NAG	J	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	J	2	2	-	-	0/1/1/1
2	NAG	J	3	2	-	2/6/23/26	0/1/1/1
3	NAG	K	1	1,3	-	2/6/23/26	0/1/1/1
3	FUC	K	2	3	-	-	0/1/1/1
3	NAG	L	1	1,3	-	2/6/23/26	0/1/1/1
3	FUC	L	2	3	-	-	0/1/1/1
2	NAG	M	1	1,2	-	0/6/23/26	0/1/1/1
2	FUC	M	2	2	-	-	0/1/1/1
2	NAG	M	3	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	1	NAG	C1-O5-C5	3.12	116.42	112.19
2	E	1	NAG	C2-N2-C7	-2.95	118.71	122.90
3	L	1	NAG	C1-O5-C5	2.92	116.16	112.19
2	G	2	FUC	C1-C2-C3	2.89	113.22	109.67
2	E	3	NAG	O5-C1-C2	2.87	115.81	111.29

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	F	3	NAG	O5-C5-C6-O6
2	J	3	NAG	O5-C5-C6-O6

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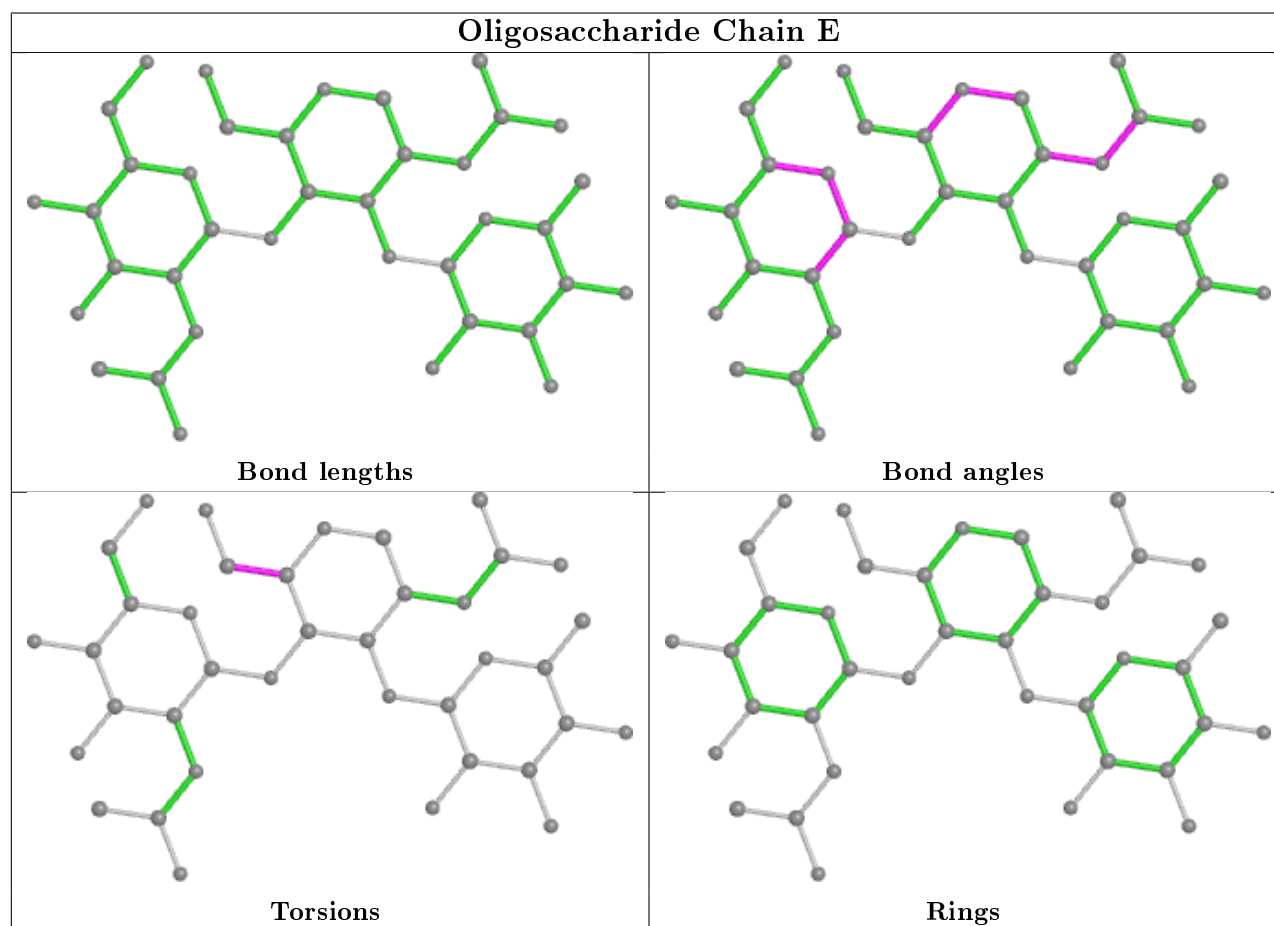
Mol	Chain	Res	Type	Atoms
2	F	3	NAG	C4-C5-C6-O6
2	J	3	NAG	C4-C5-C6-O6
2	F	3	NAG	C8-C7-N2-C2

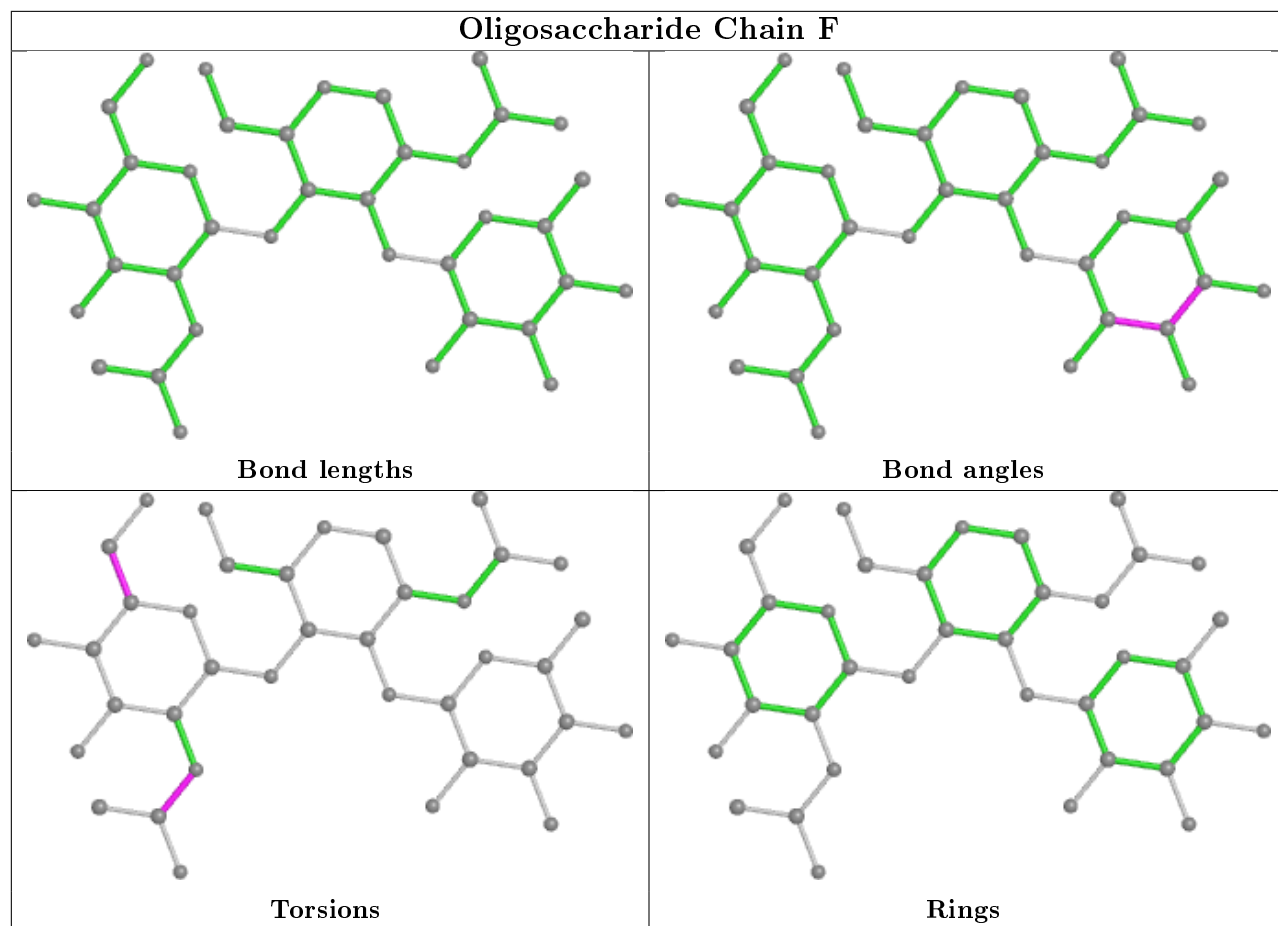
There are no ring outliers.

