



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 08:59 AM UTC

PDB ID : 8RMJ / pdb_00008rmj
Title : Drosophila Semaphorin 2b in complex with glycosaminoglycan mimic SOS
Authors : Nourisanami, F.; Sobol, M.; Rozbesky, D.
Deposited on : 2024-01-08
Resolution : 2.79 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

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
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

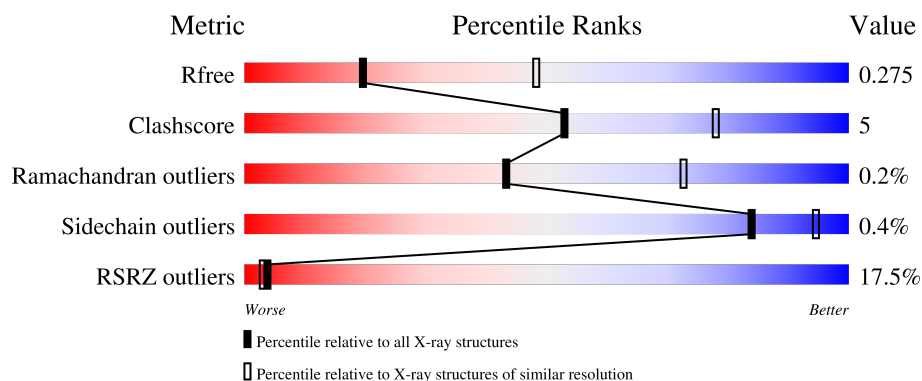
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.79 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	657	16% 81% 13% 6%
2	B	2	50% 50%
3	C	7	29% 71%
4	D	9	11% 78% 11%
5	E	4	25% 75%

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Mol	Chain	Length	Quality of chain
6	F	2	 50% 50%
6	G	2	 100%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 5353 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 FI18622p1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	616	4935	3128	855	920	32	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	32	GLU	-	expression tag	UNP A1ZAF5
A	33	THR	-	expression tag	UNP A1ZAF5
A	34	GLY	-	expression tag	UNP A1ZAF5
A	132	LYS	-	insertion	UNP A1ZAF5
A	680	GLY	-	expression tag	UNP A1ZAF5
A	681	THR	-	expression tag	UNP A1ZAF5
A	682	LYS	-	expression tag	UNP A1ZAF5
A	683	HIS	-	expression tag	UNP A1ZAF5
A	684	HIS	-	expression tag	UNP A1ZAF5
A	685	HIS	-	expression tag	UNP A1ZAF5
A	686	HIS	-	expression tag	UNP A1ZAF5
A	687	HIS	-	expression tag	UNP A1ZAF5
A	688	HIS	-	expression tag	UNP A1ZAF5

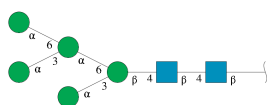
- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



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

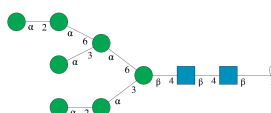
- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyran

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



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

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



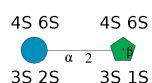
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	D	9	Total	C	N	O	0	0	0
			105	58	2	45			

- Molecule 5 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.



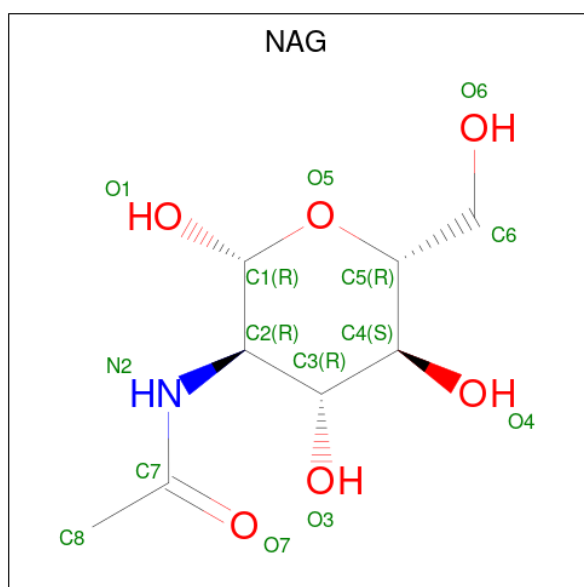
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	E	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 6 is an oligosaccharide called 1,3,4,6-tetra-O-sulfo-beta-D-fructofuranose-(2-1)-2,3,4,6-tetra-O-sulfonato-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	F	2	Total	C	O	S	0	0	0
			55	12	35	8			
6	G	2	Total	C	O	S	0	0	0
			55	12	35	8			

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

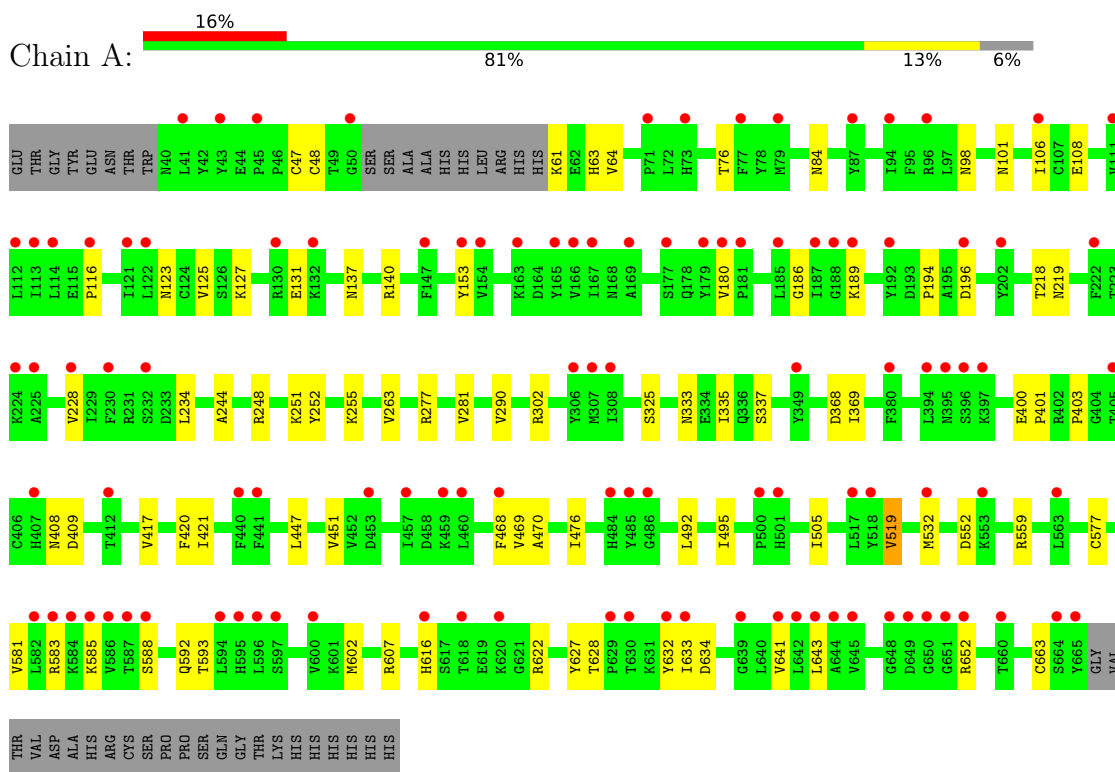


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			14	8	1	5		
7	A	1	Total	C	N	O	0	0
			14	8	1	5		
7	A	1	Total	C	N	O	0	0
			14	8	1	5		

3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: FI18622p1

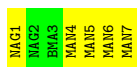


• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



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





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

Chain D: 11% 78% 11%



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

Chain E: 25% 75%



- Molecule 6: 1,3,4,6-tetra-O-sulfo-beta-D-fructofuranose-(2-1)-2,3,4,6-tetra-O-sulfonato-alpha-D-glucopyranose

Chain F: 50% 50%



- Molecule 6: 1,3,4,6-tetra-O-sulfo-beta-D-fructofuranose-(2-1)-2,3,4,6-tetra-O-sulfonato-alpha-D-glucopyranose

Chain G: 100%



4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	181.49Å 181.49Å 168.38Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.67 – 2.79 45.67 – 2.79	Depositor EDS
% Data completeness (in resolution range)	56.7 (45.67-2.79) 53.5 (45.67-2.79)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.58 (at 2.77Å)	Xtriage
Refinement program	PHENIX 1.19_4092, PHENIX 1.19_4092	Depositor
R, R_{free}	0.246 , 0.274 0.252 , 0.275	Depositor DCC
R_{free} test set	1193 reflections (2.90%)	wwPDB-VP
Wilson B-factor (Å ²)	89.1	Xtriage
Anisotropy	0.125	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 46.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	5353	wwPDB-VP
Average B, all atoms (Å ²)	91.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.09% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BMA, MAN, NAG, GU4, YYJ

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	0.08	0/5055	0.26	0/6845

There are no bond length outliers.

There are no bond angle outliers.

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	4935	0	4785	51	0
2	B	28	0	25	0	0
3	C	83	0	70	1	0
4	D	105	0	88	1	0
5	E	50	0	43	1	0
6	F	55	0	6	1	0
6	G	55	0	6	3	0
7	A	42	0	39	0	0
All	All	5353	0	5062	52	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.

