



## Full wwPDB X-ray Structure Validation Report ⓘ

Nov 1, 2023 – 03:25 AM EDT

PDB ID : 3IB1  
Title : Structural basis of the prevention of NSAID-induced damage of the gastrointestinal tract by C-terminal half (C-lobe) of bovine colostrum protein lactoferrin: Binding and structural studies of C-lobe complex with indomethacin  
Authors : Mir, R.; Singh, N.; Sinha, M.; Sharma, S.; Kaur, P.; Srinivasan, A.; Singh, T.P.  
Deposited on : 2009-07-15  
Resolution : 2.20 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>.

---

The following versions of software and data (see [references](#) ①) 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  
buster-report : 1.1.7 (2018)  
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

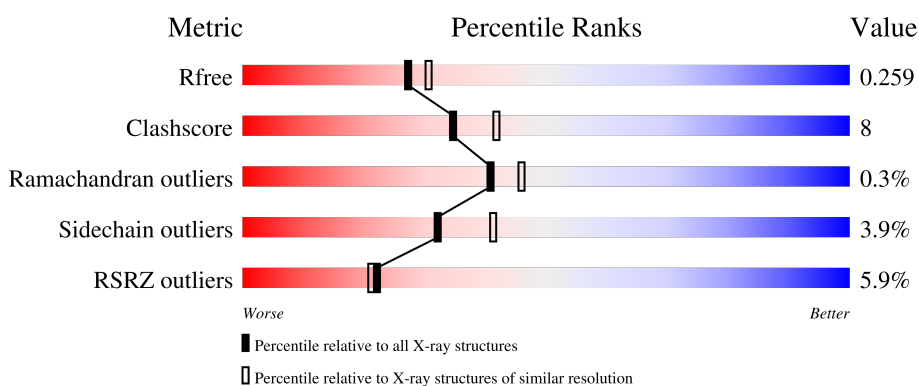
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	345	
2	B	3	
3	C	6	

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
3	MAN	C	3	X	-	-	X
3	MAN	C	4	-	-	-	X
3	MAN	C	5	X	-	-	X
3	MAN	C	6	X	-	-	X
9	IMN	A	701	-	-	X	X

## 2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 3010 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.

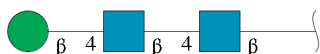
- Molecule 1 is a protein called Lactotransferrin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	341	2604	1622	454	507	21	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

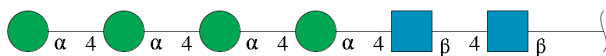
Chain	Residue	Modelled	Actual	Comment	Reference
A	565	LYS	ASN	SEE SEQUENCE DETAILS	UNP P24627
A	608	GLU	LYS	SEE SEQUENCE DETAILS	UNP P24627

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



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

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	6	72	40	2	30	0	0	0

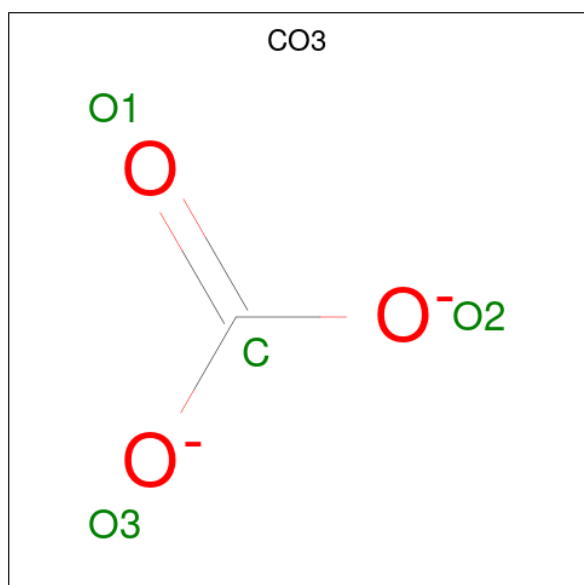
- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	Zn	0	0
			2	2		

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

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

- Molecule 6 is CARBONATE ION (three-letter code: CO3) (formula: CO<sub>3</sub>).



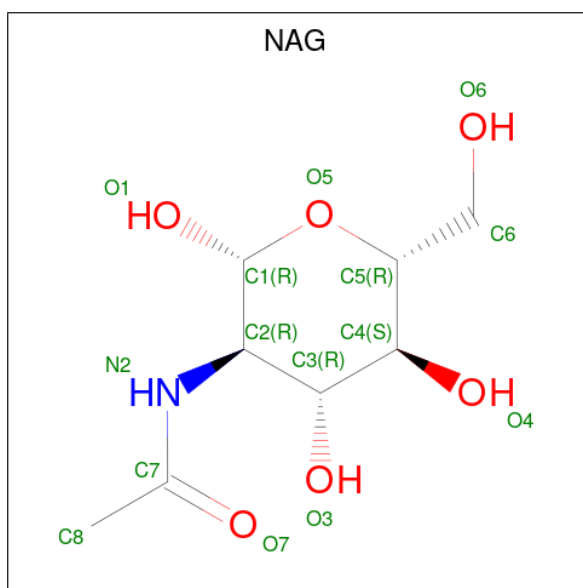
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	1	3		

