



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 05:54 PM UTC

PDB ID : 9DIO / pdb_00009dio
Title : Crystal structure of H5 hemagglutinin Q226L mutant from the influenza virus
A/Texas/37/2024 (H5N1) with LSTc
Authors : Lin, T.H.; Zhu, Y.; Wilson, I.A.
Deposited on : 2024-09-05
Resolution : 2.70 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

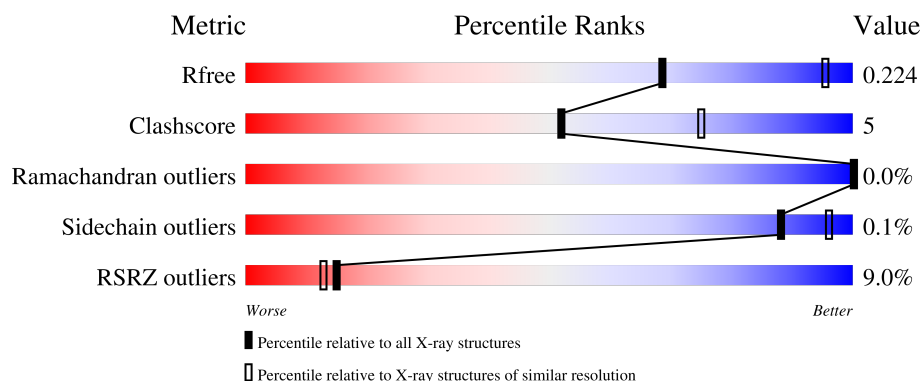
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	325	4% 86% 13% .
1	C	325	2% 87% 12% .
1	E	325	4% 86% 13% .
1	G	325	% 89% 10% .
1	I	325	3% 85% 14% .

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Mol	Chain	Length	Quality of chain
1	K	325	4% 87% 12% .
1	M	325	7% 82% 17% .
1	O	325	2% 89% 10%
1	Q	325	4% 91% 8% ..
2	B	176	5% 82% 16% .
2	D	176	19% 80% 19% ..
2	F	176	29% 78% 22%
2	H	176	10% 82% 16% .
2	J	176	7% 85% 14% .
2	L	176	26% 83% 17%
2	N	176	35% 86% 13% .
2	P	176	9% 80% 19% .
2	R	176	31% 88% 12%
3	S	4	25% 75%
3	W	4	25% 75%
3	d	4	25% 50% 25%
4	T	2	50% 50%
5	U	3	100%
5	V	3	67% 33%
5	X	3	100%
5	Z	3	67% 33%
5	b	3	100%
5	c	3	67% 33%
5	f	3	100%
6	Y	3	33% 33% 33%

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Mol	Chain	Length	Quality of chain
7	a	5	 20% 80%
8	e	4	 25% 25% 50%

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
7	GLC	a	1	X	-	-	-

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 36829 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 Hemagglutinin HA1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	322	Total	C	N	O	S	0	0	0
			2545	1612	442	476	15			
1	C	324	Total	C	N	O	S	0	0	0
			2560	1621	444	480	15			
1	E	323	Total	C	N	O	S	0	0	0
			2553	1616	443	479	15			
1	G	322	Total	C	N	O	S	0	0	0
			2545	1612	442	476	15			
1	I	322	Total	C	N	O	S	0	0	0
			2545	1612	442	476	15			
1	K	323	Total	C	N	O	S	0	0	0
			2553	1616	443	479	15			
1	M	322	Total	C	N	O	S	0	0	0
			2545	1612	442	476	15			
1	O	324	Total	C	N	O	S	0	0	0
			2560	1621	444	480	15			
1	Q	323	Total	C	N	O	S	0	0	0
			2553	1616	443	479	15			

There are 81 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7	ALA	-	expression tag	UNP A0A8E4ZAK5
A	8	ASP	-	expression tag	UNP A0A8E4ZAK5
A	9	PRO	-	expression tag	UNP A0A8E4ZAK5
A	10	GLY	-	expression tag	UNP A0A8E4ZAK5
A	111	MET	LEU	conflict	UNP A0A8E4ZAK5
A	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
A	199	ILE	THR	conflict	UNP A0A8E4ZAK5
A	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
A	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
C	7	ALA	-	expression tag	UNP A0A8E4ZAK5
C	8	ASP	-	expression tag	UNP A0A8E4ZAK5

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Chain	Residue	Modelled	Actual	Comment	Reference
C	9	PRO	-	expression tag	UNP A0A8E4ZAK5
C	10	GLY	-	expression tag	UNP A0A8E4ZAK5
C	111	MET	LEU	conflict	UNP A0A8E4ZAK5
C	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
C	199	ILE	THR	conflict	UNP A0A8E4ZAK5
C	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
C	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
E	7	ALA	-	expression tag	UNP A0A8E4ZAK5
E	8	ASP	-	expression tag	UNP A0A8E4ZAK5
E	9	PRO	-	expression tag	UNP A0A8E4ZAK5
E	10	GLY	-	expression tag	UNP A0A8E4ZAK5
E	111	MET	LEU	conflict	UNP A0A8E4ZAK5
E	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
E	199	ILE	THR	conflict	UNP A0A8E4ZAK5
E	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
E	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
G	7	ALA	-	expression tag	UNP A0A8E4ZAK5
G	8	ASP	-	expression tag	UNP A0A8E4ZAK5
G	9	PRO	-	expression tag	UNP A0A8E4ZAK5
G	10	GLY	-	expression tag	UNP A0A8E4ZAK5
G	111	MET	LEU	conflict	UNP A0A8E4ZAK5
G	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
G	199	ILE	THR	conflict	UNP A0A8E4ZAK5
G	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
G	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
I	7	ALA	-	expression tag	UNP A0A8E4ZAK5
I	8	ASP	-	expression tag	UNP A0A8E4ZAK5
I	9	PRO	-	expression tag	UNP A0A8E4ZAK5
I	10	GLY	-	expression tag	UNP A0A8E4ZAK5
I	111	MET	LEU	conflict	UNP A0A8E4ZAK5
I	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
I	199	ILE	THR	conflict	UNP A0A8E4ZAK5
I	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
I	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
K	7	ALA	-	expression tag	UNP A0A8E4ZAK5
K	8	ASP	-	expression tag	UNP A0A8E4ZAK5
K	9	PRO	-	expression tag	UNP A0A8E4ZAK5
K	10	GLY	-	expression tag	UNP A0A8E4ZAK5
K	111	MET	LEU	conflict	UNP A0A8E4ZAK5
K	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
K	199	ILE	THR	conflict	UNP A0A8E4ZAK5
K	214	ALA	VAL	conflict	UNP A0A8E4ZAK5

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Chain	Residue	Modelled	Actual	Comment	Reference
K	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
M	7	ALA	-	expression tag	UNP A0A8E4ZAK5
M	8	ASP	-	expression tag	UNP A0A8E4ZAK5
M	9	PRO	-	expression tag	UNP A0A8E4ZAK5
M	10	GLY	-	expression tag	UNP A0A8E4ZAK5
M	111	MET	LEU	conflict	UNP A0A8E4ZAK5
M	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
M	199	ILE	THR	conflict	UNP A0A8E4ZAK5
M	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
M	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
O	7	ALA	-	expression tag	UNP A0A8E4ZAK5
O	8	ASP	-	expression tag	UNP A0A8E4ZAK5
O	9	PRO	-	expression tag	UNP A0A8E4ZAK5
O	10	GLY	-	expression tag	UNP A0A8E4ZAK5
O	111	MET	LEU	conflict	UNP A0A8E4ZAK5
O	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
O	199	ILE	THR	conflict	UNP A0A8E4ZAK5
O	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
O	226	LEU	GLN	conflict	UNP A0A8E4ZAK5
Q	7	ALA	-	expression tag	UNP A0A8E4ZAK5
Q	8	ASP	-	expression tag	UNP A0A8E4ZAK5
Q	9	PRO	-	expression tag	UNP A0A8E4ZAK5
Q	10	GLY	-	expression tag	UNP A0A8E4ZAK5
Q	111	MET	LEU	conflict	UNP A0A8E4ZAK5
Q	122	GLN	LEU	engineered mutation	UNP A0A8E4ZAK5
Q	199	ILE	THR	conflict	UNP A0A8E4ZAK5
Q	214	ALA	VAL	conflict	UNP A0A8E4ZAK5
Q	226	LEU	GLN	conflict	UNP A0A8E4ZAK5

- Molecule 2 is a protein called Hemagglutinin HA2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			
2	D	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			
2	F	176	Total	C	N	O	S	0	0	0
			1422	883	247	284	8			
2	H	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			
2	J	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	176	Total	C	N	O	S	0	0	0
			1422	883	247	284	8			
2	N	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			
2	P	174	Total	C	N	O	S	0	0	0
			1412	878	245	281	8			
2	R	176	Total	C	N	O	S	0	0	0
			1422	883	247	284	8			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	175	SER	-	expression tag	UNP A0A6B7HQ27
B	176	GLY	-	expression tag	UNP A0A6B7HQ27
D	175	SER	-	expression tag	UNP A0A6B7HQ27
D	176	GLY	-	expression tag	UNP A0A6B7HQ27
F	175	SER	-	expression tag	UNP A0A6B7HQ27
F	176	GLY	-	expression tag	UNP A0A6B7HQ27
H	175	SER	-	expression tag	UNP A0A6B7HQ27
H	176	GLY	-	expression tag	UNP A0A6B7HQ27
J	175	SER	-	expression tag	UNP A0A6B7HQ27
J	176	GLY	-	expression tag	UNP A0A6B7HQ27
L	175	SER	-	expression tag	UNP A0A6B7HQ27
L	176	GLY	-	expression tag	UNP A0A6B7HQ27
N	175	SER	-	expression tag	UNP A0A6B7HQ27
N	176	GLY	-	expression tag	UNP A0A6B7HQ27
P	175	SER	-	expression tag	UNP A0A6B7HQ27
P	176	GLY	-	expression tag	UNP A0A6B7HQ27
R	175	SER	-	expression tag	UNP A0A6B7HQ27
R	176	GLY	-	expression tag	UNP A0A6B7HQ27

- Molecule 3 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose.



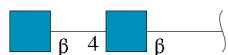
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	S	4	Total	C	N	O	0	0	0
			57	31	2	24			

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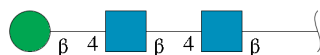
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	W	4	Total	C	N	O	0	0	0
			57	31	2	24			
3	d	4	Total	C	N	O	0	0	0
			57	31	2	24			

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



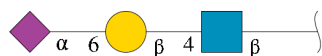
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	T	2	Total	C	N	O	0	0	0
			28	16	2	10			

- 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.



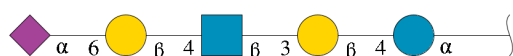
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	U	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	V	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	X	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	Z	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	b	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	c	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	f	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 6 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



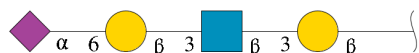
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	Y	3	Total	C	N	O	0	0	0
			46	25	2	19			

- Molecule 7 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose-(1-4)-alpha-D-glucopyranose.



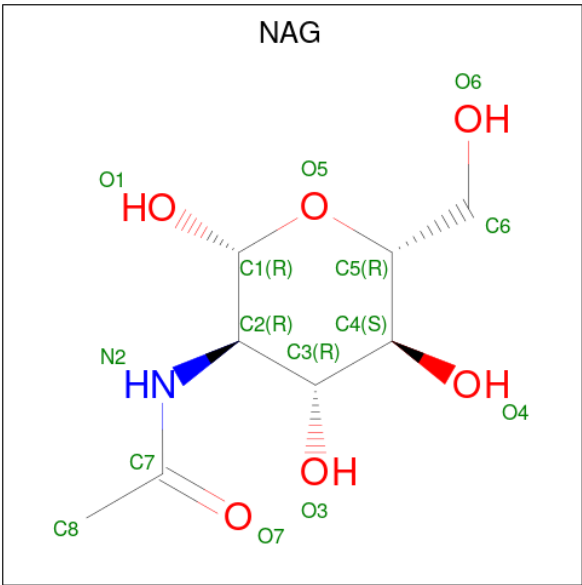
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
7	a	5	Total	C	N	O	0	0	0
			68	37	2	29			

- Molecule 8 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
8	e	4	Total	C	N	O	0	0	0
			57	31	2	24			

- Molecule 9 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
9	A	1	Total	C	N	O	0	0
			14	8	1	5		
9	A	1	Total	C	N	O	0	0
			14	8	1	5		
9	B	1	Total	C	N	O	0	0
			14	8	1	5		
9	C	1	Total	C	N	O	0	0
			14	8	1	5		
9	E	1	Total	C	N	O	0	0
			14	8	1	5		
9	G	1	Total	C	N	O	0	0
			14	8	1	5		
9	G	1	Total	C	N	O	0	0
			14	8	1	5		
9	I	1	Total	C	N	O	0	0
			14	8	1	5		
9	I	1	Total	C	N	O	0	0
			14	8	1	5		
9	K	1	Total	C	N	O	0	0
			14	8	1	5		
9	M	1	Total	C	N	O	0	0
			14	8	1	5		
9	M	1	Total	C	N	O	0	0
			14	8	1	5		
9	O	1	Total	C	N	O	0	0
			14	8	1	5		
9	O	1	Total	C	N	O	0	0
			14	8	1	5		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
9	P	1	Total	C	N	O	0	0
			14	8	1	5		
9	Q	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	19	Total	O	0	0
			19	19		
10	B	7	Total	O	0	0
			7	7		
10	C	35	Total	O	0	0
			35	35		
10	D	12	Total	O	0	0
			12	12		
10	E	13	Total	O	0	0
			13	13		
10	F	5	Total	O	0	0
			5	5		
10	G	20	Total	O	0	0
			20	20		
10	H	12	Total	O	0	0
			12	12		
10	I	15	Total	O	0	0
			15	15		
10	J	11	Total	O	0	0
			11	11		
10	K	25	Total	O	0	0
			25	25		
10	L	8	Total	O	0	0
			8	8		
10	M	22	Total	O	0	0
			22	22		
10	N	6	Total	O	0	0
			6	6		
10	O	22	Total	O	0	0
			22	22		
10	P	11	Total	O	0	0
			11	11		
10	Q	17	Total	O	0	0
			17	17		

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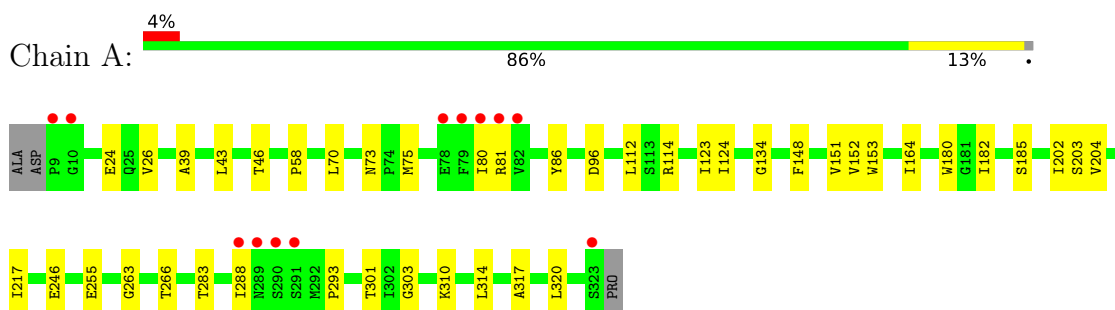
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	R	5	Total	O	0	0
			5	5		

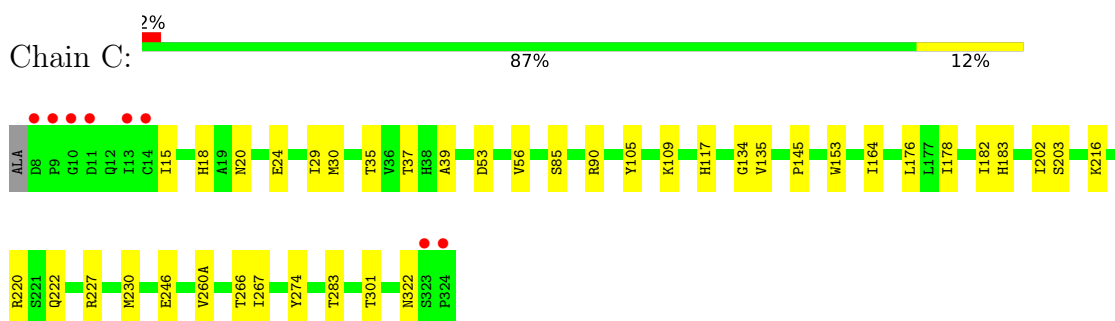
3 Residue-property plots [i](#)

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.

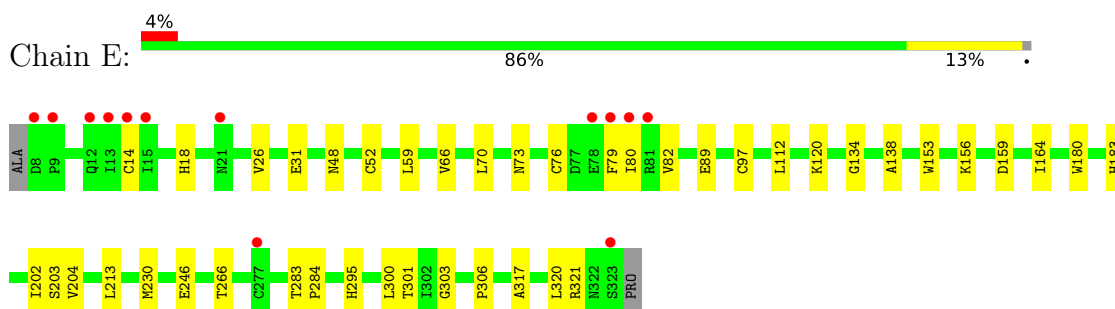
- Molecule 1: Hemagglutinin HA1



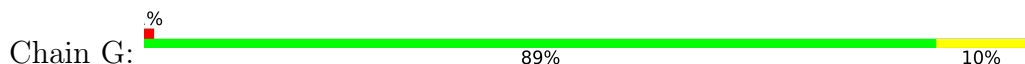
- Molecule 1: Hemagglutinin HA1

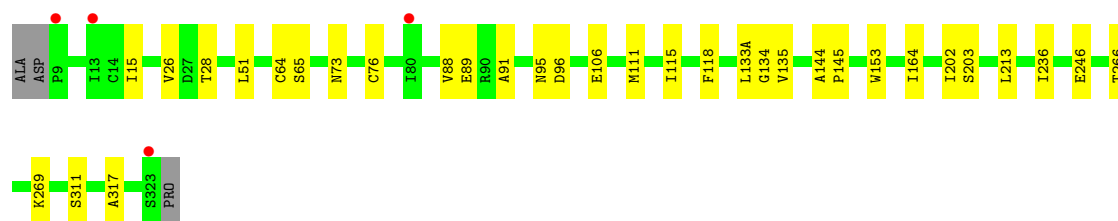


- Molecule 1: Hemagglutinin HA1

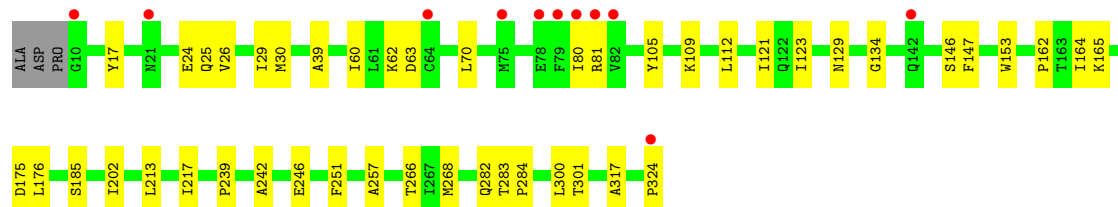
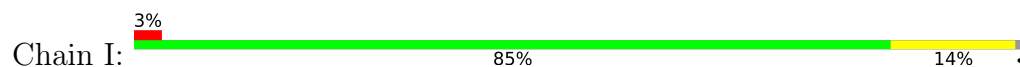


- Molecule 1: Hemagglutinin HA1

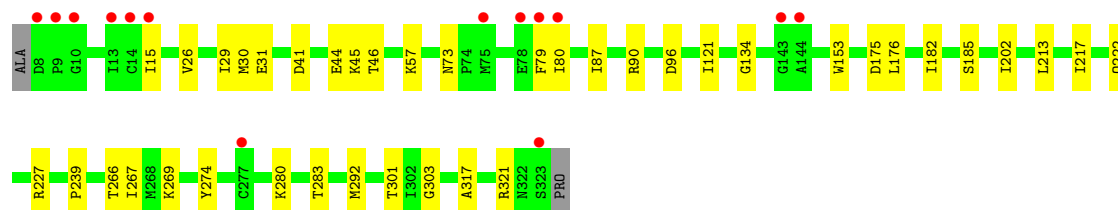
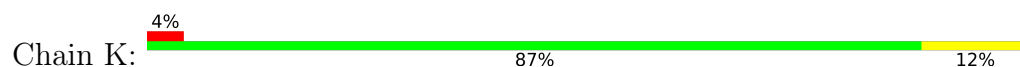




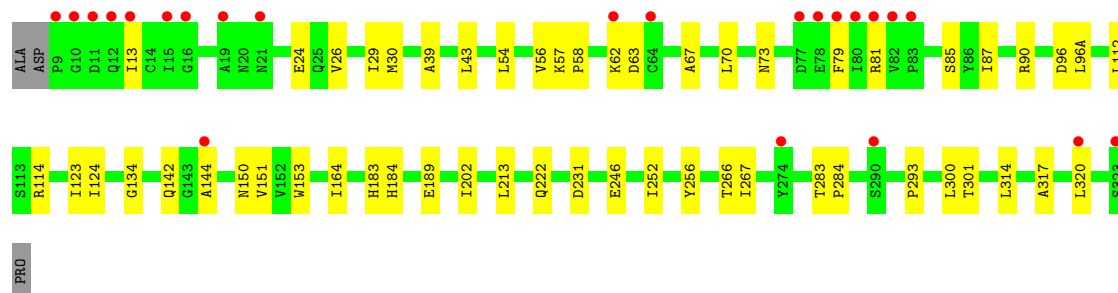
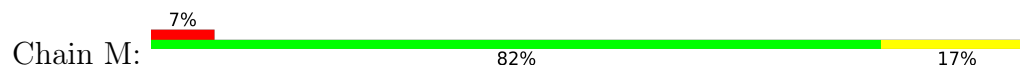
• Molecule 1: Hemagglutinin HA1



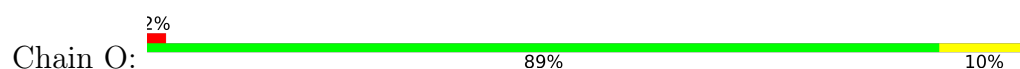
• Molecule 1: Hemagglutinin HA1

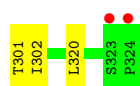


• Molecule 1: Hemagglutinin HA1

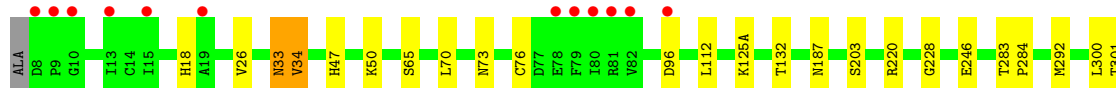
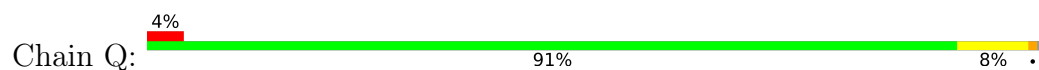


• Molecule 1: Hemagglutinin HA1

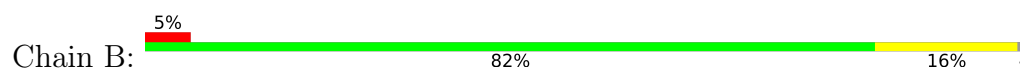




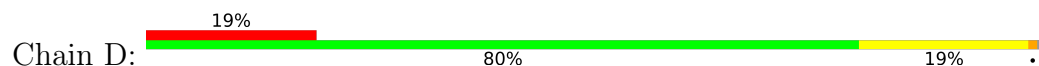
• Molecule 1: Hemagglutinin HA1



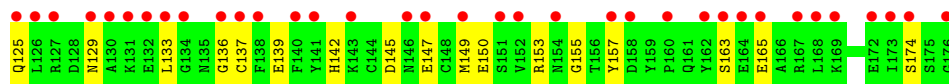
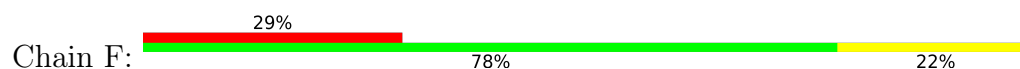
• Molecule 2: Hemagglutinin HA2



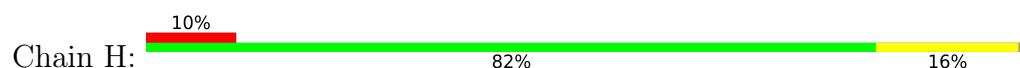
• Molecule 2: Hemagglutinin HA2

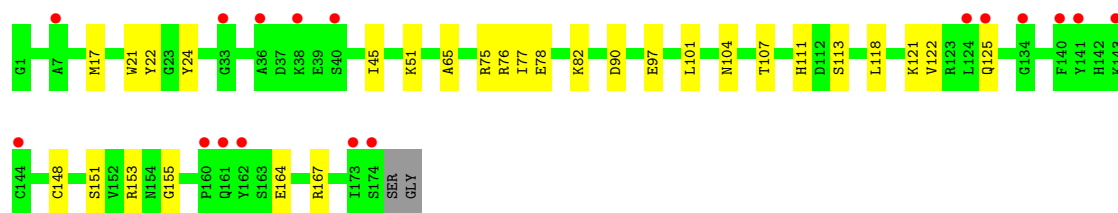


• Molecule 2: Hemagglutinin HA2

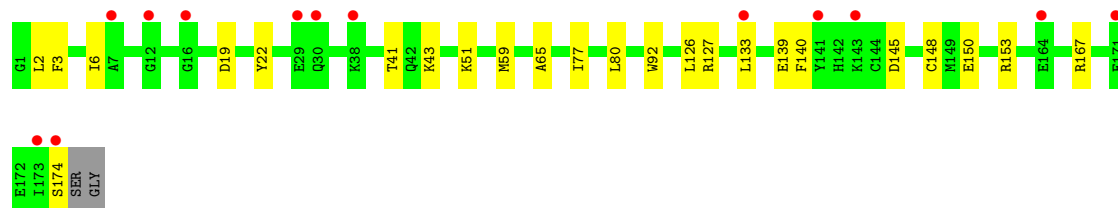
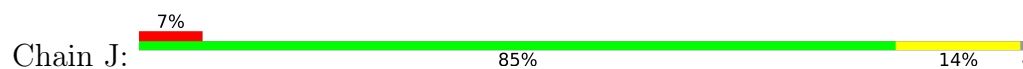


• Molecule 2: Hemagglutinin HA2

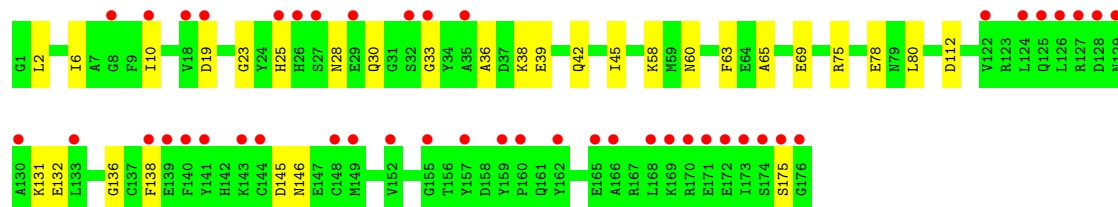
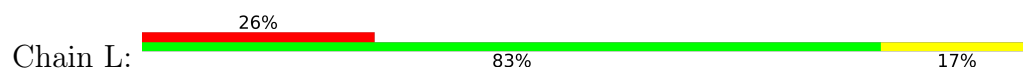




