



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 07:38 PM UTC

PDB ID : 6QP7 / pdb_00006qp7
Title : Drosophila Semaphorin 2a
Authors : Robinson, R.A.; Rozbesky, D.; Harlos, K.; Siebold, C.; Jones, E.Y.
Deposited on : 2019-02-13
Resolution : 1.96 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
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

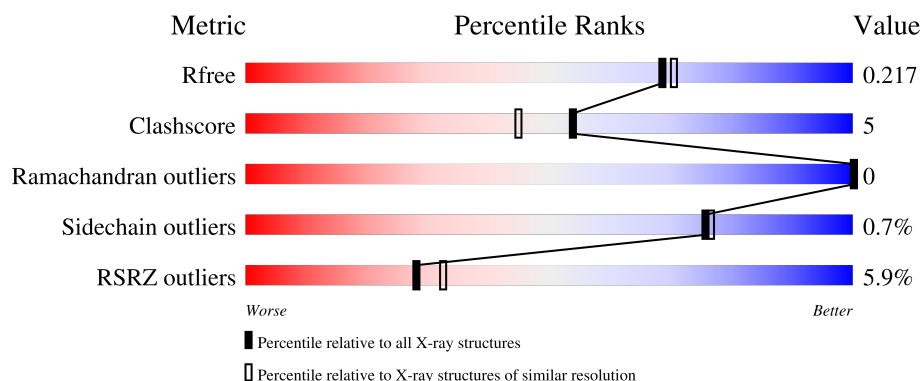
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.96 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.



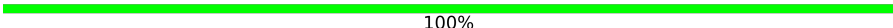
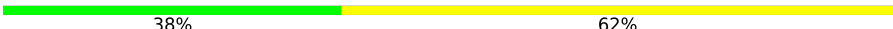
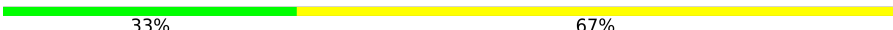
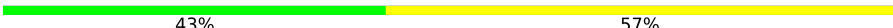
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3494 (1.96-1.96)
Clashscore	190562	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)
RSRZ outliers	180081	3495 (1.96-1.96)

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	5% 84% 10% 6%
1	B	657	6% 83% 11% 6%
2	C	2	100%
2	D	2	100%
2	G	2	100%

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Mol	Chain	Length	Quality of chain
2	K	2	 100%
3	E	6	 50% 17% 33%
3	F	6	 50% 33% 17%
4	H	8	 38% 62%
5	I	3	 33% 67%
6	J	7	 43% 57%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
9	CL	B	731	-	-	X	-
9	CL	B	732	-	-	X	-

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 11373 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 Semaphorin-2A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	620	Total	C	N	O	S	0	0	0
			5009	3174	867	940	28			
1	B	619	Total	C	N	O	S	0	0	0
			4995	3163	864	940	28			

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	GLU	-	expression tag	UNP Q24323
A	25	THR	-	expression tag	UNP Q24323
A	26	GLY	-	expression tag	UNP Q24323
A	166	TYR	HIS	conflict	UNP Q24323
A	672	GLY	-	expression tag	UNP Q24323
A	673	THR	-	expression tag	UNP Q24323
A	674	LYS	-	expression tag	UNP Q24323
A	675	HIS	-	expression tag	UNP Q24323
A	676	HIS	-	expression tag	UNP Q24323
A	677	HIS	-	expression tag	UNP Q24323
A	678	HIS	-	expression tag	UNP Q24323
A	679	HIS	-	expression tag	UNP Q24323
A	680	HIS	-	expression tag	UNP Q24323
B	24	GLU	-	expression tag	UNP Q24323
B	25	THR	-	expression tag	UNP Q24323
B	26	GLY	-	expression tag	UNP Q24323
B	166	TYR	HIS	conflict	UNP Q24323
B	672	GLY	-	expression tag	UNP Q24323
B	673	THR	-	expression tag	UNP Q24323
B	674	LYS	-	expression tag	UNP Q24323
B	675	HIS	-	expression tag	UNP Q24323
B	676	HIS	-	expression tag	UNP Q24323
B	677	HIS	-	expression tag	UNP Q24323
B	678	HIS	-	expression tag	UNP Q24323
B	679	HIS	-	expression tag	UNP Q24323

