



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 12:02 PM EDT

PDB ID : 5AWB  
Title : Crystal structure of human TLR8 in complex with N1-3-aminomethylbenzyl (meta-amine)  
Authors : Tanji, H.; Ohto, U.; Shimizu, T.  
Deposited on : 2015-07-03  
Resolution : 2.10 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 ⓘ](#)) 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 : 2.37.1  
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) : 2.37.1

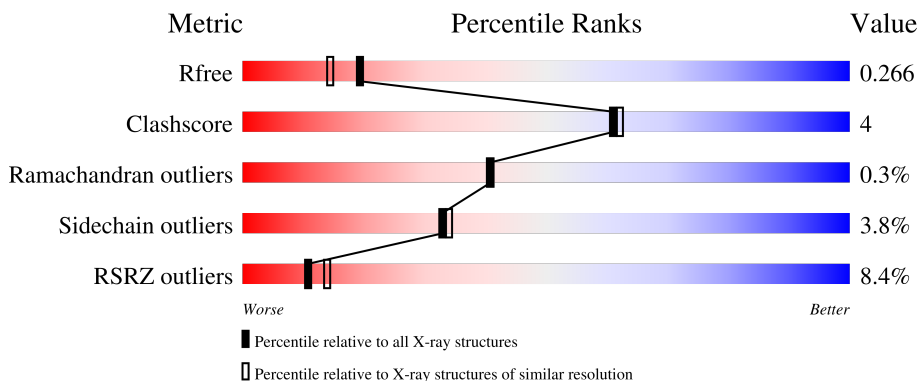
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*



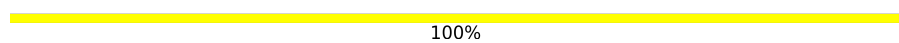
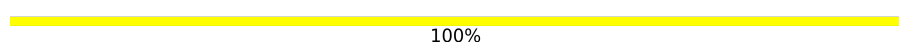
The reported resolution of this entry is 2.10 Å.

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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	811	 8% 80% 11% 8%
2	B	4	 50% 50%
3	C	2	 100%
4	D	3	 100%

## 2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 6393 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 Toll-like receptor 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	748	6017	3851	1021	1126	19	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	22	ARG	-	expression tag	UNP Q9NR97
A	23	SER	-	expression tag	UNP Q9NR97
A	24	PRO	-	expression tag	UNP Q9NR97
A	25	TRP	-	expression tag	UNP Q9NR97
A	828	GLU	-	expression tag	UNP Q9NR97
A	829	PHE	-	expression tag	UNP Q9NR97
A	830	LEU	-	expression tag	UNP Q9NR97
A	831	VAL	-	expression tag	UNP Q9NR97
A	832	PRO	-	expression tag	UNP Q9NR97
A	833	ARG	-	expression tag	UNP Q9NR97

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



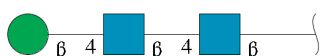
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	4	50	28	2	20	0	0	0

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



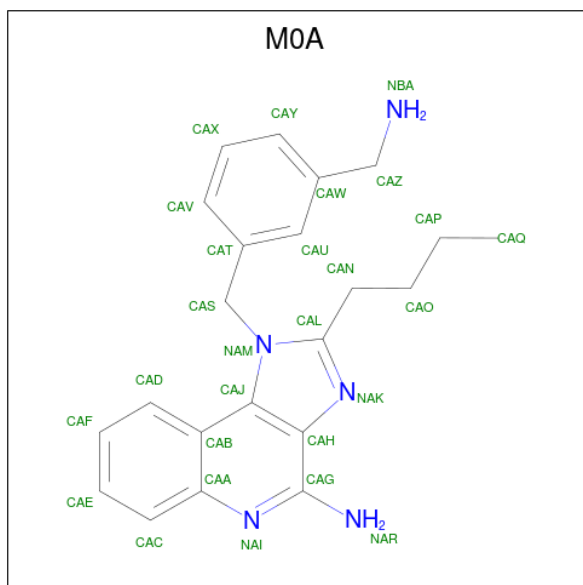
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	2	28	16	2	10	0	0	0

- Molecule 4 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			
4	D	3	39	22	2	15	0	0	0

- Molecule 5 is 1-[[3-(aminomethyl)phenyl]methyl]-2-butyl-imidazo[4,5-c]quinolin-4-amine (three-letter code: M0A) (formula: C<sub>22</sub>H<sub>25</sub>N<sub>5</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	27	22	5	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		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	190	Total	O	0	0
			190	190		

### 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: Toll-like receptor 8



- Molecule 2: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1  
MAG2

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

Chain D:

100%

MAG1  
MAG2  
BMA3

## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	134.90Å 107.05Å 72.09Å 90.00° 106.35° 90.00°	Depositor
Resolution (Å)	27.50 – 2.10 27.50 – 2.10	Depositor EDS
% Data completeness (in resolution range)	98.7 (27.50-2.10) 98.7 (27.50-2.10)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.62 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.201 , 0.259 0.209 , 0.266	Depositor DCC
$R_{free}$ test set	2872 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	41.7	Xtrriage
Anisotropy	0.043	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 48.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	6393	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.27% 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: M0A, BMA, MAN, NAG

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	0.79	0/6141	0.89	7/8328 (0.1%)

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	0	2

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	300	ARG	NE-CZ-NH2	-8.15	116.23	120.30
1	A	300	ARG	NE-CZ-NH1	6.55	123.57	120.30
1	A	290	ARG	NE-CZ-NH1	6.31	123.46	120.30
1	A	630	ARG	NE-CZ-NH2	-5.70	117.45	120.30
1	A	375	ARG	NE-CZ-NH1	5.61	123.10	120.30
1	A	643	ARG	NE-CZ-NH1	5.47	123.03	120.30
1	A	250	LEU	CA-CB-CG	5.15	127.15	115.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	38	LYS	Peptide
1	A	496	ILE	Peptide

## 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	6017	0	6000	52	0
2	B	50	0	43	5	0
3	C	28	0	25	0	0
4	D	39	0	34	0	0
5	A	27	0	25	2	0
6	A	42	0	39	0	0
7	A	190	0	0	5	0
All	All	6393	0	6166	55	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 4.