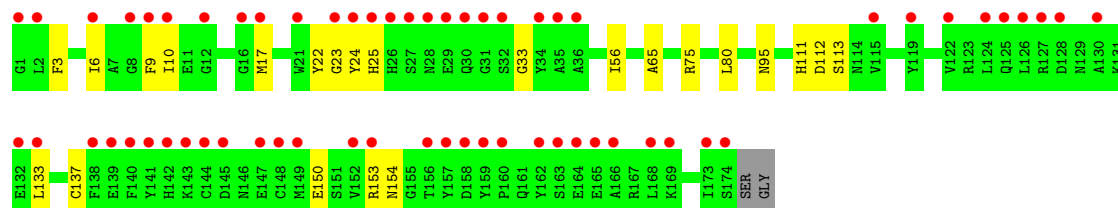
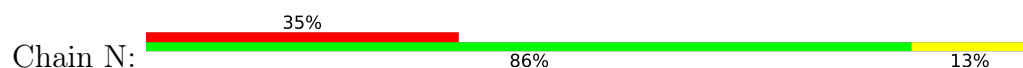
• Molecule 2: Hemagglutinin HA2



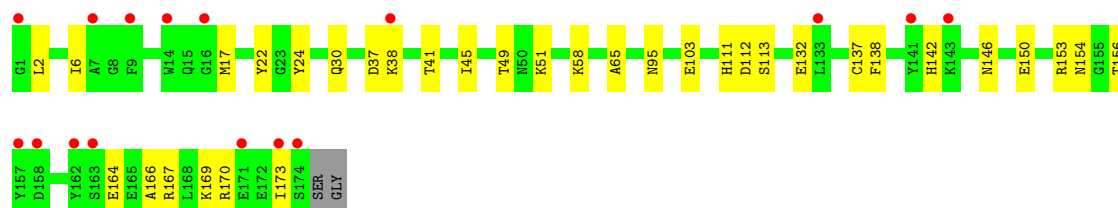
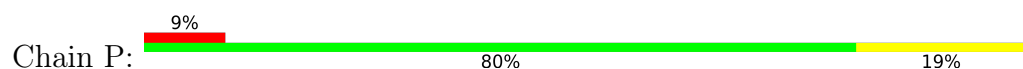
• Molecule 2: Hemagglutinin HA2



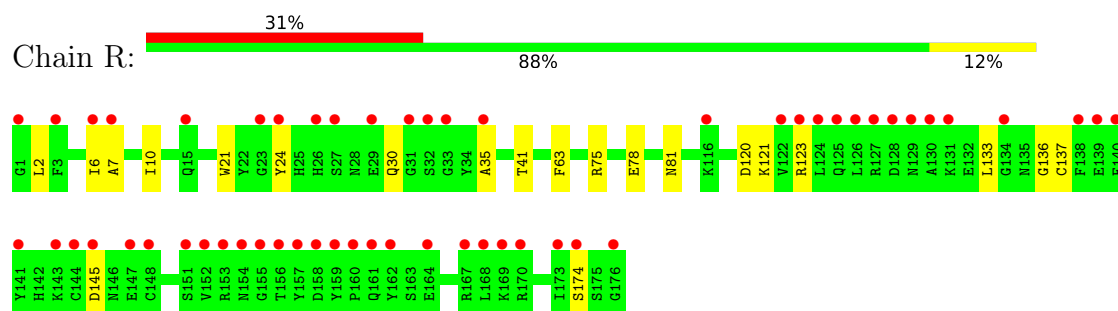
• Molecule 2: Hemagglutinin HA2



• Molecule 2: Hemagglutinin HA2



- Molecule 2: Hemagglutinin HA2



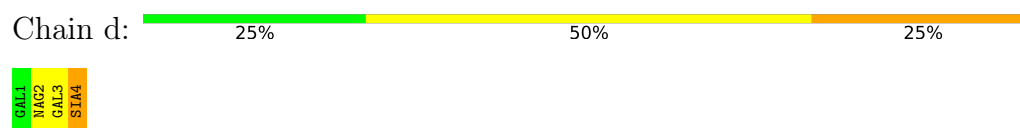
- Molecule 3: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose



- Molecule 3: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose



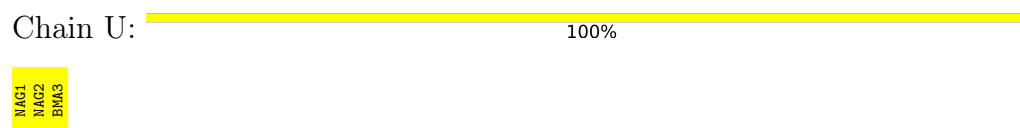
- Molecule 3: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose



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



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

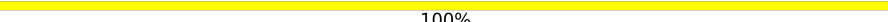


- Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain V:  67% 33%

MAG1
MAG2
BMA3

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

Chain X:  100%

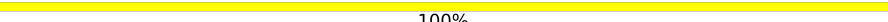
MAG1
MAG2
BMA3

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

Chain Z:  67% 33%

MAG1
MAG2
BMA3

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

Chain b:  100%

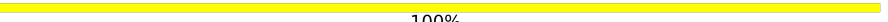
MAG1
MAG2
BMA3

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

Chain c:  67% 33%

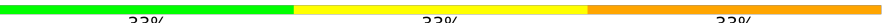
MAG1
MAG2
BMA3

- Molecule 5: 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

- Molecule 6: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain Y:  33% 33% 33%



- Molecule 7: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose-(1-4)-alpha-D-glucopyranose

Chain a:



- Molecule 8: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-beta-D-galactopyranose

Chain e:



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	254.38Å 214.47Å 136.04Å 90.00° 115.08° 90.00°	Depositor
Resolution (Å)	45.33 – 2.70 45.33 – 2.70	Depositor EDS
% Data completeness (in resolution range)	98.6 (45.33-2.70) 99.7 (45.33-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.13 (at 2.69Å)	Xtriage
Refinement program	PHENIX (1.21rc1_5127: ???)	Depositor
R, R_{free}	0.216 , 0.256 (Not available) , 0.224	Depositor DCC
R_{free} test set	9127 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	41.9	Xtriage
Anisotropy	0.310	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 44.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	36829	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.36% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GLC, SIA, BMA, GAL, 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	0.11	0/2609	0.29	0/3546
1	C	0.10	0/2625	0.28	0/3570
1	E	0.11	0/2617	0.28	0/3558
1	G	0.09	0/2609	0.28	0/3546
1	I	0.10	0/2609	0.28	0/3547
1	K	0.10	0/2617	0.27	0/3558
1	M	0.09	0/2609	0.28	0/3546
1	O	0.09	0/2625	0.26	0/3570
1	Q	0.10	0/2617	0.32	2/3558 (0.1%)
2	B	0.09	0/1439	0.23	0/1934
2	D	0.09	0/1439	0.26	0/1934
2	F	0.09	0/1449	0.23	0/1947
2	H	0.10	0/1439	0.24	0/1934
2	J	0.10	0/1439	0.29	0/1934
2	L	0.09	0/1449	0.22	0/1947
2	N	0.09	0/1439	0.22	0/1934
2	P	0.09	0/1439	0.24	0/1934
2	R	0.08	0/1449	0.23	0/1947
All	All	0.09	0/36518	0.27	2/49444 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	Q	33	ASN	CA-C-N	5.33	131.56	121.97
1	Q	33	ASN	C-N-CA	5.33	131.56	121.97

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	2545	0	2496	24	0
1	C	2560	0	2506	23	0
1	E	2553	0	2499	26	0
1	G	2545	0	2495	22	0
1	I	2545	0	2494	29	0
1	K	2553	0	2500	25	0
1	M	2545	0	2496	32	0
1	O	2560	0	2506	23	0
1	Q	2553	0	2499	18	0
2	B	1412	0	1318	21	0
2	D	1412	0	1321	28	0
2	F	1422	0	1327	25	0
2	H	1412	0	1319	23	0
2	J	1412	0	1318	20	0
2	L	1422	0	1329	22	0
2	N	1412	0	1321	17	0
2	P	1412	0	1318	30	0
2	R	1422	0	1329	14	0
3	S	57	0	49	0	0
3	W	57	0	49	0	0
3	d	57	0	49	1	0
4	T	28	0	25	0	0
5	U	39	0	34	0	0
5	V	39	0	34	1	0
5	X	39	0	34	0	0
5	Z	39	0	34	1	0
5	b	39	0	34	0	0
5	c	39	0	34	1	0
5	f	39	0	34	0	0
6	Y	46	0	40	1	0
7	a	68	0	58	0	0
8	e	57	0	49	1	0
9	A	28	0	26	0	0
9	B	14	0	13	0	0
9	C	14	0	13	0	0
9	E	14	0	13	0	0
9	G	28	0	26	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
9	I	28	0	26	1	0
9	K	14	0	13	0	0
9	M	28	0	26	0	0
9	O	28	0	26	0	0
9	P	14	0	13	1	0
9	Q	14	0	13	0	0
10	A	19	0	0	0	0
10	B	7	0	0	0	0
10	C	35	0	0	0	0
10	D	12	0	0	1	0
10	E	13	0	0	0	0
10	F	5	0	0	0	0
10	G	20	0	0	0	0
10	H	12	0	0	0	0
10	I	15	0	0	0	0
10	J	11	0	0	0	0
10	K	25	0	0	0	0
10	L	8	0	0	0	0
10	M	22	0	0	0	0
10	N	6	0	0	0	0
10	O	22	0	0	0	0
10	P	11	0	0	0	0
10	Q	17	0	0	0	0
10	R	5	0	0	0	0
All	All	36829	0	35156	363	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 5.

The worst 5 of 363 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:22:TYR:HH	2:H:111:HIS:HD1	1.14	0.96
2:F:30:GLN:HE22	2:F:145:ASP:HB2	1.45	0.80
1:M:29:ILE:HG23	1:M:30:MET:HG3	1.71	0.71
1:K:90:ARG:O	1:K:269:LYS:NZ	2.24	0.70
1:M:26:VAL:HG21	1:M:317:ALA:HB2	1.72	0.70

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	320/325 (98%)	299 (93%)	21 (7%)	0	100	100
1	C	322/325 (99%)	316 (98%)	6 (2%)	0	100	100
1	E	321/325 (99%)	312 (97%)	9 (3%)	0	100	100
1	G	320/325 (98%)	309 (97%)	11 (3%)	0	100	100
1	I	320/325 (98%)	311 (97%)	9 (3%)	0	100	100
1	K	321/325 (99%)	311 (97%)	10 (3%)	0	100	100
1	M	320/325 (98%)	302 (94%)	18 (6%)	0	100	100
1	O	322/325 (99%)	316 (98%)	6 (2%)	0	100	100
1	Q	321/325 (99%)	312 (97%)	8 (2%)	1 (0%)	36	60
2	B	172/176 (98%)	171 (99%)	1 (1%)	0	100	100
2	D	172/176 (98%)	168 (98%)	3 (2%)	1 (1%)	21	44
2	F	174/176 (99%)	167 (96%)	7 (4%)	0	100	100
2	H	172/176 (98%)	171 (99%)	1 (1%)	0	100	100
2	J	172/176 (98%)	166 (96%)	6 (4%)	0	100	100
2	L	174/176 (99%)	170 (98%)	4 (2%)	0	100	100
2	N	172/176 (98%)	170 (99%)	2 (1%)	0	100	100
2	P	172/176 (98%)	163 (95%)	9 (5%)	0	100	100
2	R	174/176 (99%)	166 (95%)	8 (5%)	0	100	100
All	All	4441/4509 (98%)	4300 (97%)	139 (3%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	Q	34	VAL
2	D	5	ALA

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	285/287 (99%)	284 (100%)	1 (0%)	84	93
1	C	287/287 (100%)	287 (100%)	0	100	100
1	E	286/287 (100%)	286 (100%)	0	100	100
1	G	285/287 (99%)	285 (100%)	0	100	100
1	I	285/287 (99%)	285 (100%)	0	100	100
1	K	286/287 (100%)	285 (100%)	1 (0%)	86	94
1	M	285/287 (99%)	285 (100%)	0	100	100
1	O	287/287 (100%)	286 (100%)	1 (0%)	86	94
1	Q	286/287 (100%)	286 (100%)	0	100	100
2	B	149/150 (99%)	149 (100%)	0	100	100
2	D	149/150 (99%)	148 (99%)	1 (1%)	76	90
2	F	150/150 (100%)	150 (100%)	0	100	100
2	H	149/150 (99%)	149 (100%)	0	100	100
2	J	149/150 (99%)	149 (100%)	0	100	100
2	L	150/150 (100%)	150 (100%)	0	100	100
2	N	149/150 (99%)	149 (100%)	0	100	100
2	P	149/150 (99%)	149 (100%)	0	100	100
2	R	150/150 (100%)	149 (99%)	1 (1%)	76	90
All	All	3916/3933 (100%)	3911 (100%)	5 (0%)	88	96

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	310	LYS
2	D	95	ASN
1	K	80	ILE
1	O	135	VAL
2	R	121	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 51 such sidechains are listed below:

Mol	Chain	Res	Type
2	J	25	HIS
2	N	42	GLN
2	R	50	ASN
2	J	42	GLN
2	L	95	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 ⓘ

47 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	GAL	S	1	3	12,12,12	0.63	0	17,17,17	0.79	0
3	NAG	S	2	3	14,14,15	0.69	0	17,19,21	1.03	1 (5%)
3	GAL	S	3	3	11,11,12	0.75	0	15,15,17	1.09	1 (6%)
3	SIA	S	4	3	20,20,21	1.56	2 (10%)	21,28,31	1.93	4 (19%)
4	NAG	T	1	4,1	14,14,15	0.68	0	17,19,21	0.90	0
4	NAG	T	2	4	14,14,15	0.70	0	17,19,21	0.97	1 (5%)
5	NAG	U	1	5,1	14,14,15	0.70	0	17,19,21	1.00	1 (5%)
5	NAG	U	2	5	14,14,15	0.70	0	17,19,21	0.95	1 (5%)
5	BMA	U	3	5	11,11,12	0.77	0	15,15,17	1.88	1 (6%)
5	NAG	V	1	5,2	14,14,15	0.63	0	17,19,21	1.09	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	V	2	5	14,14,15	0.72	0	17,19,21	1.15	2 (11%)
5	BMA	V	3	5	11,11,12	0.81	0	15,15,17	1.67	1 (6%)
3	GAL	W	1	3	12,12,12	0.62	0	17,17,17	0.78	0
3	NAG	W	2	3	14,14,15	0.64	0	17,19,21	1.06	1 (5%)
3	GAL	W	3	3	11,11,12	0.67	0	15,15,17	1.33	1 (6%)
3	SIA	W	4	3	20,20,21	1.74	4 (20%)	21,28,31	1.23	2 (9%)
5	NAG	X	1	5,1	14,14,15	0.72	0	17,19,21	0.98	1 (5%)
5	NAG	X	2	5	14,14,15	0.71	0	17,19,21	0.94	1 (5%)
5	BMA	X	3	5	11,11,12	0.77	0	15,15,17	1.71	1 (6%)
6	NAG	Y	1	6	15,15,15	0.57	0	21,21,21	1.09	3 (14%)
6	GAL	Y	2	6	11,11,12	0.80	0	15,15,17	1.08	0
6	SIA	Y	3	6	20,20,21	1.56	1 (5%)	21,28,31	1.68	4 (19%)
5	NAG	Z	1	5,1	14,14,15	0.68	0	17,19,21	1.03	1 (5%)
5	NAG	Z	2	5	14,14,15	0.70	0	17,19,21	0.99	1 (5%)
5	BMA	Z	3	5	11,11,12	0.80	0	15,15,17	1.65	1 (6%)
7	GLC	a	1	7	12,12,12	0.51	0	17,17,17	0.71	0
7	GAL	a	2	7	11,11,12	0.76	0	15,15,17	1.21	3 (20%)
7	NAG	a	3	7	14,14,15	0.68	0	17,19,21	0.93	1 (5%)
7	GAL	a	4	7	11,11,12	0.78	0	15,15,17	1.11	2 (13%)
7	SIA	a	5	7	20,20,21	1.55	3 (15%)	21,28,31	1.59	3 (14%)
5	NAG	b	1	5,1	14,14,15	0.67	0	17,19,21	1.03	1 (5%)
5	NAG	b	2	5	14,14,15	0.69	0	17,19,21	0.91	1 (5%)
5	BMA	b	3	5	11,11,12	0.80	0	15,15,17	1.71	1 (6%)
5	NAG	c	1	5,2	14,14,15	0.91	1 (7%)	17,19,21	1.74	6 (35%)
5	NAG	c	2	5	14,14,15	0.83	0	17,19,21	1.72	5 (29%)
5	BMA	c	3	5	11,11,12	0.81	0	15,15,17	1.57	2 (13%)
3	GAL	d	1	3	12,12,12	0.62	0	17,17,17	0.79	0
3	NAG	d	2	3	14,14,15	0.68	0	17,19,21	1.22	2 (11%)
3	GAL	d	3	3	11,11,12	0.83	0	15,15,17	1.16	2 (13%)
3	SIA	d	4	3	20,20,21	1.50	2 (10%)	21,28,31	1.60	2 (9%)
8	GAL	e	1	8	12,12,12	0.59	0	17,17,17	0.87	0
8	NAG	e	2	8	14,14,15	0.74	0	17,19,21	1.24	3 (17%)
8	GAL	e	3	8	11,11,12	0.60	0	15,15,17	2.15	2 (13%)
8	SIA	e	4	8	20,20,21	1.52	2 (10%)	21,28,31	1.49	2 (9%)
5	NAG	f	1	5,1	14,14,15	0.66	0	17,19,21	1.04	1 (5%)
5	NAG	f	2	5	14,14,15	0.69	0	17,19,21	1.06	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	BMA	f	3	5	11,11,12	0.73	0	15,15,17	1.78	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
3	GAL	S	1	3	-	0/2/22/22	0/1/1/1
3	NAG	S	2	3	-	0/6/23/26	0/1/1/1
3	GAL	S	3	3	-	0/2/19/22	0/1/1/1
3	SIA	S	4	3	-	3/18/34/38	0/1/1/1
4	NAG	T	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	T	2	4	-	1/6/23/26	0/1/1/1
5	NAG	U	1	5,1	-	0/6/23/26	0/1/1/1
5	NAG	U	2	5	-	2/6/23/26	0/1/1/1
5	BMA	U	3	5	-	0/2/19/22	0/1/1/1
5	NAG	V	1	5,2	-	2/6/23/26	0/1/1/1
5	NAG	V	2	5	-	4/6/23/26	0/1/1/1
5	BMA	V	3	5	-	2/2/19/22	0/1/1/1
3	GAL	W	1	3	-	0/2/22/22	0/1/1/1
3	NAG	W	2	3	-	0/6/23/26	0/1/1/1
3	GAL	W	3	3	-	2/2/19/22	0/1/1/1
3	SIA	W	4	3	-	7/18/34/38	0/1/1/1
5	NAG	X	1	5,1	-	0/6/23/26	0/1/1/1
5	NAG	X	2	5	-	2/6/23/26	0/1/1/1
5	BMA	X	3	5	-	0/2/19/22	0/1/1/1
6	NAG	Y	1	6	-	2/6/26/26	0/1/1/1
6	GAL	Y	2	6	-	0/2/19/22	0/1/1/1
6	SIA	Y	3	6	-	4/18/34/38	0/1/1/1
5	NAG	Z	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	Z	2	5	-	4/6/23/26	0/1/1/1
5	BMA	Z	3	5	-	0/2/19/22	0/1/1/1
7	GLC	a	1	7	1/1/5/5	2/2/22/22	0/1/1/1
7	GAL	a	2	7	-	2/2/19/22	0/1/1/1
7	NAG	a	3	7	-	0/6/23/26	0/1/1/1
7	GAL	a	4	7	-	0/2/19/22	0/1/1/1
7	SIA	a	5	7	-	4/18/34/38	0/1/1/1
5	NAG	b	1	5,1	-	3/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	b	2	5	-	0/6/23/26	0/1/1/1
5	BMA	b	3	5	-	0/2/19/22	0/1/1/1
5	NAG	c	1	5,2	-	2/6/23/26	0/1/1/1
5	NAG	c	2	5	-	2/6/23/26	0/1/1/1
5	BMA	c	3	5	-	0/2/19/22	0/1/1/1
3	GAL	d	1	3	-	0/2/22/22	0/1/1/1
3	NAG	d	2	3	-	0/6/23/26	0/1/1/1
3	GAL	d	3	3	-	0/2/19/22	0/1/1/1
3	SIA	d	4	3	-	4/18/34/38	0/1/1/1
8	GAL	e	1	8	-	0/2/22/22	0/1/1/1
8	NAG	e	2	8	-	0/6/23/26	0/1/1/1
8	GAL	e	3	8	-	2/2/19/22	0/1/1/1
8	SIA	e	4	8	-	4/18/34/38	0/1/1/1
5	NAG	f	1	5,1	-	0/6/23/26	0/1/1/1
5	NAG	f	2	5	-	0/6/23/26	0/1/1/1
5	BMA	f	3	5	-	0/2/19/22	0/1/1/1

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	W	4	SIA	C2-C1	6.14	1.59	1.52
3	S	4	SIA	C2-C1	5.49	1.58	1.52
6	Y	3	SIA	C2-C1	5.45	1.58	1.52
7	a	5	SIA	C2-C1	5.26	1.58	1.52
8	e	4	SIA	C2-C1	5.21	1.58	1.52

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	e	3	GAL	C1-O5-C5	6.90	121.44	112.19
5	U	3	BMA	C1-O5-C5	6.22	120.53	112.19
5	f	3	BMA	C1-O5-C5	5.81	119.97	112.19
3	S	4	SIA	O1A-C1-C2	-5.35	111.30	122.85
5	X	3	BMA	C1-O5-C5	5.24	119.21	112.19

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
7	a	1	GLC	C1

5 of 61 torsion outliers are listed below:

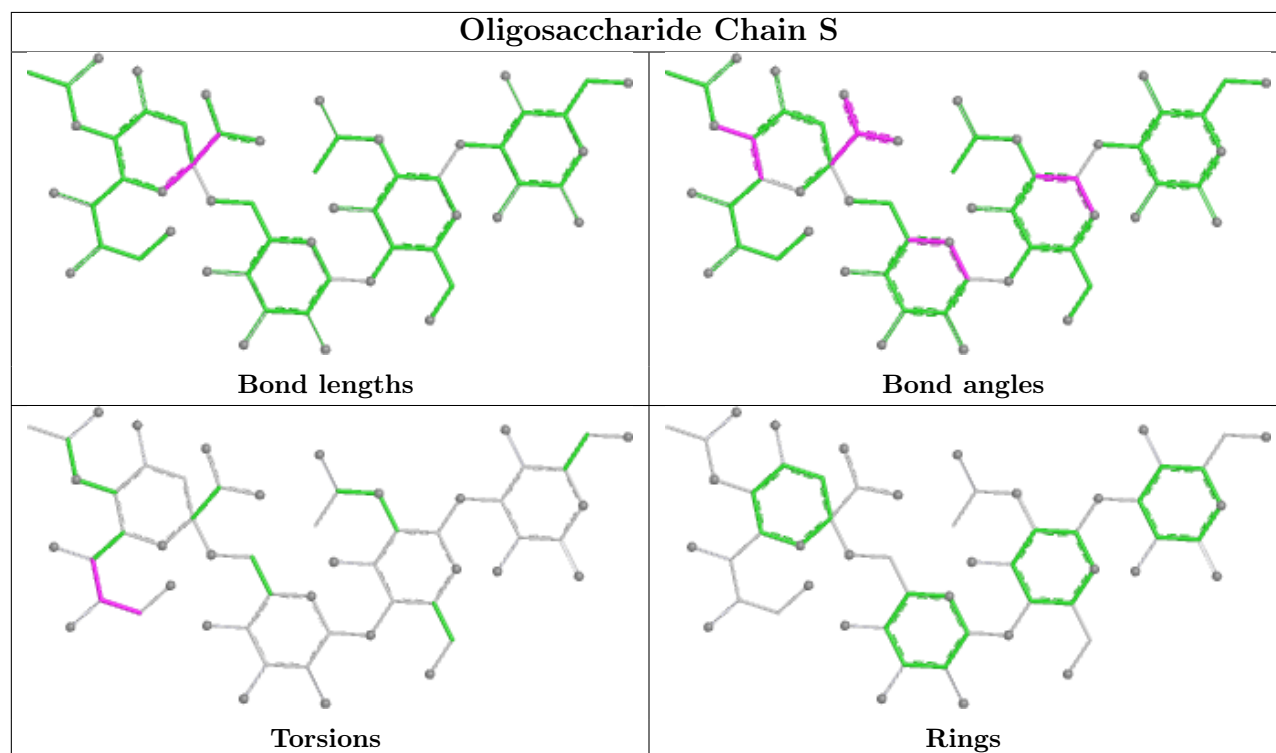
Mol	Chain	Res	Type	Atoms
3	W	3	GAL	O5-C5-C6-O6
8	e	3	GAL	O5-C5-C6-O6
3	W	3	GAL	C4-C5-C6-O6
3	d	4	SIA	C6-C7-C8-O8
8	e	4	SIA	C6-C7-C8-O8

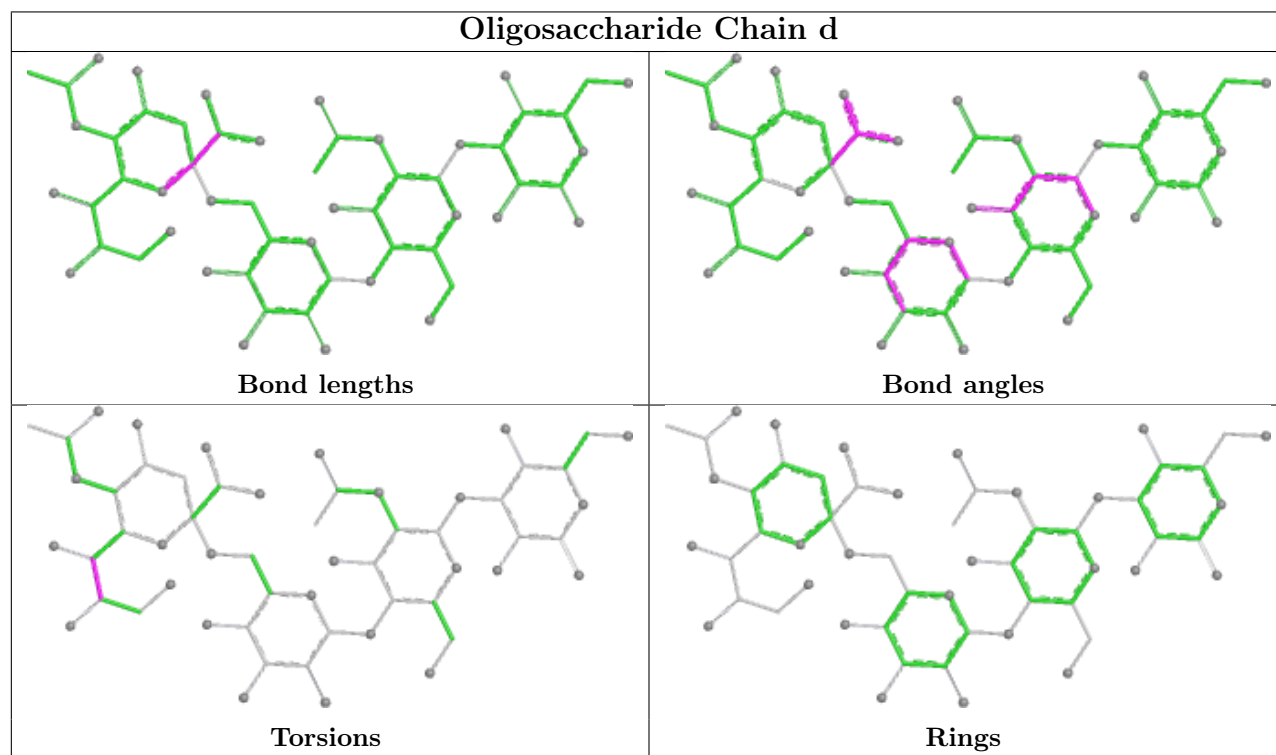
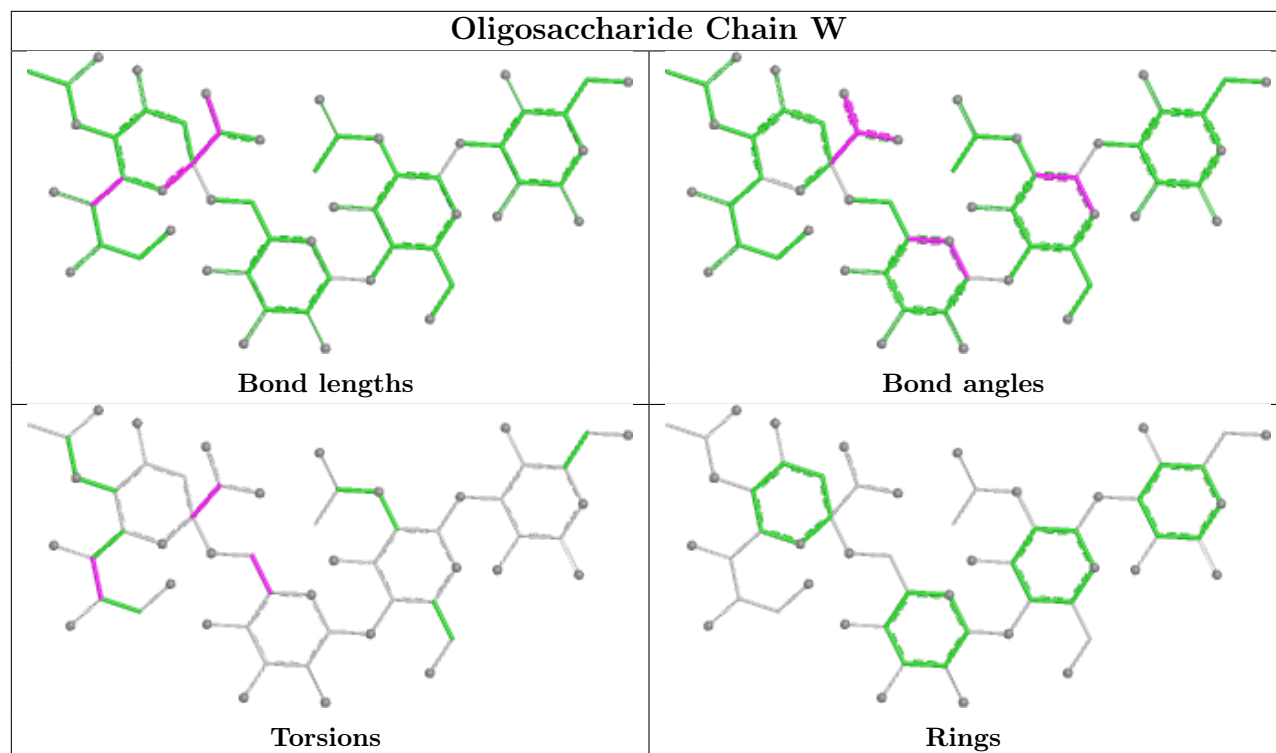
There are no ring outliers.