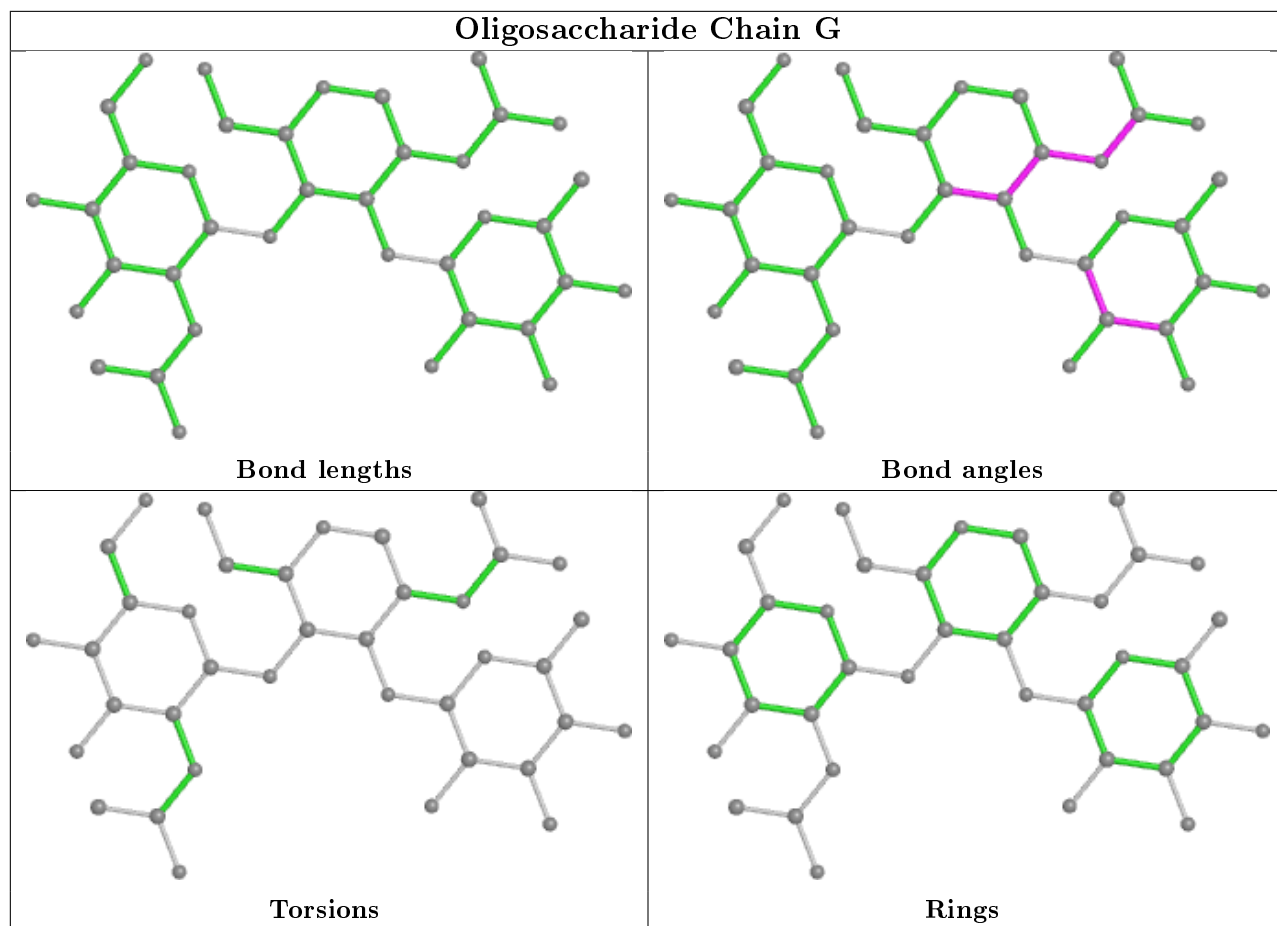
4 monomers are involved in 3 short contacts:

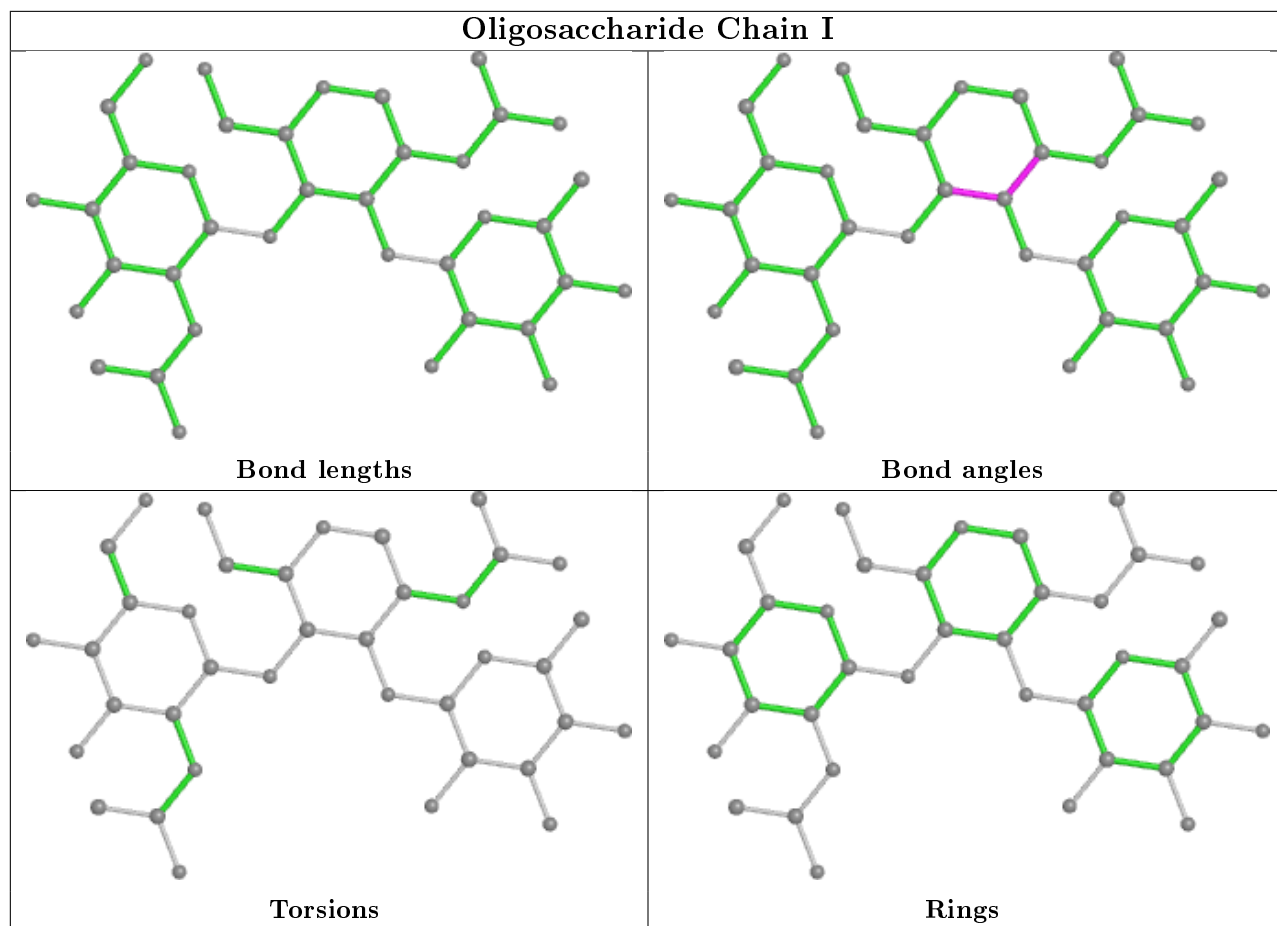
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	I	2	FUC	1	0
2	F	3	NAG	2	0
2	F	2	FUC	2	0
2	I	1	NAG	1	0

