



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 8, 2024 – 08:23 am GMT

PDB ID : 6HG5
Title : Influenza A virus N6 neuraminidase complex with Oseltamivir (Duck/England/56).
Authors : Salinger, M.T.; Hobbs, J.R.; Murray, J.W.; Laver, W.G.; Kuhn, P.; Garman, E.F.
Deposited on : 2018-08-22
Resolution : 1.60 Å(reported)

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

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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 : 1.8.4, CSD as541be (2020)
Xtriage (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

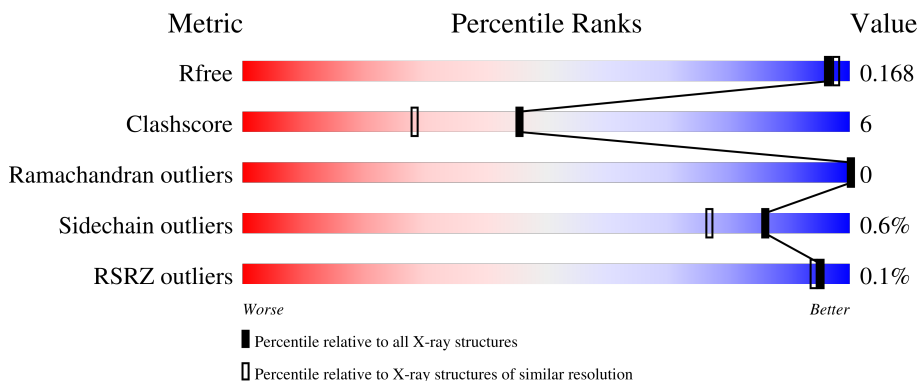
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.60 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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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	389	87% 12% .
1	B	389	88% 11% .
1	C	389	88% 11% .
1	D	389	90% 9% .

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Mol	Chain	Length	Quality of chain
2	E	2	 100%
2	G	2	 100%
2	I	2	 100%
2	K	2	 100%
3	F	7	 100%
3	H	7	 57%  43%
4	J	6	 100%
4	L	6	 100%

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
9	CO2	D	514	-	-	X	-

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 15100 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 Neuraminidase.

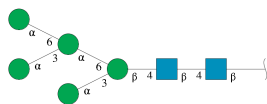
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	389	Total 3189	C 1980	N 570	O 605	S 34	0	22	0
1	B	389	Total 3195	C 1988	N 568	O 606	S 33	0	23	0
1	C	389	Total 3135	C 1956	N 556	O 593	S 30	0	19	0
1	D	389	Total 3148	C 1961	N 561	O 594	S 32	0	18	0

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



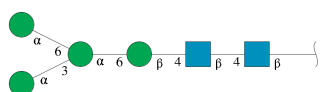
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	E	2	Total 28	C 16	N 2	O 10	0	0	0
2	G	2	Total 28	C 16	N 2	O 10	0	0	0
2	I	2	Total 28	C 16	N 2	O 10	0	0	0
2	K	2	Total 28	C 16	N 2	O 10	0	0	0

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



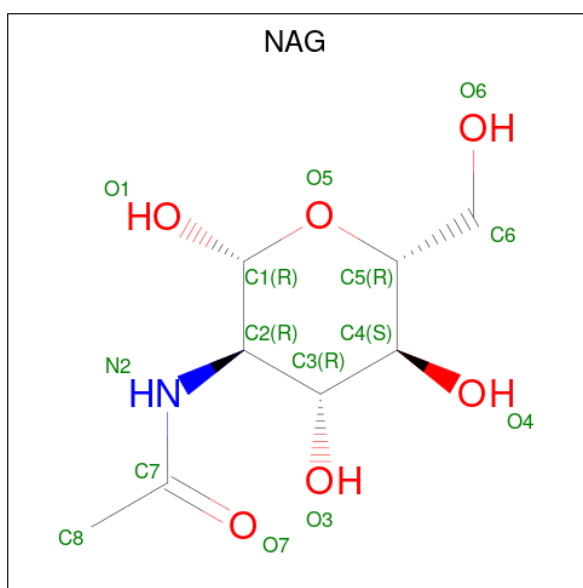
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	F	7	Total	C	N	O	0	0	0
			83	46	2	35			
3	H	7	Total	C	N	O	0	0	0
			83	46	2	35			

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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.



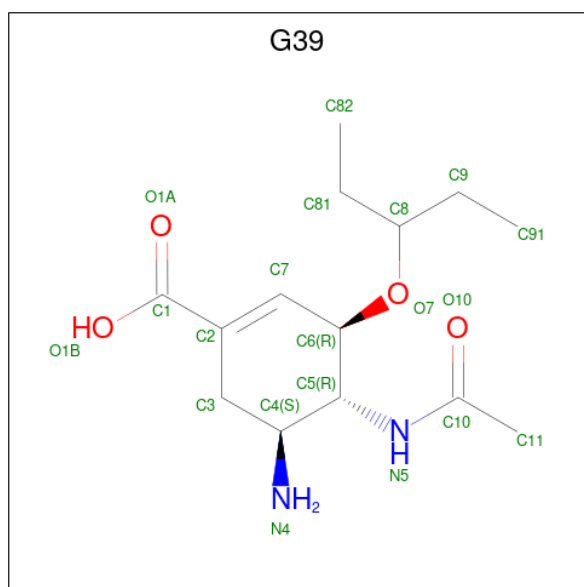
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	J	6	Total	C	N	O	0	0	0
			72	40	2	30			
4	L	6	Total	C	N	O	0	0	0
			72	40	2	30			

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 6 is (3R,4R,5S)-4-(acetylamino)-5-amino-3-(pentan-3-yloxy)cyclohex-1-ene-1-carboxylic acid (three-letter code: G39) (formula: C₁₄H₂₄N₂O₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			20	14	2	4		
6	B	1	Total	C	N	O	0	0
			20	14	2	4		
6	C	1	Total	C	N	O	0	0
			20	14	2	4		
6	D	1	Total	C	N	O	0	0
			20	14	2	4		

- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total C O 6 3 3	0	0
7	B	1	Total C O 6 3 3	0	0
7	B	1	Total C O 6 3 3	0	0
7	B	1	Total C O 6 3 3	0	0
7	B	1	Total C O 6 3 3	0	0
7	C	1	Total C O 6 3 3	0	0
7	C	1	Total C O 6 3 3	0	0
7	D	1	Total C O 6 3 3	0	0
7	D	1	Total C O 6 3 3	0	0

- Molecule 8 is CALCIUM ION (three-letter code: CA) (formula: Ca).

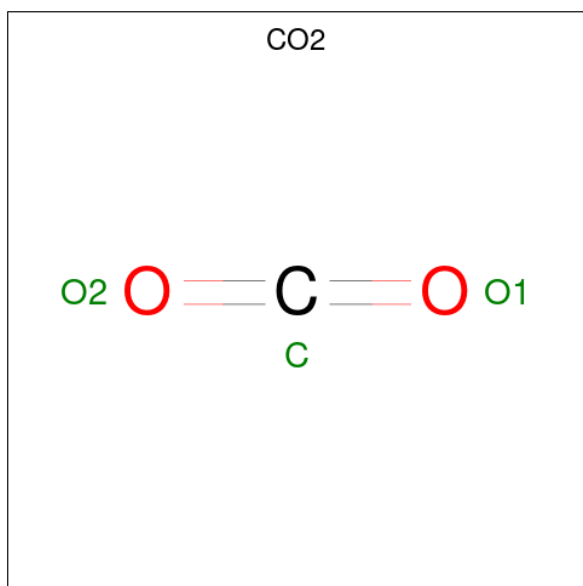
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total Ca 1 1	0	0
8	B	1	Total Ca 1 1	0	0
8	C	1	Total Ca 1 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	D	1	Total Ca 1 1	0	0

- Molecule 9 is CARBON DIOXIDE (three-letter code: CO2) (formula: CO₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	D	1	Total C O 3 1 2	0	0

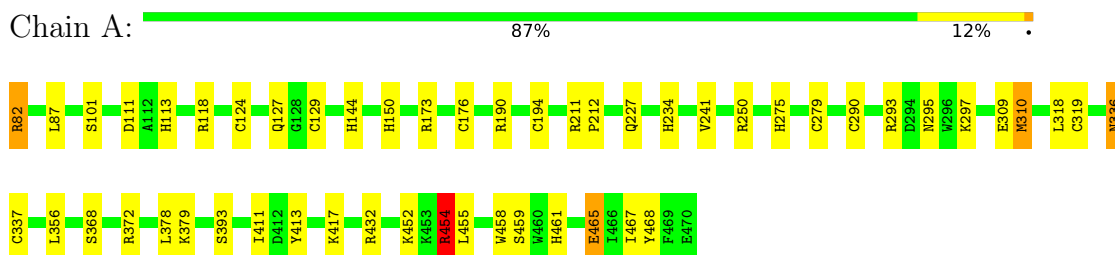
- Molecule 10 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	454	Total O 454 454	0	0
10	B	466	Total O 466 466	0	0
10	C	463	Total O 463 463	0	0
10	D	444	Total O 445 445	0	1

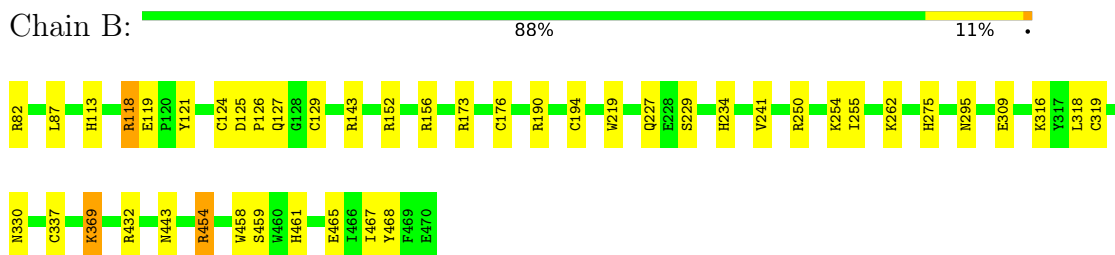
3 Residue-property plots [i](#)

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.

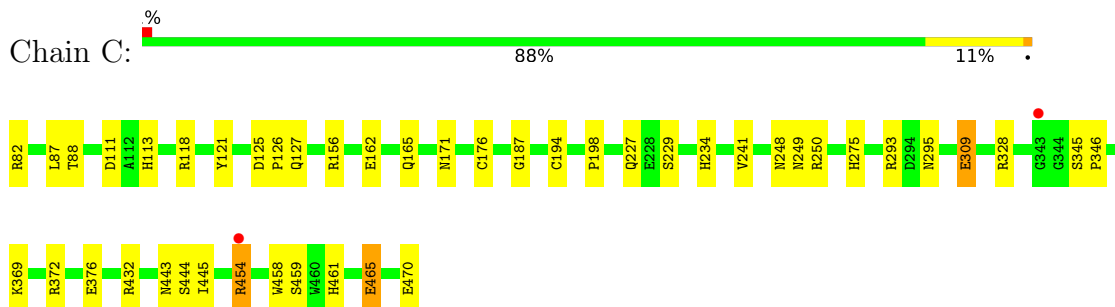
- Molecule 1: Neuraminidase



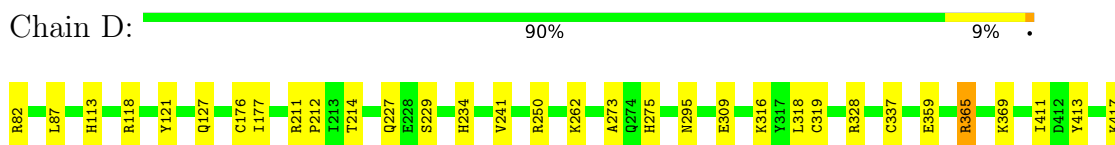
- Molecule 1: Neuraminidase

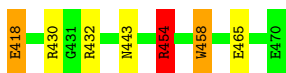


- Molecule 1: Neuraminidase



- Molecule 1: Neuraminidase





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

Chain E: 100%

MAG1
MAG2

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

Chain G: 100%

MAG1
MAG2

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

Chain I: 100%

MAG1
MAG2

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

Chain K: 100%

MAG1
MAG2

- Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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

Chain F: 100%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6
MAN7

- Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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

Chain H: 57% 43%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6
MAN7

- Molecule 4: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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 J:  100%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6