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



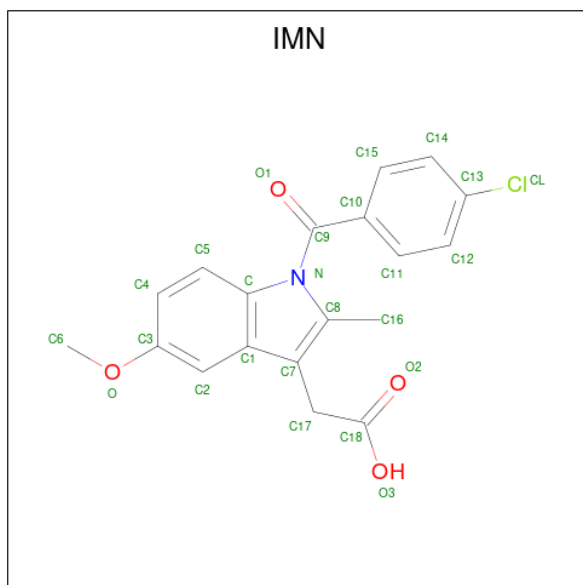
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).



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

- Molecule 9 is INDOMETHACIN (three-letter code: IMN) (formula:  $C_{19}H_{16}ClNO_4$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	Cl	N			O
9	A	1	25	19	1	1	4	0	0

- Molecule 10 is water.

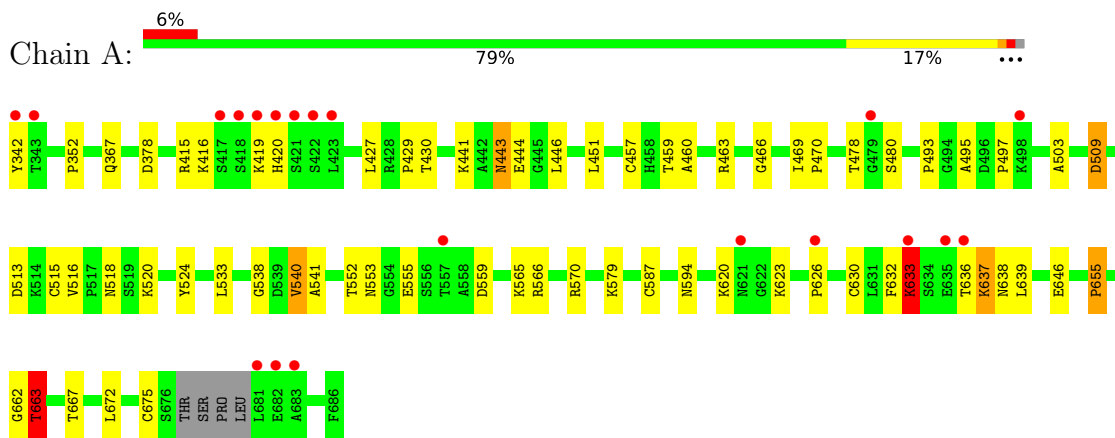
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	244	Total	O	0	0
			244	244		



### 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: Lactotransferrin



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



- Molecule 3: alpha-D-mannopyranose-(1-4)-alpha-D-mannopyranose-(1-4)-alpha-D-mannopyranose-(1-4)-alpha-D-mannopyranose-(1-4)-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	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	63.84Å 50.65Å 66.12Å 90.00° 107.56° 90.00°	Depositor
Resolution (Å)	62.99 – 2.20 19.92 – 2.20	Depositor EDS
% Data completeness (in resolution range)	91.0 (62.99-2.20) 91.1 (19.92-2.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.52 (at 2.19Å)	Xtrriage
Refinement program	REFMAC 5.0	Depositor
R, $R_{free}$	0.209 , 0.244 0.223 , 0.259	Depositor DCC
$R_{free}$ test set	952 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	31.4	Xtrriage
Anisotropy	0.343	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 67.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.000 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	3010	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.69% 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, SO4, NAG, IMN, FE, CO3, MAN, ZN

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	0.93	2/2652 (0.1%)	1.04	10/3591 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	1	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	524	TYR	CD2-CE2	5.55	1.47	1.39
1	A	633	LYS	C-N	5.50	1.46	1.34

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	663	THR	CA-CB-OG1	10.69	131.45	109.00
1	A	655	PRO	CA-N-CD	-9.61	98.05	111.50
1	A	663	THR	CA-CB-CG2	-6.92	102.71	112.40
1	A	378	ASP	CB-CG-OD1	5.87	123.58	118.30
1	A	342	TYR	CA-CB-CG	5.85	124.51	113.40
1	A	633	LYS	C-N-CA	5.73	136.03	121.70
1	A	443	ASN	CA-CB-CG	5.61	125.74	113.40
1	A	367	GLN	CB-CA-C	5.56	121.52	110.40
1	A	533	LEU	CB-CG-CD2	-5.41	101.81	111.00
1	A	509	ASP	CA-CB-CG	5.04	124.49	113.40

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	557	THR	CB

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	633	LYS	Mainchain

## 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	2604	0	2518	36	0
2	B	39	0	34	0	0
3	C	72	0	61	2	0
4	A	2	0	0	0	0
5	A	1	0	0	0	0
6	A	4	0	0	0	0
7	A	5	0	0	0	0
8	A	14	0	13	0	0
9	A	25	0	15	12	0
10	A	244	0	0	1	0
All	All	3010	0	2641	45	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 8.

