



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 09:46 AM EDT

PDB ID : 6O3O  
Title : Structure of human DNAM-1 (CD226) bound to nectin-like protein-5 (necl-5)  
Authors : Deuss, F.A.; Watson, G.M.; Rossjohn, J.; Berry, R.  
Deposited on : 2019-02-27  
Resolution : 2.80 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)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36.2  
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) : 2.36.2

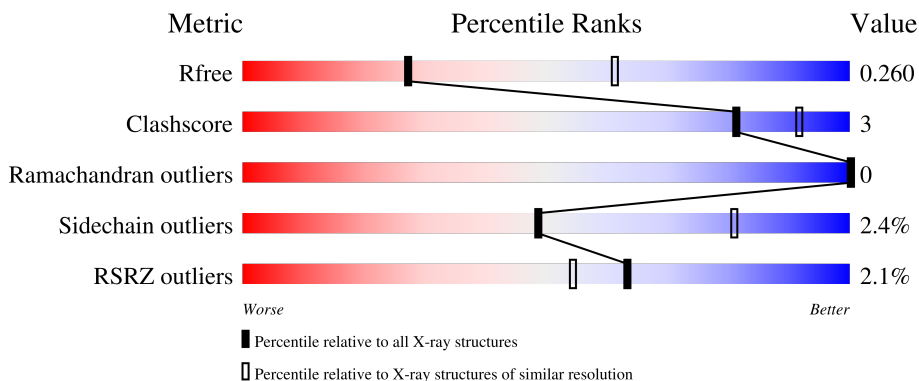
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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.





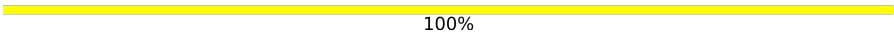
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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	243	 2% 82% 7% 10%
1	B	243	 4% 73% 8% 19%
2	C	317	 2% 82% 9% 10%
2	D	317	 0% 84% 9% 8%
3	E	4	 75% 25%

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Mol	Chain	Length	Quality of chain
3	G	4	 25% 75%
4	F	5	 60% 40%
5	H	2	 100%

## 2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 7982 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 CD226 antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	218	1711	1096	290	315	10	0	1	0
1	B	196	1485	954	251	269	11	0	0	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	17	THR	-	expression tag	UNP Q15762
A	18	GLY	-	expression tag	UNP Q15762
A	251	GLY	-	expression tag	UNP Q15762
A	252	THR	-	expression tag	UNP Q15762
A	253	LYS	-	expression tag	UNP Q15762
A	254	HIS	-	expression tag	UNP Q15762
A	255	HIS	-	expression tag	UNP Q15762
A	256	HIS	-	expression tag	UNP Q15762
A	257	HIS	-	expression tag	UNP Q15762
A	258	HIS	-	expression tag	UNP Q15762
A	259	HIS	-	expression tag	UNP Q15762
B	17	THR	-	expression tag	UNP Q15762
B	18	GLY	-	expression tag	UNP Q15762
B	251	GLY	-	expression tag	UNP Q15762
B	252	THR	-	expression tag	UNP Q15762
B	253	LYS	-	expression tag	UNP Q15762
B	254	HIS	-	expression tag	UNP Q15762
B	255	HIS	-	expression tag	UNP Q15762
B	256	HIS	-	expression tag	UNP Q15762
B	257	HIS	-	expression tag	UNP Q15762
B	258	HIS	-	expression tag	UNP Q15762
B	259	HIS	-	expression tag	UNP Q15762

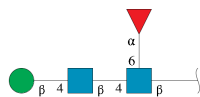
- Molecule 2 is a protein called Poliovirus receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	286	2126	1341	367	408	10	0	2	0
2	D	293	2188	1386	379	413	10	0	2	0

There are 20 discrepancies between the modelled and reference sequences:

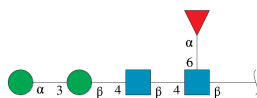
Chain	Residue	Modelled	Actual	Comment	Reference
C	26	LEU	-	expression tag	UNP P15151
C	27	GLU	-	expression tag	UNP P15151
C	335	THR	-	expression tag	UNP P15151
C	336	SER	-	expression tag	UNP P15151
C	337	HIS	-	expression tag	UNP P15151
C	338	HIS	-	expression tag	UNP P15151
C	339	HIS	-	expression tag	UNP P15151
C	340	HIS	-	expression tag	UNP P15151
C	341	HIS	-	expression tag	UNP P15151
C	342	HIS	-	expression tag	UNP P15151
D	26	LEU	-	expression tag	UNP P15151
D	27	GLU	-	expression tag	UNP P15151
D	335	THR	-	expression tag	UNP P15151
D	336	SER	-	expression tag	UNP P15151
D	337	HIS	-	expression tag	UNP P15151
D	338	HIS	-	expression tag	UNP P15151
D	339	HIS	-	expression tag	UNP P15151
D	340	HIS	-	expression tag	UNP P15151
D	341	HIS	-	expression tag	UNP P15151
D	342	HIS	-	expression tag	UNP P15151

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	E	4	49	28	2	19	1	0	0
3	G	4	49	28	2	19	0	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-beta-D-mannopyranos e-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acet amido-2-deoxy-beta-D-glucopyranose.



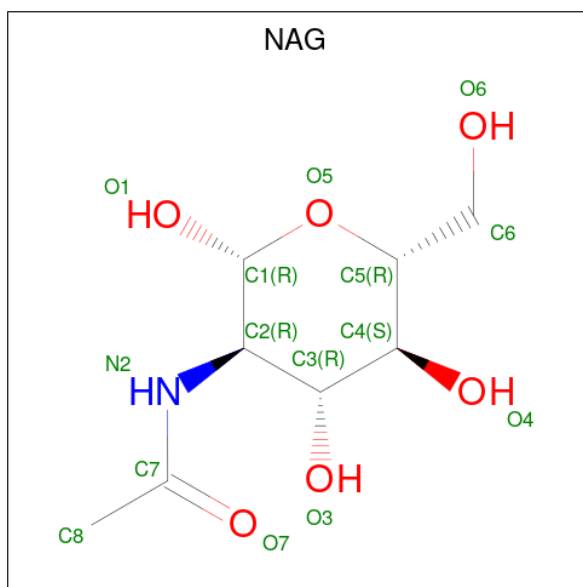
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	F	5	60	34	2	24	0	0	0

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-a cetamido-2-deoxy-beta-D-glucopyranose.



