



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 7, 2020 – 11:48 AM BST

PDB ID : 4UNW  
Title : Structure of the A\_Equine\_Newmarket\_2\_93 H3 haemagglutinin  
Authors : Vachieri, S.G.; Collins, P.J.; Haire, L.F.; Ogradowicz, R.W.; Martin, S.R.;  
Walker, P.A.; Xiong, X.; Gamblin, S.J.; Skehel, J.J.  
Deposited on : 2014-05-31  
Resolution : 2.60 Å(reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.13.1  
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) : 2.13.1

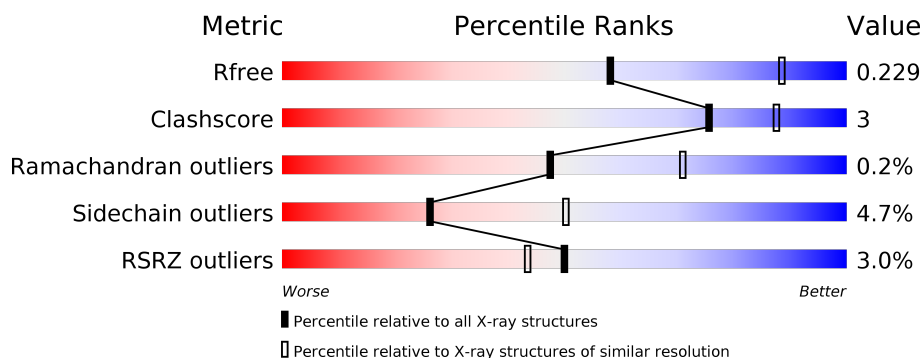
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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.



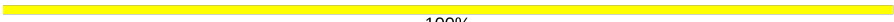
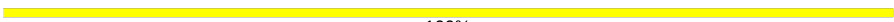












Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	323	<div> <div>2%</div> <div>91%</div> <div>7%</div> <div>..</div> </div>
1	C	323	<div> <div>7%</div> <div>88%</div> <div>11%</div> <div>..</div> </div>
1	E	323	<div> <div>5%</div> <div>89%</div> <div>10%</div> <div>.</div> </div>
2	B	173	<div> <div>87%</div> <div>10%</div> <div>...</div> </div>
2	D	173	<div> <div>85%</div> <div>13%</div> <div>...</div> </div>
2	F	173	<div> <div>%</div> <div>88%</div> <div>10%</div> <div>...</div> </div>

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Mol	Chain	Length	Quality of chain
3	G	2	 100%
3	J	2	 100%
3	L	2	 50% 50%
3	M	2	 100%
3	P	2	 100%
3	T	2	 100%
4	H	4	 50% 50%
5	I	5	 40% 60%
5	N	5	 20% 80%
5	O	5	 20% 40% 40%
5	R	5	 100%
6	K	2	 100%
6	Q	2	 100%
7	S	6	 83% 17%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	NAG	L	2	-	-	-	X
3	NAG	M	2	-	-	-	X
5	MAN	O	4	-	-	-	X
6	FUL	Q	2	-	-	-	X
7	NAG	S	5	X	-	-	-
7	MAN	S	6	-	-	-	X
8	NAG	C	611	-	-	-	X
8	NAG	E	411	-	-	-	X
8	NAG	E	421	X	-	-	-

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 12914 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 H3 HAEMAGGLUTININ HA1 CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	320	Total	C	N	O	S	0	0	0
			2493	1558	440	481	14			
1	C	321	Total	C	N	O	S	0	0	0
			2501	1564	441	482	14			
1	E	321	Total	C	N	O	S	0	0	0
			2501	1564	441	482	14			

- Molecule 2 is a protein called H3 HAEMAGGLUTININ HA2 CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	172	Total	C	N	O	S	0	0	0
			1396	870	245	275	6			
2	D	172	Total	C	N	O	S	0	0	0
			1396	870	245	275	6			
2	F	172	Total	C	N	O	S	0	0	0
			1396	870	245	275	6			

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



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

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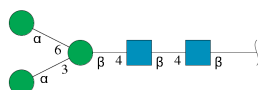
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	M	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	P	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	T	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 4 is an oligosaccharide called 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	H	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



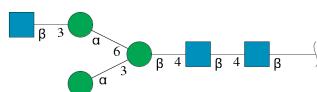
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	I	5	Total	C	N	O	0	0	0
			61	34	2	25			
5	N	5	Total	C	N	O	0	0	0
			61	34	2	25			
5	O	5	Total	C	N	O	0	0	0
			61	34	2	25			
5	R	5	Total	C	N	O	0	0	0
			61	34	2	25			

- Molecule 6 is an oligosaccharide called beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



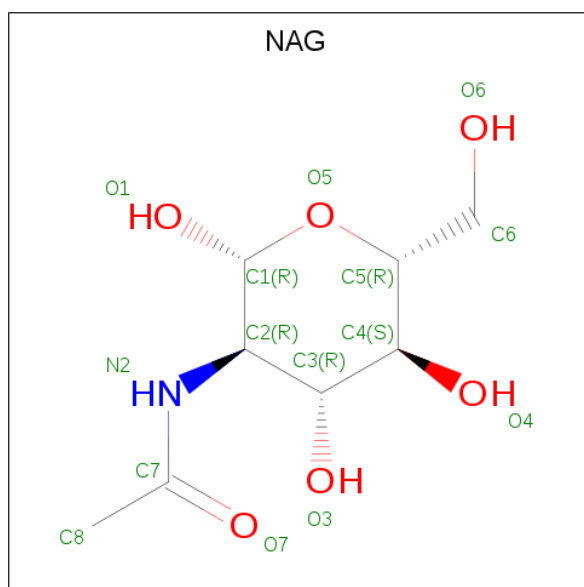
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	K	2	Total	C	N	O	0	0	0
			24	14	1	9			
6	Q	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 7 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
7	S	6	Total	C	N	O	0	0	0
			75	42	3	30			

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



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

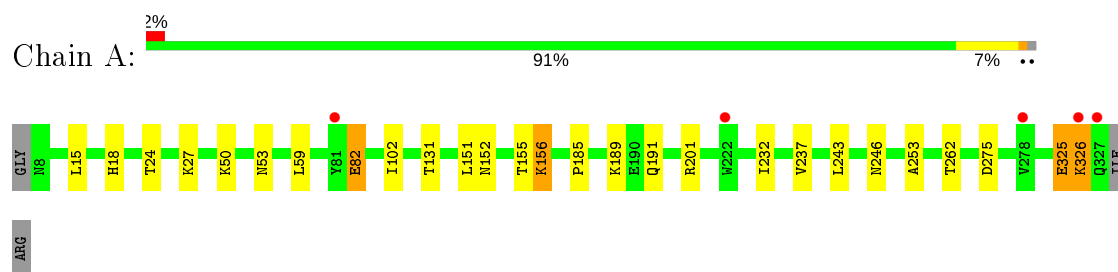
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	120	Total	O	0	0
			120	120		
9	B	124	Total	O	0	0
			124	124		
9	C	83	Total	O	0	0
			83	83		
9	D	98	Total	O	0	0
			98	98		
9	E	73	Total	O	0	0
			73	73		
9	F	64	Total	O	0	0
			64	64		

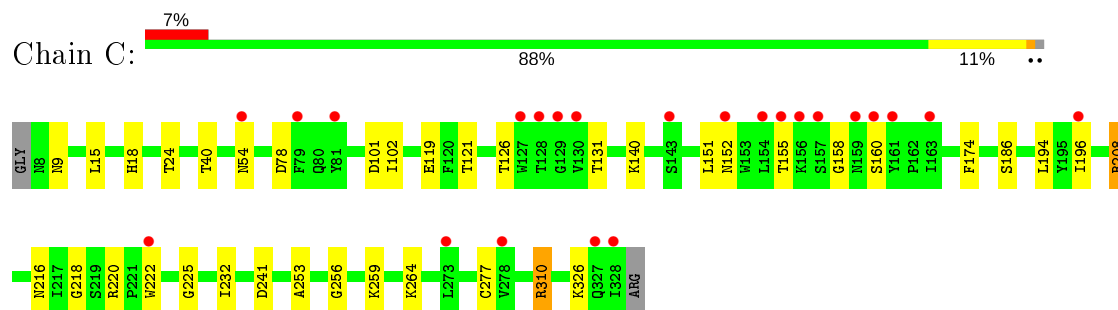
### 3 Residue-property plots [i](#)

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.

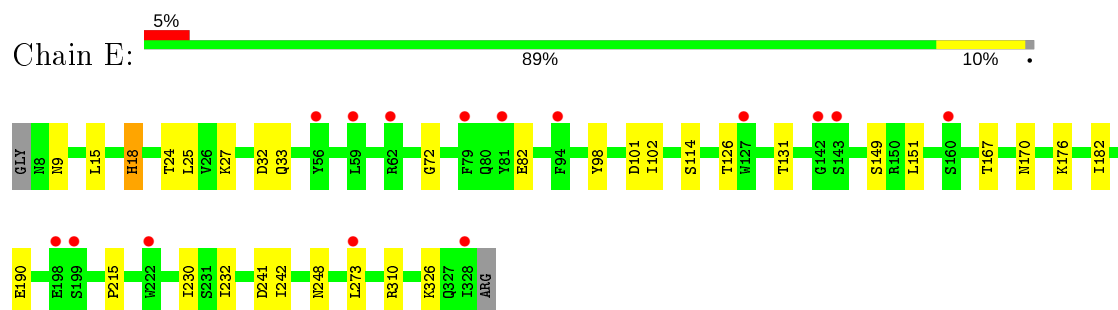
- Molecule 1: H3 HAEMAGGLUTININ HA1 CHAIN



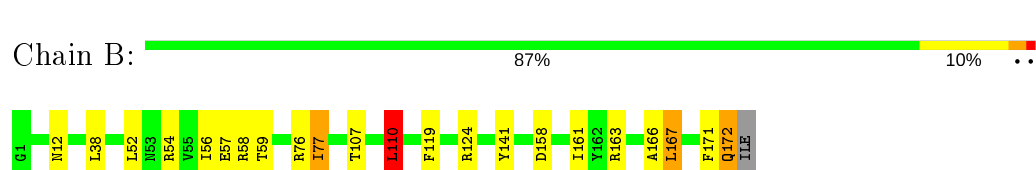
- Molecule 1: H3 HAEMAGGLUTININ HA1 CHAIN



- Molecule 1: H3 HAEMAGGLUTININ HA1 CHAIN




- Molecule 2: H3 HAEMAGGLUTININ HA2 CHAIN






- Molecule 2: H3 HAEMAGGLUTININ HA2 CHAIN

Chain D:  85% 13% ...



- Molecule 2: H3 HAEMAGGLUTININ HA2 CHAIN

Chain F:  88% 10% ...



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

Chain G:  100%



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

Chain J:  100%



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

Chain L:  50% 50%



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

Chain M:  100%



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

Chain P:  100%

MAG1  
MAG2

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

Chain T:  100%

MAG1  
MAG2

- Molecule 4: 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 H:  50% 50%

MAG1  
MAG2  
BMA3  
MAN4

- Molecule 5: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:  40% 60%


MAG1  
MAG2  
BMA3  
MAN4  
MAN5

- Molecule 5: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain N:  20% 80%

MAG1  
MAG2  
BMA3  
MAN4  
MAN5

- Molecule 5: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain O:  20% 40% 40%


MAG1  
MAG2  
BMA3  
MAN4  
MAN5

- Molecule 5: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain R:  100%

NA61  
NA62  
BNA3  
MAN4  
MAN5

- Molecule 6: beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain K:  100%


NA61  
FUL2

- Molecule 6: beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain Q:  100%

NA61  
FUL2

- Molecule 7: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain S:  83% 17%

NA61  
NA62  
BNA3  
MAN4  
NA65  
MAN6

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	100.68Å 102.51Å 229.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	114.74 – 2.60 46.80 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.8 (114.74-2.60) 99.8 (46.80-2.60)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.26 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.8.0069	Depositor
R, $R_{free}$	0.186 , 0.228 0.186 , 0.229	Depositor DCC
$R_{free}$ test set	3714 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	52.2	Xtriage
Anisotropy	0.184	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 47.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.017 for k,h,-l	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	12914	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.92% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FUL, BMA, NAG, MAN

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	0.42	0/2546	0.60	0/3457
1	C	0.40	0/2554	0.58	0/3468
1	E	0.39	0/2554	0.58	0/3468
2	B	0.46	0/1421	0.67	1/1910 (0.1%)
2	D	0.46	0/1421	0.67	1/1910 (0.1%)
2	F	0.45	0/1421	0.65	1/1910 (0.1%)
All	All	0.42	0/11917	0.61	3/16123 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	110	LEU	CA-CB-CG	8.24	134.26	115.30
2	B	110	LEU	CA-CB-CG	7.17	131.80	115.30
2	F	110	LEU	CA-CB-CG	7.00	131.41	115.30

There are no chirality outliers.

There are no planarity outliers.

### 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	2493	0	2435	15	0
1	C	2501	0	2445	17	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2501	0	2445	12	0
2	B	1396	0	1317	13	0
2	D	1396	0	1317	16	0
2	F	1396	0	1317	12	0
3	G	28	0	25	0	0
3	J	28	0	25	0	0
3	L	28	0	25	1	0
3	M	28	0	25	0	0
3	P	28	0	25	0	0
3	T	28	0	25	0	0
4	H	50	0	43	1	0
5	I	61	0	52	0	0
5	N	61	0	52	0	0
5	O	61	0	52	1	0
5	R	61	0	52	0	0
6	K	24	0	22	0	0
6	Q	24	0	22	0	0
7	S	75	0	64	1	0
8	A	14	0	13	0	0
8	C	14	0	13	0	0
8	E	42	0	39	0	0
8	F	14	0	13	0	0
9	A	120	0	0	1	0
9	B	124	0	0	2	0
9	C	83	0	0	0	0
9	D	98	0	0	2	0
9	E	73	0	0	2	0
9	F	64	0	0	1	0
All	All	12914	0	11863	74	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 3.