All (45) 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)
9:A:701:IMN:H11	9:A:701:IMN:C5	1.34	1.53
9:A:701:IMN:H5	9:A:701:IMN:C11	1.47	1.44
9:A:701:IMN:O1	9:A:701:IMN:H161	1.60	1.01
1:A:429:PRO:HB3	9:A:701:IMN:CL	2.05	0.94
9:A:701:IMN:H11	9:A:701:IMN:C	2.07	0.84
1:A:637:LYS:HB3	1:A:639:LEU:HG	1.70	0.73

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
9:A:701:IMN:C5	9:A:701:IMN:C11	2.30	0.72
1:A:469:ILE:HB	1:A:470:PRO:HD3	1.73	0.70
1:A:493:PRO:HA	1:A:515:CYS:SG	2.35	0.66
1:A:429:PRO:CB	9:A:701:IMN:CL	2.85	0.61
1:A:459:THR:OG1	1:A:466:GLY:HA3	2.02	0.60
1:A:626:PRO:HA	1:A:630:CYS:SG	2.43	0.59
1:A:427:LEU:O	1:A:429:PRO:HD3	2.04	0.58
9:A:701:IMN:O1	9:A:701:IMN:C16	2.35	0.57
1:A:662:GLY:HA2	9:A:701:IMN:O2	2.05	0.56
1:A:503:ALA:HA	10:A:732:HOH:O	2.08	0.54
1:A:513:ASP:O	1:A:516:VAL:HG22	2.07	0.53
1:A:566:ARG:HH12	3:C:5:MAN:H62	1.73	0.53
1:A:663:THR:O	1:A:667:THR:HG23	2.08	0.53
1:A:552:THR:OG1	1:A:566:ARG:HG3	2.08	0.53
1:A:460:ALA:HB3	1:A:463:ARG:HD3	1.90	0.52
3:C:2:NAG:O3	3:C:3:MAN:H5	2.10	0.52
1:A:419:LYS:O	1:A:420:HIS:HB2	2.10	0.50
1:A:553:ASN:OD1	1:A:565:LYS:HA	2.11	0.50
9:A:701:IMN:H11	9:A:701:IMN:H5	0.56	0.49
1:A:430:THR:O	9:A:701:IMN:H14	2.14	0.47
1:A:430:THR:HB	1:A:594:ASN:ND2	2.29	0.47
1:A:352:PRO:HG3	1:A:520:LYS:NZ	2.28	0.47
9:A:701:IMN:H5	9:A:701:IMN:C12	2.31	0.47
1:A:518:ASN:OD1	1:A:520:LYS:HG3	2.15	0.46
1:A:419:LYS:HD2	1:A:420:HIS:ND1	2.31	0.46
1:A:672:LEU:O	1:A:675:CYS:HB2	2.16	0.46
1:A:416:LYS:HD3	1:A:646:GLU:HG3	1.99	0.45
1:A:620:LYS:O	1:A:620:LYS:HG3	2.17	0.45
1:A:478:THR:HG22	1:A:480:SER:HB3	1.99	0.44
1:A:579:LYS:HD2	1:A:587:CYS:HB2	1.99	0.44
1:A:441:LYS:HD2	1:A:570:ARG:NH2	2.33	0.44
1:A:540:VAL:CG2	1:A:541:ALA:N	2.81	0.43
1:A:451:LEU:HD23	1:A:451:LEU:HA	1.87	0.43
1:A:632:PHE:O	1:A:633:LYS:HE2	2.20	0.42
1:A:552:THR:O	1:A:555:GLU:HB2	2.19	0.41
1:A:637:LYS:O	1:A:638:ASN:HB2	2.20	0.41
1:A:495:ALA:O	1:A:497:PRO:HD3	2.21	0.41
1:A:446:LEU:HD11	1:A:451:LEU:HD23	2.02	0.41
1:A:457:CYS:SG	1:A:538:GLY:HA3	2.61	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	337/345 (98%)	312 (93%)	24 (7%)	1 (0%)	41	46

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	623	LYS

### 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	282/286 (99%)	271 (96%)	11 (4%)	32	41

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	415	ARG
1	A	443	ASN
1	A	444	GLU
1	A	509	ASP
1	A	540	VAL
1	A	559	ASP
1	A	633	LYS
1	A	636	THR
1	A	637	LYS
1	A	655	PRO

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type
1	A	663	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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](#)

9 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	B	1	1,2	14,14,15	0.79	0	17,19,21	1.81	5 (29%)
2	NAG	B	2	2	14,14,15	0.54	0	17,19,21	2.65	6 (35%)
2	BMA	B	3	2	11,11,12	0.43	0	15,15,17	2.30	3 (20%)
3	NAG	C	1	1,3	14,14,15	0.97	1 (7%)	17,19,21	1.72	4 (23%)
3	NAG	C	2	3	14,14,15	0.63	0	17,19,21	1.48	4 (23%)
3	MAN	C	3	3	11,11,12	1.07	1 (9%)	15,15,17	2.32	4 (26%)
3	MAN	C	4	3	11,11,12	0.53	0	15,15,17	1.98	6 (40%)
3	MAN	C	5	3	11,11,12	0.70	0	15,15,17	1.66	2 (13%)
3	MAN	C	6	3	11,11,12	0.49	0	15,15,17	1.08	1 (6%)