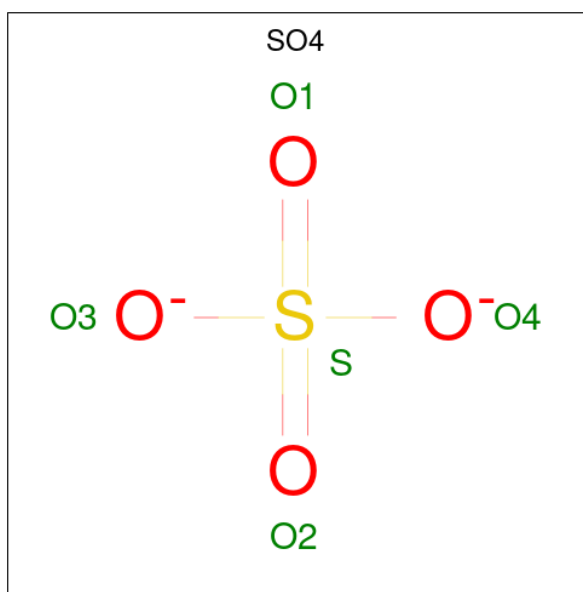
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	H	2	28	16	2	10	0	0	0

- Molecule 6 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
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	B	1	Total	C	N	O	0	0
			14	8	1	5		
6	B	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	C	1	Total	C	N	O	0	0
			14	8	1	5		
6	D	1	Total	C	N	O	0	0
			14	8	1	5		
6	D	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 7 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total O S 5 4 1	0	0
7	A	1	Total O S 5 4 1	0	0
7	D	1	Total O S 5 4 1	0	0

- Molecule 8 is water.

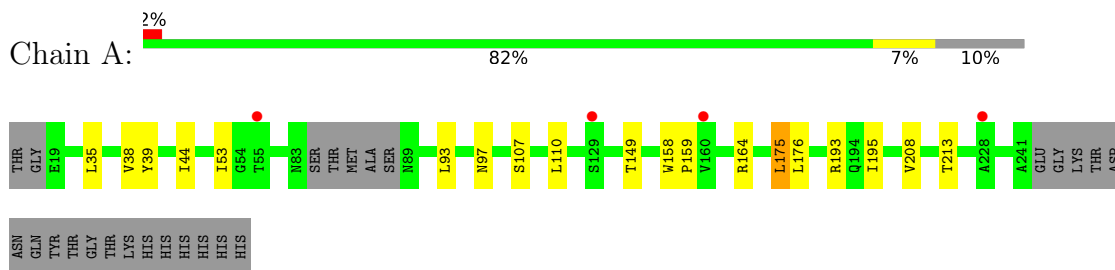
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	19	Total O 19 19	0	0
8	B	10	Total O 10 10	0	0
8	C	40	Total O 40 40	0	0
8	D	34	Total O 34 34	0	0



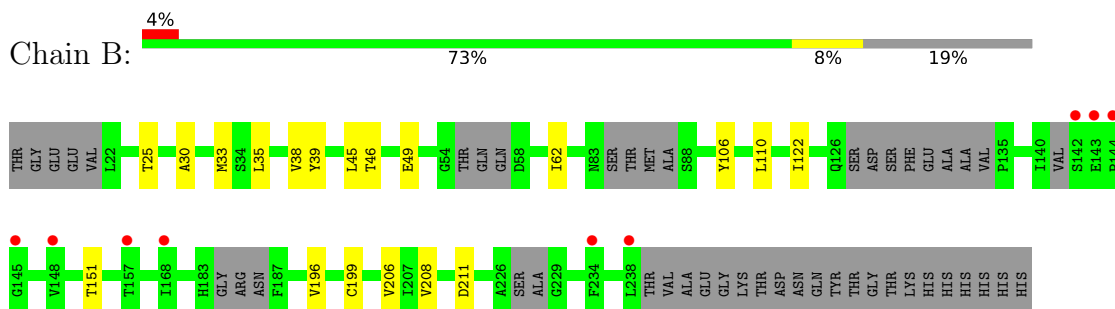
### 3 Residue-property plots [i](#)

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.

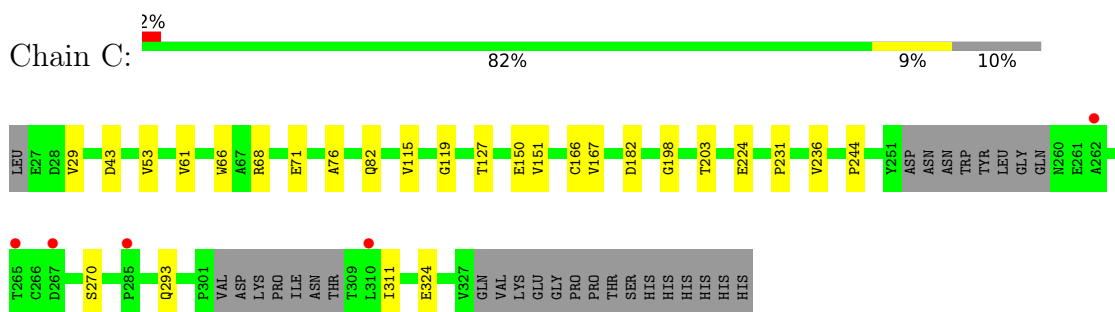
- Molecule 1: CD226 antigen



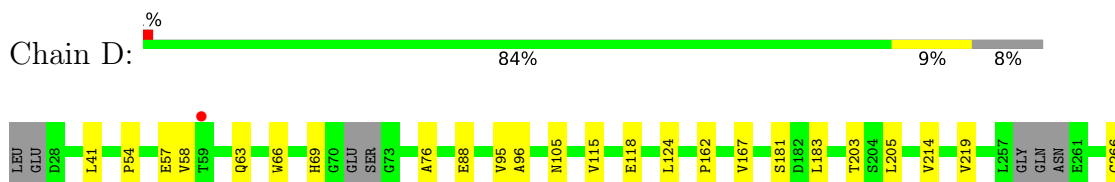
- Molecule 1: CD226 antigen

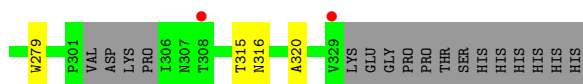


- Molecule 2: Poliovirus receptor



- Molecule 2: Poliovirus receptor





- Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



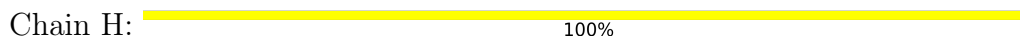
- Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