All (74) 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:D:107:THR:HA	2:D:110:LEU:HD13	1.57	0.87
1:C:102:ILE:HG12	1:C:232:ILE:HB	1.60	0.82
2:F:107:THR:HA	2:F:110:LEU:HD13	1.62	0.81
2:B:171:PHE:O	2:B:172:GLN:HB3	1.83	0.76
1:A:27:LYS:HD2	2:D:54:ARG:HH22	1.53	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:102:ILE:HG12	1:E:232:ILE:HB	1.73	0.70
1:C:155:THR:HG21	1:C:194:LEU:HD22	1.76	0.68
1:A:15:LEU:HD22	2:B:119:PHE:HA	1.76	0.68
2:F:171:PHE:O	2:F:172:GLN:HB3	1.93	0.67
2:B:107:THR:HA	2:B:110:LEU:HD13	1.77	0.66
1:A:102:ILE:HG12	1:A:232:ILE:HB	1.78	0.65
1:E:27:LYS:HG2	1:E:32:ASP:O	1.98	0.64
1:C:15:LEU:HD22	2:D:119:PHE:HA	1.80	0.64
1:A:53:ASN:HB2	9:A:2043:HOH:O	1.98	0.63
2:B:76:ARG:NE	2:D:77:ILE:HD11	2.14	0.62
4:H:3:BMA:H62	4:H:4:MAN:H5	1.82	0.61
2:D:124:ARG:HD2	9:D:2081:HOH:O	2.01	0.60
2:F:27:GLN:HG3	2:F:32:THR:HG22	1.85	0.59
1:A:27:LYS:CD	2:D:54:ARG:HH22	2.16	0.59
2:B:76:ARG:HE	2:D:77:ILE:HD11	1.70	0.57
2:D:30:GLU:OE2	2:D:145:ASP:HB2	2.05	0.55
2:F:56:ILE:O	2:F:58:ARG:HG2	2.07	0.54
1:E:182:ILE:HD11	1:E:215:PRO:HD3	1.89	0.54
1:C:222:TRP:CZ2	1:C:225:GLY:HA2	2.44	0.53
2:B:158:ASP:HB3	2:B:161:ILE:HD12	1.90	0.53
1:E:167:THR:HB	1:E:242:ILE:HD11	1.91	0.52
1:C:208:ARG:HD2	1:C:241:ASP:OD2	2.09	0.52
1:C:186:SER:HA	1:C:218:GLY:O	2.10	0.51
2:D:123:ARG:NH2	9:D:2079:HOH:O	2.44	0.50
2:B:171:PHE:O	2:B:172:GLN:CB	2.56	0.49
1:A:131:THR:HG22	1:A:156:LYS:O	2.12	0.49
1:E:170:ASN:OD1	1:E:176:LYS:HE3	2.13	0.49
1:A:201:ARG:NH2	1:A:246:ASN:HB3	2.28	0.48
2:B:124:ARG:HD2	9:B:2103:HOH:O	2.14	0.48
1:E:18:HIS:HE1	9:E:2008:HOH:O	1.95	0.48
1:E:72:GLY:HA3	1:E:149:SER:OG	2.13	0.47
1:E:15:LEU:HD22	2:F:119:PHE:HA	1.96	0.47
1:A:131:THR:HG23	1:A:155:THR:OG1	2.15	0.47
1:A:152:ASN:HB3	1:A:253:ALA:HB3	1.97	0.46
1:E:25:LEU:HD13	1:E:33:GLN:HB3	1.97	0.46
1:C:160:SER:HA	1:C:196:ILE:HG13	1.97	0.46
2:B:163:ARG:HG2	2:B:167:LEU:HD22	1.98	0.46
1:E:98:TYR:CD1	1:E:230:ILE:HD12	2.51	0.45
1:A:50:LYS:HD2	1:A:275:ASP:HB3	1.97	0.45
1:C:152:ASN:HB3	1:C:253:ALA:HB3	1.99	0.45
1:C:216:ASN:HB2	1:C:220:ARG:HH22	1.81	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:237:VAL:HG21	1:A:243:LEU:HB2	1.99	0.45
1:C:310:ARG:NH1	2:D:90:ASP:OD1	2.50	0.45
2:F:124:ARG:HD2	9:F:2050:HOH:O	2.17	0.45
1:C:174:PHE:CE1	1:C:259:LYS:HG3	2.52	0.44
2:D:158:ASP:HB3	2:D:161:ILE:HD12	2.00	0.44
2:B:77:ILE:HD11	2:F:76:ARG:NE	2.33	0.44
1:A:325:GLU:O	1:A:326:LYS:HB2	2.18	0.44
1:C:121:THR:O	1:C:256:GLY:HA3	2.18	0.43
2:F:69:GLU:OE2	7:S:2:NAG:H82	2.18	0.43
2:B:54:ARG:NH2	9:B:2047:HOH:O	2.51	0.43
1:C:40:THR:HG21	2:D:52:LEU:HD11	2.00	0.43
5:O:3:BMA:H3	5:O:4:MAN:H2	1.82	0.43
2:F:6:ILE:HD12	2:F:112:ASP:HA	2.00	0.42
1:C:264:LYS:HB2	2:D:63:PHE:CD1	2.54	0.42
1:E:101:ASP:HB3	9:E:2032:HOH:O	2.18	0.42
1:A:201:ARG:HH22	1:A:246:ASN:HB3	1.82	0.42
1:A:59:LEU:HD22	1:A:82:GLU:HG2	2.01	0.42
1:C:54:ASN:HD22	3:L:1:NAG:H82	1.84	0.42
2:F:167:LEU:HD12	2:F:167:LEU:HA	1.92	0.42
1:C:15:LEU:CD2	2:D:118:LEU:HG	2.50	0.42
1:E:15:LEU:HD23	2:F:118:LEU:HG	2.02	0.42
2:B:141:TYR:O	2:B:166:ALA:HA	2.20	0.41
2:D:130:ALA:HA	2:D:139:LYS:O	2.20	0.41
1:A:185:PRO:HG2	1:A:191:GLN:OE1	2.20	0.41
2:B:163:ARG:O	2:B:167:LEU:HB2	2.21	0.41
2:F:110:LEU:HD22	2:F:111:THR:HG23	2.03	0.40
1:C:119:GLU:O	1:C:119:GLU:HG3	2.20	0.40
2:D:51:LYS:HE3	2:D:107:THR:OG1	2.21	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	318/323 (98%)	300 (94%)	17 (5%)	1 (0%)	41	64
1	C	319/323 (99%)	302 (95%)	16 (5%)	1 (0%)	41	64
1	E	319/323 (99%)	302 (95%)	17 (5%)	0	100	100
2	B	170/173 (98%)	162 (95%)	7 (4%)	1 (1%)	25	47
2	D	170/173 (98%)	159 (94%)	11 (6%)	0	100	100
2	F	170/173 (98%)	162 (95%)	8 (5%)	0	100	100
All	All	1466/1488 (98%)	1387 (95%)	76 (5%)	3 (0%)	47	71

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	326	LYS
1	C	158	GLY
2	B	57	GLU

### 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	281/283 (99%)	273 (97%)	8 (3%)	43	69
1	C	282/283 (100%)	269 (95%)	13 (5%)	27	51
1	E	282/283 (100%)	268 (95%)	14 (5%)	24	47
2	B	144/145 (99%)	134 (93%)	10 (7%)	15	31
2	D	144/145 (99%)	134 (93%)	10 (7%)	15	31
2	F	144/145 (99%)	139 (96%)	5 (4%)	36	62
All	All	1277/1284 (100%)	1217 (95%)	60 (5%)	26	50

All (60) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	HIS
1	A	24	THR

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Mol	Chain	Res	Type
1	A	82	GLU
1	A	151	LEU
1	A	156	LYS
1	A	189	LYS
1	A	262	THR
1	A	325	GLU
2	B	12	ASN
2	B	38	LEU
2	B	52	LEU
2	B	56	ILE
2	B	58	ARG
2	B	59	THR
2	B	77	ILE
2	B	110	LEU
2	B	167	LEU
2	B	172	GLN
1	C	9	ASN
1	C	18	HIS
1	C	24	THR
1	C	78	ASP
1	C	101	ASP
1	C	126	THR
1	C	131	THR
1	C	140	LYS
1	C	151	LEU
1	C	208	ARG
1	C	277	CYS
1	C	310	ARG
1	C	326	LYS
2	D	12	ASN
2	D	32	THR
2	D	38	LEU
2	D	52	LEU
2	D	56	ILE
2	D	58	ARG
2	D	77	ILE
2	D	110	LEU
2	D	167	LEU
2	D	172	GLN
1	E	9	ASN
1	E	18	HIS
1	E	24	THR

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Mol	Chain	Res	Type
1	E	82	GLU
1	E	114	SER
1	E	126	THR
1	E	131	THR
1	E	151	LEU
1	E	190	GLU
1	E	241	ASP
1	E	248	ASN
1	E	273	LEU
1	E	310	ARG
1	E	326	LYS
2	F	12	ASN
2	F	77	ILE
2	F	110	LEU
2	F	167	LEU
2	F	168	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	8	ASN
1	A	159	ASN
1	A	211	GLN
1	C	248	ASN
1	E	248	ASN
1	E	327	GLN
2	F	12	ASN

### 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](#)

46 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	NAG	G	1	1,3	14,14,15	0.62	0	17,19,21	1.67	3 (17%)
3	NAG	G	2	3	14,14,15	0.52	0	17,19,21	1.15	3 (17%)
4	NAG	H	1	1,4	14,14,15	0.63	0	17,19,21	1.41	2 (11%)
4	NAG	H	2	4	14,14,15	0.42	0	17,19,21	1.27	2 (11%)
4	BMA	H	3	4	11,11,12	0.62	0	15,15,17	2.08	3 (20%)
4	MAN	H	4	4	11,11,12	0.63	0	15,15,17	1.48	2 (13%)
5	NAG	I	1	1,5	14,14,15	0.64	0	17,19,21	1.26	2 (11%)
5	NAG	I	2	5	14,14,15	0.57	0	17,19,21	0.88	0
5	BMA	I	3	5	11,11,12	0.50	0	15,15,17	1.53	1 (6%)
5	MAN	I	4	5	11,11,12	0.59	0	15,15,17	0.98	0
5	MAN	I	5	5	11,11,12	0.70	0	15,15,17	2.12	5 (33%)
3	NAG	J	1	1,3	14,14,15	0.60	0	17,19,21	1.97	4 (23%)
3	NAG	J	2	3	14,14,15	0.59	0	17,19,21	1.52	5 (29%)
6	NAG	K	1	2,6	14,14,15	0.61	0	17,19,21	1.66	1 (5%)
6	FUL	K	2	6	10,10,11	0.67	0	14,14,16	1.08	1 (7%)
3	NAG	L	1	1,3	14,14,15	0.61	0	17,19,21	1.36	1 (5%)
3	NAG	L	2	3	14,14,15	0.57	0	17,19,21	1.28	2 (11%)
3	NAG	M	1	1,3	14,14,15	0.68	0	17,19,21	1.36	2 (11%)
3	NAG	M	2	3	14,14,15	0.51	0	17,19,21	1.19	1 (5%)
5	NAG	N	1	1,5	14,14,15	0.50	0	17,19,21	1.22	2 (11%)
5	NAG	N	2	5	14,14,15	0.53	0	17,19,21	0.95	0
5	BMA	N	3	5	11,11,12	0.64	0	15,15,17	2.27	3 (20%)
5	MAN	N	4	5	11,11,12	0.68	0	15,15,17	2.04	2 (13%)
5	MAN	N	5	5	11,11,12	0.68	0	15,15,17	1.32	3 (20%)
5	NAG	O	1	1,5	14,14,15	0.60	0	17,19,21	0.89	0
5	NAG	O	2	5	14,14,15	0.48	0	17,19,21	0.99	1 (5%)
5	BMA	O	3	5	11,11,12	0.69	0	15,15,17	1.67	2 (13%)
5	MAN	O	4	5	11,11,12	0.61	0	15,15,17	1.09	1 (6%)
5	MAN	O	5	5	11,11,12	0.56	0	15,15,17	1.31	2 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	NAG	P	1	1,3	14,14,15	0.48	0	17,19,21	1.39	4 (23%)
3	NAG	P	2	3	14,14,15	0.77	1 (7%)	17,19,21	1.77	4 (23%)
6	NAG	Q	1	2,6	14,14,15	0.71	0	17,19,21	1.90	4 (23%)
6	FUL	Q	2	6	10,10,11	0.80	0	14,14,16	1.39	3 (21%)
5	NAG	R	1	1,5	14,14,15	0.50	0	17,19,21	1.12	2 (11%)
5	NAG	R	2	5	14,14,15	0.54	0	17,19,21	1.10	1 (5%)
5	BMA	R	3	5	11,11,12	0.46	0	15,15,17	2.02	5 (33%)
5	MAN	R	4	5	11,11,12	0.69	0	15,15,17	1.68	4 (26%)
5	MAN	R	5	5	11,11,12	0.55	0	15,15,17	1.85	4 (26%)
7	NAG	S	1	1,7	14,14,15	0.56	0	17,19,21	1.15	1 (5%)
7	NAG	S	2	7	14,14,15	0.48	0	17,19,21	1.17	1 (5%)
7	BMA	S	3	7	11,11,12	0.70	0	15,15,17	1.50	3 (20%)
7	MAN	S	4	7	11,11,12	0.59	0	15,15,17	2.26	4 (26%)
7	NAG	S	5	7	14,14,15	0.92	1 (7%)	17,19,21	2.68	6 (35%)
7	MAN	S	6	7	11,11,12	0.77	0	15,15,17	1.88	3 (20%)
3	NAG	T	1	1,3	14,14,15	0.51	0	17,19,21	1.02	2 (11%)
3	NAG	T	2	3	14,14,15	0.54	0	17,19,21	1.65	2 (11%)

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	NAG	G	1	1,3	-	1/6/23/26	0/1/1/1
3	NAG	G	2	3	-	3/6/23/26	0/1/1/1
4	NAG	H	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	H	2	4	-	1/6/23/26	0/1/1/1
4	BMA	H	3	4	-	1/2/19/22	0/1/1/1
4	MAN	H	4	4	-	2/2/19/22	0/1/1/1
5	NAG	I	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	I	2	5	-	0/6/23/26	0/1/1/1
5	BMA	I	3	5	-	0/2/19/22	0/1/1/1
5	MAN	I	4	5	-	2/2/19/22	0/1/1/1
5	MAN	I	5	5	-	2/2/19/22	1/1/1/1
3	NAG	J	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	J	2	3	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	NAG	K	1	2,6	-	2/6/23/26	0/1/1/1
6	FUL	K	2	6	-	-	0/1/1/1
3	NAG	L	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	L	2	3	-	1/6/23/26	0/1/1/1
3	NAG	M	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	M	2	3	-	2/6/23/26	0/1/1/1
5	NAG	N	1	1,5	-	0/6/23/26	0/1/1/1
5	NAG	N	2	5	-	0/6/23/26	0/1/1/1
5	BMA	N	3	5	-	1/2/19/22	0/1/1/1
5	MAN	N	4	5	-	2/2/19/22	0/1/1/1
5	MAN	N	5	5	-	2/2/19/22	0/1/1/1
5	NAG	O	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	O	2	5	-	0/6/23/26	0/1/1/1
5	BMA	O	3	5	-	0/2/19/22	0/1/1/1
5	MAN	O	4	5	-	2/2/19/22	1/1/1/1
5	MAN	O	5	5	-	2/2/19/22	1/1/1/1
3	NAG	P	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	P	2	3	-	1/6/23/26	0/1/1/1
6	NAG	Q	1	2,6	-	2/6/23/26	0/1/1/1
6	FUL	Q	2	6	-	-	0/1/1/1
5	NAG	R	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	R	2	5	-	2/6/23/26	0/1/1/1
5	BMA	R	3	5	-	1/2/19/22	0/1/1/1
5	MAN	R	4	5	-	0/2/19/22	0/1/1/1
5	MAN	R	5	5	-	0/2/19/22	0/1/1/1
7	NAG	S	1	1,7	-	2/6/23/26	0/1/1/1
7	NAG	S	2	7	-	0/6/23/26	0/1/1/1
7	BMA	S	3	7	-	2/2/19/22	0/1/1/1
7	MAN	S	4	7	-	2/2/19/22	0/1/1/1
7	NAG	S	5	7	1/1/5/7	5/6/23/26	0/1/1/1
7	MAN	S	6	7	-	2/2/19/22	0/1/1/1
3	NAG	T	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	T	2	3	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	S	5	NAG	C1-C2	2.57	1.56	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	P	2	NAG	C1-C2	2.11	1.55	1.52

