



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 2, 2024 – 06:06 pm GMT

PDB ID : 5CQ0  
Title : Crystal structure of murine polyomavirus RA strain VP1 in complex with the GD1a glycan  
Authors : Buch, M.H.C.; Liaci, A.M.; Neu, U.; Stehle, T.  
Deposited on : 2015-07-21  
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 : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

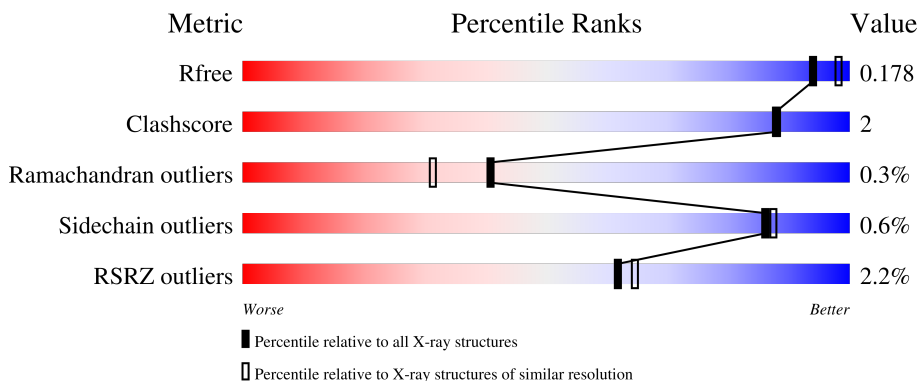
# 1 Overall quality at a glance

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.







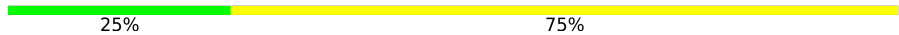
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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	284	 3% 95% 2% 1%
1	B	284	 3% 95% 2% 1%
1	C	284	 2% 93% 5% 1%
1	D	284	 1% 95% 2% 1%
1	E	284	 2% 93% 5% 1%

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Mol	Chain	Length	Quality of chain
2	F	4	 25% 75%
2	G	4	 50% 50%
2	H	4	 25% 75%
2	I	4	 50% 50%
2	J	4	 25% 75%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	GOL	A	406	-	-	X	-

## 2 Entry composition [i](#)

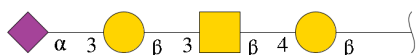
There are 5 unique types of molecules in this entry. The entry contains 13481 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Capsid protein VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	281	Total 2261	C 1447	N 377	O 428	S 9	0	13	0
1	B	279	Total 2235	C 1428	N 374	O 424	S 9	0	10	0
1	C	278	Total 2232	C 1433	N 371	O 420	S 8	0	11	0
1	D	284	Total 2257	C 1438	N 377	O 431	S 11	0	8	0
1	E	278	Total 2240	C 1432	N 375	O 424	S 9	0	12	0

- Molecule 2 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	F	4	Total 57	C 31	N 2	O 24	0	0	0
2	G	4	Total 57	C 31	N 2	O 24	0	0	0
2	H	4	Total 57	C 31	N 2	O 24	0	0	0
2	I	4	Total 57	C 31	N 2	O 24	0	0	0
2	J	4	Total 57	C 31	N 2	O 24	0	0	0

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 6 3 3	0	0
4	C	1	Total C O 4 2 2	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	D	1	Total C O 4 2 2	0	0
4	D	1	Total C O 6 3 3	0	0
4	D	1	Total C O 6 3 3	0	0
4	D	1	Total C O 4 2 2	0	0
4	E	1	Total C O 4 2 2	0	0
4	E	1	Total C O 6 3 3	0	0
4	E	1	Total C O 6 3 3	0	0
4	E	1	Total C O 4 2 2	0	0

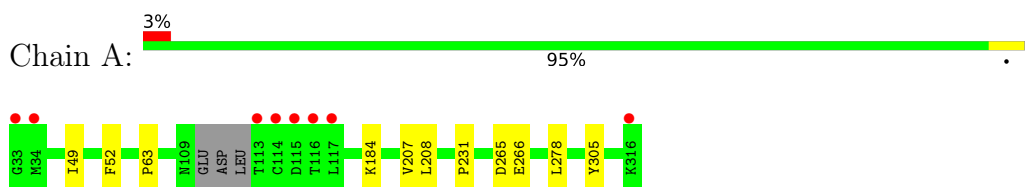
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	353	Total O 353 353	0	0
5	B	330	Total O 330 330	0	0
5	C	338	Total O 338 338	0	0
5	D	392	Total O 392 392	0	0
5	E	380	Total O 380 380	0	0

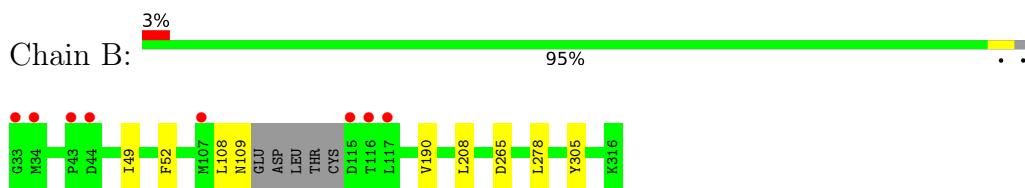
### 3 Residue-property plots [i](#)

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.

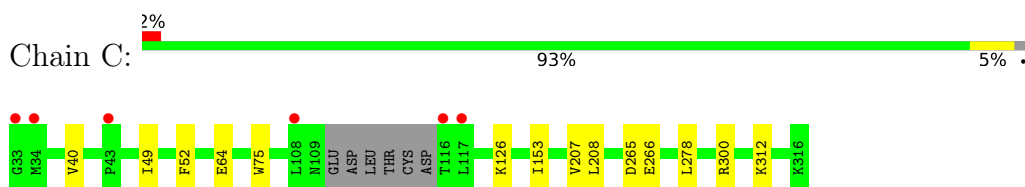
- Molecule 1: Capsid protein VP1



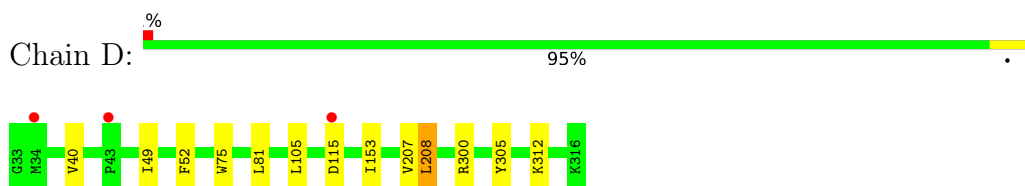
- Molecule 1: Capsid protein VP1



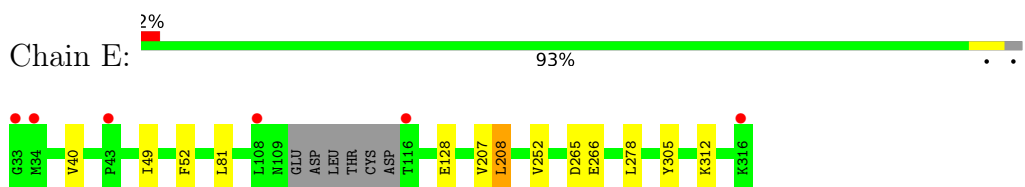
- Molecule 1: Capsid protein VP1



- Molecule 1: Capsid protein VP1



- Molecule 1: Capsid protein VP1





- Molecule 2: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose

Chain F:  25% 75%

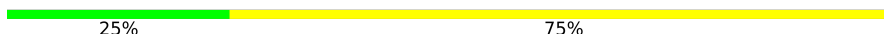
GAL1  
NGA2  
GAL3  
SIA4

- Molecule 2: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose

Chain G:  50% 50%

GAL1  
NGA2  
GAL3  
SIA4

- Molecule 2: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose

Chain H:  25% 75%

GAL1  
NGA2  
GAL3  
SIA4

- Molecule 2: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose

Chain I:  50% 50%

GAL1  
NGA2  
GAL3  
SIA4

- Molecule 2: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-galactopyranose-(1-4)-beta-D-galactopyranose

