



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 06:57 AM UTC

PDB ID : 7YTX / pdb_00007ytx
Title : Crystal structure of TLR8 in complex with its antagonist
Authors : Shimizu, T.; Sakaniwa, K.
Deposited on : 2022-08-16
Resolution : 2.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

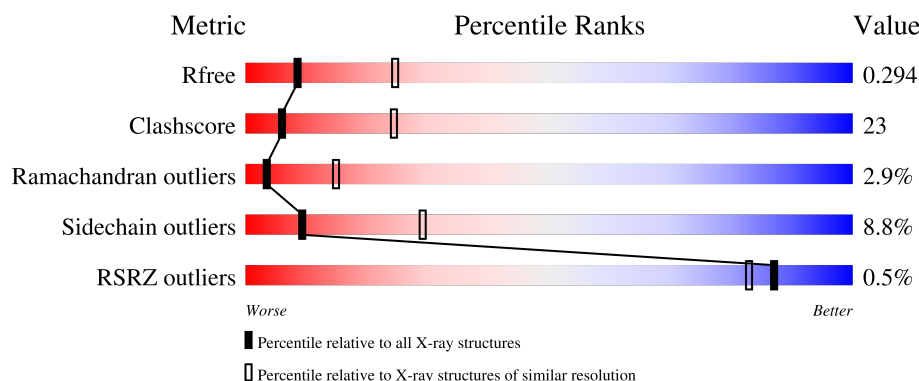
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 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	
1	B	811	
2	C	6	
3	D	2	
3	H	2	

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Mol	Chain	Length	Quality of chain
4	E	7	
4	I	7	
5	G	3	

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	BMA	E	3	-	X	X	-
4	MAN	E	5	-	X	-	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 12732 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.

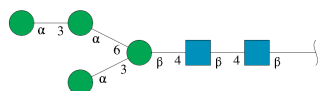
- Molecule 1 is a protein called Toll-like receptor 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	749	Total	C	N	O	S	0	1	0
			6038	3861	1029	1129	19			
1	B	750	Total	C	N	O	S	0	2	0
			6053	3870	1032	1132	19			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	23	ARG	-	expression tag	UNP Q9NR97
A	24	SER	-	expression tag	UNP Q9NR97
A	25	PRO	-	expression tag	UNP Q9NR97
A	26	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
B	23	ARG	-	expression tag	UNP Q9NR97
B	24	SER	-	expression tag	UNP Q9NR97
B	25	PRO	-	expression tag	UNP Q9NR97
B	26	TRP	-	expression tag	UNP Q9NR97
B	828	GLU	-	expression tag	UNP Q9NR97
B	829	PHE	-	expression tag	UNP Q9NR97
B	830	LEU	-	expression tag	UNP Q9NR97
B	831	VAL	-	expression tag	UNP Q9NR97
B	832	PRO	-	expression tag	UNP Q9NR97
B	833	ARG	-	expression tag	UNP Q9NR97

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[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.



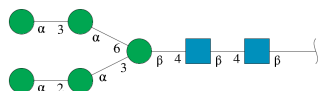
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	6	Total	C	N	O	0	0	0
			72	40	2	30			

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



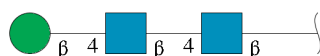
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	H	2	Total	C	N	O	0	0	0
			28	16	2	10			

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



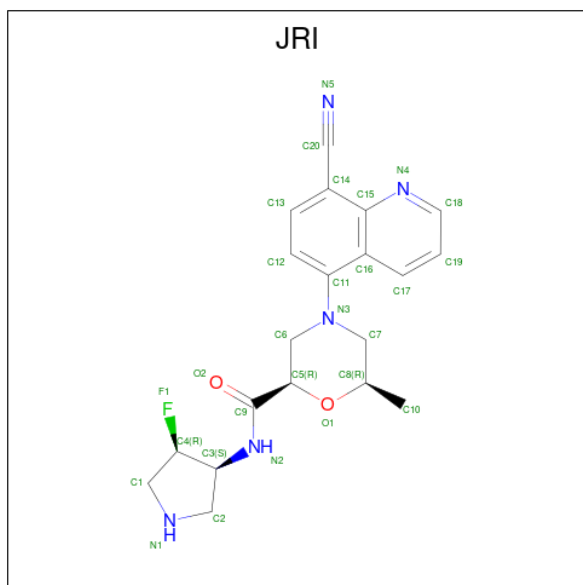
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	7	Total	C	N	O	0	0	0
			83	46	2	35			
4	I	7	Total	C	N	O	0	0	0
			83	46	2	35			

- Molecule 5 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
5	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 6 is (2R,6R)-4-(8-cyanoquinolin-5-yl)-N-[(3S,4R)-4-fluoranylpyrrolidin-3-yl]-6-methyl-morpholine-2-carboxamide (CCD ID: JRI) (formula: C₂₀H₂₂FN₅O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	F	N	O	
			28	20	1	5	2	0
6	B	1	Total	C	F	N	O	
			28	20	1	5	2	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

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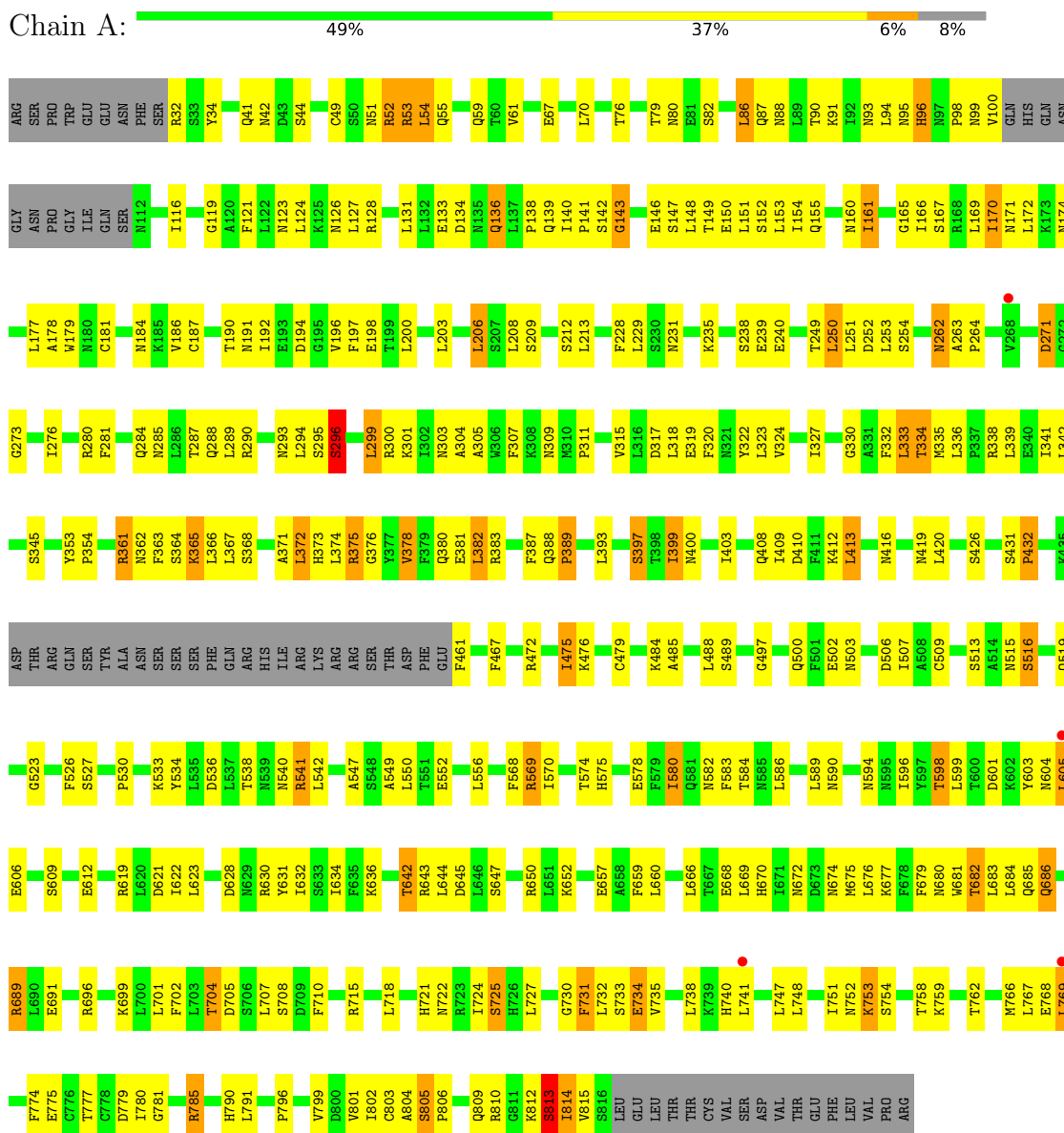
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	C	N	O	0	0
			14	8	1	5		
7	B	1	Total	C	N	O	0	0
			14	8	1	5		
7	B	1	Total	C	N	O	0	0
			14	8	1	5		
7	B	1	Total	C	N	O	0	0
			14	8	1	5		