All (109) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	S	5	NAG	C2-N2-C7	7.58	133.70	122.90
5	N	3	BMA	C1-O5-C5	6.61	121.14	112.19
7	S	4	MAN	C1-O5-C5	6.48	120.97	112.19
4	H	3	BMA	C1-O5-C5	6.46	120.95	112.19
5	I	5	MAN	C1-O5-C5	6.36	120.81	112.19
5	N	4	MAN	C1-C2-C3	5.92	116.95	109.67
7	S	6	MAN	C1-C2-C3	5.46	116.38	109.67
6	K	1	NAG	C1-O5-C5	5.39	119.50	112.19
3	T	2	NAG	C1-O5-C5	5.33	119.42	112.19
7	S	5	NAG	C1-O5-C5	5.02	119.00	112.19
5	R	5	MAN	C1-O5-C5	5.02	118.99	112.19
5	R	3	BMA	C1-C2-C3	5.00	115.81	109.67
3	J	1	NAG	C4-C3-C2	4.78	118.02	111.02
5	I	3	BMA	C1-O5-C5	4.74	118.61	112.19
6	Q	1	NAG	C2-N2-C7	4.53	129.36	122.90
3	P	2	NAG	C2-N2-C7	4.53	129.35	122.90
3	G	1	NAG	C2-N2-C7	4.35	129.10	122.90
3	M	2	NAG	C1-O5-C5	4.34	118.08	112.19
5	O	3	BMA	C1-O5-C5	4.19	117.86	112.19
5	O	3	BMA	C1-C2-C3	4.00	114.58	109.67
3	L	1	NAG	C4-C3-C2	3.97	116.84	111.02
5	O	5	MAN	C1-O5-C5	3.92	117.51	112.19
4	H	4	MAN	C1-O5-C5	3.88	117.44	112.19
7	S	4	MAN	C1-C2-C3	3.86	114.41	109.67
5	N	4	MAN	C1-O5-C5	3.83	117.38	112.19
3	M	1	NAG	C4-C3-C2	3.82	116.62	111.02
7	S	3	BMA	C3-C4-C5	3.81	117.03	110.24
5	R	4	MAN	C1-C2-C3	3.70	114.22	109.67
5	N	3	BMA	C1-C2-C3	3.69	114.20	109.67
5	R	5	MAN	C3-C4-C5	3.58	116.62	110.24
3	J	1	NAG	C3-C4-C5	3.47	116.43	110.24
5	R	3	BMA	C1-O5-C5	3.46	116.88	112.19
5	R	4	MAN	C2-C3-C4	3.26	116.54	110.89
4	H	1	NAG	C3-C4-C5	-3.26	104.43	110.24
7	S	5	NAG	C8-C7-N2	3.25	121.60	116.10
7	S	6	MAN	C2-C3-C4	3.24	116.50	110.89
4	H	2	NAG	C1-O5-C5	3.14	116.45	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	O	4	MAN	C1-O5-C5	3.14	116.44	112.19
3	J	2	NAG	O5-C5-C6	3.13	112.11	107.20
6	Q	1	NAG	C1-C2-N2	3.09	115.77	110.49
3	P	2	NAG	C4-C3-C2	3.09	115.54	111.02
3	G	1	NAG	C1-O5-C5	3.01	116.28	112.19
4	H	4	MAN	C1-C2-C3	2.98	113.33	109.67
4	H	3	BMA	O5-C1-C2	2.94	115.31	110.77
7	S	5	NAG	C1-C2-N2	2.92	115.47	110.49
7	S	4	MAN	O5-C1-C2	2.91	115.26	110.77
6	Q	2	FUL	C1-C2-C3	-2.87	106.14	109.67
3	L	2	NAG	C1-O5-C5	2.87	116.08	112.19
5	I	1	NAG	C8-C7-N2	2.84	120.91	116.10
6	Q	1	NAG	C4-C3-C2	2.83	115.17	111.02
3	P	2	NAG	C1-C2-N2	2.81	115.29	110.49
5	N	1	NAG	C1-O5-C5	2.79	115.97	112.19
4	H	3	BMA	C1-C2-C3	2.75	113.05	109.67
5	R	1	NAG	C1-O5-C5	2.75	115.92	112.19
6	K	2	FUL	C3-C4-C5	2.75	114.06	109.77
5	N	5	MAN	C3-C4-C5	2.74	115.13	110.24
5	N	5	MAN	O5-C1-C2	-2.74	106.55	110.77
3	P	1	NAG	O5-C5-C6	2.72	111.47	107.20
5	R	3	BMA	C3-C4-C5	2.71	115.07	110.24
3	J	1	NAG	O5-C1-C2	2.69	115.54	111.29
7	S	6	MAN	O5-C5-C6	2.69	111.42	107.20
5	I	1	NAG	C2-N2-C7	2.69	126.73	122.90
3	G	2	NAG	C2-N2-C7	2.66	126.69	122.90
3	T	1	NAG	C1-O5-C5	2.63	115.76	112.19
3	P	1	NAG	C3-C4-C5	-2.63	105.54	110.24
3	P	1	NAG	O4-C4-C5	2.57	115.69	109.30
5	R	4	MAN	C3-C4-C5	2.56	114.81	110.24
5	R	3	BMA	O3-C3-C4	-2.49	104.58	110.35
3	G	1	NAG	O5-C1-C2	-2.46	107.40	111.29
3	J	2	NAG	C1-O5-C5	-2.44	108.89	112.19
5	I	5	MAN	C3-C4-C5	2.44	114.59	110.24
3	G	2	NAG	C1-O5-C5	2.43	115.49	112.19
7	S	2	NAG	C1-O5-C5	2.43	115.49	112.19
3	J	1	NAG	C1-C2-N2	-2.43	106.33	110.49
5	I	5	MAN	C1-C2-C3	2.41	112.63	109.67
5	I	5	MAN	O5-C1-C2	2.41	114.48	110.77
7	S	5	NAG	O5-C1-C2	2.40	115.08	111.29
5	R	2	NAG	C1-O5-C5	2.40	115.44	112.19
6	Q	1	NAG	O6-C6-C5	2.40	119.52	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	S	3	BMA	C1-O5-C5	2.38	115.41	112.19
5	R	4	MAN	C1-O5-C5	2.37	115.41	112.19
7	S	4	MAN	O5-C5-C6	2.35	110.89	107.20
5	I	5	MAN	O5-C5-C6	2.34	110.87	107.20
3	P	2	NAG	C3-C4-C5	2.33	114.39	110.24
7	S	5	NAG	O5-C5-C6	2.32	110.83	107.20
5	N	1	NAG	O4-C4-C3	-2.30	105.02	110.35
3	L	2	NAG	C2-N2-C7	2.26	126.13	122.90
5	N	3	BMA	O5-C1-C2	2.26	114.26	110.77
3	J	2	NAG	O5-C1-C2	-2.26	107.72	111.29
7	S	1	NAG	O4-C4-C3	-2.21	105.23	110.35
7	S	3	BMA	C2-C3-C4	2.20	114.70	110.89
5	R	3	BMA	C2-C3-C4	2.20	114.70	110.89
5	R	1	NAG	O4-C4-C3	-2.19	105.29	110.35
3	T	1	NAG	C4-C3-C2	2.18	114.21	111.02
4	H	2	NAG	C3-C4-C5	-2.17	106.38	110.24
6	Q	2	FUL	O5-C1-C2	-2.14	107.46	110.77
5	O	2	NAG	O5-C5-C6	2.12	110.53	107.20
3	T	2	NAG	O5-C1-C2	2.12	114.63	111.29
6	Q	2	FUL	C3-C4-C5	2.11	113.06	109.77
3	J	2	NAG	C4-C3-C2	2.11	114.11	111.02
3	G	2	NAG	O5-C5-C6	2.10	110.50	107.20
4	H	1	NAG	C1-O5-C5	2.10	115.03	112.19
3	M	1	NAG	O4-C4-C3	2.06	115.12	110.35
5	R	5	MAN	C2-C3-C4	2.05	114.44	110.89
5	R	5	MAN	C1-C2-C3	2.04	112.18	109.67
5	O	5	MAN	O5-C5-C6	2.04	110.41	107.20
3	J	2	NAG	C3-C4-C5	2.03	113.86	110.24
3	P	1	NAG	C1-O5-C5	-2.02	109.45	112.19
5	N	5	MAN	C2-C3-C4	2.01	114.38	110.89

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
7	S	5	NAG	C1

All (61) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	P	1	NAG	O5-C5-C6-O6
6	Q	1	NAG	C4-C5-C6-O6
7	S	3	BMA	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
3	M	2	NAG	O5-C5-C6-O6
5	O	4	MAN	O5-C5-C6-O6
5	O	5	MAN	C4-C5-C6-O6
5	O	5	MAN	O5-C5-C6-O6
6	Q	1	NAG	O5-C5-C6-O6
3	J	2	NAG	O5-C5-C6-O6
7	S	5	NAG	O5-C5-C6-O6
5	I	5	MAN	O5-C5-C6-O6
3	J	1	NAG	C4-C5-C6-O6
5	N	5	MAN	O5-C5-C6-O6
5	N	4	MAN	O5-C5-C6-O6
7	S	5	NAG	C4-C5-C6-O6
3	M	2	NAG	C4-C5-C6-O6
3	P	1	NAG	C4-C5-C6-O6
5	I	5	MAN	C4-C5-C6-O6
7	S	4	MAN	O5-C5-C6-O6
3	G	2	NAG	O5-C5-C6-O6
6	K	1	NAG	C4-C5-C6-O6
5	I	1	NAG	C8-C7-N2-C2
5	I	1	NAG	O7-C7-N2-C2
7	S	1	NAG	C8-C7-N2-C2
7	S	1	NAG	O7-C7-N2-C2
7	S	5	NAG	C8-C7-N2-C2
7	S	5	NAG	O7-C7-N2-C2
5	O	1	NAG	C8-C7-N2-C2
5	O	1	NAG	O7-C7-N2-C2
7	S	3	BMA	C4-C5-C6-O6
3	J	1	NAG	O5-C5-C6-O6
5	R	2	NAG	O5-C5-C6-O6
5	N	5	MAN	C4-C5-C6-O6
5	I	4	MAN	O5-C5-C6-O6
5	N	4	MAN	C4-C5-C6-O6
4	H	3	BMA	C4-C5-C6-O6
5	O	4	MAN	C4-C5-C6-O6
7	S	6	MAN	C4-C5-C6-O6
3	G	2	NAG	C4-C5-C6-O6
6	K	1	NAG	O5-C5-C6-O6
5	R	3	BMA	O5-C5-C6-O6
7	S	6	MAN	O5-C5-C6-O6
5	N	3	BMA	O5-C5-C6-O6
4	H	4	MAN	C4-C5-C6-O6
3	L	2	NAG	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
3	P	2	NAG	C3-C2-N2-C7
3	J	2	NAG	C4-C5-C6-O6
3	L	1	NAG	O5-C5-C6-O6
7	S	4	MAN	C4-C5-C6-O6
3	G	2	NAG	C3-C2-N2-C7
7	S	5	NAG	C3-C2-N2-C7
3	L	1	NAG	C4-C5-C6-O6
4	H	2	NAG	C4-C5-C6-O6
5	R	1	NAG	O5-C5-C6-O6
4	H	4	MAN	O5-C5-C6-O6
5	R	2	NAG	C4-C5-C6-O6
3	T	1	NAG	C4-C5-C6-O6
5	I	4	MAN	C4-C5-C6-O6
3	G	1	NAG	C3-C2-N2-C7
3	T	1	NAG	O5-C5-C6-O6
5	R	1	NAG	C4-C5-C6-O6

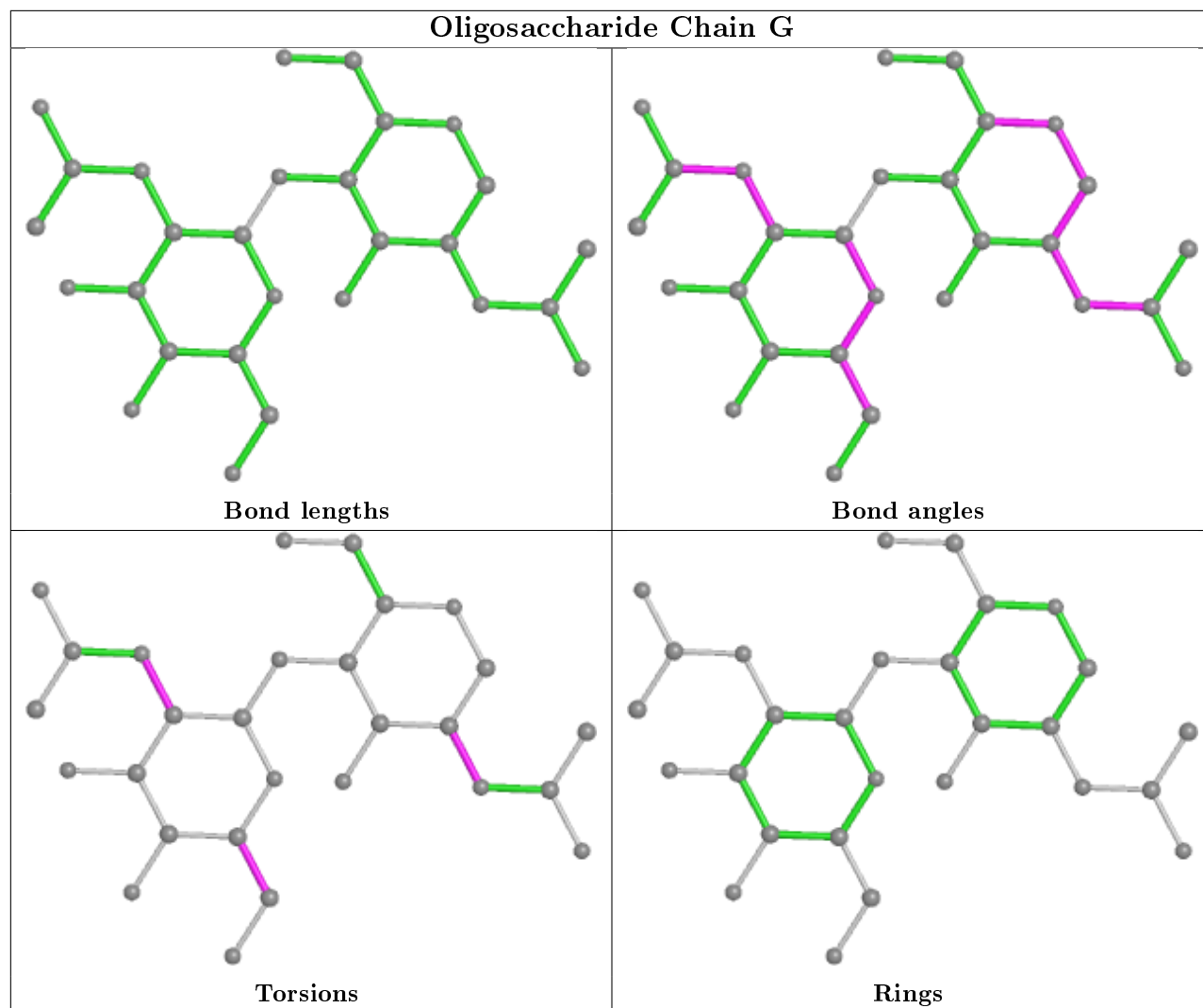
All (3) ring outliers are listed below:

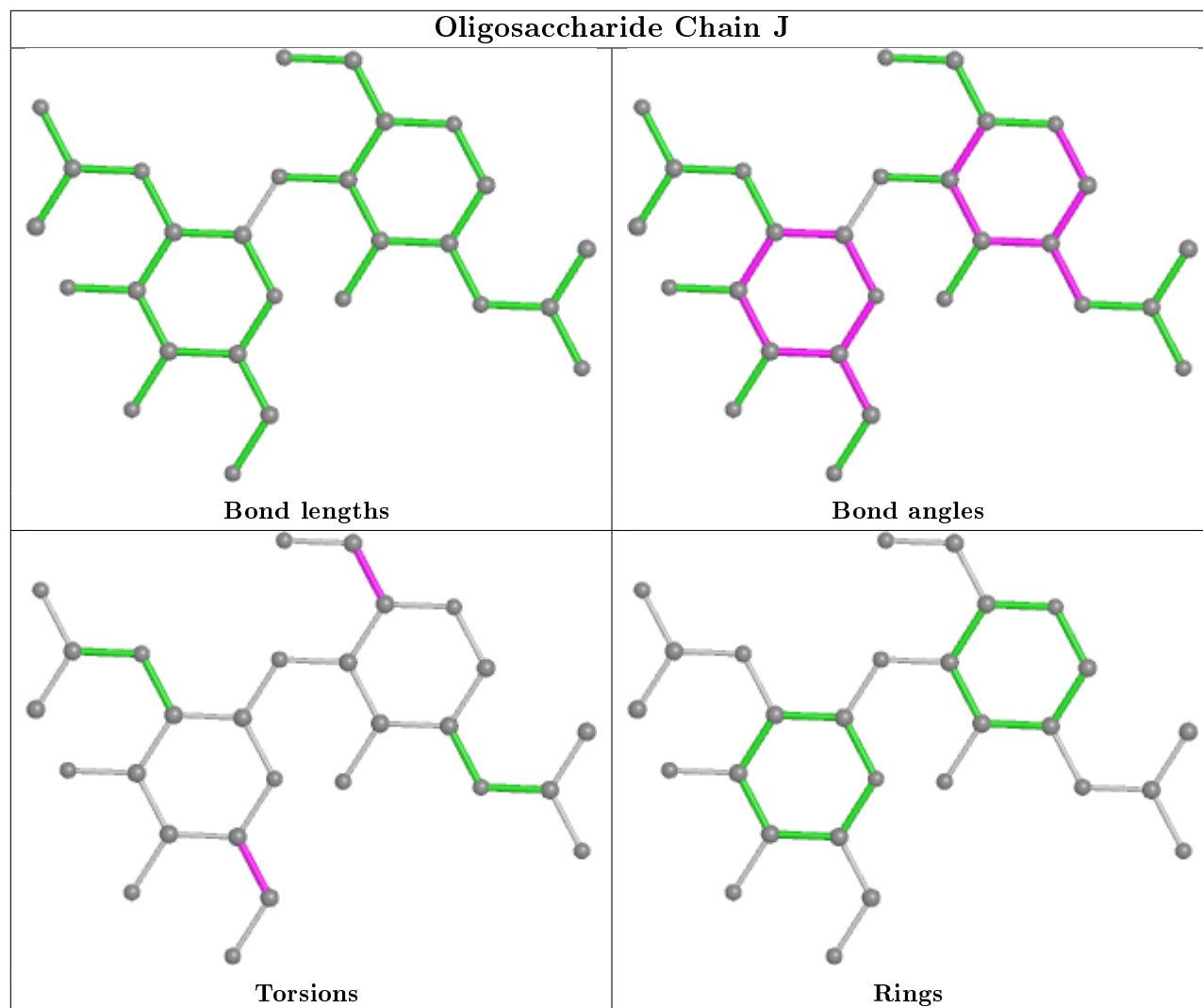
Mol	Chain	Res	Type	Atoms
5	I	5	MAN	C1-C2-C3-C4-C5-O5
5	O	5	MAN	C1-C2-C3-C4-C5-O5
5	O	4	MAN	C1-C2-C3-C4-C5-O5