- Molecule 4: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]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 L:  100%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	106.21Å 75.18Å 106.39Å 90.00° 90.52° 90.00°	Depositor
Resolution (Å)	61.47 – 1.60 61.40 – 1.60	Depositor EDS
% Data completeness (in resolution range)	97.8 (61.47-1.60) 97.8 (61.40-1.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.18 (at 1.60Å)	Xtrriage
Refinement program	REFMAC 5.8.0230	Depositor
R, R_{free}	0.133 , 0.158 0.146 , 0.168	Depositor DCC
R_{free} test set	10772 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	9.0	Xtrriage
Anisotropy	0.126	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 49.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.001 for l,k,-h 0.013 for h,-k,-l 0.012 for l,-k,h	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	15100	wwPDB-VP
Average B, all atoms (Å ²)	12.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.74% 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: MAN, GOL, CA, NAG, CO2, BMA, G39

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	0.86	4/3266 (0.1%)	1.00	12/4427 (0.3%)
1	B	0.90	4/3275 (0.1%)	1.01	10/4437 (0.2%)
1	C	0.92	6/3231 (0.2%)	1.02	10/4381 (0.2%)
1	D	0.93	6/3234 (0.2%)	1.02	7/4383 (0.2%)
All	All	0.91	20/13006 (0.2%)	1.01	39/17628 (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	3
1	B	0	2
1	C	0	2
1	D	0	4
All	All	0	11

The worst 5 of 20 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	369[A]	LYS	C-O	-8.68	1.06	1.23
1	B	369[B]	LYS	C-O	-8.68	1.06	1.23
1	B	369[C]	LYS	C-O	-8.68	1.06	1.23
1	C	162	GLU	CD-OE1	7.44	1.33	1.25
1	B	119	GLU	CD-OE1	6.49	1.32	1.25

The worst 5 of 39 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	250	ARG	NE-CZ-NH1	11.69	126.14	120.30
1	D	250	ARG	NE-CZ-NH2	-9.77	115.41	120.30
1	C	156	ARG	NE-CZ-NH2	8.57	124.58	120.30
1	C	156	ARG	NE-CZ-NH1	-8.27	116.17	120.30
1	B	152	ARG	NE-CZ-NH2	-8.16	116.22	120.30

There are no chirality outliers.

5 of 11 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	250	ARG	Sidechain
1	A	454	ARG	Sidechain
1	A	82[A]	ARG	Sidechain
1	B	432	ARG	Sidechain
1	B	454	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	3189	0	3046	51	0
1	B	3195	0	3065	33	0
1	C	3135	0	3034	47	0
1	D	3148	0	3024	33	0
2	E	28	0	25	0	0
2	G	28	0	25	0	0
2	I	28	0	25	0	0
2	K	28	0	25	0	0
3	F	83	0	70	0	0
3	H	83	0	70	6	0
4	J	72	0	61	0	0
4	L	72	0	61	0	0
5	A	14	0	13	0	0
5	C	14	0	13	2	0
5	D	14	0	13	1	0
6	A	20	0	23	0	0
6	B	20	0	23	0	0
6	C	20	0	23	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	D	20	0	23	0	0
7	A	6	0	8	0	0
7	B	24	0	32	3	0
7	C	12	0	16	0	0
7	D	12	0	16	1	0
8	A	1	0	0	0	0
8	B	1	0	0	0	0
8	C	1	0	0	0	0
8	D	1	0	0	0	0
9	D	3	0	0	4	0
10	A	454	0	0	9	0
10	B	466	0	0	12	0
10	C	463	0	0	18	0
10	D	445	0	0	7	0
All	All	15100	0	12734	167	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 6.

The worst 5 of 167 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:B:319:CYS:SG	1:B:337[B]:CYS:HB3	1.77	1.23
10:A:748:HOH:O	1:C:454[A]:ARG:HD2	1.38	1.18
1:D:82:ARG:NH2	1:D:127:GLN:HE22	1.44	1.13
1:C:369[B]:LYS:HD3	10:C:814:HOH:O	1.47	1.12
1:D:319:CYS:SG	1:D:337[C]:CYS:HB3	1.93	1.08

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	409/389 (105%)	393 (96%)	16 (4%)	0	100	100
1	B	412/389 (106%)	401 (97%)	11 (3%)	0	100	100
1	C	406/389 (104%)	391 (96%)	15 (4%)	0	100	100
1	D	405/389 (104%)	391 (96%)	14 (4%)	0	100	100
All	All	1632/1556 (105%)	1576 (97%)	56 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	354/331 (107%)	349 (99%)	5 (1%)	67	47
1	B	356/331 (108%)	354 (99%)	2 (1%)	86	77
1	C	350/331 (106%)	349 (100%)	1 (0%)	92	87
1	D	349/331 (105%)	345 (99%)	4 (1%)	73	57
All	All	1409/1324 (106%)	1397 (99%)	12 (1%)	86	65

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	458	TRP
1	D	418	GLU
1	D	458[B]	TRP
1	D	454	ARG
1	A	458[A]	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	421	ASN
1	D	416	ASN
1	C	461	HIS

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Mol	Chain	Res	Type
1	D	227	GLN
1	B	227	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

34 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	E	1	2,1	14,14,15	1.14	0	17,19,21	1.22	2 (11%)
2	NAG	E	2	2	14,14,15	0.79	0	17,19,21	1.94	4 (23%)
3	NAG	F	1	3,1	14,14,15	1.68	3 (21%)	17,19,21	2.45	4 (23%)
3	NAG	F	2	3	14,14,15	0.68	0	17,19,21	1.74	4 (23%)
3	BMA	F	3	3	11,11,12	1.09	0	15,15,17	1.55	2 (13%)
3	MAN	F	4	3	11,11,12	2.10	3 (27%)	15,15,17	1.26	2 (13%)
3	MAN	F	5	3	11,11,12	0.93	0	15,15,17	1.49	3 (20%)
3	MAN	F	6	3	11,11,12	1.44	3 (27%)	15,15,17	2.40	3 (20%)
3	MAN	F	7	3	11,11,12	2.05	3 (27%)	15,15,17	1.71	4 (26%)
2	NAG	G	1	2,1	14,14,15	1.35	2 (14%)	17,19,21	1.19	2 (11%)
2	NAG	G	2	2	14,14,15	0.96	0	17,19,21	1.55	4 (23%)
3	NAG	H	1	3,1	14,14,15	1.47	3 (21%)	17,19,21	2.91	7 (41%)
3	NAG	H	2	3	14,14,15	1.66	4 (28%)	17,19,21	2.10	6 (35%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	BMA	H	3	3	11,11,12	0.83	0	15,15,17	1.74	4 (26%)
3	MAN	H	4	3	11,11,12	1.86	2 (18%)	15,15,17	2.05	4 (26%)
3	MAN	H	5	3	11,11,12	1.07	1 (9%)	15,15,17	1.41	3 (20%)
3	MAN	H	6	3	11,11,12	2.77	4 (36%)	15,15,17	2.16	7 (46%)
3	MAN	H	7	3	11,11,12	1.16	1 (9%)	15,15,17	2.43	4 (26%)
2	NAG	I	1	2,1	14,14,15	1.39	3 (21%)	17,19,21	1.77	3 (17%)
2	NAG	I	2	2	14,14,15	1.38	2 (14%)	17,19,21	1.78	5 (29%)
4	NAG	J	1	4,1	14,14,15	1.18	1 (7%)	17,19,21	2.34	6 (35%)
4	NAG	J	2	4	14,14,15	1.69	5 (35%)	17,19,21	1.63	5 (29%)
4	BMA	J	3	4	11,11,12	0.89	0	15,15,17	2.16	6 (40%)
4	MAN	J	4	4	11,11,12	1.27	1 (9%)	15,15,17	1.37	1 (6%)
4	MAN	J	5	4	11,11,12	1.24	0	15,15,17	1.69	4 (26%)
4	MAN	J	6	4	11,11,12	1.51	2 (18%)	15,15,17	2.54	6 (40%)
2	NAG	K	1	2,1	14,14,15	1.41	3 (21%)	17,19,21	1.37	2 (11%)
2	NAG	K	2	2	14,14,15	1.15	0	17,19,21	1.92	6 (35%)
4	NAG	L	1	4,1	14,14,15	1.35	2 (14%)	17,19,21	3.22	8 (47%)
4	NAG	L	2	4	14,14,15	1.41	4 (28%)	17,19,21	1.38	4 (23%)
4	BMA	L	3	4	11,11,12	1.32	1 (9%)	15,15,17	2.56	5 (33%)
4	MAN	L	4	4	11,11,12	1.13	1 (9%)	15,15,17	1.19	1 (6%)
4	MAN	L	5	4	11,11,12	1.16	1 (9%)	15,15,17	2.22	4 (26%)
4	MAN	L	6	4	11,11,12	2.00	5 (45%)	15,15,17	2.13	6 (40%)

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	E	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1
3	NAG	F	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	F	2	3	-	0/6/23/26	0/1/1/1
3	BMA	F	3	3	-	0/2/19/22	0/1/1/1
3	MAN	F	4	3	-	0/2/19/22	0/1/1/1
3	MAN	F	5	3	-	1/2/19/22	0/1/1/1
3	MAN	F	6	3	-	0/2/19/22	0/1/1/1
3	MAN	F	7	3	-	0/2/19/22	0/1/1/1
2	NAG	G	1	2,1	-	0/6/23/26	0/1/1/1

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

The worst 5 of 60 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	H	6	MAN	O5-C1	6.49	1.54	1.43
3	F	4	MAN	O5-C1	-5.06	1.35	1.43
3	F	7	MAN	O2-C2	4.80	1.53	1.43
3	H	6	MAN	C4-C3	4.66	1.64	1.52
3	H	4	MAN	O5-C1	-4.44	1.36	1.43

The worst 5 of 141 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	1	NAG	O5-C1-C2	-9.68	96.00	111.29
3	F	1	NAG	O5-C1-C2	-7.80	98.98	111.29
3	F	6	MAN	C1-O5-C5	6.79	121.39	112.19
3	H	1	NAG	C1-O5-C5	6.67	121.23	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	3	BMA	O5-C5-C6	-6.52	96.98	107.20

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

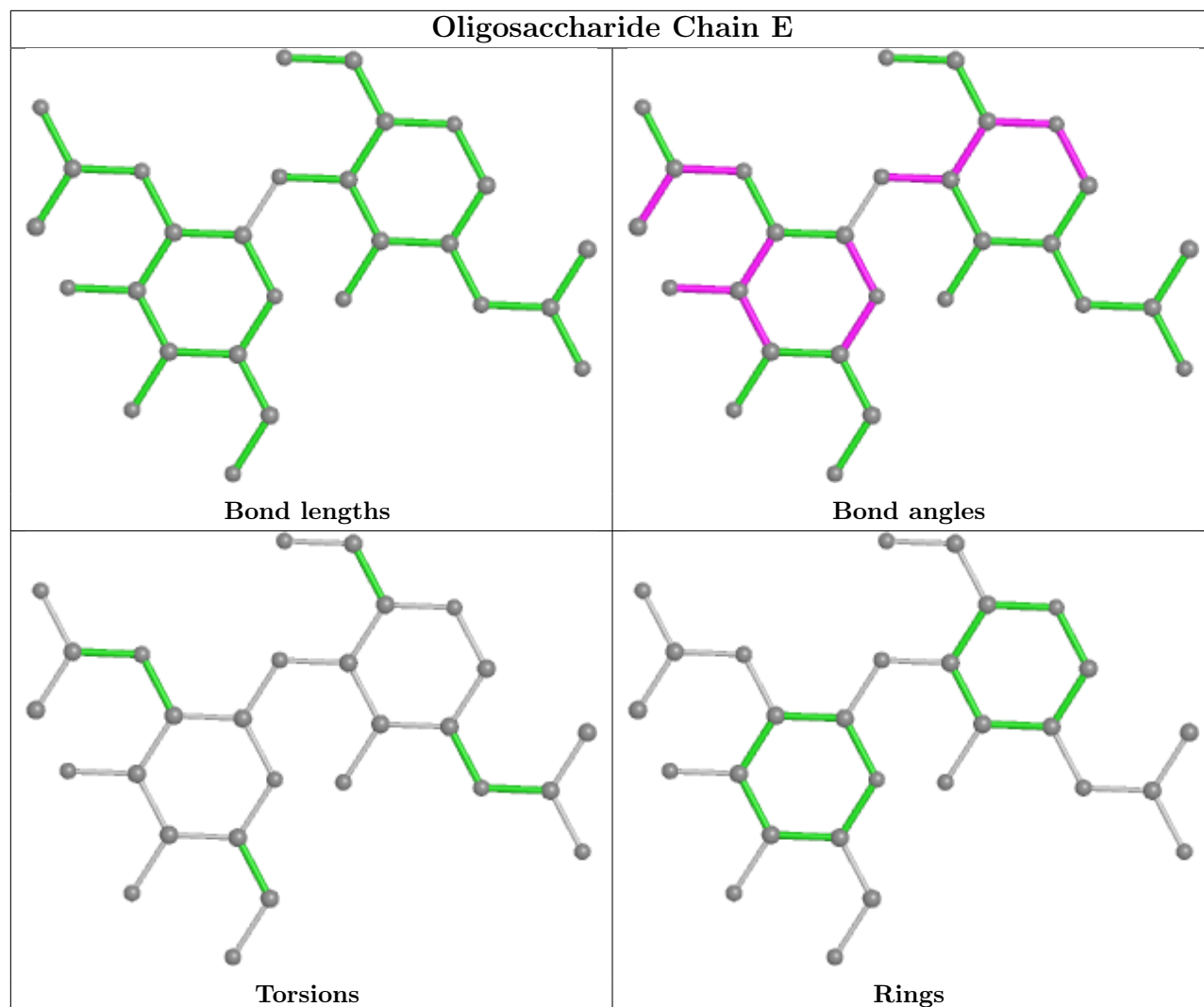
Mol	Chain	Res	Type	Atoms
4	J	6	MAN	O5-C5-C6-O6
3	H	1	NAG	O5-C5-C6-O6
4	J	6	MAN	C4-C5-C6-O6
3	H	7	MAN	C4-C5-C6-O6
3	H	3	BMA	O5-C5-C6-O6