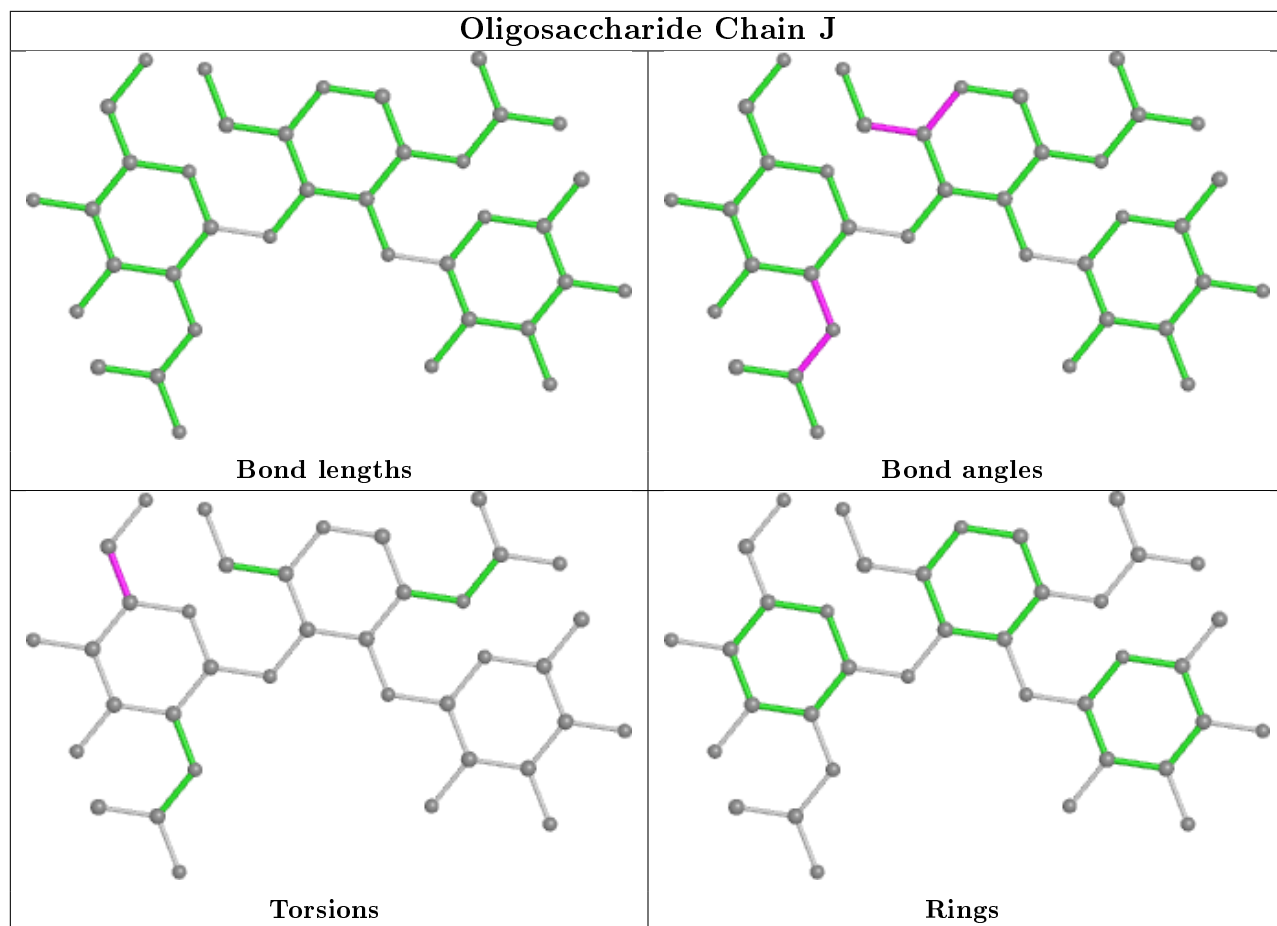
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