Chain J:  25% 75%

GAL1  
NGA2  
GAL3  
SIA4

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	219.06Å 219.06Å 99.40Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.12 – 1.90 48.08 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.9 (48.12-1.90) 99.0 (48.08-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.11	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.13 (at 1.90Å)	Xtrriage
Refinement program	REFMAC 5.7.0029	Depositor
R, $R_{free}$	0.155 , 0.178 0.154 , 0.178	Depositor DCC
$R_{free}$ test set	6393 reflections (3.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	15.5	Xtrriage
Anisotropy	0.132	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 55.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.022 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	13481	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.53% 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: GAL, NGA, SO4, GOL, SIA

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	0.45	0/2351	0.57	0/3201
1	B	0.41	0/2318	0.56	0/3158
1	C	0.41	0/2326	0.56	0/3172
1	D	0.43	0/2335	0.58	0/3180
1	E	0.45	0/2327	0.60	0/3168
All	All	0.43	0/11657	0.57	0/15879

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	2261	0	2267	9	0
1	B	2235	0	2235	8	0
1	C	2232	0	2251	11	0
1	D	2257	0	2256	10	0
1	E	2240	0	2250	13	0
2	F	57	0	49	0	0
2	G	57	0	49	0	0
2	H	57	0	49	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	I	57	0	49	0	0
2	J	57	0	49	0	0
3	A	10	0	0	0	0
3	B	15	0	0	0	0
3	C	15	0	0	1	0
3	D	15	0	0	0	0
3	E	15	0	0	0	0
4	A	32	0	40	9	0
4	B	20	0	24	3	0
4	C	16	0	20	1	0
4	D	20	0	23	1	0
4	E	20	0	24	2	0
5	A	353	0	0	2	0
5	B	330	0	0	0	0
5	C	338	0	0	2	0
5	D	392	0	0	0	0
5	E	380	0	0	2	0
All	All	13481	0	11635	47	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 (47) 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:266:GLU:H	4:A:406:GOL:H32	1.22	1.02
1:C:64:GLU:H	4:C:406:GOL:H12	1.41	0.85
4:A:412:GOL:H12	5:A:573:HOH:O	1.84	0.77
1:A:266:GLU:N	4:A:406:GOL:H32	1.99	0.76
1:D:52[A]:PHE:CE1	1:D:305:TYR:HB2	2.21	0.76
4:A:412:GOL:H11	1:B:265:ASP:HA	1.70	0.74
1:D:52[A]:PHE:CD1	1:E:208:LEU:HD13	2.24	0.72
3:C:401:SO4:O2	5:C:501:HOH:O	2.12	0.66
1:E:265:ASP:HA	4:E:406:GOL:H31	1.77	0.66
1:A:49:ILE:HD11	1:A:278:LEU:HD23	1.77	0.65
1:E:49:ILE:HD11	1:E:278:LEU:HD23	1.77	0.65
1:E:52[A]:PHE:CE1	1:E:305:TYR:HB2	2.36	0.61
4:B:411:GOL:H11	1:C:266:GLU:H	1.66	0.59
1:A:52[B]:PHE:CE1	1:A:305:TYR:HB2	2.38	0.59
4:A:406:GOL:H12	5:A:509:HOH:O	2.03	0.58
1:A:49:ILE:HD11	1:A:278:LEU:CD2	2.34	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:52[A]:PHE:CE1	1:E:208:LEU:HD13	2.40	0.56
1:B:52[B]:PHE:CE1	1:B:305:TYR:HB2	2.42	0.55
1:E:49:ILE:HD11	1:E:278:LEU:CD2	2.38	0.54
4:A:412:GOL:H11	1:B:265:ASP:CA	2.39	0.53
1:D:49[A]:ILE:HD13	1:D:105:LEU:CD2	2.42	0.50
1:B:49:ILE:HD11	1:B:278:LEU:HD23	1.94	0.50
1:C:52[A]:PHE:CD1	1:D:208[A]:LEU:HG	2.48	0.49
1:B:108[B]:LEU:O	1:B:109[B]:ASN:HB2	2.12	0.48
1:D:153:ILE:HA	1:E:81:LEU:HD21	1.94	0.48
1:E:252[C]:VAL:HG12	5:E:693:HOH:O	2.14	0.47
4:B:411:GOL:H11	1:C:266:GLU:N	2.29	0.47
1:D:40:VAL:HB	1:D:312:LYS:HB2	1.98	0.46
1:E:266:GLU:H	4:E:406:GOL:H11	1.81	0.46
1:D:52[A]:PHE:CE1	1:E:208:LEU:CD1	2.98	0.46
1:E:128[B]:GLU:HG2	5:E:731:HOH:O	2.17	0.45
1:C:49:ILE:HD11	1:C:278:LEU:HD23	1.98	0.45
1:A:63:PRO:HA	4:A:404:GOL:H2	1.98	0.44
1:C:126:LYS:HZ1	4:D:406:GOL:H12	1.83	0.43
1:C:153:ILE:HA	1:D:81:LEU:HD21	2.00	0.43
1:D:75:TRP:CZ3	1:D:300:ARG:HB2	2.53	0.43
1:A:265:ASP:CB	4:A:406:GOL:H11	2.49	0.42
4:B:411:GOL:H31	1:C:265:ASP:HA	2.01	0.42
1:E:40:VAL:HB	1:E:312:LYS:HB2	2.00	0.42
1:B:49:ILE:HD11	1:B:278:LEU:CD2	2.48	0.42
1:C:75:TRP:CZ3	1:C:300:ARG:HB2	2.54	0.42
1:C:40:VAL:HB	1:C:312:LYS:HB2	2.02	0.42
1:C:49:ILE:HD11	1:C:278:LEU:CD2	2.50	0.42
1:A:184:LYS:HG2	4:A:402:GOL:H11	2.01	0.41
1:B:108[B]:LEU:O	1:B:109[B]:ASN:CB	2.68	0.41
1:A:231:PRO:HB3	1:E:128[B]:GLU:OE1	2.21	0.40
1:B:52[A]:PHE:HZ	5:C:530:HOH:O	2.03	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	290/284 (102%)	283 (98%)	6 (2%)	1 (0%)	41	31
1	B	286/284 (101%)	280 (98%)	6 (2%)	0	100	100
1	C	288/284 (101%)	278 (96%)	9 (3%)	1 (0%)	41	31
1	D	290/284 (102%)	278 (96%)	11 (4%)	1 (0%)	41	31
1	E	286/284 (101%)	278 (97%)	7 (2%)	1 (0%)	41	31
All	All	1440/1420 (101%)	1397 (97%)	39 (3%)	4 (0%)	41	31

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	207	VAL
1	A	207	VAL
1	D	207	VAL
1	E	207	VAL

### 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	255/249 (102%)	254 (100%)	1 (0%)	91	91
1	B	252/249 (101%)	250 (99%)	2 (1%)	81	82
1	C	253/249 (102%)	252 (100%)	1 (0%)	91	91
1	D	255/249 (102%)	251 (98%)	4 (2%)	62	60
1	E	254/249 (102%)	253 (100%)	1 (0%)	91	91
All	All	1269/1245 (102%)	1260 (99%)	9 (1%)	86	84

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	208	LEU

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Mol	Chain	Res	Type
1	B	190	VAL
1	B	208	LEU
1	C	208	LEU
1	D	115[A]	ASP
1	D	115[B]	ASP
1	D	208[A]	LEU
1	D	208[B]	LEU
1	E	208	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	293	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](#)