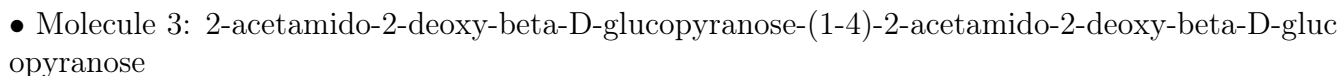
3 Residue-property plots

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 1: Toll-like receptor 8



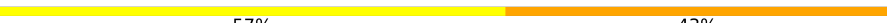
NAG1
NAG2

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

Chain H:  50% 50%

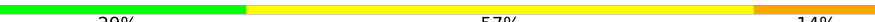
NAG1
NAG2

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

Chain E:  57% 43%

NAG1
NAG2
BMA3
MAN4
MAN5
MAN6
MAN7

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

Chain I:  29% 57% 14%

NAG1
NAG2
BMA3
MAN4
MAN5
MAN6
MAN7

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

Chain G:  100%

NAG1
NAG2
BMA3

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	145.64Å 97.57Å 143.81Å 90.00° 104.95° 90.00°	Depositor
Resolution (Å)	43.35 – 2.90 43.35 – 2.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (43.35-2.90) 100.0 (43.35-2.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.99 (at 2.65Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.220 , 0.296 0.221 , 0.294	Depositor DCC
R_{free} test set	2912 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	61.0	Xtriage
Anisotropy	0.450	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 57.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.41$, $\langle L^2 \rangle = 0.23$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	12732	wwPDB-VP
Average B, all atoms (Å ²)	88.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.17% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: JRI, MAN, NAG, BMA

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	0.58	0/6165	1.17	12/8360 (0.1%)
1	B	0.59	2/6182 (0.0%)	1.20	17/8382 (0.2%)
All	All	0.58	2/12347 (0.0%)	1.19	29/16742 (0.2%)

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	13
1	B	0	12
All	All	0	25

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	356	HIS	CE1-NE2	5.86	1.38	1.32
1	B	575	HIS	CE1-NE2	5.32	1.37	1.32

The worst 5 of 29 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	416	ASN	CB-CA-C	-7.49	102.01	111.22
1	A	123	ASN	CB-CA-C	-6.67	100.36	110.90
1	B	283	PHE	CB-CA-C	-6.25	101.41	111.28
1	A	324	VAL	CA-C-N	5.97	126.45	119.94
1	A	324	VAL	C-N-CA	5.97	126.45	119.94

There are no chirality outliers.

5 of 25 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	128	ARG	Sidechain
1	A	32	ARG	Sidechain
1	A	361	ARG	Sidechain
1	A	52	ARG	Sidechain
1	A	53	ARG	Sidechain

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	6038	0	6036	250	0
1	B	6053	0	6050	312	0
2	C	72	0	61	1	0
3	D	28	0	25	2	0
3	H	28	0	25	0	0
4	E	83	0	55	8	0
4	I	83	0	70	5	0
5	G	39	0	31	4	0
6	A	28	0	0	1	0
6	B	28	0	0	1	0
7	A	126	0	117	1	0
7	B	126	0	117	1	0
All	All	12732	0	12587	575	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 23.

The worst 5 of 575 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)
4:E:3:BMA:C5	4:E:3:BMA:C6	1.75	1.60
4:E:3:BMA:C5	4:E:3:BMA:O5	1.64	1.45
4:E:5:MAN:O5	4:E:5:MAN:C5	1.74	1.36
1:B:708:SER:HA	1:B:734:GLU:HB2	1.21	1.14
5:G:3:BMA:O6	5:G:3:BMA:C6	1.97	1.12

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	744/811 (92%)	599 (80%)	126 (17%)	19 (3%)	4	17
1	B	744/811 (92%)	601 (81%)	118 (16%)	25 (3%)	3	12
All	All	1488/1622 (92%)	1200 (81%)	244 (16%)	44 (3%)	3	14

5 of 44 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	569[A]	ARG
1	A	569[B]	ARG
1	A	606	GLU
1	B	58	PRO
1	B	170	ILE

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	697/755 (92%)	637 (91%)	60 (9%)	10	30
1	B	699/755 (93%)	637 (91%)	62 (9%)	9	28
All	All	1396/1510 (92%)	1274 (91%)	122 (9%)	9	30

5 of 122 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	769	LEU
1	B	731	PHE
1	B	191	ASN
1	B	727	LEU
1	B	808	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	135	ASN
1	B	686	GLN
1	B	184	ASN
1	B	564	ASN
1	B	157	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

27 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	C	1	1,2	14,14,15	0.53	0	17,19,21	1.09	2 (11%)
2	NAG	C	2	2	14,14,15	0.48	0	17,19,21	0.73	0
2	BMA	C	3	2	11,11,12	0.60	0	15,15,17	0.96	1 (6%)
2	MAN	C	4	2	11,11,12	0.75	0	15,15,17	1.43	3 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	MAN	C	5	2	11,11,12	0.55	0	15,15,17	1.06	1 (6%)
2	MAN	C	6	2	11,11,12	0.55	0	15,15,17	0.56	0
3	NAG	D	1	1,3	14,14,15	0.58	0	17,19,21	1.27	2 (11%)
3	NAG	D	2	3	14,14,15	0.49	0	17,19,21	1.29	2 (11%)
4	NAG	E	1	1,4	14,14,15	5.28	7 (50%)	17,19,21	2.87	10 (58%)
4	NAG	E	2	4	14,14,15	5.46	9 (64%)	17,19,21	4.14	9 (52%)
4	BMA	E	3	4	11,11,12	11.51	11 (100%)	15,15,17	4.81	8 (53%)
4	MAN	E	4	4	11,11,12	3.36	6 (54%)	15,15,17	8.34	8 (53%)
4	MAN	E	5	4	11,11,12	7.05	10 (90%)	15,15,17	5.63	11 (73%)
4	MAN	E	6	4	11,11,12	5.81	6 (54%)	15,15,17	3.43	9 (60%)
4	MAN	E	7	4	11,11,12	4.07	7 (63%)	15,15,17	3.50	7 (46%)
5	NAG	G	1	1,5	14,14,15	3.21	7 (50%)	17,19,21	3.91	12 (70%)
5	NAG	G	2	5	14,14,15	4.79	6 (42%)	17,19,21	3.75	7 (41%)
5	BMA	G	3	5	11,11,12	5.82	8 (72%)	15,15,17	5.02	8 (53%)
3	NAG	H	1	1,3	14,14,15	0.62	0	17,19,21	1.52	3 (17%)
3	NAG	H	2	3	14,14,15	0.42	0	17,19,21	0.89	0
4	NAG	I	1	1,4	14,14,15	0.52	0	17,19,21	1.21	2 (11%)
4	NAG	I	2	4	14,14,15	0.42	0	17,19,21	0.64	0
4	BMA	I	3	4	11,11,12	0.51	0	15,15,17	1.08	1 (6%)
4	MAN	I	4	4	11,11,12	0.63	0	15,15,17	0.61	0
4	MAN	I	5	4	11,11,12	0.60	0	15,15,17	1.18	1 (6%)
4	MAN	I	6	4	11,11,12	0.64	0	15,15,17	0.87	0
4	MAN	I	7	4	11,11,12	0.71	0	15,15,17	0.94	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	C	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
2	BMA	C	3	2	-	0/2/19/22	0/1/1/1
2	MAN	C	4	2	-	1/2/19/22	0/1/1/1
2	MAN	C	5	2	-	2/2/19/22	1/1/1/1
2	MAN	C	6	2	-	2/2/19/22	0/1/1/1
3	NAG	D	1	1,3	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	D	2	3	-	2/6/23/26	0/1/1/1
4	NAG	E	1	1,4	-	4/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
4	BMA	E	3	4	-	0/2/19/22	0/1/1/1
4	MAN	E	4	4	-	2/2/19/22	0/1/1/1
4	MAN	E	5	4	-	2/2/19/22	0/1/1/1
4	MAN	E	6	4	-	2/2/19/22	0/1/1/1
4	MAN	E	7	4	-	0/2/19/22	1/1/1/1
5	NAG	G	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	G	2	5	-	4/6/23/26	0/1/1/1
5	BMA	G	3	5	-	0/2/19/22	0/1/1/1
3	NAG	H	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	H	2	3	-	2/6/23/26	0/1/1/1
4	NAG	I	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	I	2	4	-	3/6/23/26	0/1/1/1
4	BMA	I	3	4	-	0/2/19/22	0/1/1/1
4	MAN	I	4	4	-	2/2/19/22	0/1/1/1
4	MAN	I	5	4	-	0/2/19/22	0/1/1/1
4	MAN	I	6	4	-	2/2/19/22	0/1/1/1
4	MAN	I	7	4	-	0/2/19/22	1/1/1/1

The worst 5 of 77 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	3	BMA	O2-C2	-26.18	0.88	1.43
4	E	2	NAG	O5-C1	-17.90	1.13	1.43
4	E	3	BMA	O5-C1	-16.60	1.15	1.43
4	E	1	NAG	C1-C2	-15.79	1.30	1.52
4	E	5	MAN	O5-C5	15.73	1.74	1.43

The worst 5 of 108 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	4	MAN	C1-O5-C5	28.15	149.92	112.19
5	G	3	BMA	C1-O5-C5	14.20	131.22	112.19
4	E	5	MAN	C1-O5-C5	13.83	130.72	112.19
4	E	2	NAG	C1-O5-C5	-13.06	94.69	112.19
4	E	5	MAN	C1-C2-C3	12.04	127.18	109.64

There are no chirality outliers.