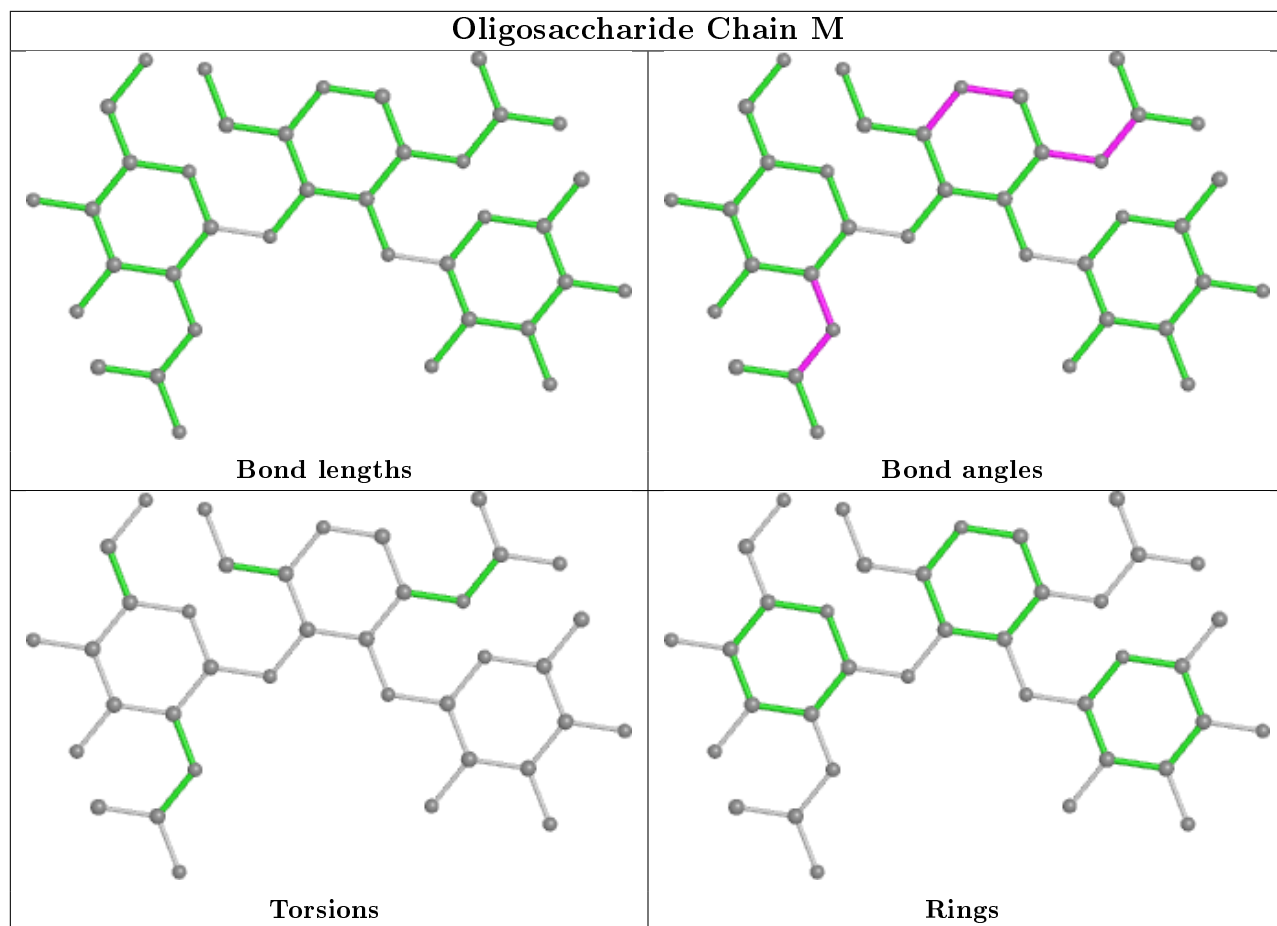


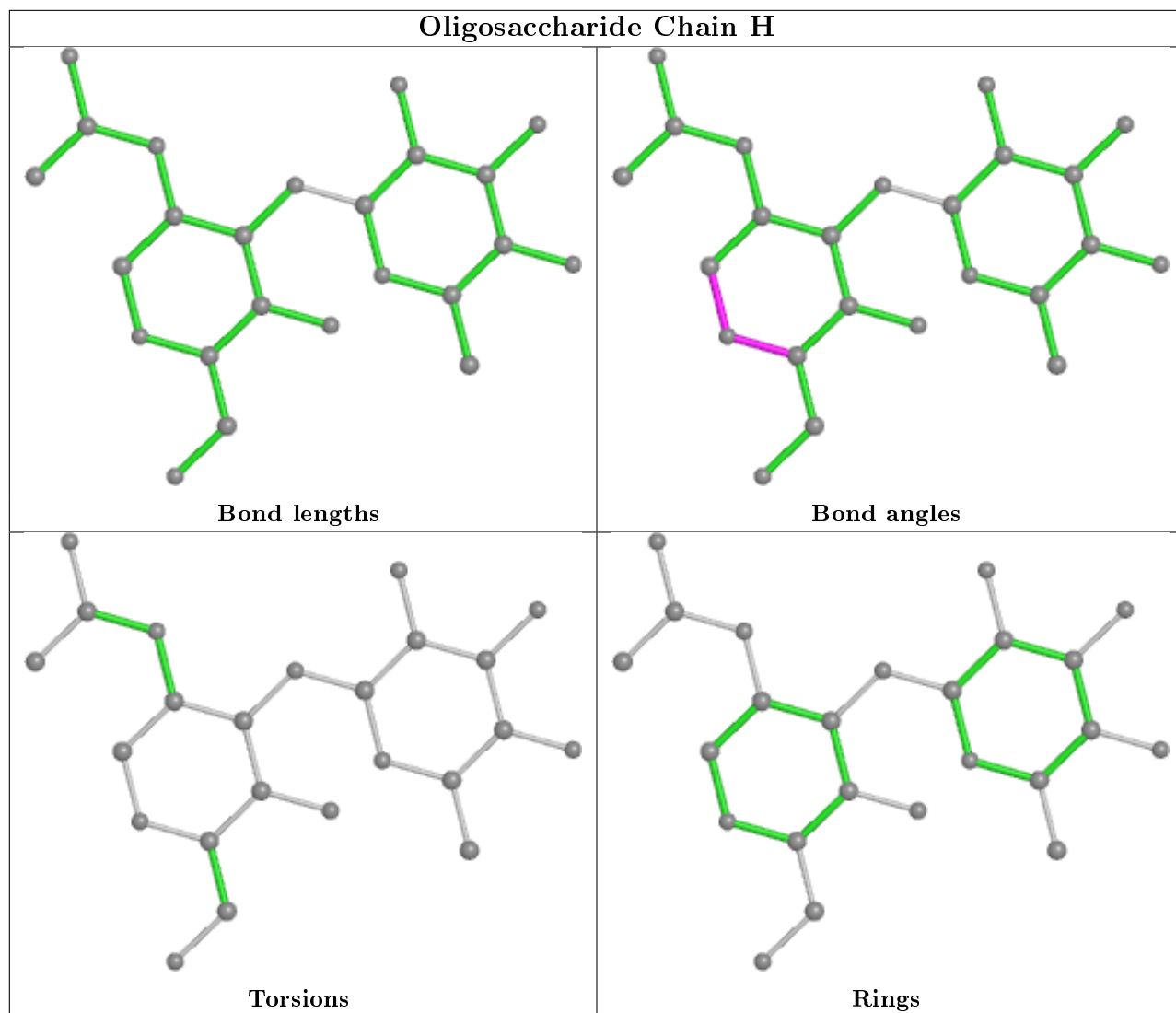


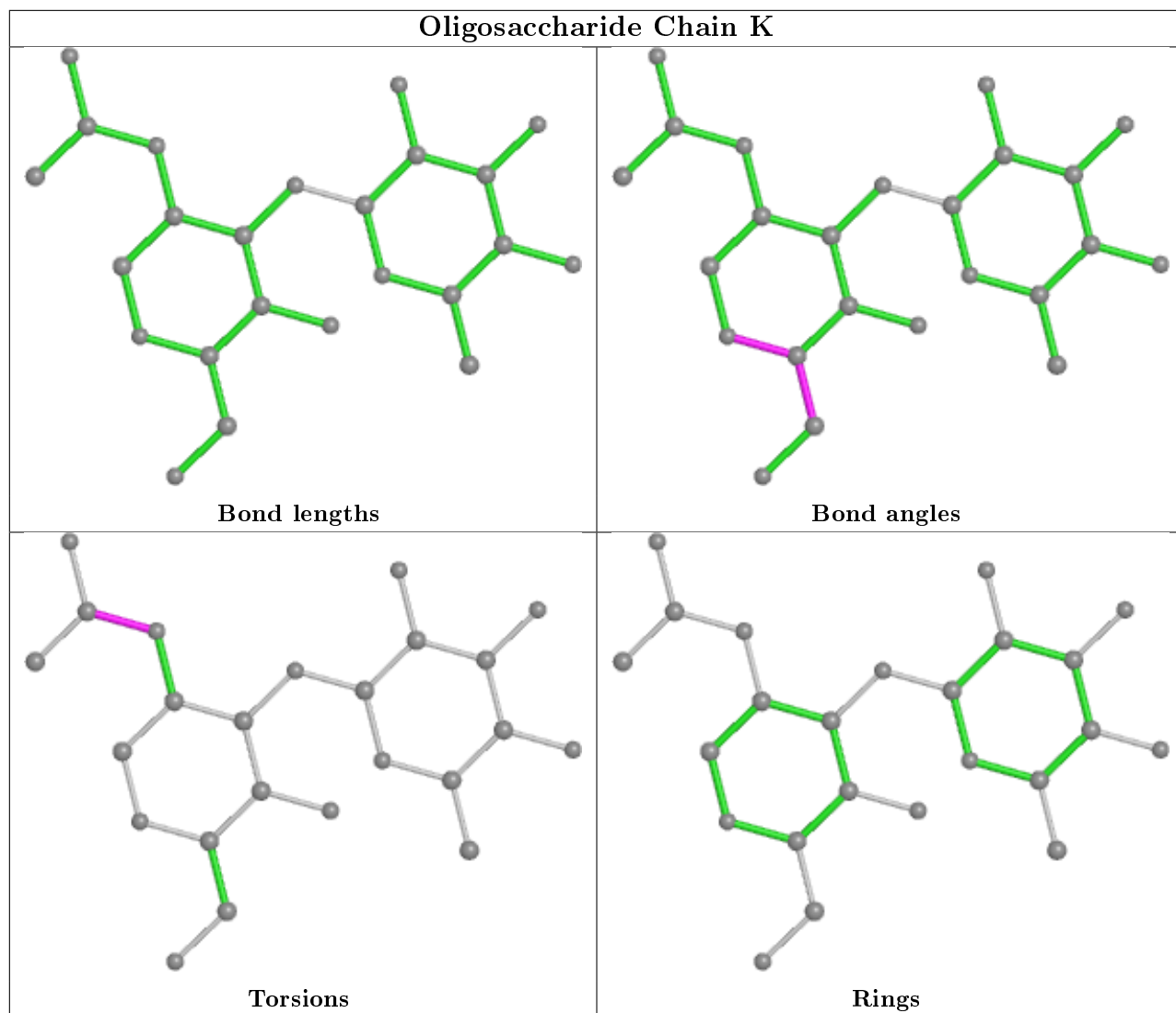


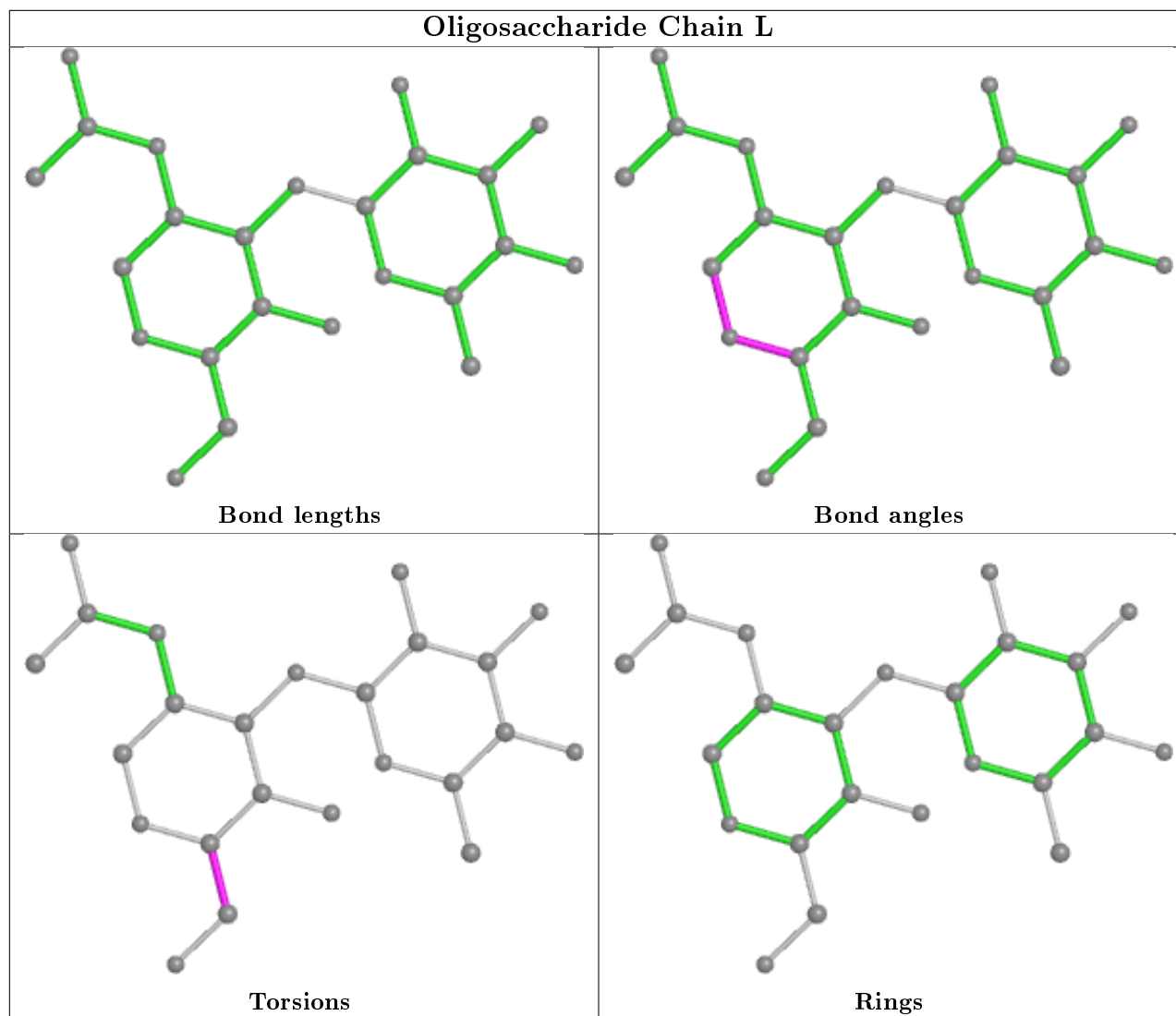












## 5.6 Ligand geometry [i](#)

Of 33 ligands modelled in this entry, 8 are monoatomic - leaving 25 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$
10	NAG	A	508	1	14,14,15	0.51	0	17,19,21	0.78	1 (5%)
8	SO4	A	506	-	4,4,4	0.20	0	6,6,6	0.13	0
8	SO4	A	505	-	4,4,4	0.17	0	6,6,6	0.25	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
9	EDO	D	511	-	3,3,3	0.50	0	2,2,2	0.26	0
10	NAG	B	507	1	14,14,15	0.46	0	17,19,21	1.41	2 (11%)
8	SO4	C	505	-	4,4,4	0.18	0	6,6,6	0.11	0
9	EDO	D	510	-	3,3,3	0.55	0	2,2,2	0.23	0
6	0K7	B	503	5,4	11,16,16	1.00	1 (9%)	9,22,22	2.06	1 (11%)
10	NAG	D	517	1	14,14,15	0.43	0	17,19,21	1.33	2 (11%)
10	NAG	B	508	1	14,14,15	0.55	0	17,19,21	0.61	0
10	NAG	C	508	1	14,14,15	0.52	0	17,19,21	1.42	3 (17%)
7	GOL	C	504	-	5,5,5	0.38	0	5,5,5	0.33	0
9	EDO	A	507	-	3,3,3	0.52	0	2,2,2	0.41	0
7	GOL	A	504	-	5,5,5	0.37	0	5,5,5	0.20	0
6	0K7	A	503	5,4	11,16,16	1.30	2 (18%)	9,22,22	2.05	1 (11%)
8	SO4	D	505	-	4,4,4	0.19	0	6,6,6	0.20	0
8	SO4	B	506	-	4,4,4	0.17	0	6,6,6	0.28	0
10	NAG	D	509	1	14,14,15	0.51	0	17,19,21	0.75	0
9	EDO	D	506	-	3,3,3	0.54	0	2,2,2	0.39	0
6	0K7	C	503	5,4	11,16,16	1.04	2 (18%)	9,22,22	2.08	1 (11%)
6	0K7	D	503	5	2,8,16	0.55	0	2,10,22	4.62	2 (100%)
9	EDO	D	507	-	3,3,3	0.50	0	2,2,2	0.32	0
9	EDO	D	508	-	3,3,3	0.59	0	2,2,2	0.19	0
10	NAG	C	512	1	14,14,15	0.66	0	17,19,21	1.02	1 (5%)
7	GOL	D	504	-	5,5,5	0.29	0	5,5,5	0.43	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
7	GOL	C	504	-	-	0/4/4/4	-
9	EDO	A	507	-	-	1/1/1/1	-
10	NAG	A	508	1	-	2/6/23/26	0/1/1/1
6	0K7	A	503	5,4	-	0/4/8/8	0/2/2/2
9	EDO	D	511	-	-	1/1/1/1	-
10	NAG	B	507	1	-	0/6/23/26	0/1/1/1
6	0K7	C	503	5,4	-	3/4/8/8	0/2/2/2
9	EDO	D	506	-	-	1/1/1/1	-
6	0K7	D	503	5	-	0/0/4/8	0/1/1/2
9	EDO	D	507	-	-	0/1/1/1	-
6	0K7	B	503	5,4	-	0/4/8/8	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	GOL	D	504	-	-	2/4/4/4	-
9	EDO	D	510	-	-	0/1/1/1	-