20 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	GAL	F	1	2	12,12,12	0.47	0	17,17,17	1.16	1 (5%)
2	NGA	F	2	2	14,14,15	0.48	0	17,19,21	0.79	0
2	GAL	F	3	2	11,11,12	0.55	0	15,15,17	0.91	2 (13%)
2	SIA	F	4	2	20,20,21	0.73	0	24,28,31	1.10	2 (8%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	GAL	G	1	2	12,12,12	0.51	0	17,17,17	0.98	2 (11%)
2	NGA	G	2	2	14,14,15	0.48	0	17,19,21	0.57	0
2	GAL	G	3	2	11,11,12	0.53	0	15,15,17	0.70	0
2	SIA	G	4	2	20,20,21	0.75	0	24,28,31	1.13	3 (12%)
2	GAL	H	1	2	12,12,12	0.51	0	17,17,17	0.99	2 (11%)
2	NGA	H	2	2	14,14,15	0.44	0	17,19,21	0.65	0
2	GAL	H	3	2	11,11,12	0.63	0	15,15,17	0.87	1 (6%)
2	SIA	H	4	2	20,20,21	0.73	0	24,28,31	1.09	2 (8%)
2	GAL	I	1	2	12,12,12	0.55	0	17,17,17	1.28	3 (17%)
2	NGA	I	2	2	14,14,15	0.41	0	17,19,21	0.64	0
2	GAL	I	3	2	11,11,12	0.49	0	15,15,17	0.79	0
2	SIA	I	4	2	20,20,21	0.86	1 (5%)	24,28,31	0.96	1 (4%)
2	GAL	J	1	2	12,12,12	0.54	0	17,17,17	1.01	2 (11%)
2	NGA	J	2	2	14,14,15	0.46	0	17,19,21	0.77	0
2	GAL	J	3	2	11,11,12	0.60	0	15,15,17	0.95	1 (6%)
2	SIA	J	4	2	20,20,21	0.78	1 (5%)	24,28,31	1.14	3 (12%)

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	GAL	F	1	2	-	2/2/22/22	0/1/1/1
2	NGA	F	2	2	-	2/6/23/26	0/1/1/1
2	GAL	F	3	2	-	0/2/19/22	0/1/1/1
2	SIA	F	4	2	-	6/18/34/38	0/1/1/1
2	GAL	G	1	2	-	2/2/22/22	0/1/1/1
2	NGA	G	2	2	-	0/6/23/26	0/1/1/1
2	GAL	G	3	2	-	0/2/19/22	0/1/1/1
2	SIA	G	4	2	-	0/18/34/38	0/1/1/1
2	GAL	H	1	2	-	2/2/22/22	0/1/1/1
2	NGA	H	2	2	-	0/6/23/26	0/1/1/1
2	GAL	H	3	2	-	0/2/19/22	0/1/1/1
2	SIA	H	4	2	-	1/18/34/38	0/1/1/1
2	GAL	I	1	2	-	2/2/22/22	0/1/1/1
2	NGA	I	2	2	-	0/6/23/26	0/1/1/1
2	GAL	I	3	2	-	0/2/19/22	0/1/1/1
2	SIA	I	4	2	-	0/18/34/38	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GAL	J	1	2	-	2/2/22/22	0/1/1/1
2	NGA	J	2	2	-	0/6/23/26	0/1/1/1
2	GAL	J	3	2	-	0/2/19/22	0/1/1/1
2	SIA	J	4	2	-	0/18/34/38	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	4	SIA	C2-C1	-2.46	1.50	1.52
2	J	4	SIA	C2-C1	-2.01	1.50	1.52

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	1	GAL	C3-C4-C5	-3.31	104.33	110.24
2	J	1	GAL	C3-C4-C5	-3.08	104.74	110.24
2	G	4	SIA	C6-O6-C2	3.02	117.81	111.34
2	H	4	SIA	C6-O6-C2	2.96	117.66	111.34
2	F	1	GAL	C3-C4-C5	-2.86	105.15	110.24
2	H	1	GAL	O5-C5-C6	2.73	113.22	106.44
2	F	4	SIA	C6-O6-C2	2.73	117.17	111.34
2	G	1	GAL	C3-C4-C5	-2.69	105.44	110.24
2	F	4	SIA	O9-C9-C8	-2.67	105.25	111.07
2	H	1	GAL	C3-C4-C5	-2.54	105.71	110.24
2	G	4	SIA	O6-C2-C1	2.47	112.54	107.70
2	I	1	GAL	O5-C5-C6	2.37	112.32	106.44
2	J	4	SIA	C8-C7-C6	-2.35	108.58	113.03
2	H	4	SIA	O6-C2-C1	2.34	112.29	107.70
2	G	1	GAL	O5-C5-C6	2.32	112.20	106.44
2	I	4	SIA	C6-O6-C2	2.31	116.29	111.34
2	J	4	SIA	O6-C2-C1	2.27	112.15	107.70
2	H	3	GAL	C1-O5-C5	2.25	115.25	112.19
2	J	1	GAL	O5-C5-C6	2.25	112.03	106.44
2	J	3	GAL	C1-O5-C5	2.24	115.23	112.19
2	F	3	GAL	C1-C2-C3	2.23	112.41	109.67
2	J	4	SIA	C6-O6-C2	2.10	115.83	111.34
2	I	1	GAL	O5-C1-C2	2.06	113.96	110.28
2	G	4	SIA	O6-C2-C3	-2.04	107.65	110.46
2	F	3	GAL	C1-O5-C5	2.02	114.92	112.19

There are no chirality outliers.