5 of 44 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	1	NAG	C8-C7-N2-C2
4	E	1	NAG	O7-C7-N2-C2
4	I	1	NAG	C8-C7-N2-C2
4	I	1	NAG	O7-C7-N2-C2
4	I	2	NAG	C8-C7-N2-C2

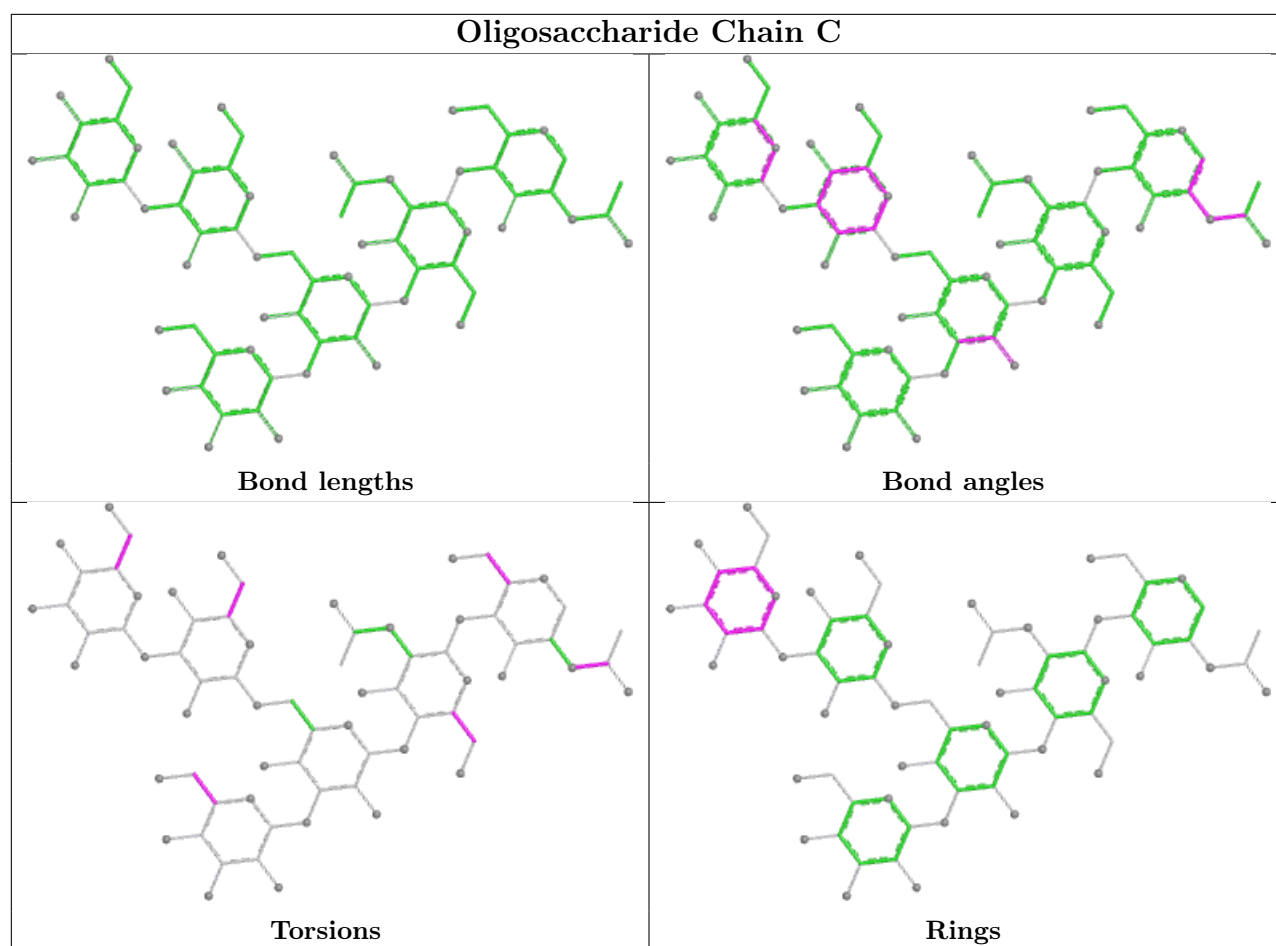
All (3) ring outliers are listed below:

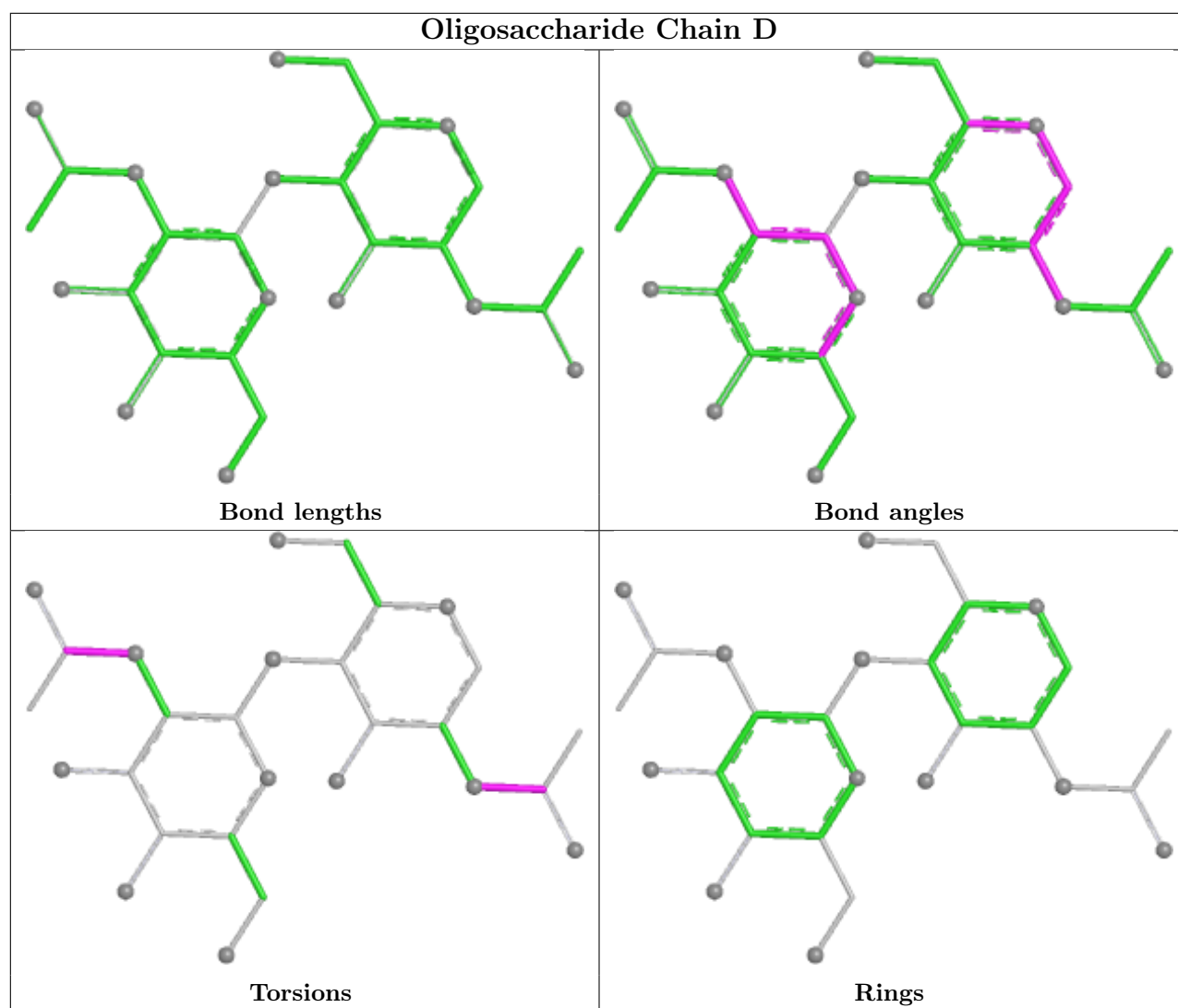
Mol	Chain	Res	Type	Atoms
4	E	7	MAN	C1-C2-C3-C4-C5-O5
4	I	7	MAN	C1-C2-C3-C4-C5-O5
2	C	5	MAN	C1-C2-C3-C4-C5-O5