All (52) close contacts within the same asymmetric unit are listed below, sorted by their clash

magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:248:ARG:HH12	1:A:251:LYS:HB2	1.55	0.70
1:A:652:ARG:N	6:G:2:YYJ:O1S6	2.27	0.67
1:A:633:ILE:HB	1:A:641:VAL:HB	1.75	0.67
1:A:552:ASP:OD2	1:A:559:ARG:NH2	2.29	0.64
1:A:588:SER:OG	1:A:592:GLN:NE2	2.30	0.64
1:A:186:GLY:HA2	1:A:189:LYS:HD2	1.78	0.64
1:A:302:ARG:HD3	1:A:409:ASP:HA	1.80	0.64
1:A:228:VAL:HG21	1:A:248:ARG:HB2	1.83	0.60
1:A:61:LYS:NZ	6:F:1:GU4:O26	2.34	0.59
1:A:116:PRO:HG3	1:A:137:ASN:HB2	1.85	0.58
1:A:140:ARG:NH1	1:A:194:PRO:O	2.37	0.57
1:A:447:LEU:HD13	1:A:469:VAL:HG11	1.87	0.56
1:A:628:THR:H	1:A:632:TYR:HB2	1.71	0.55
1:A:277:ARG:HB3	1:A:335:ILE:HG22	1.89	0.54
1:A:106:ILE:HG22	1:A:108:GLU:H	1.73	0.54
1:A:492:LEU:HD21	1:A:495:ILE:HD11	1.90	0.54
1:A:123:ASN:O	1:A:127:LYS:HG2	2.10	0.52
1:A:196:ASP:HA	3:C:1:NAG:H82	1.92	0.52
1:A:234:LEU:HB2	1:A:244:ALA:HB3	1.92	0.51
1:A:616:HIS:ND1	1:A:622:ARG:HG3	2.26	0.51
1:A:451:VAL:HG23	1:A:468:PHE:HB2	1.93	0.49
1:A:84:ASN:ND2	1:A:98:ASN:OD1	2.39	0.49
1:A:505:ILE:HG23	1:A:519:VAL:HG13	1.94	0.49
1:A:652:ARG:NH1	6:G:1:GU4:O21	2.46	0.49
1:A:403:PRO:HB3	1:A:421:ILE:HB	1.94	0.48
1:A:408:ASN:N	1:A:408:ASN:OD1	2.46	0.48
1:A:251:LYS:HE2	1:A:252:TYR:CZ	2.48	0.48
1:A:263:VAL:HB	1:A:337:SER:HA	1.96	0.48
1:A:368:ASP:OD1	1:A:369:ILE:N	2.49	0.46
1:A:634:ASP:OD1	1:A:634:ASP:N	2.42	0.46
1:A:593:THR:OG1	1:A:643:LEU:HA	2.17	0.45
1:A:403:PRO:HG3	1:A:417:VAL:HG13	1.97	0.45
1:A:581:VAL:HG13	1:A:663:CYS:HA	1.98	0.45
1:A:125:VAL:HG22	1:A:131:GLU:HB3	1.97	0.45
1:A:290:VAL:O	1:A:333:ASN:HB3	2.17	0.45
1:A:403:PRO:HG2	1:A:420:PHE:CD2	2.52	0.45
1:A:602:MET:HB3	1:A:607:ARG:HG2	2.00	0.44
1:A:153:TYR:OH	1:A:189:LYS:HD3	2.17	0.44
1:A:577:CYS:O	1:A:581:VAL:HG23	2.18	0.44
1:A:48:CYS:HB3	1:A:64:VAL:HG21	1.99	0.43
1:A:47:CYS:HA	1:A:48:CYS:HA	1.63	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:98:ASN:HB3	1:A:101:ASN:O	2.19	0.42
1:A:63:HIS:HB3	1:A:532:MET:HE2	2.01	0.42
1:A:218:THR:OG1	1:A:219:ASN:N	2.45	0.42
1:A:325:SER:OG	4:D:2:NAG:O7	2.33	0.42
1:A:583:ARG:HH22	1:A:652:ARG:HG3	1.85	0.42
1:A:585:LYS:HE3	6:G:2:YYJ:S4	2.59	0.42
1:A:627:TYR:CE1	1:A:634:ASP:HB3	2.54	0.42
1:A:255:LYS:HD3	1:A:281:VAL:HG11	2.02	0.42
1:A:470:ALA:HA	1:A:476:ILE:HD13	2.01	0.41
1:A:400:GLU:HA	1:A:401:PRO:C	2.46	0.41
5:E:2:NAG:H4	5:E:3:BMA:H2	1.65	0.41

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	612/657 (93%)	575 (94%)	36 (6%)	1 (0%)	43 72

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	76	THR

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	545/580 (94%)	543 (100%)	2 (0%)	84 94

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	180	VAL
1	A	519	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	481	GLN

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 ⓘ

26 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	B	1	1,2	14,14,15	0.21	0	17,19,21	0.58	0
2	NAG	B	2	2	14,14,15	0.79	1 (7%)	17,19,21	1.61	3 (17%)
3	NAG	C	1	1,3	14,14,15	0.35	0	17,19,21	0.49	0
3	NAG	C	2	3	14,14,15	0.35	0	17,19,21	0.50	0
3	BMA	C	3	3	11,11,12	0.61	0	15,15,17	0.70	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	MAN	C	4	3	11,11,12	0.78	0	15,15,17	0.86	1 (6%)
3	MAN	C	5	3	11,11,12	0.62	0	15,15,17	0.93	2 (13%)
3	MAN	C	6	3	11,11,12	1.56	2 (18%)	15,15,17	1.99	3 (20%)
3	MAN	C	7	3	11,11,12	0.64	0	15,15,17	1.08	2 (13%)
4	NAG	D	1	1,4	14,14,15	0.18	0	17,19,21	0.52	0
4	NAG	D	2	4	14,14,15	0.30	0	17,19,21	0.91	1 (5%)
4	BMA	D	3	4	11,11,12	0.81	1 (9%)	15,15,17	0.87	0
4	MAN	D	4	4	11,11,12	0.82	0	15,15,17	0.95	2 (13%)
4	MAN	D	5	4	11,11,12	0.70	0	15,15,17	1.20	2 (13%)
4	MAN	D	6	4	11,11,12	0.73	0	15,15,17	0.87	1 (6%)
4	MAN	D	7	4	11,11,12	0.78	0	15,15,17	0.84	1 (6%)
4	MAN	D	8	4	11,11,12	0.82	0	15,15,17	0.83	1 (6%)
4	MAN	D	9	4	11,11,12	0.70	0	15,15,17	0.92	2 (13%)
5	NAG	E	1	5,1	14,14,15	0.44	0	17,19,21	0.54	0
5	NAG	E	2	5	14,14,15	0.22	0	17,19,21	0.55	0
5	BMA	E	3	5	11,11,12	0.66	0	15,15,17	0.87	0
5	MAN	E	4	5	11,11,12	0.64	0	15,15,17	0.99	2 (13%)
6	GU4	F	1	6	27,27,28	1.92	6 (22%)	32,43,45	1.56	9 (28%)
6	YYJ	F	2	6	27,28,28	3.29	10 (37%)	33,46,46	1.36	5 (15%)
6	GU4	G	1	6	27,27,28	1.99	7 (25%)	32,43,45	1.80	14 (43%)
6	YYJ	G	2	6	27,28,28	3.27	9 (33%)	33,46,46	1.51	7 (21%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

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

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	BMA	D	3	4	-	0/2/19/22	0/1/1/1
4	MAN	D	4	4	-	0/2/19/22	0/1/1/1
4	MAN	D	5	4	-	0/2/19/22	0/1/1/1
4	MAN	D	6	4	-	0/2/19/22	0/1/1/1
4	MAN	D	7	4	-	0/2/19/22	0/1/1/1
4	MAN	D	8	4	-	1/2/19/22	0/1/1/1
4	MAN	D	9	4	-	0/2/19/22	0/1/1/1
5	NAG	E	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	E	2	5	-	0/6/23/26	0/1/1/1
5	BMA	E	3	5	-	0/2/19/22	0/1/1/1
5	MAN	E	4	5	-	0/2/19/22	0/1/1/1
6	GU4	F	1	6	-	6/21/38/41	0/1/1/1
6	YYJ	F	2	6	-	16/23/42/42	0/1/1/1
6	GU4	G	1	6	-	11/21/38/41	0/1/1/1
6	YYJ	G	2	6	-	2/23/42/42	0/1/1/1