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



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	129.34Å 182.27Å 146.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.99 – 2.80 85.62 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.5 (40.99-2.80) 99.5 (85.62-2.80)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.70 (at 2.82Å)	Xtrriage
Refinement program	BUSTER 2.10.3	Depositor
R, $R_{free}$	0.208 , 0.231 0.231 , 0.260	Depositor DCC
$R_{free}$ test set	2189 reflections (5.13%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	52.3	Xtrriage
Anisotropy	0.583	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 54.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	7982	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.91% 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: BMA, MAN, FUC, NAG, 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	0.36	0/1760	0.56	0/2407
1	B	0.37	0/1521	0.51	0/2074
2	C	0.36	0/2182	0.54	0/2992
2	D	0.36	0/2245	0.55	0/3079
All	All	0.36	0/7708	0.54	0/10552

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	1711	0	1623	9	0
1	B	1485	0	1364	10	0
2	C	2126	0	2035	12	0
2	D	2188	0	2111	11	0
3	E	49	0	43	1	0
3	G	49	0	43	0	0
4	F	60	0	52	0	0
5	H	28	0	25	0	0
6	A	56	0	52	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	28	0	26	1	0
6	C	56	0	52	0	0
6	D	28	0	26	0	0
7	A	10	0	0	0	0
7	D	5	0	0	0	0
8	A	19	0	0	0	0
8	B	10	0	0	0	0
8	C	40	0	0	0	0
8	D	34	0	0	0	0
All	All	7982	0	7452	40	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 3.

All (40) 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)
2:D:183:LEU:HD22	2:D:214:VAL:HG12	1.84	0.59
1:B:38:VAL:HG21	6:B:700:NAG:H82	1.86	0.58
2:D:96:ALA:HB3	2:D:105:ASN:HB3	1.92	0.52
2:D:181:SER:HB3	2:D:219[B]:VAL:HG13	1.92	0.52
1:A:38:VAL:HG21	6:A:803:NAG:H82	1.91	0.52
1:A:164:ARG:HD3	1:A:175:LEU:HD11	1.92	0.51
1:A:158:TRP:CD2	1:A:159:PRO:HA	2.46	0.50
1:B:151:THR:HG22	1:B:206:VAL:HG22	1.94	0.50
2:C:66:TRP:HB2	2:C:76:ALA:HB3	1.94	0.49
1:A:176:LEU:HB3	1:A:195:ILE:HD13	1.94	0.49
1:A:39:TYR:HB2	1:A:110:LEU:HD22	1.94	0.49
2:C:311:ILE:HD12	2:C:324:GLU:HG2	1.94	0.49
1:B:106:TYR:HB2	1:B:122:ILE:HG13	1.95	0.49
2:C:119:GLY:HA2	3:E:1:NAG:H82	1.94	0.48
1:B:49:GLU:HG3	1:B:62:ILE:HG13	1.96	0.48
2:C:68[A]:ARG:HB3	2:C:71:GLU:HB2	1.97	0.46
2:C:61:VAL:HG22	2:C:127:THR:HG22	1.98	0.46
2:D:54:PRO:HG2	2:D:57:GLU:HB2	1.98	0.46
1:B:39:TYR:HB2	1:B:110:LEU:HD22	1.97	0.46
2:D:315:THR:HG22	2:D:320:ALA:HB2	1.99	0.45
1:B:46:THR:HG21	2:D:63:GLN:HB2	1.98	0.45
1:A:149:THR:HG22	1:A:208:VAL:HG22	1.99	0.44
1:B:35:LEU:HD13	1:B:122:ILE:HD11	1.99	0.44
2:D:266:CYS:HB2	2:D:279:TRP:CZ2	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:44:ILE:HD13	2:C:82:GLN:HG3	2.00	0.44
2:C:167:VAL:HG22	2:C:203:THR:HG23	1.98	0.43
1:B:196:VAL:HB	1:B:208:VAL:HG23	2.00	0.43
2:D:162:PRO:HB3	2:D:205:LEU:HB3	2.01	0.42
2:D:167:VAL:HG22	2:D:203:THR:HG23	2.02	0.42
2:C:115:VAL:HG21	2:C:198:GLY:HA3	2.02	0.42
2:C:151:VAL:HG22	2:C:236:VAL:HG13	2.01	0.42
1:B:30:ALA:HB3	1:B:33:MET:HB3	2.01	0.41
2:C:29:VAL:HG12	2:C:53:VAL:HA	2.02	0.41
2:D:41:LEU:HD21	2:D:115:VAL:HG23	2.03	0.41
1:B:25:THR:HB	1:B:122:ILE:HG22	2.02	0.41
2:C:224:GLU:HG2	2:C:231:PRO:HB3	2.03	0.41
1:A:35:LEU:HD12	1:A:93:LEU:HD23	2.03	0.41
2:D:66:TRP:HB2	2:D:76:ALA:HB3	2.03	0.41
1:A:53:ILE:HD11	1:A:107:SER:HB2	2.02	0.40
2:C:244:PRO:HA	2:C:270:SER:HB3	2.03	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	215/243 (88%)	209 (97%)	6 (3%)	0	100	100
1	B	182/243 (75%)	170 (93%)	12 (7%)	0	100	100
2	C	282/317 (89%)	275 (98%)	7 (2%)	0	100	100
2	D	287/317 (90%)	282 (98%)	5 (2%)	0	100	100
All	All	966/1120 (86%)	936 (97%)	30 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains

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	187/219 (85%)	183 (98%)	4 (2%)	53	84
1	B	155/219 (71%)	152 (98%)	3 (2%)	57	85
2	C	230/274 (84%)	225 (98%)	5 (2%)	52	83
2	D	237/274 (86%)	230 (97%)	7 (3%)	41	75
All	All	809/986 (82%)	790 (98%)	19 (2%)	49	82