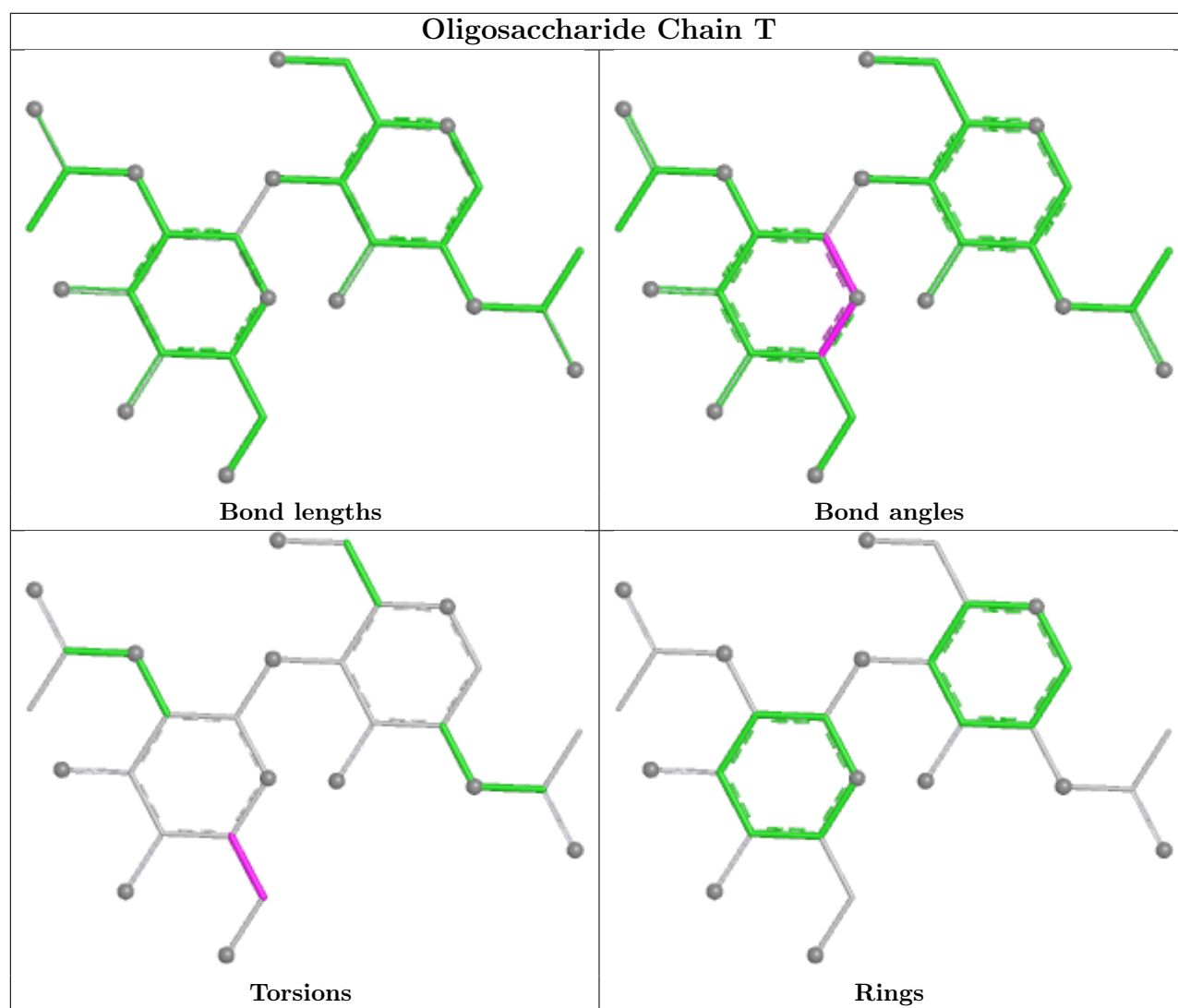
7 monomers are involved in 6 short contacts:

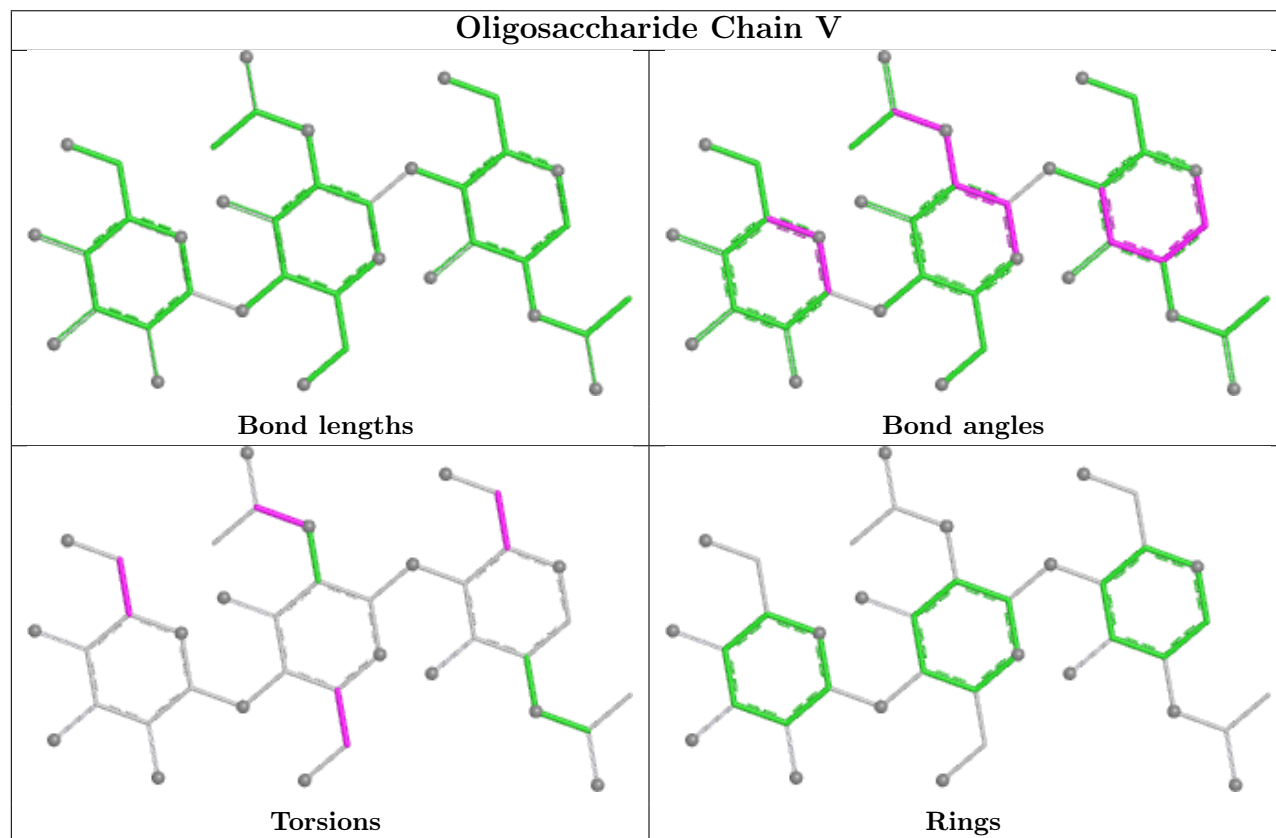
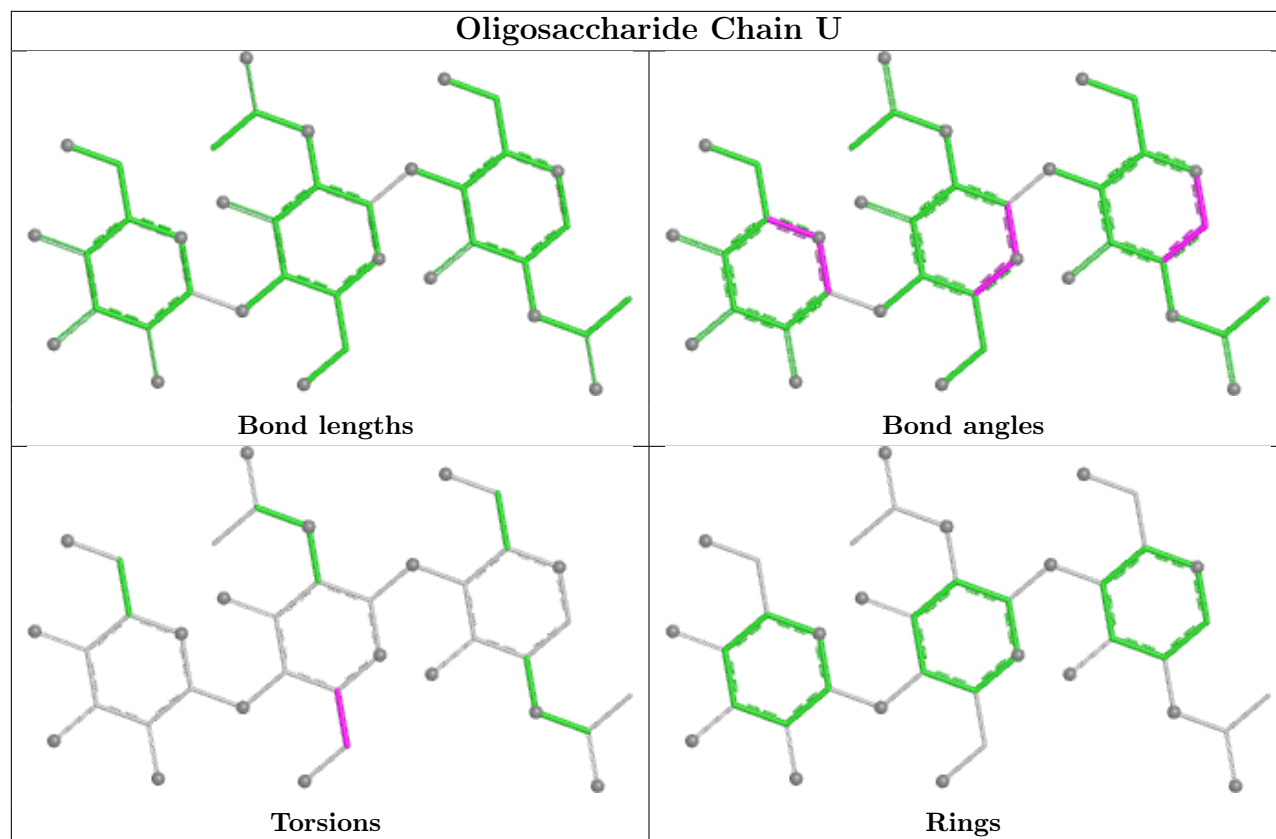
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	Z	3	BMA	1	0
6	Y	3	SIA	1	0
3	d	4	SIA	1	0
5	V	2	NAG	1	0
8	e	2	NAG	1	0
8	e	4	SIA	1	0
5	c	1	NAG	1	0

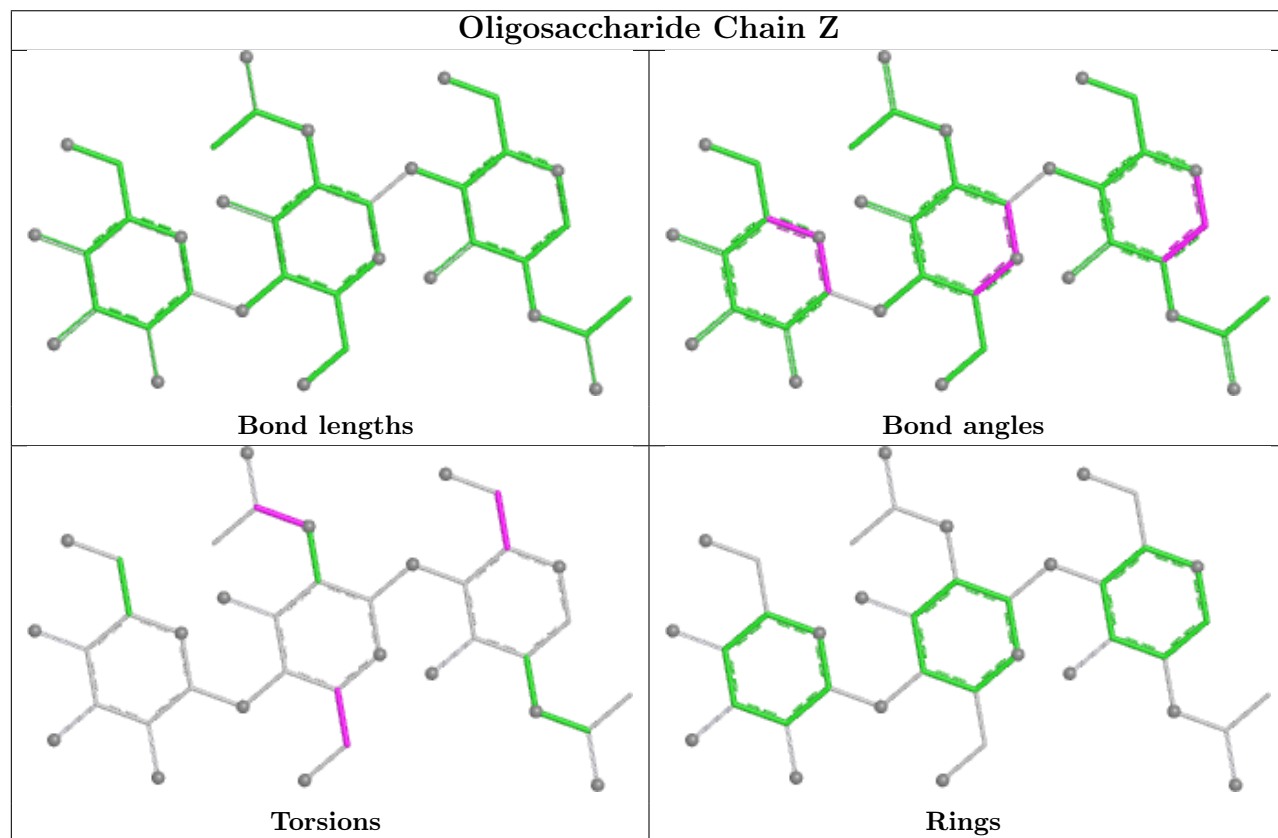
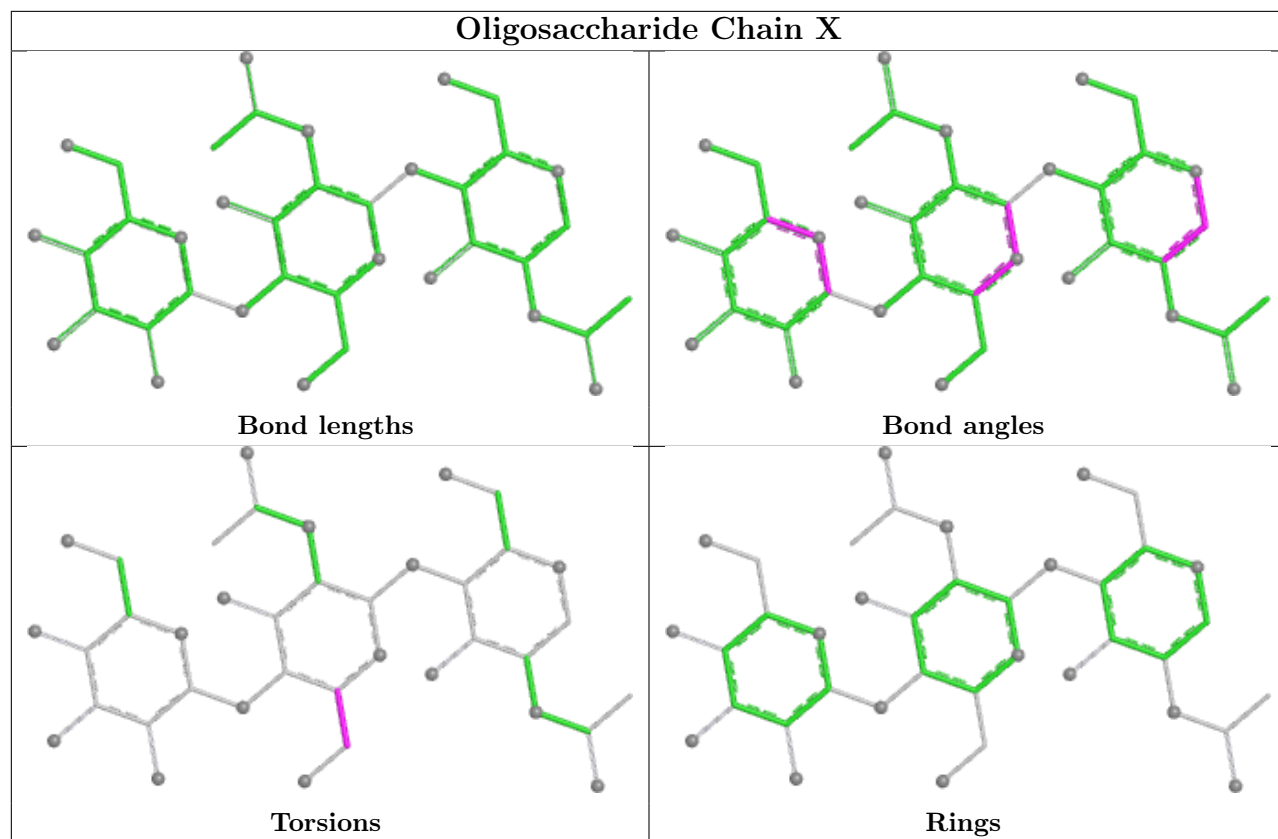
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

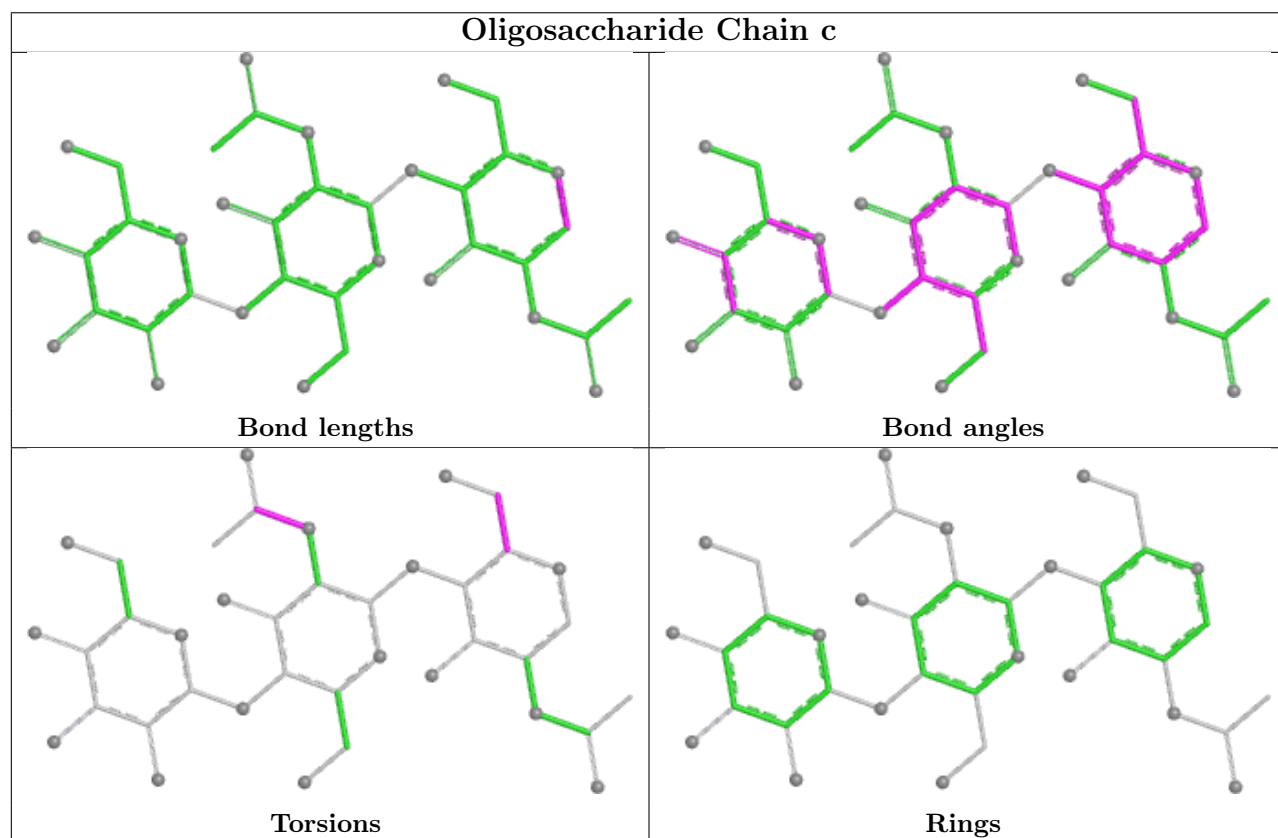
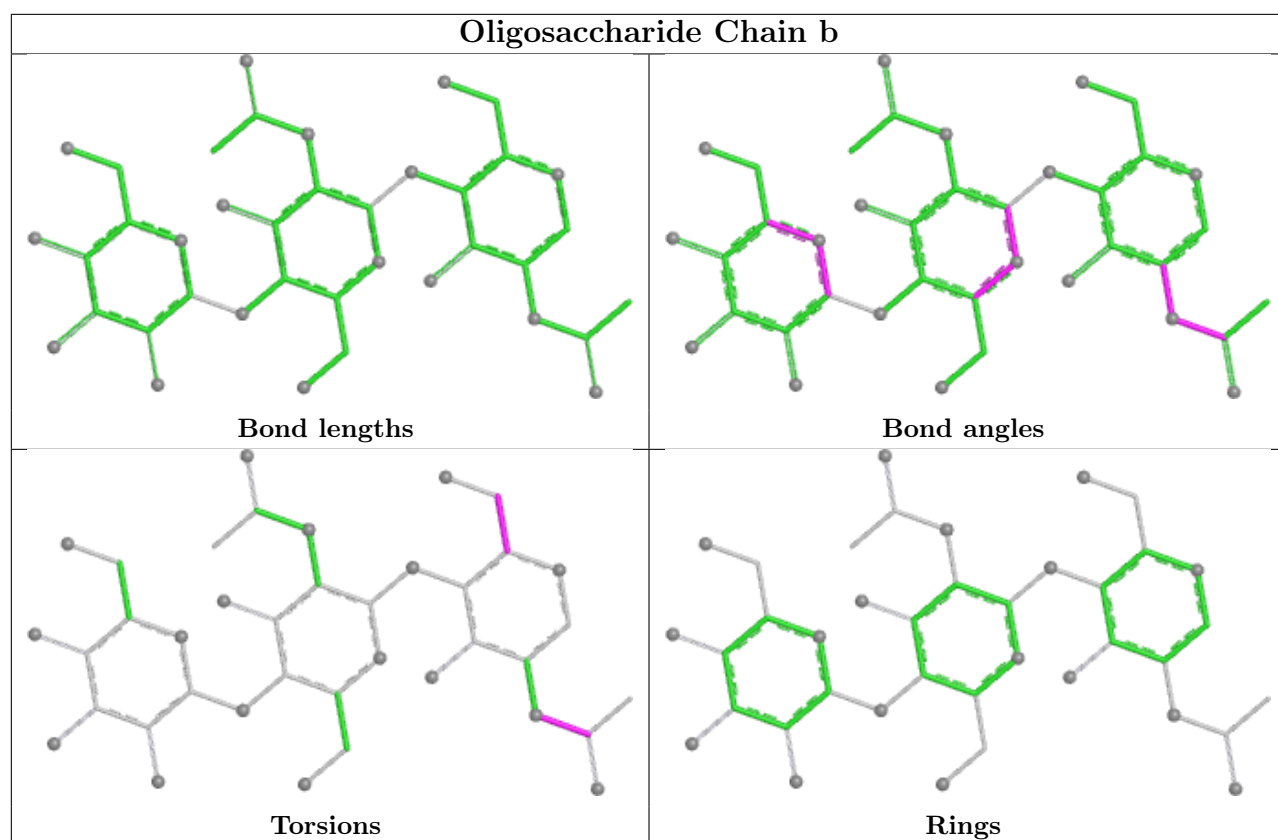