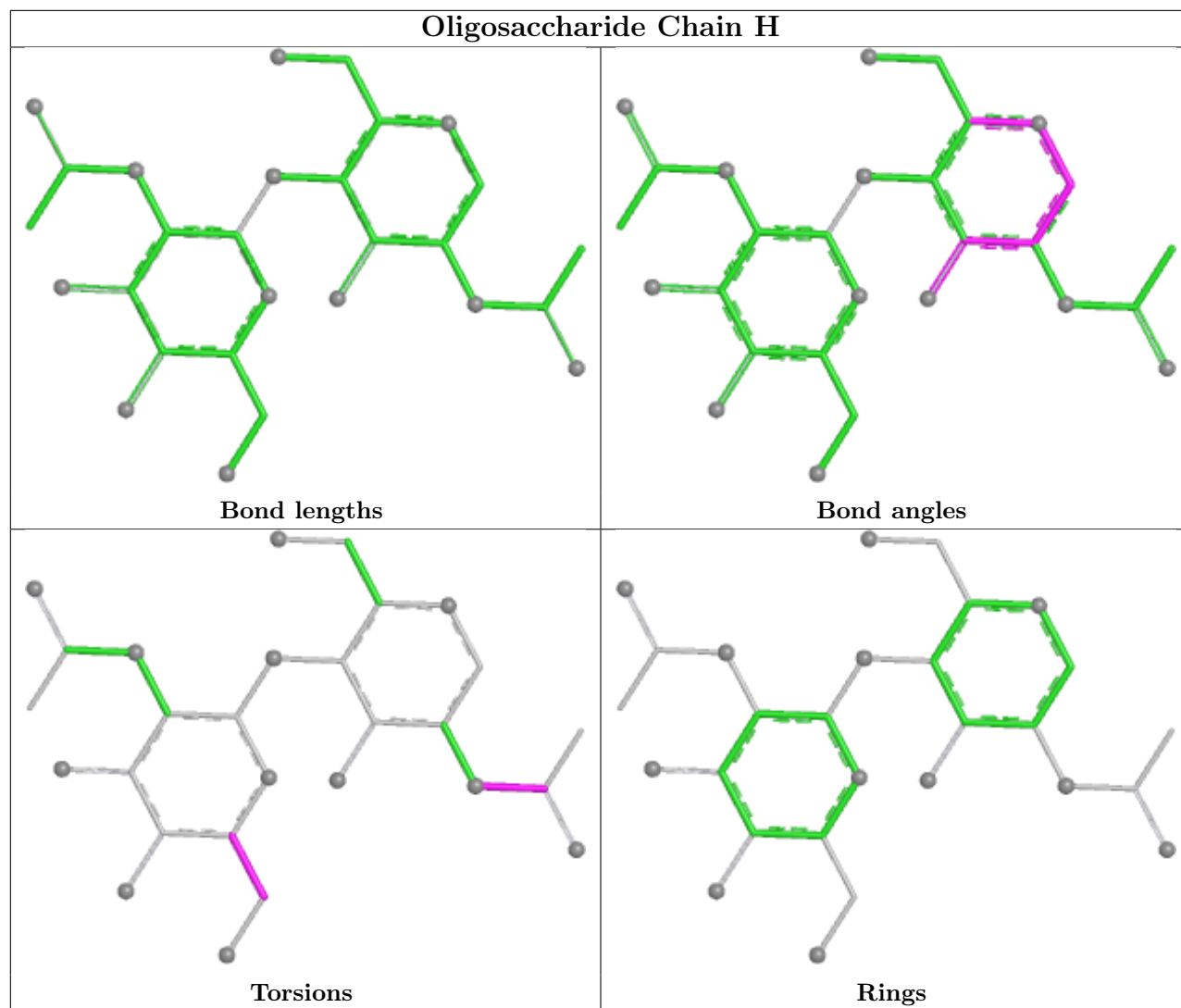
11 monomers are involved in 20 short contacts:

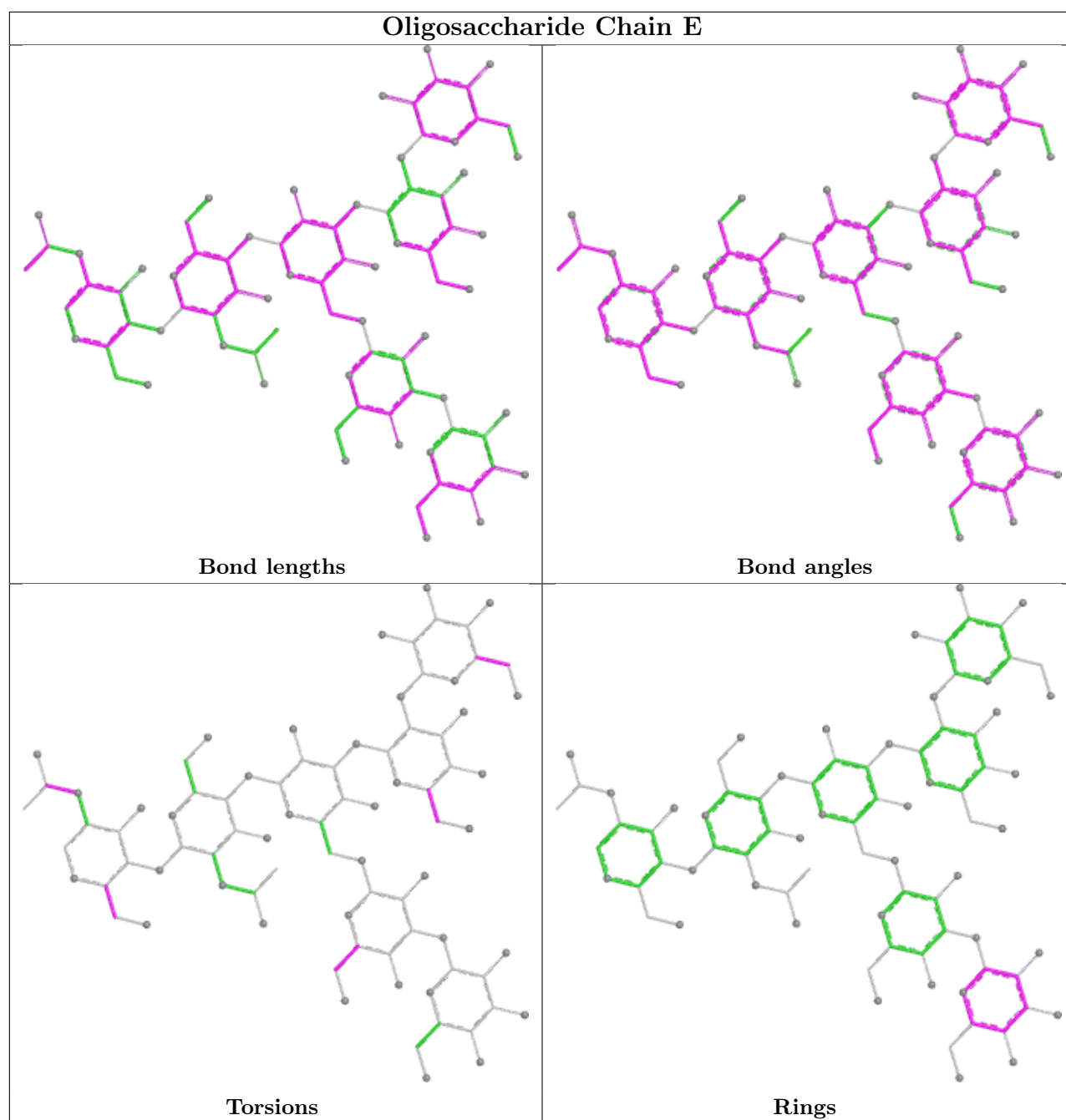
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	G	3	BMA	1	0
4	E	3	BMA	6	0
5	G	1	NAG	3	0
3	D	1	NAG	2	0
4	E	1	NAG	1	0
3	D	2	NAG	1	0
4	I	1	NAG	1	0
4	I	2	NAG	5	0
2	C	1	NAG	1	0
4	E	5	MAN	1	0
5	G	2	NAG	3	0