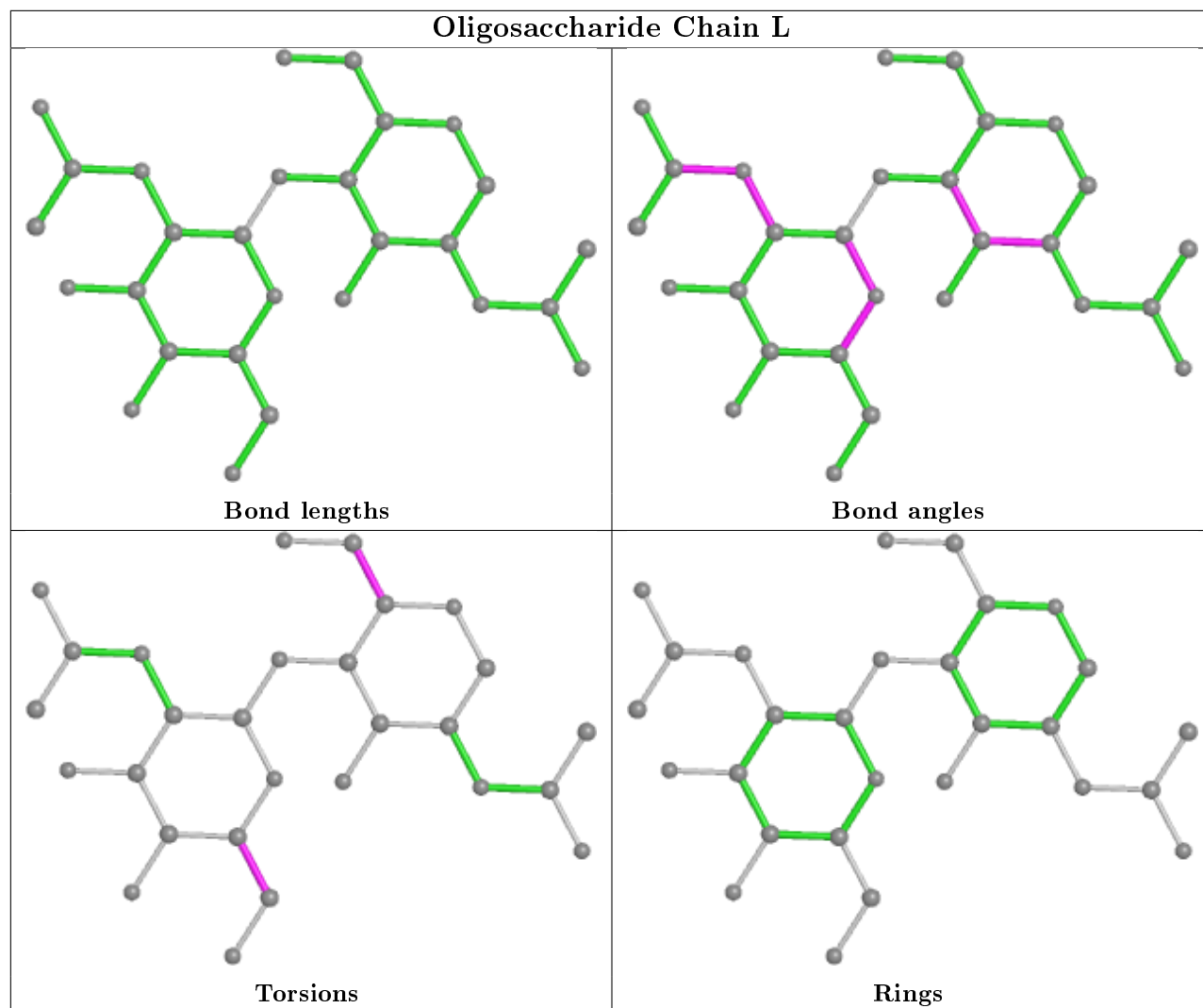
6 monomers are involved in 4 short contacts:

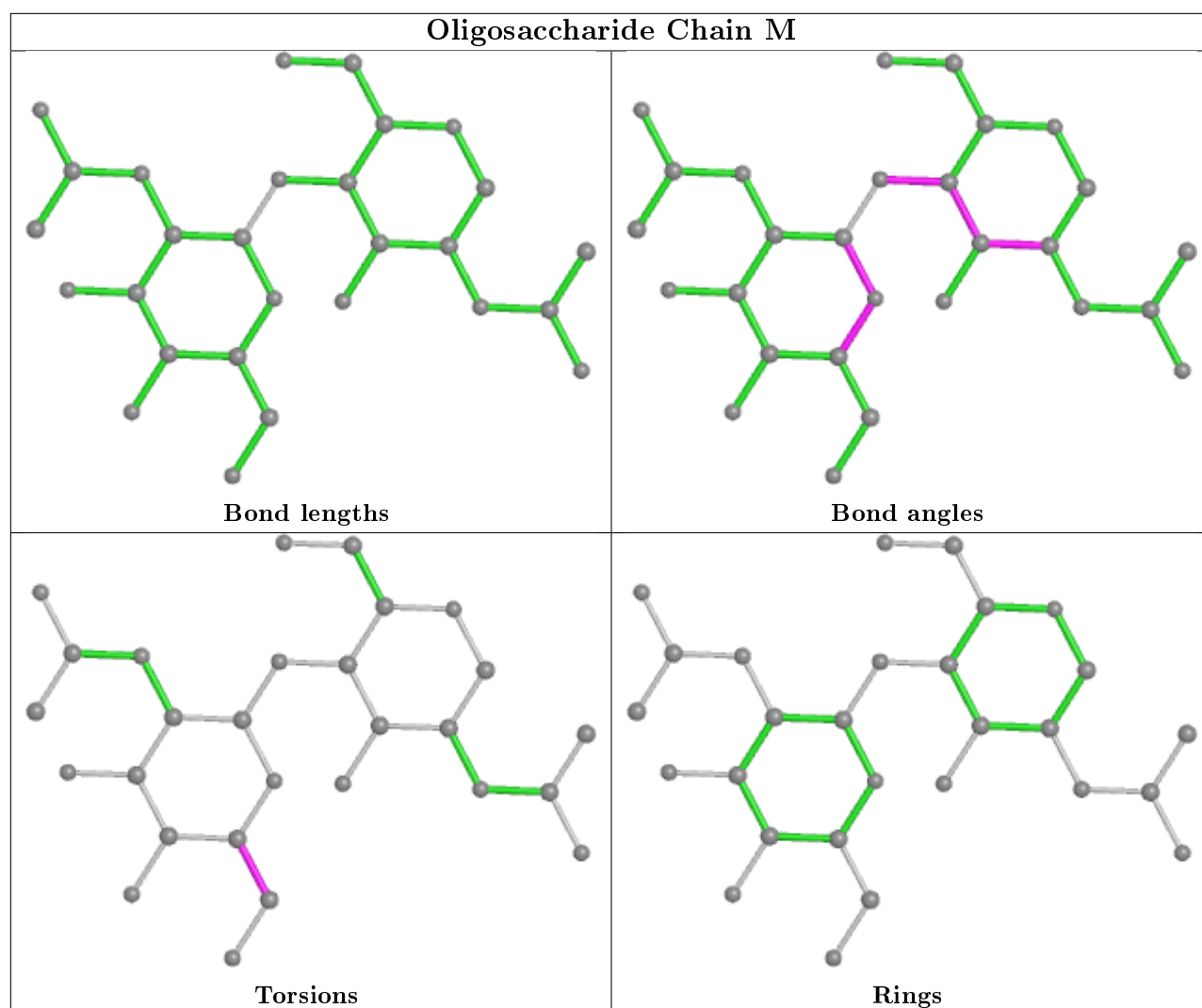
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	S	2	NAG	1	0
3	L	1	NAG	1	0
5	O	4	MAN	1	0
5	O	3	BMA	1	0
4	H	3	BMA	1	0
4	H	4	MAN	1	0

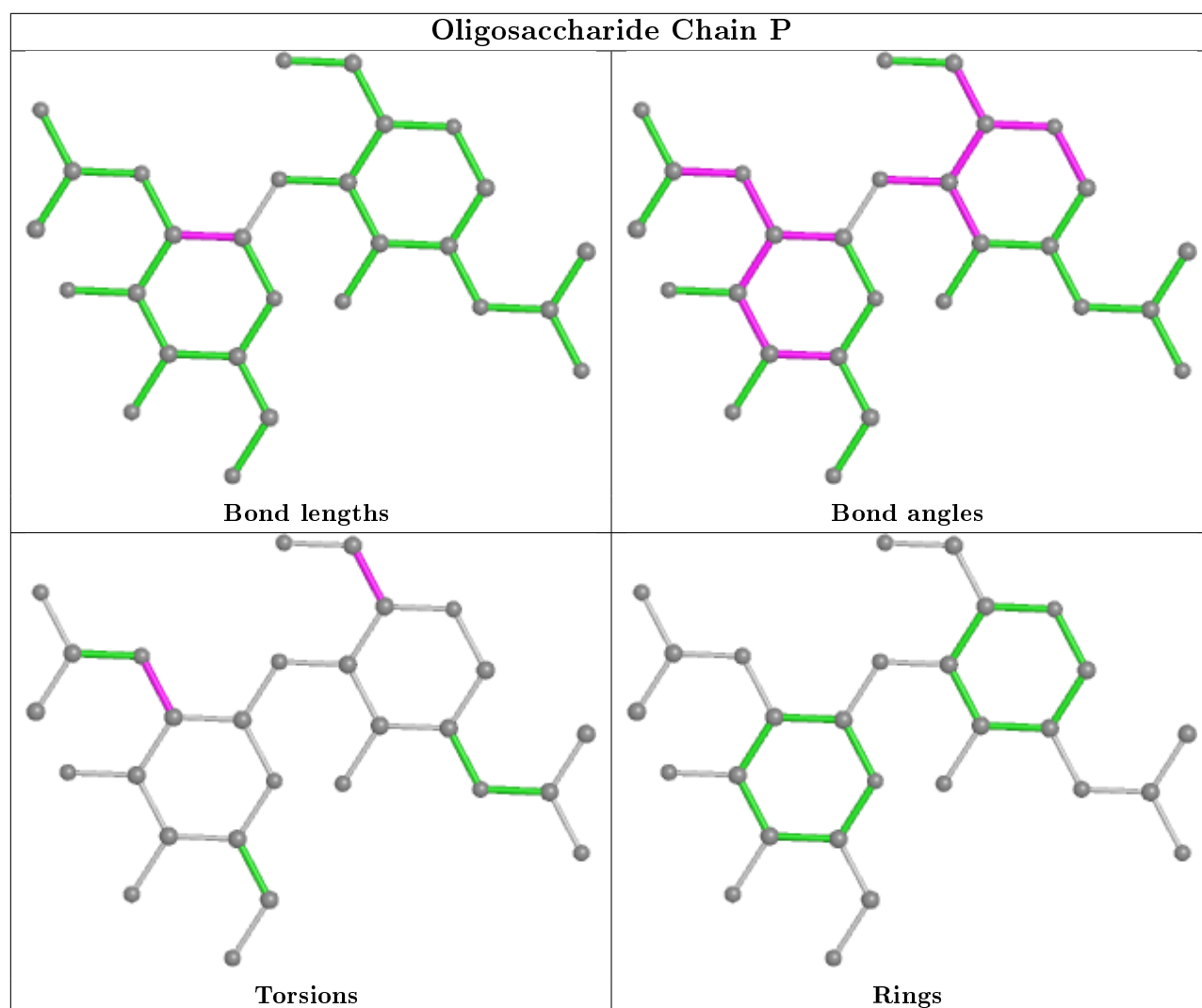
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