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	B	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	1/6/23/26	0/1/1/1
2	BMA	B	3	2	-	2/2/19/22	0/1/1/1
3	NAG	C	1	1,3	-	1/6/23/26	0/1/1/1
3	NAG	C	2	3	-	4/6/23/26	0/1/1/1
3	MAN	C	3	3	1/1/4/5	1/2/19/22	0/1/1/1
3	MAN	C	4	3	-	0/2/19/22	0/1/1/1
3	MAN	C	5	3	1/1/4/5	2/2/19/22	0/1/1/1
3	MAN	C	6	3	1/1/4/5	1/2/19/22	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1	NAG	C1-C2	2.97	1.56	1.52
3	C	3	MAN	O5-C1	-2.40	1.39	1.43

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	NAG	C1-O5-C5	8.70	123.98	112.19
2	B	3	BMA	C1-O5-C5	6.62	121.16	112.19
3	C	3	MAN	C1-O5-C5	-6.41	103.51	112.19
2	B	1	NAG	C2-N2-C7	-4.37	116.68	122.90
2	B	3	BMA	O5-C1-C2	4.24	117.32	110.77
3	C	5	MAN	C1-O5-C5	4.08	117.72	112.19
3	C	3	MAN	O5-C1-C2	-3.89	104.76	110.77
3	C	5	MAN	O4-C4-C5	3.87	118.90	109.30
3	C	1	NAG	O4-C4-C3	-3.86	101.44	110.35
3	C	3	MAN	C2-C3-C4	3.49	116.93	110.89
3	C	4	MAN	C2-C3-C4	3.47	116.89	110.89
2	B	1	NAG	C3-C4-C5	-3.20	104.52	110.24
3	C	4	MAN	C3-C4-C5	3.15	115.85	110.24
2	B	3	BMA	C2-C3-C4	-3.07	105.59	110.89
2	B	2	NAG	O5-C1-C2	3.05	116.10	111.29
2	B	1	NAG	C8-C7-N2	2.90	121.01	116.10
3	C	4	MAN	O5-C5-C6	2.81	111.62	107.20
3	C	1	NAG	C1-O5-C5	2.78	115.96	112.19
3	C	2	NAG	O5-C5-C6	2.76	111.53	107.20
3	C	4	MAN	C1-C2-C3	2.76	113.06	109.67
3	C	4	MAN	O3-C3-C2	-2.71	104.80	109.99

*Continued on next page...*



Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	6	MAN	O5-C1-C2	-2.68	106.63	110.77
2	B	2	NAG	C3-C4-C5	2.60	114.88	110.24
3	C	4	MAN	C1-O5-C5	2.52	115.61	112.19
3	C	1	NAG	C1-C2-N2	2.46	114.70	110.49
3	C	2	NAG	C2-N2-C7	2.45	126.40	122.90
2	B	2	NAG	O5-C5-C4	2.37	116.59	110.83
2	B	2	NAG	C4-C3-C2	2.36	114.47	111.02
3	C	1	NAG	O5-C1-C2	-2.25	107.74	111.29
2	B	1	NAG	O5-C5-C6	2.24	110.72	107.20
2	B	2	NAG	O4-C4-C3	-2.15	105.37	110.35
3	C	2	NAG	O7-C7-N2	2.15	125.91	121.95
2	B	1	NAG	O5-C5-C4	-2.13	105.65	110.83
3	C	2	NAG	C3-C4-C5	-2.08	106.53	110.24
3	C	3	MAN	C3-C4-C5	2.08	113.94	110.24

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	C	3	MAN	C1
3	C	5	MAN	C1
3	C	6	MAN	C1

All (12) torsion outliers are listed below:

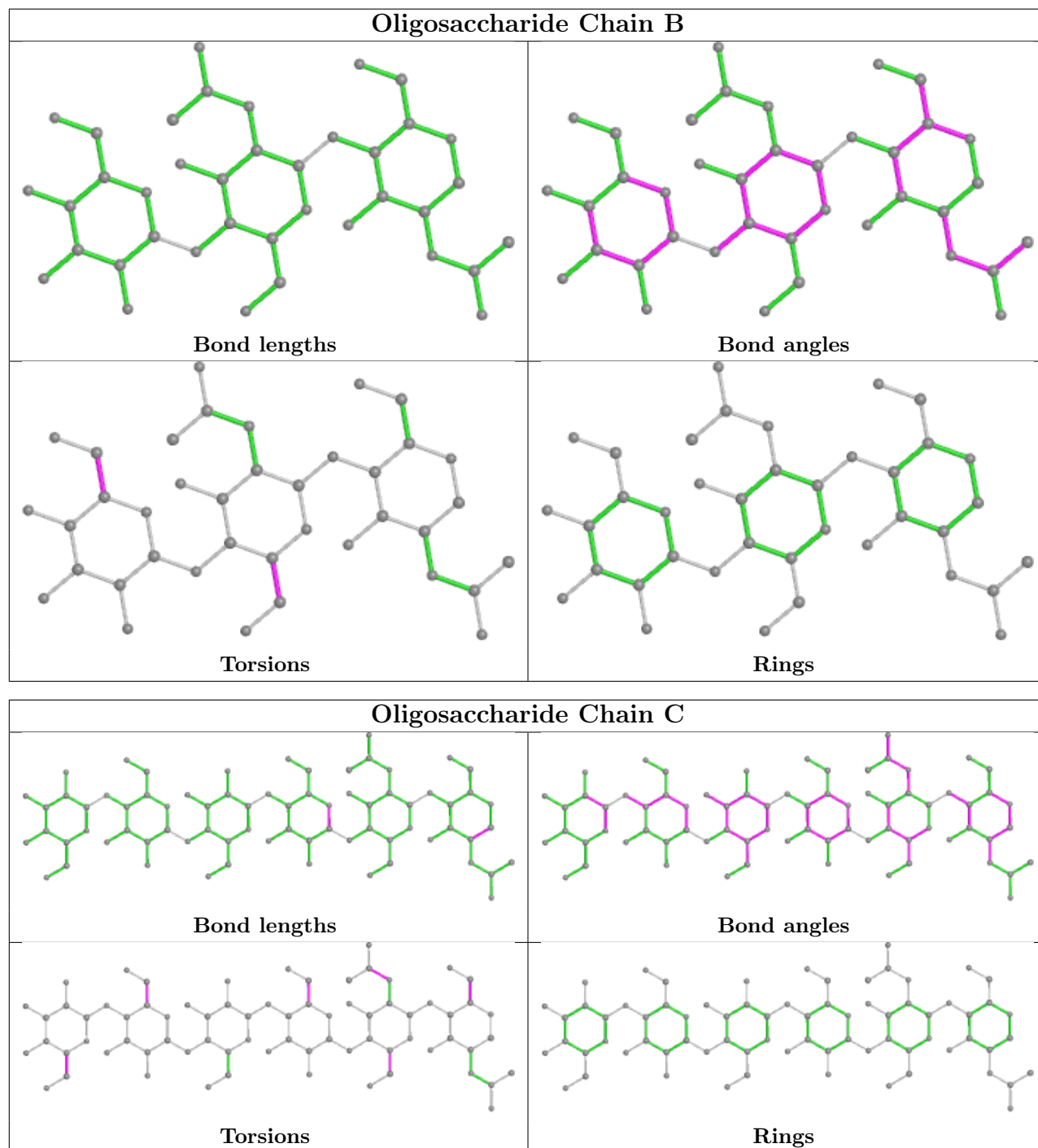
Mol	Chain	Res	Type	Atoms
2	B	3	BMA	O5-C5-C6-O6
3	C	2	NAG	O5-C5-C6-O6
3	C	5	MAN	O5-C5-C6-O6
3	C	5	MAN	C4-C5-C6-O6
2	B	3	BMA	C4-C5-C6-O6
3	C	2	NAG	C4-C5-C6-O6
3	C	2	NAG	C8-C7-N2-C2
3	C	2	NAG	O7-C7-N2-C2
3	C	3	MAN	C4-C5-C6-O6
3	C	6	MAN	O5-C5-C6-O6
3	C	1	NAG	C4-C5-C6-O6
2	B	2	NAG	O5-C5-C6-O6

There are no ring outliers.

3 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	3	MAN	1	0
3	C	2	NAG	1	0
3	C	5	MAN	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

Of 7 ligands modelled in this entry, 3 are monoatomic - leaving 4 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	CO3	A	691	5	2,3,3	0.60	0	2,3,3	0.96	0
8	NAG	A	1	1	14,14,15	0.77	1 (7%)	17,19,21	1.58	4 (23%)
7	SO4	A	301	-	4,4,4	0.13	0	6,6,6	0.47	0
9	IMN	A	701	-	24,27,27	1.63	5 (20%)	29,39,39	3.48	4 (13%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	A	1	1	-	2/6/23/26	0/1/1/1
9	IMN	A	701	-	-	4/10/14/14	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	701	IMN	C8-C7	4.55	1.48	1.39
9	A	701	IMN	O2-C18	3.33	1.33	1.22
9	A	701	IMN	C13-CL	2.72	1.80	1.74
9	A	701	IMN	C2-C3	2.32	1.41	1.37
9	A	701	IMN	O3-C18	-2.28	1.23	1.30
8	A	1	NAG	O5-C1	-2.23	1.40	1.43

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	A	701	IMN	C7-C17-C18	14.70	131.84	114.18
9	A	701	IMN	C17-C7-C8	-7.71	119.61	126.41
9	A	701	IMN	C10-C9-N	5.63	124.53	117.95

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	A	701	IMN	C16-C8-N	3.91	127.29	122.37
8	A	1	NAG	C6-C5-C4	-3.61	104.55	113.00
8	A	1	NAG	C1-O5-C5	2.84	116.04	112.19
8	A	1	NAG	C2-N2-C7	-2.52	119.32	122.90
8	A	1	NAG	O5-C1-C2	-2.40	107.49	111.29

There are no chirality outliers.

All (6) torsion outliers are listed below:

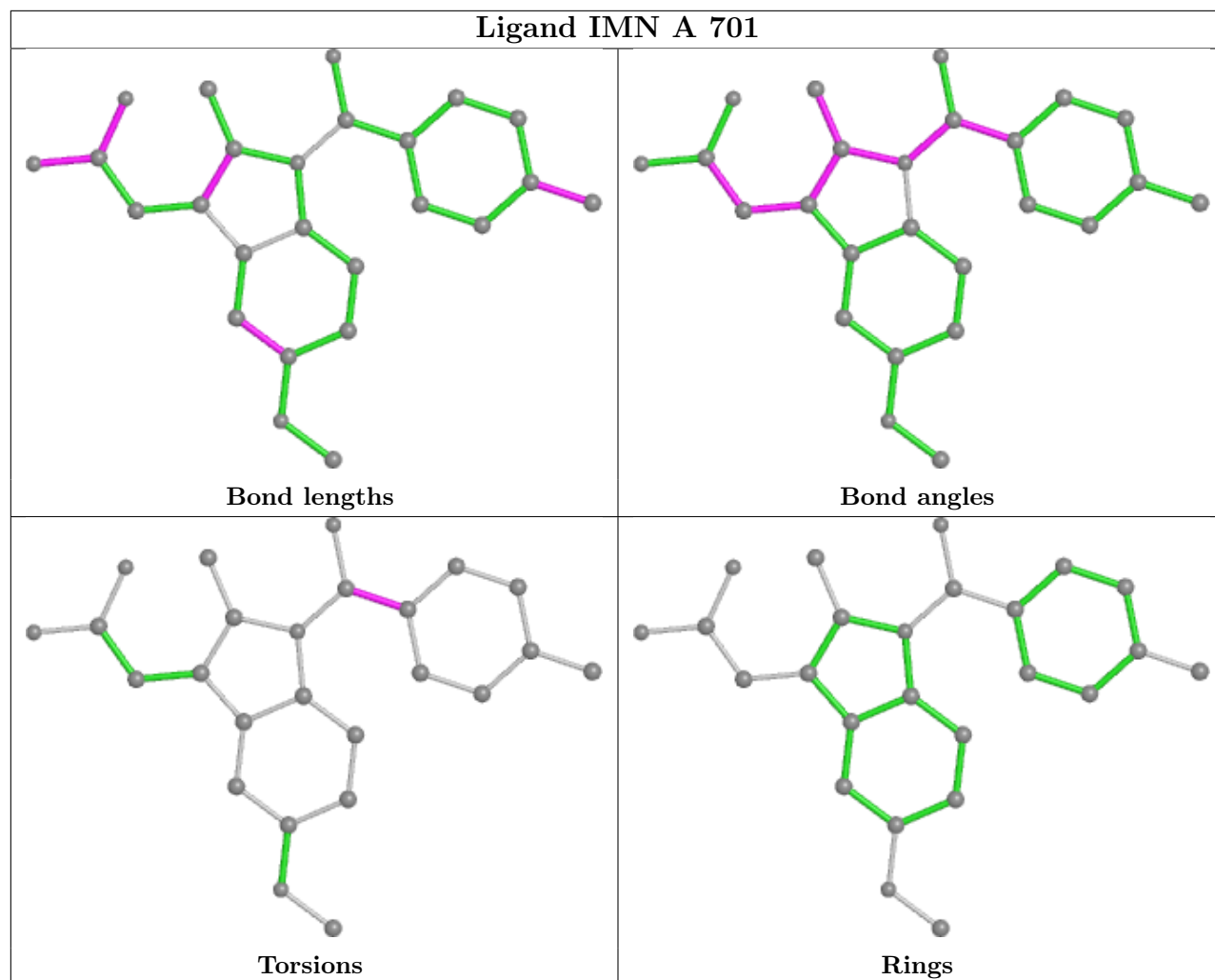
Mol	Chain	Res	Type	Atoms
9	A	701	IMN	C11-C10-C9-N
9	A	701	IMN	C15-C10-C9-N
9	A	701	IMN	C11-C10-C9-O1
9	A	701	IMN	C15-C10-C9-O1
8	A	1	NAG	C4-C5-C6-O6
8	A	1	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	701	IMN	12	0

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



## 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	341/345 (98%)	0.09	20 (5%) <span style="border: 1px solid red; padding: 2px;">22</span> <span style="border: 1px solid red; padding: 2px;">21</span>	17, 33, 57, 82	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	342	TYR	12.5
1	A	682	GLU	7.4
1	A	681	LEU	7.1
1	A	683	ALA	5.7
1	A	422	SER	5.6
1	A	498	LYS	5.5
1	A	423	LEU	4.4
1	A	419	LYS	4.3
1	A	420	HIS	3.8
1	A	635	GLU	3.5
1	A	418	SER	3.4
1	A	421	SER	3.1
1	A	343	THR	2.6
1	A	479	GLY	2.5
1	A	633	LYS	2.5
1	A	557	THR	2.4
1	A	636	THR	2.4
1	A	621	ASN	2.3
1	A	417	SER	2.2
1	A	626	PRO	2.1