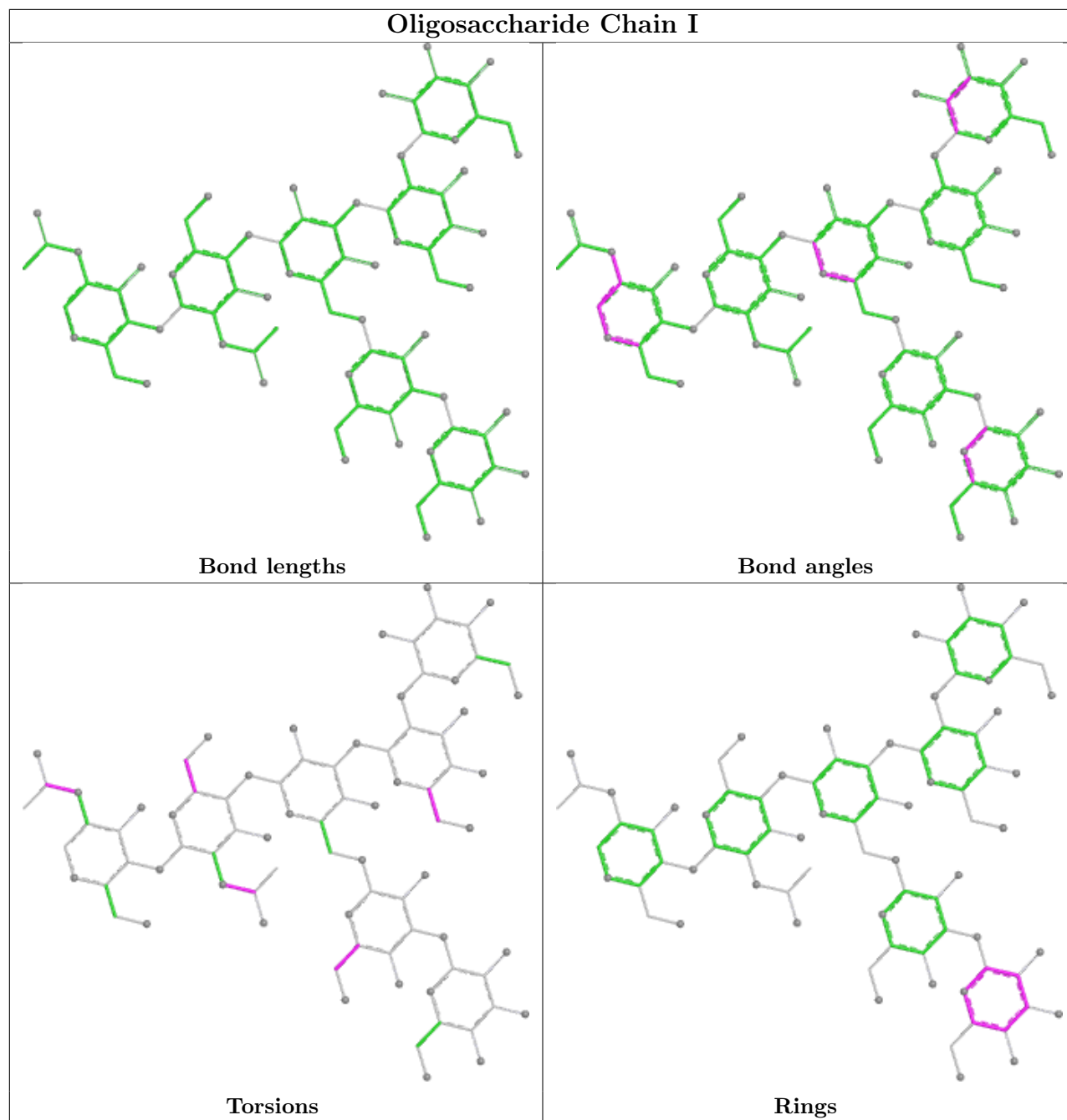
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

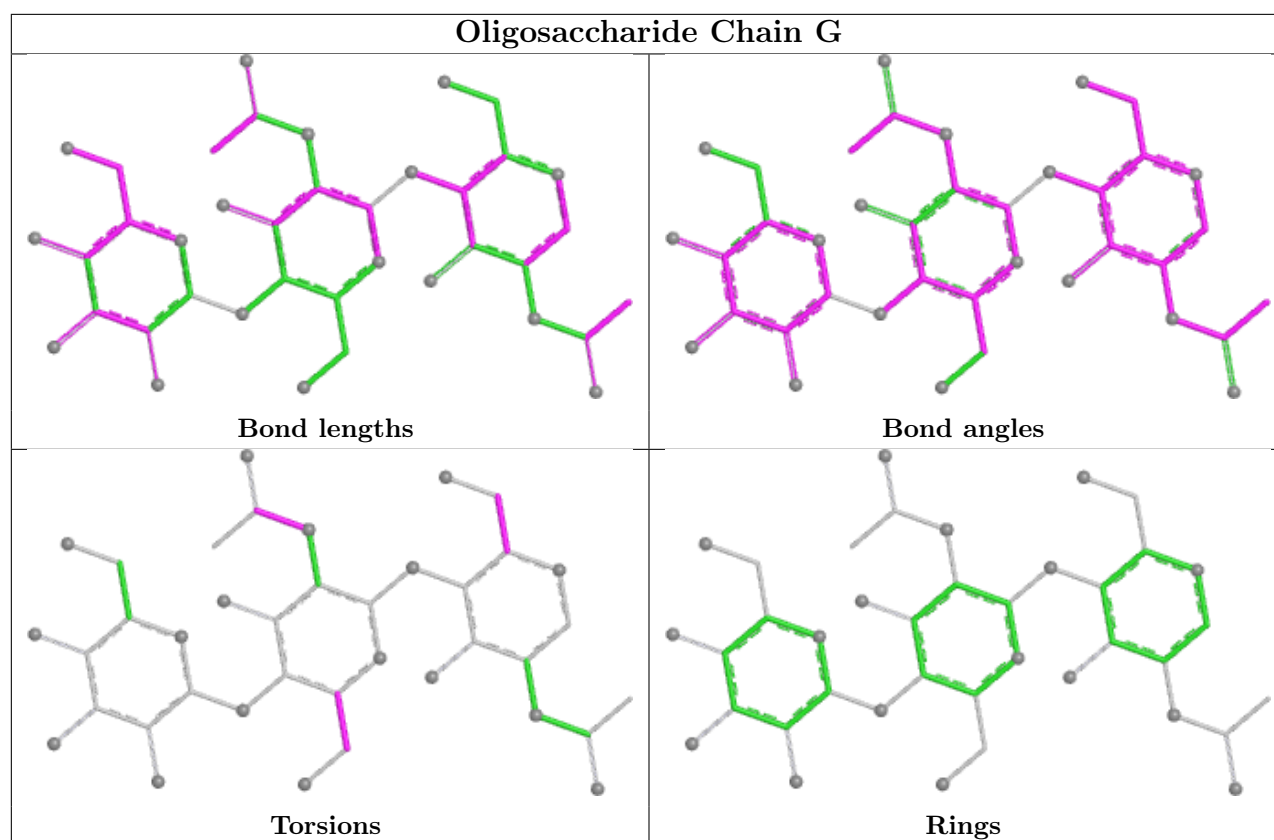












5.6 Ligand geometry [i](#)

20 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	$\# Z > 2$
7	NAG	B	904	1	14,14,15	0.42	0	17,19,21	1.36	3 (17%)
7	NAG	A	903	1	14,14,15	0.44	0	17,19,21	0.88	1 (5%)
7	NAG	A	908	1	14,14,15	0.57	0	17,19,21	1.39	2 (11%)
7	NAG	B	910	1	14,14,15	0.51	0	17,19,21	1.93	4 (23%)
7	NAG	A	902	1	14,14,15	0.48	0	17,19,21	1.13	3 (17%)
7	NAG	A	904	1	14,14,15	0.44	0	17,19,21	0.98	1 (5%)
7	NAG	A	905	1	14,14,15	0.45	0	17,19,21	2.42	3 (17%)
7	NAG	A	910	1	14,14,15	0.45	0	17,19,21	1.49	3 (17%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	NAG	B	905	1	14,14,15	0.46	0	17,19,21	1.07	2 (11%)
7	NAG	B	911	1	14,14,15	0.46	0	17,19,21	0.87	1 (5%)
7	NAG	A	907	1	14,14,15	0.37	0	17,19,21	1.53	3 (17%)
6	JRI	A	901	-	30,31,31	0.43	0	32,44,44	0.87	0
7	NAG	A	906	1	14,14,15	0.42	0	17,19,21	1.78	3 (17%)
7	NAG	B	908	1	14,14,15	0.68	1 (7%)	17,19,21	1.91	2 (11%)
7	NAG	B	907	1	14,14,15	0.45	0	17,19,21	2.02	4 (23%)
7	NAG	A	909	1	14,14,15	0.47	0	17,19,21	1.23	3 (17%)
7	NAG	B	902	1	14,14,15	0.51	0	17,19,21	2.11	3 (17%)
7	NAG	B	909	1	14,14,15	0.49	0	17,19,21	0.96	1 (5%)
7	NAG	B	906	1	14,14,15	0.54	0	17,19,21	1.78	2 (11%)
6	JRI	B	901	-	30,31,31	0.55	0	32,44,44	0.85	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	B	904	1	-	3/6/23/26	0/1/1/1
7	NAG	A	903	1	-	4/6/23/26	0/1/1/1
7	NAG	A	908	1	-	4/6/23/26	0/1/1/1
7	NAG	B	910	1	-	3/6/23/26	0/1/1/1
7	NAG	A	902	1	-	3/6/23/26	0/1/1/1
7	NAG	A	904	1	-	3/6/23/26	0/1/1/1
7	NAG	A	905	1	-	5/6/23/26	0/1/1/1
7	NAG	A	910	1	-	2/6/23/26	0/1/1/1
7	NAG	B	905	1	-	4/6/23/26	0/1/1/1
7	NAG	B	911	1	-	2/6/23/26	0/1/1/1
7	NAG	A	907	1	-	1/6/23/26	0/1/1/1
6	JRI	A	901	-	-	4/14/36/36	0/4/4/4
7	NAG	A	906	1	-	2/6/23/26	0/1/1/1
7	NAG	B	908	1	-	4/6/23/26	0/1/1/1
7	NAG	B	907	1	-	4/6/23/26	0/1/1/1
7	NAG	A	909	1	-	4/6/23/26	0/1/1/1
7	NAG	B	902	1	-	3/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	B	909	1	-	2/6/23/26	0/1/1/1
7	NAG	B	906	1	-	3/6/23/26	0/1/1/1
6	JRI	B	901	-	-	4/14/36/36	0/4/4/4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	908	NAG	C1-C2	2.10	1.55	1.52

The worst 5 of 44 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	905	NAG	C1-C2-N2	7.80	122.73	110.43
7	B	902	NAG	O5-C1-C2	7.06	122.21	111.29
7	B	908	NAG	O5-C1-C2	6.24	120.95	111.29
7	B	910	NAG	O5-C1-C2	6.09	120.72	111.29
7	B	907	NAG	C1-O5-C5	5.66	119.77	112.19

There are no chirality outliers.