All (55) 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:736:SER:O	1:A:763:LYS:HG2	1.63	0.97
1:A:732:LEU:O	1:A:735:VAL:HG12	1.83	0.79
1:A:517:ASN:H	1:A:540:ASN:HD22	1.31	0.78
1:A:736:SER:O	1:A:763:LYS:CG	2.31	0.78
1:A:158:ILE:H	1:A:180:ASN:HD22	1.33	0.76
1:A:52:ARG:HB2	1:A:799:VAL:HG21	1.69	0.75
1:A:226:LYS:NZ	2:B:2:NAG:H81	2.03	0.73
1:A:95:ASN:ND2	1:A:133:GLU:H	1.89	0.71
1:A:190:THR:HG21	1:A:211:ASN:HB3	1.73	0.68
1:A:691:GLU:OE2	7:A:1001:HOH:O	2.12	0.67
1:A:736:SER:O	1:A:763:LYS:CD	2.44	0.66
1:A:736:SER:O	1:A:763:LYS:HD3	1.97	0.64
1:A:300:ARG:HD3	7:A:1189:HOH:O	1.97	0.64
7:A:1153:HOH:O	2:B:2:NAG:H82	1.97	0.63
1:A:96:HIS:HB3	7:A:1041:HOH:O	2.00	0.60
1:A:234:ILE:O	1:A:256:ASN:HB3	2.00	0.60
1:A:226:LYS:HZ3	2:B:2:NAG:H81	1.67	0.58
1:A:660:LEU:HD22	1:A:686:GLN:HG3	1.85	0.58
1:A:211:ASN:O	1:A:232:THR:HA	2.04	0.58
1:A:732:LEU:CD1	1:A:756:LEU:HD12	2.34	0.57

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:44:SER:HB2	7:A:1104:HOH:O	2.06	0.55
1:A:762:THR:O	1:A:762:THR:HG23	2.08	0.53
1:A:732:LEU:HD13	1:A:756:LEU:HD12	1.91	0.53
1:A:720:SER:HA	1:A:744:SER:O	2.09	0.52
1:A:226:LYS:HZ2	2:B:2:NAG:H81	1.74	0.52
1:A:597:TYR:HB3	1:A:619:ARG:HB2	1.92	0.51
1:A:764:LEU:O	1:A:793:VAL:HG22	2.11	0.50
5:A:901:M0A:H15	5:A:901:M0A:CAS	2.41	0.50
5:A:901:M0A:H15	5:A:901:M0A:H16	1.95	0.49
1:A:682:THR:HG22	1:A:710:PHE:CZ	2.47	0.48
1:A:606:GLU:HG2	1:A:637:GLY:HA3	1.94	0.48
1:A:692:LEU:C	1:A:692:LEU:HD23	2.34	0.48
1:A:737:SER:HA	1:A:763:LYS:HD3	1.95	0.47
1:A:616:SER:HA	1:A:647:SER:O	2.14	0.47
1:A:758:THR:HB	1:A:760:THR:HG22	1.95	0.47
1:A:735:VAL:HG13	1:A:735:VAL:O	2.14	0.46
1:A:329:SER:OG	1:A:330:GLY:N	2.48	0.45
1:A:660:LEU:HD21	1:A:683:LEU:HD22	1.99	0.45
1:A:250:LEU:HD22	1:A:291:TYR:HB2	1.98	0.44
1:A:467:PHE:HB3	2:B:1:NAG:H81	1.98	0.44
1:A:37:GLU:HA	1:A:46:ILE:O	2.17	0.44
1:A:79:THR:HA	1:A:117:THR:OG1	2.17	0.44
1:A:357:ILE:HG13	1:A:377:TYR:CE1	2.53	0.44
1:A:319:GLU:HG2	1:A:345:SER:HB2	1.99	0.43
1:A:356:HIS:CD2	1:A:381:GLU:HG3	2.53	0.43
1:A:93:ASN:HA	1:A:131:LEU:HB2	2.01	0.43
1:A:171:ASN:HD22	1:A:171:ASN:N	2.17	0.42
1:A:190:THR:CG2	1:A:211:ASN:HB3	2.46	0.42
1:A:672:ASN:HA	1:A:696:ARG:O	2.20	0.42
1:A:573:VAL:O	1:A:575:HIS:CE1	2.72	0.42
1:A:388:GLN:N	1:A:389:PRO:CD	2.84	0.41
1:A:156:ASN:HB2	1:A:180:ASN:HD21	1.84	0.41
1:A:170:ILE:HG22	1:A:171:ASN:HD22	1.86	0.41
1:A:134:ASP:HA	1:A:155:GLN:O	2.21	0.41
1:A:95:ASN:HD22	1:A:133:GLU:H	1.64	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	740/811 (91%)	692 (94%)	46 (6%)	2 (0%)	41 41

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	39	LYS
1	A	378	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	692/755 (92%)	666 (96%)	26 (4%)	33 34

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	VAL
1	A	48	GLU
1	A	49	CYS
1	A	81	GLU
1	A	117	THR
1	A	128	ARG
1	A	160	ASN
1	A	164	GLU
1	A	170	ILE

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	A	190	THR
1	A	245	LEU
1	A	250	LEU
1	A	301	LYS
1	A	355	GLN
1	A	374	LEU
1	A	385	ASP
1	A	388	GLN
1	A	460	GLU
1	A	472	ARG
1	A	534	TYR
1	A	595	ASN
1	A	715	ARG
1	A	729	SER
1	A	756	LEU
1	A	763	LYS
1	A	808	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	77	HIS
1	A	95	ASN
1	A	99	ASN
1	A	171	ASN
1	A	180	ASN
1	A	184	ASN
1	A	285	ASN
1	A	540	ASN
1	A	566	HIS
1	A	653	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

10 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	NAG	D	1	1,4	14,14,15	0.83	0	17,19,21	1.36	1 (5%)
6	NAG	A	913	1	14,14,15	0.83	0	17,19,21	2.01	3 (17%)
3	NAG	C	1	1,3	14,14,15	1.22	1 (7%)	17,19,21	1.43	3 (17%)
2	NAG	B	2	2	14,14,15	1.11	1 (7%)	17,19,21	2.08	4 (23%)
6	NAG	A	906	1	14,14,15	1.36	1 (7%)	17,19,21	3.07	7 (41%)
3	NAG	C	2	3	14,14,15	0.93	1 (7%)	17,19,21	2.29	7 (41%)
6	NAG	A	912	1	14,14,15	0.92	0	17,19,21	1.54	3 (17%)
2	NAG	B	1	2,1	14,14,15	0.81	0	17,19,21	1.70	6 (35%)
4	NAG	D	2	4	14,14,15	0.97	0	17,19,21	1.03	1 (5%)
2	MAN	B	4	2	11,11,12	0.82	0	15,15,17	1.90	4 (26%)

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
4	NAG	D	1	1,4	-	0/6/23/26	0/1/1/1
6	NAG	A	913	1	-	2/6/23/26	0/1/1/1
3	NAG	C	1	1,3	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	4/6/23/26	0/1/1/1
6	NAG	A	906	1	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
6	NAG	A	912	1	-	0/6/23/26	0/1/1/1
2	NAG	B	1	2,1	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
2	MAN	B	4	2	-	0/2/19/22	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	906	NAG	C1-C2	4.52	1.59	1.52
3	C	1	NAG	O5-C1	-3.20	1.38	1.43

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2	NAG	O5-C1	-2.70	1.39	1.43
2	B	2	NAG	C2-N2	-2.19	1.42	1.46