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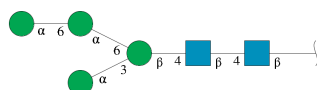
Chain	Residue	Modelled	Actual	Comment	Reference
B	680	HIS	-	expression tag	UNP Q24323

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



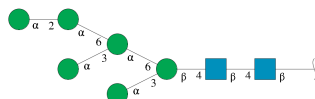
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	K	2	Total	C	N	O	0	0	0
			28	16	2	10			

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



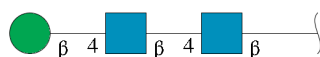
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	6	Total	C	N	O	0	0	0
			72	40	2	30			
3	F	6	Total	C	N	O	0	0	0
			72	40	2	30			

- 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-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



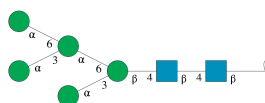
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	H	8	Total	C	N	O	0	0	0
			94	52	2	40			

- Molecule 5 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



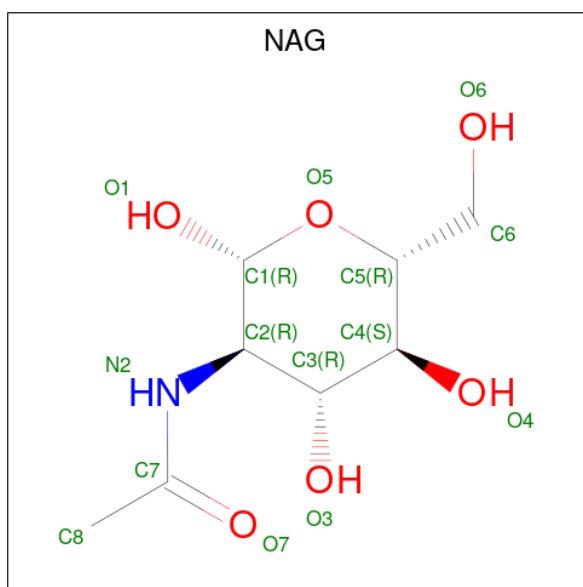
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	I	3	Total	C	N	O	0	0	0
			39	22	2	15			

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



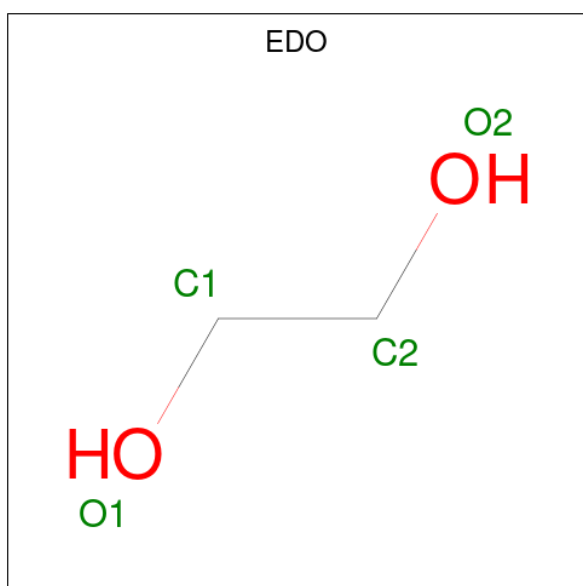
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	J	7	Total	C	N	O	0	0	0
			83	46	2	35			

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



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

- Molecule 8 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	A	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0
8	B	1	Total C O 4 2 2	0	0

- Molecule 9 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	2	Total Cl 2 2	0	0
9	B	2	Total Cl 2 2	0	0