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	97	ASN
1	A	175	LEU
1	A	193	ARG
1	A	213	THR
1	B	45	LEU
1	B	199	CYS
1	B	211	ASP
2	C	43	ASP
2	C	150	GLU
2	C	166	CYS
2	C	182	ASP
2	C	293	GLN
2	D	58	VAL
2	D	69	HIS
2	D	88	GLU
2	D	95	VAL
2	D	118	GLU
2	D	124	LEU
2	D	316	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	89	ASN
1	A	123	GLN

### 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](#)

15 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	NAG	E	1	3,2	14,14,15	0.30	0	17,19,21	0.66	0
3	NAG	E	2	3	14,14,15	0.29	0	17,19,21	0.38	0
3	BMA	E	3	3	11,11,12	0.36	0	15,15,17	0.64	0
3	FUC	E	4	3	10,10,11	0.41	0	14,14,16	0.89	0
4	NAG	F	1	2,4	14,14,15	0.29	0	17,19,21	0.79	1 (5%)
4	NAG	F	2	4	14,14,15	0.29	0	17,19,21	0.56	0
4	BMA	F	3	4	11,11,12	0.35	0	15,15,17	0.60	0
4	MAN	F	4	4	11,11,12	0.37	0	15,15,17	0.94	1 (6%)
4	FUC	F	5	4	10,10,11	0.45	0	14,14,16	0.65	0
3	NAG	G	1	3,2	14,14,15	0.30	0	17,19,21	0.73	0
3	NAG	G	2	3	14,14,15	0.39	0	17,19,21	0.95	1 (5%)
3	BMA	G	3	3	11,11,12	0.33	0	15,15,17	0.64	1 (6%)
3	FUC	G	4	3	10,10,11	0.43	0	14,14,16	1.12	1 (7%)
5	NAG	H	1	2,5	14,14,15	0.30	0	17,19,21	0.70	1 (5%)
5	NAG	H	2	5	14,14,15	0.33	0	17,19,21	0.88	2 (11%)



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

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

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	4	MAN	C1-O5-C5	3.10	116.39	112.19
4	F	1	NAG	C1-O5-C5	2.60	115.71	112.19
3	G	2	NAG	O5-C1-C2	-2.50	107.35	111.29
3	G	4	FUC	C1-O5-C5	2.40	118.22	112.78
5	H	2	NAG	C1-O5-C5	2.33	115.35	112.19
5	H	1	NAG	C1-O5-C5	2.20	115.17	112.19
5	H	2	NAG	C2-N2-C7	2.02	125.79	122.90
3	G	3	BMA	C1-O5-C5	2.01	114.91	112.19

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	H	2	NAG	O5-C5-C6-O6
3	G	1	NAG	C4-C5-C6-O6
5	H	2	NAG	C4-C5-C6-O6
3	G	1	NAG	O5-C5-C6-O6

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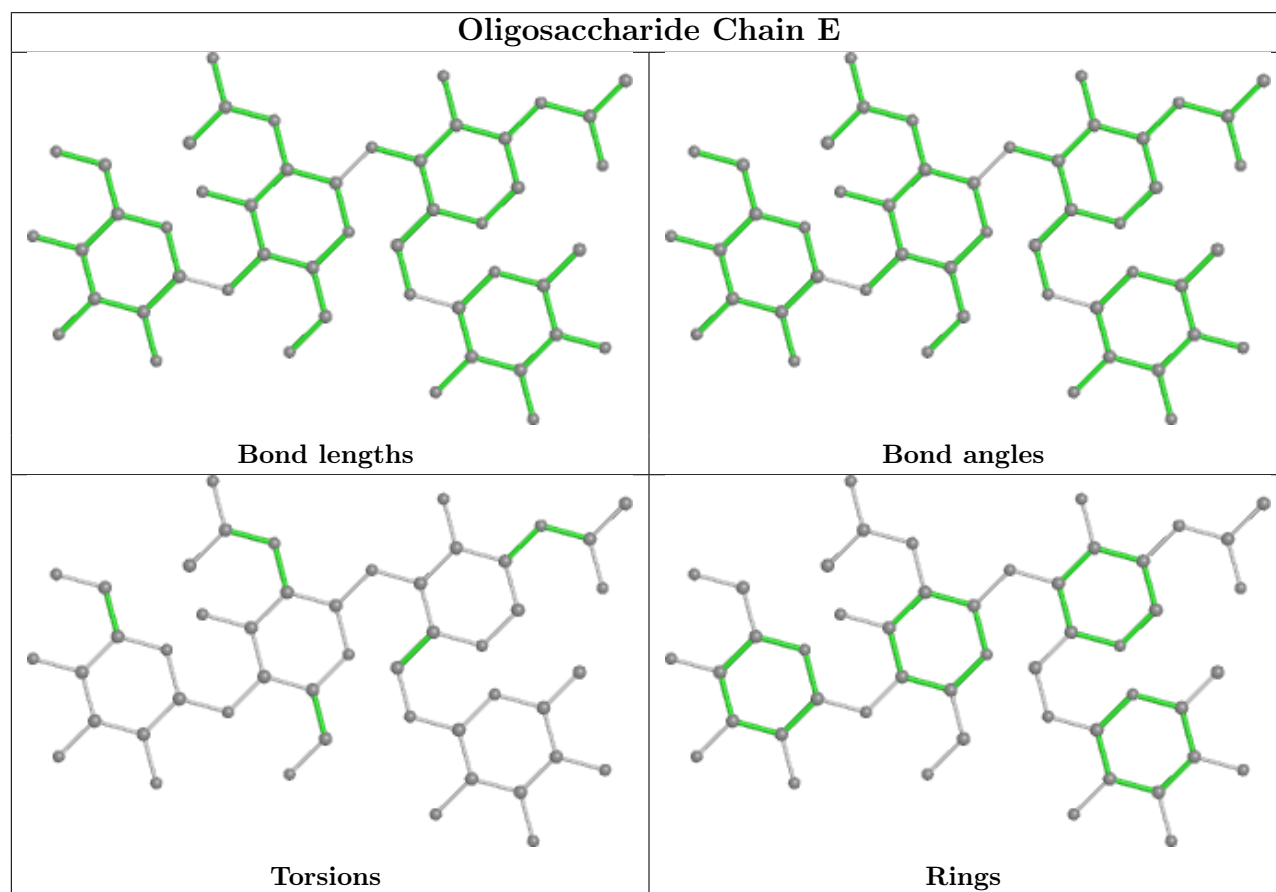
Mol	Chain	Res	Type	Atoms
3	G	2	NAG	C3-C2-N2-C7
5	H	2	NAG	C3-C2-N2-C7