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	906	NAG	C1-O5-C5	9.21	124.67	112.19
6	A	906	NAG	O5-C1-C2	-5.40	102.77	111.29
6	A	913	NAG	O5-C1-C2	-5.30	102.93	111.29
3	C	2	NAG	C1-O5-C5	4.43	118.19	112.19
2	B	2	NAG	C2-N2-C7	4.30	129.03	122.90
2	B	4	MAN	O3-C3-C2	4.13	117.91	109.99
2	B	2	NAG	O5-C1-C2	-4.12	104.78	111.29
3	C	2	NAG	O3-C3-C2	-4.07	101.05	109.47
6	A	913	NAG	O3-C3-C4	-4.06	100.96	110.35
6	A	912	NAG	C1-C2-N2	-3.38	104.72	110.49
3	C	1	NAG	C1-C2-N2	-3.37	104.74	110.49
3	C	2	NAG	O5-C1-C2	-3.26	106.14	111.29
2	B	4	MAN	O5-C5-C6	3.21	112.23	107.20
6	A	906	NAG	C6-C5-C4	-3.13	105.67	113.00
6	A	912	NAG	O4-C4-C3	-3.13	103.11	110.35
6	A	913	NAG	C1-O5-C5	3.06	116.34	112.19
6	A	906	NAG	O3-C3-C4	-2.90	103.66	110.35
6	A	906	NAG	C1-C2-N2	2.87	115.38	110.49
2	B	2	NAG	O6-C6-C5	-2.84	101.54	111.29
2	B	1	NAG	C1-O5-C5	-2.79	108.41	112.19
3	C	2	NAG	O4-C4-C3	2.73	116.67	110.35
3	C	2	NAG	C1-C2-N2	2.72	115.14	110.49
6	A	906	NAG	O5-C5-C6	2.65	111.36	107.20
2	B	1	NAG	O3-C3-C4	2.65	116.47	110.35
4	D	1	NAG	O5-C5-C4	-2.62	104.46	110.83
3	C	1	NAG	C4-C3-C2	-2.55	107.28	111.02
2	B	4	MAN	C1-O5-C5	2.54	115.64	112.19
3	C	2	NAG	C6-C5-C4	-2.50	107.14	113.00
3	C	2	NAG	C3-C4-C5	-2.50	105.78	110.24
2	B	1	NAG	O6-C6-C5	-2.48	102.78	111.29
2	B	4	MAN	C3-C4-C5	-2.47	105.83	110.24
2	B	2	NAG	O5-C5-C4	2.37	116.59	110.83
2	B	1	NAG	O4-C4-C3	2.35	115.79	110.35
2	B	1	NAG	C2-N2-C7	2.31	126.19	122.90
6	A	906	NAG	O7-C7-C8	-2.30	117.79	122.06
3	C	1	NAG	O5-C5-C6	2.14	110.56	107.20

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	NAG	C3-C4-C5	-2.13	106.44	110.24
4	D	2	NAG	O4-C4-C3	-2.10	105.50	110.35
6	A	912	NAG	O3-C3-C4	-2.03	105.65	110.35

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	2	NAG	O5-C5-C6-O6
6	A	913	NAG	O5-C5-C6-O6
6	A	913	NAG	C4-C5-C6-O6
3	C	2	NAG	C4-C5-C6-O6
2	B	2	NAG	C4-C5-C6-O6
2	B	2	NAG	C8-C7-N2-C2
2	B	2	NAG	O7-C7-N2-C2
2	B	2	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	2	NAG	4	0
2	B	1	NAG	1	0

## 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	2,1	14,14,15	0.81	0	17,19,21	1.70	6 (35%)
2	NAG	B	2	2	14,14,15	1.11	1 (7%)	17,19,21	2.08	4 (23%)
2	BMA	B	3	2	11,11,12	0.58	0	15,15,17	1.77	4 (26%)



Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	MAN	B	4	2	11,11,12	0.82	0	15,15,17	1.90	4 (26%)
3	NAG	C	1	1,3	14,14,15	1.22	1 (7%)	17,19,21	1.43	3 (17%)
3	NAG	C	2	3	14,14,15	0.93	1 (7%)	17,19,21	2.29	7 (41%)
4	NAG	D	1	1,4	14,14,15	0.83	0	17,19,21	1.36	1 (5%)
4	NAG	D	2	4	14,14,15	0.97	0	17,19,21	1.03	1 (5%)
4	BMA	D	3	4	11,11,12	0.72	0	15,15,17	2.95	8 (53%)

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

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1	NAG	O5-C1	-3.20	1.38	1.43
3	C	2	NAG	O5-C1	-2.70	1.39	1.43
2	B	2	NAG	C2-N2	-2.19	1.42	1.46

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	3	BMA	C1-O5-C5	7.03	121.72	112.19
3	C	2	NAG	C1-O5-C5	4.43	118.19	112.19
2	B	2	NAG	C2-N2-C7	4.30	129.03	122.90
2	B	4	MAN	O3-C3-C2	4.13	117.91	109.99
2	B	2	NAG	O5-C1-C2	-4.12	104.78	111.29
3	C	2	NAG	O3-C3-C2	-4.07	101.05	109.47
4	D	3	BMA	C3-C4-C5	4.04	117.45	110.24

*Continued on next page...*

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	3	BMA	O4-C4-C3	-3.80	101.56	110.35
4	D	3	BMA	O3-C3-C2	3.69	117.06	109.99
4	D	3	BMA	C6-C5-C4	-3.40	105.03	113.00
3	C	1	NAG	C1-C2-N2	-3.37	104.74	110.49
3	C	2	NAG	O5-C1-C2	-3.26	106.14	111.29
2	B	4	MAN	O5-C5-C6	3.21	112.23	107.20
2	B	3	BMA	C1-C2-C3	3.19	113.59	109.67
2	B	2	NAG	O6-C6-C5	-2.84	101.54	111.29
2	B	1	NAG	C1-O5-C5	-2.79	108.41	112.19
4	D	3	BMA	O2-C2-C1	-2.77	103.48	109.15
4	D	3	BMA	O5-C5-C4	2.73	117.48	110.83
3	C	2	NAG	O4-C4-C3	2.73	116.67	110.35
3	C	2	NAG	C1-C2-N2	2.72	115.14	110.49
2	B	3	BMA	O5-C5-C6	2.65	111.35	107.20
2	B	1	NAG	O3-C3-C4	2.65	116.47	110.35
4	D	1	NAG	O5-C5-C4	-2.62	104.46	110.83
2	B	3	BMA	O5-C1-C2	-2.58	106.79	110.77
3	C	1	NAG	C4-C3-C2	-2.55	107.28	111.02
2	B	4	MAN	C1-O5-C5	2.54	115.64	112.19
2	B	3	BMA	O2-C2-C1	-2.53	103.97	109.15
3	C	2	NAG	C6-C5-C4	-2.50	107.14	113.00
3	C	2	NAG	C3-C4-C5	-2.50	105.78	110.24
2	B	1	NAG	O6-C6-C5	-2.48	102.78	111.29
2	B	4	MAN	C3-C4-C5	-2.47	105.83	110.24
2	B	2	NAG	O5-C5-C4	2.37	116.59	110.83
2	B	1	NAG	O4-C4-C3	2.35	115.79	110.35
2	B	1	NAG	C2-N2-C7	2.31	126.19	122.90
3	C	1	NAG	O5-C5-C6	2.14	110.56	107.20
2	B	1	NAG	C3-C4-C5	-2.13	106.44	110.24
4	D	2	NAG	O4-C4-C3	-2.10	105.50	110.35
4	D	3	BMA	C2-C3-C4	-2.09	107.28	110.89

There are no chirality outliers.