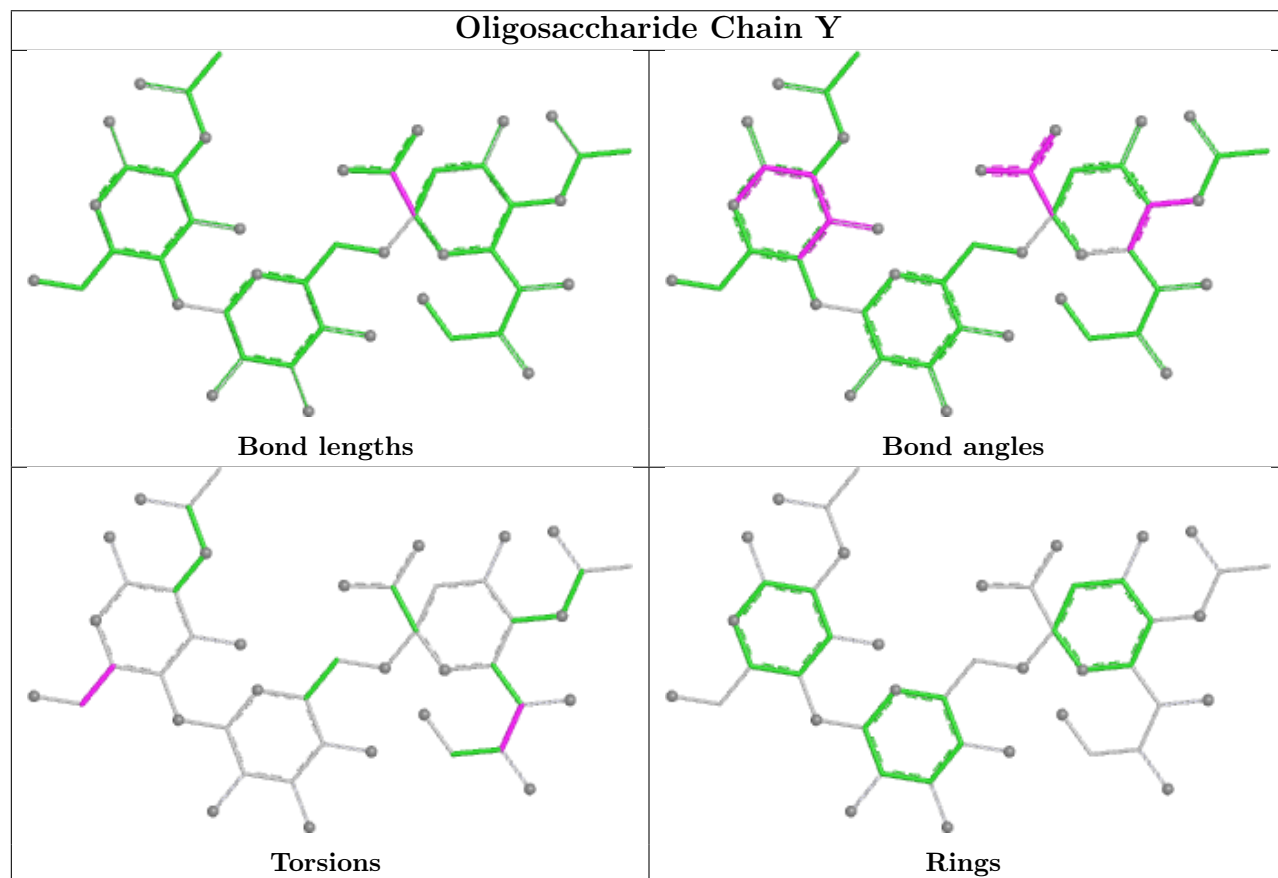
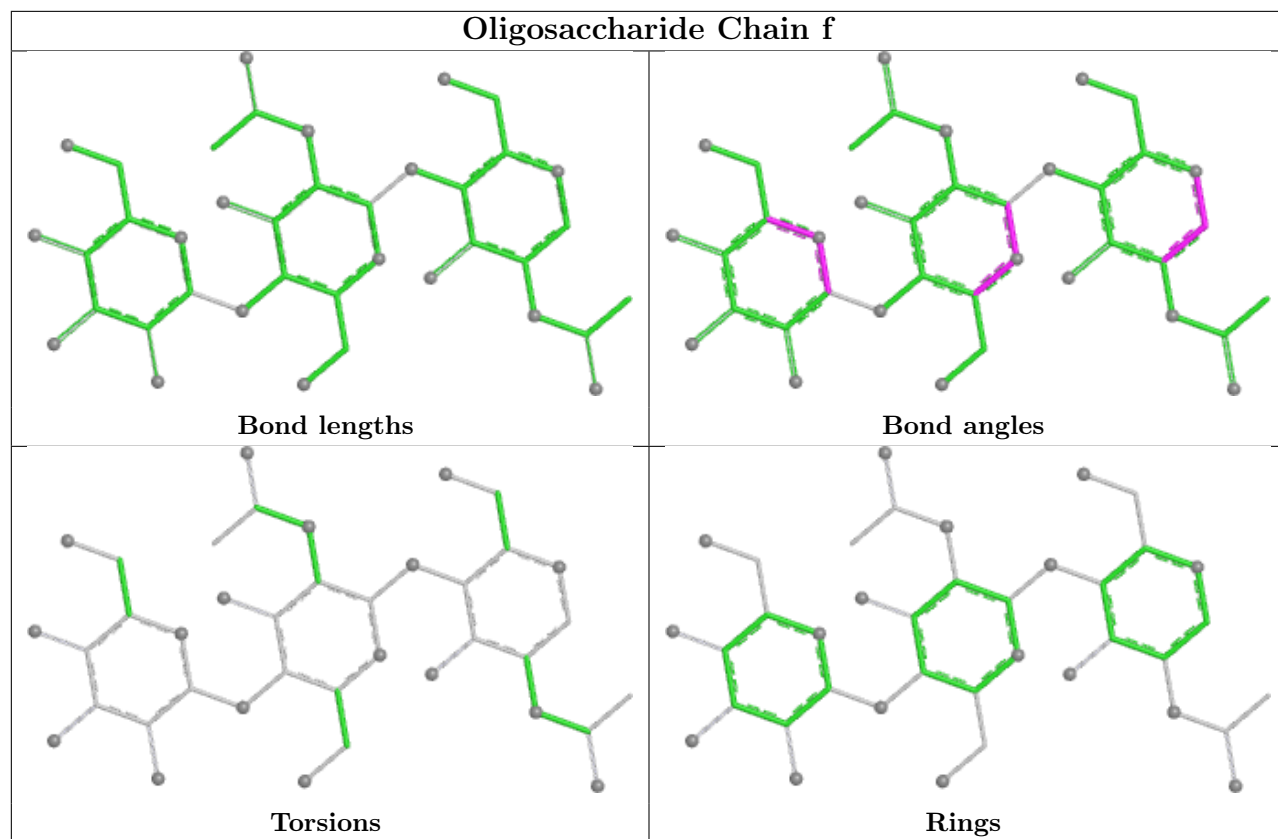


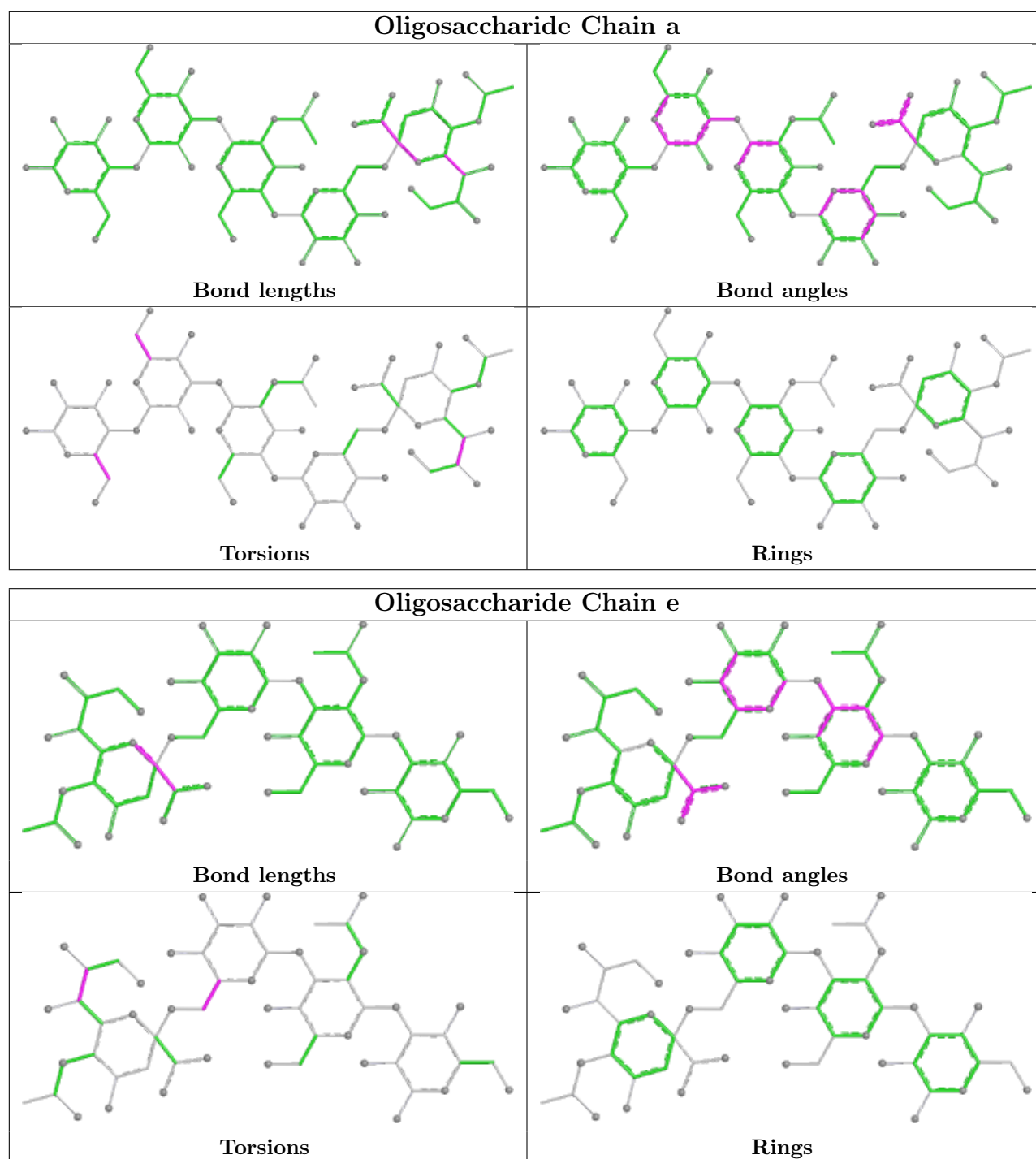












5.6 Ligand geometry [i](#)

16 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
9	NAG	I	401	1	14,14,15	0.70	0	17,19,21	0.99	1 (5%)
9	NAG	A	401	1	14,14,15	0.67	0	17,19,21	0.89	0
9	NAG	O	402	1	14,14,15	0.69	0	17,19,21	1.01	1 (5%)
9	NAG	Q	401	1	14,14,15	0.70	0	17,19,21	1.03	1 (5%)
9	NAG	G	402	1	14,14,15	0.71	0	17,19,21	1.10	2 (11%)
9	NAG	C	401	1	14,14,15	0.69	0	17,19,21	1.13	1 (5%)
9	NAG	A	402	1	14,14,15	0.69	0	17,19,21	1.11	2 (11%)
9	NAG	M	402	1	14,14,15	0.70	0	17,19,21	1.05	1 (5%)
9	NAG	E	401	1	14,14,15	0.68	0	17,19,21	1.07	1 (5%)
9	NAG	G	401	1	14,14,15	0.69	0	17,19,21	0.95	0
9	NAG	K	401	1	14,14,15	0.65	0	17,19,21	1.25	1 (5%)
9	NAG	O	401	1	14,14,15	0.67	0	17,19,21	0.98	0
9	NAG	I	402	1	14,14,15	0.66	0	17,19,21	1.27	1 (5%)
9	NAG	B	201	2	14,14,15	0.69	0	17,19,21	1.11	1 (5%)
9	NAG	P	201	2	14,14,15	0.65	0	17,19,21	1.07	1 (5%)
9	NAG	M	401	1	14,14,15	0.70	0	17,19,21	0.88	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
9	NAG	I	401	1	-	1/6/23/26	0/1/1/1
9	NAG	A	401	1	-	0/6/23/26	0/1/1/1
9	NAG	O	402	1	-	4/6/23/26	0/1/1/1
9	NAG	Q	401	1	-	1/6/23/26	0/1/1/1
9	NAG	G	402	1	-	2/6/23/26	0/1/1/1
9	NAG	C	401	1	-	4/6/23/26	0/1/1/1
9	NAG	A	402	1	-	4/6/23/26	0/1/1/1
9	NAG	M	402	1	-	2/6/23/26	0/1/1/1
9	NAG	E	401	1	-	4/6/23/26	0/1/1/1
9	NAG	G	401	1	-	3/6/23/26	0/1/1/1
9	NAG	K	401	1	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	NAG	O	401	1	-	4/6/23/26	0/1/1/1
9	NAG	I	402	1	-	3/6/23/26	0/1/1/1
9	NAG	B	201	2	-	2/6/23/26	0/1/1/1
9	NAG	P	201	2	-	4/6/23/26	0/1/1/1
9	NAG	M	401	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	I	402	NAG	C2-N2-C7	3.62	127.75	122.90
9	K	401	NAG	C2-N2-C7	3.50	127.59	122.90
9	B	201	NAG	C1-O5-C5	2.99	116.19	112.19
9	C	401	NAG	C1-O5-C5	2.89	116.06	112.19
9	G	402	NAG	C1-O5-C5	2.78	115.91	112.19

There are no chirality outliers.

5 of 42 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
9	P	201	NAG	O5-C5-C6-O6
9	P	201	NAG	C4-C5-C6-O6
9	A	402	NAG	O5-C5-C6-O6
9	A	402	NAG	C8-C7-N2-C2
9	A	402	NAG	O7-C7-N2-C2

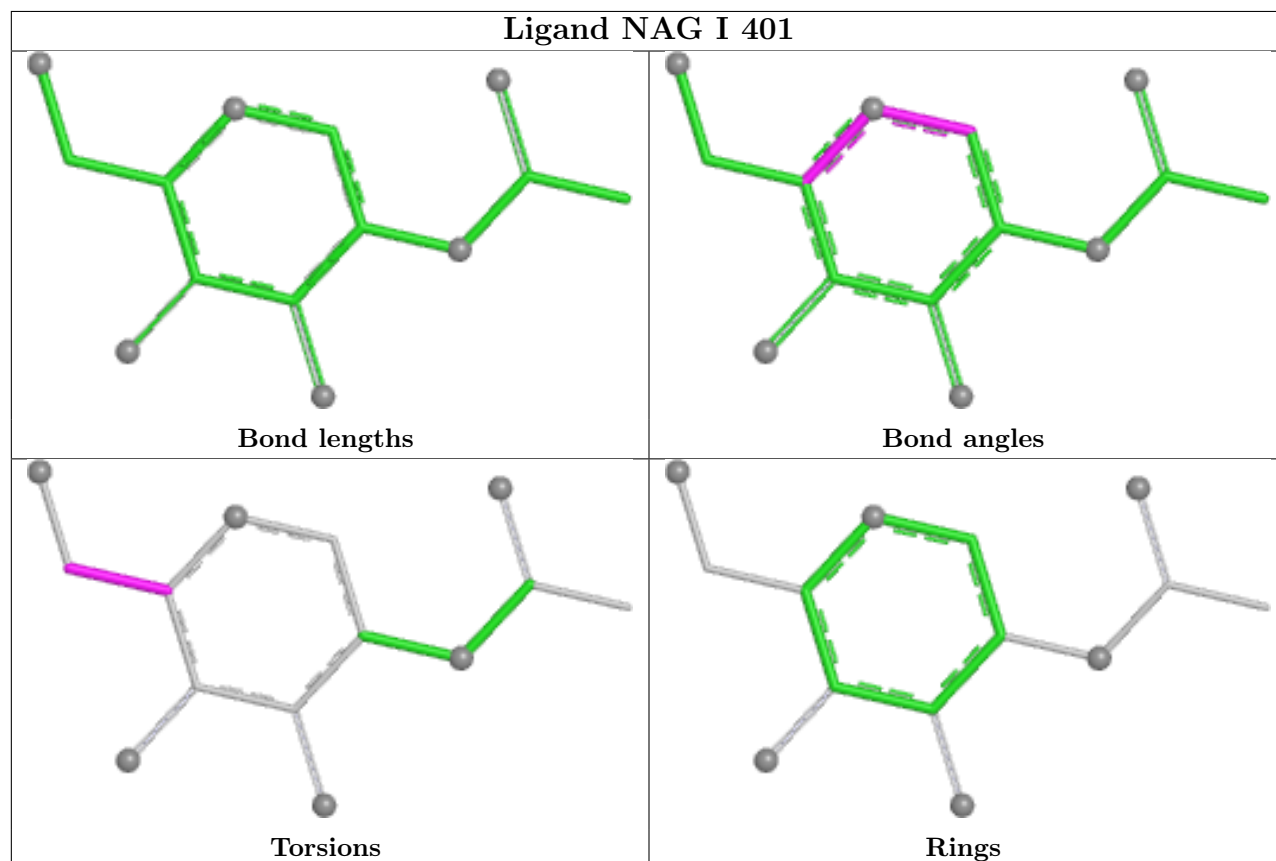
There are no ring outliers.

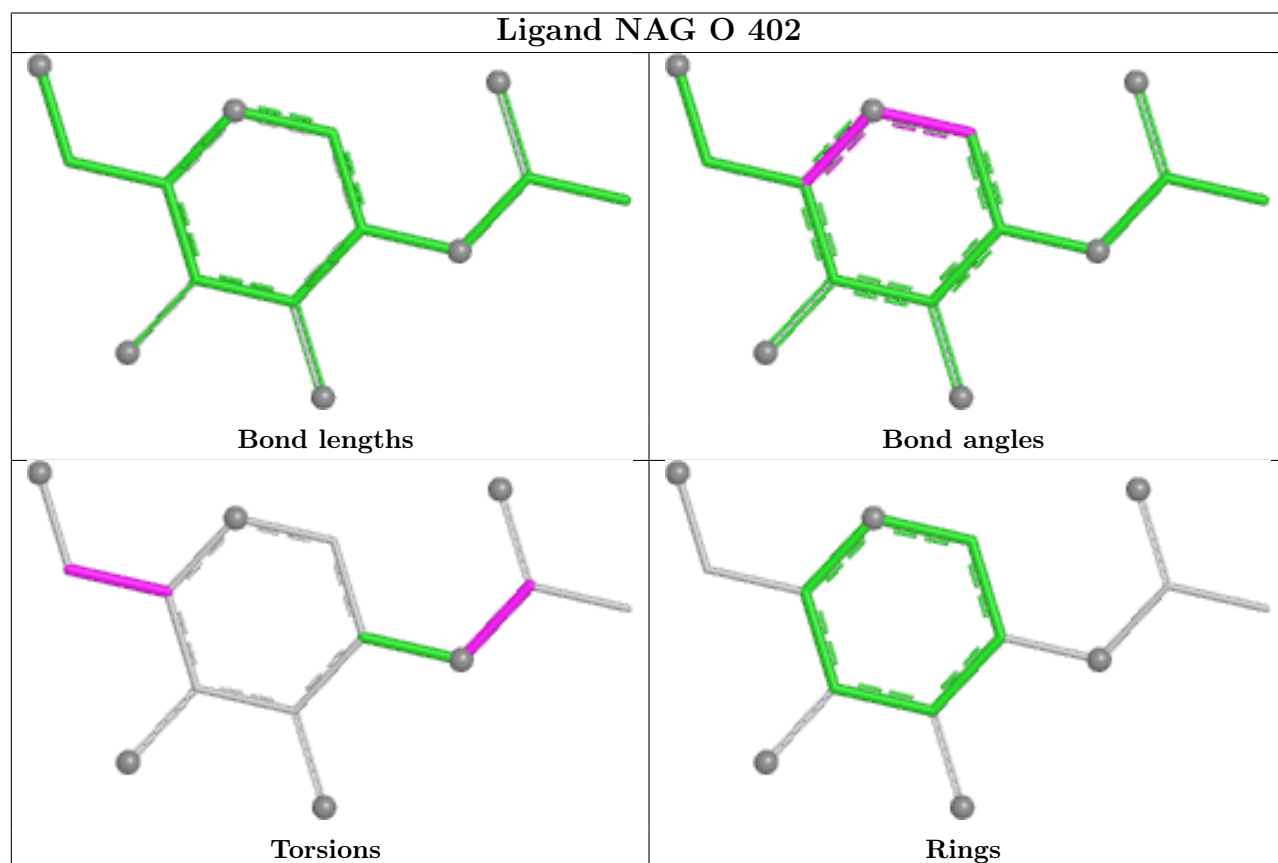
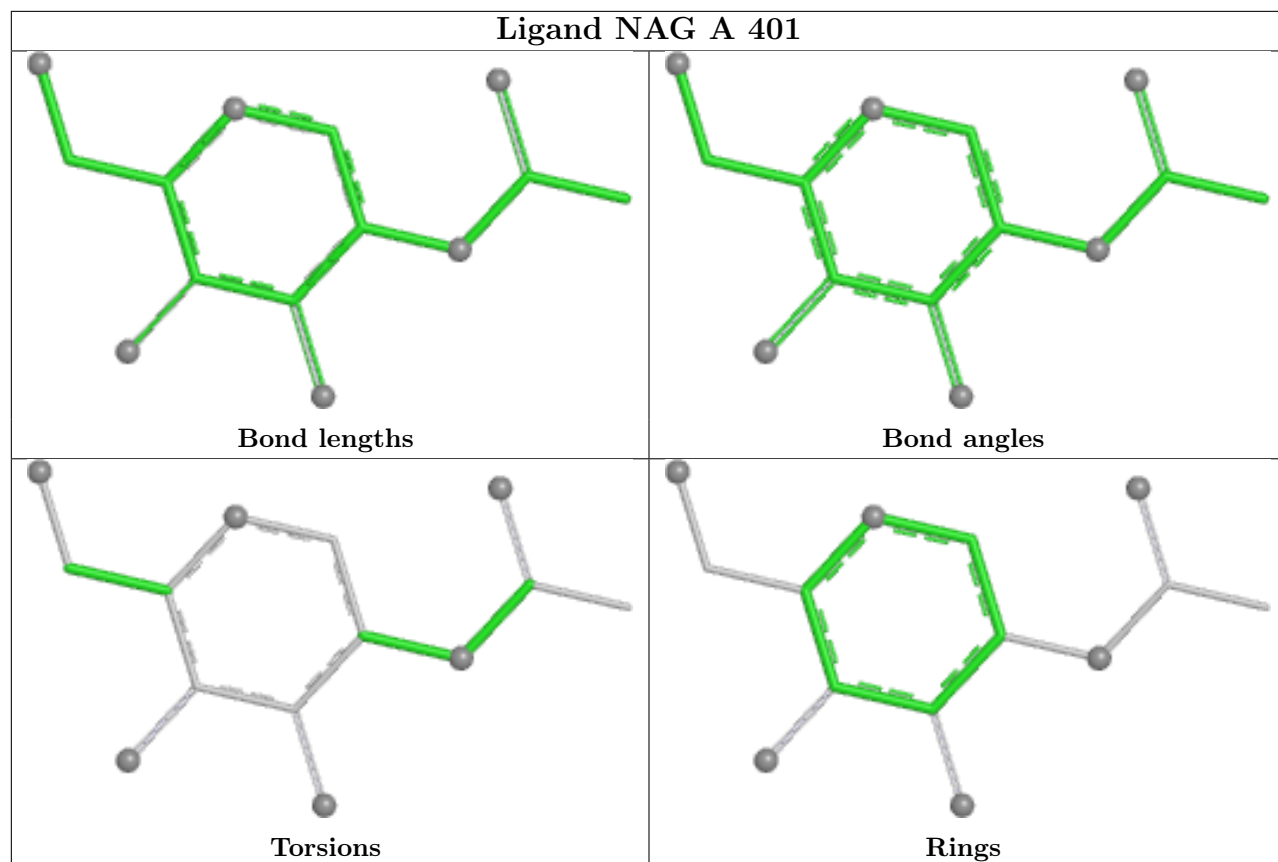
2 monomers are involved in 2 short contacts:

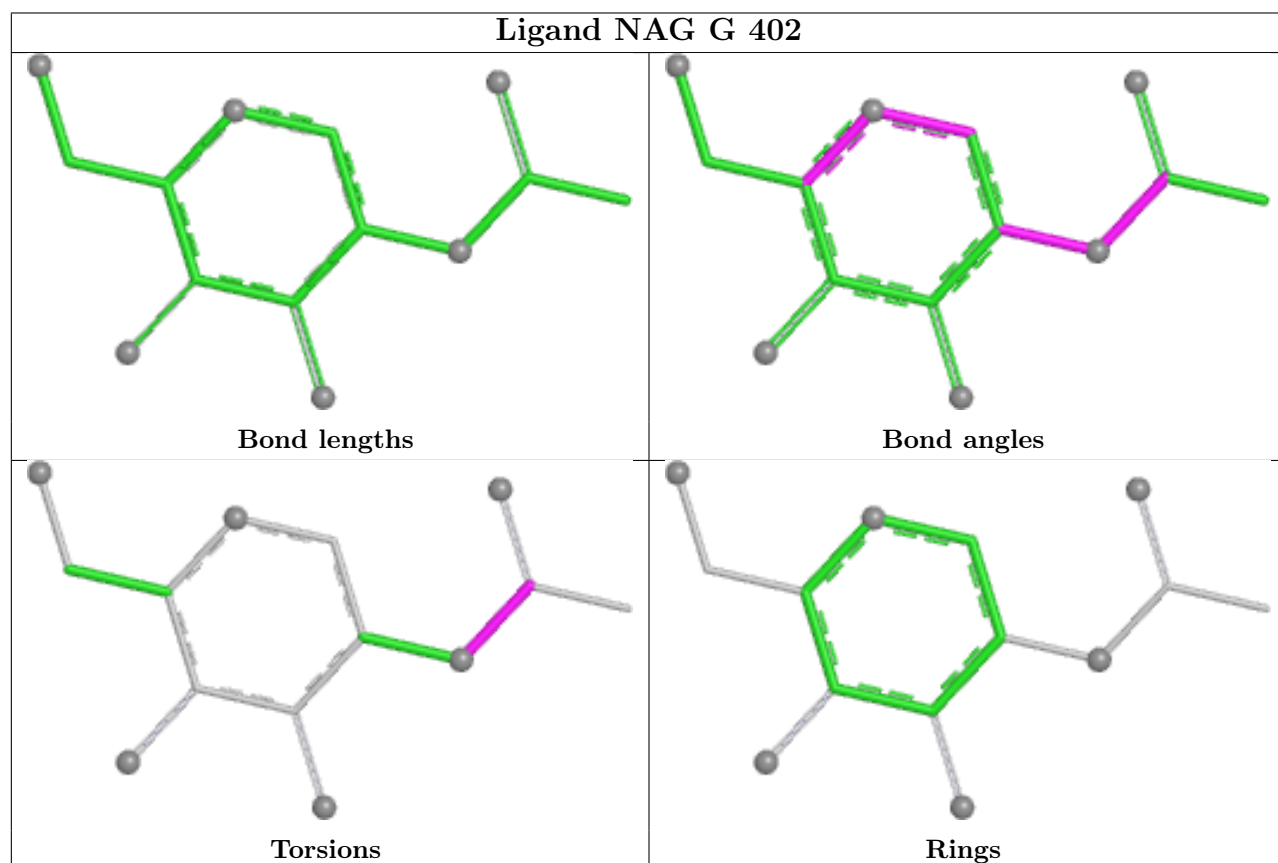
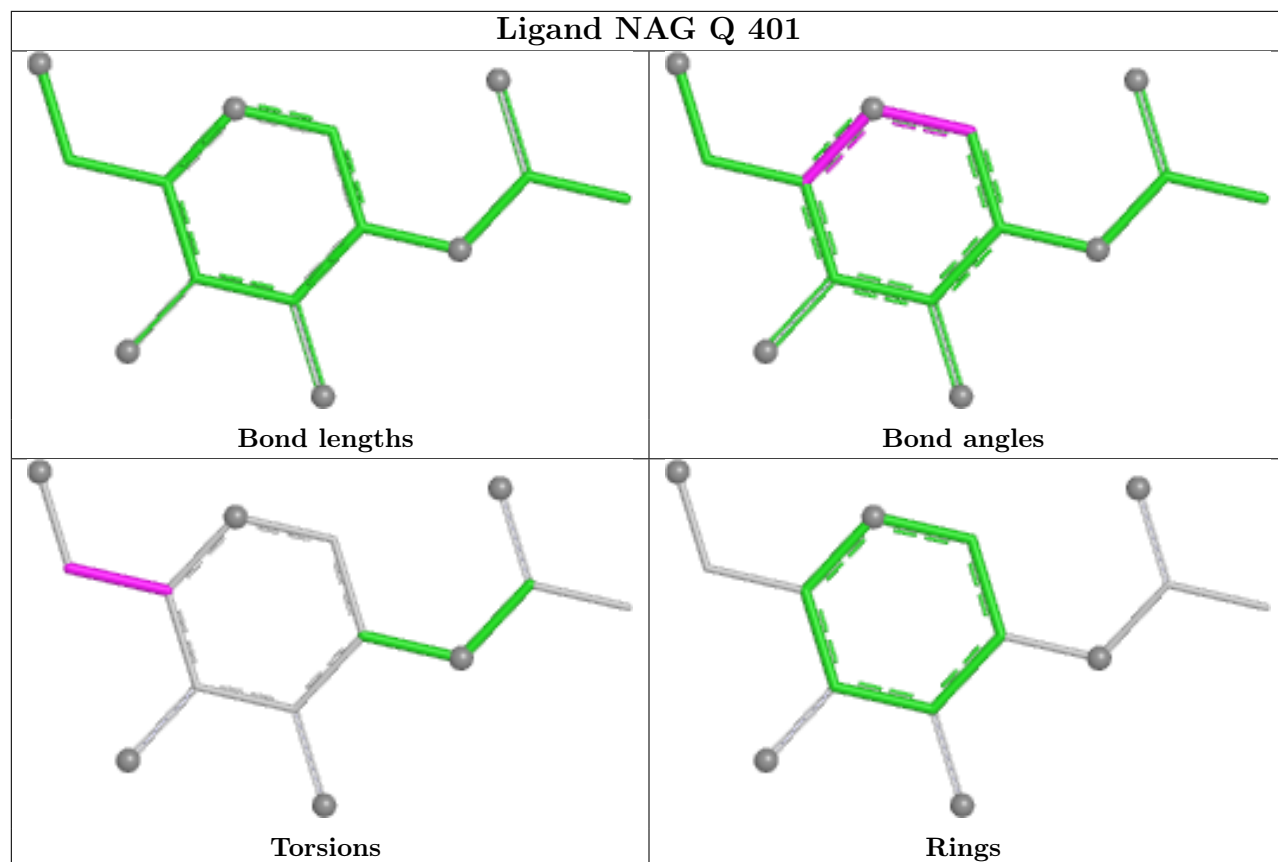
Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	I	401	NAG	1	0
9	P	201	NAG	1	0

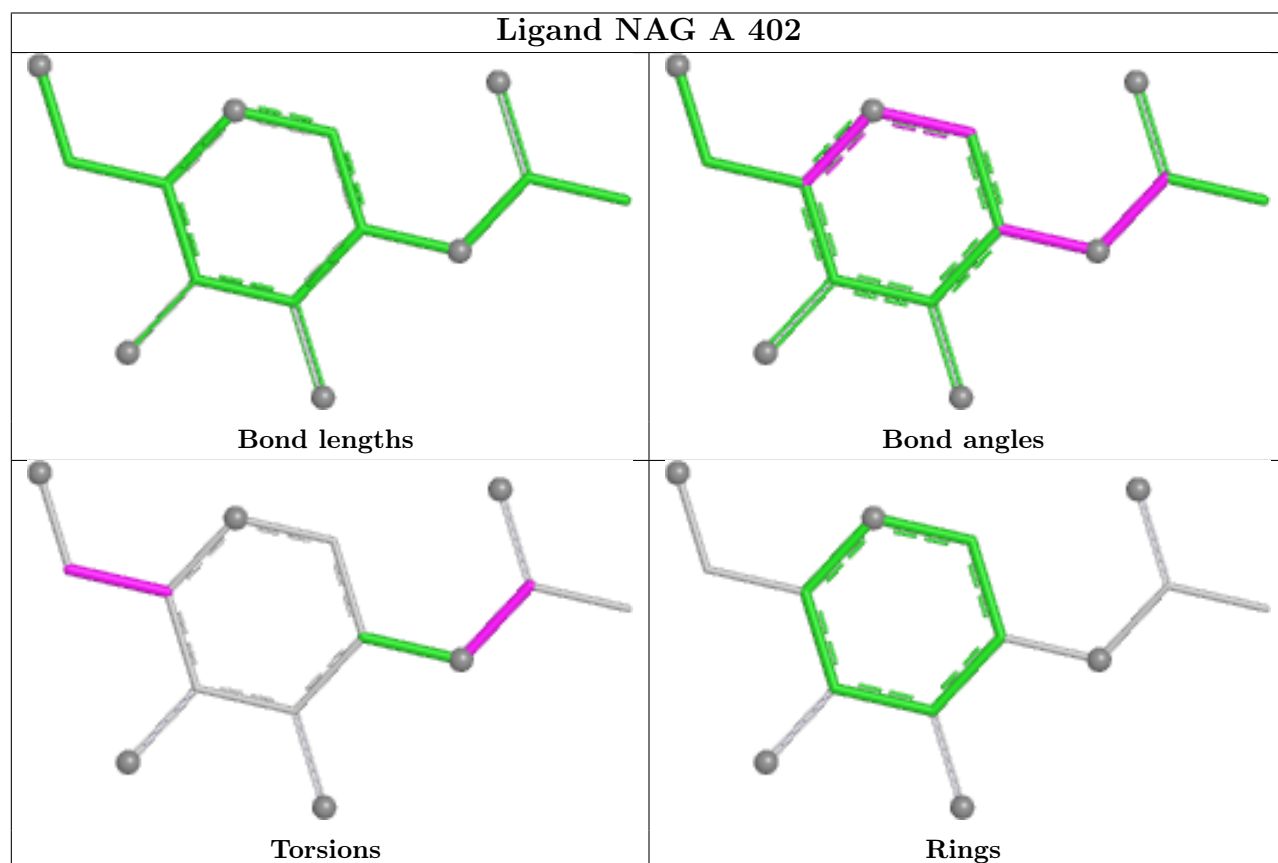
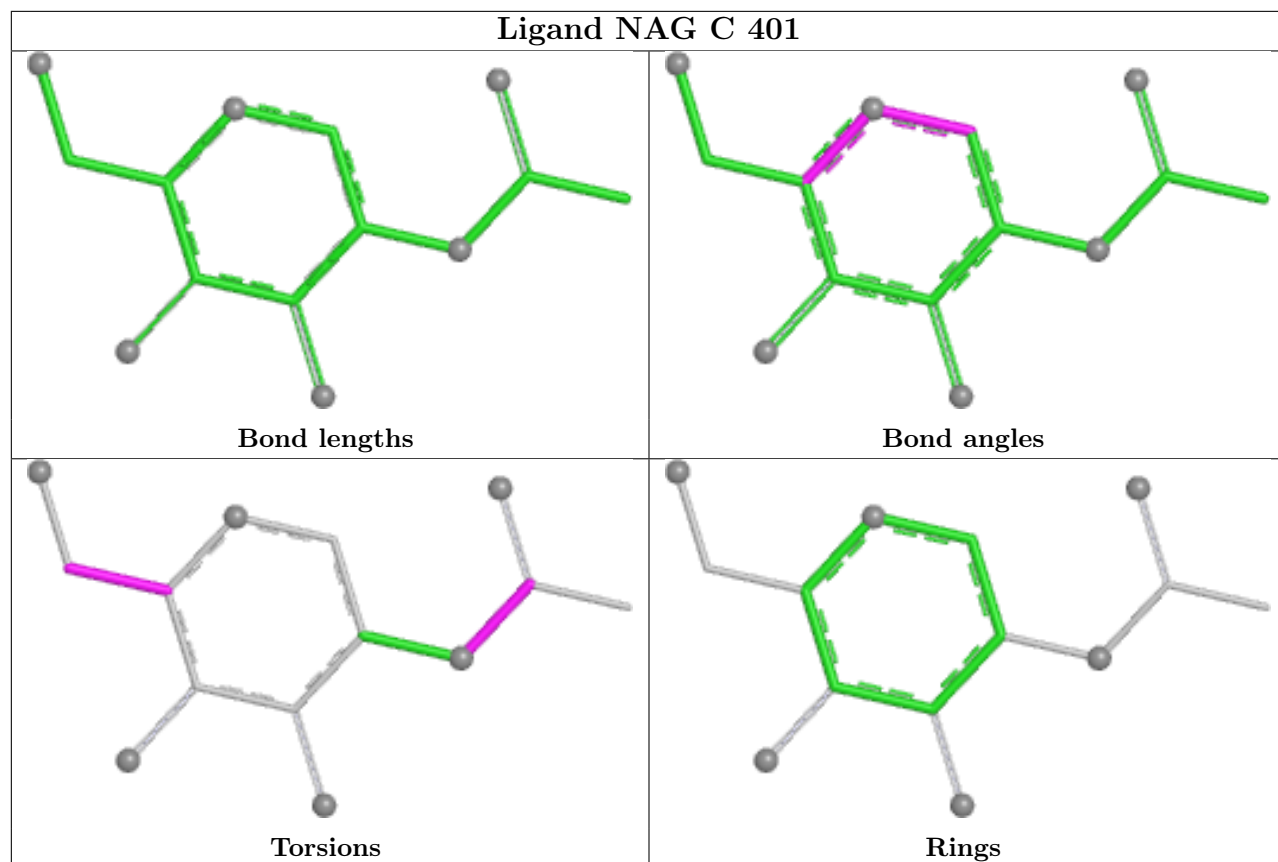
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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

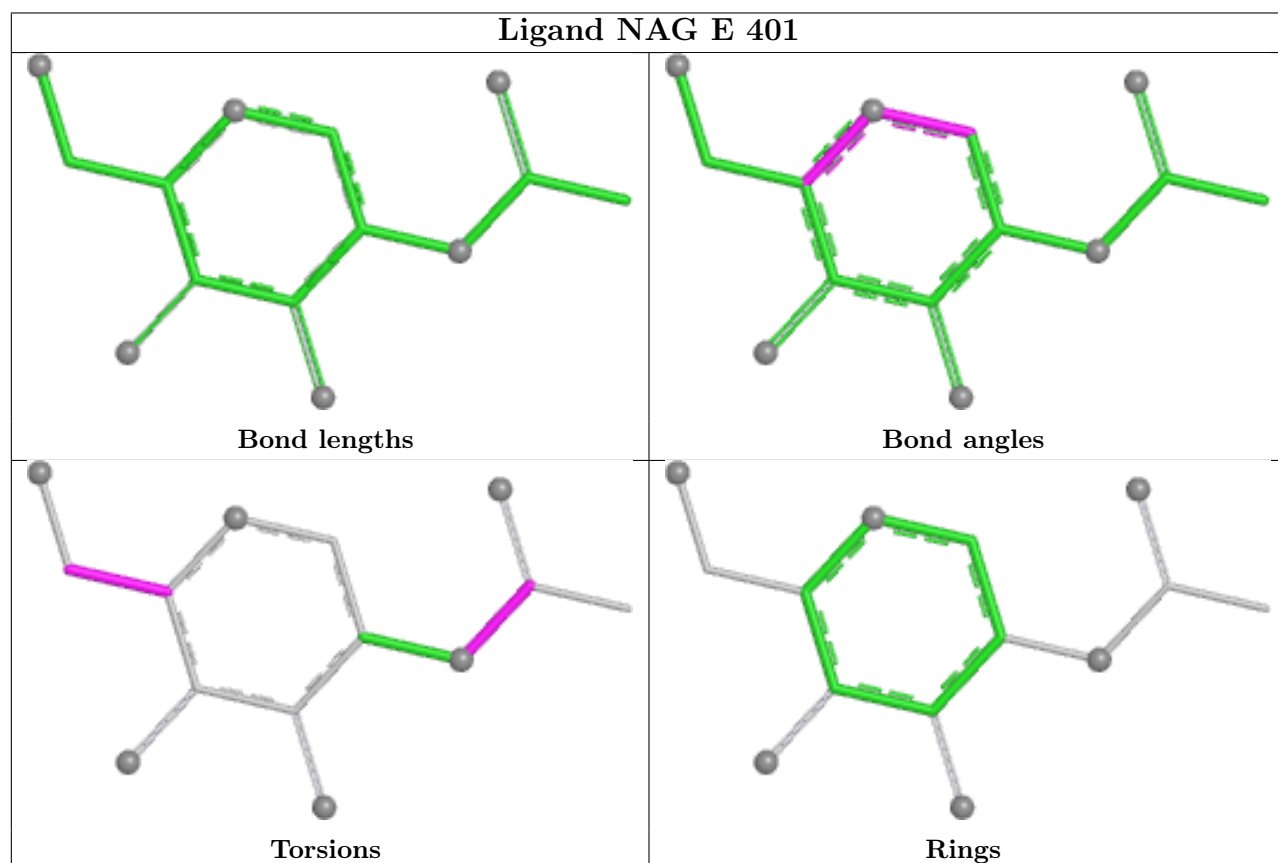
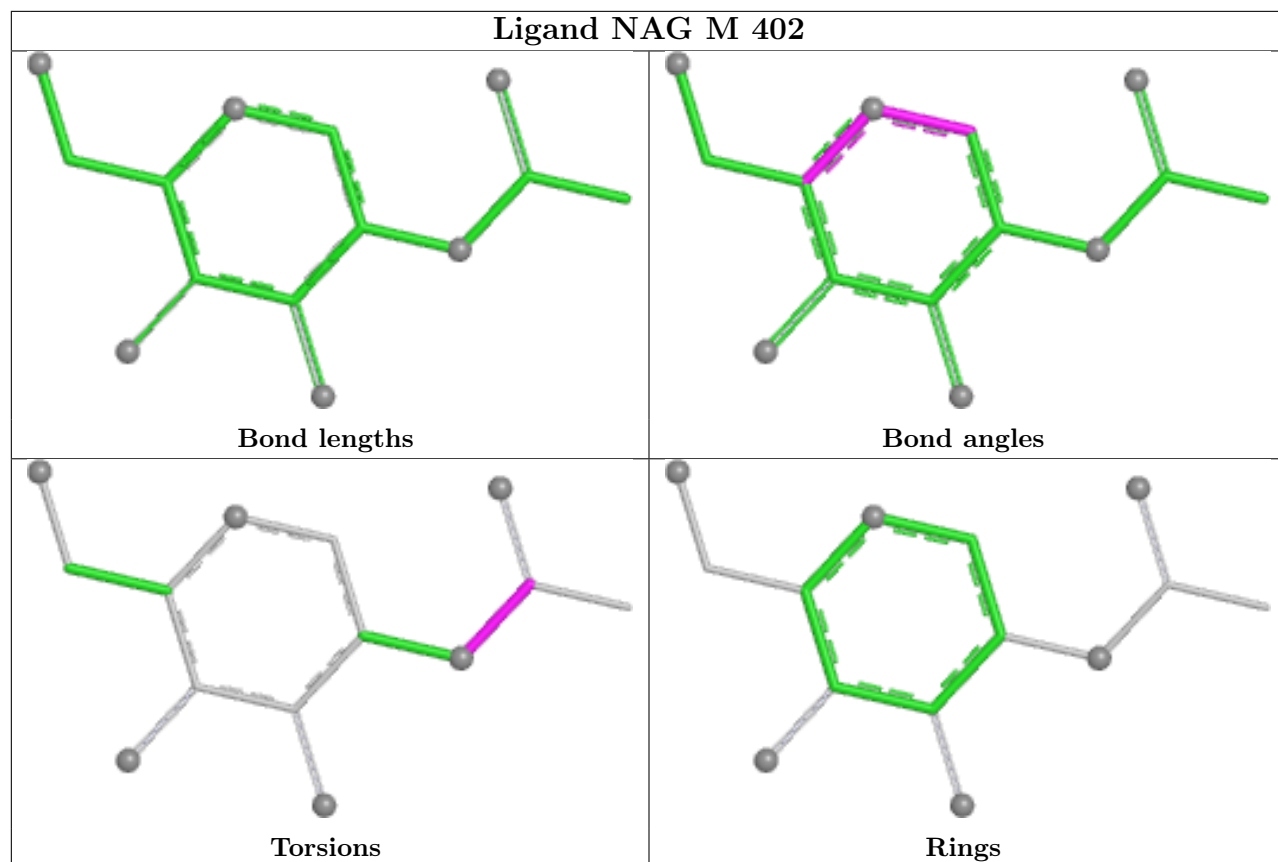
in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

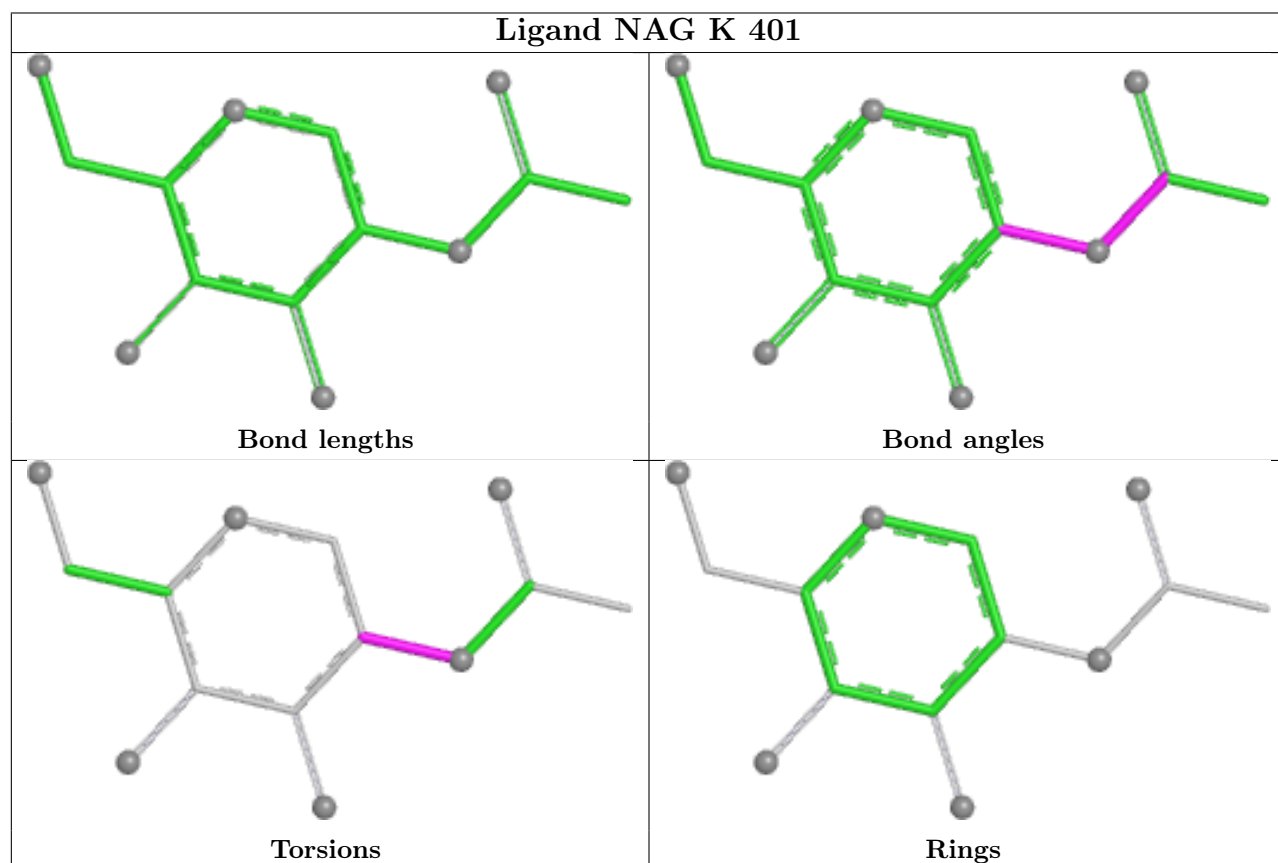
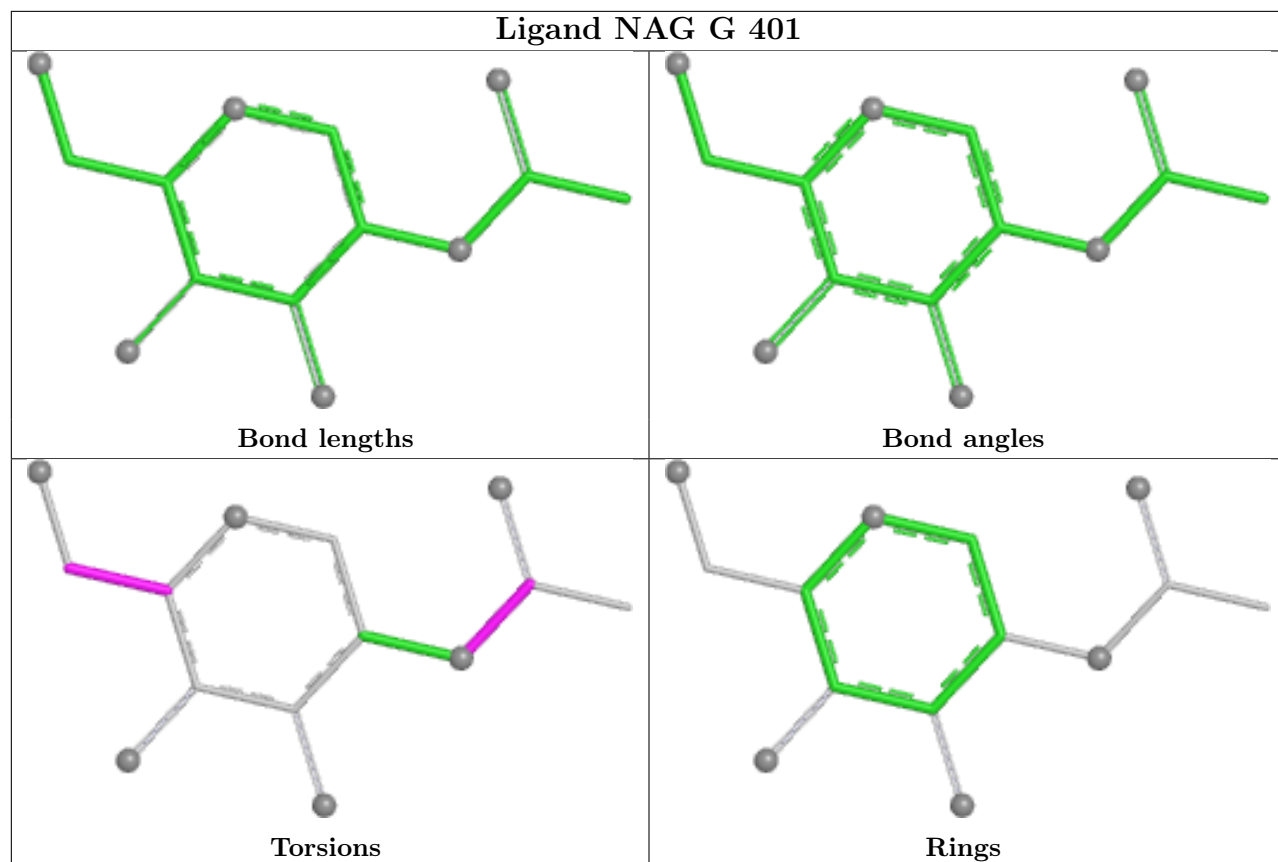