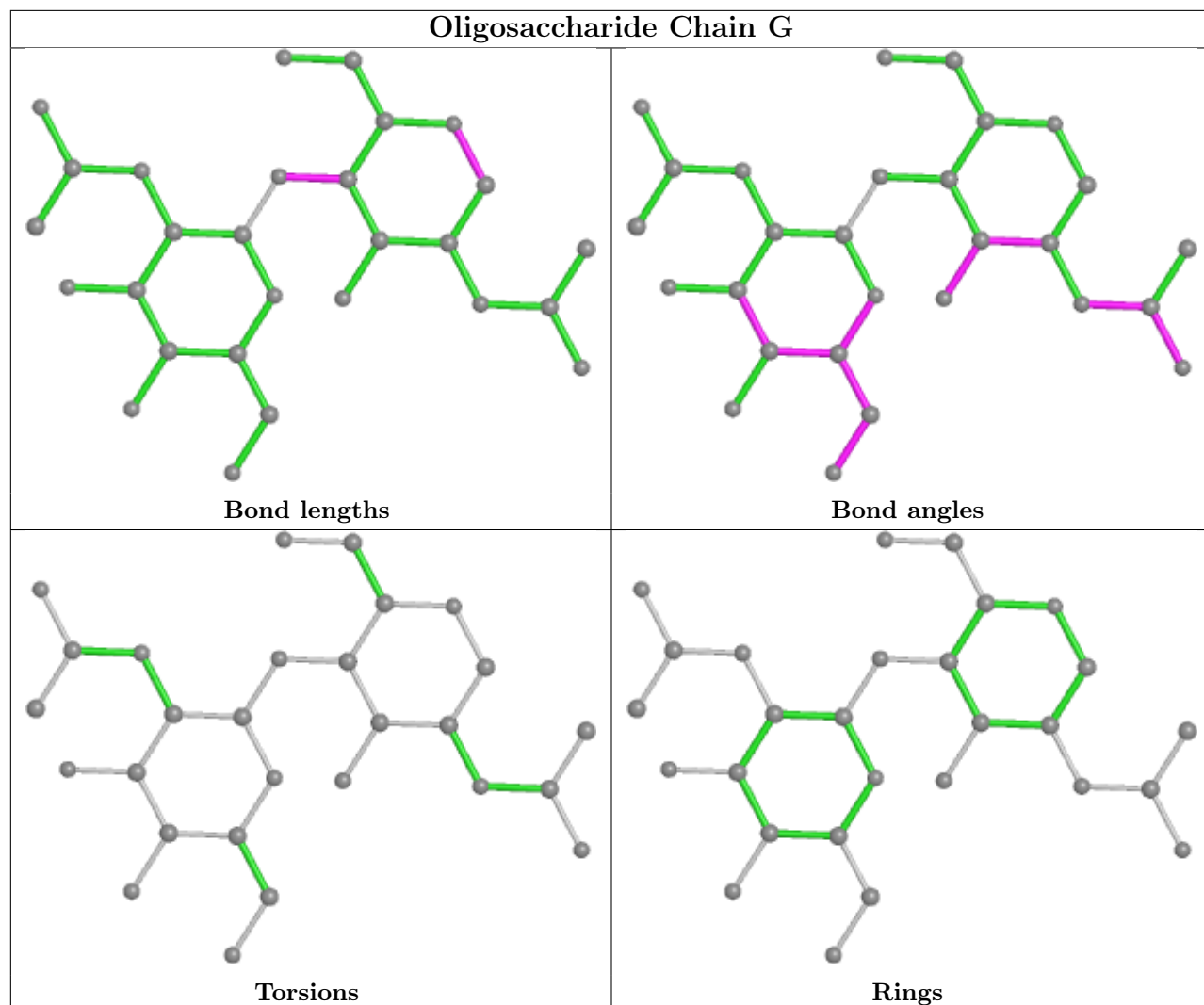
There are no ring outliers.

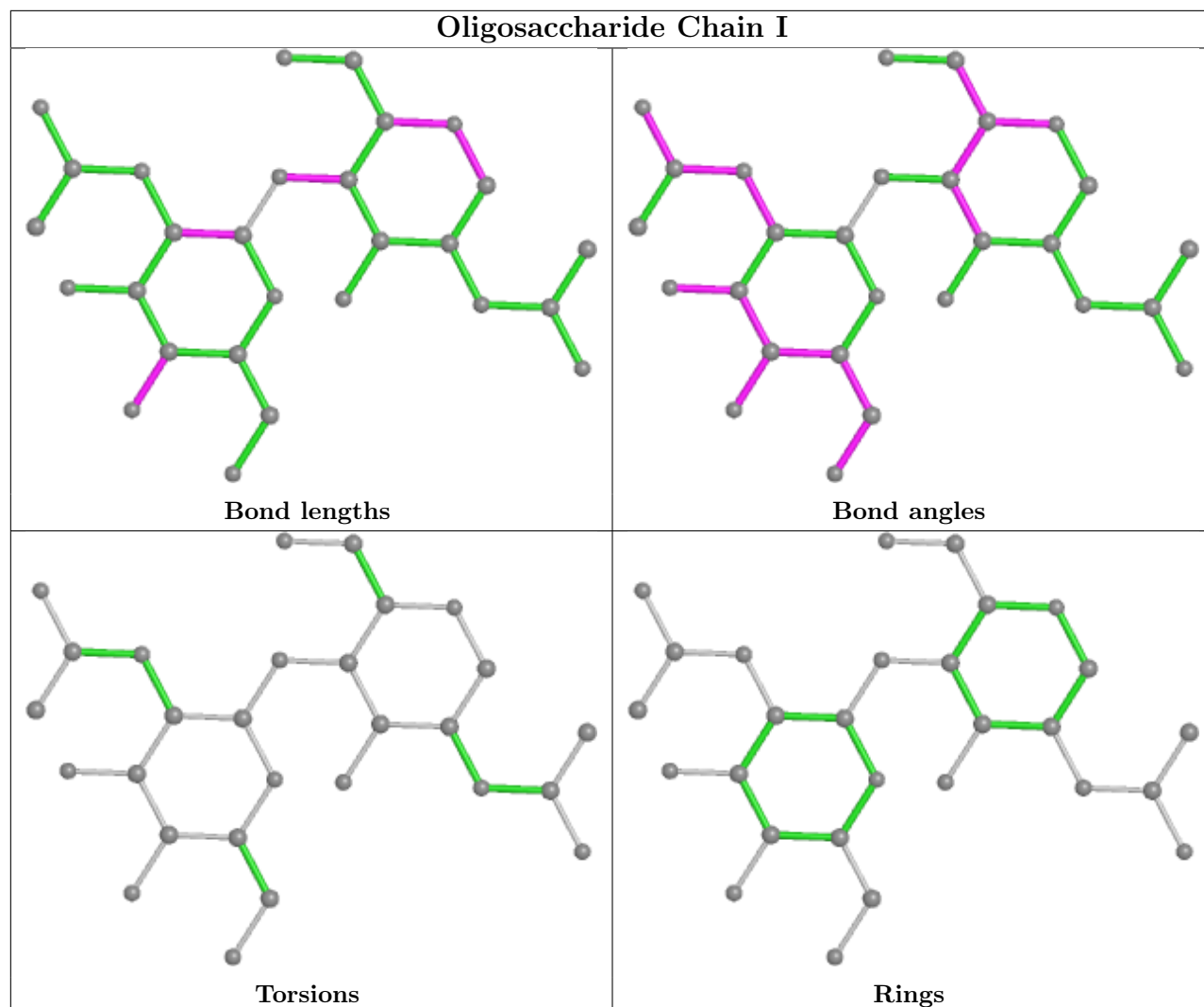
3 monomers are involved in 6 short contacts:

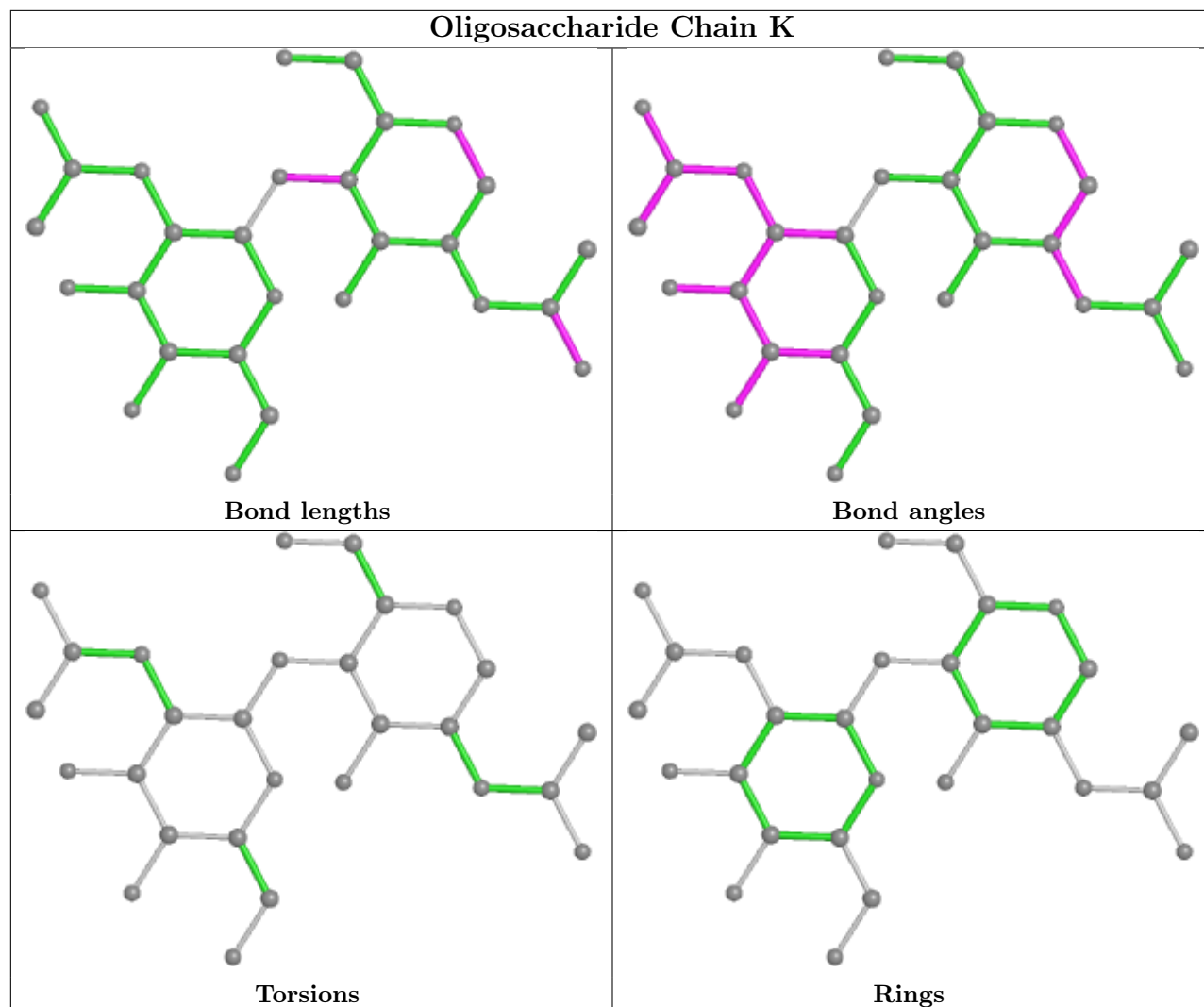
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	2	NAG	1	0
3	H	7	MAN	2	0
3	H	1	NAG	4	0