All (6) torsion outliers are listed below:

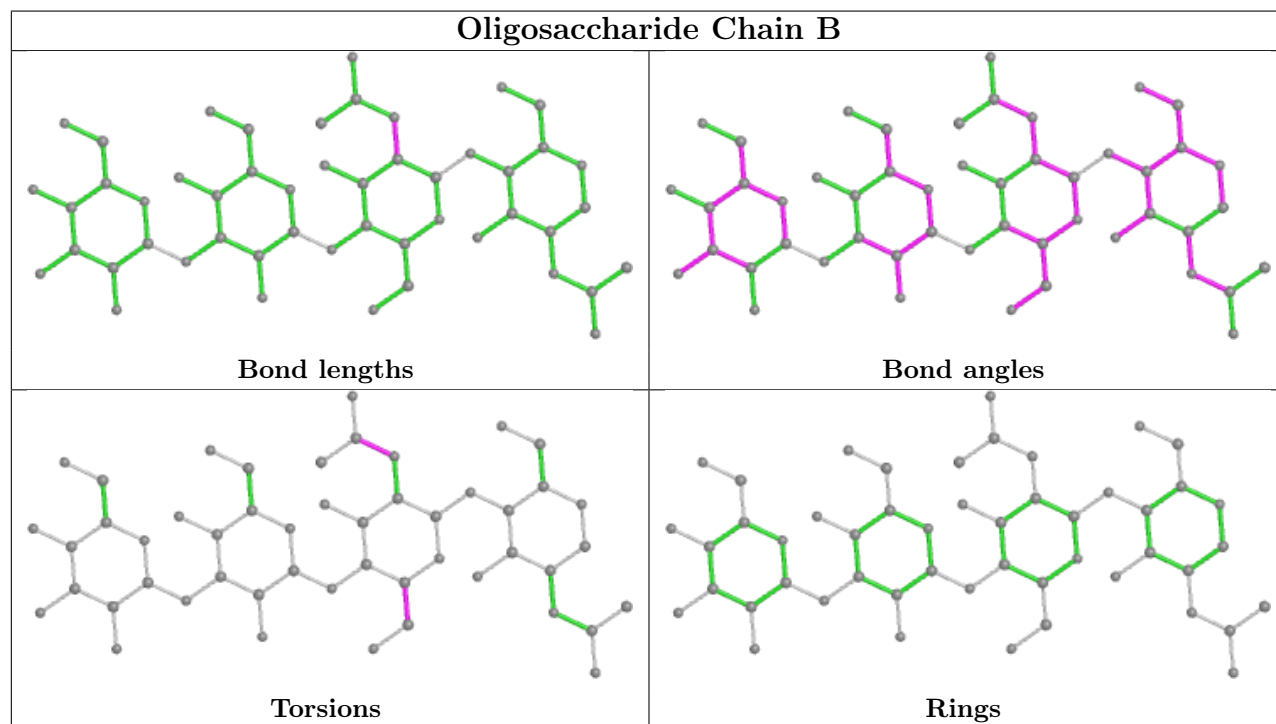
Mol	Chain	Res	Type	Atoms
3	C	2	NAG	O5-C5-C6-O6
3	C	2	NAG	C4-C5-C6-O6
2	B	2	NAG	C4-C5-C6-O6
2	B	2	NAG	C8-C7-N2-C2
2	B	2	NAG	O7-C7-N2-C2
2	B	2	NAG	O5-C5-C6-O6

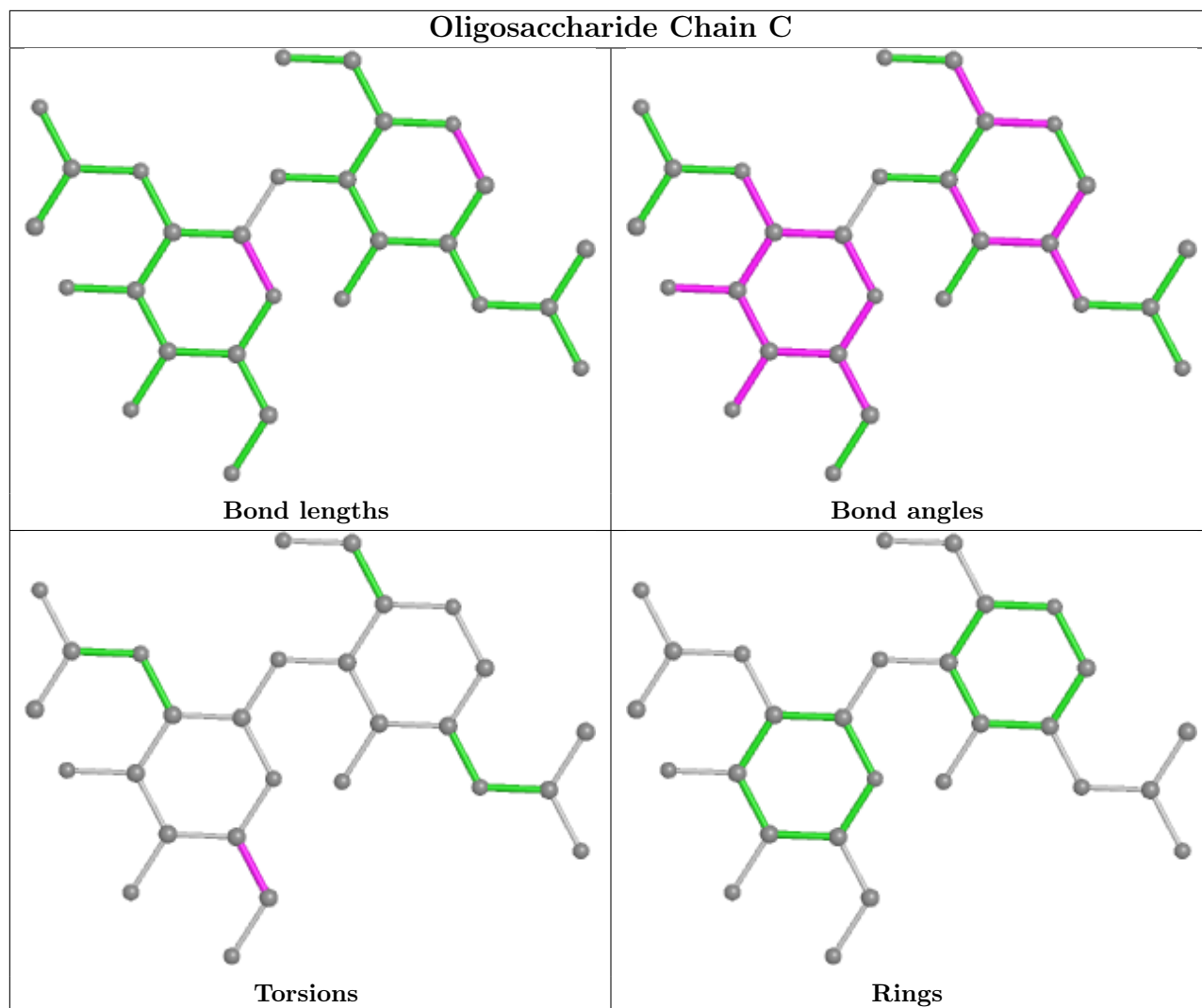
There are no ring outliers.