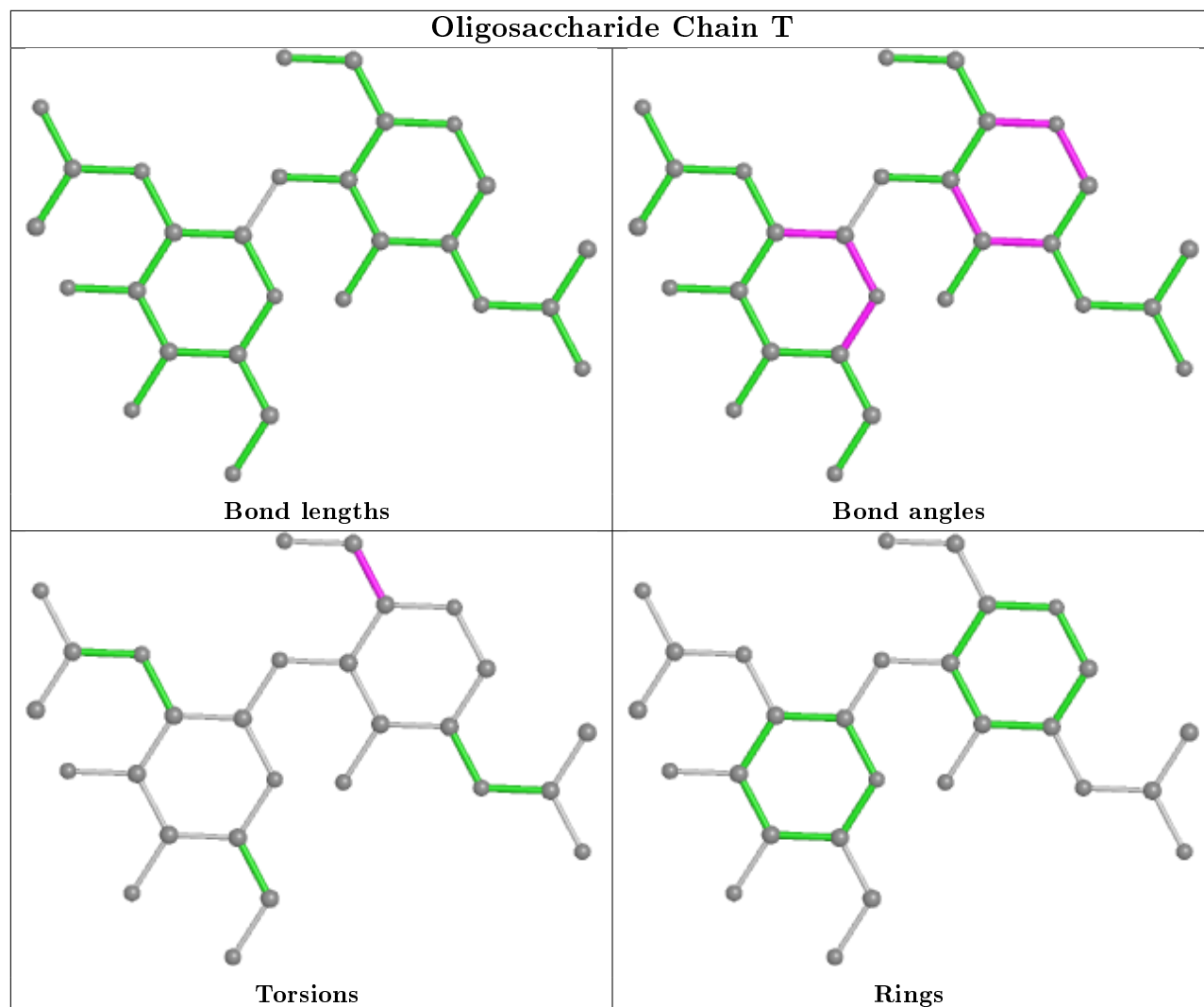


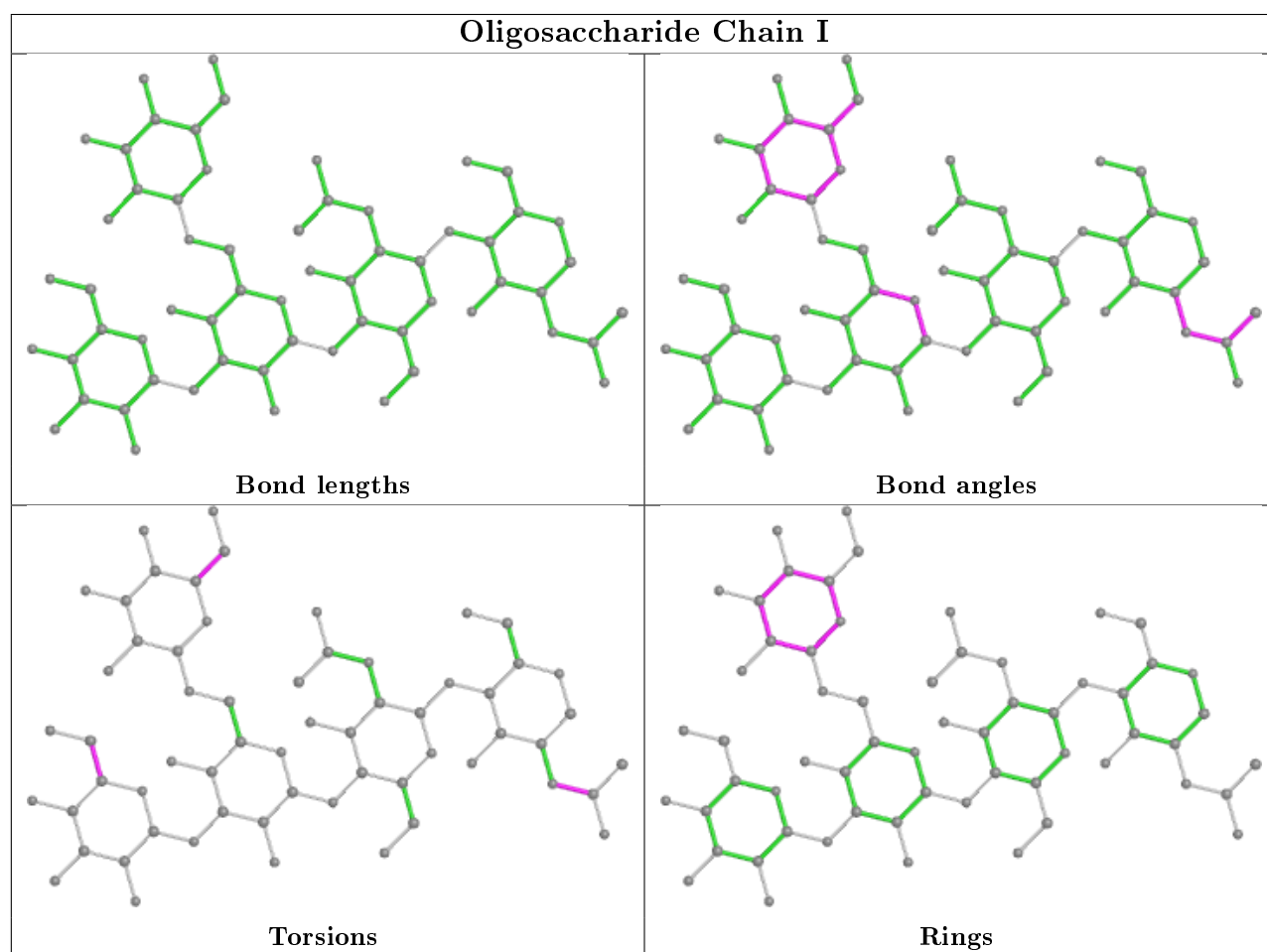
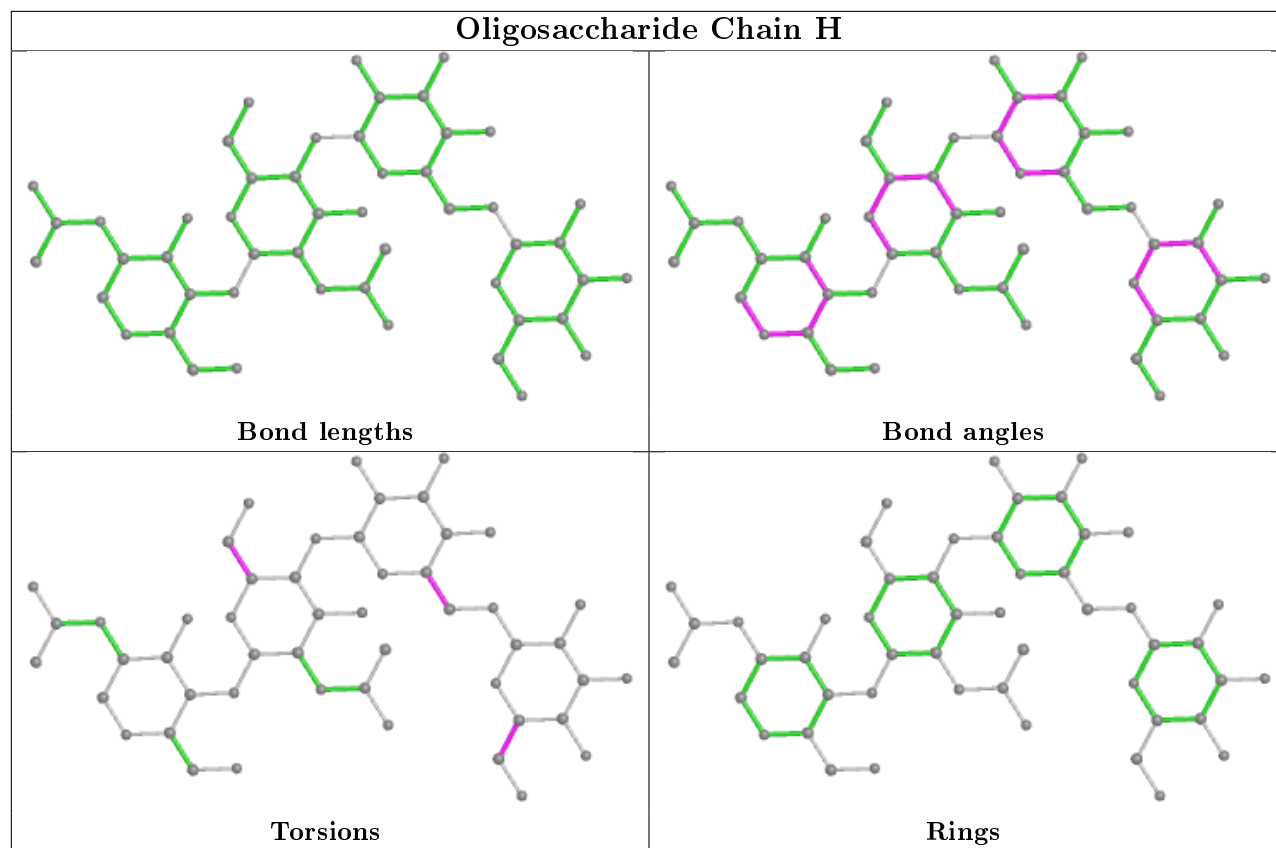