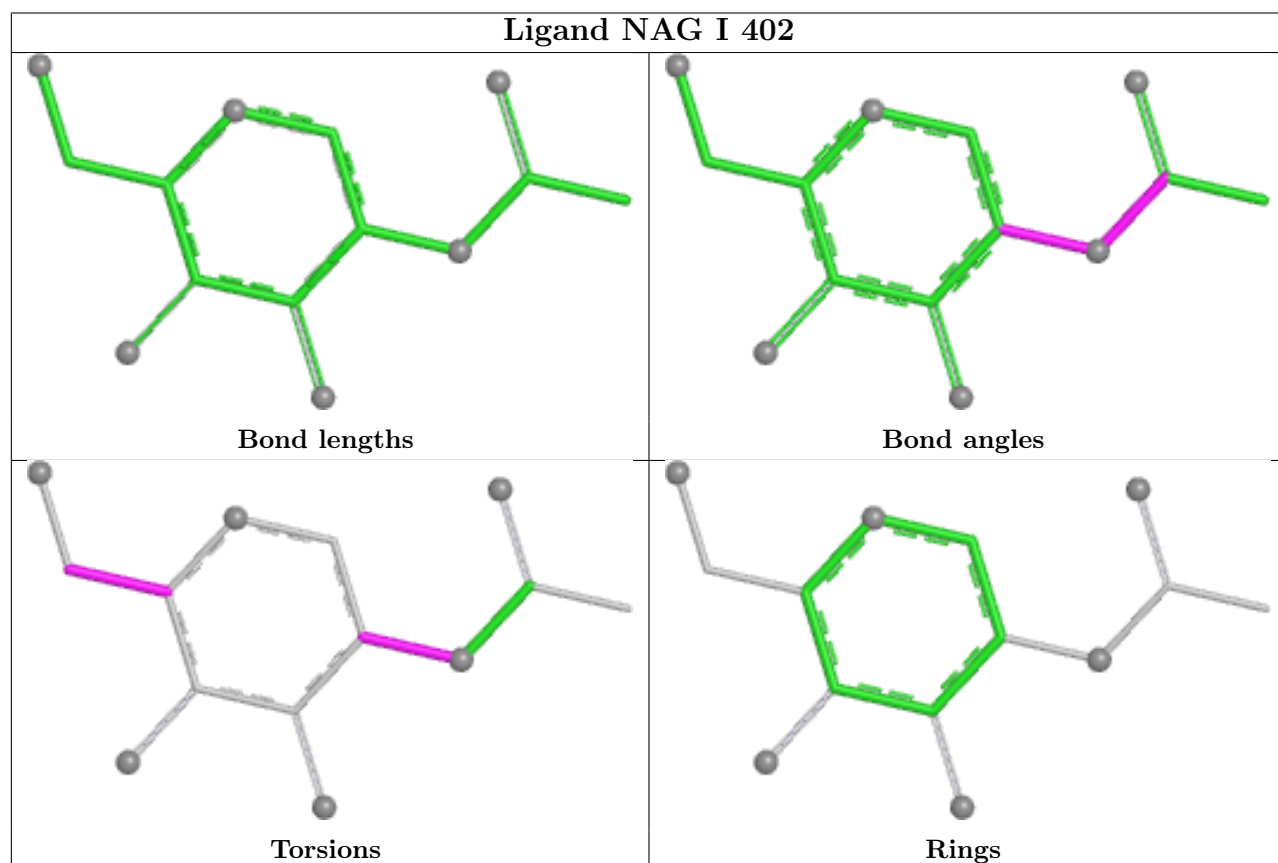
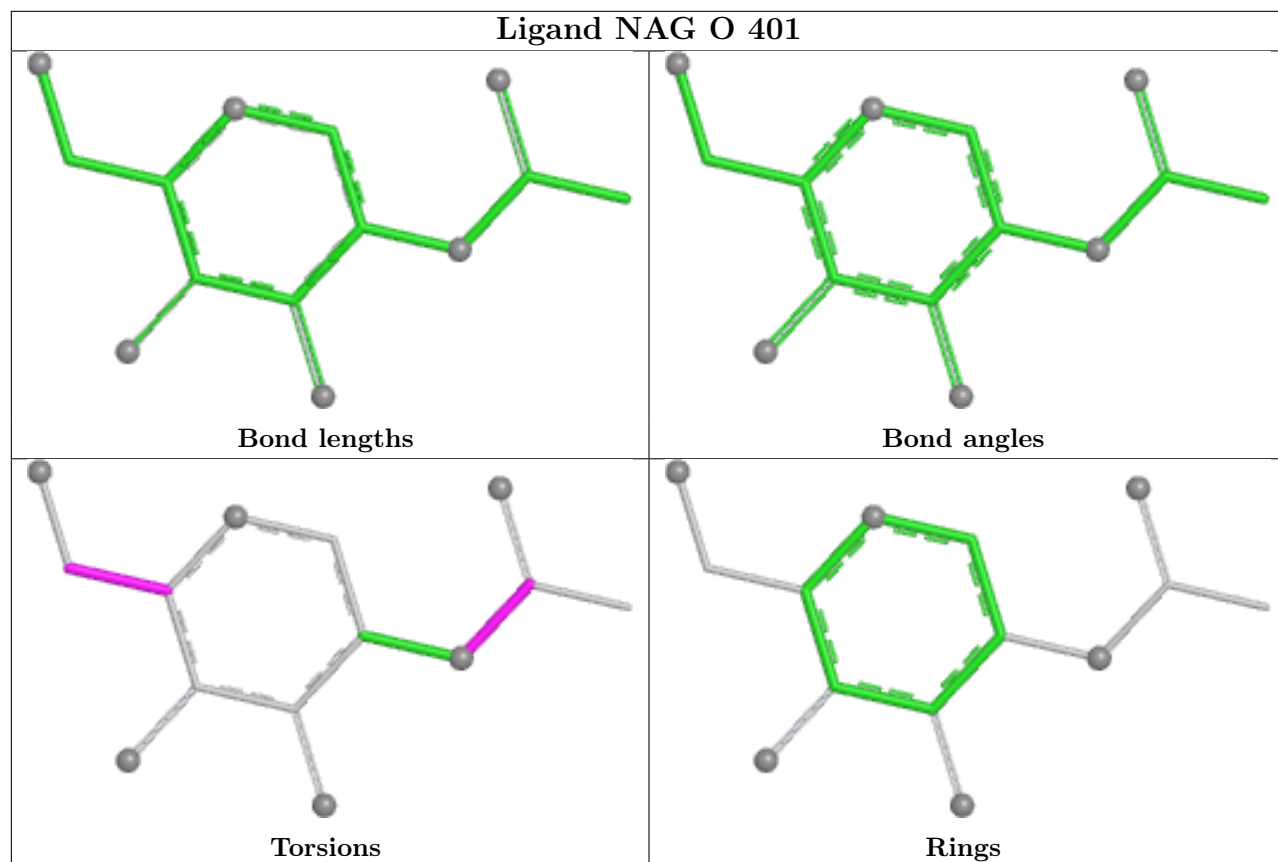


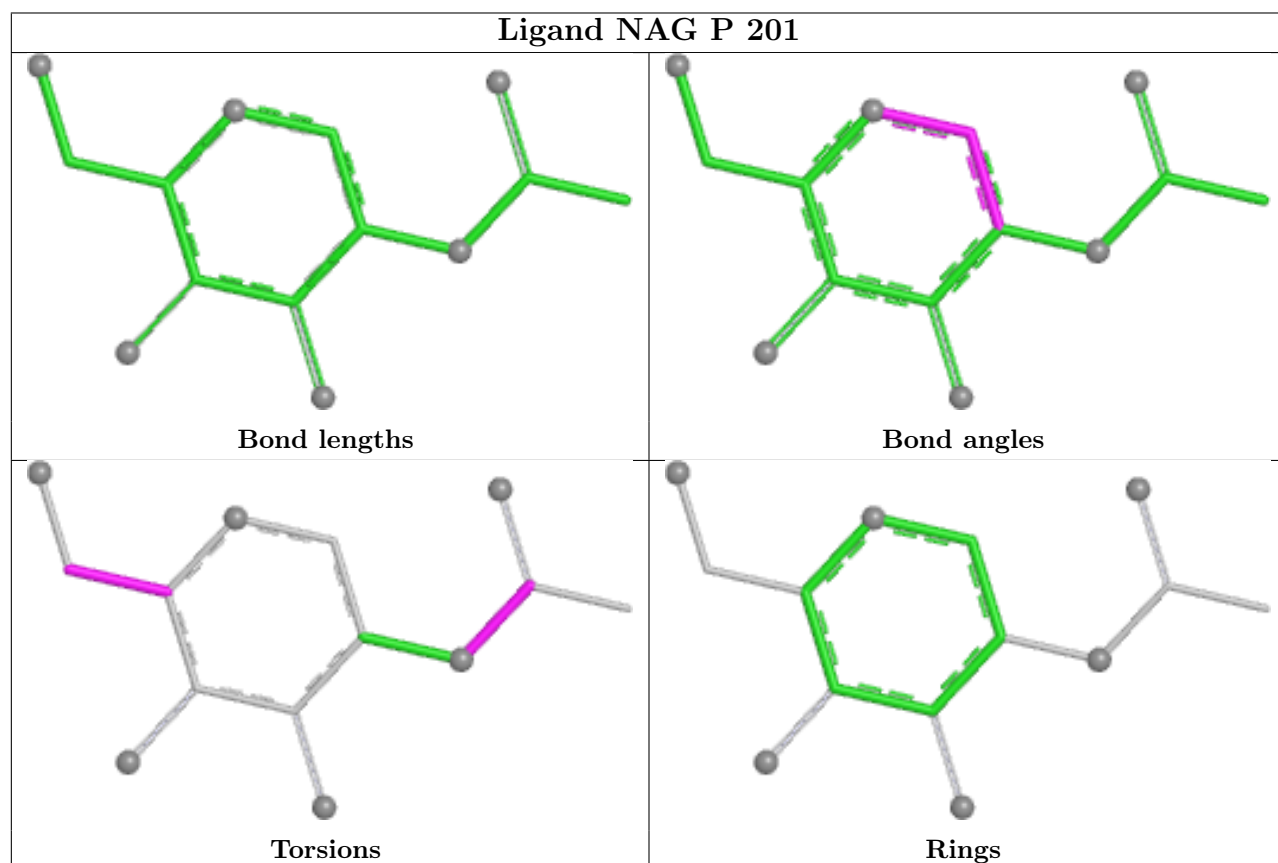
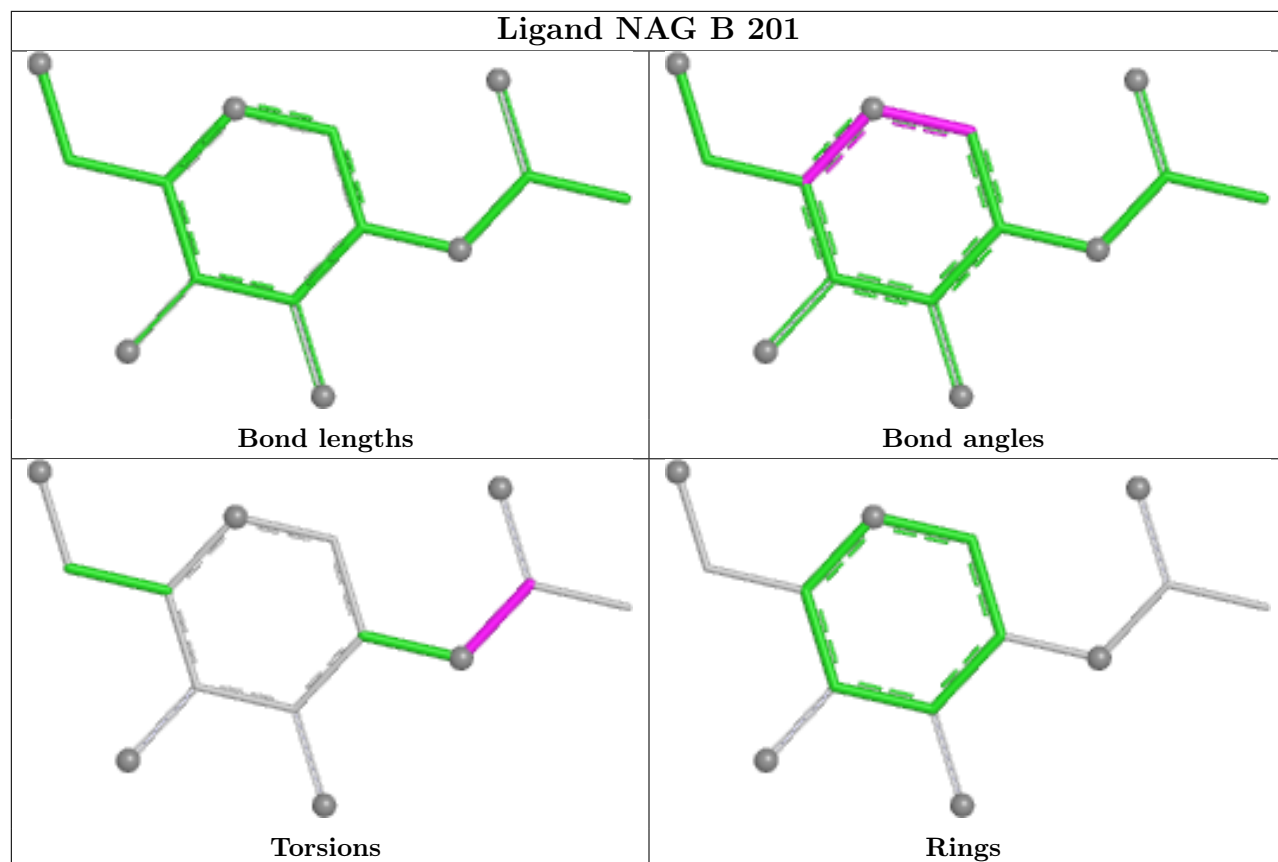


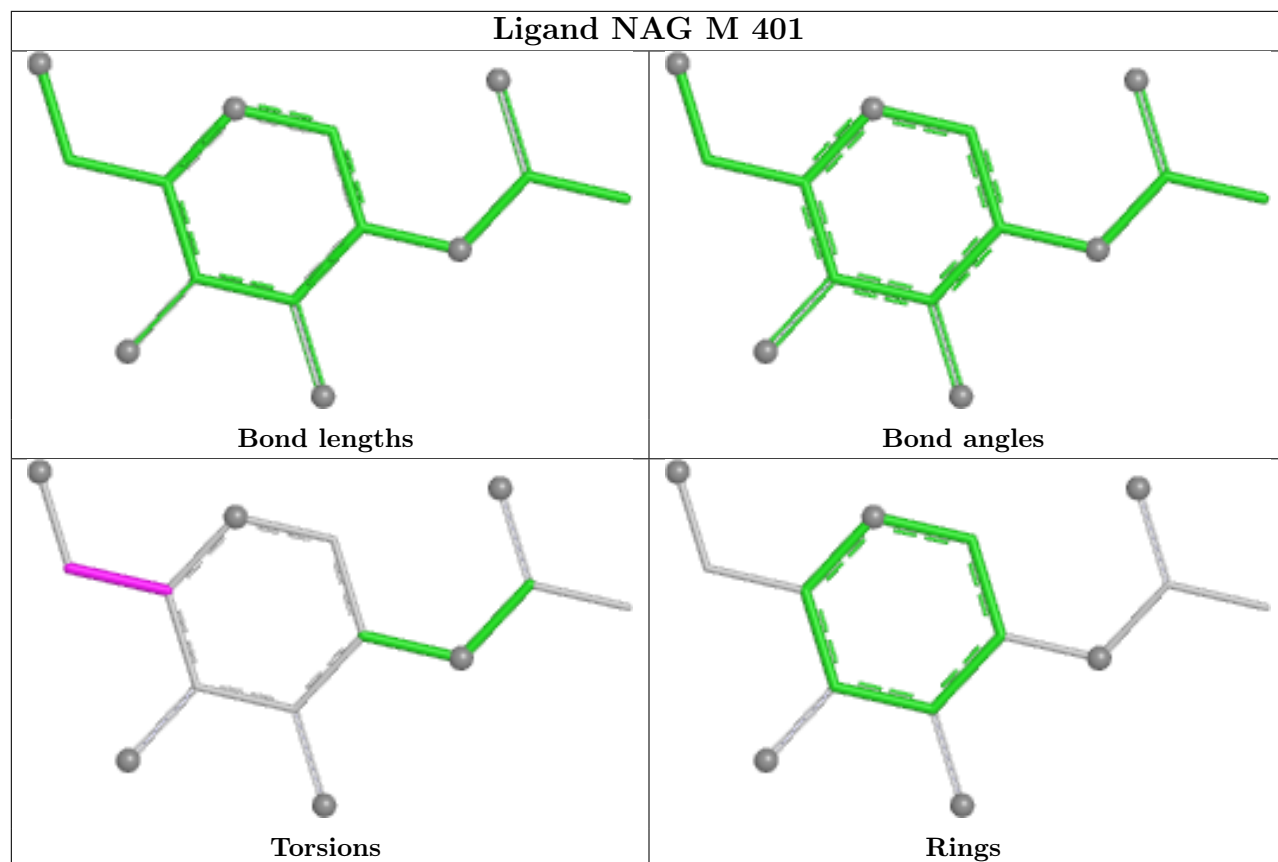












5.7 Other polymers [i](#)

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, 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	322/325 (99%)	0.13	12 (3%) 45 41	30, 44, 68, 107	0
1	C	324/325 (99%)	-0.15	8 (2%) 58 55	22, 32, 62, 176	0
1	E	323/325 (99%)	0.14	13 (4%) 42 38	31, 43, 70, 135	0
1	G	322/325 (99%)	-0.22	4 (1%) 76 75	22, 31, 56, 119	0
1	I	322/325 (99%)	0.13	11 (3%) 48 44	25, 39, 64, 104	0
1	K	323/325 (99%)	0.15	14 (4%) 40 36	27, 43, 70, 133	0
1	M	322/325 (99%)	0.61	23 (7%) 22 19	36, 55, 90, 148	0
1	O	324/325 (99%)	-0.18	5 (1%) 72 70	22, 33, 64, 154	0
1	Q	323/325 (99%)	0.35	14 (4%) 40 36	31, 47, 71, 136	0
2	B	174/176 (98%)	0.42	8 (4%) 37 34	28, 54, 86, 104	0
2	D	174/176 (98%)	0.92	34 (19%) 3 2	26, 59, 114, 124	0
2	F	176/176 (100%)	1.15	51 (28%) 1 1	25, 68, 127, 139	0
2	H	174/176 (98%)	0.57	17 (9%) 13 11	25, 55, 91, 115	0
2	J	174/176 (98%)	0.44	13 (7%) 20 17	26, 47, 76, 97	0
2	L	176/176 (100%)	1.05	45 (25%) 1 1	27, 58, 135, 169	0
2	N	174/176 (98%)	1.44	61 (35%) 1 1	35, 85, 148, 163	0
2	P	174/176 (98%)	0.70	16 (9%) 14 12	30, 65, 105, 138	0
2	R	176/176 (100%)	1.34	55 (31%) 1 1	30, 73, 130, 135	0
All	All	4477/4509 (99%)	0.38	404 (9%) 15 13	22, 45, 109, 176	0

The worst 5 of 404 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	9	PRO	7.9
2	F	173	ILE	7.2
2	D	141	TYR	7.1

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Mol	Chain	Res	Type	RSRZ
2	L	173	ILE	7.0
2	L	162	TYR	6.8

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
5	BMA	U	3	11/12	0.41	0.18	77,85,92,93	0
3	GAL	W	1	12/12	0.46	0.17	80,111,117,119	0
4	NAG	T	2	14/15	0.51	0.19	72,104,112,113	0
6	NAG	Y	1	15/15	0.57	0.16	76,93,97,97	0
3	NAG	W	2	14/15	0.59	0.15	85,99,109,111	0
5	BMA	V	3	11/12	0.66	0.15	68,84,95,98	0
5	NAG	V	1	14/15	0.68	0.22	95,103,108,109	0
5	NAG	V	2	14/15	0.68	0.15	88,102,106,112	0
3	GAL	d	1	12/12	-	-	89,96,103,104	0
3	NAG	d	2	14/15	-	-	70,94,98,102	0
3	GAL	d	3	11/12	-	-	81,91,97,100	0
3	SIA	d	4	20/21	-	-	45,60,75,77	0
3	GAL	W	3	11/12	0.71	0.14	75,83,86,88	0
6	GAL	Y	2	11/12	0.71	0.12	72,84,91,95	0
3	GAL	S	1	12/12	0.75	0.14	64,80,85,88	0
5	BMA	Z	3	11/12	0.76	0.13	45,65,68,69	0
5	NAG	U	1	14/15	0.79	0.13	67,78,94,98	0
3	SIA	W	4	20/21	0.82	0.15	47,69,78,83	0
6	SIA	Y	3	20/21	0.82	0.14	36,60,77,83	0
5	NAG	U	2	14/15	0.83	0.14	72,89,95,95	0
5	NAG	Z	2	14/15	0.83	0.13	62,70,75,79	0
3	NAG	S	2	14/15	0.84	0.12	68,73,77,79	0
4	NAG	T	1	14/15	0.84	0.11	69,80,92,97	0
5	NAG	X	1	14/15	0.86	0.11	28,38,48,51	0
5	NAG	Z	1	14/15	0.87	0.12	40,51,61,66	0
3	SIA	S	4	20/21	0.87	0.12	45,58,67,68	0

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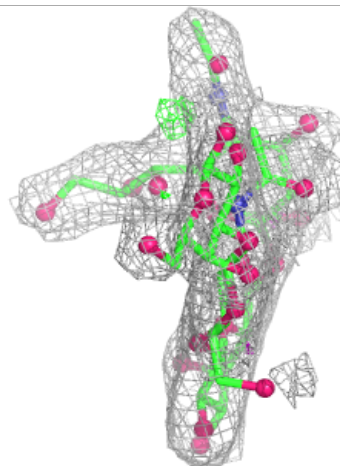
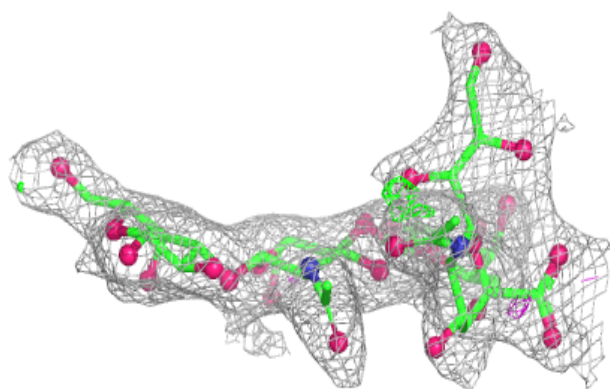
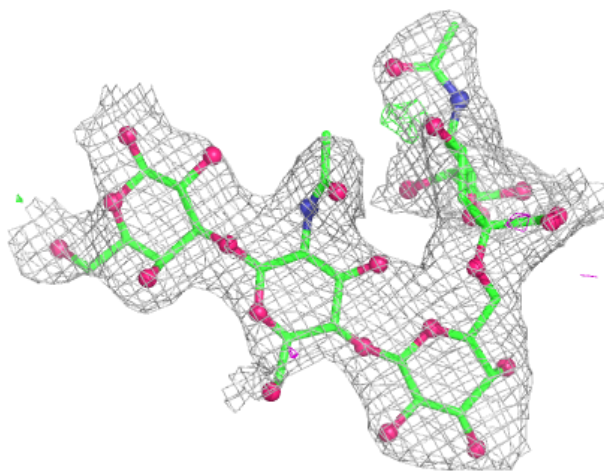
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	NAG	b	1	14/15	-	-	34,37,42,44	0
5	NAG	b	2	14/15	-	-	32,35,39,40	0
5	BMA	b	3	11/12	-	-	39,45,51,59	0
5	NAG	c	1	14/15	-	-	65,81,87,93	0
5	NAG	c	2	14/15	-	-	53,87,94,96	0
5	BMA	c	3	11/12	-	-	73,81,88,90	0
5	NAG	f	1	14/15	-	-	30,37,57,62	0
5	NAG	f	2	14/15	-	-	30,34,38,47	0
5	BMA	f	3	11/12	-	-	32,36,41,42	0
3	GAL	S	3	11/12	0.87	0.10	59,65,70,71	0
5	BMA	X	3	11/12	0.89	0.08	33,39,44,58	0
5	NAG	X	2	14/15	0.96	0.07	30,35,40,40	0
7	GLC	a	1	12/12	-	-	76,86,92,93	0
7	GAL	a	2	11/12	-	-	74,81,95,97	0
7	NAG	a	3	14/15	-	-	64,80,83,86	0
7	GAL	a	4	11/12	-	-	68,68,76,78	0
7	SIA	a	5	20/21	-	-	42,56,66,67	0
8	GAL	e	1	12/12	-	-	95,103,110,111	0
8	NAG	e	2	14/15	-	-	85,111,120,122	0
8	GAL	e	3	11/12	-	-	67,87,103,104	0
8	SIA	e	4	20/21	-	-	62,69,86,90	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.

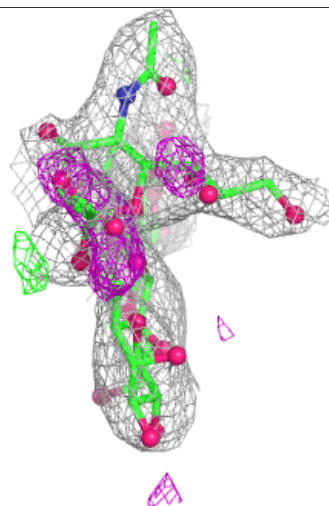
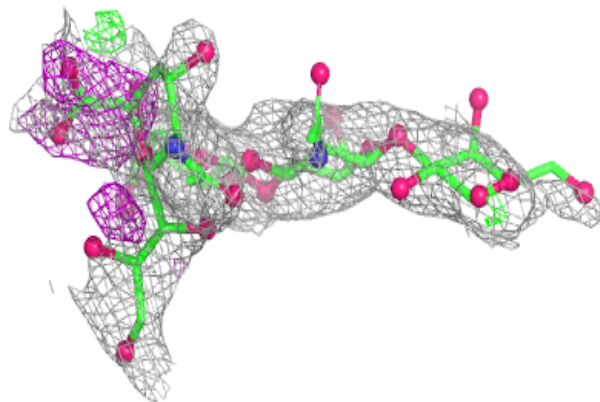
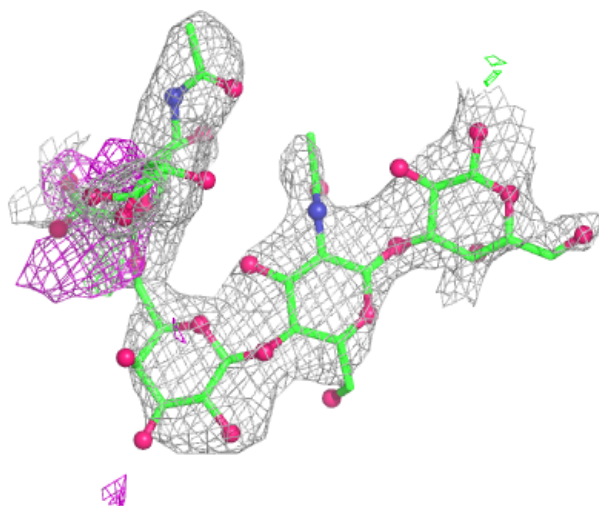
Electron density around Chain S:

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



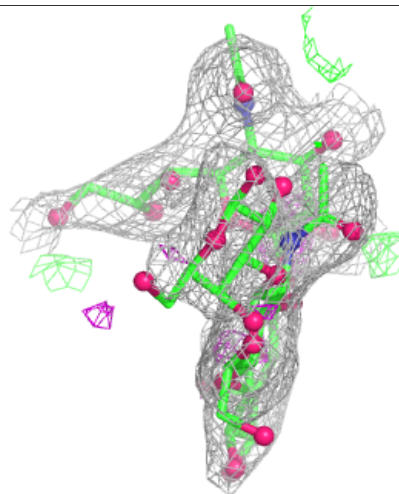
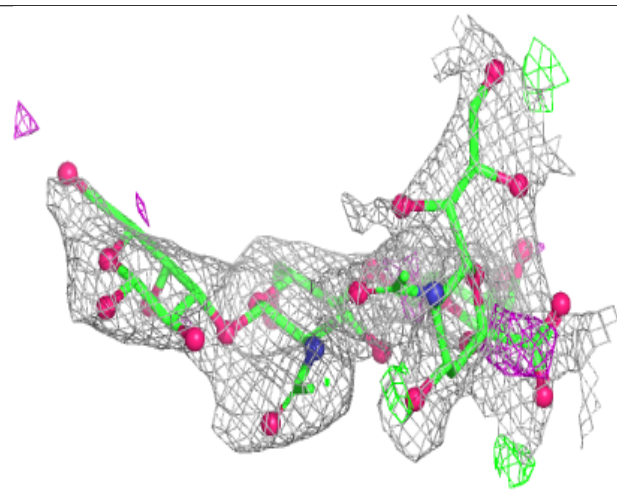
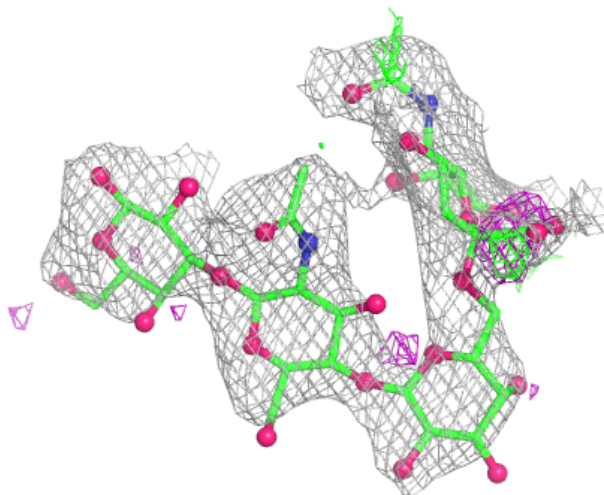
Electron density around Chain W:

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



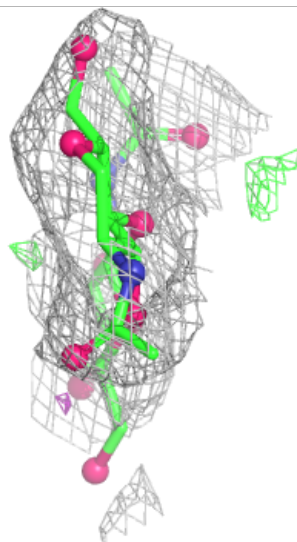
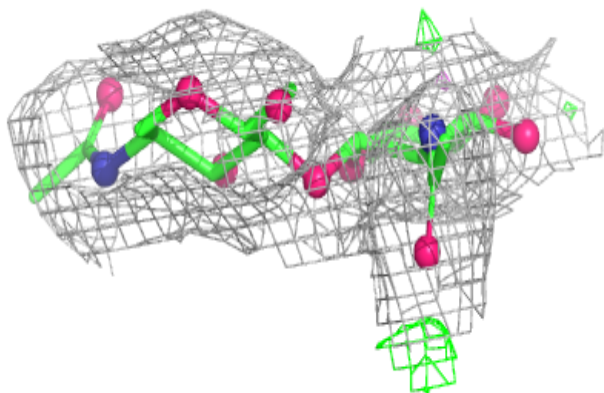
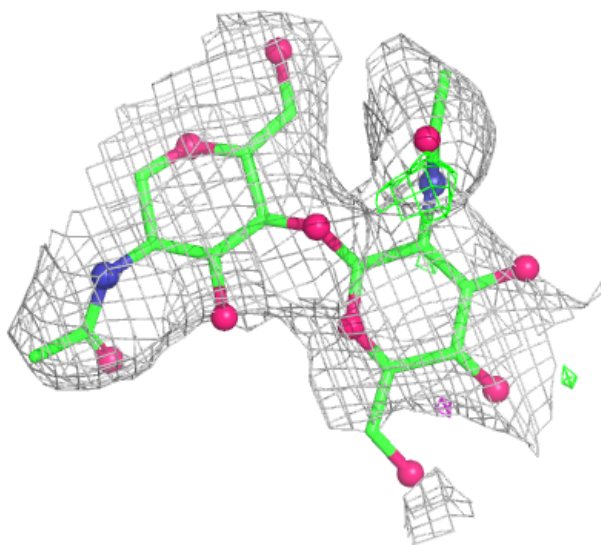
Electron density around Chain d:

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



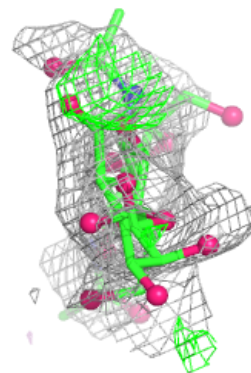
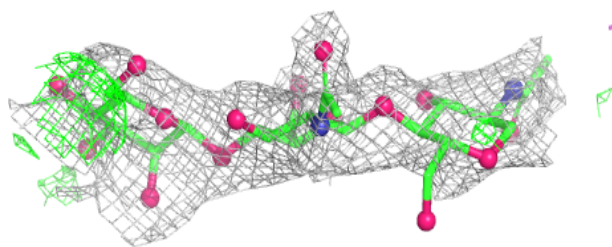
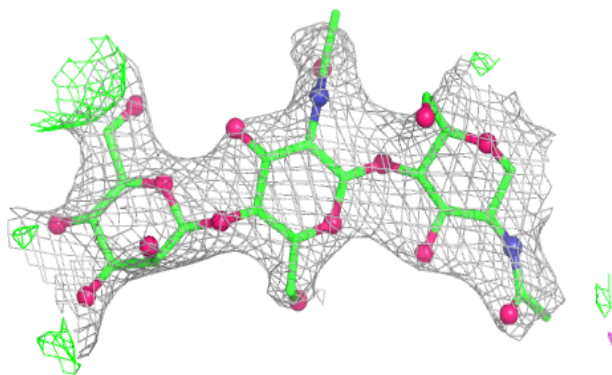
Electron density around Chain T:

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



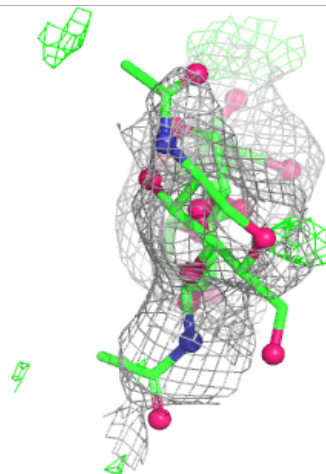
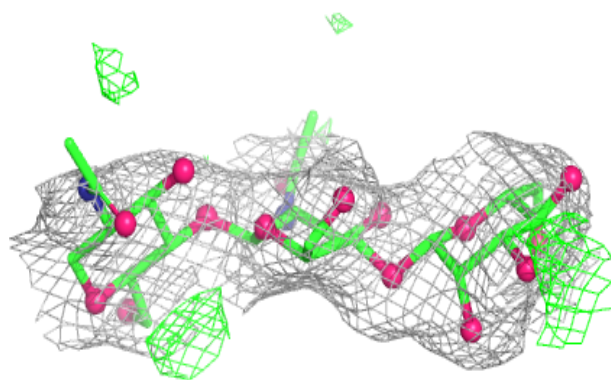
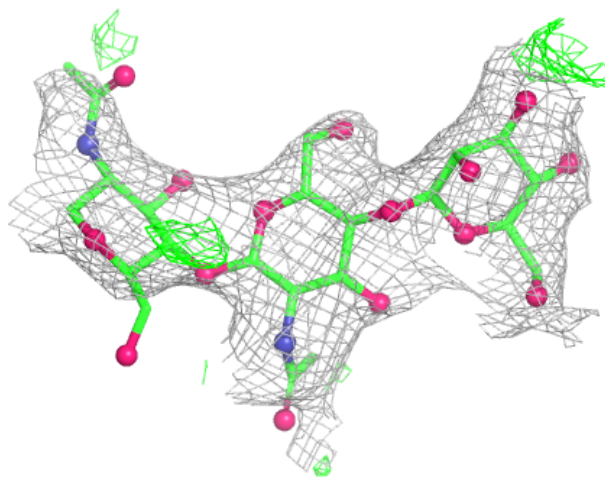
Electron density around Chain U:

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



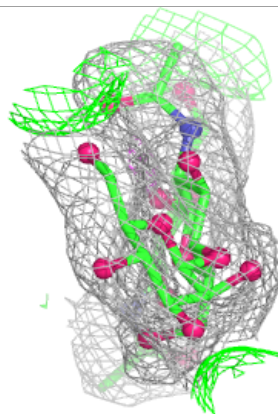
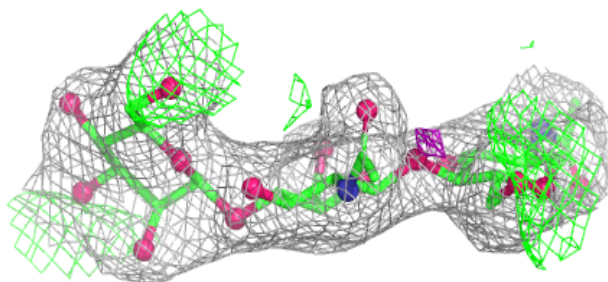
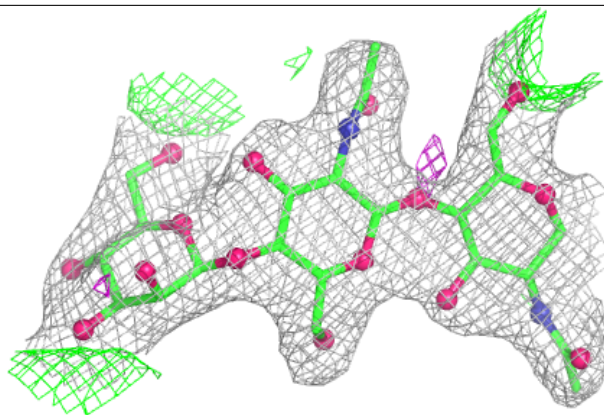
Electron density around Chain V:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

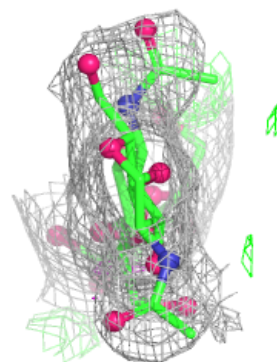
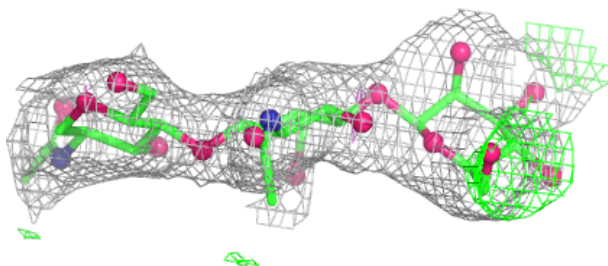
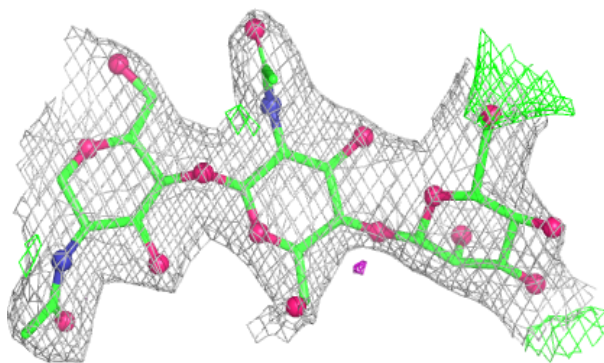


Electron density around Chain X:

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

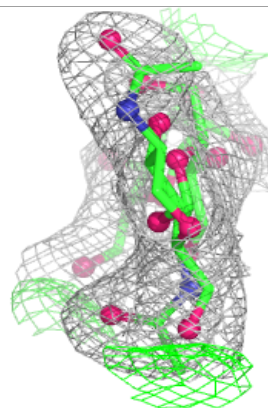
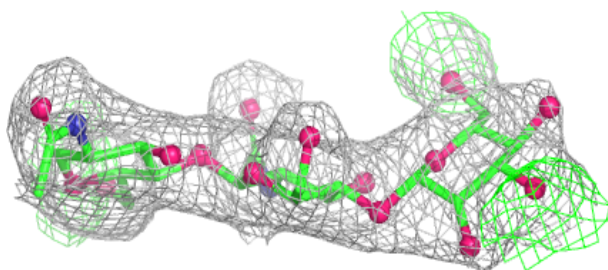
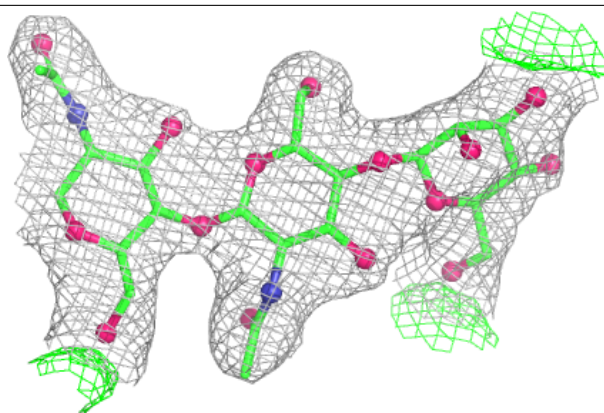
**Electron density around Chain Z:**

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

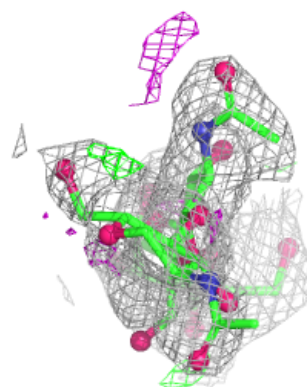
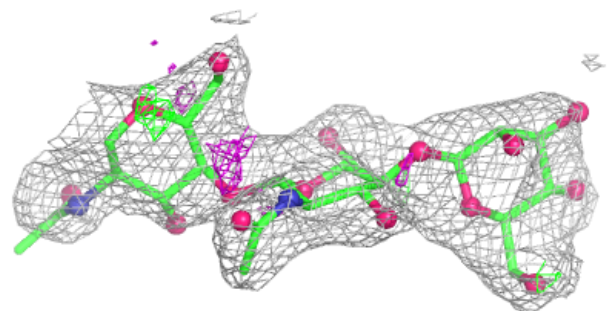
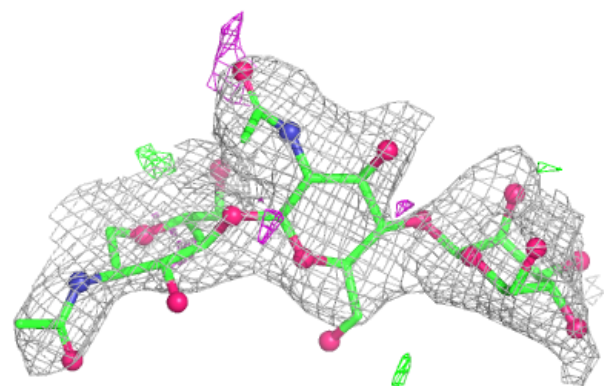


Electron density around Chain b:

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

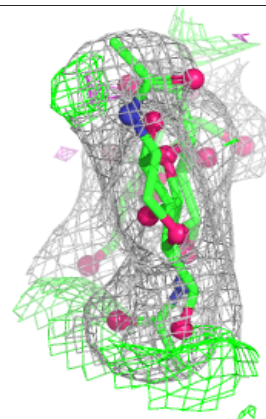
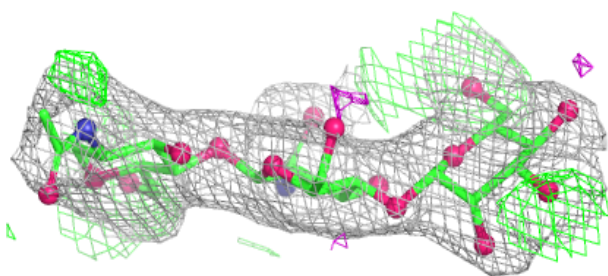
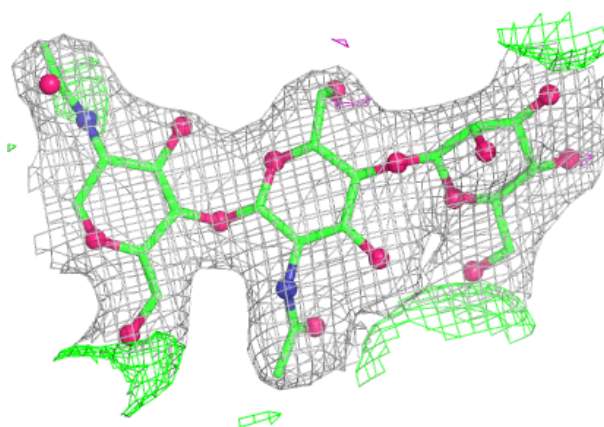
**Electron density around Chain c:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



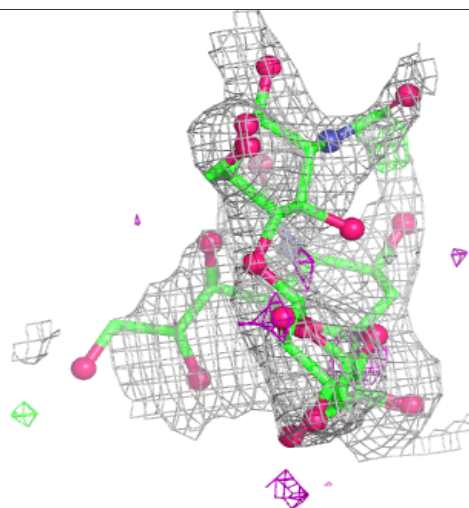
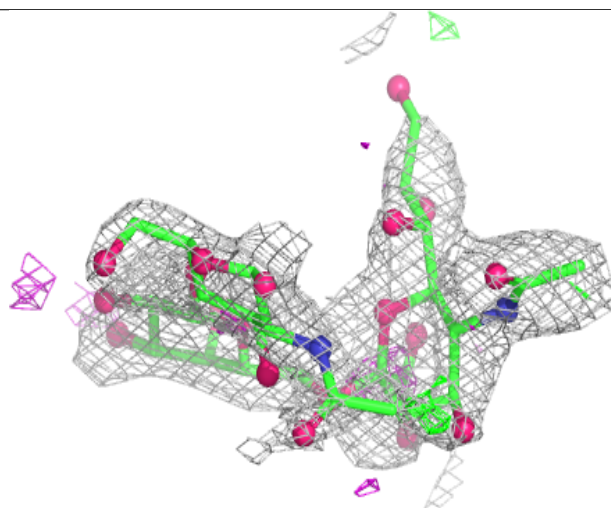
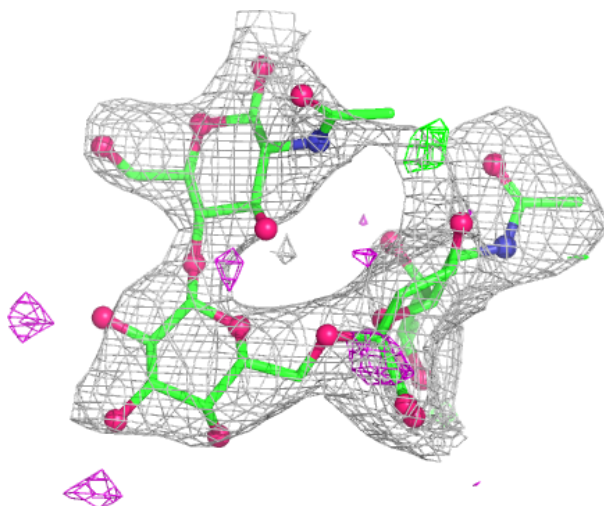
Electron density around Chain f:

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



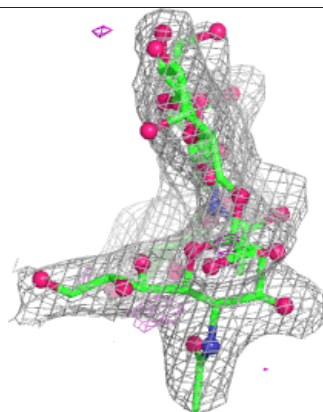
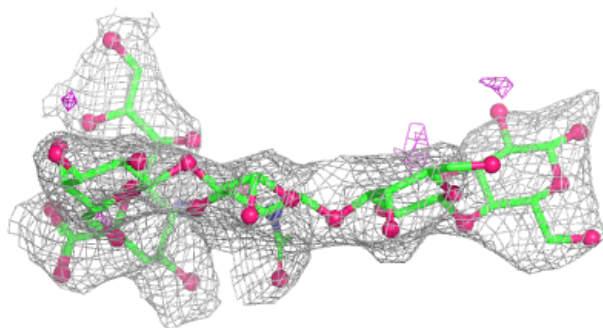
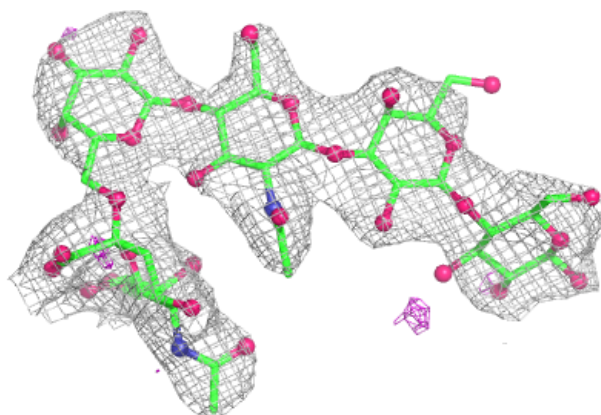
Electron density around Chain Y:

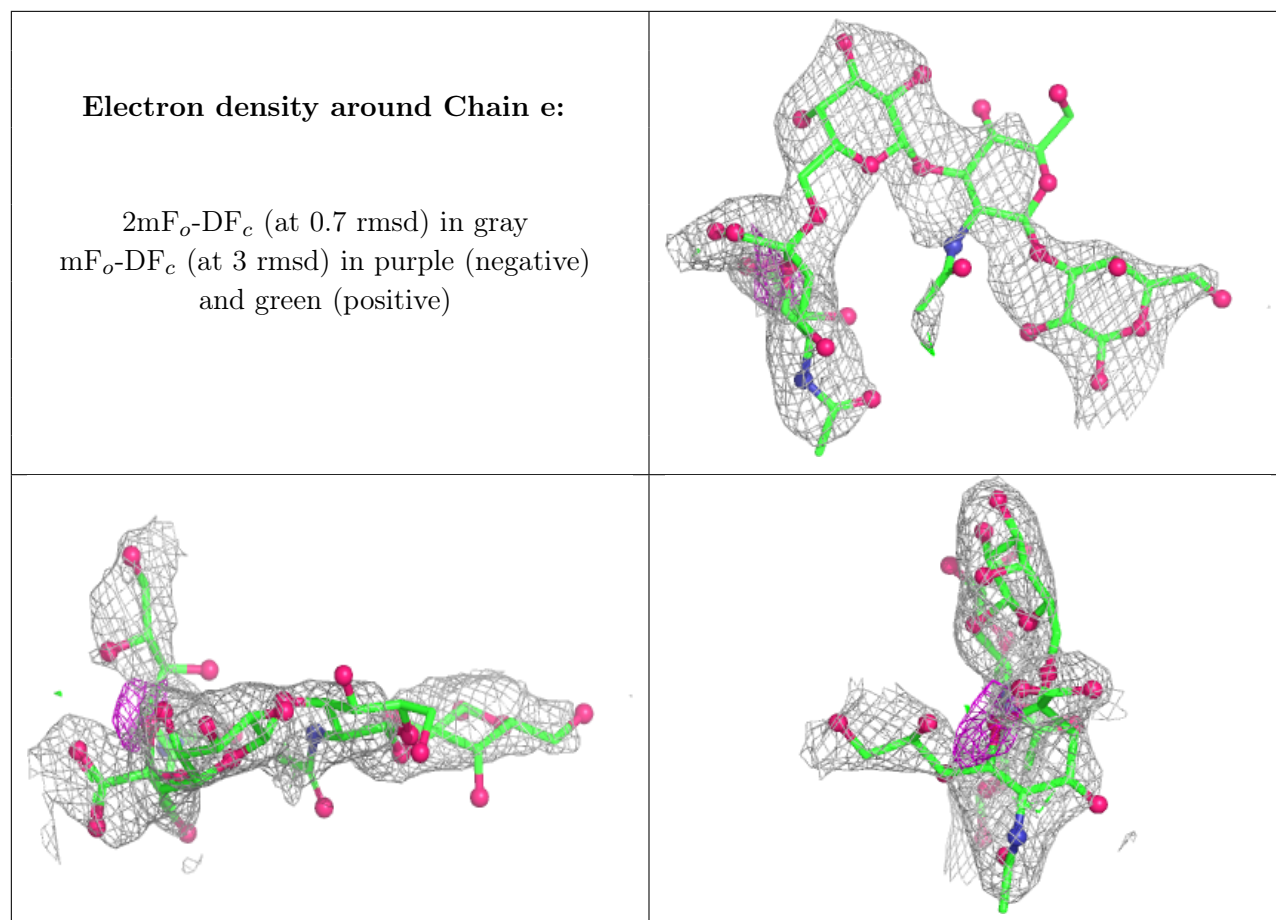
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain a:

$2mF_o - DF_c$ (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(Å ²)	Q<0.9
9	NAG	B	201	14/15	0.59	0.17	83,91,103,103	0
9	NAG	P	201	14/15	0.65	0.18	77,90,99,101	0
9	NAG	O	401	14/15	0.66	0.15	66,72,81,82	0
9	NAG	A	402	14/15	0.66	0.17	64,76,82,83	0
9	NAG	K	401	14/15	0.69	0.15	74,84,93,95	0
9	NAG	M	401	14/15	0.71	0.14	75,86,91,93	0
9	NAG	A	401	14/15	0.72	0.14	72,79,92,93	0
9	NAG	E	401	14/15	0.72	0.17	57,71,75,75	0
9	NAG	Q	401	14/15	0.73	0.16	72,90,96,97	0
9	NAG	I	401	14/15	0.76	0.16	76,85,91,98	0
9	NAG	I	402	14/15	0.77	0.14	59,77,85,86	0
9	NAG	O	402	14/15	0.78	0.14	51,58,64,69	0

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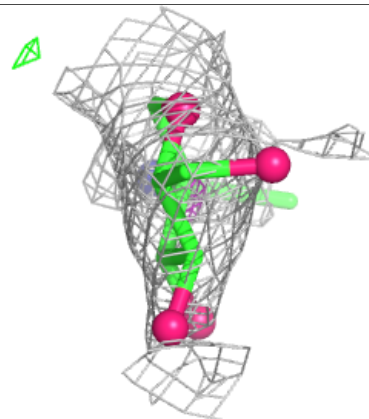
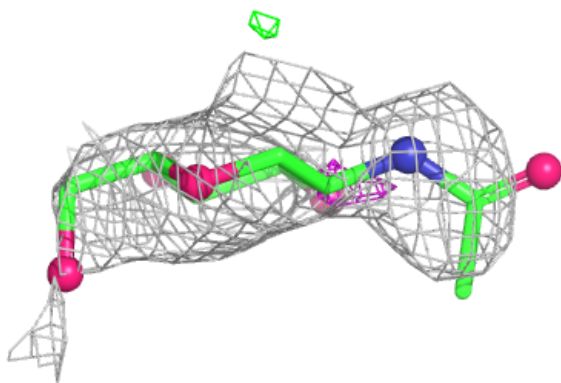
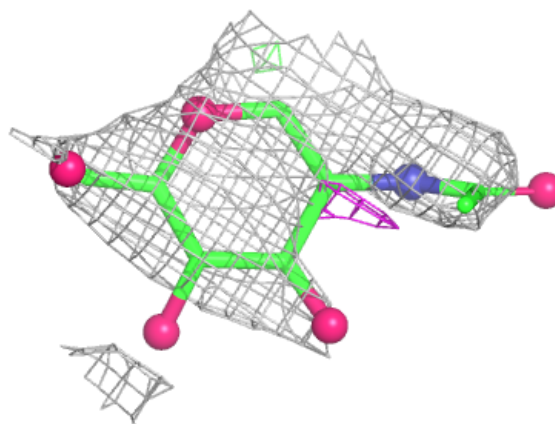
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
9	NAG	C	401	14/15	0.79	0.15	41,52,66,83	0
9	NAG	M	402	14/15	0.79	0.14	61,68,75,80	0
9	NAG	G	402	14/15	0.83	0.12	55,59,64,71	0
9	NAG	G	401	14/15	0.83	0.11	63,74,80,83	0

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.