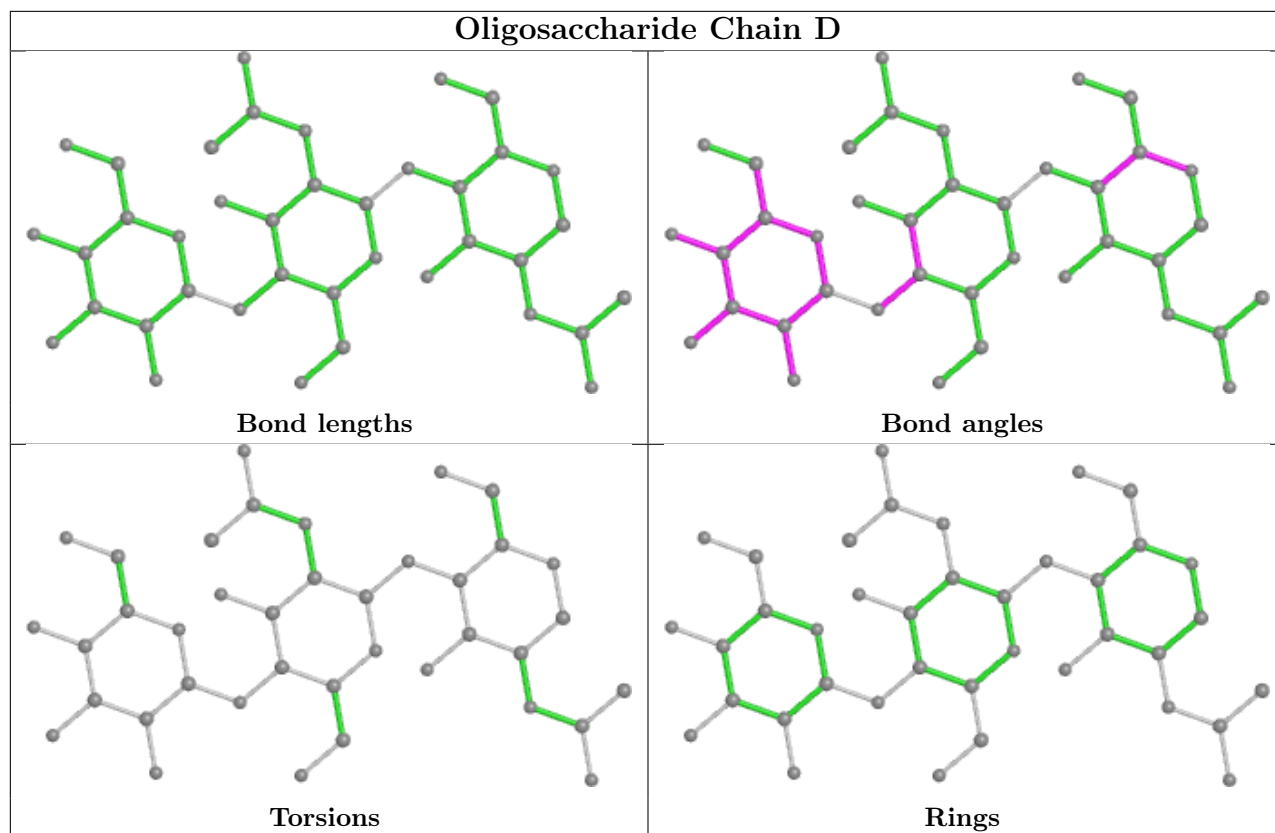
2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	2	NAG	4	0
2	B	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](#)

4 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	A	912	1	14,14,15	0.92	0	17,19,21	1.54	3 (17%)
5	M0A	A	901	-	26,30,30	1.33	5 (19%)	33,42,42	1.78	6 (18%)
6	NAG	A	913	1	14,14,15	0.83	0	17,19,21	2.01	3 (17%)
6	NAG	A	906	1	14,14,15	1.36	1 (7%)	17,19,21	3.07	7 (41%)

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	A	912	1	-	0/6/23/26	0/1/1/1
5	M0A	A	901	-	-	3/10/10/10	0/4/4/4
6	NAG	A	913	1	-	2/6/23/26	0/1/1/1
6	NAG	A	906	1	-	0/6/23/26	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	906	NAG	C1-C2	4.52	1.59	1.52
5	A	901	M0A	CAS-CAT	3.60	1.60	1.51
5	A	901	M0A	CAC-CAA	-2.43	1.37	1.41
5	A	901	M0A	CAG-CAH	-2.40	1.34	1.43
5	A	901	M0A	CAU-CAW	2.31	1.43	1.39
5	A	901	M0A	CAU-CAT	2.01	1.42	1.39

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	906	NAG	C1-O5-C5	9.21	124.67	112.19
6	A	906	NAG	O5-C1-C2	-5.40	102.77	111.29
5	A	901	M0A	CAT-CAS-NAM	-5.33	104.34	112.63
6	A	913	NAG	O5-C1-C2	-5.30	102.93	111.29
6	A	913	NAG	O3-C3-C4	-4.06	100.96	110.35
5	A	901	M0A	CAS-CAT-CAU	4.03	126.50	120.25
6	A	912	NAG	C1-C2-N2	-3.38	104.72	110.49
5	A	901	M0A	CAJ-CAB-CAA	-3.23	117.19	119.65
6	A	906	NAG	C6-C5-C4	-3.13	105.67	113.00
6	A	912	NAG	O4-C4-C3	-3.13	103.11	110.35
6	A	913	NAG	C1-O5-C5	3.06	116.34	112.19
5	A	901	M0A	CAV-CAT-CAU	-2.97	114.38	118.54
6	A	906	NAG	O3-C3-C4	-2.90	103.66	110.35
6	A	906	NAG	C1-C2-N2	2.87	115.38	110.49
6	A	906	NAG	O5-C5-C6	2.65	111.36	107.20
5	A	901	M0A	CAH-CAG-NAR	-2.42	116.68	120.35
5	A	901	M0A	CAD-CAB-CAA	2.35	120.97	117.55
6	A	906	NAG	O7-C7-C8	-2.30	117.79	122.06
6	A	912	NAG	O3-C3-C4	-2.03	105.65	110.35

There are no chirality outliers.