All (36) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	2	YYJ	O5-C5	8.05	1.61	1.43
6	G	2	YYJ	O5-C5	7.91	1.61	1.43
6	G	2	YYJ	O5-C2	-7.39	1.31	1.43
6	F	2	YYJ	O5-C2	-7.26	1.32	1.43
6	F	2	YYJ	C4-C5	-6.73	1.35	1.52
6	G	2	YYJ	O3-C3	-6.65	1.35	1.47
6	G	2	YYJ	C4-C5	-6.51	1.36	1.52
6	F	2	YYJ	O3-C3	-6.45	1.35	1.47
6	G	1	GU4	O6-S6	4.52	1.69	1.56
6	G	1	GU4	O5-C1	4.45	1.51	1.43
6	F	1	GU4	O6-S6	4.42	1.68	1.56
6	F	1	GU4	O5-C1	4.08	1.50	1.43
6	F	2	YYJ	O6-S6	4.00	1.67	1.56
6	F	2	YYJ	O2-C2	3.98	1.47	1.40
3	C	6	MAN	C1-C2	3.98	1.61	1.52
6	G	2	YYJ	O6-S6	3.78	1.66	1.56
6	G	2	YYJ	O2-C2	3.74	1.47	1.40
6	G	1	GU4	O3-S3	3.72	1.68	1.57
6	F	1	GU4	O3-S3	3.59	1.68	1.57
6	G	2	YYJ	O1-S1	3.58	1.66	1.56
6	F	2	YYJ	O1-S1	3.51	1.66	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	G	2	YYJ	O4-S4	3.08	1.66	1.57
6	F	2	YYJ	O4-S4	3.05	1.66	1.57
6	F	2	YYJ	O3-S3	2.96	1.66	1.57
6	F	1	GU4	O4-S4	2.91	1.66	1.57
6	G	2	YYJ	O3-S3	2.90	1.66	1.57
3	C	6	MAN	O5-C1	2.81	1.48	1.43
6	G	1	GU4	O2-S2	2.72	1.65	1.57
6	F	1	GU4	O2-C2	-2.71	1.43	1.47
6	G	1	GU4	O2-C2	-2.68	1.43	1.47
6	G	1	GU4	O4-S4	2.68	1.65	1.57
6	F	1	GU4	O2-S2	2.63	1.65	1.57
2	B	2	NAG	O5-C1	2.52	1.47	1.43
6	G	1	GU4	O5-C5	2.26	1.47	1.43
4	D	3	BMA	O5-C1	-2.23	1.39	1.43
6	F	2	YYJ	O1-C1	-2.06	1.42	1.45

All (58) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	6	MAN	C1-O5-C5	6.39	120.75	112.19
2	B	2	NAG	C1-O5-C5	4.86	118.69	112.19
4	D	5	MAN	C1-O5-C5	3.15	116.41	112.19
6	F	1	GU4	C1-C2-C3	3.14	114.10	109.40
6	G	1	GU4	O5-C5-C6	2.98	114.04	107.59
6	G	2	YYJ	O3S3-S3-O2S3	-2.98	100.75	112.24
3	C	7	MAN	C1-O5-C5	2.97	116.17	112.19
4	D	5	MAN	O2-C2-C3	-2.95	104.04	110.15
3	C	6	MAN	C1-C2-C3	2.94	113.92	109.64
6	F	1	GU4	O27-S3-O28	-2.92	100.97	112.24
6	G	2	YYJ	O5-C5-C4	2.91	108.27	103.54
6	G	2	YYJ	O3S6-S6-O2S6	-2.83	101.34	112.24
6	G	1	GU4	O23-S6-O22	-2.80	101.43	112.24
6	F	1	GU4	O5-C1-C2	2.72	115.02	109.51
4	D	2	NAG	C1-O5-C5	2.68	115.78	112.19
6	G	1	GU4	O2-C2-C3	2.66	109.60	106.65
6	G	1	GU4	C4-O4-S4	-2.62	112.76	119.04
6	F	2	YYJ	O1S3-S3-O3	2.54	112.21	106.37
6	G	1	GU4	O10-S2-O2	2.53	112.19	106.37
2	B	2	NAG	C1-C2-N2	2.52	114.40	110.43
6	F	1	GU4	O24-S4-O4	2.49	112.09	106.37
3	C	6	MAN	O2-C2-C3	-2.47	105.03	110.15
5	E	4	MAN	C1-O5-C5	2.47	115.50	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	G	1	GU4	C3-C4-C5	-2.44	105.58	110.58
6	G	2	YYJ	O1S1-S1-O1	2.43	111.95	106.37
6	G	2	YYJ	O1S4-S4-O3S4	-2.38	100.24	108.56
6	F	1	GU4	O10-S2-O2	2.34	111.76	106.37
6	F	1	GU4	O21-S6-O6	2.34	111.75	106.37
3	C	5	MAN	C1-O5-C5	2.30	115.27	112.19
6	F	1	GU4	O21-S6-O22	-2.29	100.54	108.56
4	D	6	MAN	O2-C2-C3	-2.26	105.46	110.15
4	D	4	MAN	O2-C2-C3	-2.25	105.48	110.15
6	F	2	YYJ	O1S4-S4-O4	2.25	111.54	106.37
3	C	5	MAN	O2-C2-C3	-2.21	105.56	110.15
4	D	9	MAN	O2-C2-C3	-2.20	105.58	110.15
6	G	1	GU4	O10-S2-O12	-2.20	100.85	108.56
6	G	1	GU4	O29-S3-O3	2.19	111.40	106.37
6	G	1	GU4	O29-S3-O28	-2.19	100.90	108.56
6	F	2	YYJ	O1S1-S1-O2S1	-2.19	100.91	108.56
3	C	7	MAN	O2-C2-C3	-2.18	105.63	110.15
4	D	9	MAN	C1-O5-C5	2.18	115.10	112.19
5	E	4	MAN	O2-C2-C3	-2.16	105.67	110.15
6	G	1	GU4	C6-C5-C4	-2.16	108.14	113.35
6	F	2	YYJ	O1S6-S6-O6	2.16	111.33	106.37
2	B	2	NAG	C2-N2-C7	2.16	125.79	122.90
6	G	1	GU4	O24-S4-O4	2.15	111.32	106.37
6	F	1	GU4	O10-S2-O11	-2.15	101.04	108.56
6	F	2	YYJ	O1S3-S3-O2S3	-2.14	101.08	108.56
6	G	1	GU4	C3-O3-S3	-2.12	113.97	119.04
4	D	7	MAN	O2-C2-C3	-2.10	105.81	110.15
6	G	1	GU4	O5-C1-C2	2.09	113.75	109.51
6	G	2	YYJ	O6-S6-O2S6	2.07	113.25	106.92
4	D	4	MAN	C1-O5-C5	2.07	114.96	112.19
4	D	8	MAN	O2-C2-C3	-2.06	105.88	110.15
3	C	4	MAN	O2-C2-C3	-2.06	105.88	110.15
6	G	2	YYJ	O1S1-S1-O3S1	-2.02	101.48	108.56
6	G	1	GU4	C4-C3-C2	-2.01	106.45	110.58
6	F	1	GU4	O24-S4-O25	-2.01	101.53	108.56

There are no chirality outliers.

All (44) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2	NAG	C3-C2-N2-C7
6	F	1	GU4	O5-C5-C6-O6