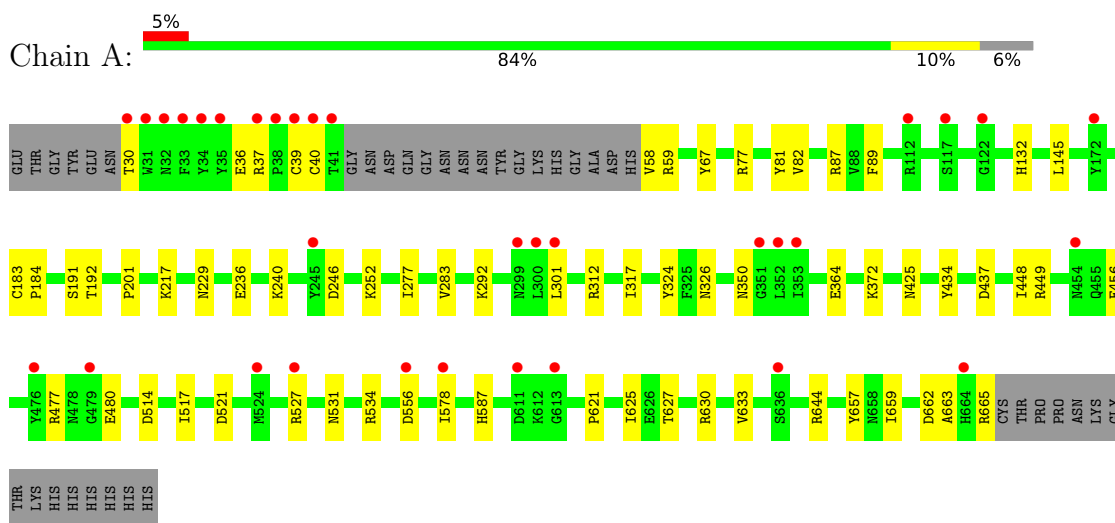
- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	415	Total 415	O 415	0	0
10	B	378	Total 378	O 378	0	0

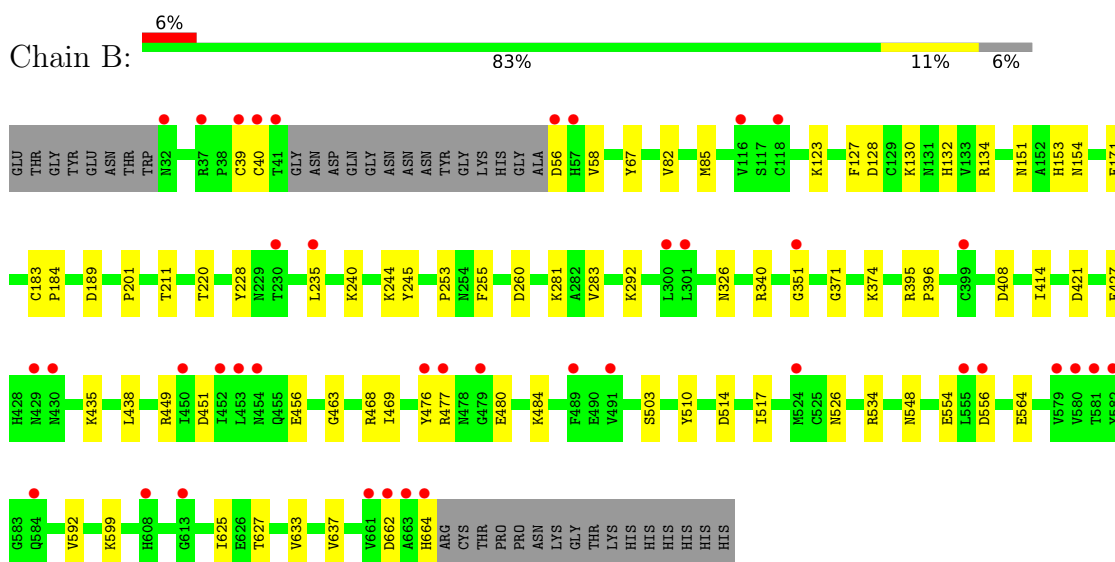
3 Residue-property plots [i](#)

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: Semaphorin-2A



• Molecule 1: Semaphorin-2A



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

Chain C:  100%

MAG1
MAG2

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

Chain D:  100%

MAG1
MAG2

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

Chain G:  100%

MAG1
MAG2

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

Chain K:  100%

MAG1
MAG2

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

Chain E:  50% 17% 33%

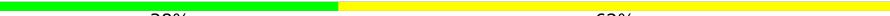
MAG1
MAG2
EMAG3
MAN4
MAN5
MAN6

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

Chain F:  50% 33% 17%

MAG1
MAG2
EMAG3
MAN4
MAN5
MAN6

- 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-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:  38% 62%