All (5) torsion outliers are listed below:

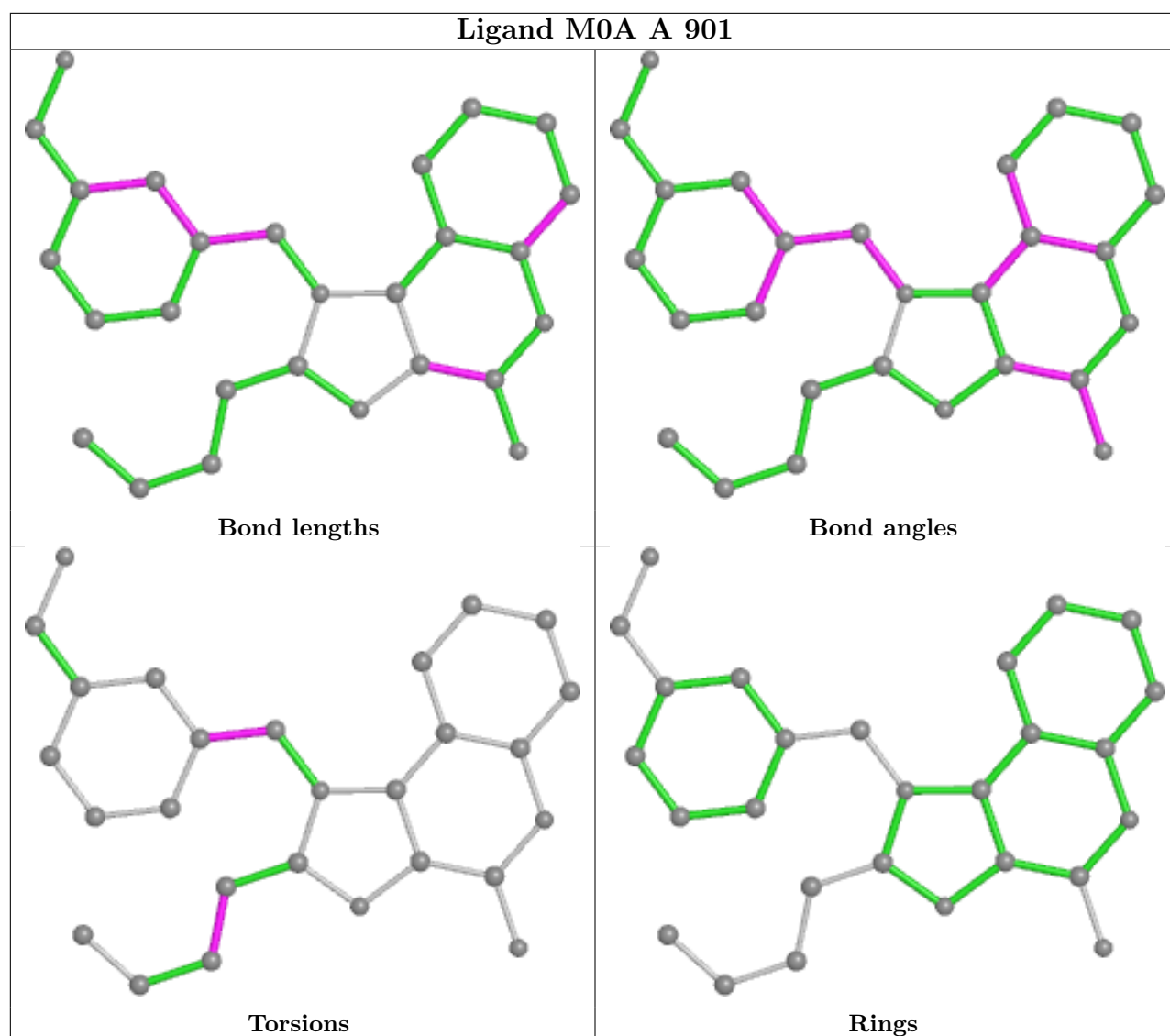
Mol	Chain	Res	Type	Atoms
5	A	901	M0A	CAL-CAN-CAO-CAP
6	A	913	NAG	O5-C5-C6-O6
6	A	913	NAG	C4-C5-C6-O6
5	A	901	M0A	NAM-CAS-CAT-CAU
5	A	901	M0A	NAM-CAS-CAT-CAV

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	901	M0A	2	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

### 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	748/811 (92%)	0.27	63 (8%) <b>11</b> <b>14</b>	29, 47, 77, 108	0

All (63) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	100	VAL	6.2
1	A	123	ASN	4.7
1	A	374	LEU	4.7
1	A	758	THR	4.4
1	A	470	PHE	4.2
1	A	64	TYR	4.1
1	A	761	THR	3.7
1	A	535	LEU	3.6
1	A	186	VAL	3.3
1	A	646	LEU	3.3
1	A	759	LYS	3.3
1	A	177	LEU	3.3
1	A	229	LEU	3.3
1	A	39	LYS	3.2
1	A	153	LEU	3.2
1	A	30	SER	3.2
1	A	559	LEU	3.2
1	A	132	LEU	3.1
1	A	273	GLY	3.1
1	A	206	LEU	3.1
1	A	253	LEU	3.1
1	A	38	LYS	3.0
1	A	122	LEU	3.0
1	A	188	GLU	3.0
1	A	130	LEU	3.0
1	A	344	LEU	3.0
1	A	591	LEU	2.9

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	A	271	ASP	2.8
1	A	644	LEU	2.8
1	A	251	LEU	2.8
1	A	615	PHE	2.8
1	A	778	CYS	2.8
1	A	175	LEU	2.8
1	A	510	LEU	2.7
1	A	227	LEU	2.7
1	A	671	ILE	2.6
1	A	512	LEU	2.6
1	A	372	LEU	2.6
1	A	634	ILE	2.6
1	A	760	THR	2.6
1	A	613	LEU	2.5
1	A	425	LEU	2.5
1	A	756	LEU	2.5
1	A	63	LYS	2.5
1	A	294	LEU	2.4
1	A	488	LEU	2.3
1	A	151	LEU	2.3
1	A	401	LEU	2.3
1	A	635	PHE	2.3
1	A	99	ASN	2.3
1	A	208	LEU	2.3
1	A	537	LEU	2.2
1	A	318	LEU	2.2
1	A	561	LEU	2.2
1	A	40	GLN	2.2
1	A	92	ILE	2.2
1	A	170	ILE	2.2
1	A	270	CYS	2.1
1	A	342	LEU	2.1
1	A	94	LEU	2.1
1	A	589	LEU	2.1
1	A	741	LEU	2.1
1	A	84	GLN	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [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.