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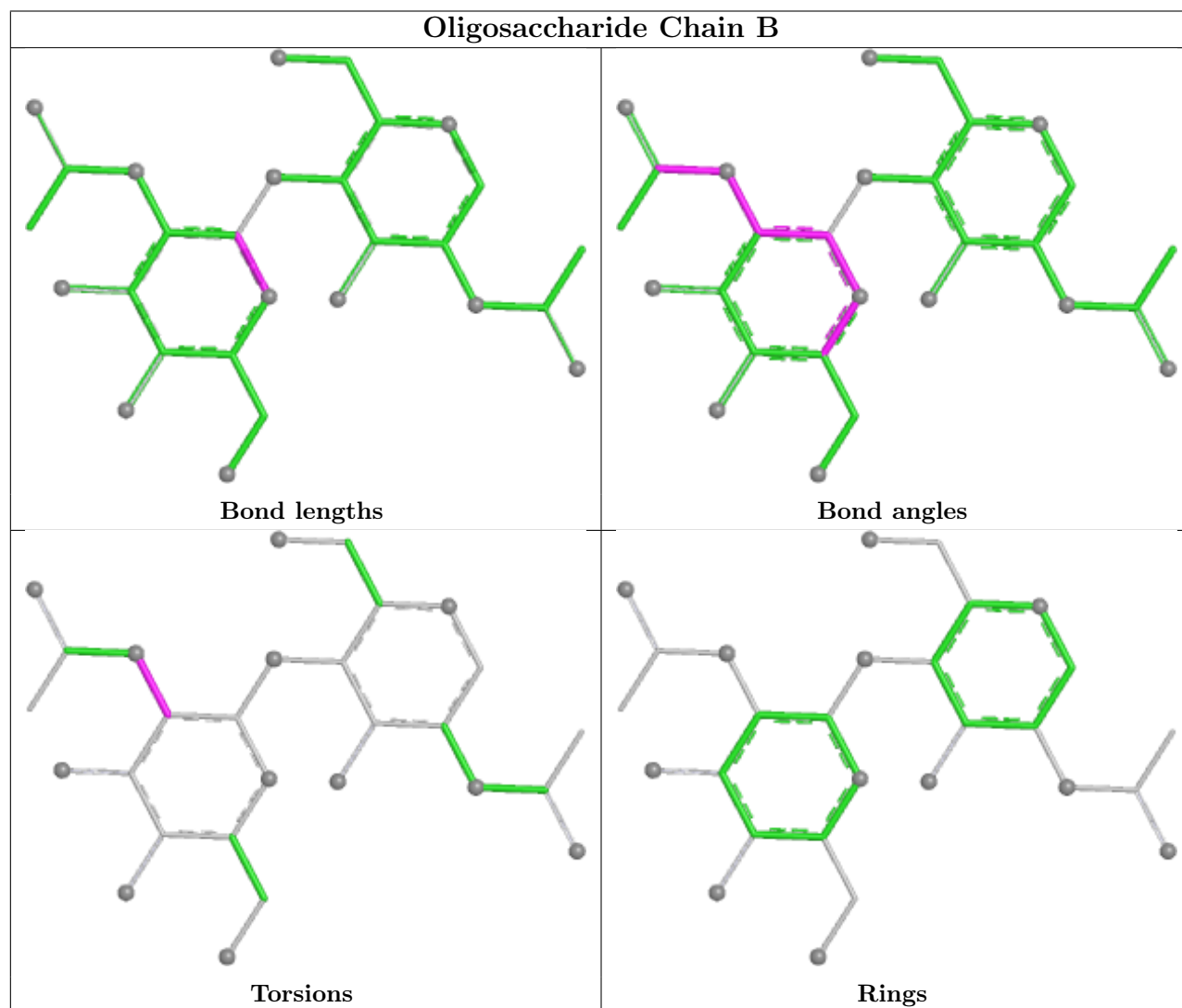
Mol	Chain	Res	Type	Atoms
6	F	1	GU4	C4-C5-C6-O6
6	F	1	GU4	C3-O3-S3-O27
6	F	2	YYJ	O1-C1-C2-O2
6	F	2	YYJ	O1-C1-C2-O5
6	F	2	YYJ	C4-C5-C6-O6
6	F	2	YYJ	O5-C5-C6-O6
6	F	2	YYJ	C3-O3-S3-O1S3
6	F	2	YYJ	C3-O3-S3-O2S3
6	F	2	YYJ	C3-O3-S3-O3S3
6	F	2	YYJ	C4-O4-S4-O3S4
6	G	1	GU4	C4-C5-C6-O6
6	G	1	GU4	C3-O3-S3-O29
6	G	2	YYJ	C5-C4-O4-S4
3	C	5	MAN	C4-C5-C6-O6
3	C	3	BMA	C4-C5-C6-O6
3	C	5	MAN	O5-C5-C6-O6
3	C	3	BMA	O5-C5-C6-O6
6	F	1	GU4	C3-O3-S3-O28
6	F	2	YYJ	C4-O4-S4-O2S4
6	G	1	GU4	C3-O3-S3-O28
6	G	1	GU4	C3-O3-S3-O27
3	C	4	MAN	O5-C5-C6-O6
6	F	2	YYJ	C1-O1-S1-O2S1
6	F	2	YYJ	C6-O6-S6-O2S6
3	C	6	MAN	O5-C5-C6-O6
4	D	8	MAN	O5-C5-C6-O6
6	F	1	GU4	C3-O3-S3-O29
6	F	2	YYJ	C4-O4-S4-O1S4
6	F	2	YYJ	C1-O1-S1-O1S1
6	F	2	YYJ	C1-O1-S1-O3S1
6	F	2	YYJ	C6-O6-S6-O3S6
6	G	1	GU4	C6-O6-S6-O22
6	G	2	YYJ	O1-C1-C2-O2
6	G	1	GU4	O5-C5-C6-O6
6	F	1	GU4	C4-O4-S4-O24
6	G	1	GU4	C2-O2-S2-O10
6	F	2	YYJ	C6-O6-S6-O1S6
5	E	1	NAG	C1-C2-N2-C7
6	G	1	GU4	C6-O6-S6-O23
6	G	1	GU4	C6-O6-S6-O21
6	G	1	GU4	C4-C3-O3-S3
6	G	1	GU4	C2-O2-S2-O11

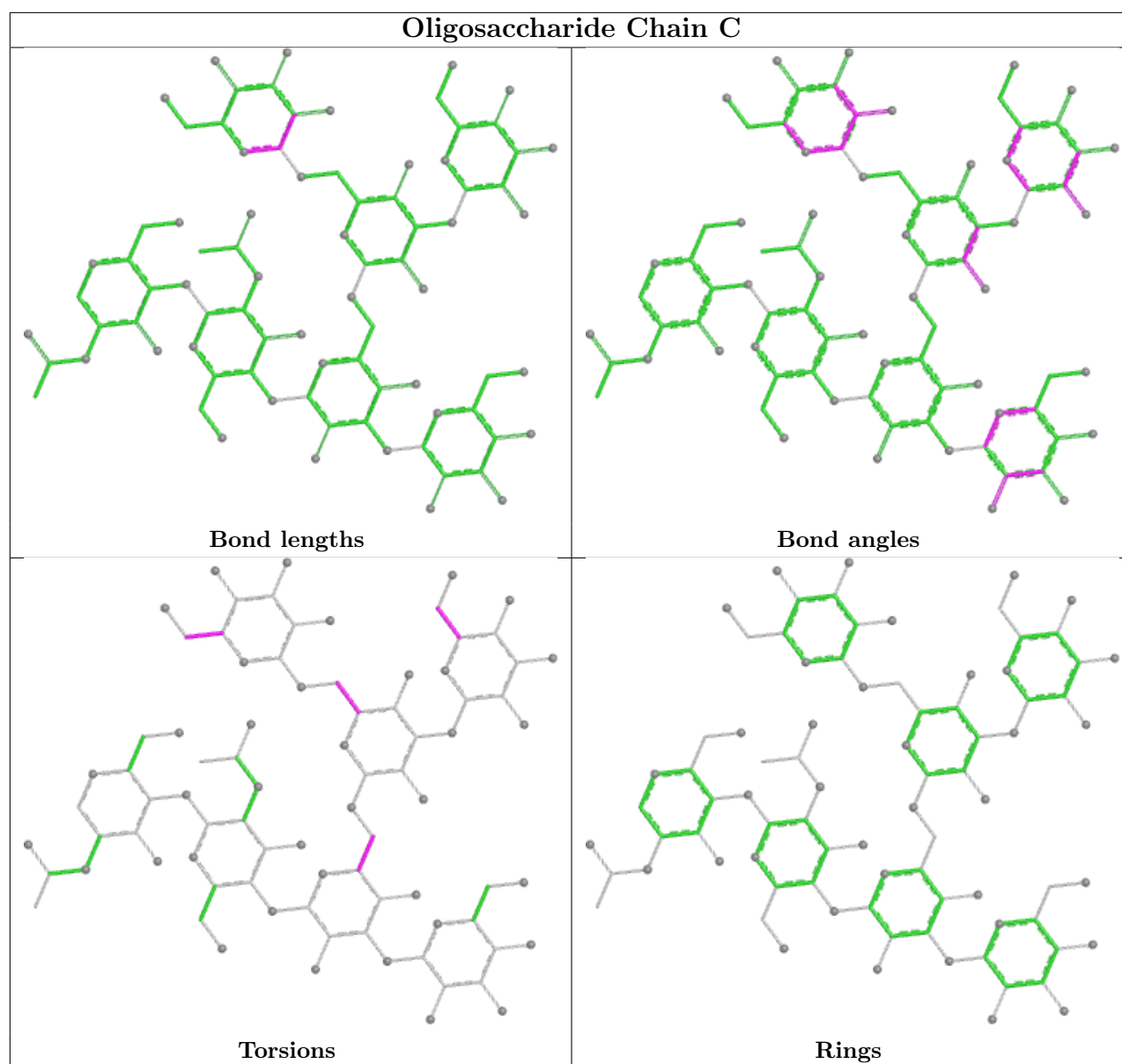
There are no ring outliers.