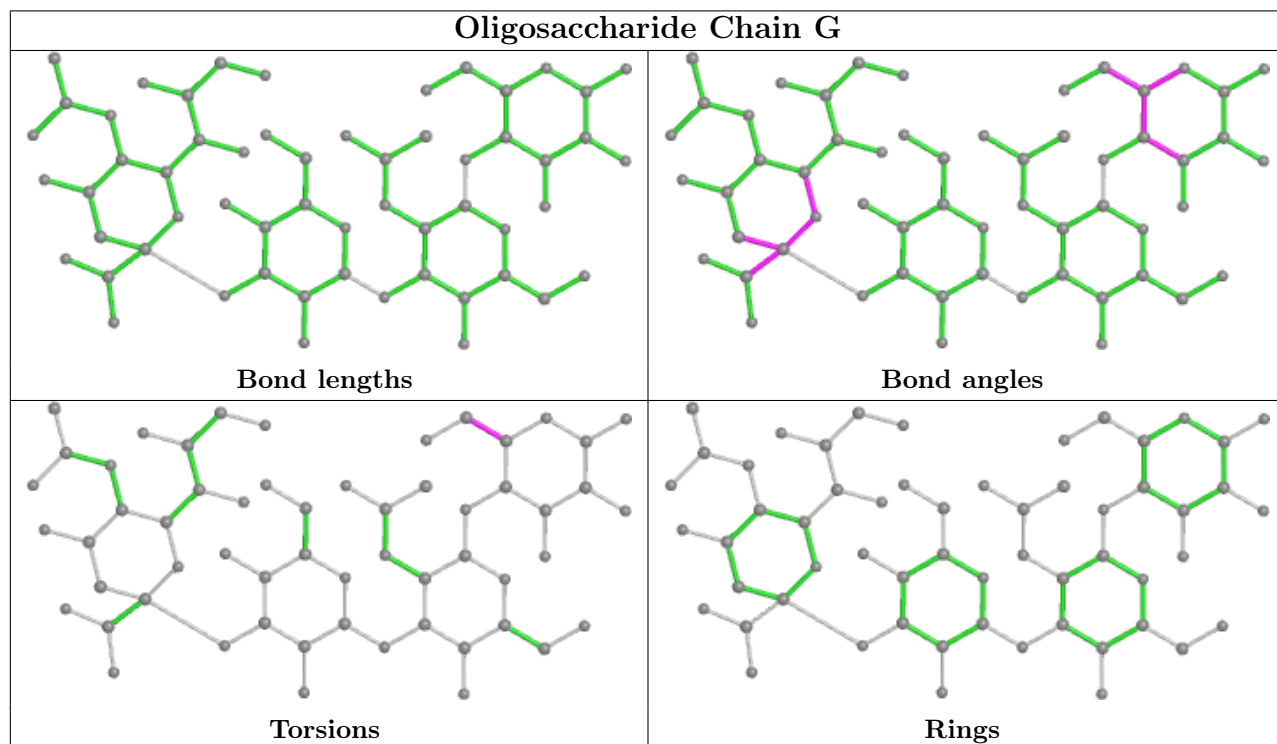
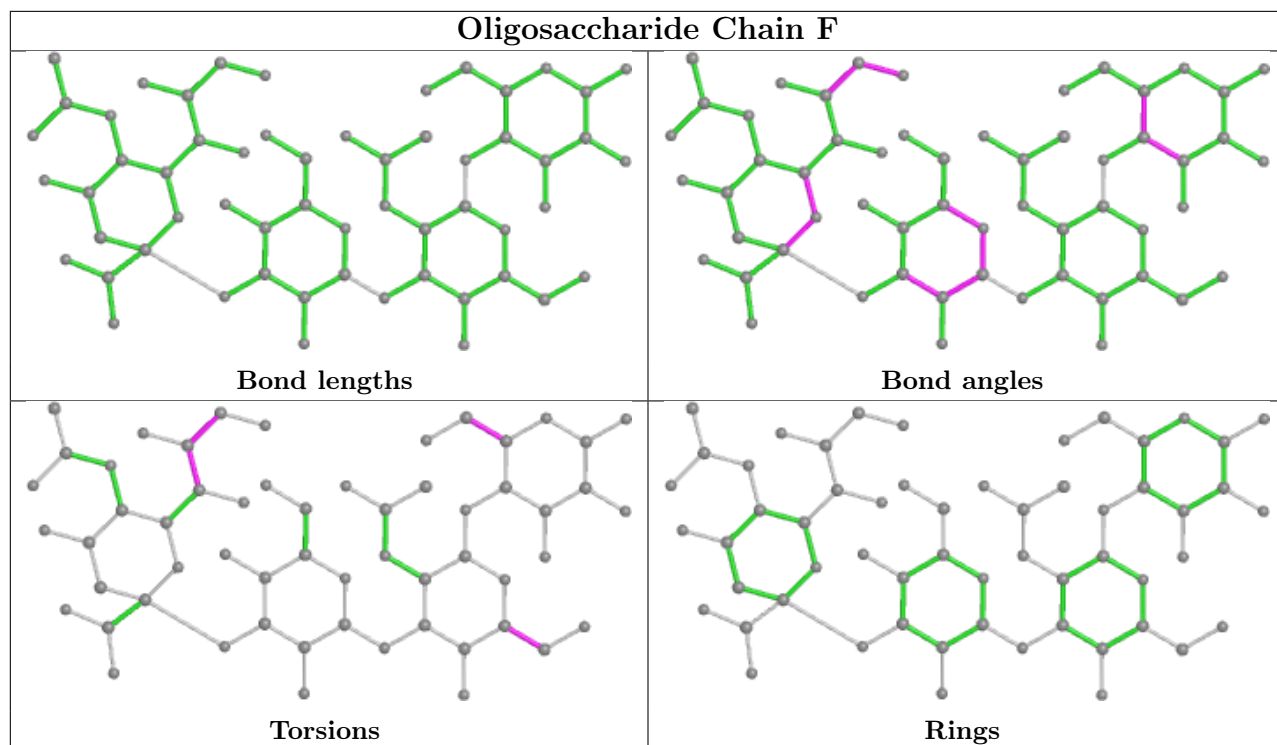
All (19) torsion outliers are listed below:

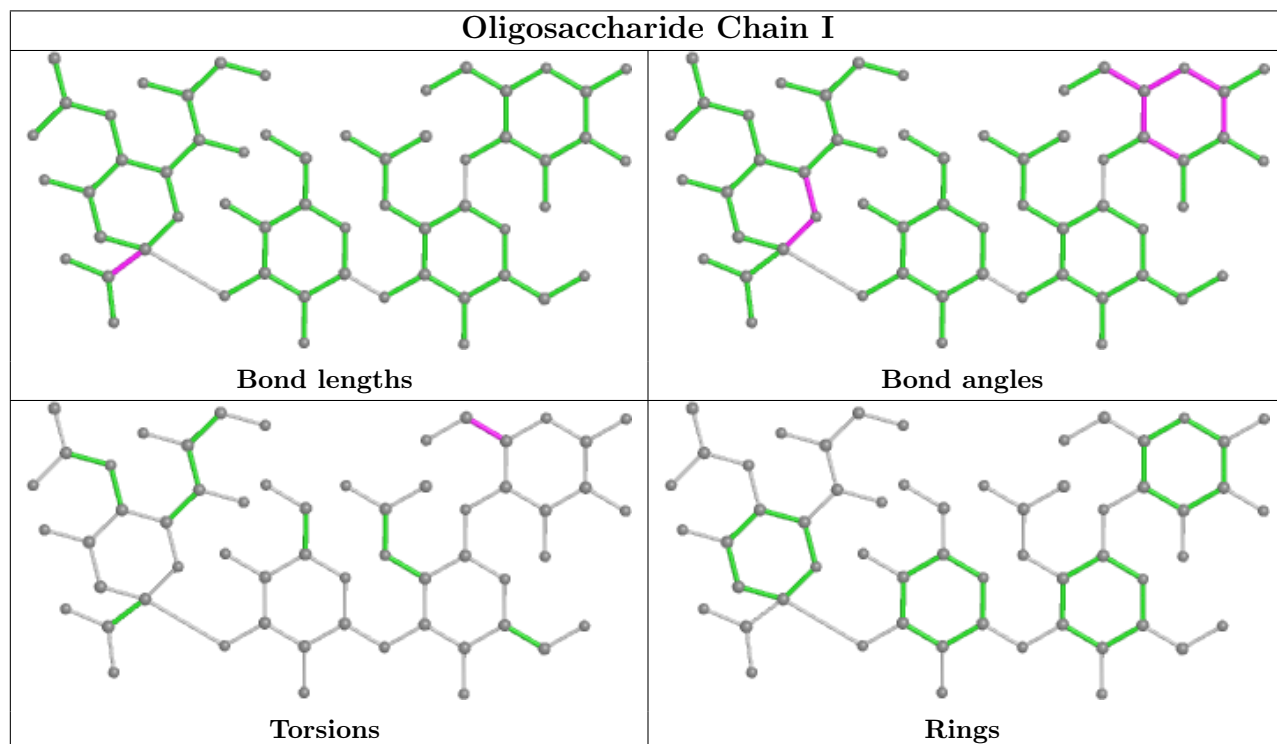
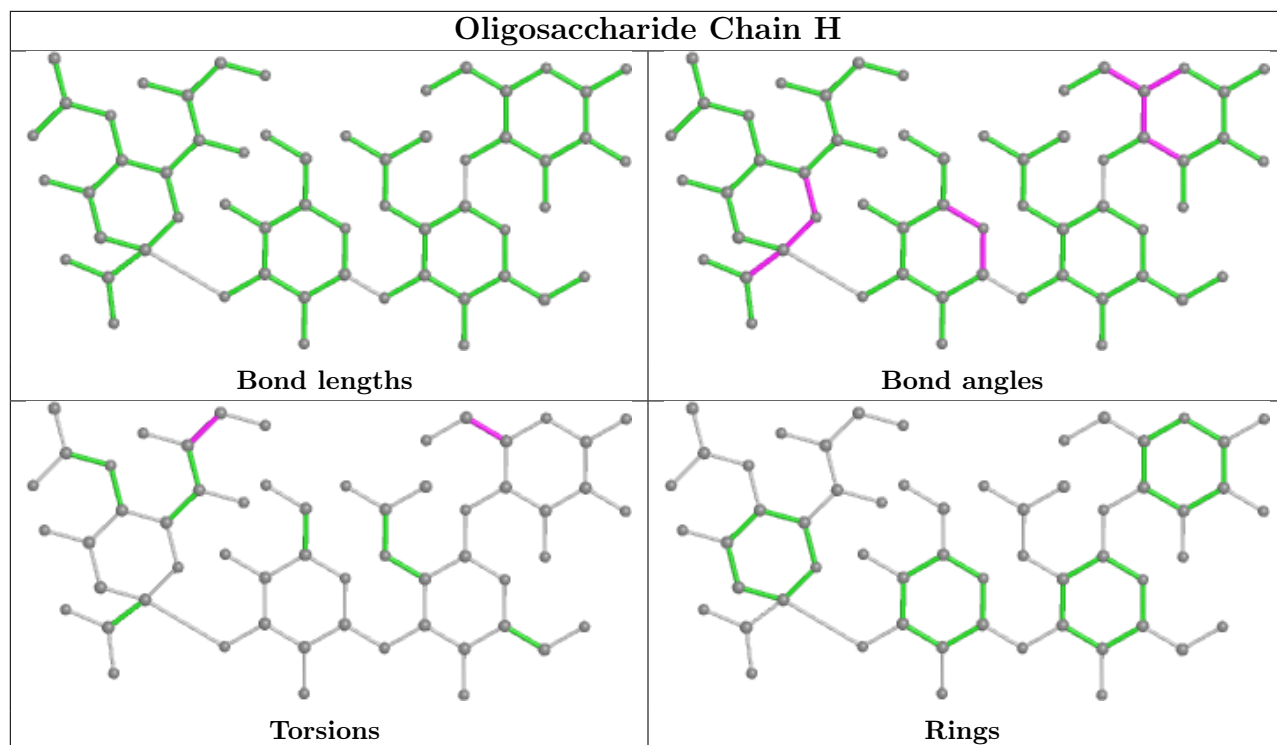
Mol	Chain	Res	Type	Atoms
2	F	2	NGA	C4-C5-C6-O6
2	F	2	NGA	O5-C5-C6-O6
2	H	1	GAL	O5-C5-C6-O6
2	F	4	SIA	O7-C7-C8-O8
2	F	1	GAL	O5-C5-C6-O6
2	G	1	GAL	O5-C5-C6-O6
2	H	1	GAL	C4-C5-C6-O6
2	F	4	SIA	O7-C7-C8-C9
2	F	1	GAL	C4-C5-C6-O6
2	G	1	GAL	C4-C5-C6-O6
2	I	1	GAL	O5-C5-C6-O6
2	I	1	GAL	C4-C5-C6-O6
2	F	4	SIA	C6-C7-C8-O8
2	F	4	SIA	C6-C7-C8-C9
2	J	1	GAL	C4-C5-C6-O6
2	F	4	SIA	C7-C8-C9-O9
2	F	4	SIA	O8-C8-C9-O9
2	J	1	GAL	O5-C5-C6-O6
2	H	4	SIA	O8-C8-C9-O9