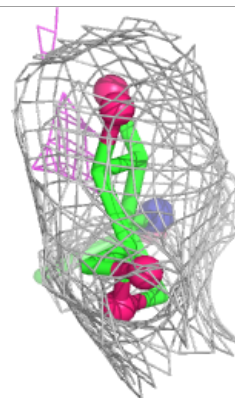
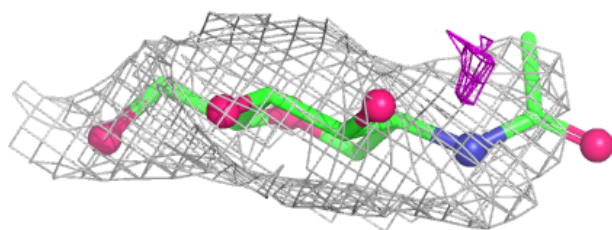
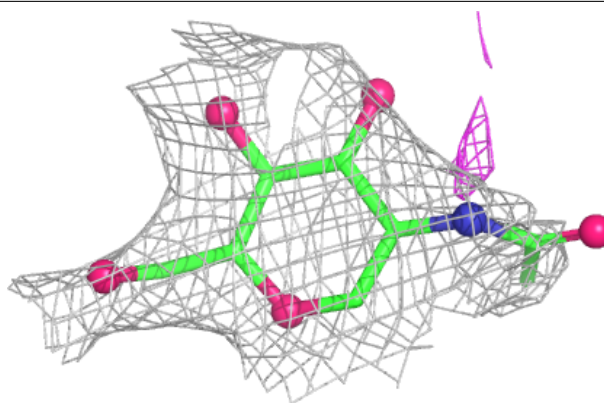
Electron density around NAG B 201:

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

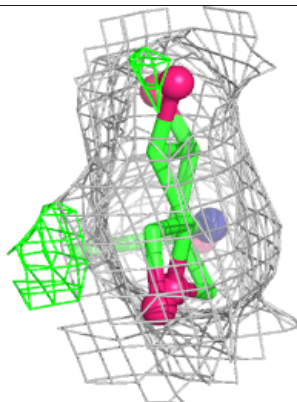
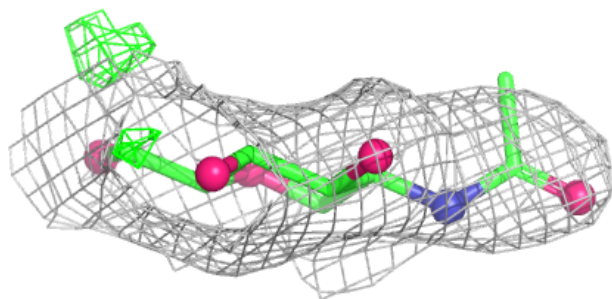
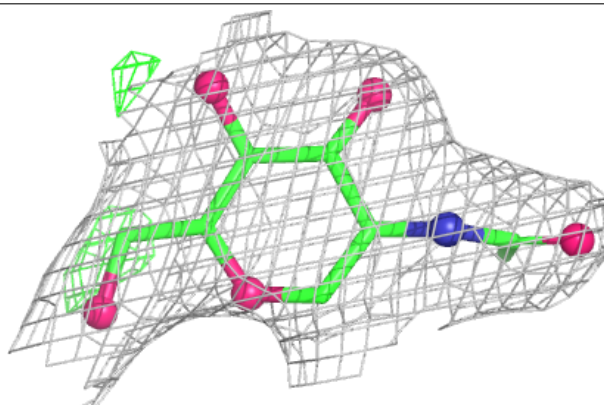


Electron density around NAG P 201:

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

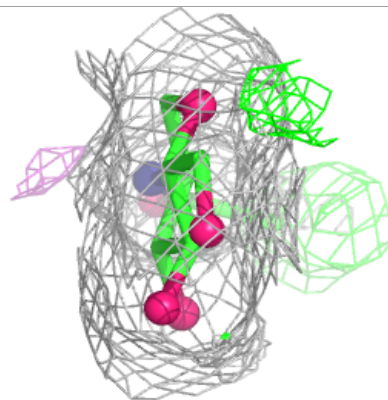
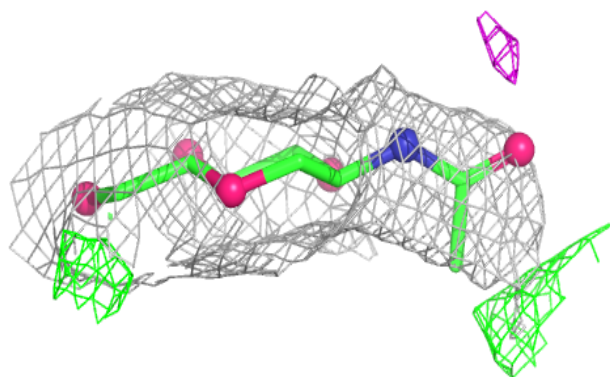
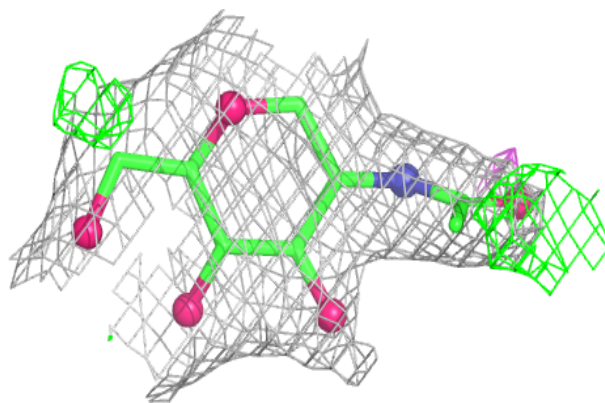
**Electron density around NAG O 401:**

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

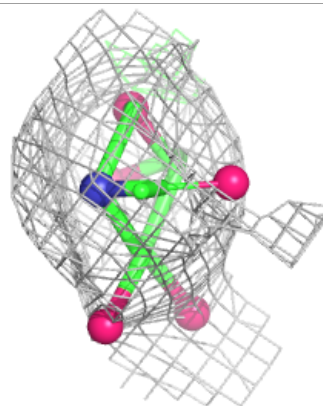
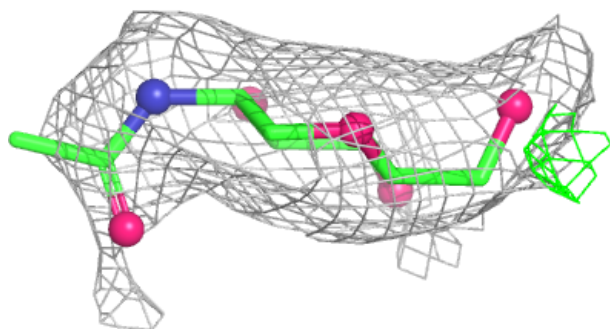
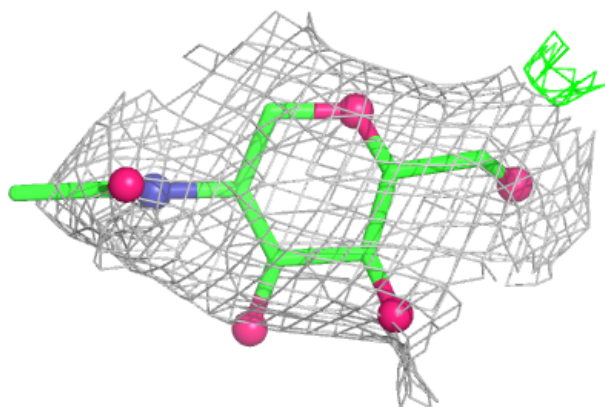


Electron density around NAG A 402:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

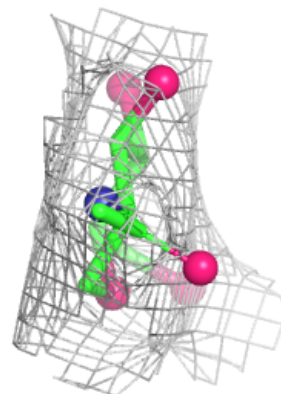
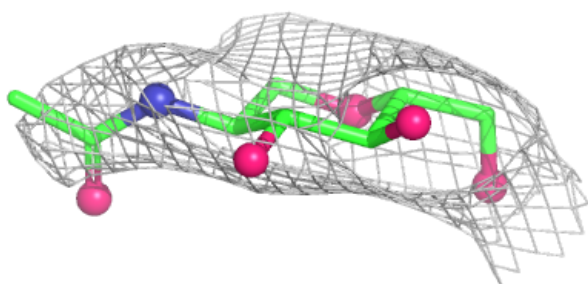
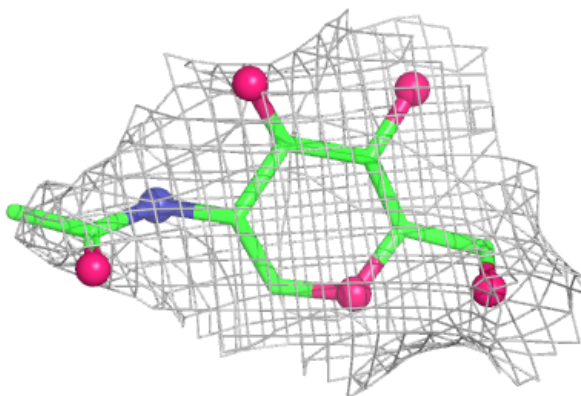
**Electron density around NAG K 401:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

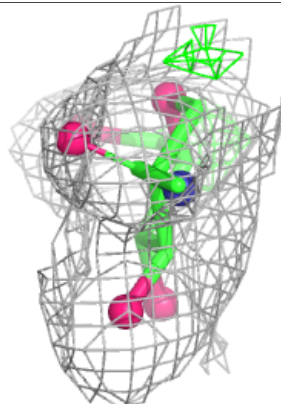
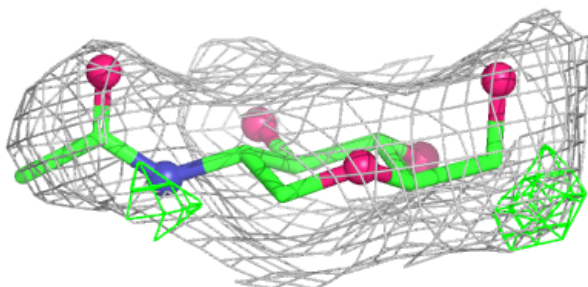
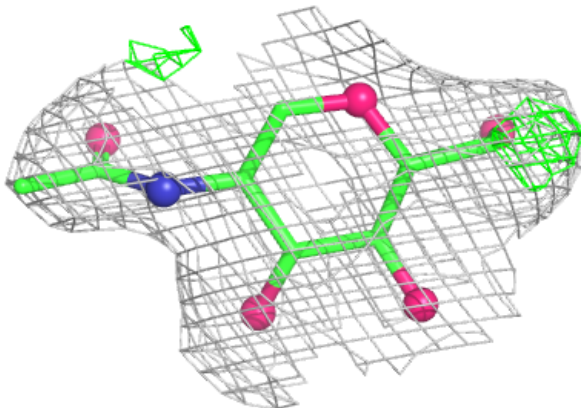


Electron density around NAG M 401:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

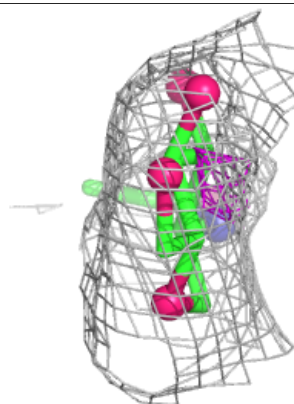
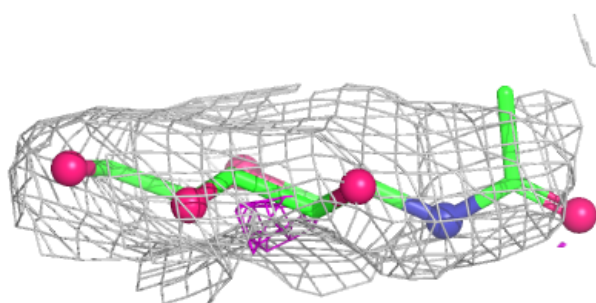
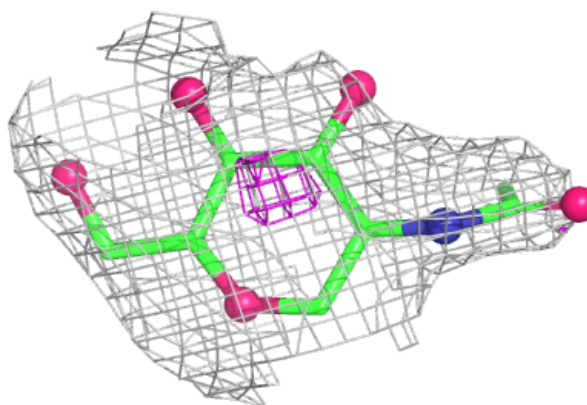
**Electron density around NAG A 401:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

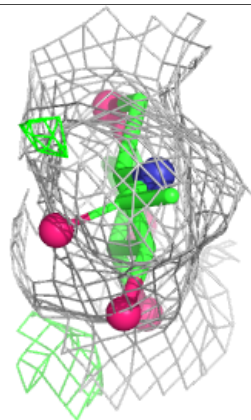
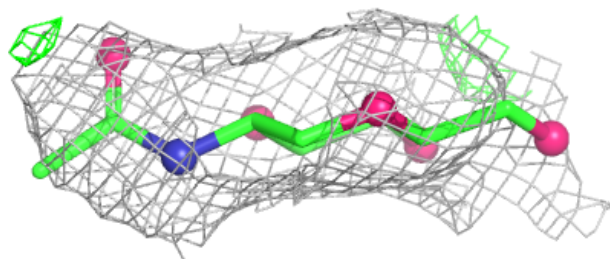
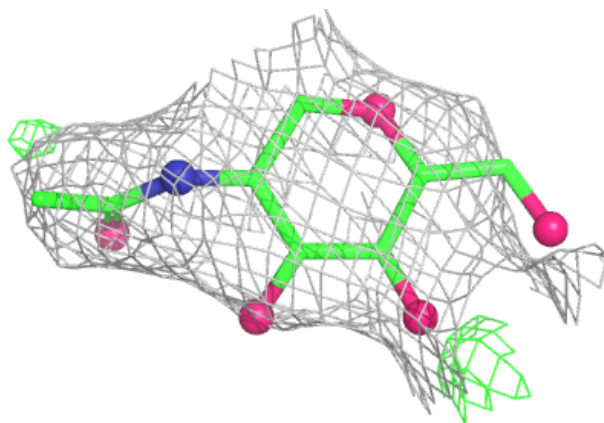


Electron density around NAG E 401:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

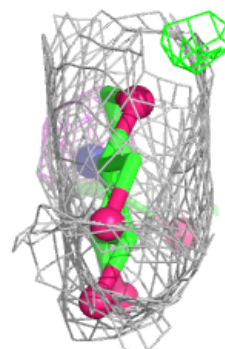
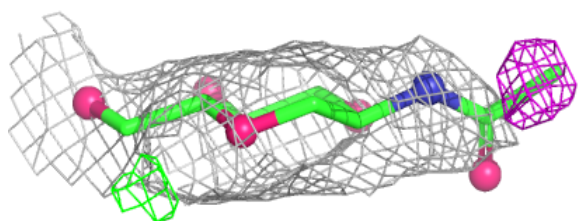
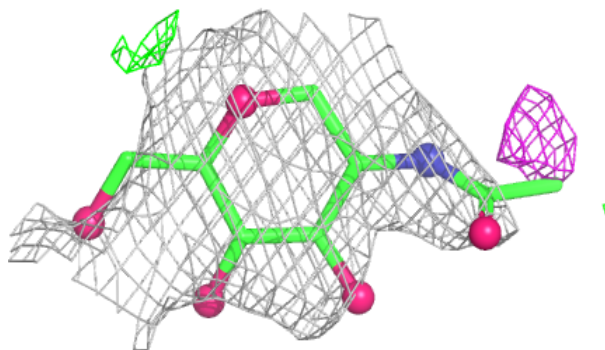
**Electron density around NAG Q 401:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

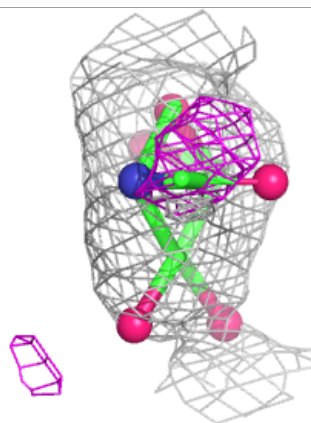
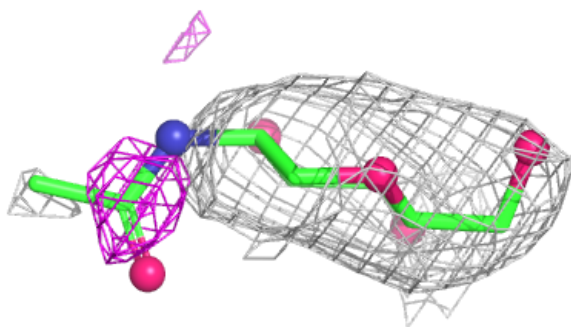
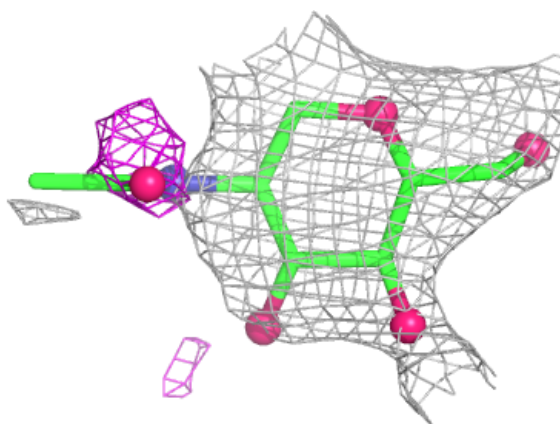


Electron density around NAG I 401:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

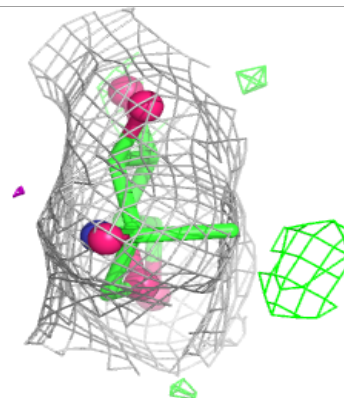
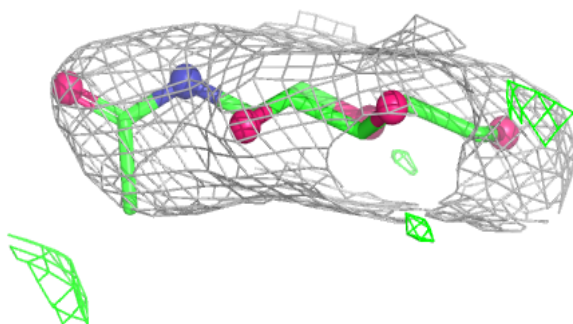
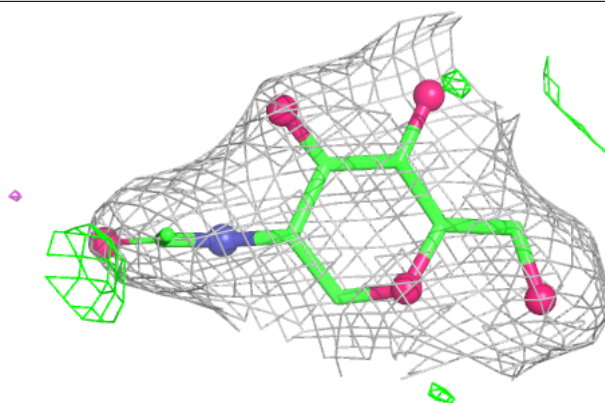
**Electron density around NAG I 402:**

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and green (positive)

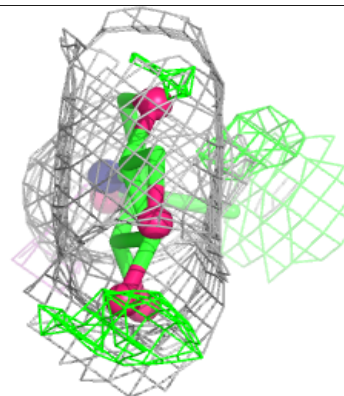
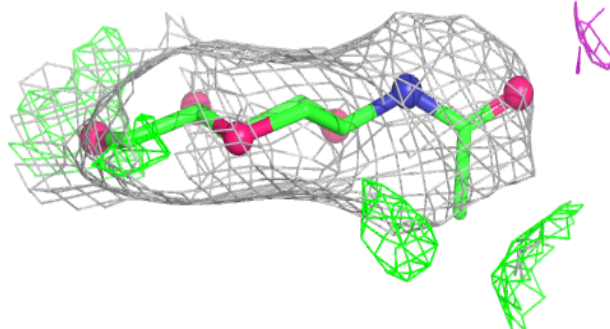
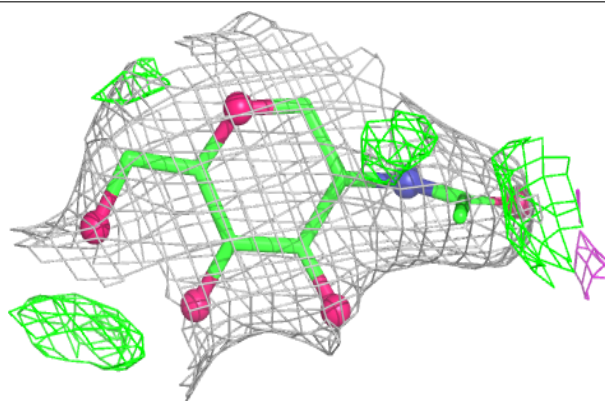


Electron density around NAG O 402:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

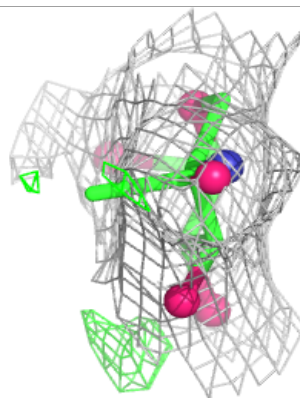
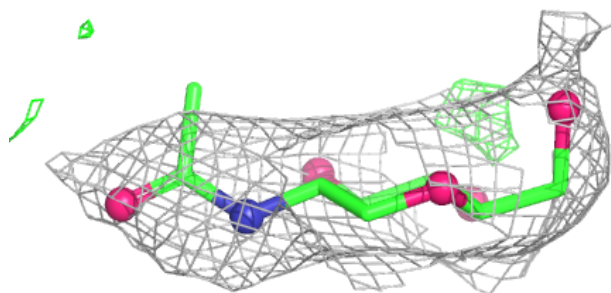
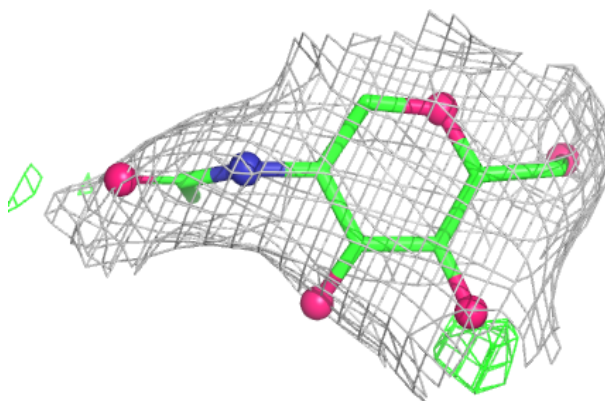
**Electron density around NAG C 401:**

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

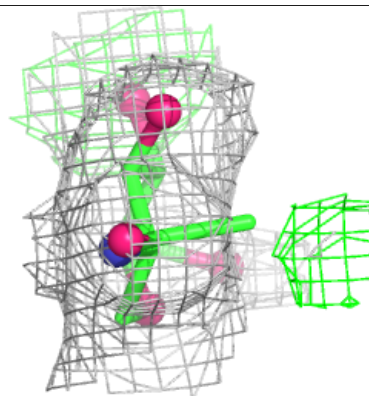
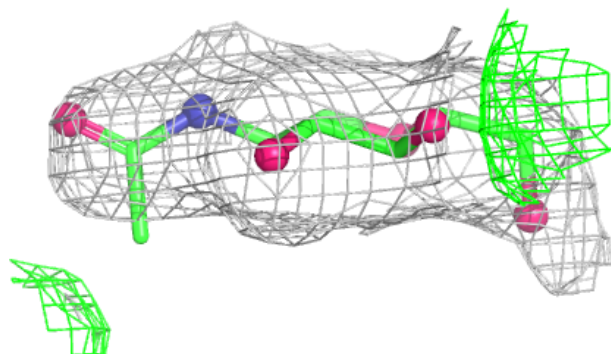
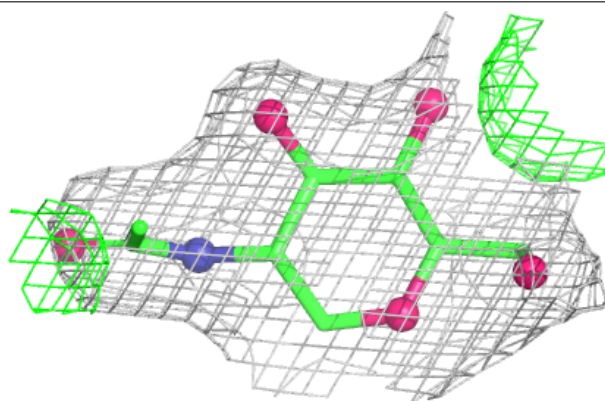


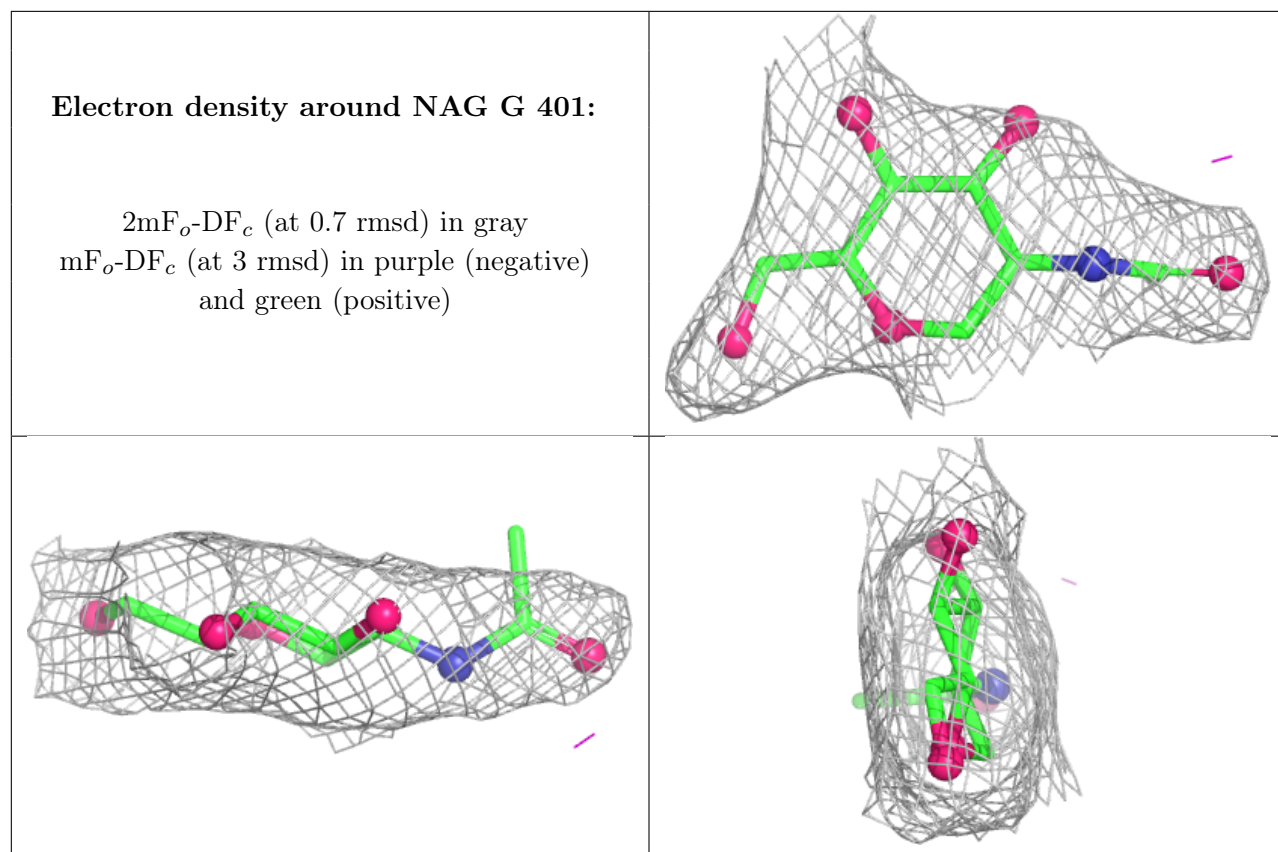
Electron density around NAG M 402:

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

**Electron density around NAG G 402:**

$2mF_o-DF_c$ (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.