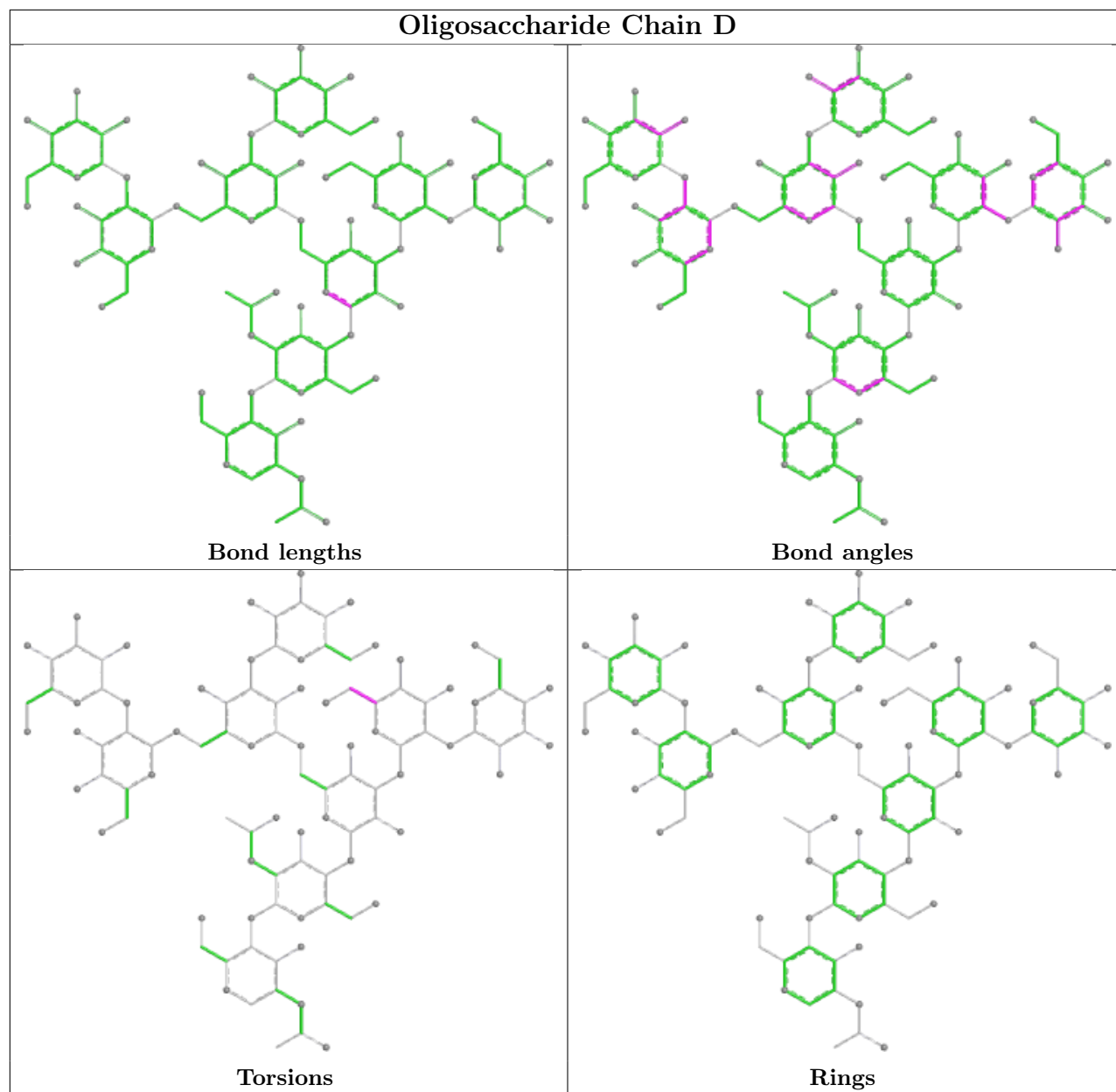
7 monomers are involved in 7 short contacts:

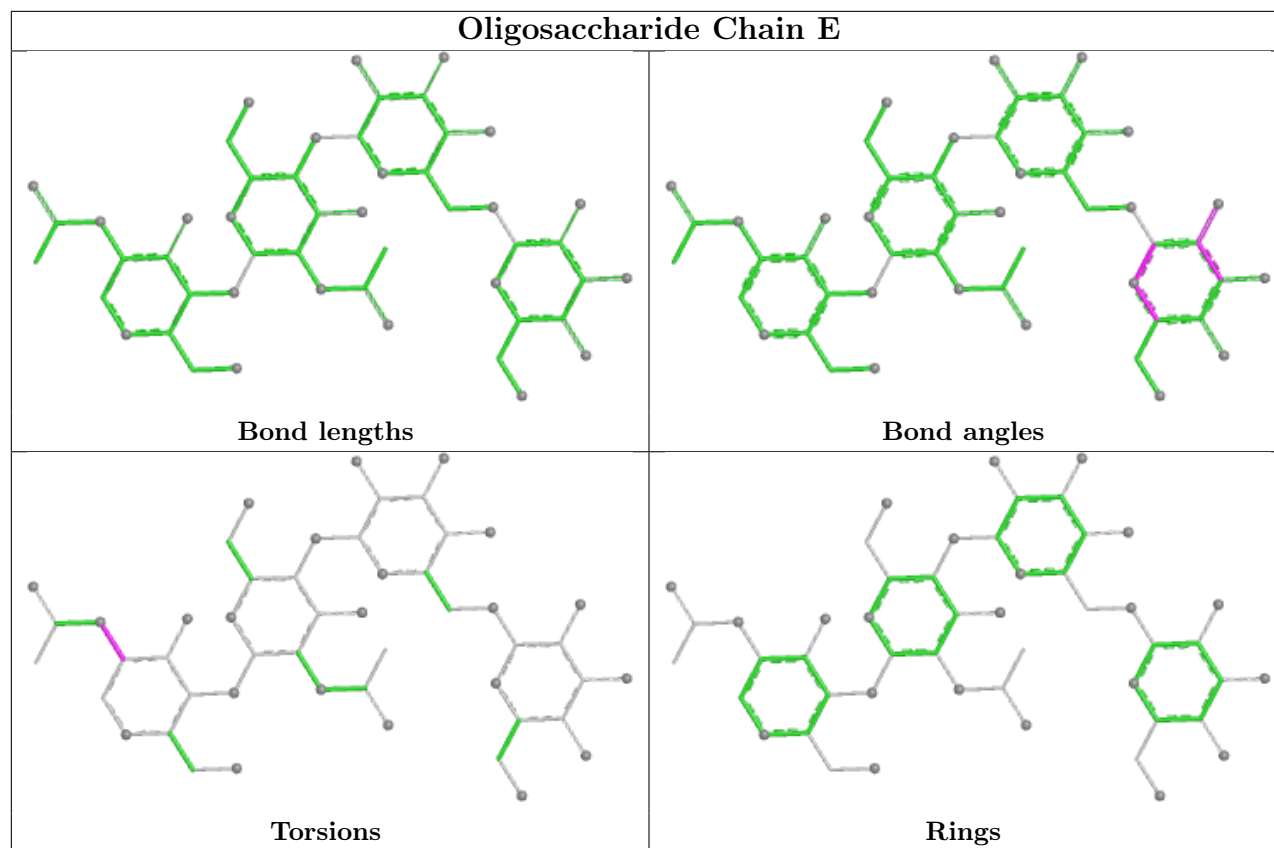
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	G	2	YYJ	2	0
5	E	3	BMA	1	0
4	D	2	NAG	1	0
6	F	1	GU4	1	0
3	C	1	NAG	1	0
5	E	2	NAG	1	0
6	G	1	GU4	1	0

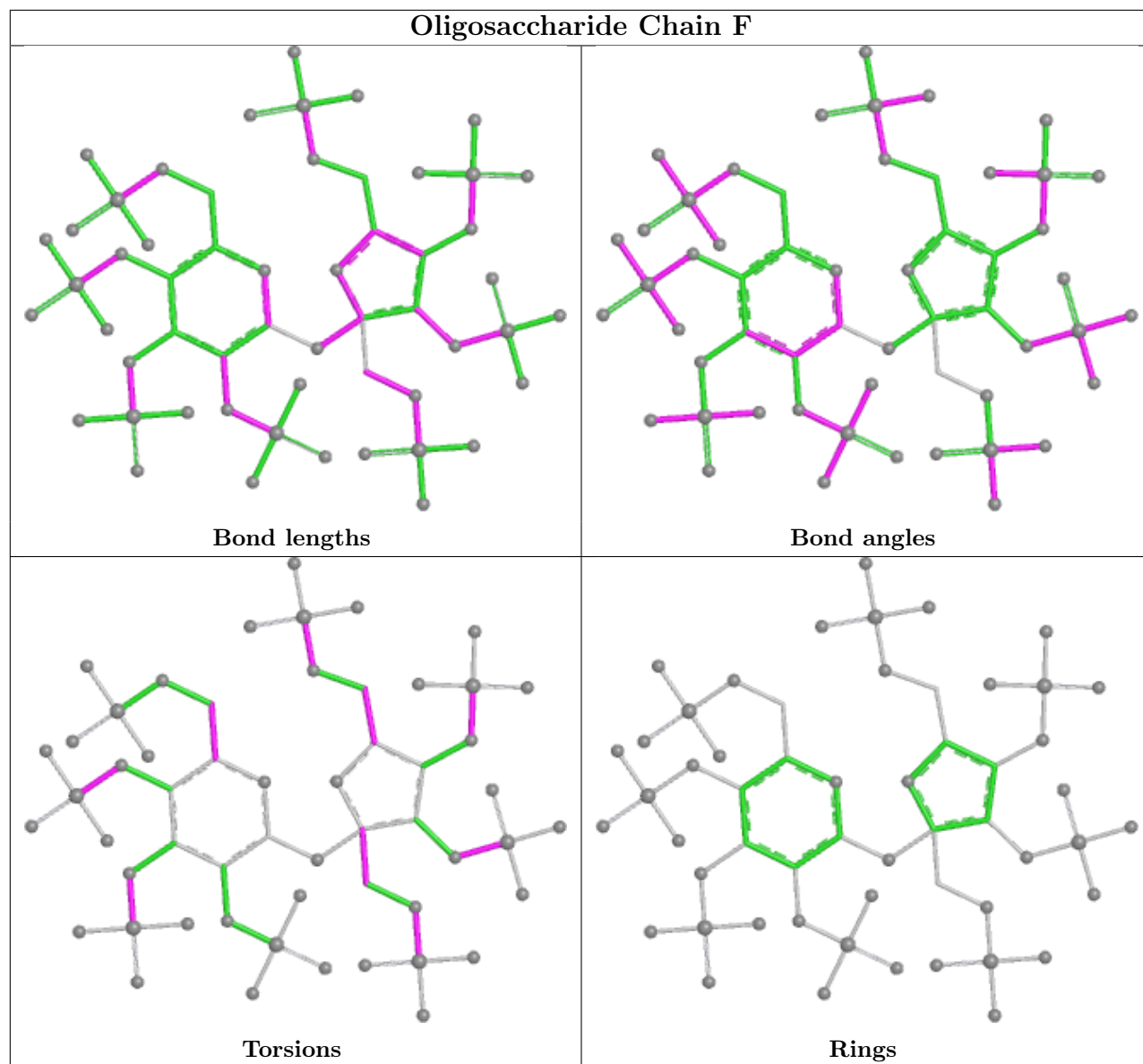
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