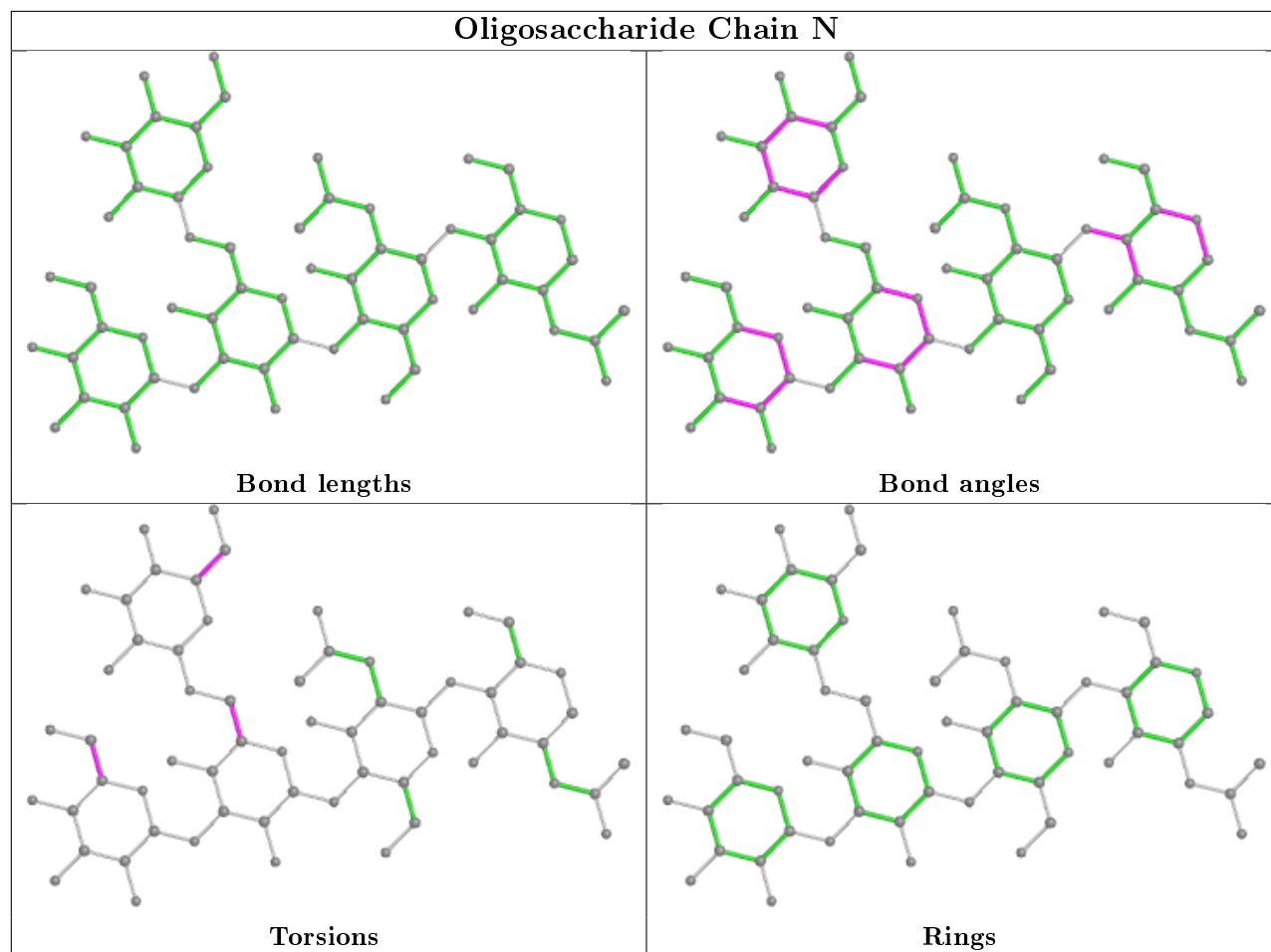


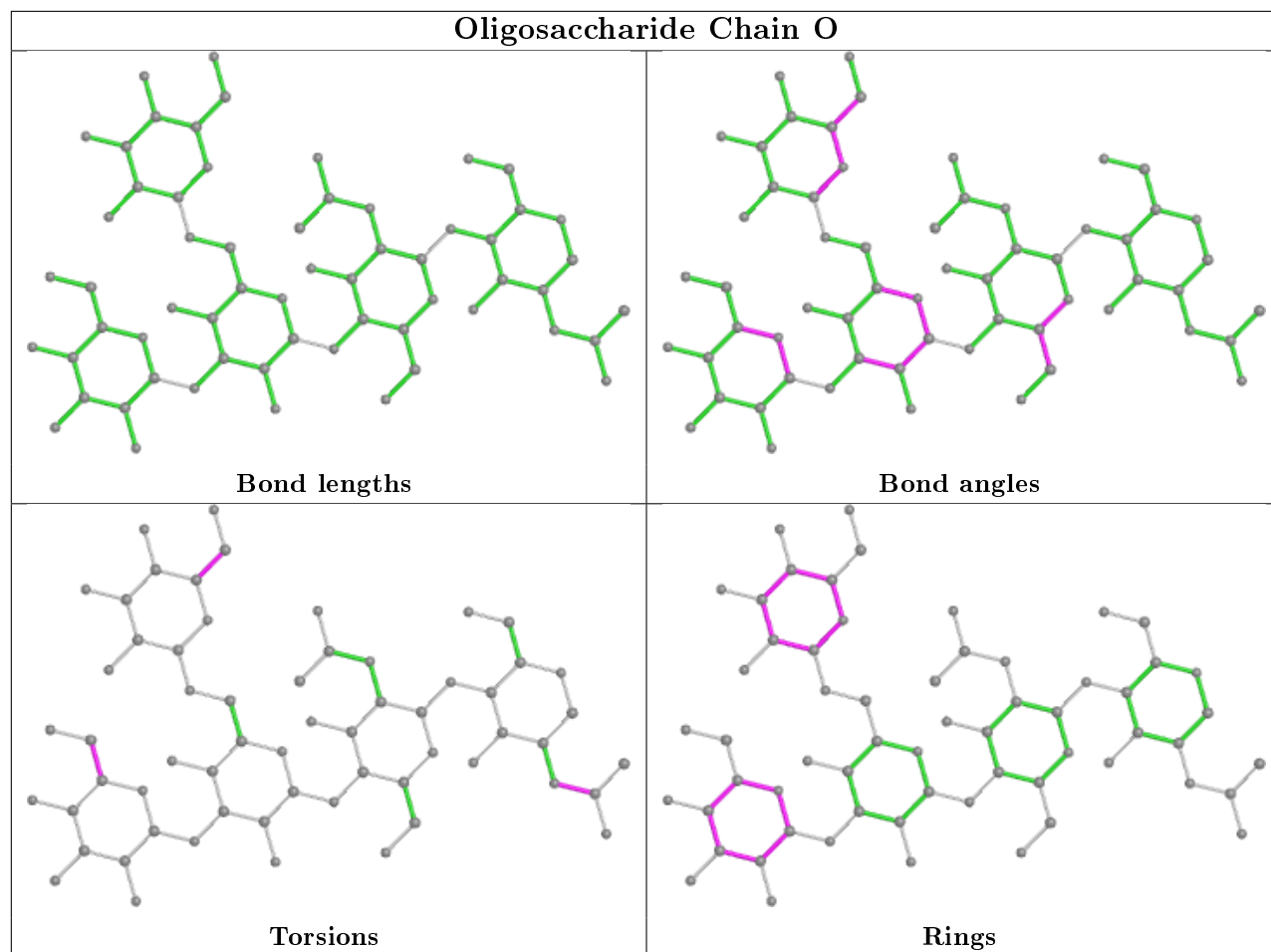


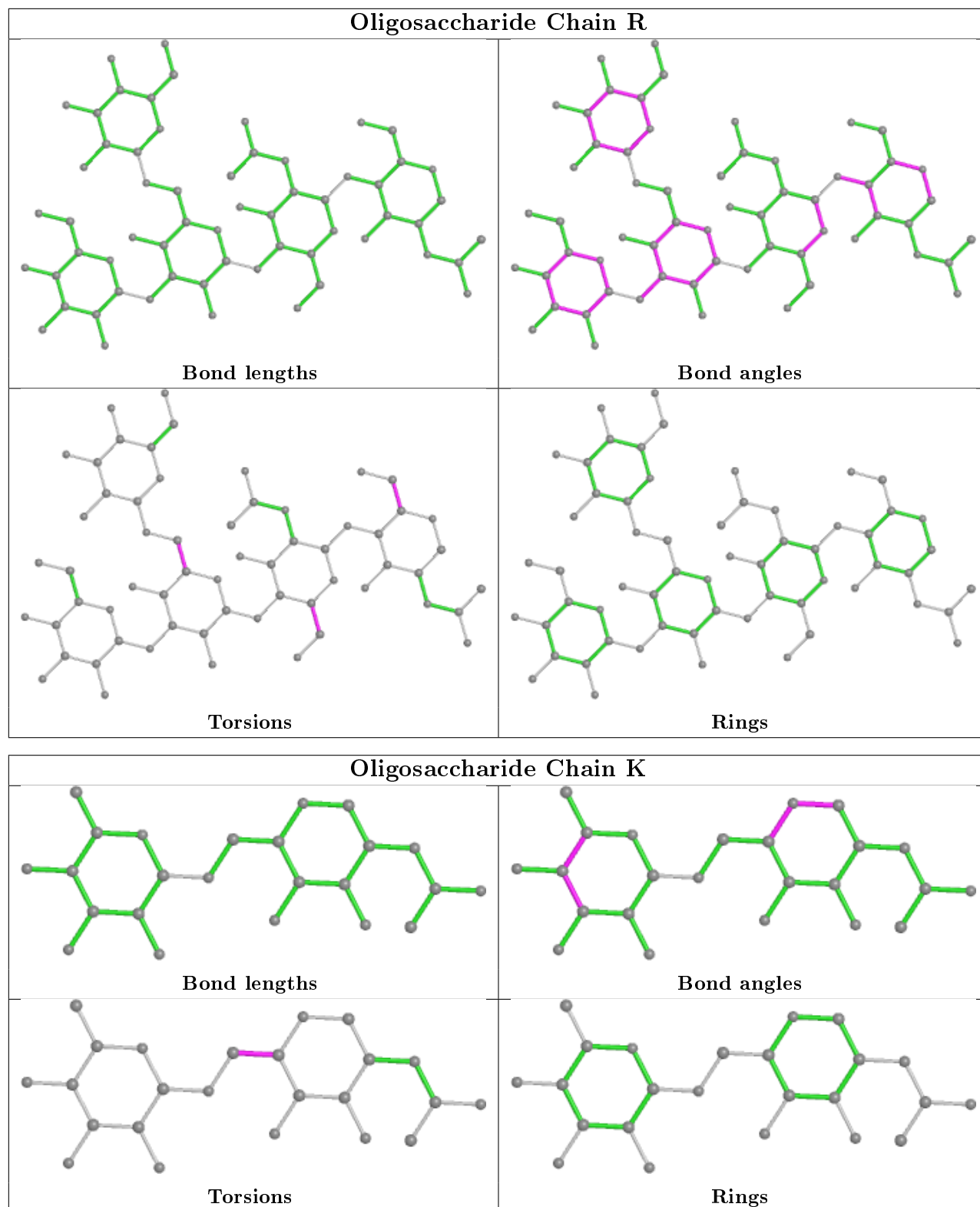


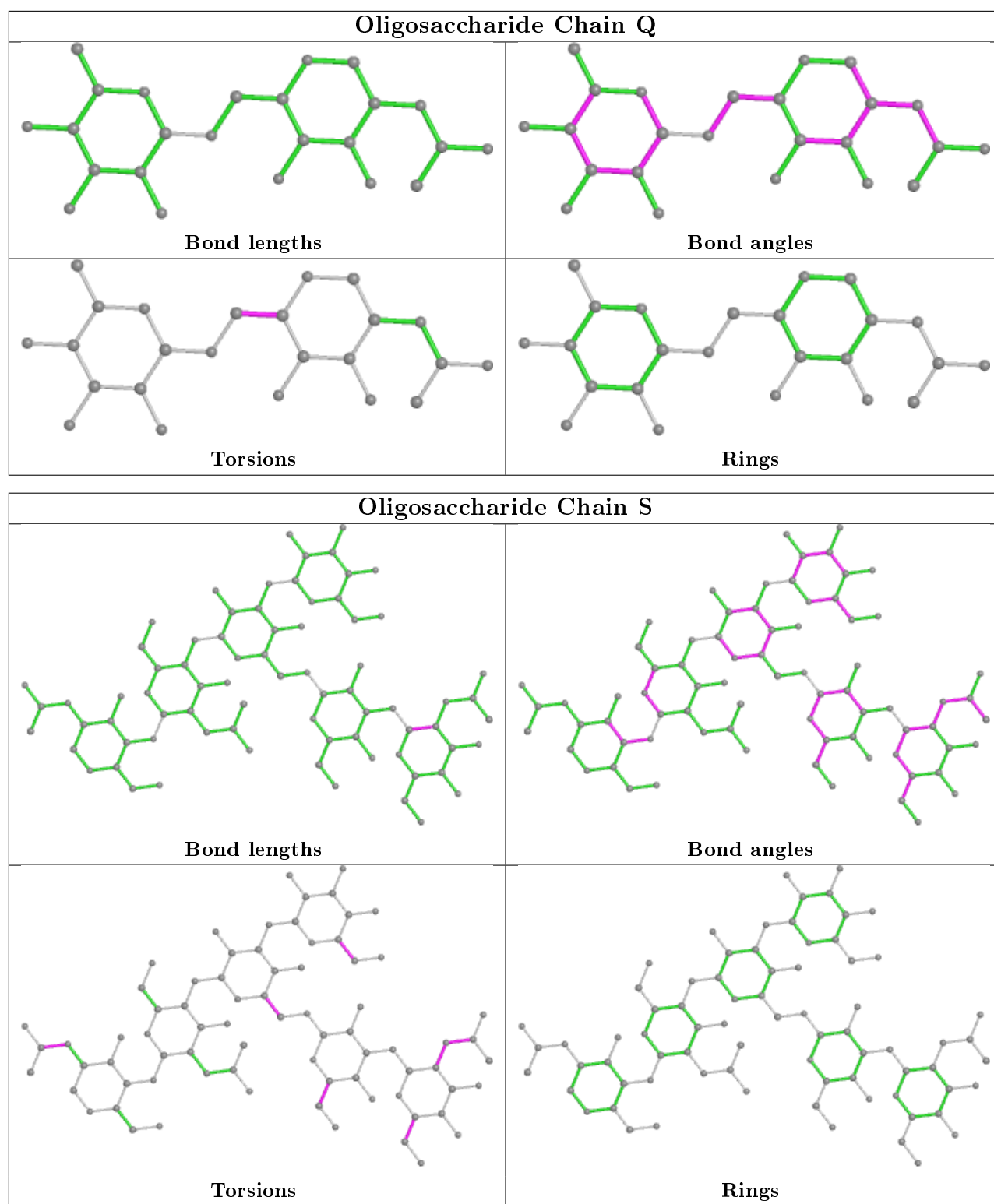












## 5.6 Ligand geometry [i](#)

6 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
8	NAG	A	421	1	14,14,15	0.43	0	17,19,21	1.24	2 (11%)
8	NAG	E	421	1	14,14,15	0.60	0	17,19,21	1.39	3 (17%)
8	NAG	F	201	2	14,14,15	0.80	1 (7%)	17,19,21	1.92	4 (23%)
8	NAG	E	411	1	14,14,15	0.74	1 (7%)	17,19,21	2.53	5 (29%)
8	NAG	C	611	1	14,14,15	0.57	0	17,19,21	1.68	1 (5%)
8	NAG	E	611	1	14,14,15	0.67	0	17,19,21	1.33	2 (11%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	A	421	1	-	0/6/23/26	0/1/1/1
8	NAG	E	421	1	1/1/5/7	0/6/23/26	0/1/1/1
8	NAG	F	201	2	-	2/6/23/26	0/1/1/1
8	NAG	E	411	1	-	1/6/23/26	0/1/1/1
8	NAG	C	611	1	-	2/6/23/26	0/1/1/1
8	NAG	E	611	1	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	F	201	NAG	C1-C2	2.34	1.55	1.52
8	E	411	NAG	C1-C2	2.26	1.55	1.52

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	E	411	NAG	C1-O5-C5	8.08	123.14	112.19
8	C	611	NAG	C1-O5-C5	6.02	120.35	112.19
8	F	201	NAG	C4-C3-C2	4.19	117.15	111.02
8	E	411	NAG	O5-C1-C2	3.76	117.23	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	F	201	NAG	O5-C5-C6	3.66	112.95	107.20
8	E	421	NAG	C4-C3-C2	3.61	116.31	111.02
8	E	611	NAG	C1-O5-C5	3.51	116.94	112.19
8	A	421	NAG	C1-O5-C5	3.41	116.81	112.19
8	E	411	NAG	C2-N2-C7	3.32	127.63	122.90
8	F	201	NAG	C2-N2-C7	3.21	127.47	122.90
8	A	421	NAG	C4-C3-C2	-2.64	107.14	111.02
8	E	421	NAG	C1-O5-C5	2.60	115.71	112.19
8	E	611	NAG	C2-N2-C7	2.40	126.32	122.90
8	E	421	NAG	C3-C4-C5	2.24	114.23	110.24
8	E	411	NAG	O5-C5-C4	2.22	116.23	110.83
8	F	201	NAG	C1-C2-N2	2.16	114.19	110.49
8	E	411	NAG	C1-C2-N2	2.03	113.96	110.49

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
8	E	421	NAG	C1

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	F	201	NAG	O5-C5-C6-O6
8	C	611	NAG	O5-C5-C6-O6
8	F	201	NAG	C4-C5-C6-O6
8	C	611	NAG	C4-C5-C6-O6
8	E	411	NAG	C3-C2-N2-C7

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.



## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	320/323 (99%)	-0.27	5 (1%) 72 68	31, 64, 92, 117	0
1	C	321/323 (99%)	0.18	23 (7%) 15 11	34, 72, 108, 126	0
1	E	321/323 (99%)	0.13	15 (4%) 31 25	38, 76, 101, 119	0
2	B	172/173 (99%)	-0.22	0 100 100	31, 44, 69, 99	0
2	D	172/173 (99%)	-0.22	0 100 100	32, 45, 69, 91	0
2	F	172/173 (99%)	-0.30	1 (0%) 89 88	32, 48, 74, 95	0
All	All	1478/1488 (99%)	-0.08	44 (2%) 50 43	31, 59, 98, 126	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	328	ILE	6.6
1	E	142	GLY	5.0
1	A	327	GLN	4.2
1	C	156	LYS	4.0
1	C	196	ILE	3.5
1	C	54	ASN	3.3
1	C	127	TRP	3.3
1	C	159	ASN	3.2
1	C	155	THR	3.1
1	E	222	TRP	3.1
1	C	157	SER	3.0
1	E	81	TYR	2.9
1	C	161	TYR	2.9
1	C	273	LEU	2.9
1	C	327	GLN	2.9
1	C	163	ILE	2.9
1	E	160	SER	2.9
1	E	198	GLU	2.9
1	C	81	TYR	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	160	SER	2.8
1	C	143	SER	2.7
1	A	222	TRP	2.6
1	C	154	LEU	2.6
1	E	273	LEU	2.6
1	C	129	GLY	2.6
1	E	62	ARG	2.5
1	E	328	ILE	2.5
1	C	130	VAL	2.5
1	E	199	SER	2.4
1	E	94	PHE	2.4
1	E	143	SER	2.3
1	C	79	PHE	2.3
1	C	128	THR	2.3
1	C	278	VAL	2.3
1	A	81	TYR	2.3
1	E	79	PHE	2.2
1	A	278	VAL	2.2
1	C	152	ASN	2.1
2	F	160	TYR	2.1
1	A	326	LYS	2.1
1	C	222	TRP	2.1
1	E	59	LEU	2.1
1	E	127	TRP	2.0
1	E	56	TYR	2.0

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

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

## 6.3 Carbohydrates ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	MAN	O	4	11/12	0.45	0.62	151,154,165,165	0
5	MAN	I	4	11/12	0.45	0.33	130,131,133,136	0
7	MAN	S	4	11/12	0.52	0.24	132,136,139,141	0