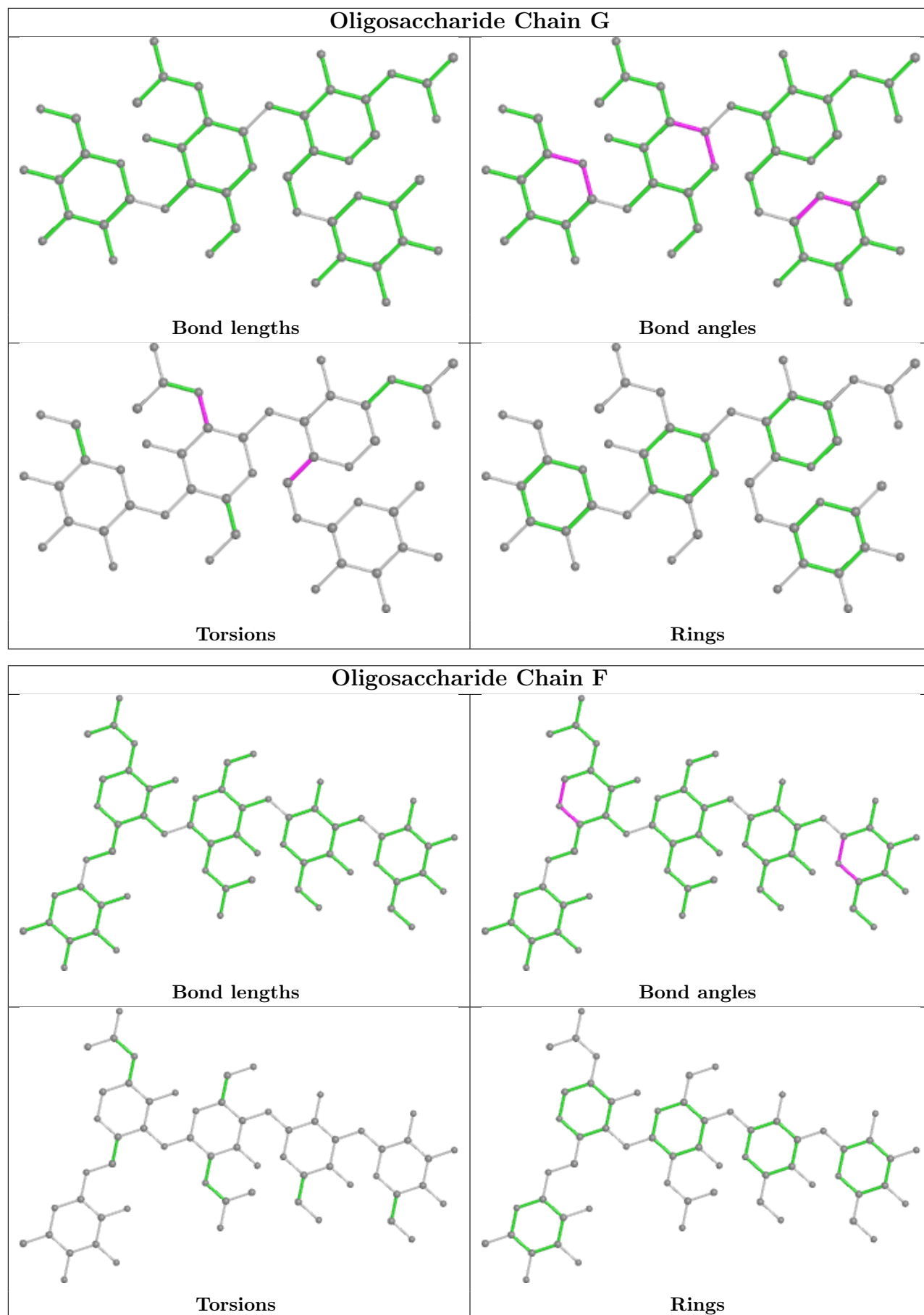
There are no ring outliers.

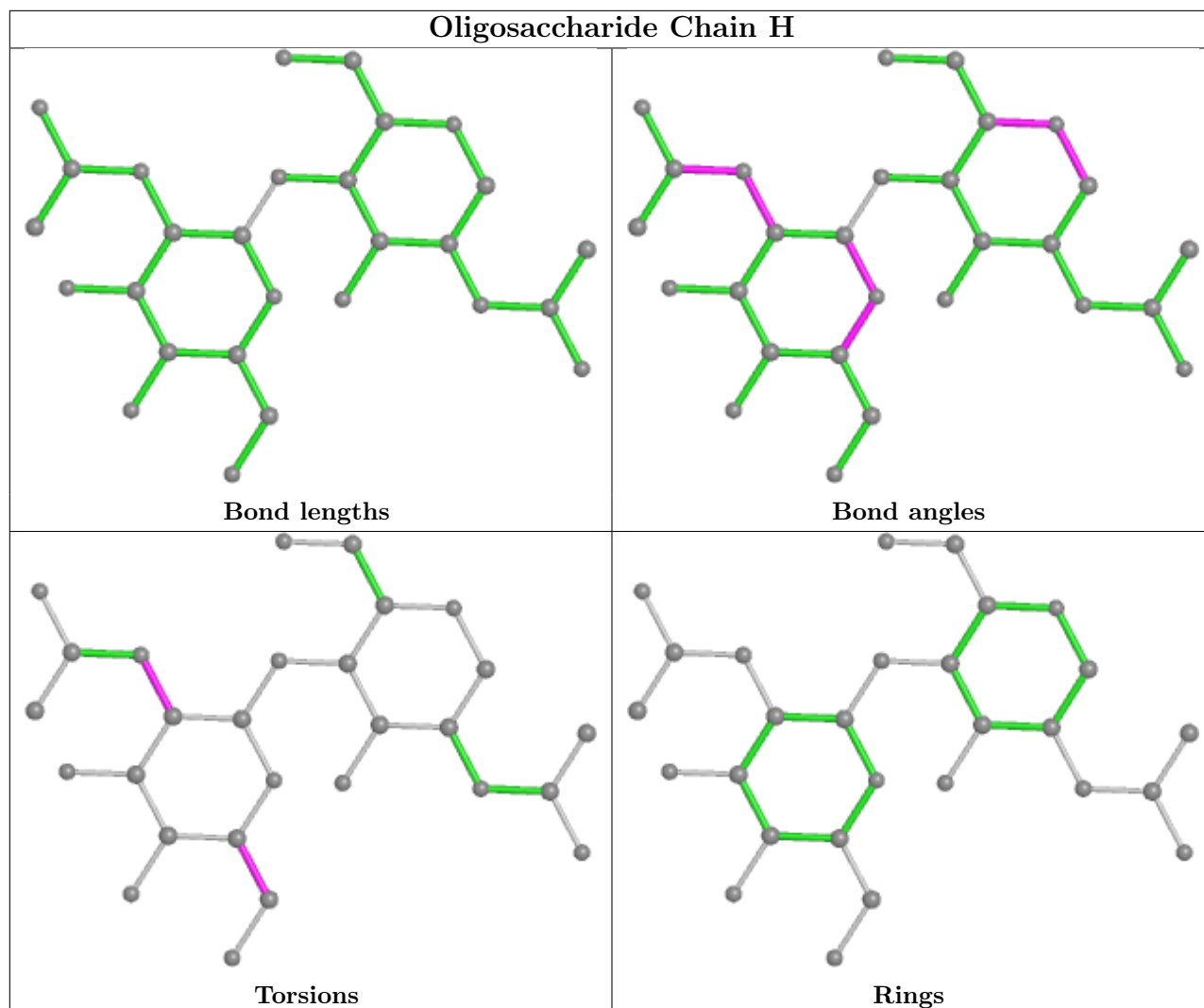
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	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](#)