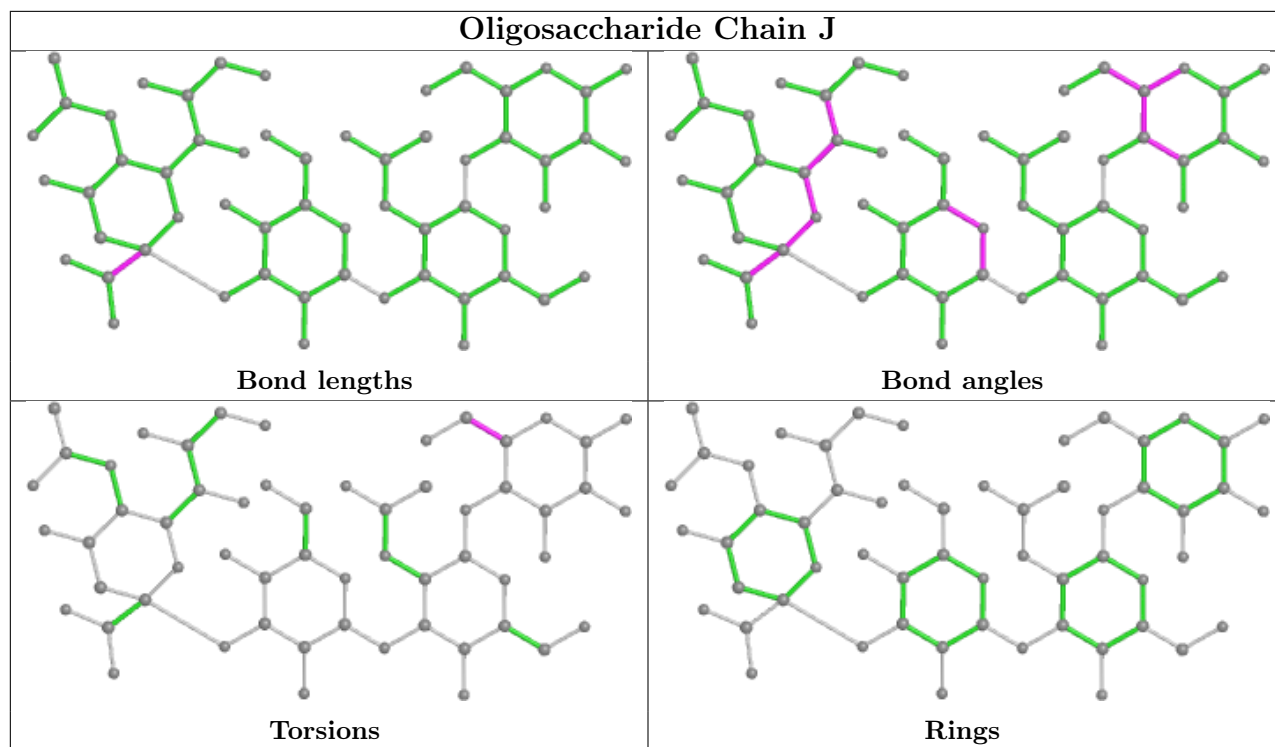
There are no ring outliers.

No monomer is involved in short contacts.