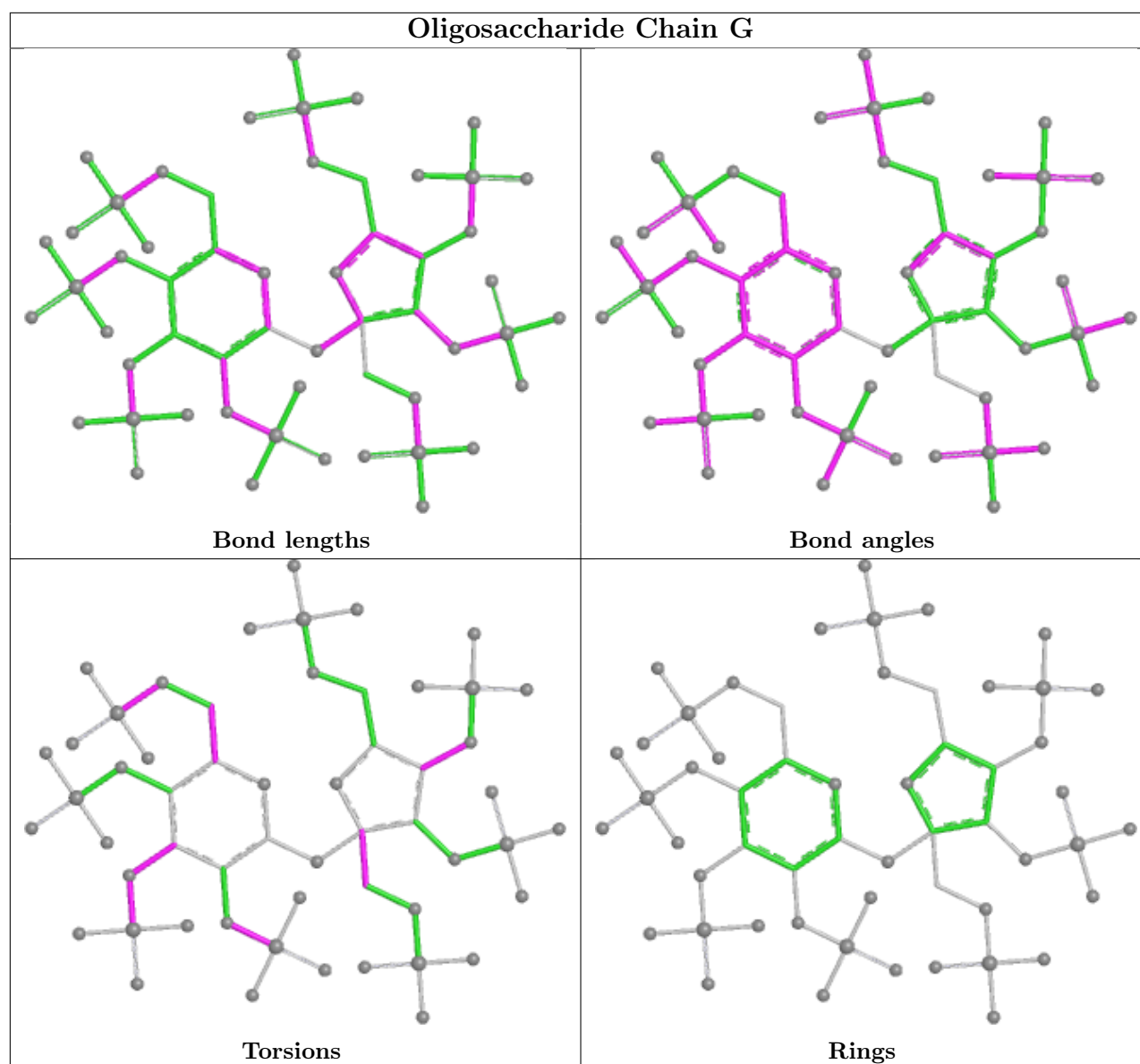












5.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
7	NAG	A	702	1	14,14,15	0.37	0	17,19,21	0.54	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	NAG	A	703	1	14,14,15	0.25	0	17,19,21	0.45	0
7	NAG	A	701	1	14,14,15	0.23	0	17,19,21	0.43	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	A	702	1	-	2/6/23/26	0/1/1/1
7	NAG	A	703	1	-	3/6/23/26	0/1/1/1
7	NAG	A	701	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	703	NAG	O5-C5-C6-O6
7	A	701	NAG	C4-C5-C6-O6
7	A	703	NAG	C1-C2-N2-C7
7	A	701	NAG	O5-C5-C6-O6
7	A	702	NAG	C3-C2-N2-C7
7	A	702	NAG	C1-C2-N2-C7
7	A	703	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, 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	616/657 (93%)	1.15	108 (17%) 4 3	44, 84, 133, 173	0

All (108) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	633	ILE	8.1
1	A	629	PRO	7.0
1	A	630	THR	6.6
1	A	50	GLY	5.7
1	A	187	ILE	5.6
1	A	43	TYR	5.5
1	A	179	TYR	5.5
1	A	595	HIS	5.5
1	A	665	TYR	5.2
1	A	641	VAL	5.2
1	A	594	LEU	5.0
1	A	584	LYS	4.6
1	A	643	LEU	4.5
1	A	307	MET	4.5
1	A	222	PHE	4.5
1	A	632	TYR	4.3
1	A	582	LEU	4.2
1	A	308	ILE	4.1
1	A	114	LEU	4.1
1	A	394	LEU	4.1
1	A	484	HIS	4.1
1	A	500	PRO	3.9
1	A	586	VAL	3.9
1	A	618	THR	3.8
1	A	380	PHE	3.8
1	A	116	PRO	3.8
1	A	644	ALA	3.7

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Mol	Chain	Res	Type	RSRZ
1	A	181	PRO	3.6
1	A	453	ASP	3.6
1	A	600	VAL	3.5
1	A	587	THR	3.5
1	A	232	SER	3.5
1	A	169	ALA	3.5
1	A	639	GLY	3.5
1	A	485	TYR	3.4
1	A	106	ILE	3.4
1	A	188	GLY	3.3
1	A	583	ARG	3.2
1	A	642	LEU	3.2
1	A	71	PRO	3.2
1	A	147	PHE	3.2
1	A	597	SER	3.1
1	A	596	LEU	3.1
1	A	77	PHE	3.0
1	A	177	SER	3.0
1	A	460	LEU	3.0
1	A	165	TYR	2.9
1	A	440	PHE	2.9
1	A	224	LYS	2.9
1	A	121	ILE	2.9
1	A	649	ASP	2.8
1	A	585	LYS	2.8
1	A	111	VAL	2.8
1	A	395	ASN	2.8
1	A	486	GLY	2.8
1	A	441	PHE	2.8
1	A	650	GLY	2.7
1	A	645	VAL	2.7
1	A	154	VAL	2.7
1	A	113	ILE	2.7
1	A	651	GLY	2.7
1	A	132	LYS	2.7
1	A	94	ILE	2.6
1	A	228	VAL	2.6
1	A	664	SER	2.6
1	A	185	LEU	2.5
1	A	501	HIS	2.5
1	A	518	TYR	2.5
1	A	648	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	349	TYR	2.5
1	A	122	LEU	2.5
1	A	79	MET	2.5
1	A	563	LEU	2.4
1	A	153	TYR	2.4
1	A	112	LEU	2.4
1	A	225	ALA	2.4
1	A	468	PHE	2.4
1	A	457	ILE	2.4
1	A	405	THR	2.3
1	A	588	SER	2.3
1	A	652	ARG	2.3
1	A	396	SER	2.3
1	A	517	LEU	2.3
1	A	163	LYS	2.3
1	A	130	ARG	2.3
1	A	73	HIS	2.3
1	A	87	TYR	2.3
1	A	45	PRO	2.2
1	A	306	TYR	2.2
1	A	166	VAL	2.2
1	A	660	THR	2.2
1	A	196	ASP	2.2
1	A	616	HIS	2.2
1	A	180	VAL	2.1
1	A	407	HIS	2.1
1	A	553	LYS	2.1
1	A	167	ILE	2.1
1	A	230	PHE	2.1
1	A	459	LYS	2.1
1	A	620	LYS	2.1
1	A	192	TYR	2.1
1	A	96	ARG	2.0
1	A	189	LYS	2.0
1	A	397	LYS	2.0
1	A	412	THR	2.0
1	A	532	MET	2.0
1	A	41	LEU	2.0
1	A	202	TYR	2.0