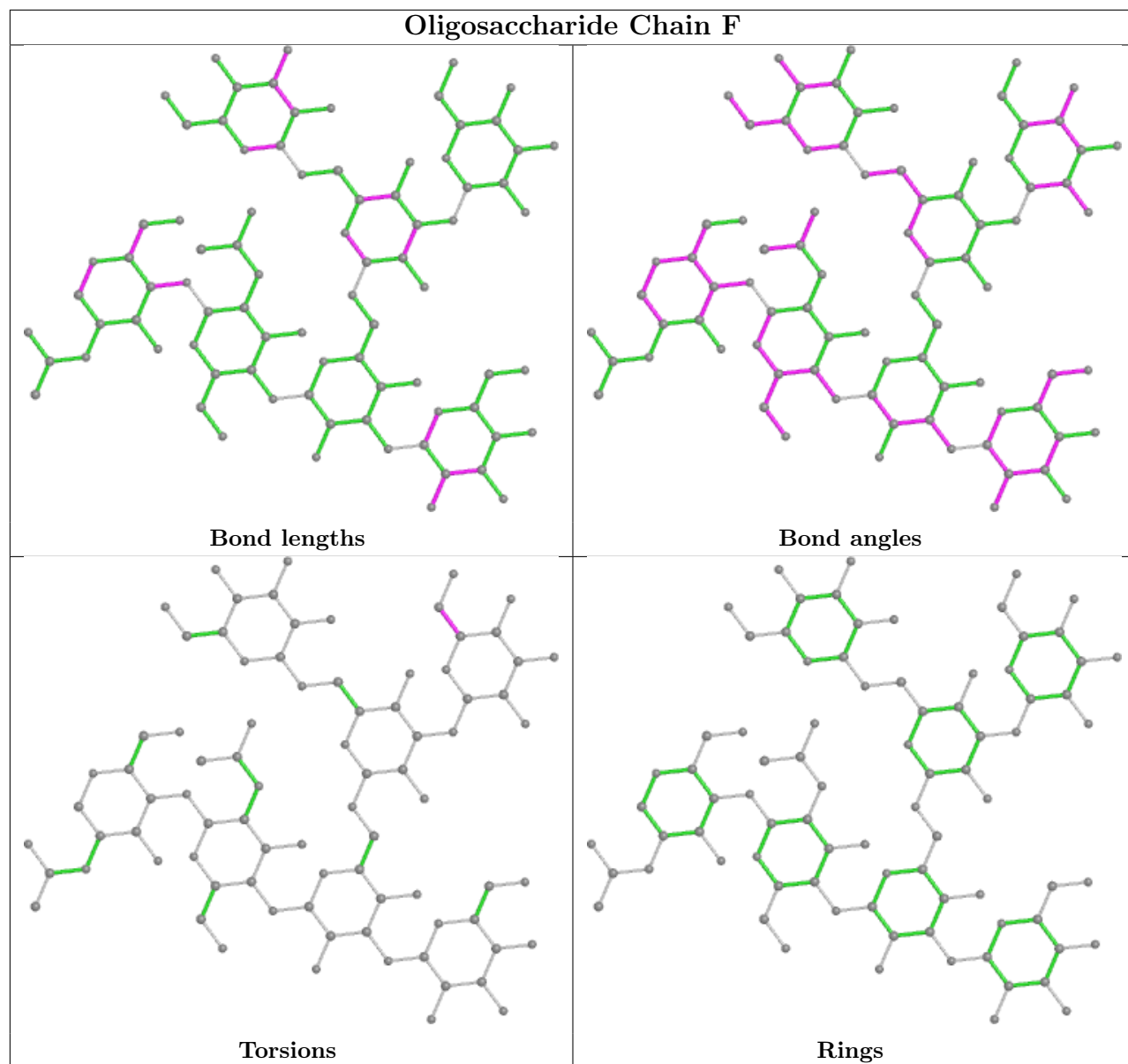
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