10	NAG	B	508	1	-	2/6/23/26	0/1/1/1
9	EDO	D	508	-	-	0/1/1/1	-
10	NAG	C	508	1	-	2/6/23/26	0/1/1/1
10	NAG	C	512	1	-	0/6/23/26	0/1/1/1
10	NAG	D	517	1	-	0/6/23/26	0/1/1/1
7	GOL	A	504	-	-	1/4/4/4	-
10	NAG	D	509	1	-	2/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	503	0K7	CAO-NAI	3.22	1.36	1.31
6	A	503	0K7	CAO-SAJ	-2.70	1.70	1.73
6	B	503	0K7	CAO-NAI	2.50	1.35	1.31
6	C	503	0K7	CAO-NAI	2.41	1.34	1.31
6	C	503	0K7	CAO-SAJ	-2.33	1.70	1.73

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	D	503	0K7	CAN-CAH-SAJ	-6.01	104.48	111.83
6	A	503	0K7	CAN-CAH-SAJ	-5.79	104.68	111.79
6	B	503	0K7	CAN-CAH-SAJ	-5.74	104.74	111.79
6	C	503	0K7	CAN-CAH-SAJ	-5.37	105.20	111.79
10	B	507	NAG	C1-O5-C5	4.30	118.01	112.19

There are no chirality outliers.

5 of 17 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	C	503	0K7	CAF-CAM-CAO-NAI
6	C	503	0K7	CAG-CAM-CAO-NAI
10	B	508	NAG	C8-C7-N2-C2
10	B	508	NAG	O7-C7-N2-C2
10	C	508	NAG	C8-C7-N2-C2

There are no ring outliers.

10 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	505	SO4	1	0
9	D	510	EDO	2	0
6	B	503	0K7	5	0
10	B	508	NAG	1	0
6	A	503	0K7	3	0
6	C	503	0K7	2	0
6	D	503	0K7	1	0
9	D	507	EDO	1	0
9	D	508	EDO	1	0
7	D	504	GOL	1	0

### 5.7 Other polymers [i](#)

There are no such residues in this entry.

### 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	424/426 (99%)	-0.91	1 (0%) 95 96	14, 21, 35, 52	0
1	B	425/426 (99%)	-0.83	4 (0%) 84 88	16, 24, 38, 69	0
1	C	424/426 (99%)	-0.81	4 (0%) 84 88	15, 23, 38, 75	1 (0%)
1	D	423/426 (99%)	-0.86	3 (0%) 87 91	16, 22, 36, 72	0
All	All	1696/1704 (99%)	-0.85	12 (0%) 87 91	14, 23, 37, 75	1 (0%)

The worst 5 of 12 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	64	ASN	5.4
1	A	431	SER	3.8
1	B	64	ASN	3.4
1	D	64	ASN	3.1
1	B	65	GLY	3.1

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

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

### 6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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
3	FUC	K	2	10/11	0.83	0.38	68,79,84,85	0
3	NAG	K	1	14/15	0.84	0.23	42,68,74,84	0