5 of 64 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	901	JRI	C2-C3-N2-C9
7	A	902	NAG	C8-C7-N2-C2
7	A	902	NAG	O7-C7-N2-C2
7	A	904	NAG	C8-C7-N2-C2
7	A	905	NAG	C1-C2-N2-C7

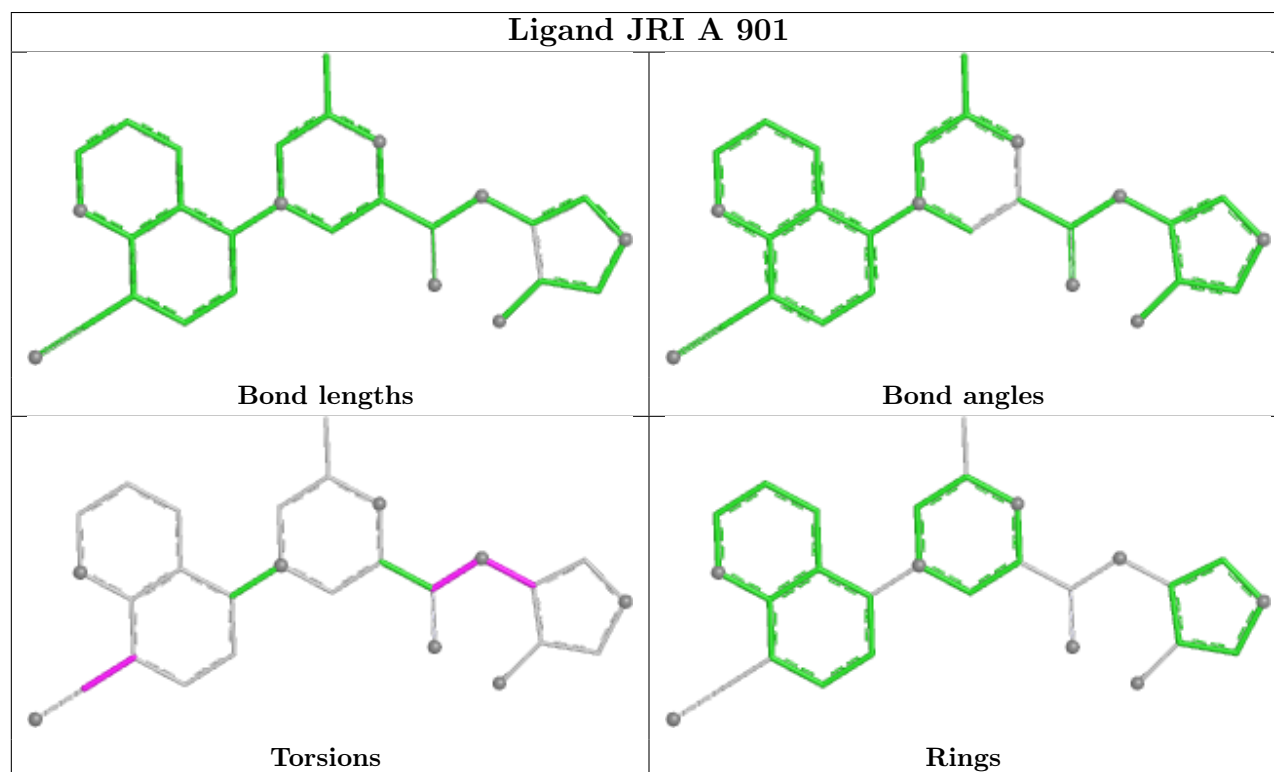
There are no ring outliers.

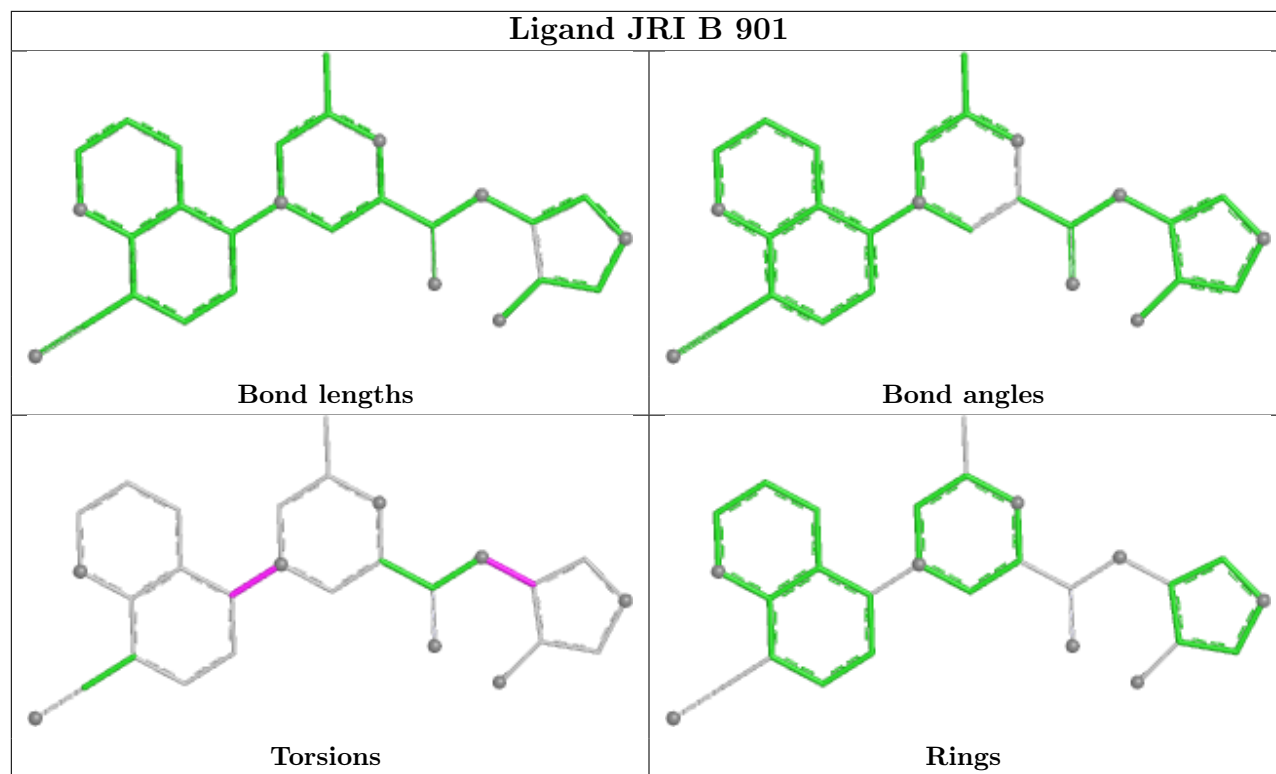
4 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	908	NAG	1	0
6	A	901	JRI	1	0
7	B	909	NAG	1	0
6	B	901	JRI	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 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, 95th 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 ²)	Q<0.9
1	A	749/811 (92%)	-0.37	4 (0%) 87 83	34, 82, 134, 223	1 (0%)
1	B	750/811 (92%)	-0.27	3 (0%) 88 85	28, 86, 131, 170	2 (0%)
All	All	1499/1622 (92%)	-0.32	7 (0%) 87 83	28, 85, 134, 223	3 (0%)

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	605	LEU	3.0
1	A	268	VAL	2.8
1	B	588	VAL	2.8
1	A	769	LEU	2.6
1	A	741	LEU	2.4

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, 95th 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 ²)	Q<0.9
4	MAN	E	5	11/12	0.57	0.08	110,112,114,114	0
2	MAN	C	5	11/12	0.63	0.07	141,154,164,172	0
4	MAN	E	7	11/12	0.69	0.08	117,120,126,126	0
2	MAN	C	6	11/12	0.78	0.07	94,116,123,128	0
4	MAN	E	6	11/12	0.80	0.06	101,104,113,114	0