15 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
6	NAG	B	701	1	14,14,15	0.27	0	17,19,21	0.72	1 (5%)
7	SO4	A	806	-	4,4,4	0.14	0	6,6,6	0.06	0
6	NAG	C	405	2	14,14,15	0.29	0	17,19,21	0.72	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	NAG	C	407	2	14,14,15	0.30	0	17,19,21	0.68	1 (5%)
6	NAG	D	413	2	14,14,15	0.31	0	17,19,21	0.71	1 (5%)
6	NAG	C	408	2	14,14,15	0.33	0	17,19,21	0.83	1 (5%)
6	NAG	A	801	1	14,14,15	0.29	0	17,19,21	0.54	0
6	NAG	A	802	1	14,14,15	0.30	0	17,19,21	0.50	0
7	SO4	A	805	-	4,4,4	0.13	0	6,6,6	0.06	0
6	NAG	B	700	1	14,14,15	0.29	0	17,19,21	1.05	2 (11%)
6	NAG	A	804	1	14,14,15	0.29	0	17,19,21	0.82	1 (5%)
7	SO4	D	414	-	4,4,4	0.12	0	6,6,6	0.08	0
6	NAG	A	803	1	14,14,15	0.29	0	17,19,21	0.86	1 (5%)
6	NAG	D	406	2	14,14,15	0.31	0	17,19,21	0.43	0
6	NAG	C	406	2	14,14,15	0.29	0	17,19,21	0.62	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
6	NAG	B	701	1	-	0/6/23/26	0/1/1/1
6	NAG	C	405	2	-	0/6/23/26	0/1/1/1
6	NAG	C	407	2	-	0/6/23/26	0/1/1/1
6	NAG	D	413	2	-	0/6/23/26	0/1/1/1
6	NAG	C	408	2	-	0/6/23/26	0/1/1/1
6	NAG	A	801	1	-	1/6/23/26	0/1/1/1
6	NAG	A	802	1	-	0/6/23/26	0/1/1/1
6	NAG	B	700	1	-	0/6/23/26	0/1/1/1
6	NAG	A	804	1	-	2/6/23/26	0/1/1/1
6	NAG	A	803	1	-	0/6/23/26	0/1/1/1
6	NAG	D	406	2	-	0/6/23/26	0/1/1/1
6	NAG	C	406	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	803	NAG	C1-O5-C5	3.24	116.59	112.19
6	B	700	NAG	C1-O5-C5	2.99	116.25	112.19
6	D	413	NAG	C1-O5-C5	2.75	115.91	112.19
6	C	408	NAG	C1-O5-C5	2.53	115.62	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	C	406	NAG	C1-O5-C5	2.34	115.37	112.19
6	A	804	NAG	C1-O5-C5	2.29	115.30	112.19
6	B	700	NAG	O5-C1-C2	-2.23	107.77	111.29
6	B	701	NAG	C1-O5-C5	2.22	115.19	112.19
6	C	407	NAG	C1-O5-C5	2.03	114.94	112.19

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	804	NAG	O5-C5-C6-O6
6	A	804	NAG	C4-C5-C6-O6
6	A	801	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	700	NAG	1	0
6	A	803	NAG	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	218/243 (89%)	0.44	4 (1%) 68 61	23, 60, 89, 108	0
1	B	196/243 (80%)	0.62	9 (4%) 32 22	47, 80, 122, 159	0
2	C	286/317 (90%)	0.47	5 (1%) 70 63	26, 55, 89, 123	0
2	D	293/317 (92%)	0.30	3 (1%) 82 77	28, 49, 91, 138	2 (0%)
All	All	993/1120 (88%)	0.44	21 (2%) 63 54	23, 61, 100, 159	2 (0%)

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	145	GLY	4.1
2	C	262	ALA	3.5
1	B	144	PRO	3.5
1	B	148	VAL	3.2
1	B	143	GLU	3.0
2	D	308	THR	2.8
2	C	265	THR	2.8
2	D	329	VAL	2.7
1	B	238	LEU	2.7
2	C	285	PRO	2.7
1	B	142	SER	2.4
1	B	168	ILE	2.4
1	A	55	THR	2.2
2	C	310	LEU	2.2
1	B	157	THR	2.1
2	D	59	THR	2.1
1	B	234	PHE	2.1
1	A	228	ALA	2.1
1	A	129	SER	2.1
2	C	267	ASP	2.0
1	A	160	VAL	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.