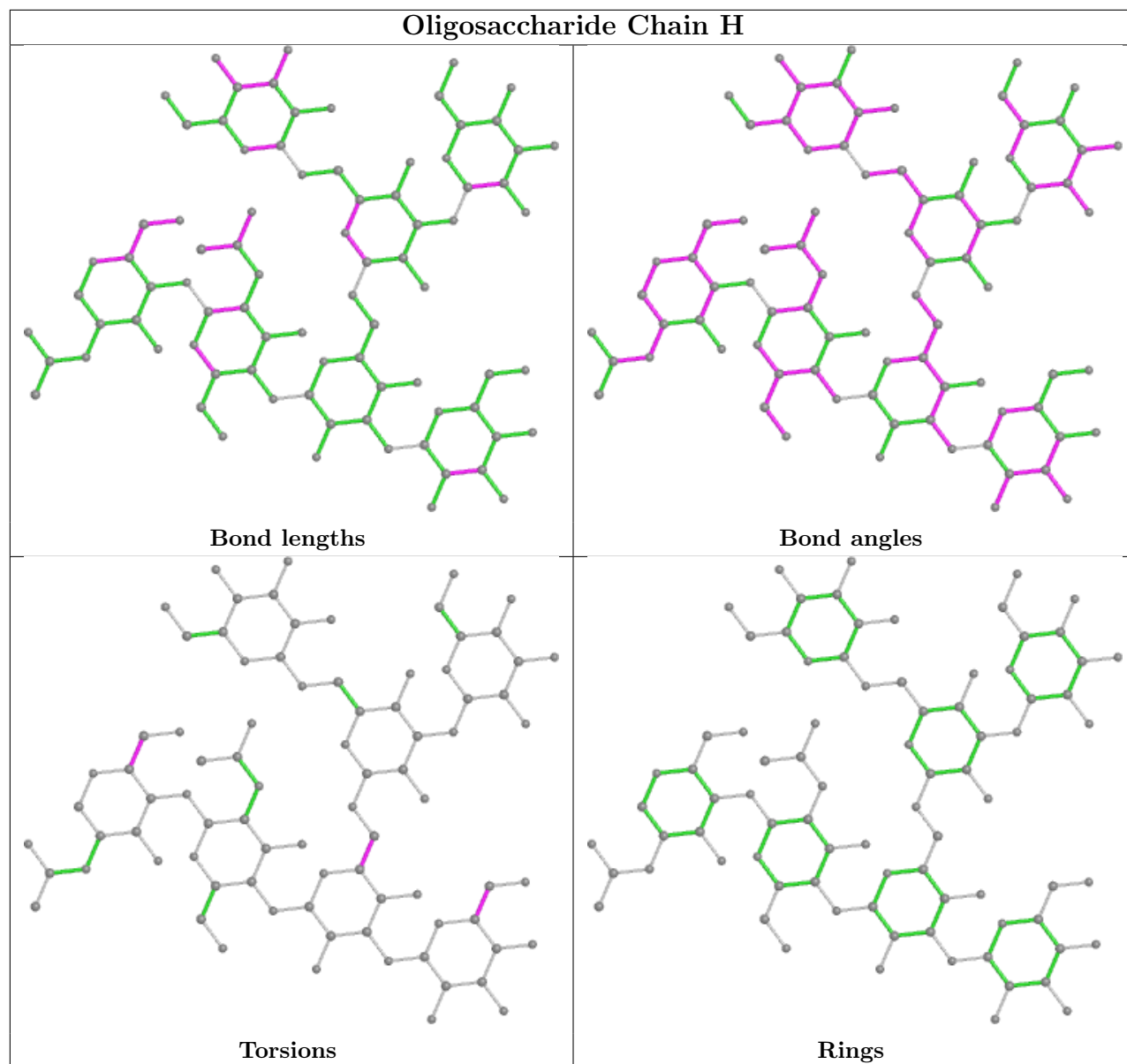


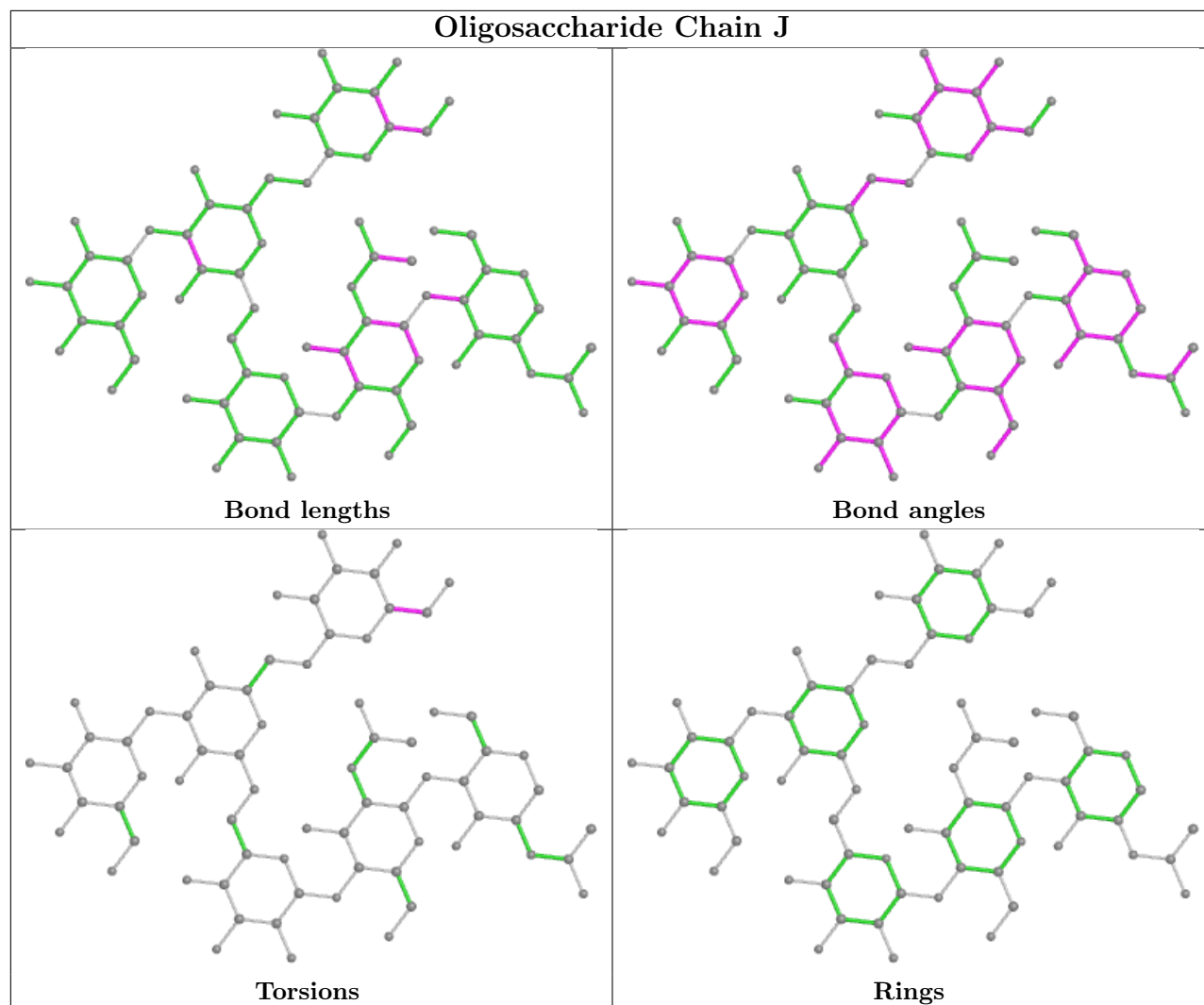


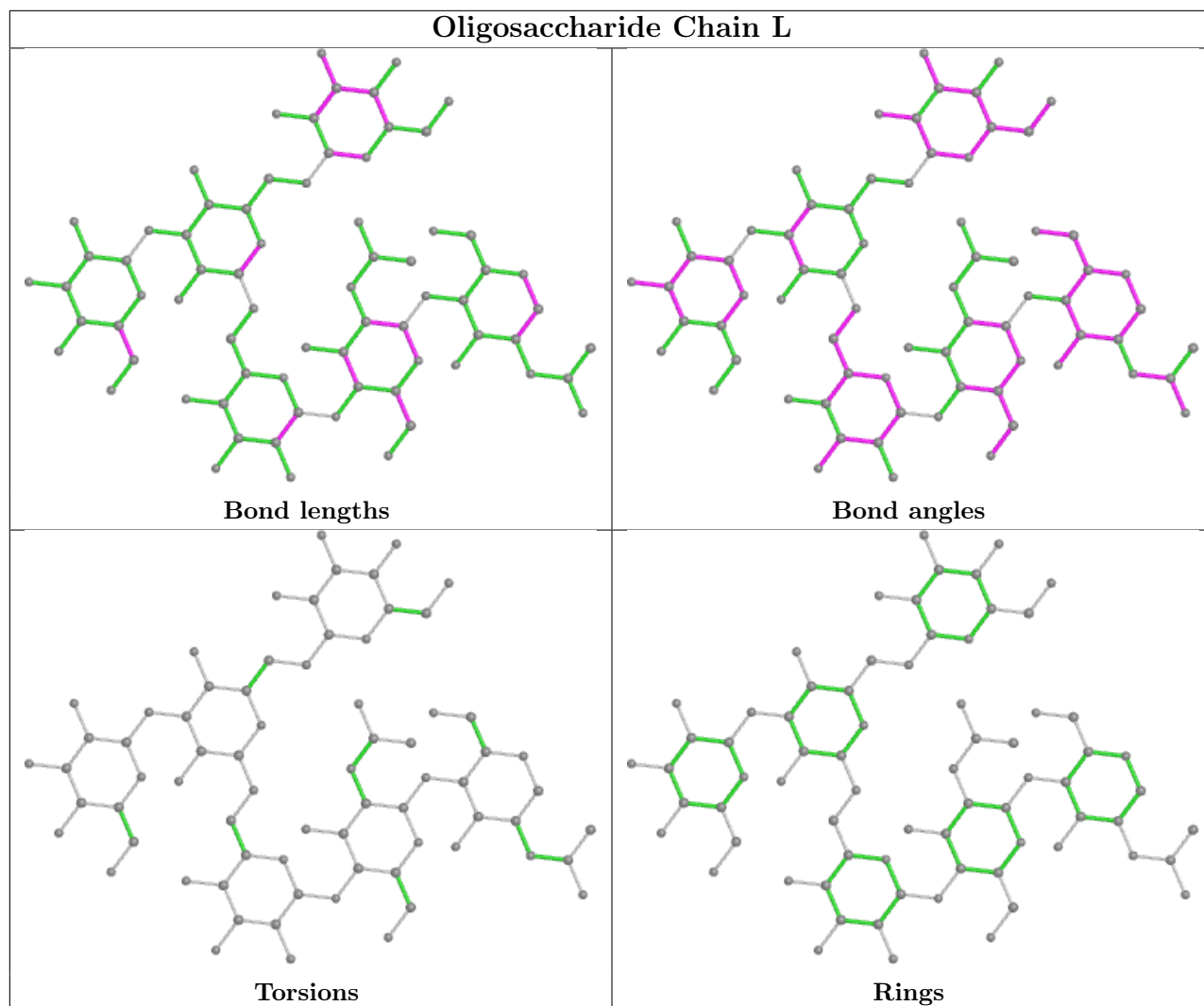












5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 4 are monoatomic - leaving 17 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$
7	GOL	B	511	-	5,5,5	0.41	0	5,5,5	1.07	1 (20%)
5	NAG	C	501	1	14,14,15	1.32	3 (21%)	17,19,21	1.88	4 (23%)
7	GOL	A	512	-	5,5,5	0.53	0	5,5,5	1.12	1 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	GOL	C	512	-	5,5,5	0.33	0	5,5,5	0.93	0
6	G39	B	510	-	20,20,20	1.09	3 (15%)	19,27,27	0.93	0
6	G39	A	511	-	20,20,20	1.10	2 (10%)	19,27,27	1.08	1 (5%)
7	GOL	B	513	-	5,5,5	0.62	0	5,5,5	0.68	0
7	GOL	D	511	-	5,5,5	0.66	0	5,5,5	1.51	1 (20%)
7	GOL	D	512	-	5,5,5	0.63	0	5,5,5	0.54	0
6	G39	C	510	-	20,20,20	0.77	0	19,27,27	1.09	2 (10%)
5	NAG	D	501	1	14,14,15	2.01	4 (28%)	17,19,21	1.83	6 (35%)
7	GOL	C	511	-	5,5,5	0.40	0	5,5,5	0.84	0
9	CO2	D	514	-	2,2,2	0.41	0	1,1,1	0.29	0
5	NAG	A	501	1	14,14,15	1.29	1 (7%)	17,19,21	1.44	2 (11%)
6	G39	D	510	-	20,20,20	0.85	1 (5%)	19,27,27	1.14	2 (10%)
7	GOL	B	512	-	5,5,5	0.83	0	5,5,5	1.02	0
7	GOL	B	514	-	5,5,5	0.32	0	5,5,5	0.64	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	GOL	B	511	-	-	0/4/4/4	-
5	NAG	C	501	1	-	0/6/23/26	0/1/1/1
7	GOL	A	512	-	-	0/4/4/4	-
7	GOL	C	512	-	-	0/4/4/4	-
6	G39	B	510	-	-	1/16/32/32	0/1/1/1
6	G39	A	511	-	-	1/16/32/32	0/1/1/1
7	GOL	B	513	-	-	2/4/4/4	-
7	GOL	D	511	-	-	4/4/4/4	-
7	GOL	D	512	-	-	0/4/4/4	-
6	G39	C	510	-	-	0/16/32/32	0/1/1/1
5	NAG	D	501	1	-	0/6/23/26	0/1/1/1
7	GOL	C	511	-	-	0/4/4/4	-
5	NAG	A	501	1	-	0/6/23/26	0/1/1/1
6	G39	D	510	-	-	1/16/32/32	0/1/1/1
7	GOL	B	512	-	-	4/4/4/4	-
7	GOL	B	514	-	-	2/4/4/4	-

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	501	NAG	O5-C5	4.10	1.51	1.43
5	D	501	NAG	O4-C4	3.35	1.50	1.43
5	D	501	NAG	C4-C5	3.24	1.59	1.53
5	A	501	NAG	O5-C1	3.05	1.48	1.43
6	A	511	G39	O1B-C1	-3.00	1.21	1.30

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	501	NAG	O5-C1-C2	-4.89	103.57	111.29
5	A	501	NAG	C1-O5-C5	-3.84	106.99	112.19
5	D	501	NAG	O4-C4-C5	3.77	118.66	109.30
5	D	501	NAG	O6-C6-C5	-3.01	100.97	111.29
5	A	501	NAG	O5-C5-C6	2.92	111.79	107.20

There are no chirality outliers.

5 of 15 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	512	GOL	C1-C2-C3-O3
7	D	511	GOL	O1-C1-C2-C3
7	B	512	GOL	O2-C2-C3-O3
7	B	513	GOL	C1-C2-C3-O3
7	B	514	GOL	O1-C1-C2-C3

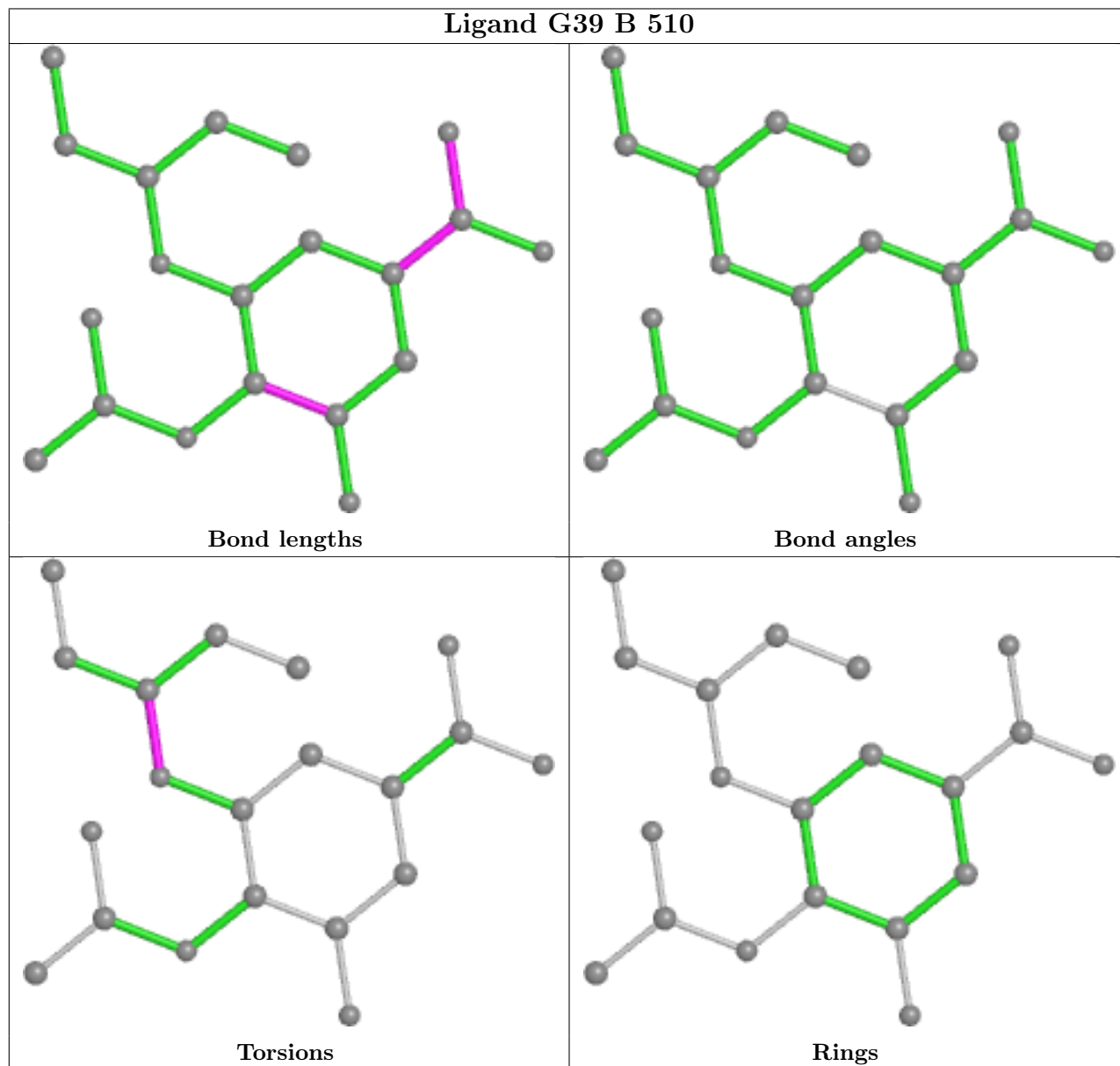
There are no ring outliers.