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







## 5.6 Ligand geometry [i](#)

35 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
3	SO4	C	403	-	4,4,4	0.35	0	6,6,6	0.18	0
4	GOL	B	402	-	5,5,5	0.25	0	5,5,5	0.32	0
4	GOL	D	405	-	5,5,5	0.28	0	5,5,5	0.26	0
3	SO4	C	402	-	4,4,4	0.32	0	6,6,6	0.11	0
3	SO4	C	401	-	4,4,4	0.33	0	6,6,6	0.28	0
4	GOL	E	406	-	5,5,5	0.25	0	5,5,5	0.22	0
4	GOL	E	407	-	3,3,5	0.57	0	2,2,5	0.24	0
4	GOL	B	405	-	3,3,5	0.42	0	2,2,5	0.66	0
4	GOL	A	406	-	5,5,5	0.29	0	5,5,5	0.40	0
3	SO4	E	402	-	4,4,4	0.33	0	6,6,6	0.14	0
3	SO4	E	401	-	4,4,4	0.21	0	6,6,6	0.32	0
3	SO4	A	405	-	4,4,4	0.29	0	6,6,6	0.10	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	GOL	C	404	-	3,3,5	0.49	0	2,2,5	0.18	0
4	GOL	A	407	-	3,3,5	0.37	0	2,2,5	0.42	0
4	GOL	A	403	-	5,5,5	0.24	0	5,5,5	0.32	0
3	SO4	B	403	-	4,4,4	0.33	0	6,6,6	0.10	0
4	GOL	E	405	-	5,5,5	0.21	0	5,5,5	0.43	0
3	SO4	B	404	-	4,4,4	0.32	0	6,6,6	0.22	0
4	GOL	D	407	-	3,3,5	0.49	0	2,2,5	0.33	0
4	GOL	D	406	-	5,5,5	0.28	0	5,5,5	0.19	0
3	SO4	D	402	-	4,4,4	0.30	0	6,6,6	0.12	0
4	GOL	C	406	-	5,5,5	0.23	0	5,5,5	0.30	0
3	SO4	D	401	-	4,4,4	0.29	0	6,6,6	0.31	0
4	GOL	E	404	-	3,3,5	0.44	0	2,2,5	0.49	0
4	GOL	B	406	-	3,3,5	0.43	0	2,2,5	0.46	0
3	SO4	A	401	-	4,4,4	0.20	0	6,6,6	0.20	0
4	GOL	C	405	-	5,5,5	0.25	0	5,5,5	0.34	0
3	SO4	B	401	-	4,4,4	0.24	0	6,6,6	0.14	0
4	GOL	D	404	-	3,3,5	0.44	0	2,2,5	0.45	0
4	GOL	A	404	-	5,5,5	0.27	0	5,5,5	0.35	0
4	GOL	B	411	-	5,5,5	0.23	0	5,5,5	0.20	0
3	SO4	D	403	-	4,4,4	0.35	0	6,6,6	0.22	0
4	GOL	A	402	-	3,3,5	0.54	0	2,2,5	0.20	0
3	SO4	E	403	-	4,4,4	0.35	0	6,6,6	0.26	0
4	GOL	A	412	-	5,5,5	0.28	0	5,5,5	0.28	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	B	402	-	-	1/4/4/4	-
4	GOL	D	405	-	-	0/4/4/4	-
4	GOL	E	406	-	-	4/4/4/4	-
4	GOL	E	407	-	-	1/1/1/4	-
4	GOL	B	405	-	-	0/1/1/4	-
4	GOL	A	406	-	-	1/4/4/4	-
4	GOL	C	404	-	-	0/1/1/4	-
4	GOL	A	407	-	-	0/1/1/4	-
4	GOL	A	403	-	-	1/4/4/4	-
4	GOL	E	405	-	-	2/4/4/4	-
4	GOL	D	407	-	-	1/1/1/4	-
4	GOL	D	406	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	C	406	-	-	2/4/4/4	-
4	GOL	E	404	-	-	0/1/1/4	-
4	GOL	B	406	-	-	1/1/1/4	-
4	GOL	C	405	-	-	0/4/4/4	-
4	GOL	D	404	-	-	0/1/1/4	-
4	GOL	A	404	-	-	2/4/4/4	-
4	GOL	B	411	-	-	4/4/4/4	-
4	GOL	A	402	-	-	0/1/1/4	-
4	GOL	A	412	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	404	GOL	O1-C1-C2-O2
4	A	404	GOL	O1-C1-C2-C3
4	A	412	GOL	C1-C2-C3-O3
4	B	411	GOL	O1-C1-C2-C3
4	B	411	GOL	C1-C2-C3-O3
4	B	411	GOL	O2-C2-C3-O3
4	E	405	GOL	C1-C2-C3-O3
4	E	406	GOL	C1-C2-C3-O3
4	A	412	GOL	O2-C2-C3-O3
4	E	406	GOL	O1-C1-C2-O2
4	A	406	GOL	C1-C2-C3-O3
4	C	406	GOL	C1-C2-C3-O3
4	E	406	GOL	O1-C1-C2-C3
4	B	411	GOL	O1-C1-C2-O2
4	E	406	GOL	O2-C2-C3-O3
4	C	406	GOL	O2-C2-C3-O3
4	B	406	GOL	O1-C1-C2-O2
4	E	405	GOL	O2-C2-C3-O3
4	D	407	GOL	O2-C2-C3-O3
4	E	407	GOL	O1-C1-C2-O2
4	A	403	GOL	O1-C1-C2-C3
4	B	402	GOL	O1-C1-C2-C3

There are no ring outliers.

9 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	401	SO4	1	0
4	E	406	GOL	2	0
4	A	406	GOL	4	0
4	D	406	GOL	1	0
4	C	406	GOL	1	0
4	A	404	GOL	1	0
4	B	411	GOL	3	0
4	A	402	GOL	1	0
4	A	412	GOL	3	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	281/284 (98%)	-0.50	8 (2%) 53 56	8, 15, 39, 107	0
1	B	279/284 (98%)	-0.39	8 (2%) 51 54	12, 19, 42, 82	0
1	C	278/284 (97%)	-0.41	6 (2%) 62 64	10, 19, 42, 74	0
1	D	284/284 (100%)	-0.58	3 (1%) 80 82	9, 15, 34, 77	0
1	E	278/284 (97%)	-0.57	6 (2%) 62 64	8, 14, 39, 68	1 (0%)
All	All	1400/1420 (98%)	-0.49	31 (2%) 62 64	8, 16, 40, 107	1 (0%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	34	MET	6.1
1	A	115	ASP	5.8
1	C	116	THR	4.8
1	A	114	CYS	4.6
1	C	33	GLY	4.4
1	C	34	MET	4.4
1	A	113	THR	4.0
1	C	117	LEU	4.0
1	A	116	THR	3.9
1	E	34	MET	3.8
1	B	107	MET	3.8
1	C	108	LEU	3.8
1	B	33	GLY	3.6
1	B	116	THR	3.5
1	B	115	ASP	3.3
1	B	43	PRO	3.2
1	E	43	PRO	3.2
1	E	116	THR	3.1
1	C	43	PRO	3.1
1	D	43	PRO	3.0

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Mol	Chain	Res	Type	RSRZ
1	E	33	GLY	3.0
1	A	34	MET	2.9
1	B	117	LEU	2.9
1	A	33	GLY	2.8
1	D	34	MET	2.7
1	D	115[A]	ASP	2.6
1	A	316	LYS	2.4
1	E	108[A]	LEU	2.3
1	E	316	LYS	2.1
1	A	117	LEU	2.1
1	B	44	ASP	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.