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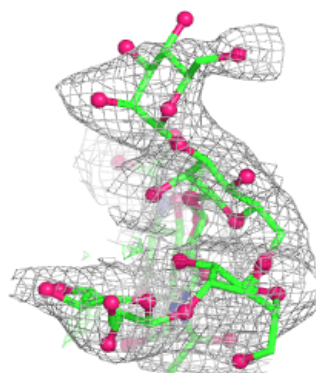
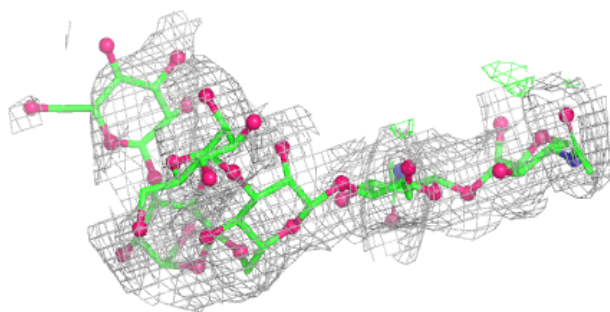
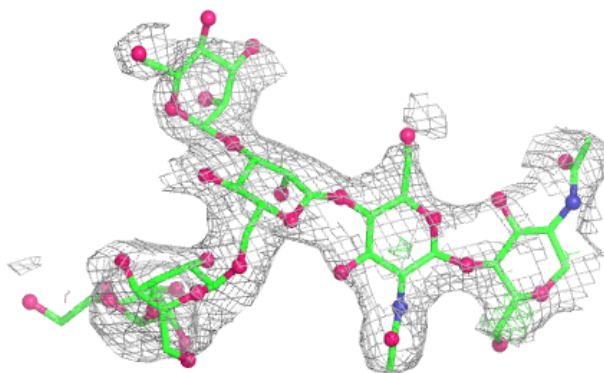
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	MAN	C	4	11/12	0.82	0.07	113,123,129,142	0
4	MAN	E	4	11/12	0.87	0.07	98,101,106,107	0
2	NAG	C	2	14/15	0.91	0.07	53,69,76,80	0
3	NAG	D	2	14/15	0.91	0.07	65,74,81,97	0
2	BMA	C	3	11/12	0.91	0.06	75,97,105,107	0
2	NAG	C	1	14/15	0.93	0.08	65,77,88,98	0
4	BMA	E	3	11/12	0.93	0.06	72,83,95,96	0
5	NAG	G	2	14/15	0.93	0.07	65,77,84,85	0
3	NAG	H	2	14/15	0.94	0.08	57,74,80,82	0
3	NAG	D	1	14/15	0.95	0.07	44,47,49,51	0
4	NAG	E	1	14/15	0.95	0.06	38,42,44,45	0
5	NAG	G	1	14/15	0.96	0.05	59,67,72,72	0
4	NAG	I	1	14/15	-	-	47,50,55,56	0
4	NAG	I	2	14/15	-	-	72,80,85,85	0
4	BMA	I	3	11/12	-	-	87,96,102,107	0
4	MAN	I	4	11/12	-	-	113,123,127,128	0
4	MAN	I	5	11/12	-	-	101,123,128,136	0
4	MAN	I	6	11/12	-	-	111,121,127,128	0
4	MAN	I	7	11/12	-	-	128,134,143,146	0
4	NAG	E	2	14/15	0.96	0.05	49,55,62,63	0
3	NAG	H	1	14/15	0.97	0.06	46,52,54,57	0
5	BMA	G	3	11/12	-	-	87,95,100,106	0

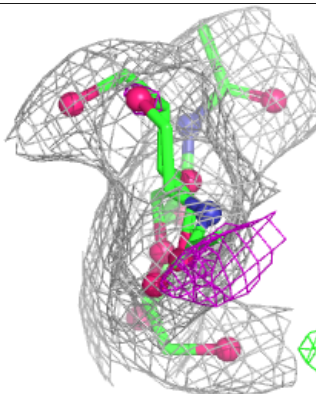
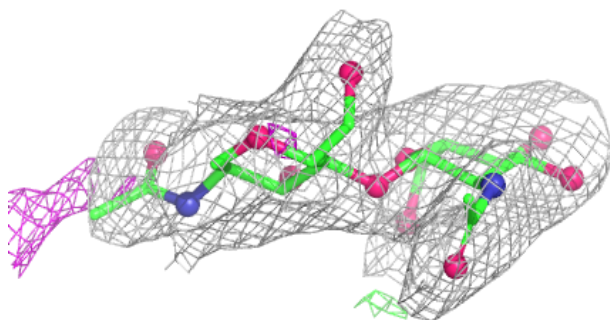
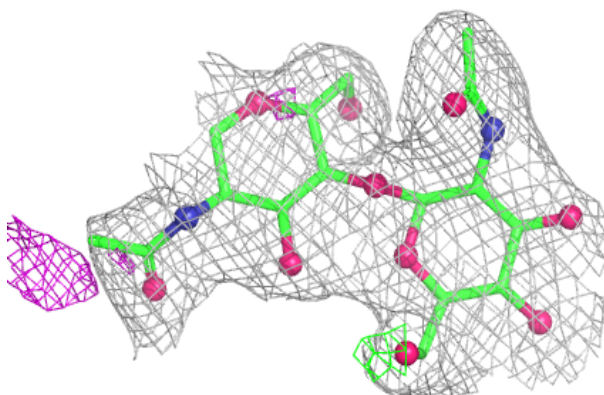
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

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)

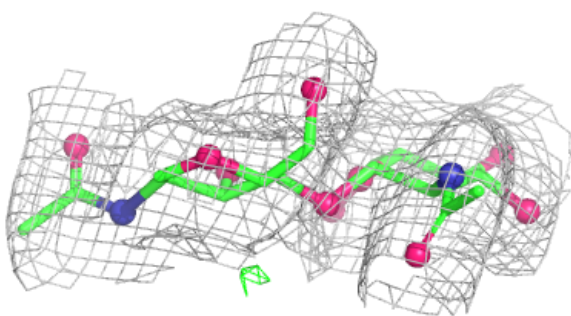
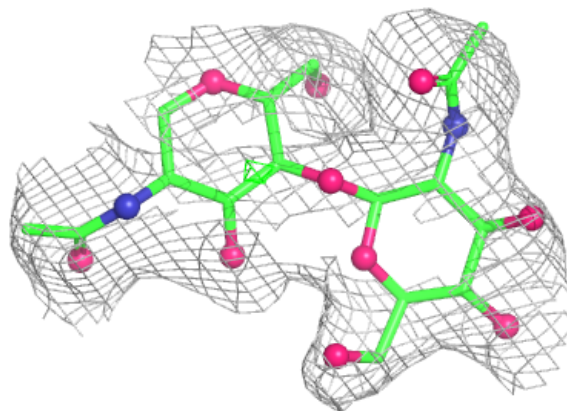
**Electron density around Chain D:**

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



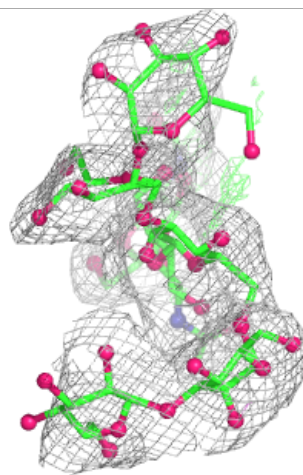
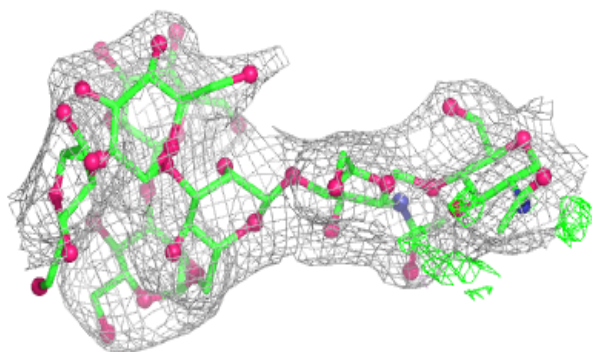
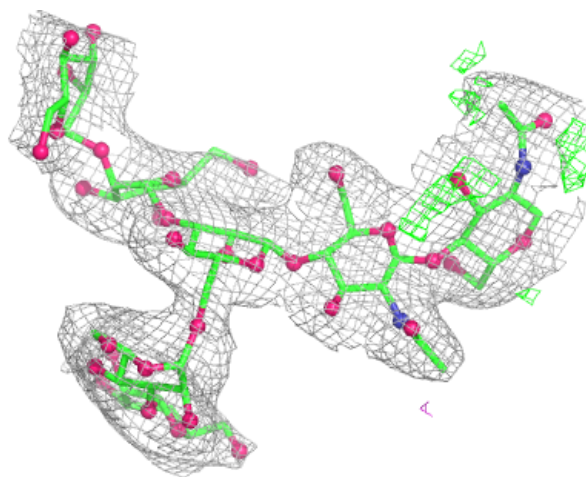
Electron density around Chain H:

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



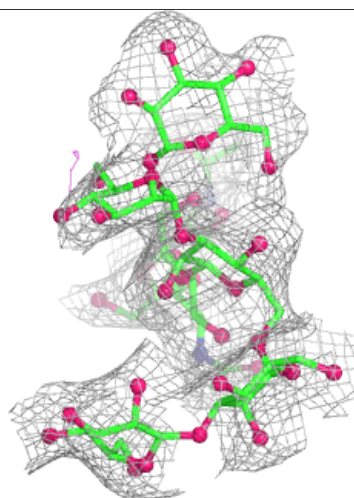
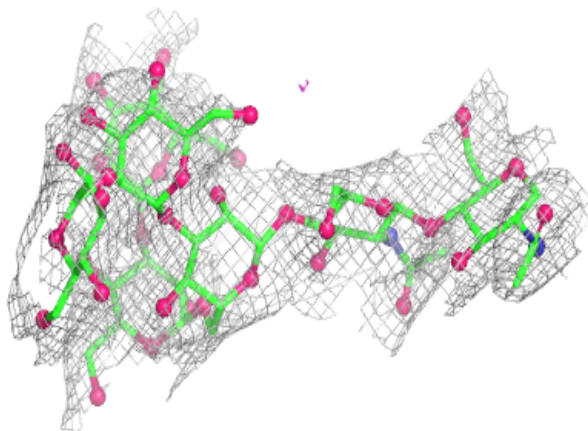
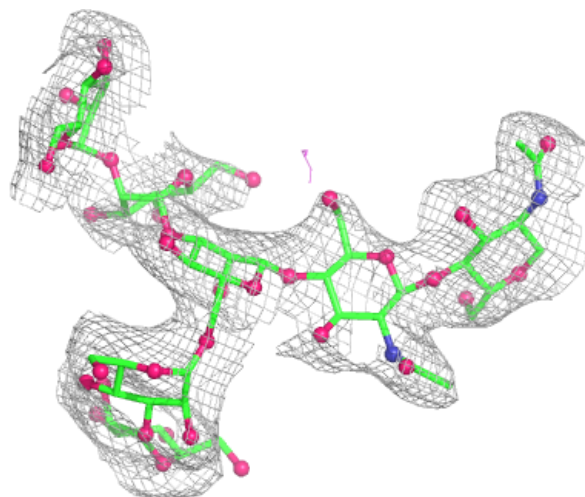
Electron density around Chain E:

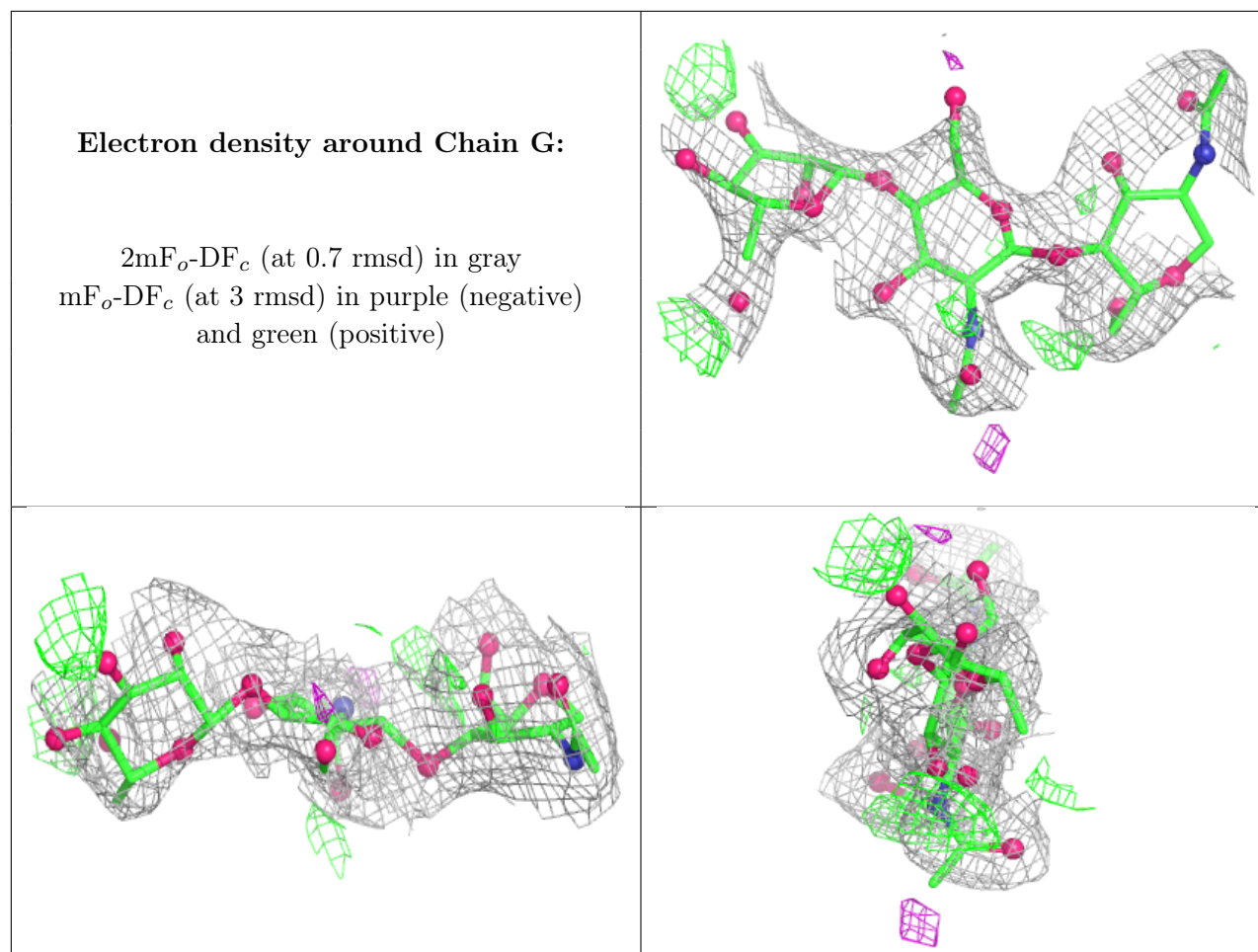
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain I:

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





6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th 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
7	NAG	B	909	14/15	0.57	0.10	127,150,161,162	0
7	NAG	A	904	14/15	0.60	0.12	107,119,130,134	0
7	NAG	B	904	14/15	0.64	0.10	137,146,155,166	0
7	NAG	A	910	14/15	0.64	0.12	113,125,136,136	0
7	NAG	B	910	14/15	0.64	0.10	103,136,149,161	0
7	NAG	B	907	14/15	0.65	0.10	136,168,178,182	0
7	NAG	A	905	14/15	0.75	0.10	103,110,117,118	0
7	NAG	A	903	14/15	0.79	0.09	130,144,148,149	0
7	NAG	A	908	14/15	0.79	0.10	118,124,151,152	0
7	NAG	B	905	14/15	0.79	0.11	94,121,129,137	0
7	NAG	A	909	14/15	0.81	0.09	86,92,101,105	0

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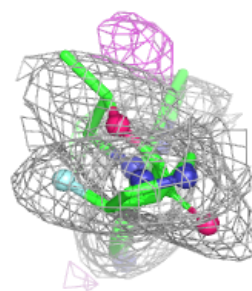
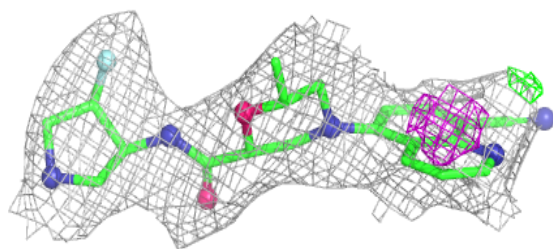
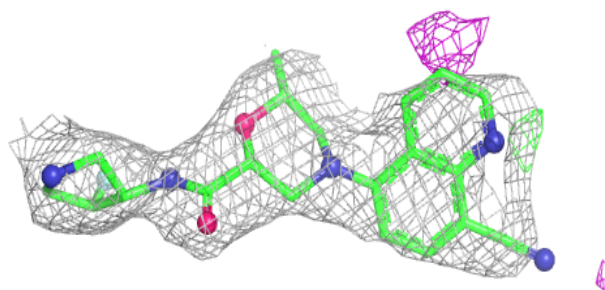
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
7	NAG	B	911	14/15	0.81	0.09	102,110,114,116	0
7	NAG	A	906	14/15	0.82	0.09	125,138,154,157	0
7	NAG	B	902	14/15	0.82	0.08	122,145,150,158	0
7	NAG	A	902	14/15	0.83	0.09	97,115,130,132	0
7	NAG	B	908	14/15	0.84	0.13	77,103,134,136	0
7	NAG	B	906	14/15	0.87	0.07	101,111,115,123	0
6	JRI	B	901	28/28	0.95	0.07	52,58,69,76	0
7	NAG	A	907	14/15	0.95	0.07	51,61,64,67	0
6	JRI	A	901	28/28	0.96	0.08	57,75,83,85	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.

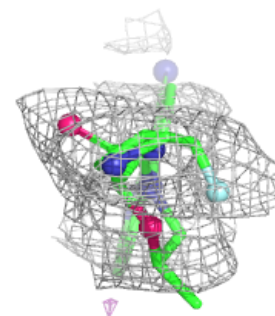
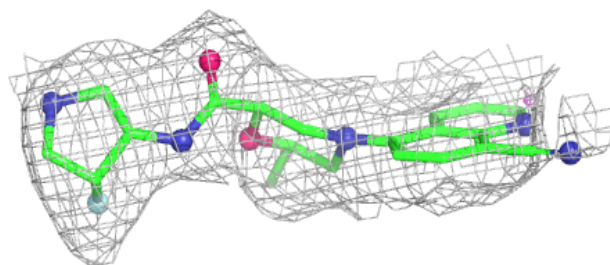
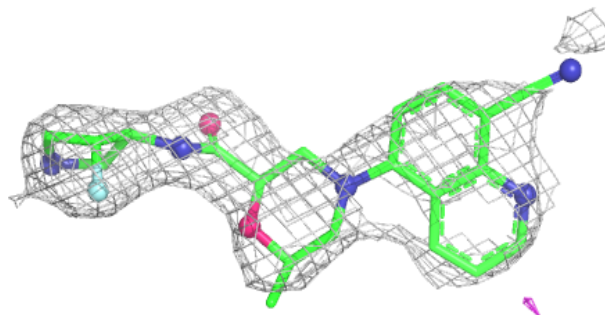
Electron density around JRI B 901:

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 JRI A 901:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.