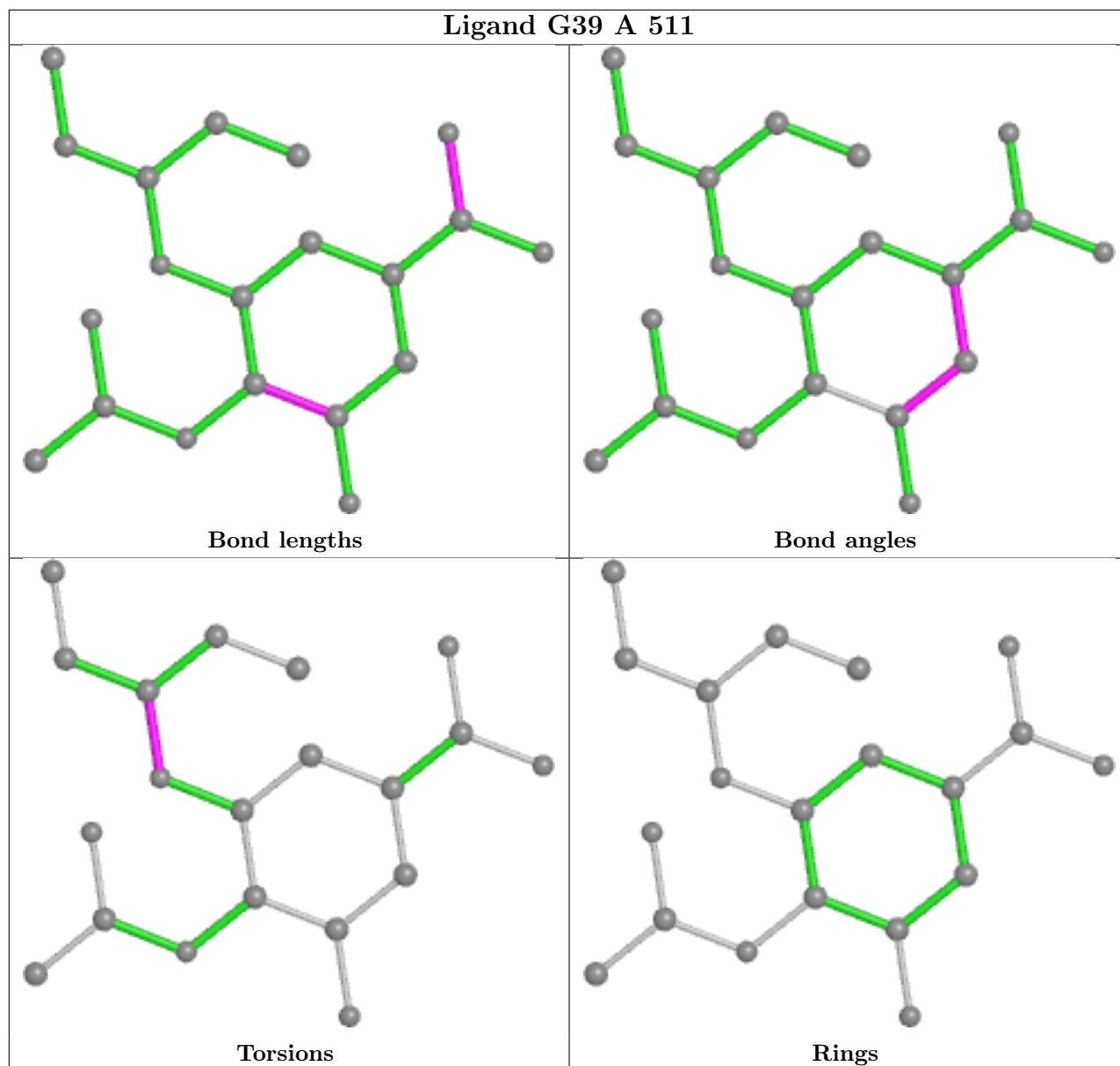
6 monomers are involved in 11 short contacts:

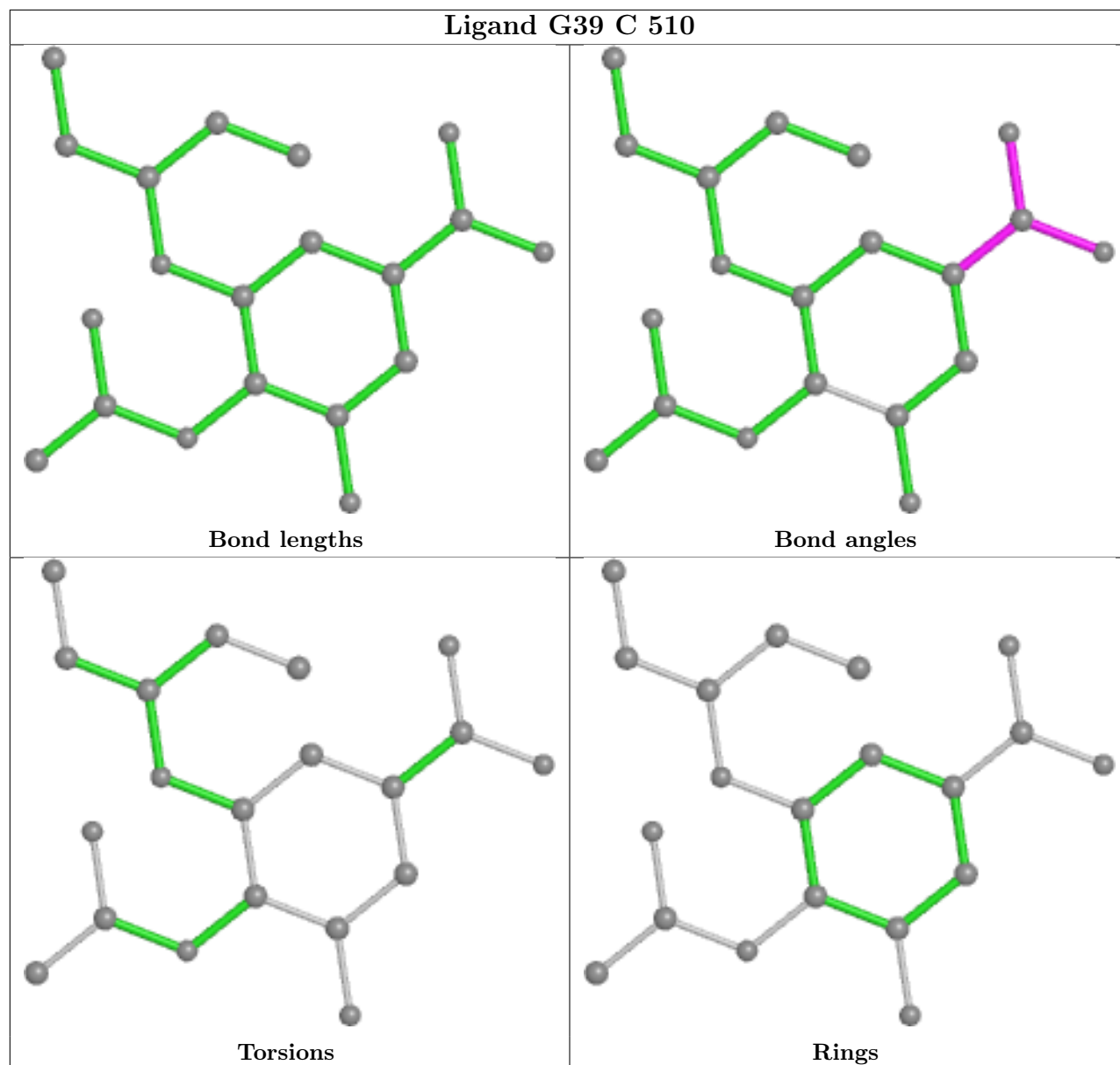
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	501	NAG	2	0
7	B	513	GOL	1	0
7	D	511	GOL	1	0
5	D	501	NAG	1	0
9	D	514	CO2	4	0
7	B	514	GOL	2	0

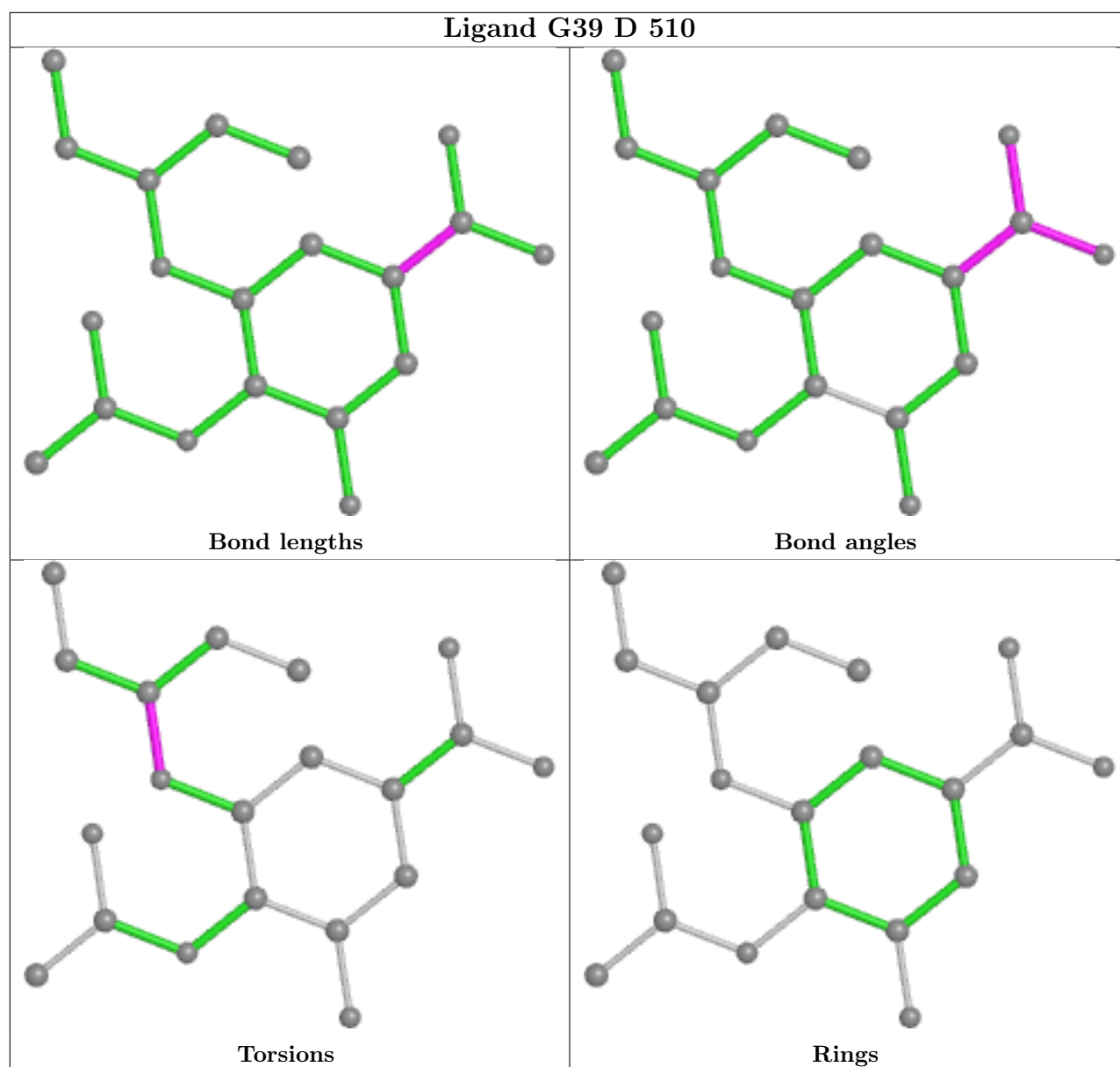
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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 [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	389/389 (100%)	-0.56	0 100 100	5, 10, 18, 28	0
1	B	389/389 (100%)	-0.57	0 100 100	5, 9, 16, 30	0
1	C	389/389 (100%)	-0.51	2 (0%) 91 90	5, 9, 16, 27	0
1	D	389/389 (100%)	-0.58	0 100 100	5, 10, 16, 25	1 (0%)
All	All	1556/1556 (100%)	-0.55	2 (0%) 95 94	5, 9, 17, 30	1 (0%)

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	343	GLY	2.3
1	C	454[A]	ARG	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, 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
3	MAN	H	7	11/12	0.66	0.30	38,45,47,51	0
4	MAN	L	6	11/12	0.68	0.23	33,34,38,41	0
4	MAN	J	6	11/12	0.73	0.23	34,35,39,41	0
2	NAG	I	2	14/15	0.73	0.21	34,39,41,44	0
2	NAG	K	2	14/15	0.76	0.22	33,39,49,54	0