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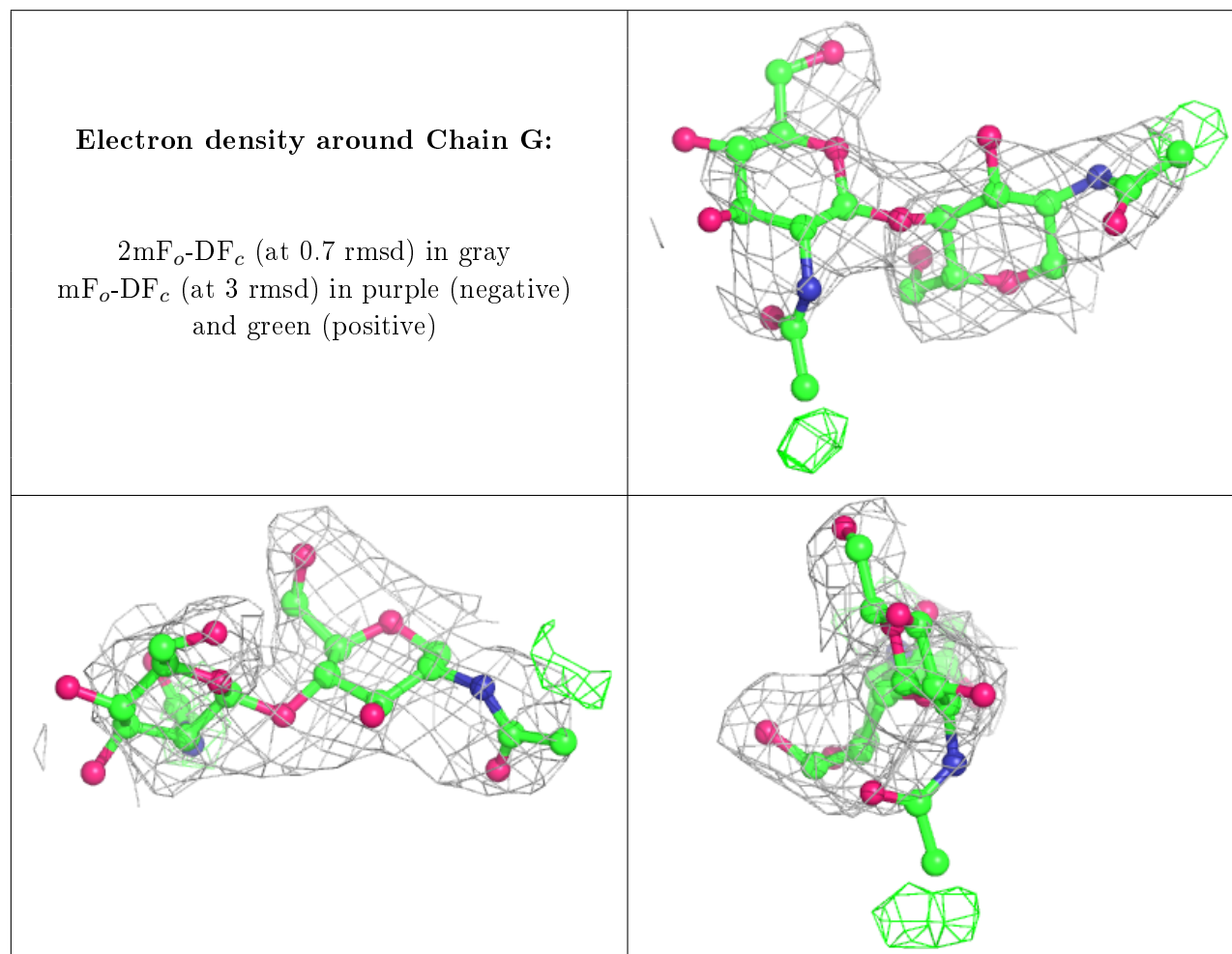
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
7	MAN	S	6	11/12	0.52	0.49	141,144,151,152	0
5	MAN	I	5	11/12	0.54	0.19	82,91,94,96	0
3	NAG	J	2	14/15	0.57	0.37	103,116,124,125	0
3	NAG	L	2	14/15	0.62	0.58	131,136,143,147	0
5	MAN	O	5	11/12	0.65	0.19	107,114,121,121	0
5	BMA	O	3	11/12	0.66	0.38	123,137,143,148	0
6	FUL	Q	2	10/11	0.68	0.42	101,107,109,112	0
4	BMA	H	3	11/12	0.69	0.34	125,132,138,140	0
3	NAG	J	1	14/15	0.71	0.26	70,80,88,98	0
5	MAN	R	4	11/12	0.72	0.20	139,142,151,155	0
5	MAN	N	4	11/12	0.74	0.15	127,131,137,137	0
5	BMA	N	3	11/12	0.75	0.21	111,116,119,125	0
5	BMA	R	3	11/12	0.75	0.17	125,130,135,139	0
5	MAN	R	5	11/12	0.76	0.27	132,140,145,146	0
7	NAG	S	5	14/15	0.78	0.22	116,125,130,132	0
7	BMA	S	3	11/12	0.79	0.19	122,128,137,140	0
3	NAG	M	2	14/15	0.79	0.43	152,159,164,169	0
5	MAN	N	5	11/12	0.79	0.32	118,124,128,130	0
3	NAG	G	2	14/15	0.79	0.39	120,126,134,134	0
4	MAN	H	4	11/12	0.81	0.28	138,144,154,154	0
6	NAG	Q	1	14/15	0.81	0.31	93,99,105,105	0
3	NAG	P	2	14/15	0.81	0.37	115,119,122,122	0
3	NAG	T	2	14/15	0.82	0.37	83,93,98,103	0
5	BMA	I	3	11/12	0.82	0.26	99,112,123,128	0
3	NAG	P	1	14/15	0.85	0.26	78,86,99,112	0
3	NAG	M	1	14/15	0.86	0.31	133,143,152,154	0
3	NAG	G	1	14/15	0.87	0.29	97,104,113,115	0
5	NAG	O	2	14/15	0.87	0.24	95,107,119,130	0
3	NAG	L	1	14/15	0.88	0.40	108,114,123,128	0
5	NAG	I	2	14/15	0.88	0.20	72,83,94,103	0
6	NAG	K	1	14/15	0.89	0.16	77,81,91,95	0
6	FUL	K	2	10/11	0.90	0.21	95,100,107,113	0
5	NAG	R	2	14/15	0.93	0.16	102,110,121,121	0
7	NAG	S	1	14/15	0.94	0.14	71,79,84,86	0
4	NAG	H	2	14/15	0.94	0.25	93,105,113,119	0
7	NAG	S	2	14/15	0.94	0.12	89,97,105,115	0
4	NAG	H	1	14/15	0.94	0.11	89,92,95,96	0
3	NAG	T	1	14/15	0.94	0.23	68,76,80,83	0
5	NAG	N	1	14/15	0.95	0.18	86,88,91,92	0
5	NAG	R	1	14/15	0.95	0.14	99,103,106,107	0
5	NAG	I	1	14/15	0.96	0.14	59,64,68,72	0
5	NAG	N	2	14/15	0.96	0.20	87,96,102,107	0

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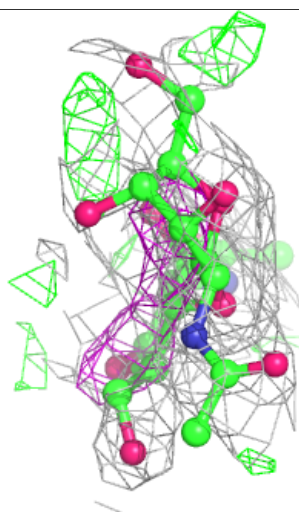
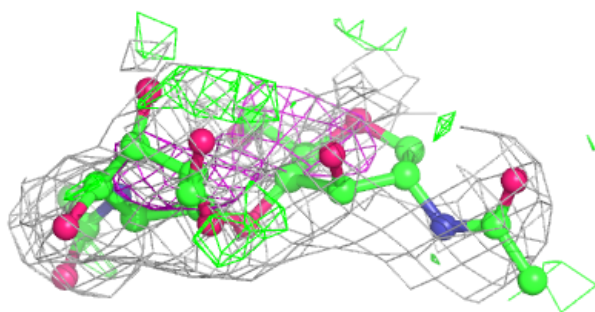
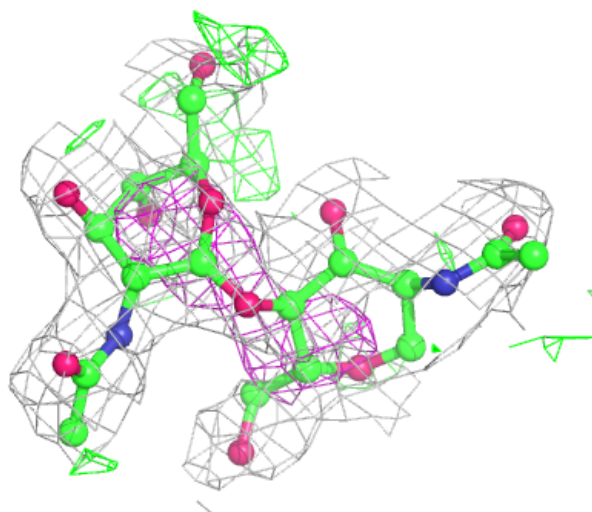
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	NAG	O	1	14/15	0.97	0.12	71,77,81,88	0

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.



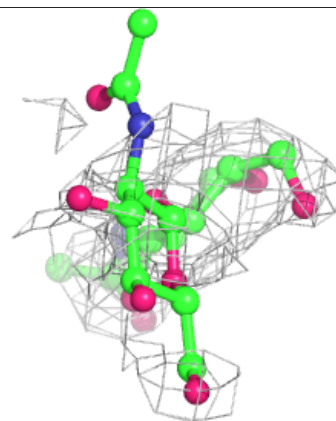
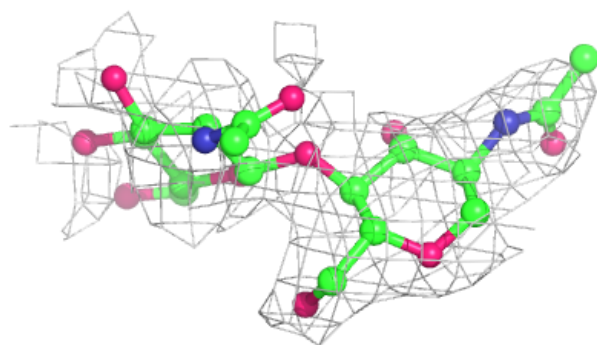
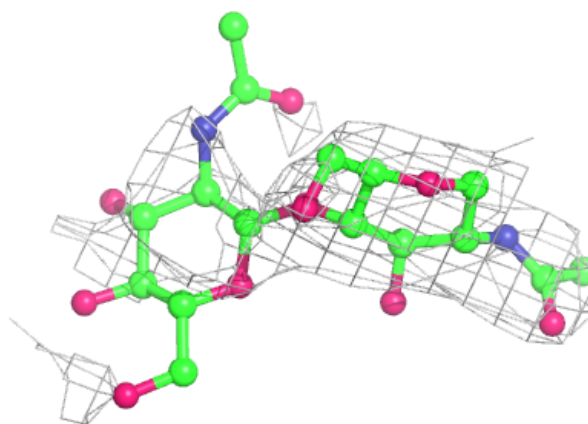
**Electron density around Chain J:**

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



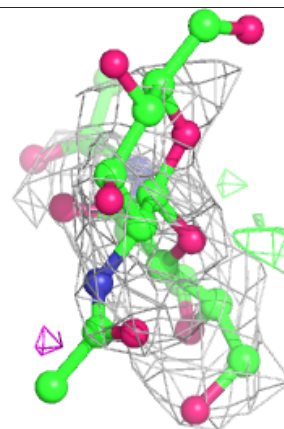
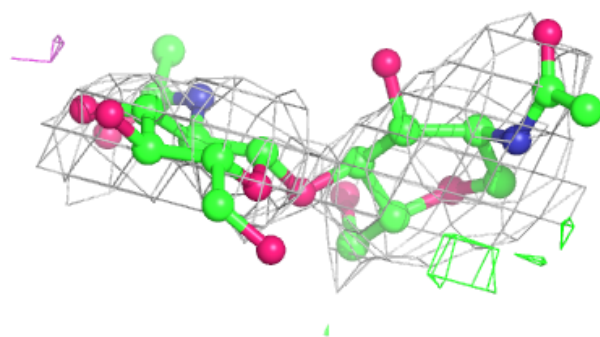
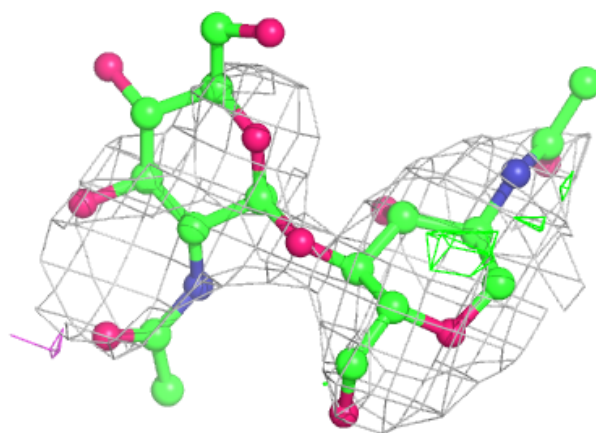
**Electron density around Chain L:**

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



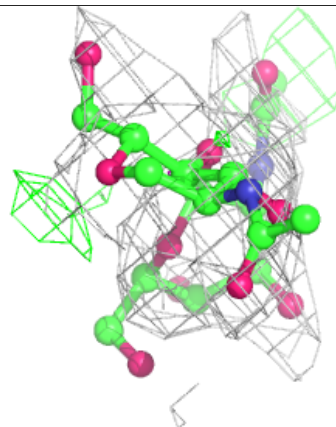
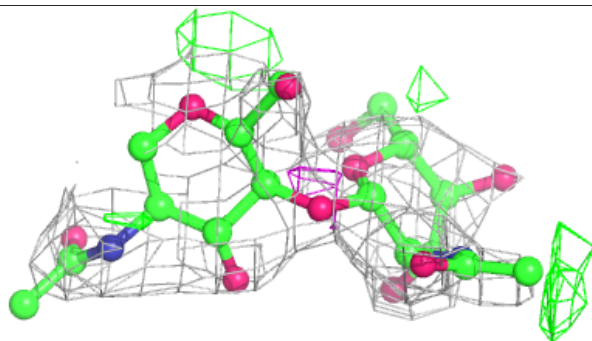
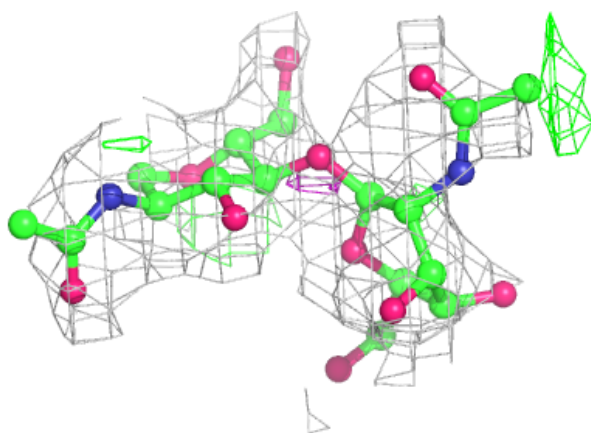
**Electron density around Chain M:**

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



**Electron density around Chain P:**

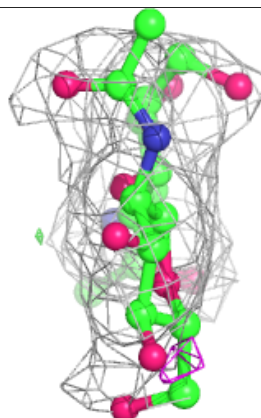
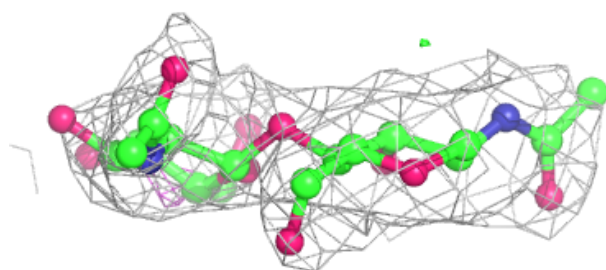
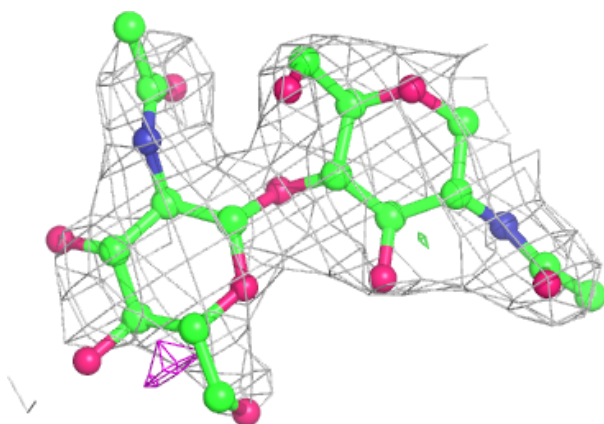
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



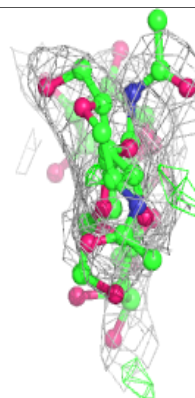
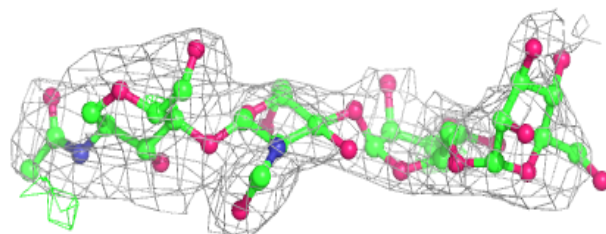
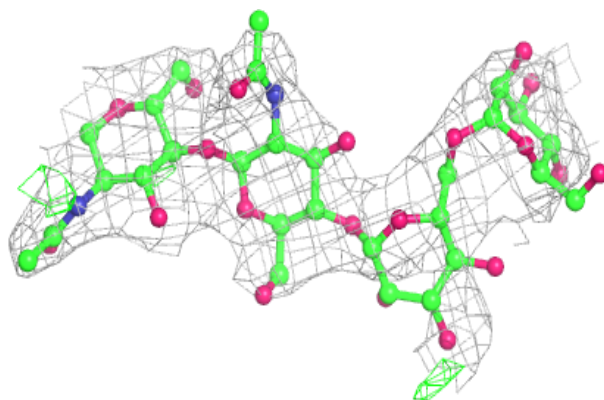