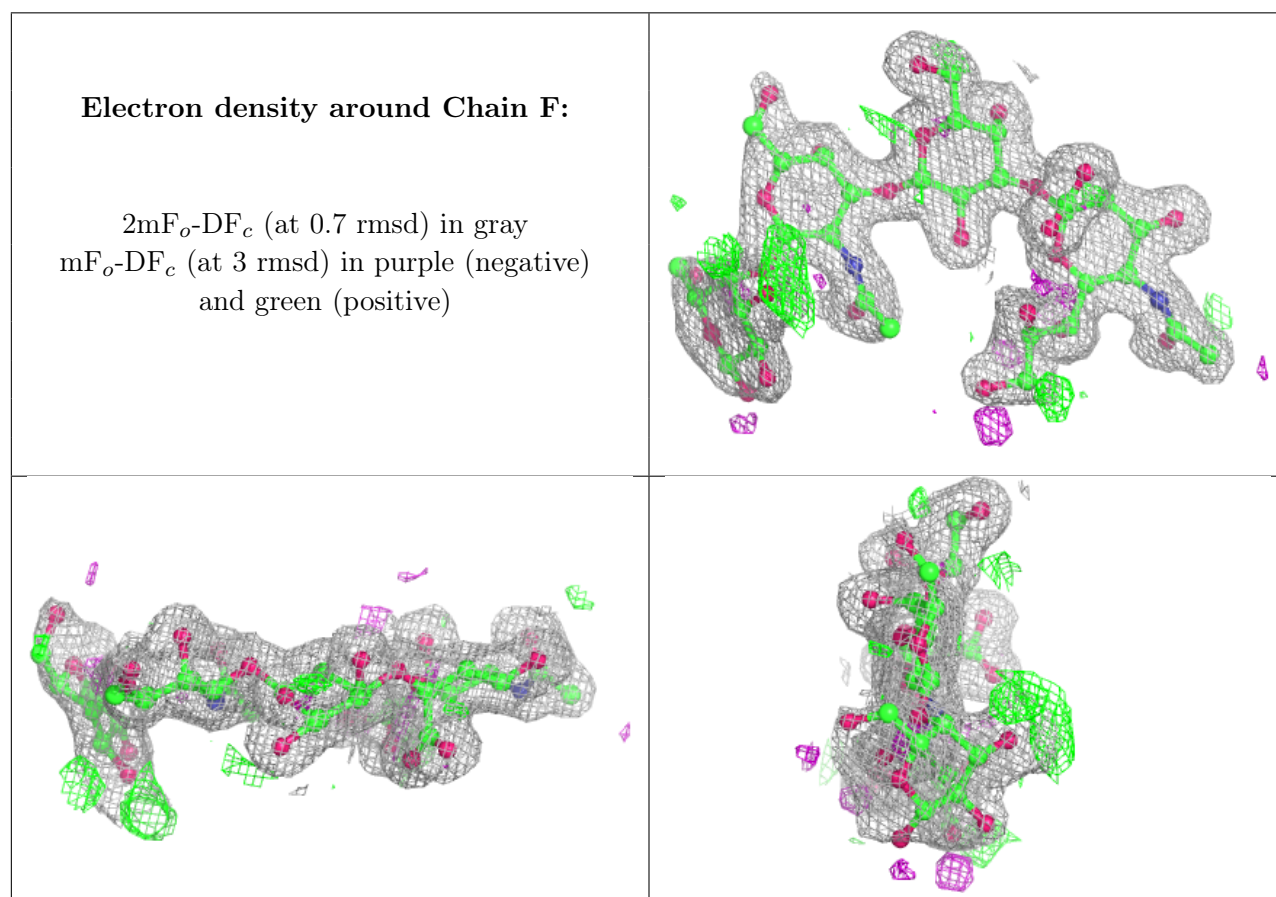
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	GAL	I	1	12/12	0.71	0.24	55,77,93,93	0
2	GAL	G	1	12/12	0.74	0.29	60,70,78,81	0
2	GAL	H	1	12/12	0.79	0.33	60,72,83,87	0
2	GAL	J	1	12/12	0.80	0.28	50,62,71,85	0
2	GAL	F	1	12/12	0.81	0.22	45,63,71,71	0
2	NGA	G	2	14/15	0.90	0.30	33,54,64,69	0
2	NGA	H	2	14/15	0.93	0.25	31,50,62,62	0
2	NGA	I	2	14/15	0.95	0.19	25,47,56,69	0
2	NGA	F	2	14/15	0.95	0.14	25,40,60,60	0
2	NGA	J	2	14/15	0.95	0.17	19,40,53,59	0
2	SIA	G	4	20/21	0.96	0.10	16,21,36,44	0
2	GAL	F	3	11/12	0.96	0.08	18,22,25,27	0
2	GAL	G	3	11/12	0.96	0.10	18,24,29,33	0
2	GAL	H	3	11/12	0.96	0.13	23,25,32,34	0
2	GAL	I	3	11/12	0.97	0.08	17,21,24,26	0
2	SIA	I	4	20/21	0.97	0.07	13,18,34,47	0
2	SIA	F	4	20/21	0.97	0.08	13,18,36,43	0

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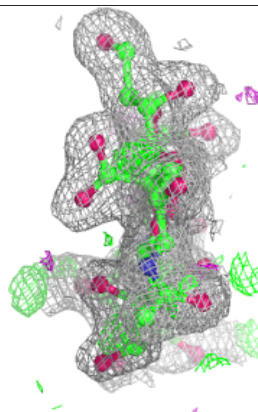
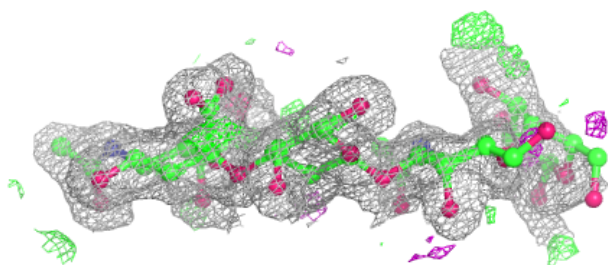
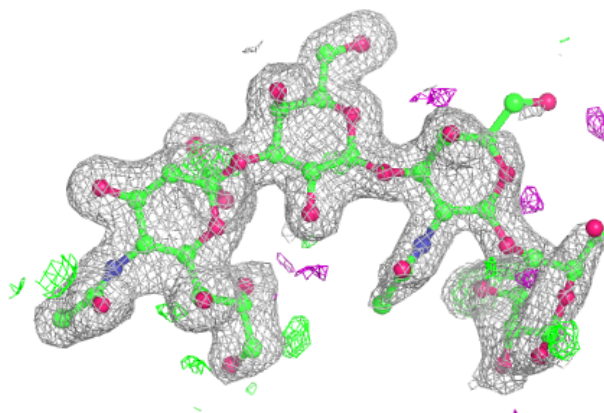
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SIA	H	4	20/21	0.97	0.10	16,23,36,43	0
2	GAL	J	3	11/12	0.97	0.07	13,18,20,22	0
2	SIA	J	4	20/21	0.97	0.07	10,15,24,38	0

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.



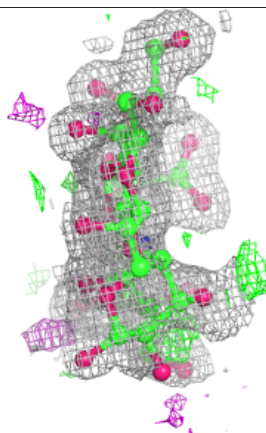
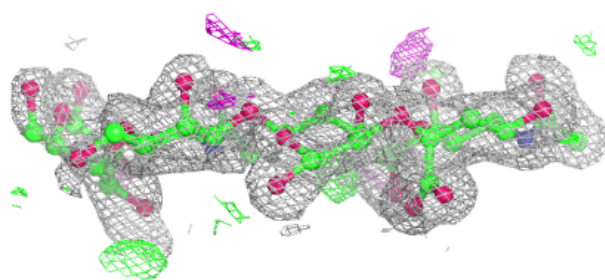
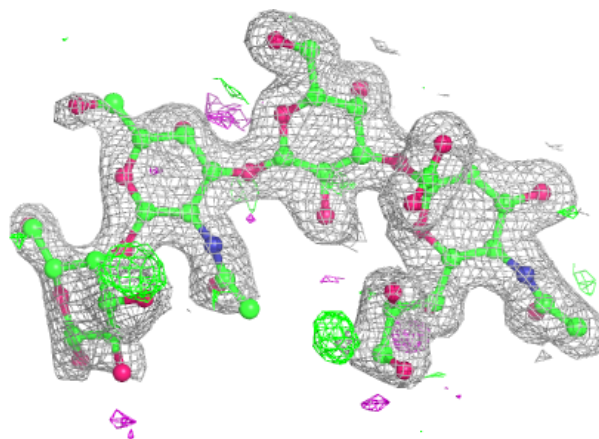
**Electron density around Chain G:**