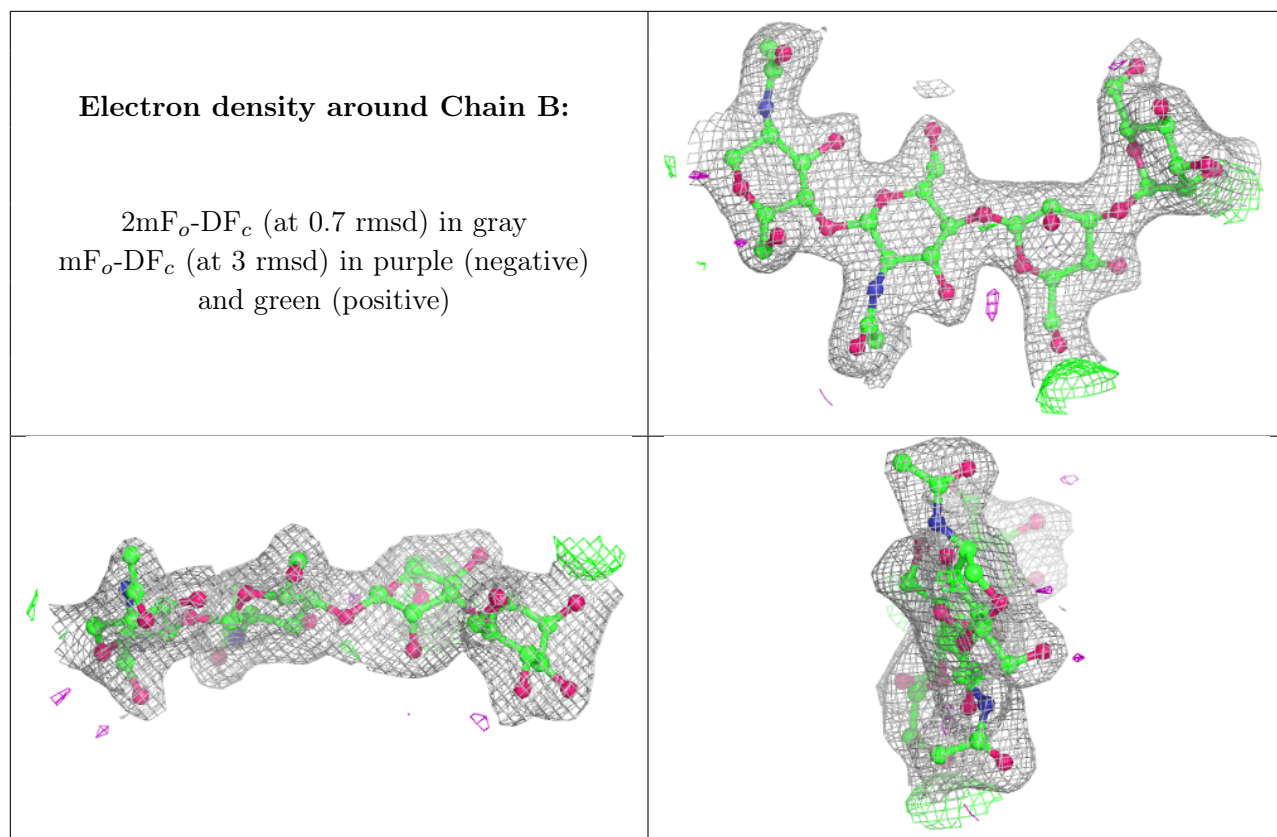
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	NAG	A	913	14/15	0.87	0.23	57,65,75,77	0
2	MAN	B	4	11/12	0.88	0.29	52,60,62,64	0
3	NAG	C	2	14/15	0.93	0.18	48,57,69,73	0
6	NAG	A	912	14/15	0.94	0.12	42,52,58,61	0
3	NAG	C	1	14/15	0.95	0.09	34,36,40,45	0
4	NAG	D	2	14/15	0.95	0.13	36,40,48,50	0
6	NAG	A	906	14/15	0.96	0.18	54,59,65,74	0
2	NAG	B	2	14/15	0.96	0.08	32,40,48,57	0
2	NAG	B	1	14/15	0.96	0.09	34,40,43,46	0
4	NAG	D	1	14/15	0.97	0.07	28,34,37,37	0

### 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.

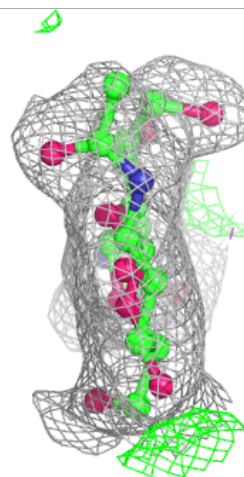
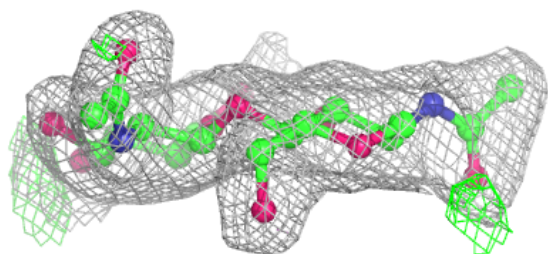
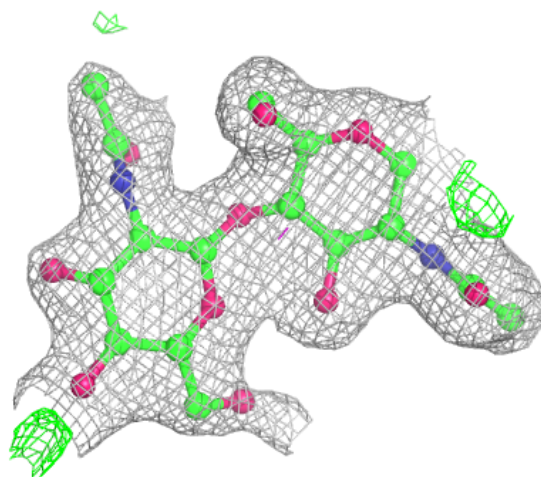
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	MAN	B	4	11/12	0.88	0.29	52,60,62,64	0
2	BMA	B	3	11/12	0.89	0.20	56,61,63,64	0
3	NAG	C	2	14/15	0.93	0.18	48,57,69,73	0
4	BMA	D	3	11/12	0.93	0.24	53,60,67,67	0
4	NAG	D	2	14/15	0.95	0.13	36,40,48,50	0
3	NAG	C	1	14/15	0.95	0.09	34,36,40,45	0
2	NAG	B	1	14/15	0.96	0.09	34,40,43,46	0
2	NAG	B	2	14/15	0.96	0.08	32,40,48,57	0
4	NAG	D	1	14/15	0.97	0.07	28,34,37,37	0