**Electron density around Chain T:**

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

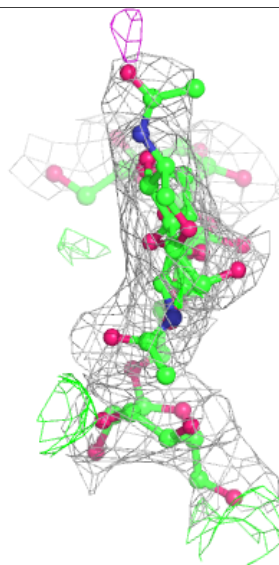
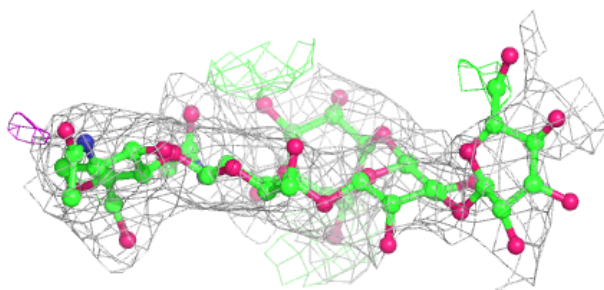
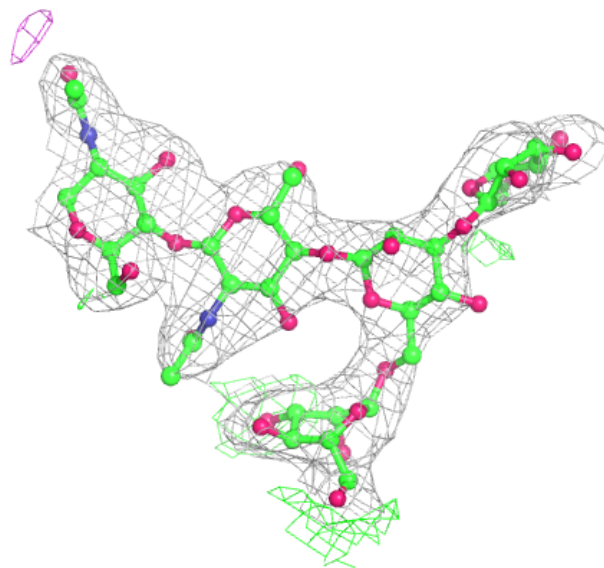
**Electron density around Chain H:**

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



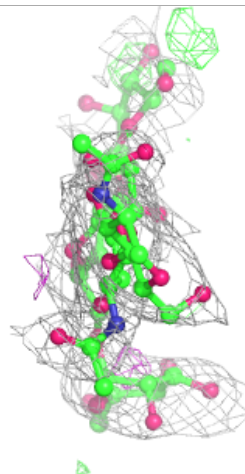
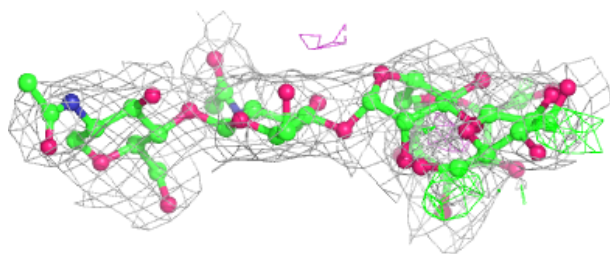
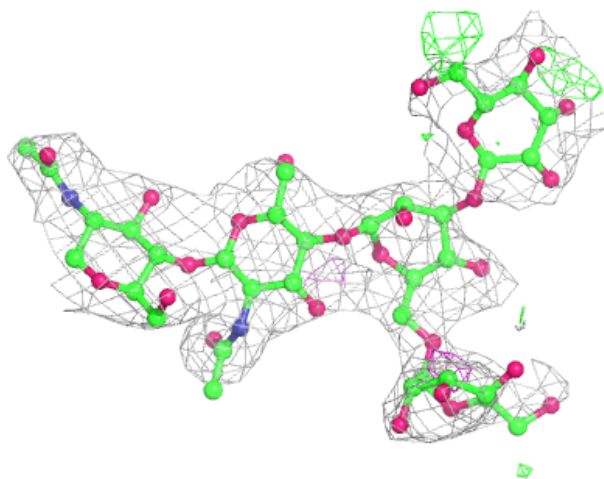
**Electron density around Chain I:**

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



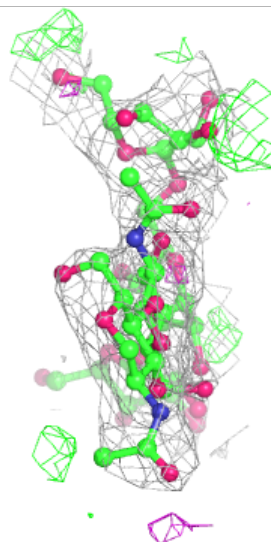
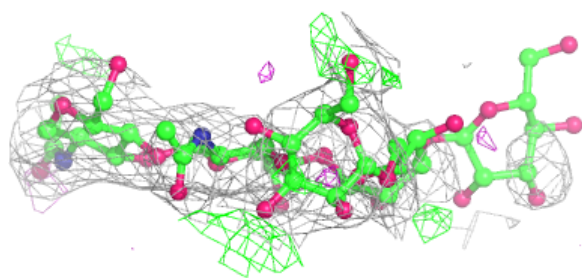
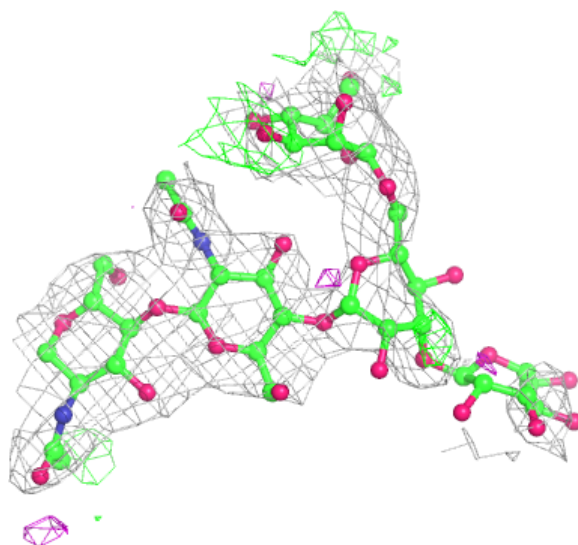
**Electron density around Chain N:**

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



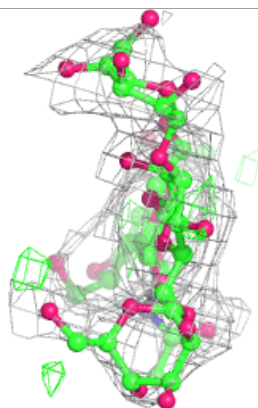
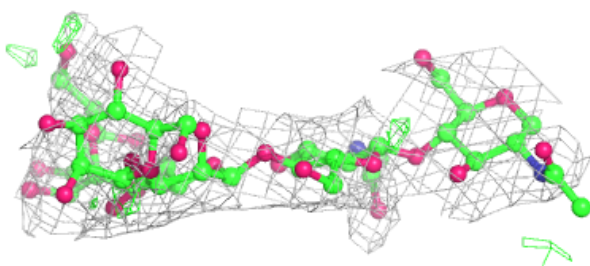
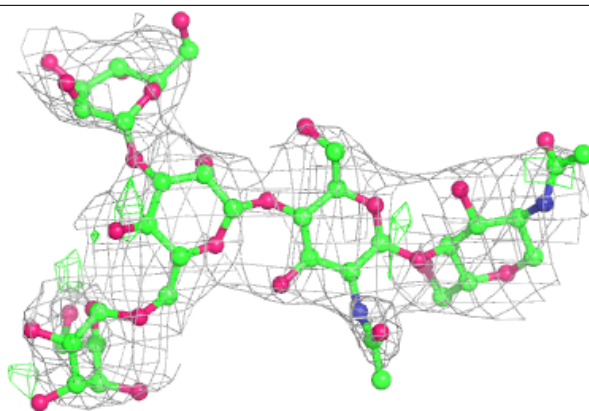
**Electron density around Chain O:**

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

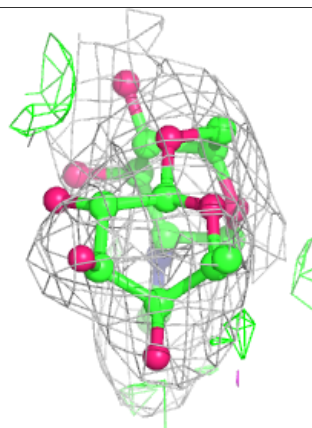
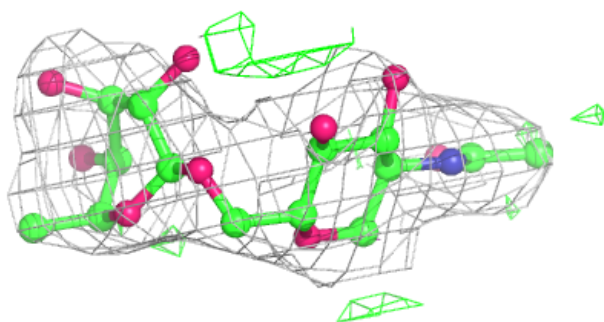
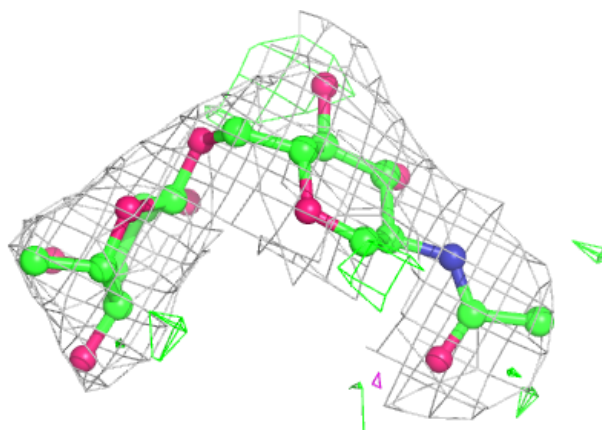


**Electron density around Chain R:**

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

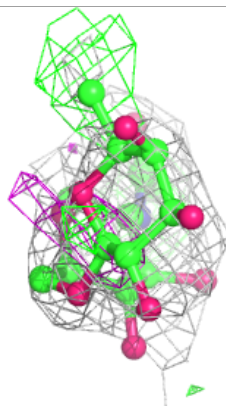
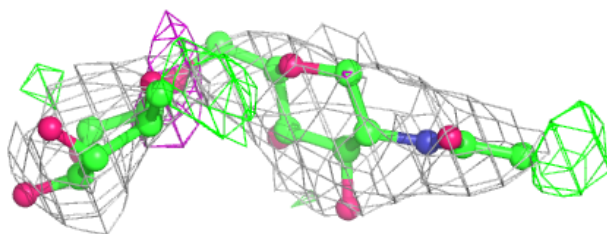
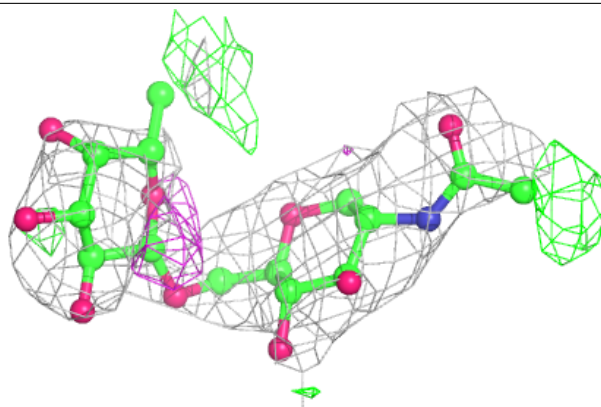
**Electron density around Chain K:**

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

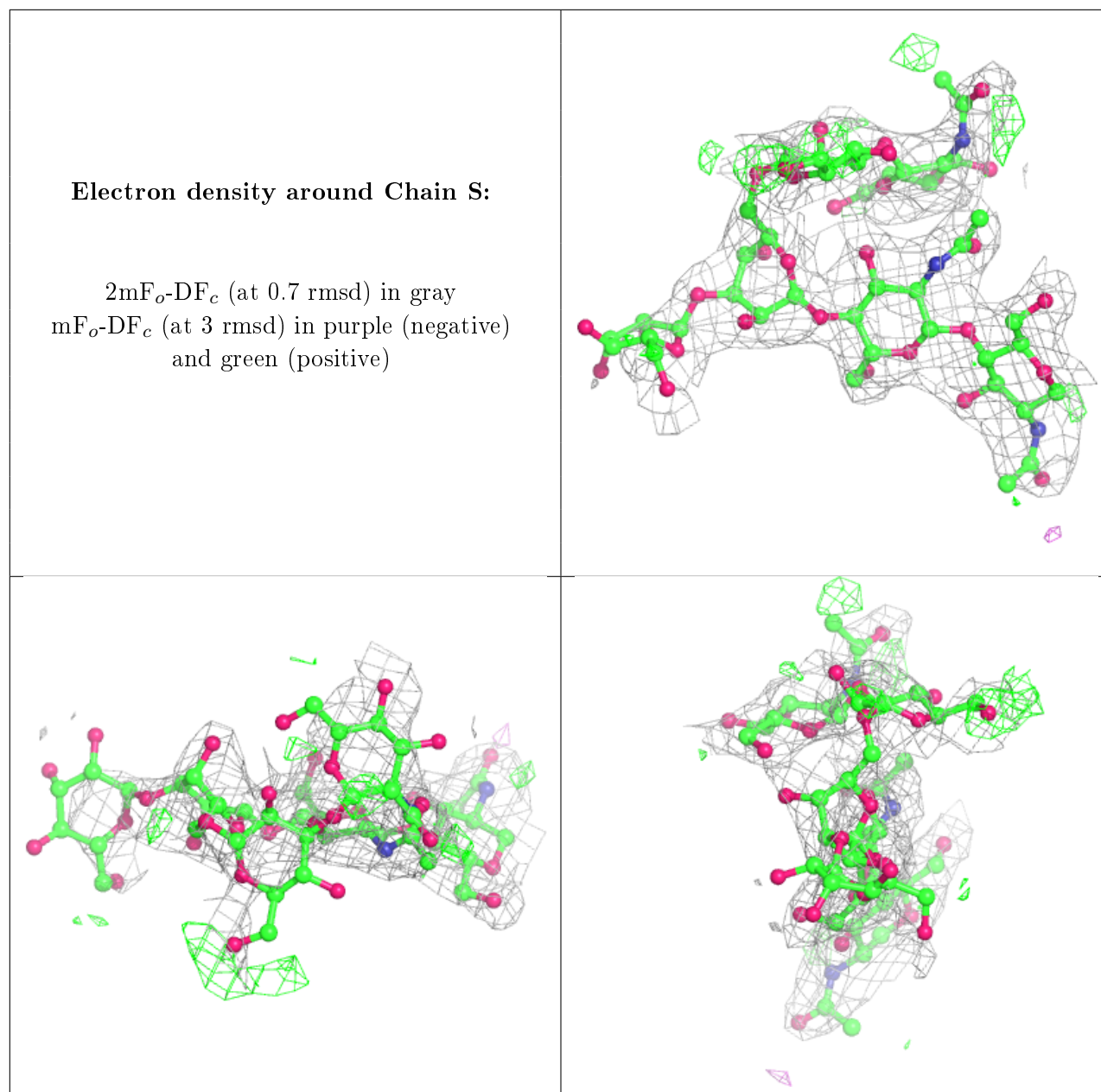


**Electron density around Chain Q:**

$2mF_o-DF_c$  (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, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
8	NAG	C	611	14/15	0.43	0.43	109,120,125,128	0
8	NAG	E	411	14/15	0.67	0.43	112,125,129,130	0
8	NAG	E	611	14/15	0.67	0.35	101,117,122,123	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
8	NAG	F	201	14/15	0.68	0.30	101,108,111,113	0
8	NAG	E	421	14/15	0.81	0.49	115,124,130,134	0
8	NAG	A	421	14/15	0.84	0.32	97,104,109,113	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.