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

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

6.3 Carbohydrates [i](#)

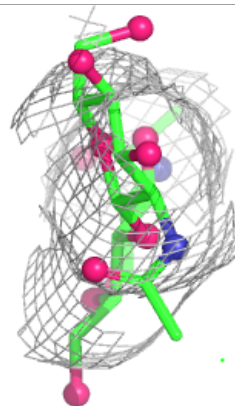
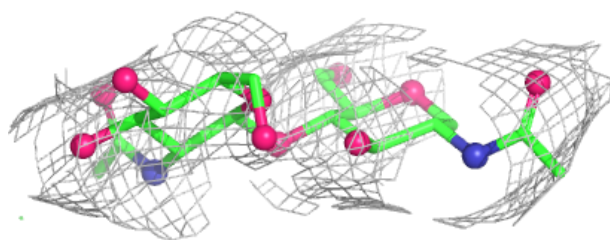
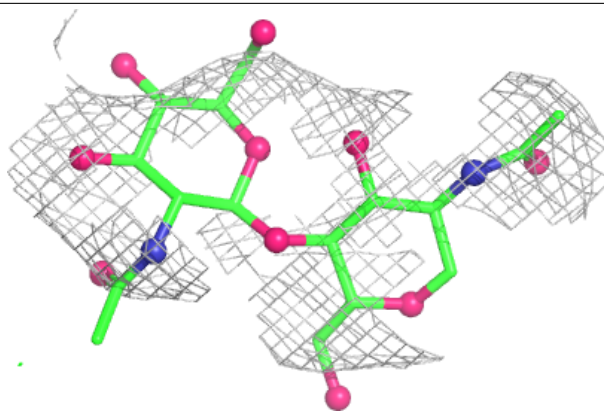
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MAN	C	6	11/12	0.07	0.17	149,176,186,192	0
5	MAN	E	4	11/12	0.28	0.24	145,169,176,178	0
3	MAN	C	7	11/12	0.40	0.17	159,175,188,201	0
3	MAN	C	4	11/12	0.50	0.12	165,171,178,179	0
5	BMA	E	3	11/12	0.60	0.12	143,151,166,177	0
2	NAG	B	2	14/15	0.67	0.16	124,140,156,166	0
6	YYJ	F	2	28/28	0.67	0.13	97,140,158,168	0
3	MAN	C	5	11/12	0.71	0.15	125,162,172,173	0
6	GU4	G	1	27/28	0.71	0.11	131,173,184,190	0
4	MAN	D	9	11/12	0.76	0.10	110,123,132,134	0
6	YYJ	G	2	28/28	0.79	0.08	135,163,190,222	0
4	MAN	D	8	11/12	0.80	0.10	104,110,117,128	0
4	BMA	D	3	11/12	0.81	0.13	79,89,98,101	0
3	BMA	C	3	11/12	0.81	0.11	144,159,176,178	0
4	MAN	D	7	11/12	0.85	0.10	76,82,97,99	0
5	NAG	E	2	14/15	0.86	0.12	109,121,131,150	0
5	NAG	E	1	14/15	0.86	0.12	67,100,112,122	0
2	NAG	B	1	14/15	0.87	0.10	106,112,124,131	0
6	GU4	F	1	27/28	0.88	0.07	93,125,151,159	0
3	NAG	C	2	14/15	0.89	0.12	94,106,123,137	0
4	MAN	D	6	11/12	0.90	0.12	60,75,80,101	0
4	MAN	D	4	11/12	0.90	0.12	78,84,90,100	0
4	NAG	D	2	14/15	0.93	0.14	57,73,88,95	0
4	MAN	D	5	11/12	0.93	0.10	70,76,83,83	0
4	NAG	D	1	14/15	0.94	0.11	46,54,69,78	0
3	NAG	C	1	14/15	0.96	0.08	62,73,82,109	0

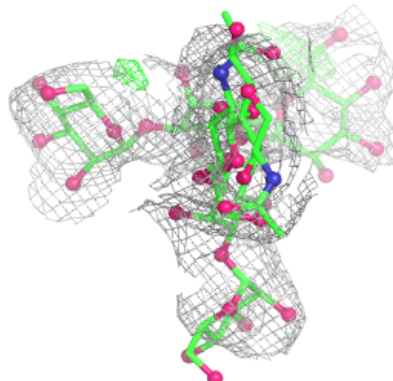
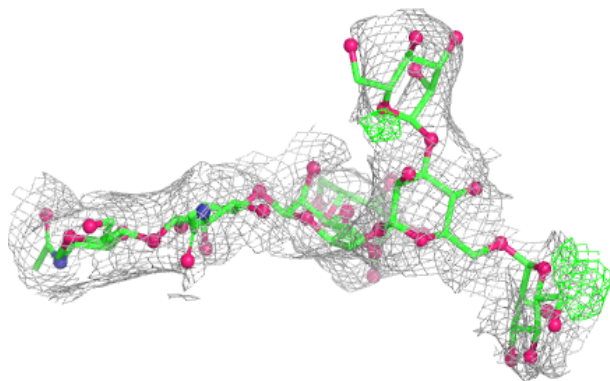
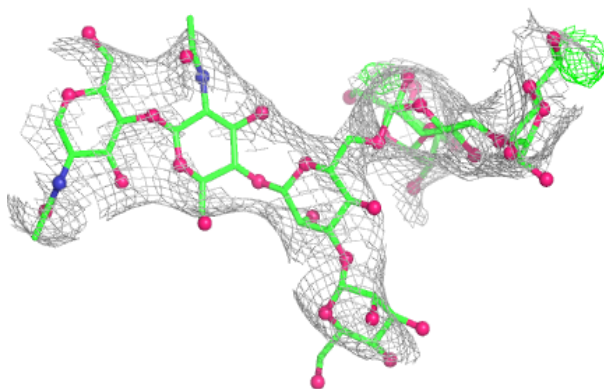
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain B:

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

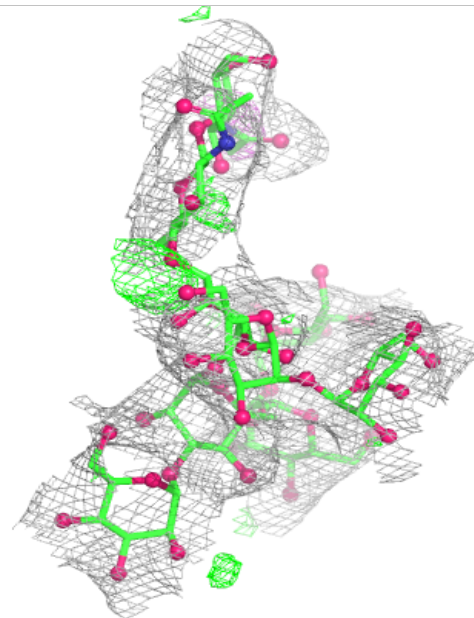
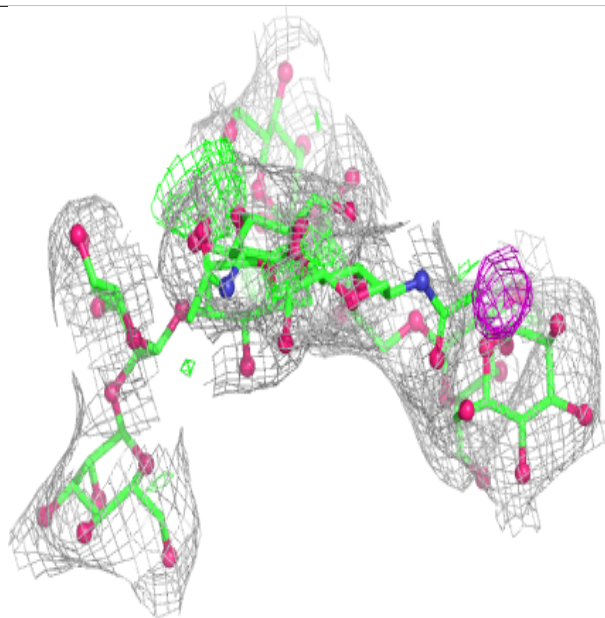
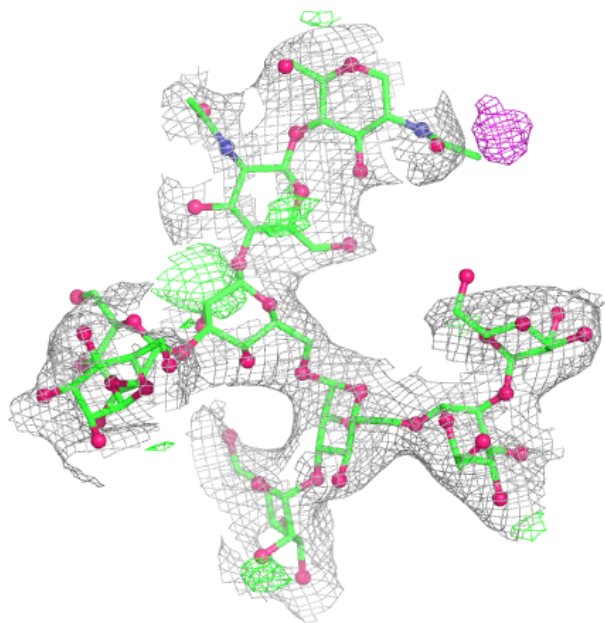
**Electron density around Chain C:**