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

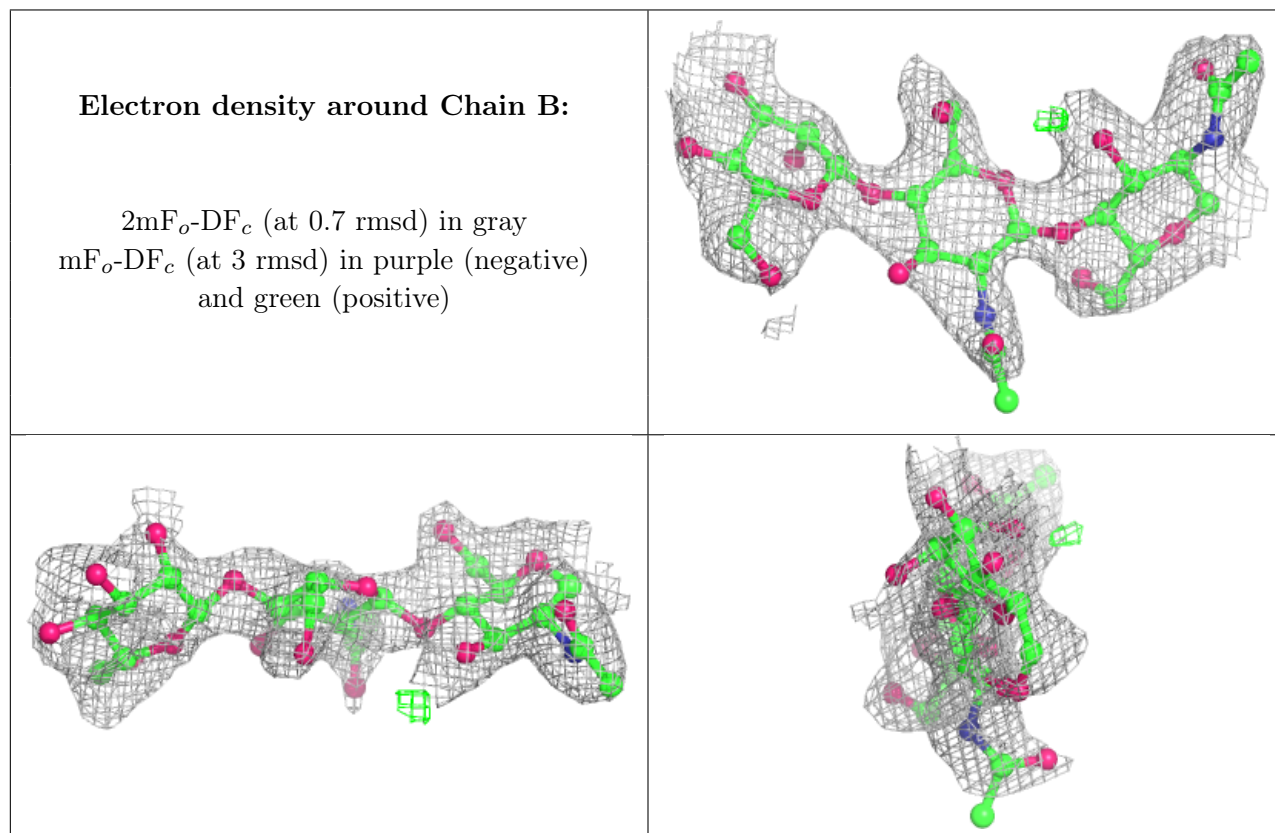
There are no non-standard protein/DNA/RNA residues in this entry.

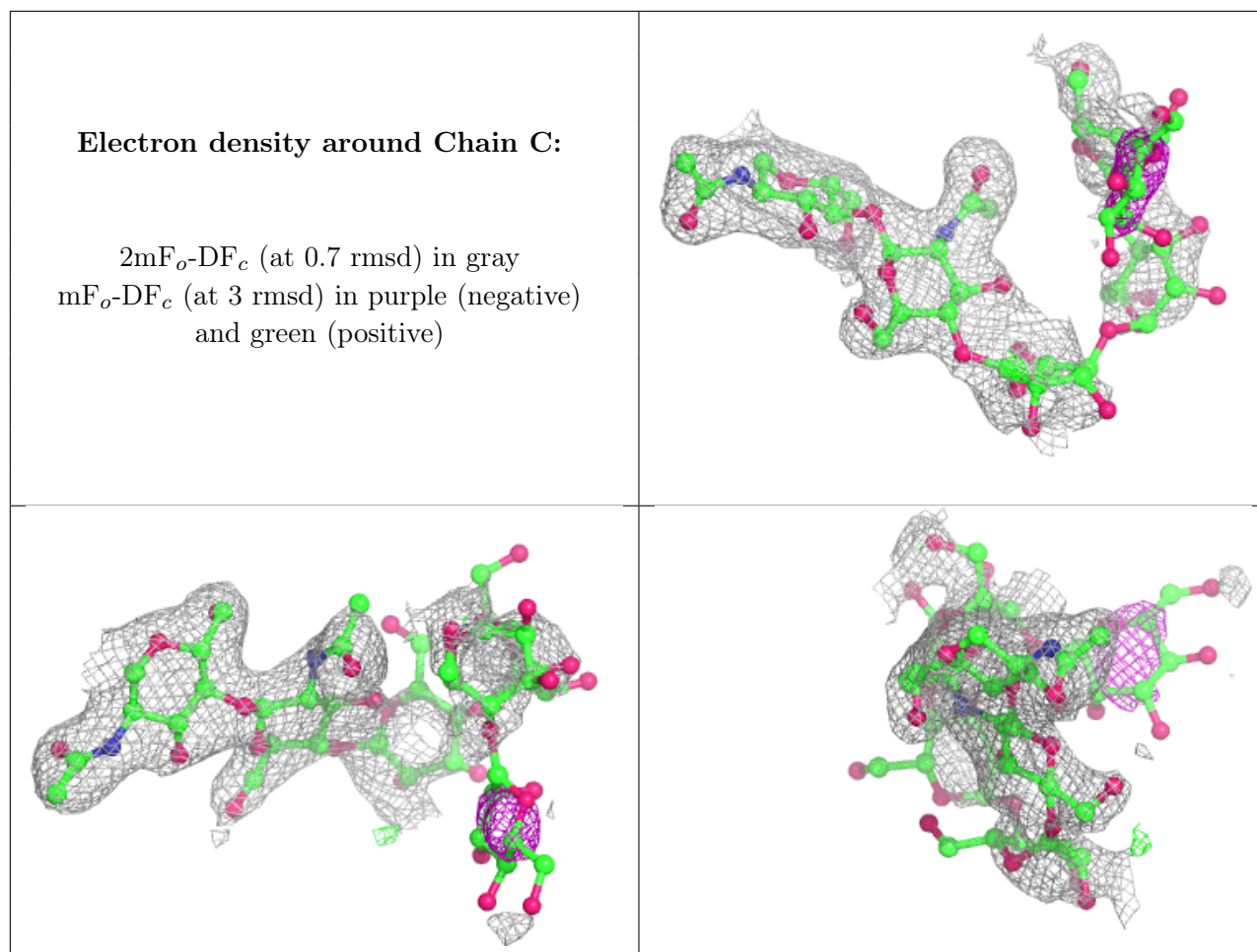
### 6.3 Carbohydrates [i](#)