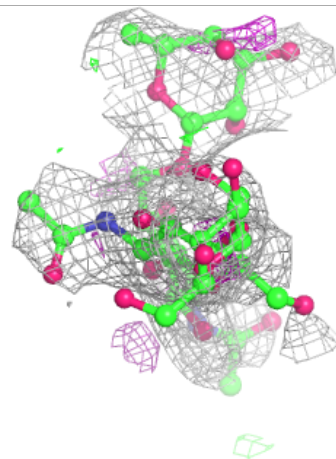
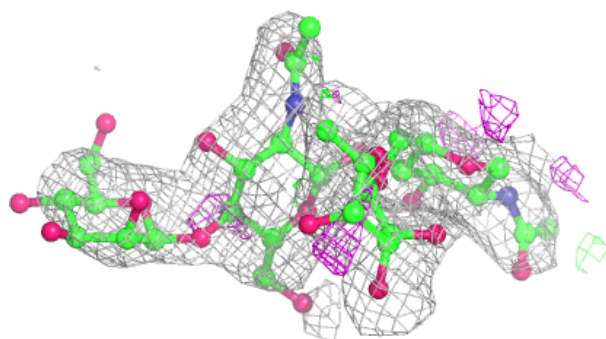
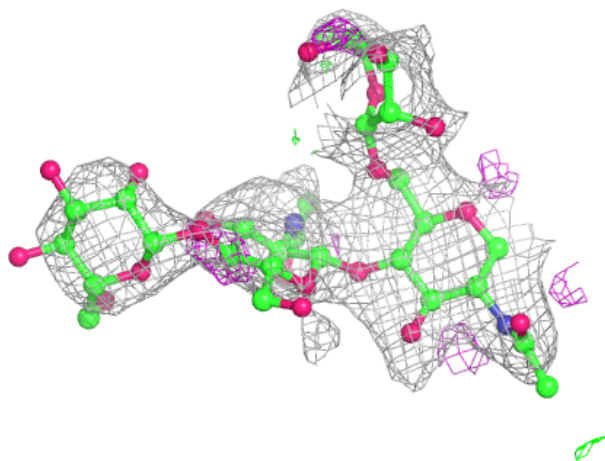
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	FUC	E	4	10/11	0.71	0.29	99,102,104,106	0
3	BMA	G	3	11/12	0.73	0.23	93,95,98,100	0
4	MAN	F	4	11/12	0.79	0.21	117,120,125,128	0
3	NAG	E	2	14/15	0.80	0.29	103,106,111,114	0
3	NAG	E	1	14/15	0.80	0.26	84,90,99,99	1
3	NAG	G	2	14/15	0.83	0.30	88,91,93,94	0
3	BMA	E	3	11/12	0.84	0.36	118,120,126,126	0
5	NAG	H	1	14/15	0.84	0.20	83,86,91,95	0
4	NAG	F	2	14/15	0.85	0.22	105,109,115,118	0
4	BMA	F	3	11/12	0.86	0.19	120,124,128,130	0
3	FUC	G	4	10/11	0.87	0.34	80,83,84,84	0
5	NAG	H	2	14/15	0.87	0.27	98,102,105,106	0
4	FUC	F	5	10/11	0.88	0.25	99,103,106,107	0
3	NAG	G	1	14/15	0.89	0.19	82,85,89,89	0
4	NAG	F	1	14/15	0.91	0.19	85,92,100,100	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.



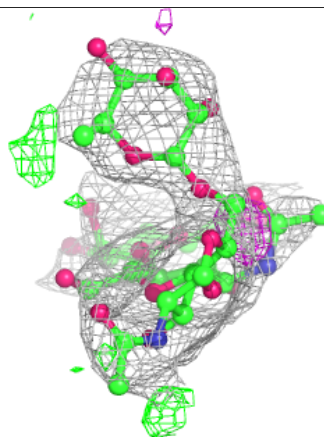
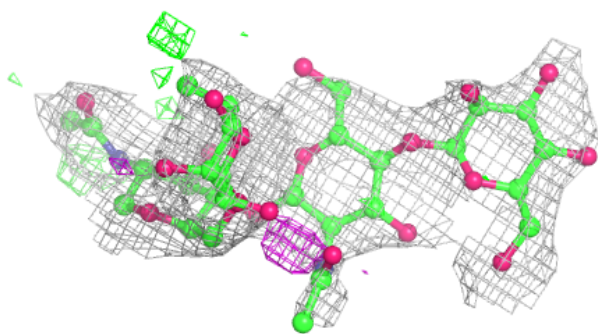
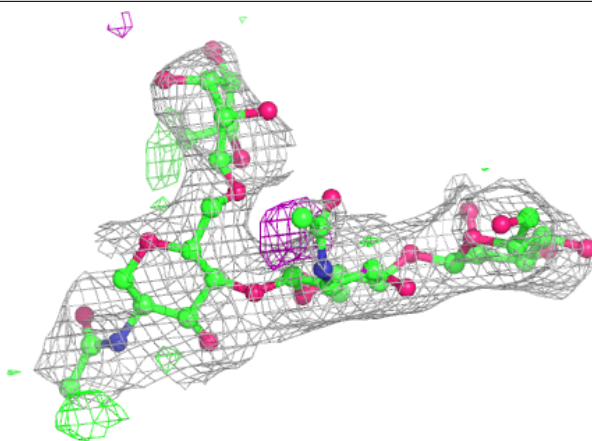
**Electron density around Chain E:**