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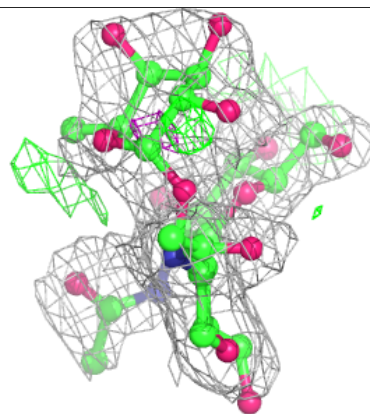
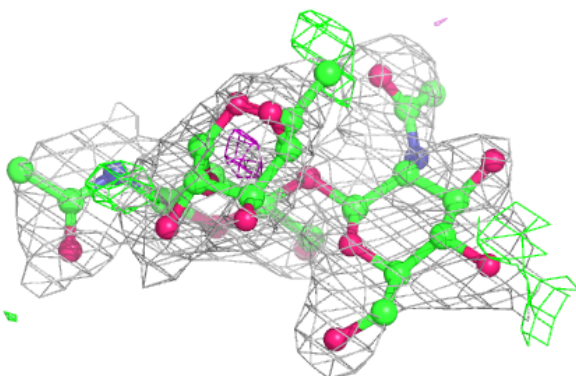
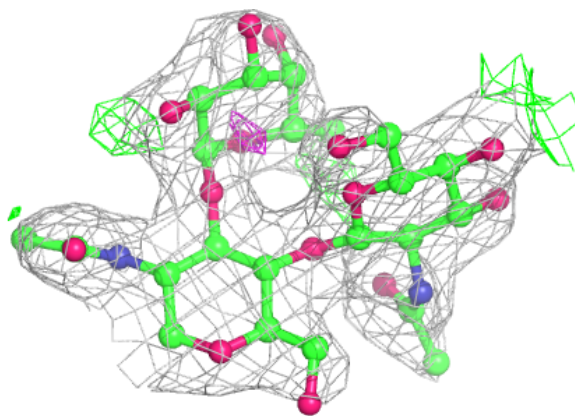
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	NAG	L	1	14/15	0.85	0.18	37,46,62,64	0
2	FUC	E	2	10/11	0.86	0.39	55,63,69,69	0
2	NAG	F	3	14/15	0.87	0.28	45,55,61,66	0
3	FUC	H	2	10/11	0.87	0.28	48,61,65,66	0
2	NAG	E	3	14/15	0.90	0.27	45,55,59,60	0
2	FUC	M	2	10/11	0.90	0.19	46,53,57,59	0
3	FUC	L	2	10/11	0.90	0.28	62,70,76,77	0
3	NAG	H	1	14/15	0.91	0.22	37,48,55,57	0
2	FUC	J	2	10/11	0.92	0.18	46,52,58,61	0
2	NAG	M	3	14/15	0.93	0.27	32,49,64,74	0
2	NAG	J	3	14/15	0.93	0.22	29,42,55,69	0
2	FUC	F	2	10/11	0.93	0.23	40,50,56,63	0
2	NAG	G	3	14/15	0.94	0.17	23,30,35,36	0
2	NAG	E	1	14/15	0.95	0.12	35,41,50,52	0
2	NAG	I	3	14/15	0.95	0.15	26,31,38,42	0
2	FUC	I	2	10/11	0.96	0.12	28,29,35,41	0
2	NAG	M	1	14/15	0.96	0.10	24,34,40,47	0
2	NAG	F	1	14/15	0.96	0.14	29,35,46,49	0
2	NAG	J	1	14/15	0.96	0.10	23,31,41,50	0
2	NAG	I	1	14/15	0.97	0.10	19,24,33,33	0
2	FUC	G	2	10/11	0.97	0.16	29,36,39,42	0
2	NAG	G	1	14/15	0.98	0.09	20,25,30,34	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.

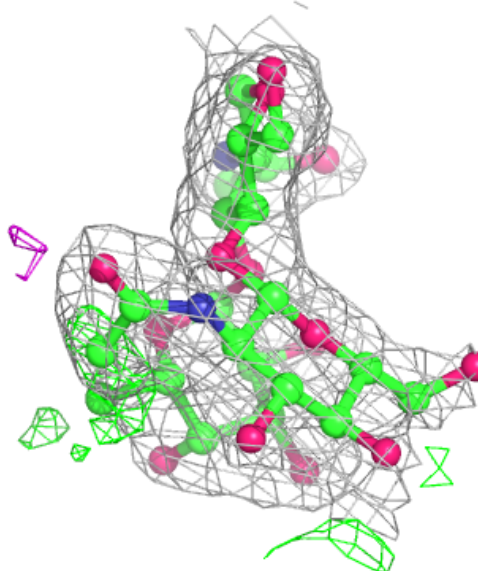
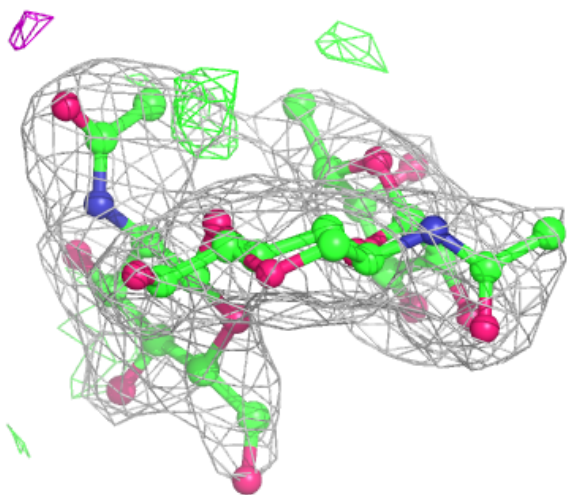
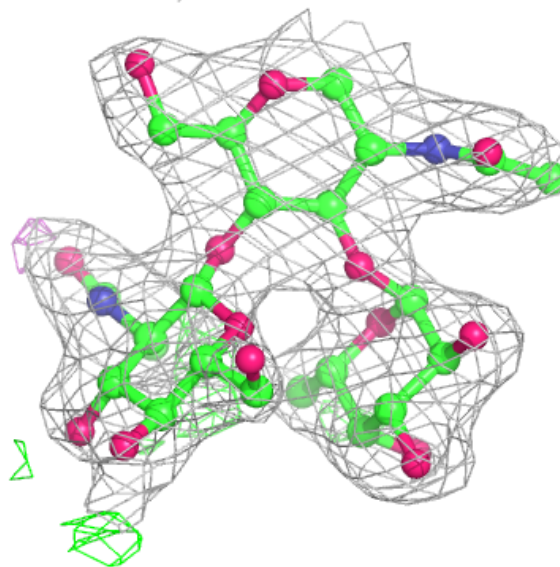
**Electron density around Chain E:**

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



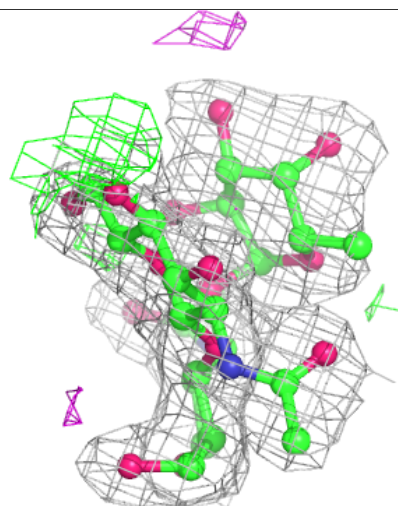
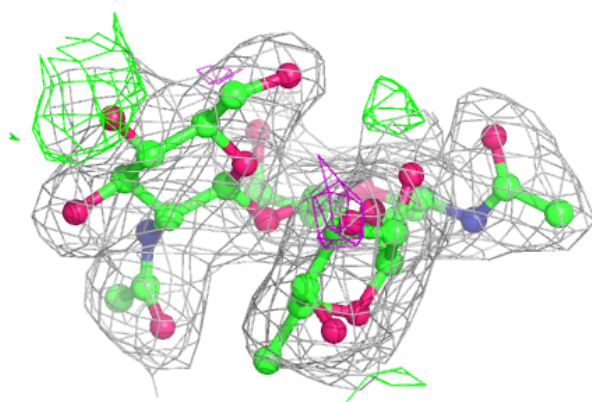
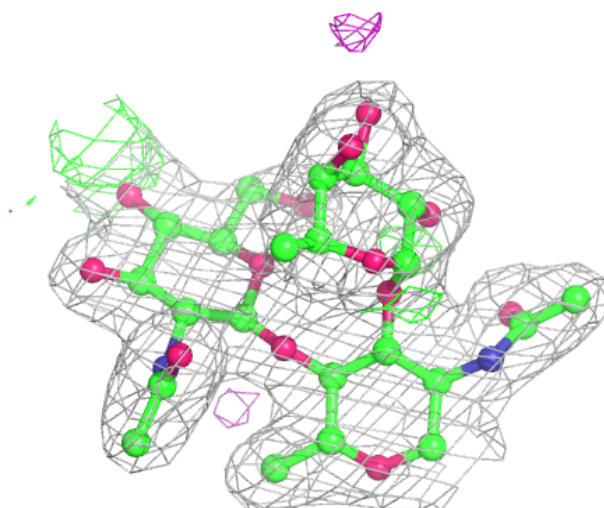
**Electron density around Chain F:**