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

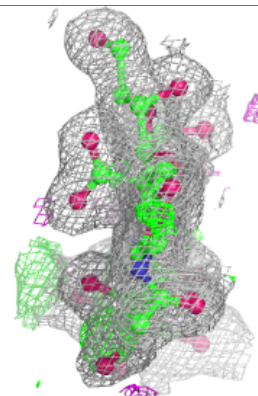
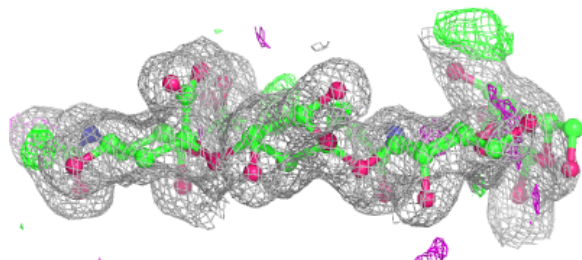
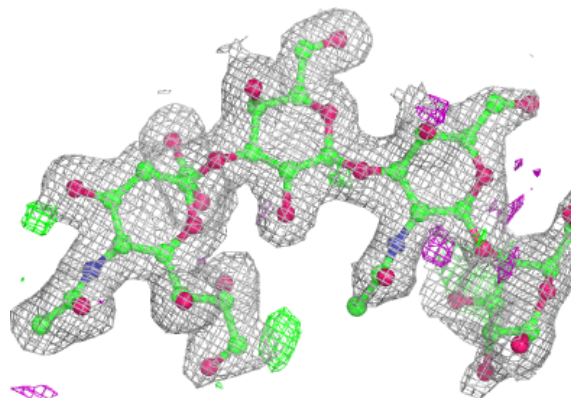


**Electron density around Chain H:**

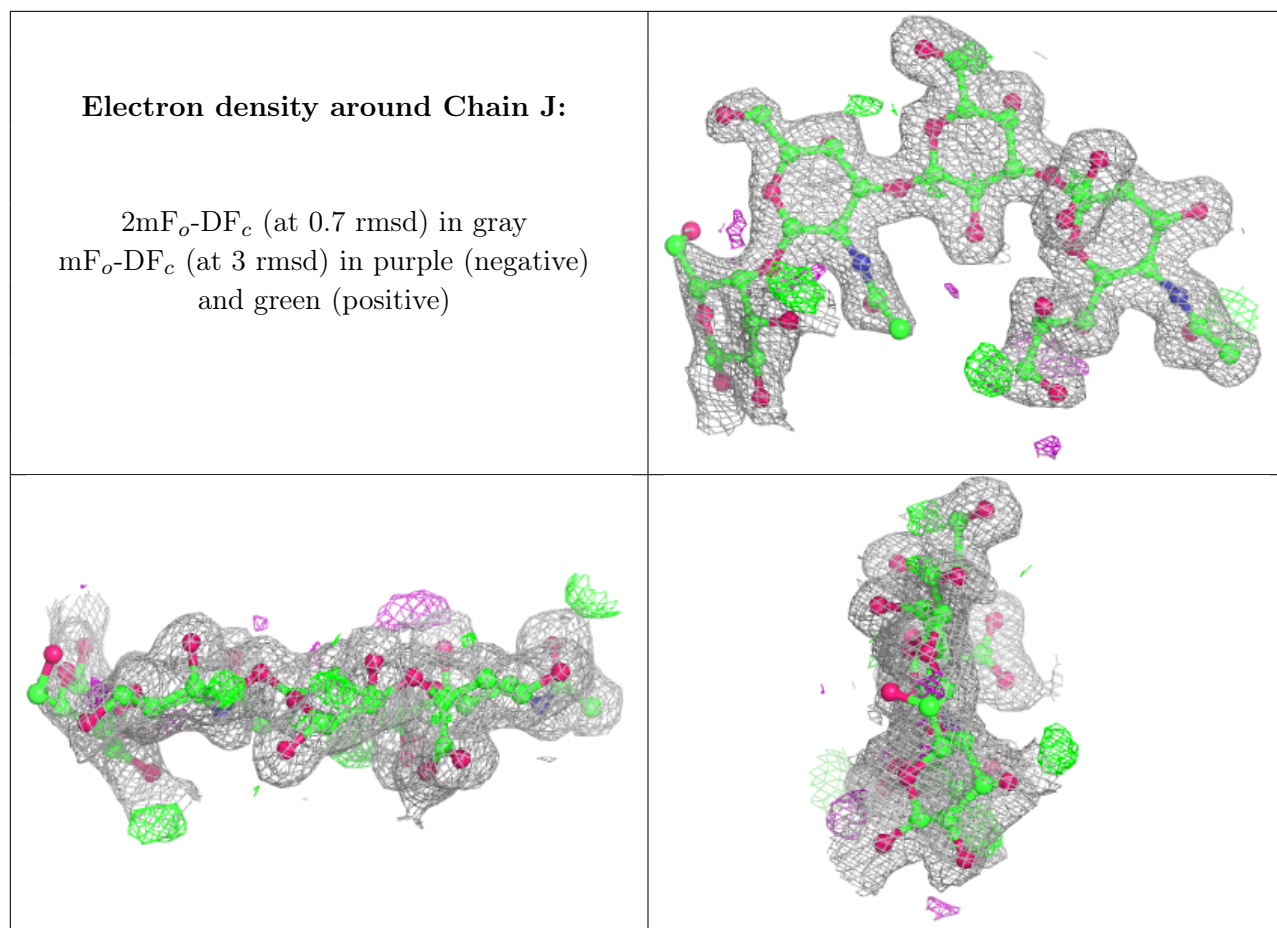
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around Chain I:**

$2mF_o-DF_c$  (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
3	SO4	C	401	5/5	0.89	0.15	25,30,55,56	5
3	SO4	E	402	5/5	0.91	0.13	24,31,38,43	5
4	GOL	A	406	6/6	0.91	0.16	27,42,43,45	0
3	SO4	C	402	5/5	0.92	0.13	24,33,42,50	5
4	GOL	B	406	4/6	0.92	0.14	35,35,42,52	0
4	GOL	E	407	4/6	0.92	0.11	15,26,31,39	0
4	GOL	A	402	4/6	0.93	0.10	35,35,36,46	0
4	GOL	B	411	6/6	0.93	0.17	28,53,66,84	0
4	GOL	D	406	6/6	0.93	0.23	27,50,60,69	0
3	SO4	D	403	5/5	0.93	0.21	26,29,59,69	5
3	SO4	A	401	5/5	0.94	0.16	30,31,51,55	5
3	SO4	B	403	5/5	0.94	0.12	30,34,37,43	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	GOL	C	404	4/6	0.94	0.13	26,29,39,46	0
4	GOL	C	406	6/6	0.94	0.16	30,41,48,58	0
3	SO4	B	404	5/5	0.94	0.16	35,35,47,57	5
4	GOL	D	407	4/6	0.94	0.09	26,37,45,52	0
4	GOL	E	405	6/6	0.94	0.17	22,26,29,29	6
4	GOL	E	406	6/6	0.94	0.19	30,51,60,70	0
4	GOL	A	412	6/6	0.94	0.17	32,51,56,60	0
3	SO4	E	401	5/5	0.95	0.16	23,32,42,55	5
4	GOL	C	405	6/6	0.95	0.12	29,32,37,38	6
4	GOL	A	404	6/6	0.95	0.11	25,35,61,69	0
3	SO4	B	401	5/5	0.95	0.13	33,48,51,52	5
3	SO4	D	401	5/5	0.96	0.15	30,37,53,68	5
4	GOL	D	405	6/6	0.96	0.13	26,28,29,32	6
4	GOL	B	402	6/6	0.96	0.17	36,38,45,46	0
3	SO4	E	403	5/5	0.96	0.11	17,23,41,45	5
3	SO4	D	402	5/5	0.96	0.11	22,36,37,42	5
3	SO4	A	405	5/5	0.96	0.11	22,38,43,49	5
3	SO4	C	403	5/5	0.96	0.23	39,39,61,67	0
4	GOL	E	404	4/6	0.97	0.10	18,21,34,37	0
4	GOL	B	405	4/6	0.97	0.14	27,29,31,44	0
4	GOL	A	403	6/6	0.97	0.12	29,35,38,41	0
4	GOL	D	404	4/6	0.97	0.09	20,23,27,31	0
4	GOL	A	407	4/6	0.98	0.10	16,17,36,37	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.