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



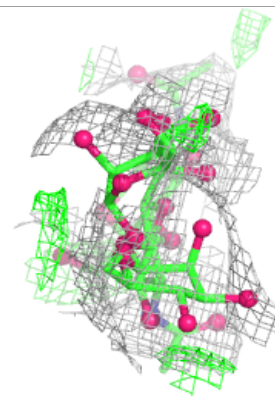
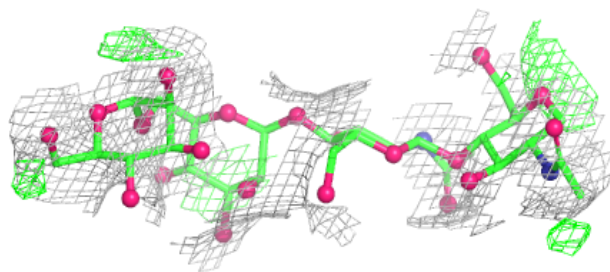
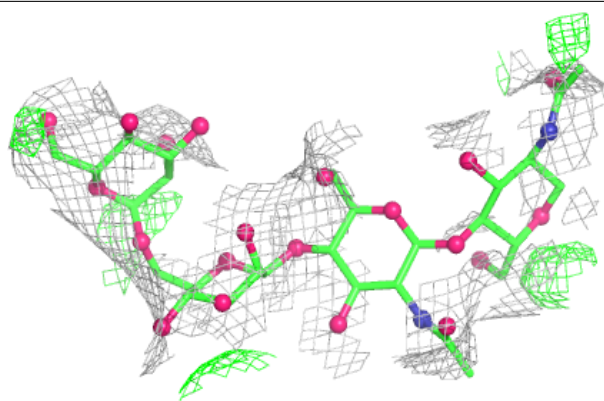
Electron density around Chain D:

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



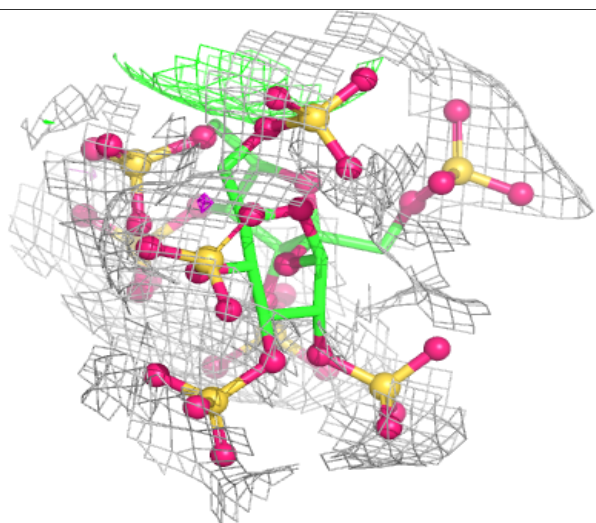
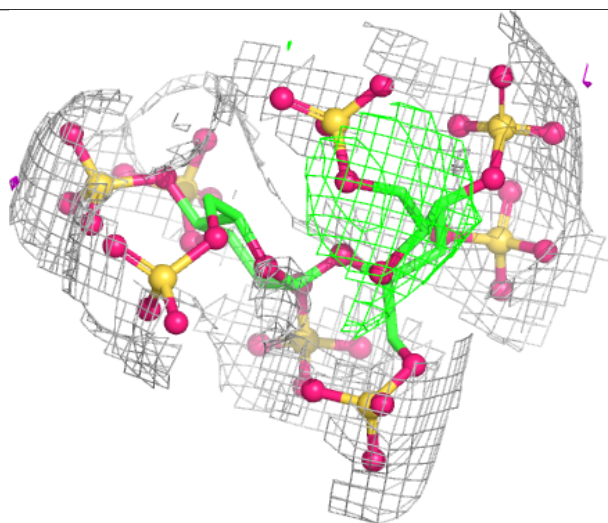
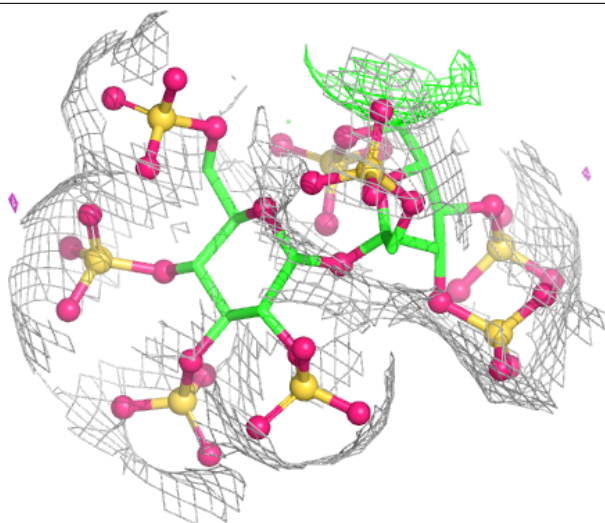
Electron density around Chain E:

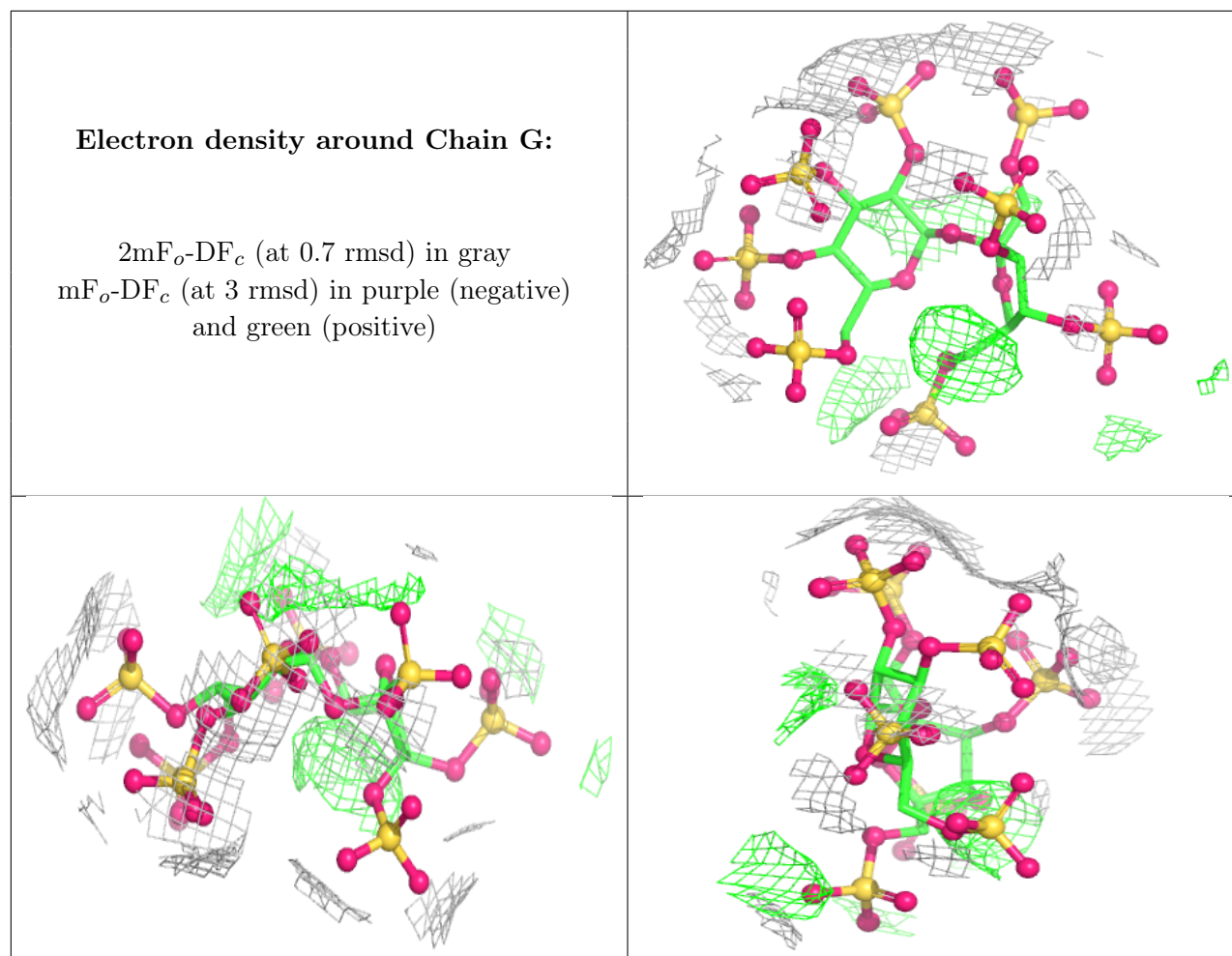
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain F:

$2mF_o-DF_c$ (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
7	NAG	A	701	14/15	0.56	0.16	118,127,137,137	0
7	NAG	A	703	14/15	0.63	0.16	135,144,153,156	0
7	NAG	A	702	14/15	0.86	0.13	108,120,130,131	0

6.5 Other polymers [i](#)

There are no such residues in this entry.