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



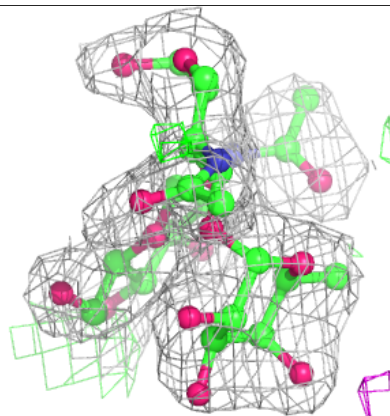
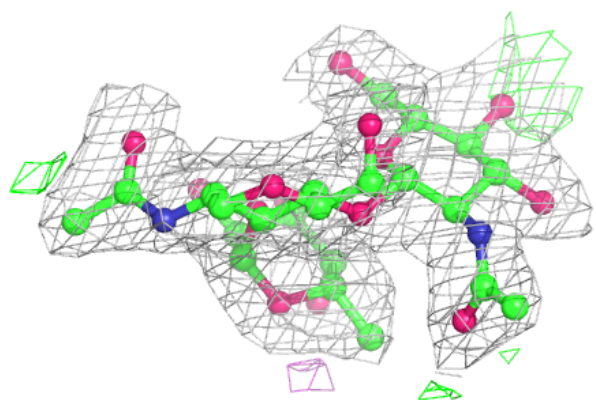
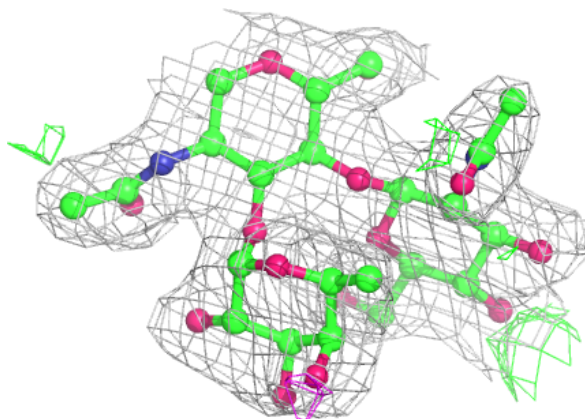
**Electron density around Chain G:**

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



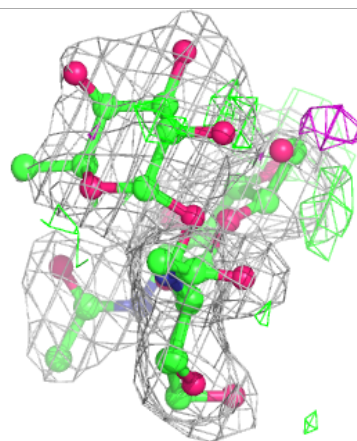
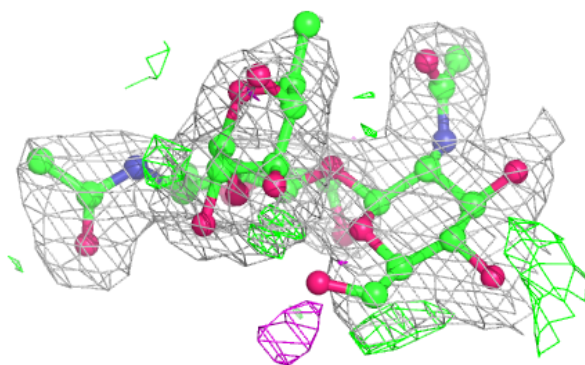
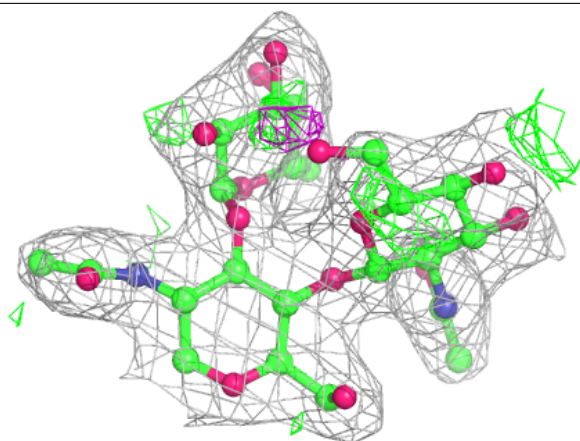
**Electron density around Chain I:**

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



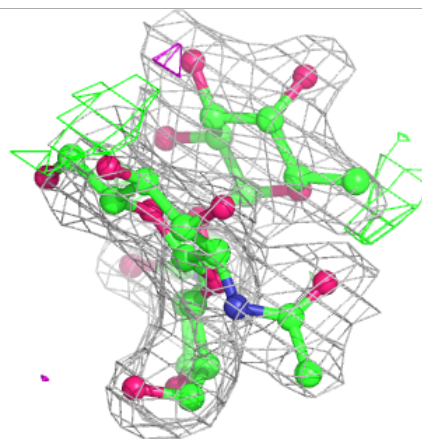
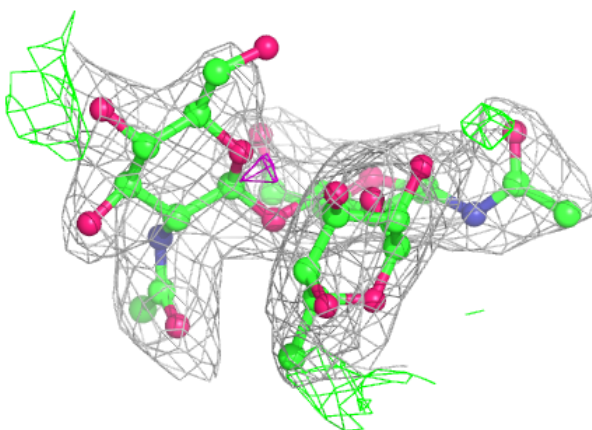
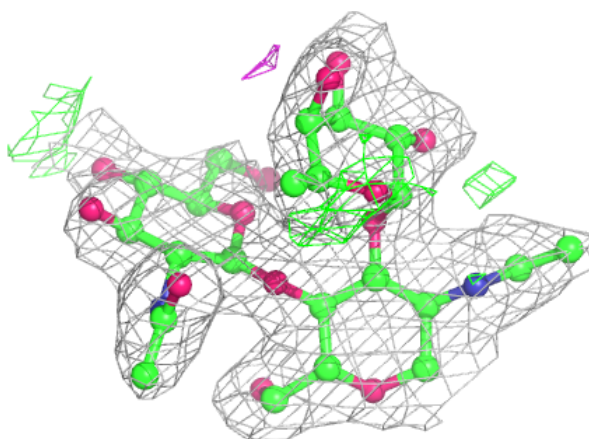
**Electron density around Chain J:**

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



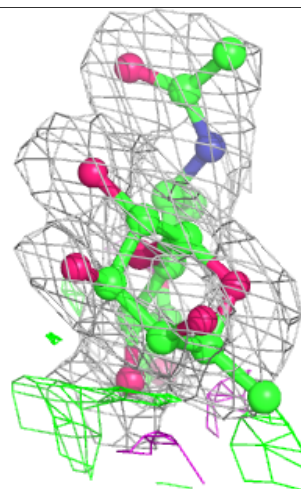
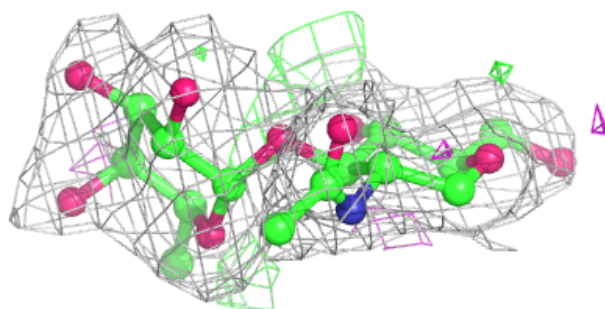
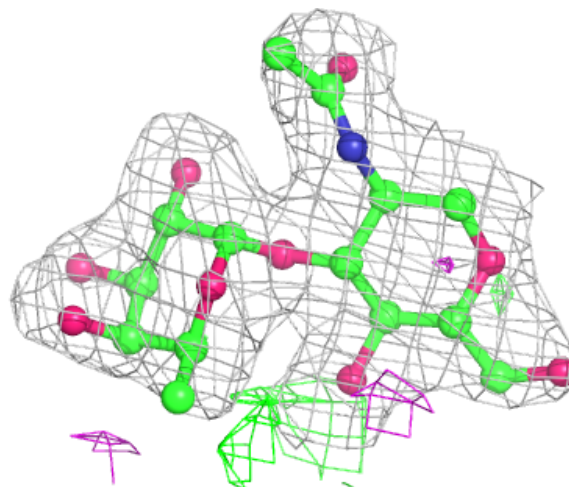
**Electron density around Chain M:**