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	MAN	C	6	11/12	-0.09	1.15	121,122,122,122	0
3	MAN	C	5	11/12	0.50	0.47	114,115,117,119	0
3	MAN	C	4	11/12	0.62	0.51	104,107,108,111	0
3	MAN	C	3	11/12	0.74	0.47	86,93,95,99	0
2	BMA	B	3	11/12	0.74	0.35	74,75,76,76	0
2	NAG	B	2	14/15	0.81	0.33	63,67,68,72	0
3	NAG	C	2	14/15	0.81	0.20	59,64,70,79	0
2	NAG	B	1	14/15	0.89	0.11	40,48,54,58	0
3	NAG	C	1	14/15	0.94	0.11	34,40,46,51	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.





## 6.4 Ligands [i](#)

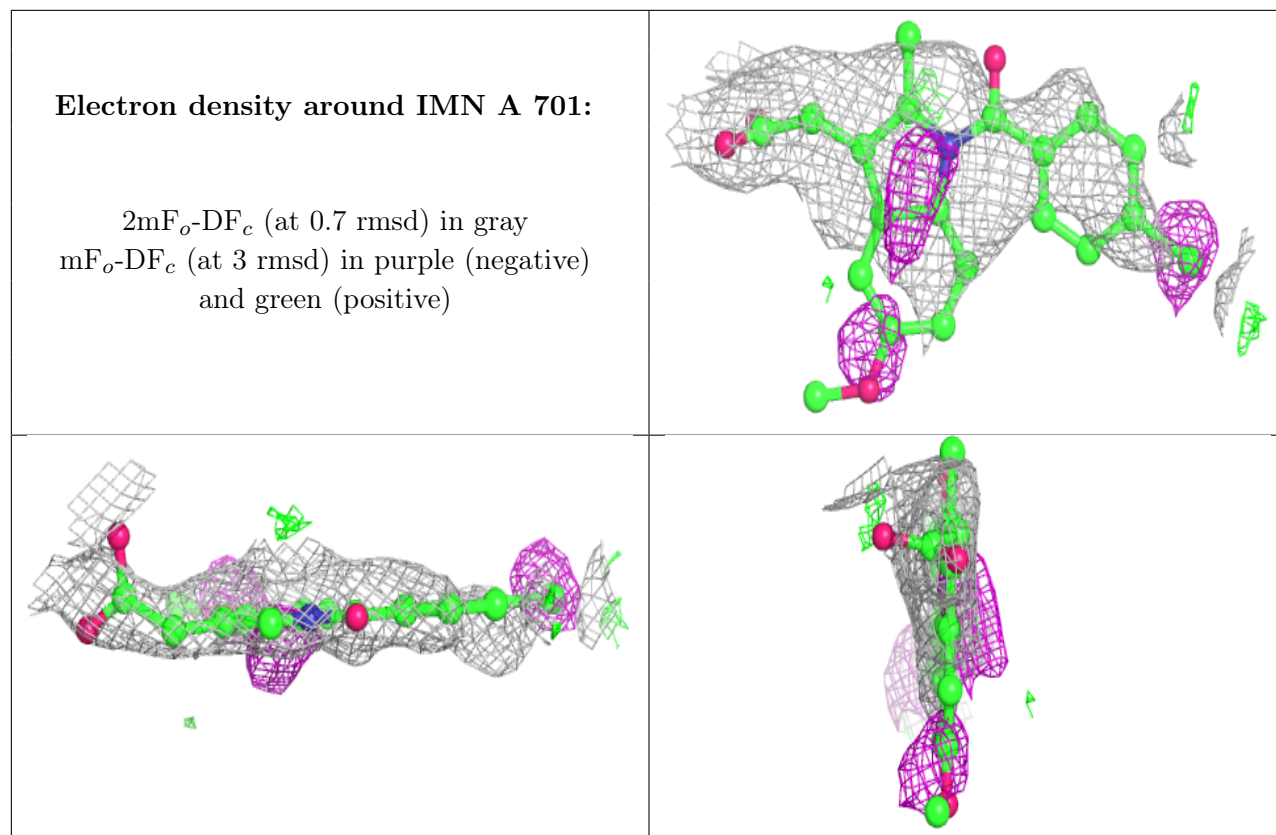
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
9	IMN	A	701	25/25	0.47	0.46	70,72,75,79	0
8	NAG	A	1	14/15	0.80	0.28	51,54,58,58	0
7	SO4	A	301	5/5	0.92	0.15	81,81,81,83	0
6	CO3	A	691	4/4	0.98	0.06	9,14,14,16	0
4	ZN	A	302	1/1	0.99	0.05	37,37,37,37	0
4	ZN	A	303	1/1	0.99	0.05	42,42,42,42	0
5	FE	A	690	1/1	1.00	0.03	18,18,18,18	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different



orientation to approximate a three-dimensional view.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.