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

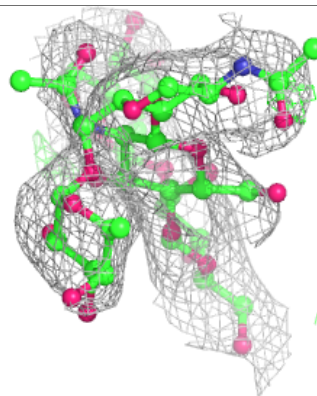
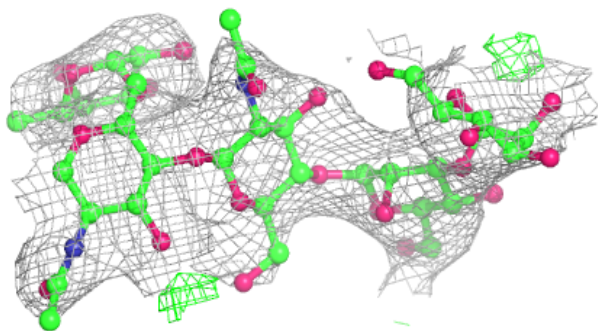
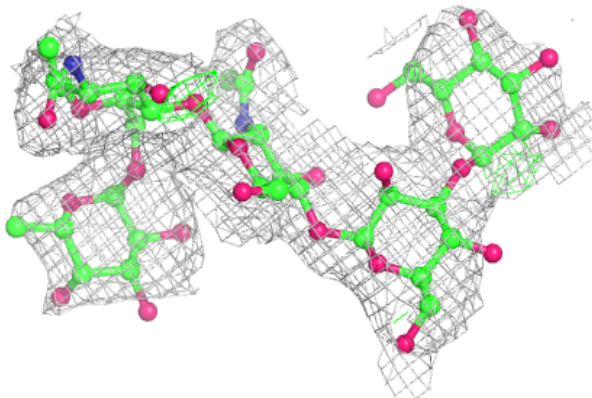


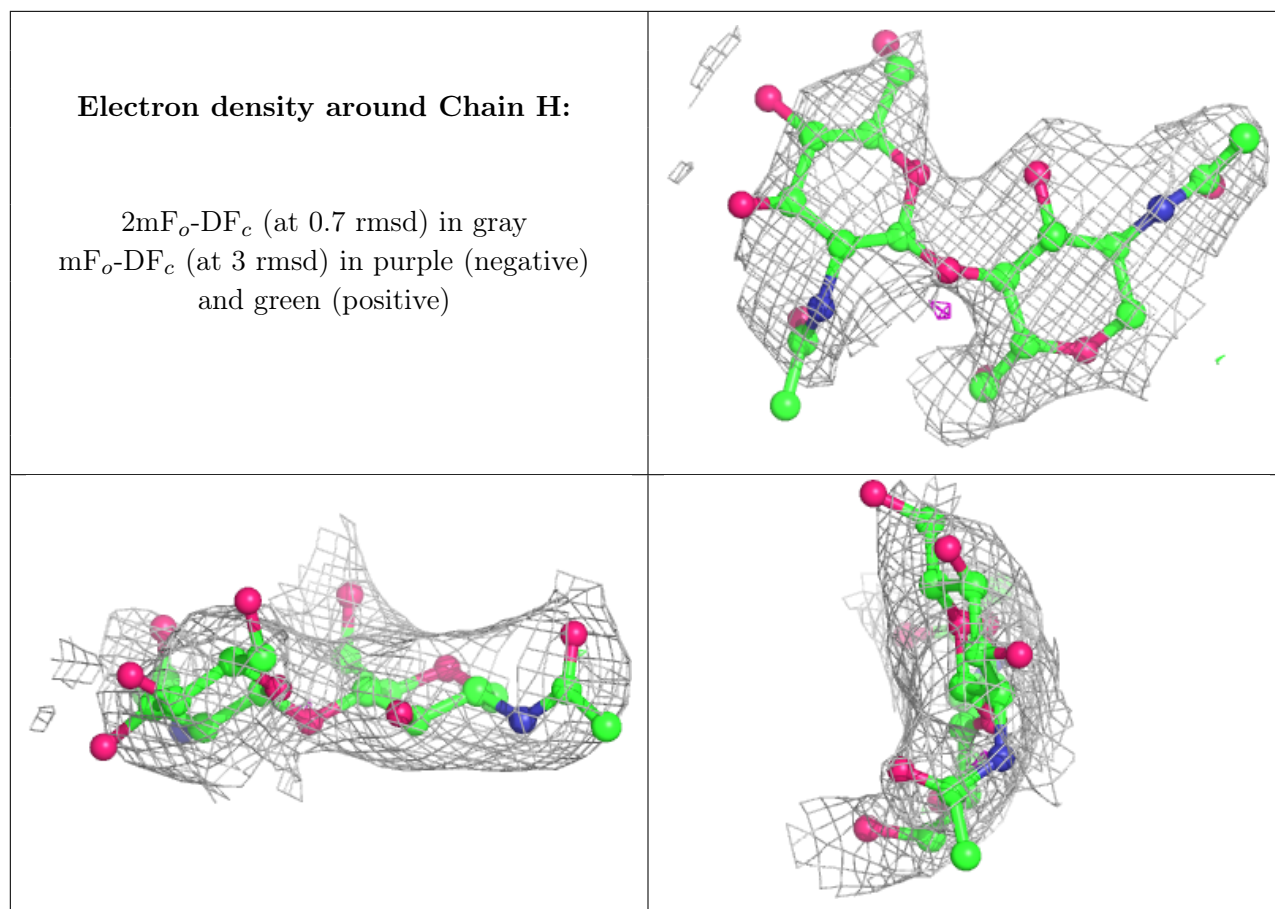
**Electron density around Chain G:**

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

**Electron density around Chain F:**

$2mF_o-DF_c$  (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
6	NAG	C	408	14/15	0.69	0.32	103,106,107,108	0
6	NAG	A	804	14/15	0.73	0.26	107,113,121,124	0
6	NAG	A	803	14/15	0.79	0.27	83,88,90,93	0
6	NAG	B	701	14/15	0.80	0.32	123,131,136,138	0
6	NAG	A	801	14/15	0.80	0.26	107,117,127,132	0
7	SO4	D	414	5/5	0.83	0.23	128,128,129,129	0
6	NAG	C	407	14/15	0.84	0.19	94,97,98,98	0
6	NAG	D	406	14/15	0.85	0.27	84,86,91,91	0
6	NAG	B	700	14/15	0.85	0.24	95,98,101,103	0
6	NAG	A	802	14/15	0.86	0.34	87,89,93,95	0
6	NAG	C	405	14/15	0.87	0.23	102,106,109,111	0
7	SO4	A	805	5/5	0.89	0.15	122,122,122,122	0
6	NAG	D	413	14/15	0.91	0.14	73,76,78,79	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
6	NAG	C	406	14/15	0.92	0.18	52,55,57,57	0
7	SO4	A	806	5/5	0.95	0.18	68,68,69,70	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.