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



**Electron density around Chain H:**

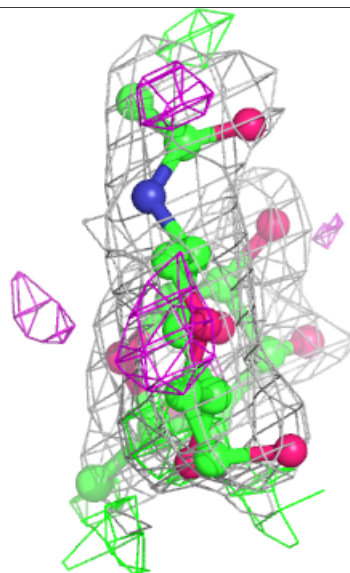
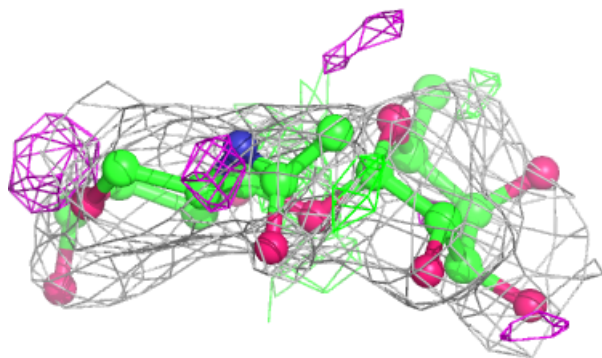
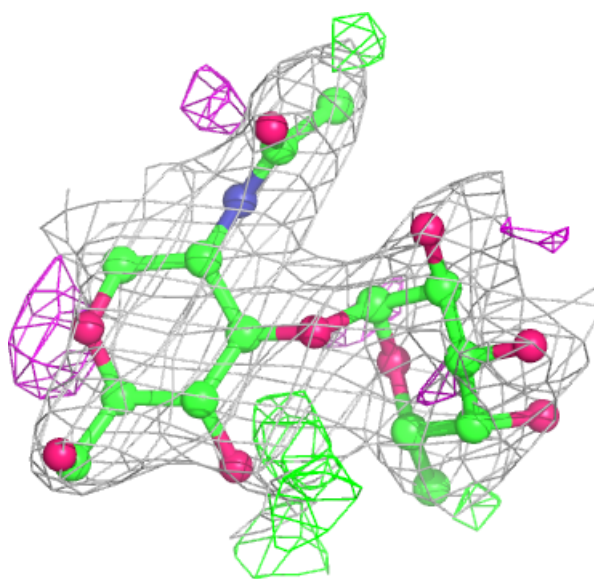
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

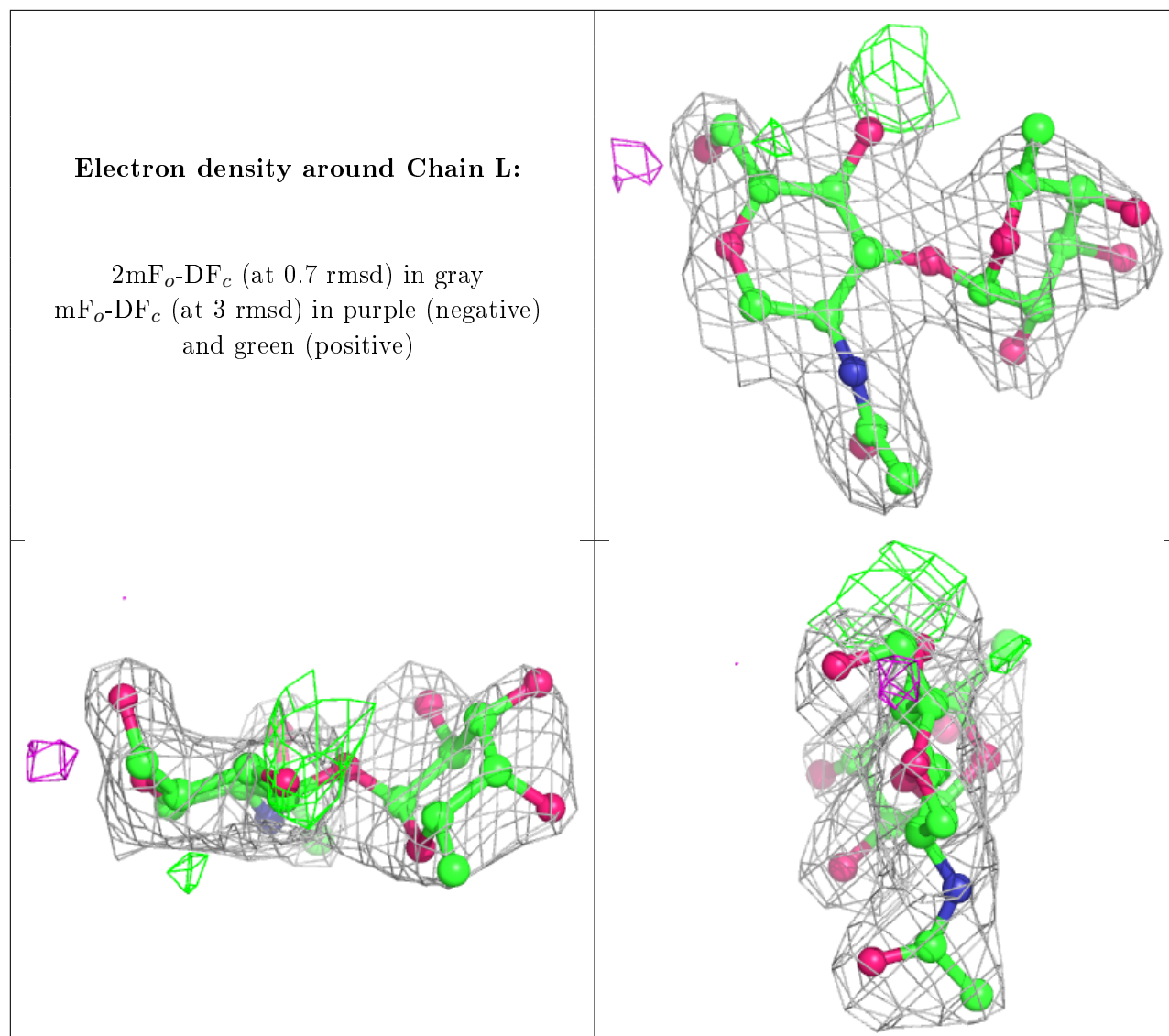




**Electron density around Chain K:**

$2mF_o-DF_c$  (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(Å <sup>2</sup> )	Q<0.9
10	NAG	C	508	14/15	0.86	0.19	38,42,51,52	0
6	0K7	B	503	15/15	0.87	0.30	28,55,70,74	0
6	0K7	A	503	15/15	0.87	0.30	28,57,70,77	0
9	EDO	D	510	4/4	0.87	0.18	36,40,44,52	0
7	GOL	D	504	6/6	0.88	0.13	29,39,43,50	0
6	0K7	C	503	15/15	0.88	0.31	33,61,78,78	0
9	EDO	D	508	4/4	0.88	0.14	30,33,34,38	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
6	OK7	D	503	8/15	0.90	0.16	26,40,50,83	0
8	SO4	C	505	5/5	0.90	0.29	58,63,88,95	0
10	NAG	B	507	14/15	0.93	0.17	33,41,45,47	0
9	EDO	D	507	4/4	0.94	0.15	33,33,35,35	0
8	SO4	B	506	5/5	0.94	0.24	40,47,60,79	0
9	EDO	D	506	4/4	0.95	0.10	31,32,33,37	0
9	EDO	A	507	4/4	0.95	0.09	30,33,36,37	0
9	EDO	D	511	4/4	0.95	0.21	28,33,37,39	0
8	SO4	A	506	5/5	0.95	0.24	38,40,55,62	0
10	NAG	D	517	14/15	0.95	0.18	39,44,48,54	0
10	NAG	D	509	14/15	0.96	0.12	23,29,37,39	0
10	NAG	B	508	14/15	0.96	0.13	23,34,40,47	0
10	NAG	A	508	14/15	0.96	0.12	16,29,33,42	0
8	SO4	D	505	5/5	0.97	0.25	30,51,55,57	0
10	NAG	C	512	14/15	0.97	0.10	23,29,37,40	0
5	FE	B	502	1/1	0.99	0.06	21,21,21,21	1
5	FE	C	502	1/1	0.99	0.02	28,28,28,28	1
7	GOL	C	504	6/6	0.99	0.05	21,23,25,26	0
5	FE	A	502	1/1	0.99	0.02	27,27,27,27	0
7	GOL	A	504	6/6	0.99	0.05	17,20,23,23	0
8	SO4	A	505	5/5	0.99	0.07	29,30,36,43	0
4	ZN	D	501	1/1	1.00	0.03	23,23,23,23	1
4	ZN	C	501	1/1	1.00	0.02	30,30,30,30	0
4	ZN	A	501	1/1	1.00	0.02	28,28,28,28	0
5	FE	D	502	1/1	1.00	0.04	29,29,29,29	1
4	ZN	B	501	1/1	1.00	0.01	27,27,27,27	0

## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.