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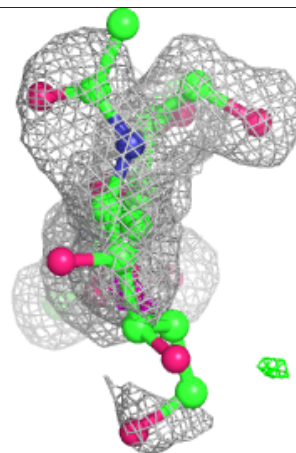
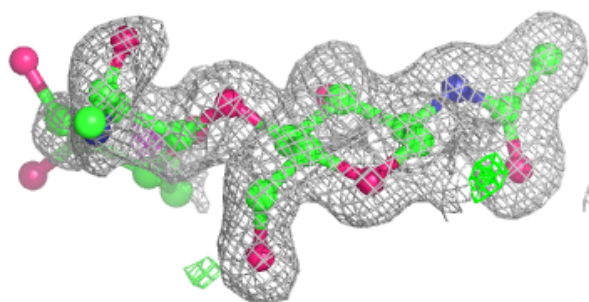
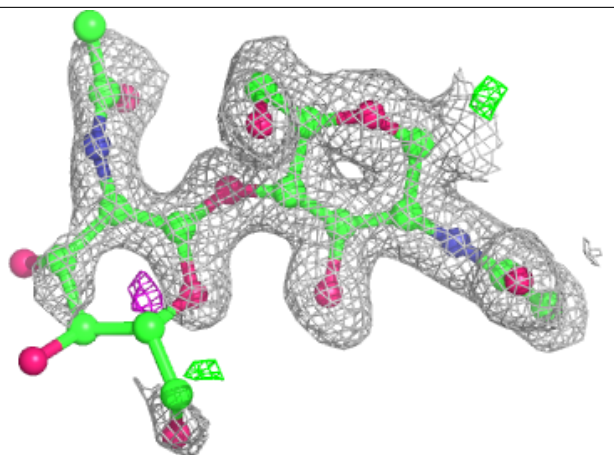
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	MAN	J	5	11/12	0.76	0.19	32,36,38,39	0
4	BMA	L	3	11/12	0.77	0.18	26,28,30,31	0
3	NAG	H	1	14/15	0.78	0.20	23,27,36,37	0
3	NAG	F	1	14/15	0.78	0.23	22,26,33,34	0
2	NAG	E	2	14/15	0.79	0.28	36,43,50,52	0
3	MAN	F	6	11/12	0.80	0.16	24,25,29,30	0
4	MAN	L	5	11/12	0.81	0.24	34,37,39,42	0
4	BMA	J	3	11/12	0.81	0.16	27,30,32,33	0
2	NAG	G	2	14/15	0.83	0.22	33,39,49,50	0
3	MAN	H	6	11/12	0.84	0.15	25,26,29,32	0
3	MAN	F	7	11/12	0.84	0.14	25,27,29,29	0
3	MAN	H	5	11/12	0.85	0.16	21,24,25,27	0
4	MAN	L	4	11/12	0.85	0.16	29,31,32,33	0
3	NAG	F	2	14/15	0.86	0.14	18,20,22,23	0
4	NAG	J	2	14/15	0.87	0.12	20,22,25,27	0
4	NAG	J	1	14/15	0.87	0.12	20,23,29,29	0
4	MAN	J	4	11/12	0.87	0.20	30,33,35,35	0
4	NAG	L	2	14/15	0.89	0.13	19,21,25,27	0
4	NAG	L	1	14/15	0.90	0.14	19,21,25,26	0
3	NAG	H	2	14/15	0.91	0.14	19,20,23,26	0
3	MAN	H	4	11/12	0.92	0.10	22,23,24,25	0
3	MAN	F	4	11/12	0.92	0.11	19,20,22,23	0
3	MAN	F	5	11/12	0.93	0.11	19,20,21,22	0
2	NAG	E	1	14/15	0.93	0.08	16,17,24,29	0
2	NAG	G	1	14/15	0.93	0.10	15,17,22,27	0
3	BMA	F	3	11/12	0.94	0.11	19,20,21,23	0
3	BMA	H	3	11/12	0.94	0.08	22,23,26,31	0
2	NAG	K	1	14/15	0.96	0.08	14,16,21,26	0
2	NAG	I	1	14/15	0.96	0.07	16,17,25,29	0

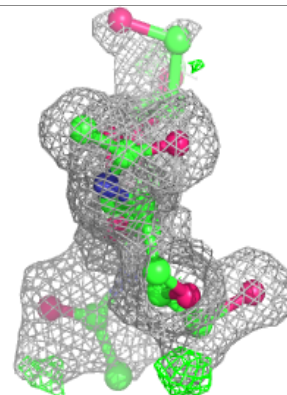
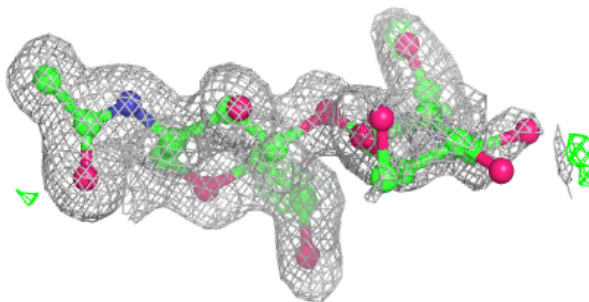
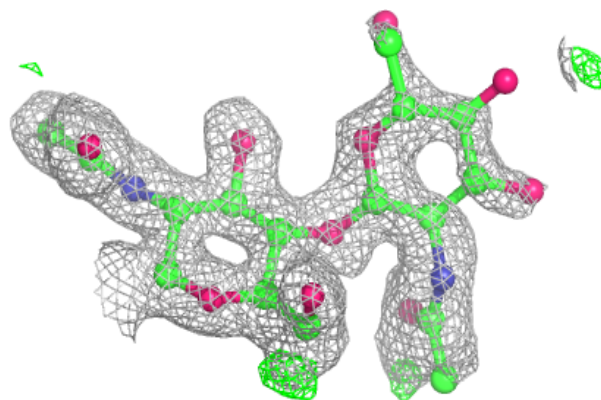
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain E:

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

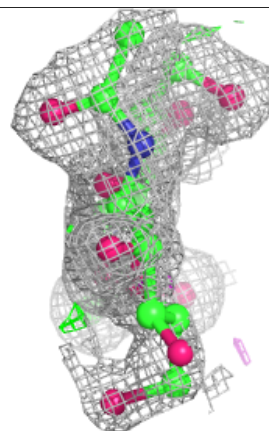
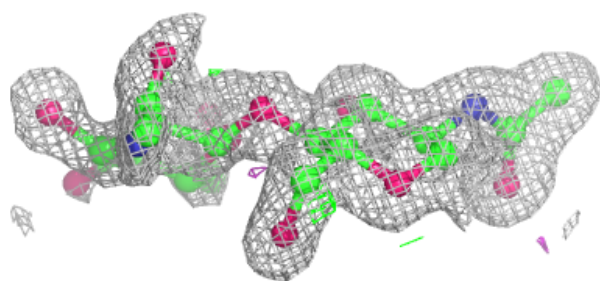
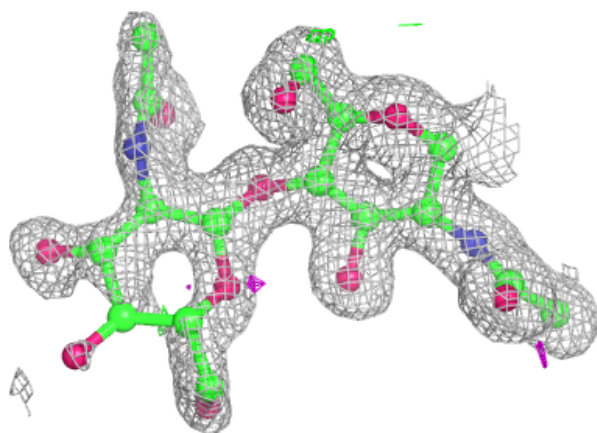
**Electron density around Chain G:**

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

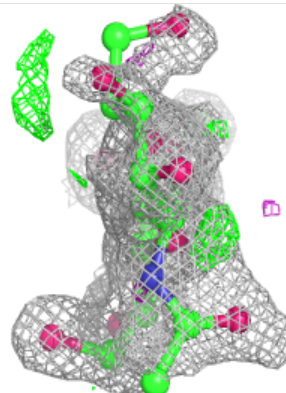
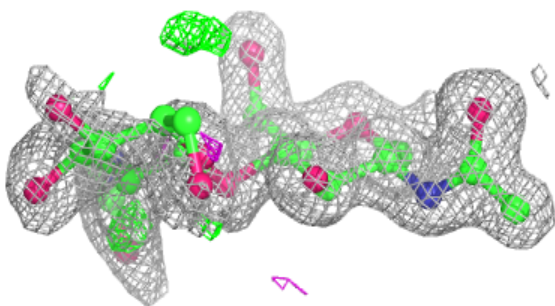
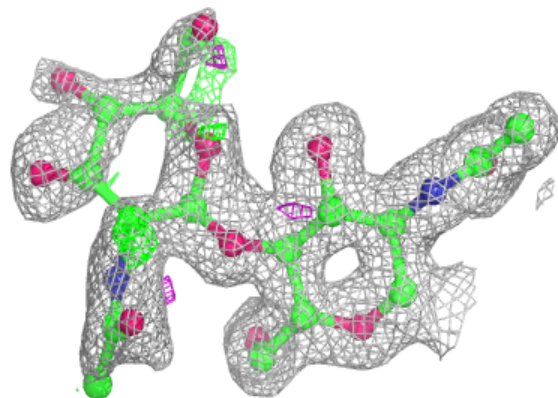


Electron density around Chain I:

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

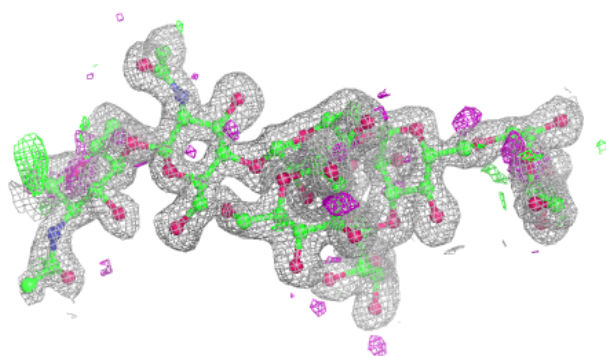
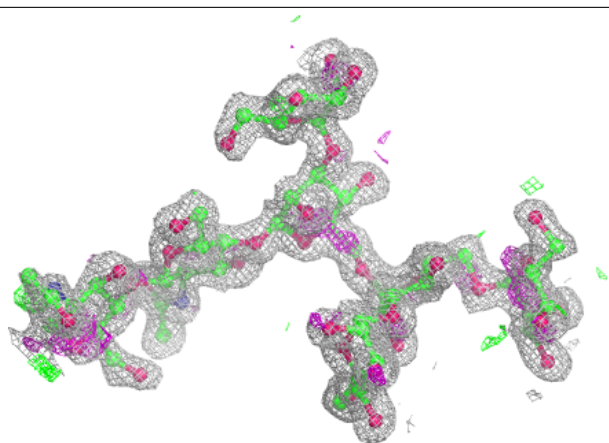
**Electron density around Chain K:**

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

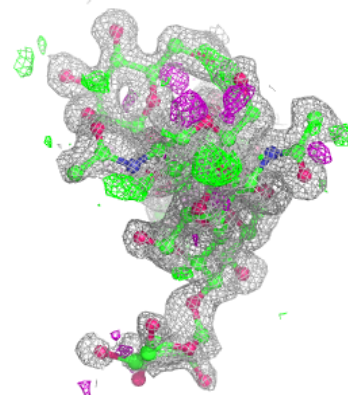
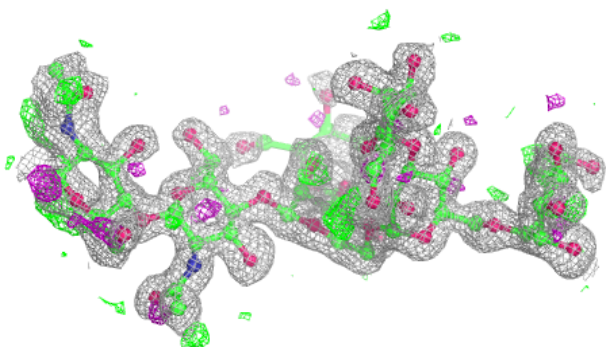
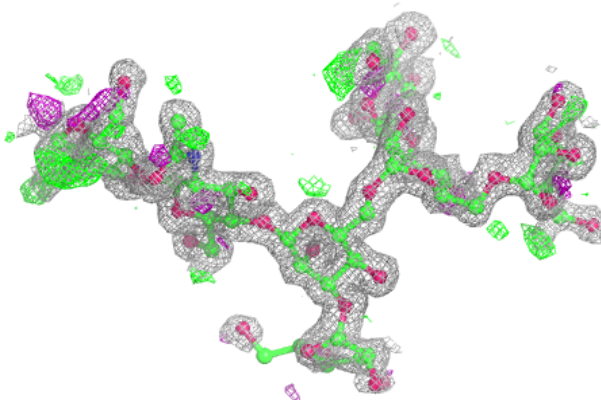


Electron density around Chain F:

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

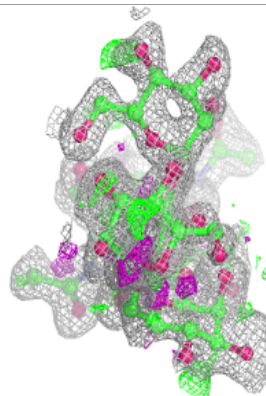
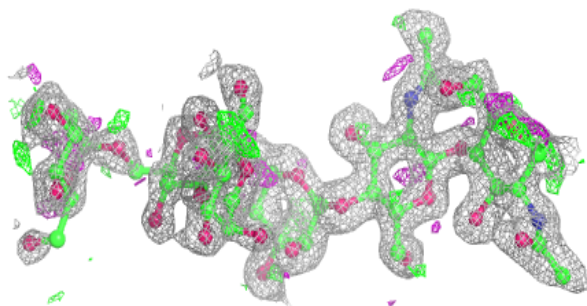
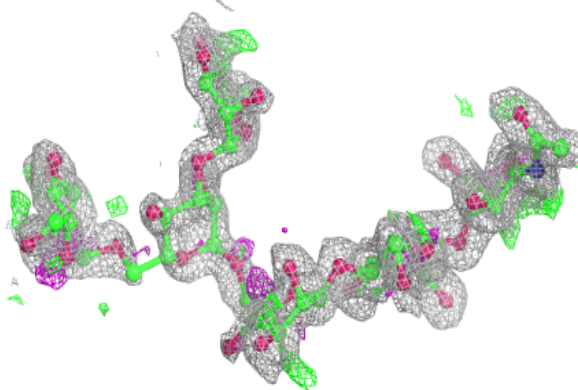
**Electron density around Chain H:**

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

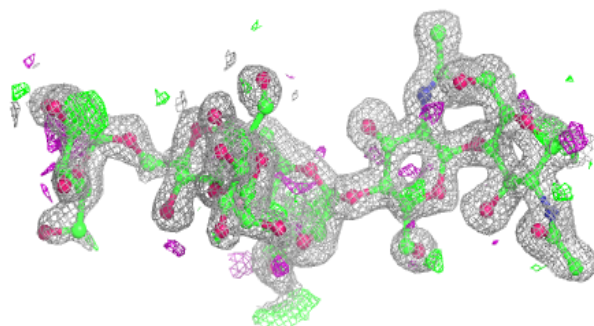
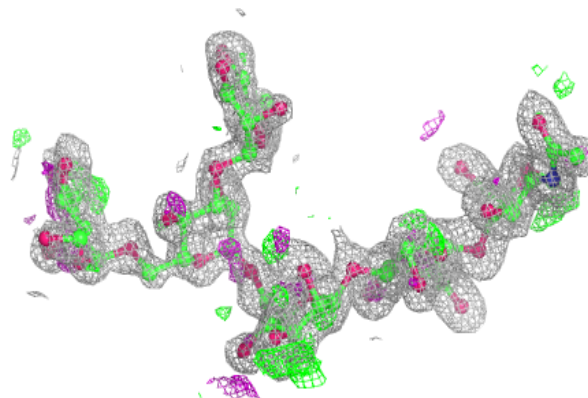


Electron density around Chain J:

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

**Electron density around Chain L:**

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



6.4 Ligands

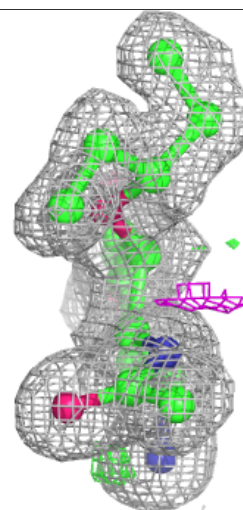
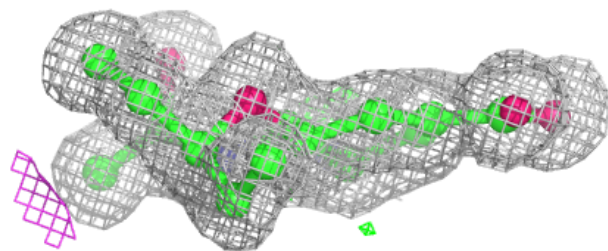
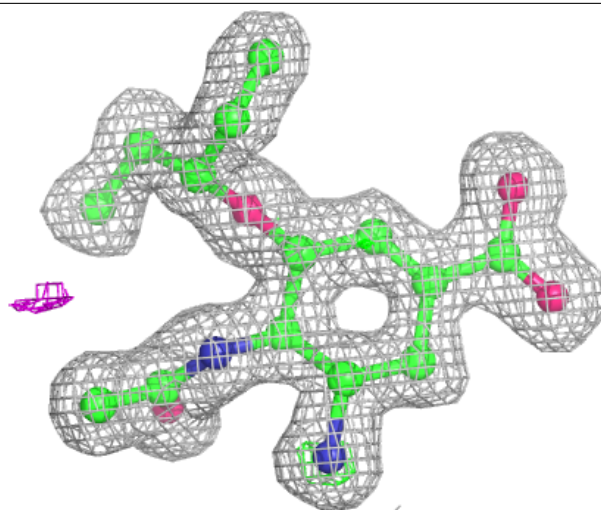
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	GOL	B	512	6/6	0.48	0.24	40,42,46,48	0
5	NAG	D	501	14/15	0.49	0.28	36,41,45,46	0
7	GOL	B	513	6/6	0.53	0.17	43,44,45,46	0
5	NAG	C	501	14/15	0.85	0.20	28,34,41,44	0
7	GOL	B	514	6/6	0.86	0.20	33,36,38,39	0
9	CO2	D	514	3/3	0.86	0.15	26,26,29,31	3
7	GOL	D	512	6/6	0.88	0.16	17,20,20,21	0
7	GOL	D	511	6/6	0.88	0.15	23,25,28,40	0
7	GOL	C	511	6/6	0.90	0.11	17,20,22,23	0
5	NAG	A	501	14/15	0.91	0.11	20,22,27,29	0
7	GOL	B	511	6/6	0.92	0.11	16,17,18,19	0
6	G39	A	511	20/20	0.96	0.08	8,9,14,15	0
7	GOL	C	512	6/6	0.96	0.07	17,19,19,19	0
6	G39	B	510	20/20	0.96	0.08	7,8,15,15	0
6	G39	C	510	20/20	0.96	0.08	6,7,13,14	0
6	G39	D	510	20/20	0.96	0.07	8,9,14,14	0
7	GOL	A	512	6/6	0.97	0.07	16,17,17,18	0
8	CA	D	513	1/1	0.99	0.05	18,18,18,18	0
8	CA	B	515	1/1	0.99	0.08	16,16,16,16	0
8	CA	A	513	1/1	1.00	0.05	17,17,17,17	0
8	CA	C	513	1/1	1.00	0.06	15,15,15,15	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.

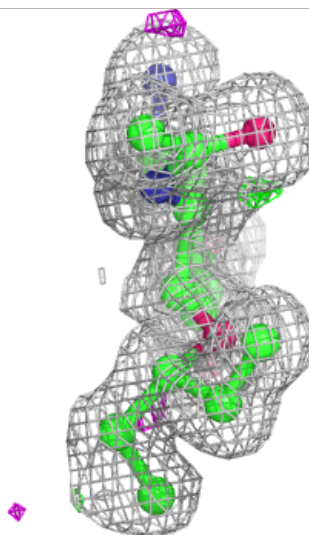
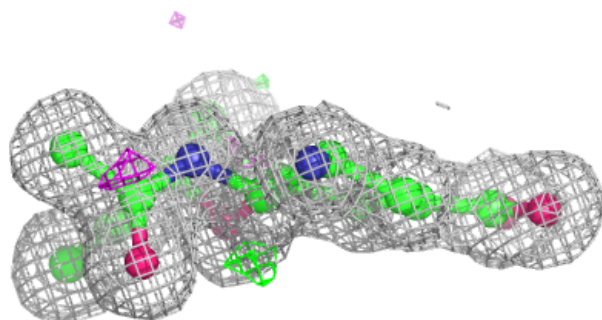
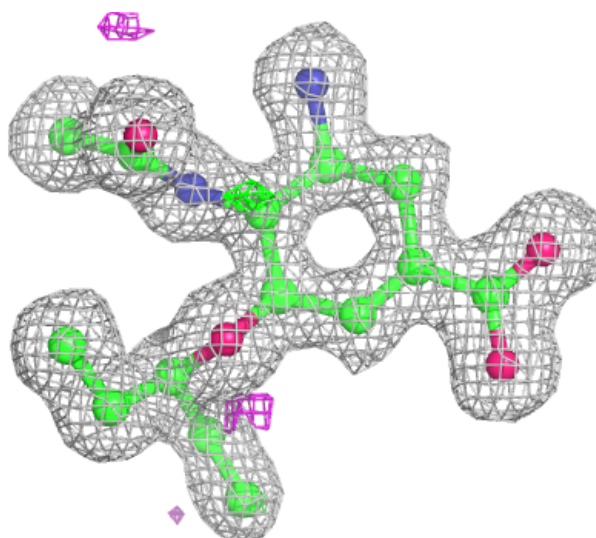
Electron density around G39 A 511:

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



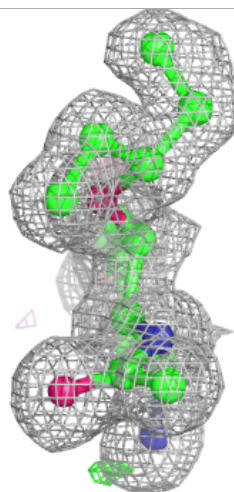
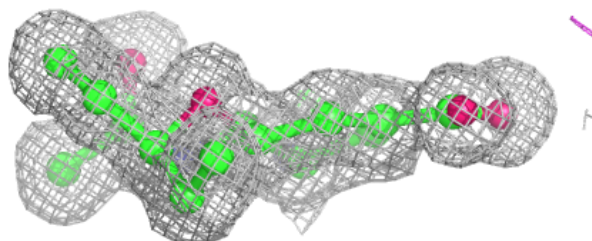
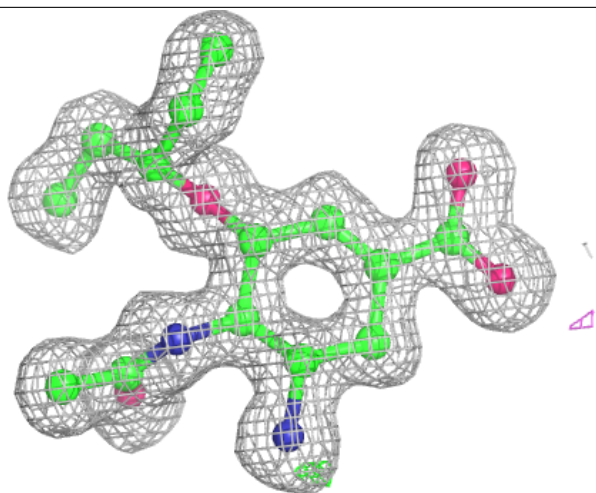
Electron density around G39 B 510:

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



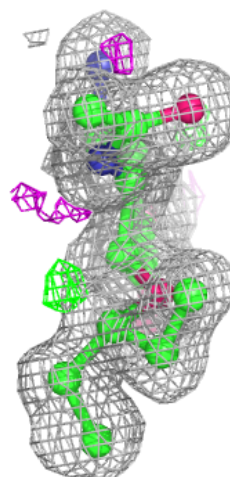
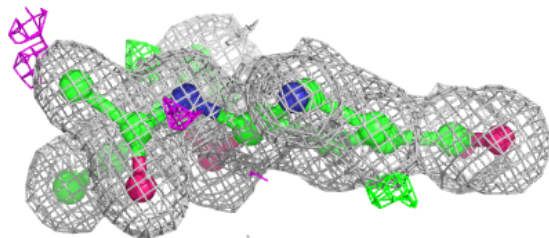
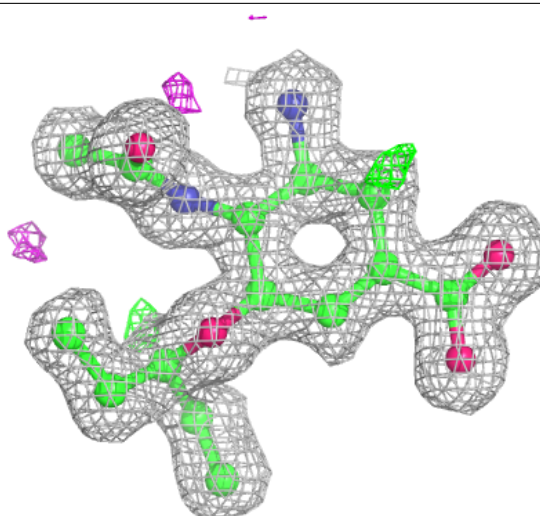
Electron density around G39 C 510:

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



Electron density around G39 D 510:

$2mF_o-DF_c$ (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.