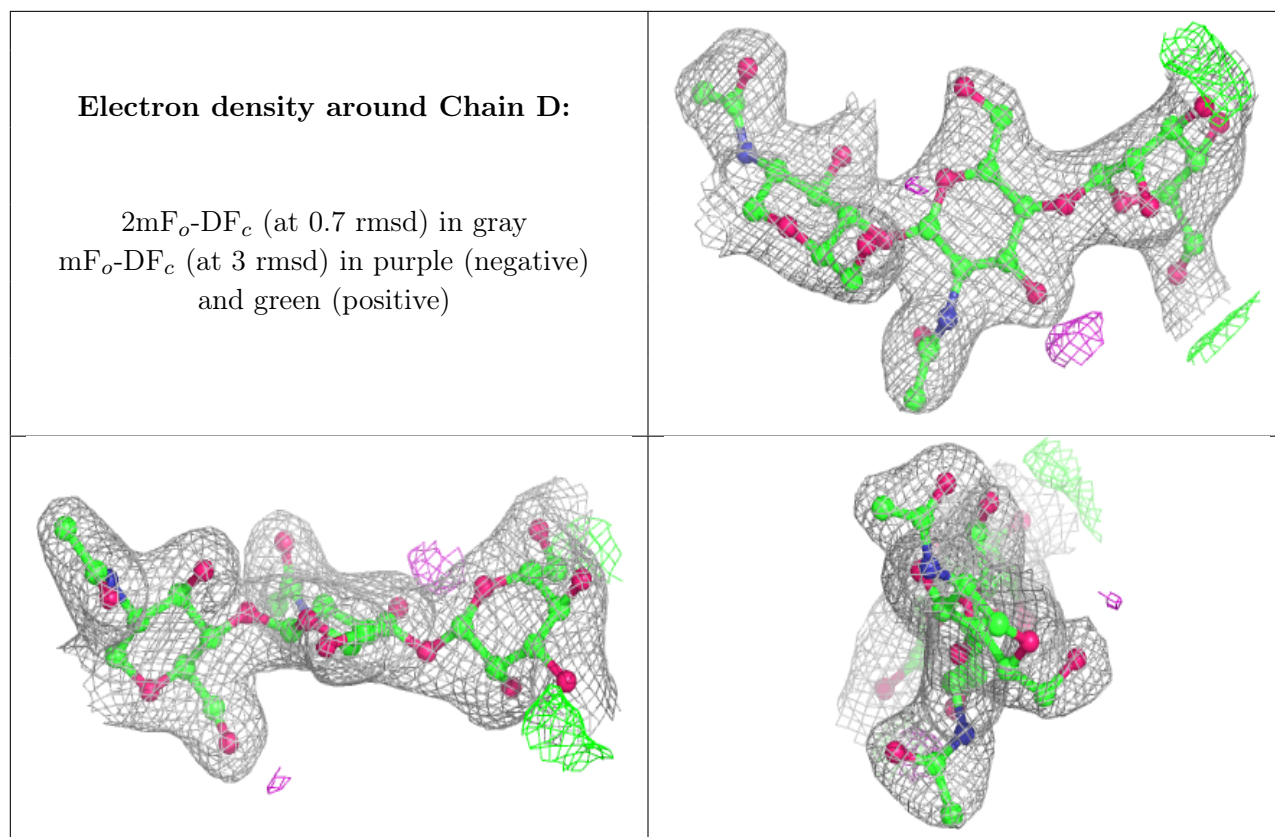
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



**Electron density around Chain C:**

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



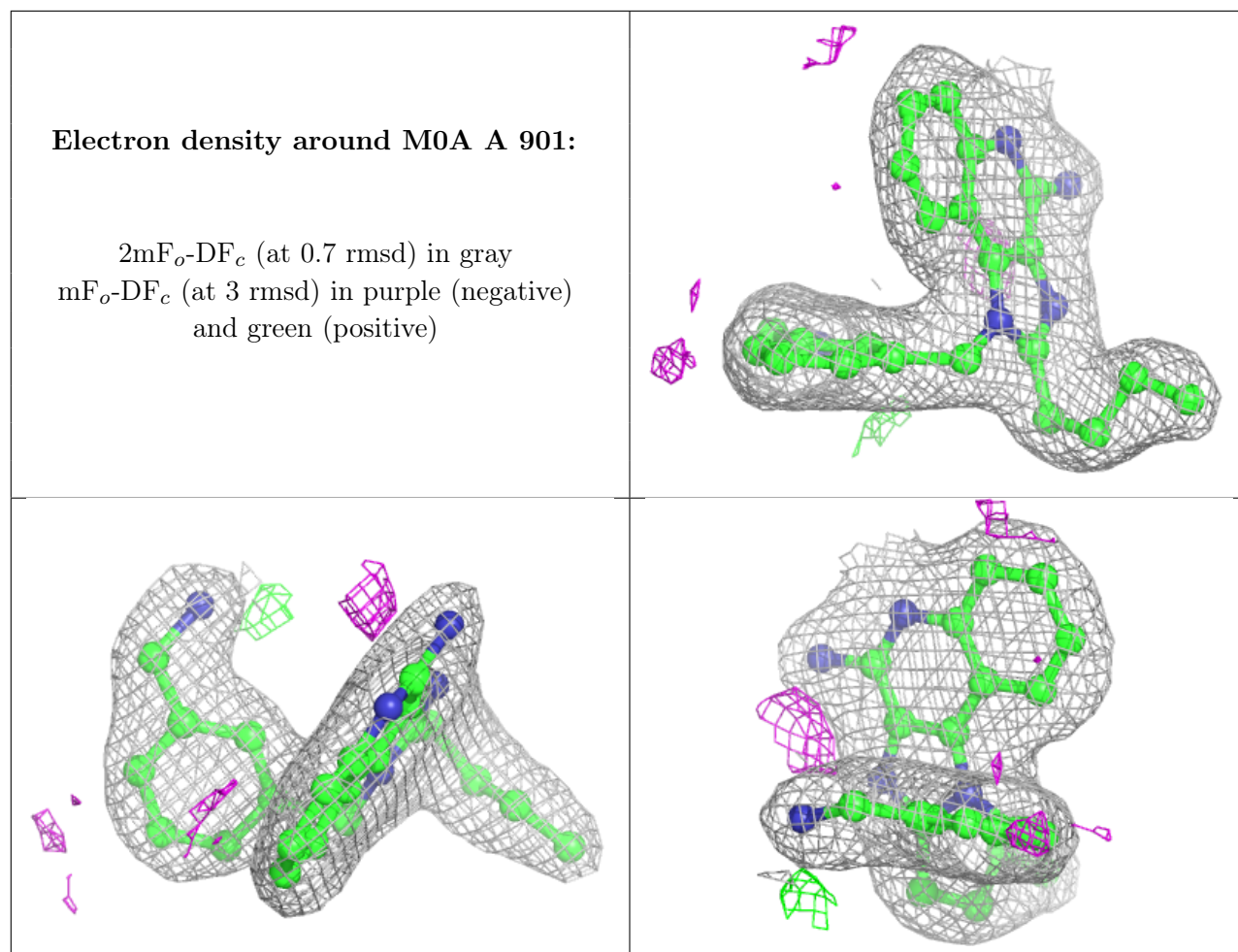


## 6.4 Ligands [i](#)

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	A	913	14/15	0.87	0.23	57,65,75,77	0
6	NAG	A	912	14/15	0.94	0.12	42,52,58,61	0
5	MOA	A	901	27/27	0.96	0.10	29,36,42,47	0
6	NAG	A	906	14/15	0.96	0.18	54,59,65,74	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.