MAG1	MAG2	MAN4	MAN5	MAN6	MAN7	MAN8
GLU3	GLU3	GLU3	GLU3	GLU3	GLU3	GLU3

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

Chain I:  33% 67%

MAG1	MAG2	MAN3
GLU3	GLU3	GLU3

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

Chain J:  43% 57%

MAG1	MAG2	MAN4	MAN5	MAN6	MAN7
GLU3	GLU3	GLU3	GLU3	GLU3	GLU3

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	103.80Å 109.98Å 134.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	57.46 – 1.96 57.46 – 1.96	Depositor EDS
% Data completeness (in resolution range)	99.6 (57.46-1.96) 99.7 (57.46-1.96)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.14 (at 1.95Å)	Xtriage
Refinement program	PHENIX (dev_3386: ???)	Depositor
R, R_{free}	0.183 , 0.218 0.183 , 0.217	Depositor DCC
R_{free} test set	5613 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	29.5	Xtriage
Anisotropy	0.667	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11373	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.17	0/5125	0.39	0/6946
1	B	0.15	0/5110	0.38	0/6925
All	All	0.16	0/10235	0.39	0/13871

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	5009	0	4861	47	0
1	B	4995	0	4841	53	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
2	G	28	0	25	0	0
2	K	28	0	25	0	0
3	E	72	0	61	2	0
3	F	72	0	61	1	0
4	H	94	0	79	0	0
5	I	39	0	34	2	0
6	J	83	0	70	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	14	0	13	0	0
7	B	14	0	13	0	0
8	A	44	0	66	12	0
8	B	28	0	42	4	0
9	A	2	0	0	1	0
9	B	2	0	0	4	0
10	A	415	0	0	13	0
10	B	378	0	0	9	0
All	All	11373	0	10241	102	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

The worst 5 of 102 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)
10:B:801:HOH:O	5:I:3:BMA:O5	1.95	0.85
8:A:726:EDO:O2	10:A:802:HOH:O	1.97	0.81
1:B:548:ASN:OD1	10:B:802:HOH:O	1.99	0.81
1:A:434:TYR:H	8:A:727:EDO:H22	1.46	0.80
1:A:324:TYR:H	8:A:724:EDO:H21	1.44	0.80

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	616/657 (94%)	597 (97%)	19 (3%)	0	100	100
1	B	615/657 (94%)	598 (97%)	17 (3%)	0	100	100
All	All	1231/1314 (94%)	1195 (97%)	36 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	557/587 (95%)	554 (100%)	3 (0%)	81	82
1	B	556/587 (95%)	551 (99%)	5 (1%)	70	70
All	All	1113/1174 (95%)	1105 (99%)	8 (1%)	76	76

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	664	HIS
1	B	662	ASP
1	B	556	ASP
1	B	240	LYS
1	B	637	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	515	HIS
1	B	602	GLN
1	B	658	ASN
1	A	515	HIS
1	A	32	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

38 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	C	1	1,2	14,14,15	0.20	0	17,19,21	0.52	0
2	NAG	C	2	2	14,14,15	0.19	0	17,19,21	0.44	0
2	NAG	D	1	1,2	14,14,15	0.52	0	17,19,21	0.59	0
2	NAG	D	2	2	14,14,15	0.21	0	17,19,21	0.53	0
3	NAG	E	1	1,3	14,14,15	0.32	0	17,19,21	0.41	0
3	NAG	E	2	3	14,14,15	0.29	0	17,19,21	0.36	0
3	BMA	E	3	3	11,11,12	0.47	0	15,15,17	0.79	0
3	MAN	E	4	3	11,11,12	0.64	0	15,15,17	0.81	0
3	MAN	E	5	3	11,11,12	0.78	0	15,15,17	0.95	2 (13%)
3	MAN	E	6	3	11,11,12	0.91	0	15,15,17	0.94	2 (13%)
3	NAG	F	1	1,3	14,14,15	0.35	0	17,19,21	0.39	0
3	NAG	F	2	3	14,14,15	0.21	0	17,19,21	0.42	0
3	BMA	F	3	3	11,11,12	0.60	0	15,15,17	0.63	0
3	MAN	F	4	3	11,11,12	0.70	0	15,15,17	1.03	1 (6%)
3	MAN	F	5	3	11,11,12	0.81	0	15,15,17	0.96	1 (6%)
3	MAN	F	6	3	11,11,12	0.71	0	15,15,17	0.95	1 (6%)
2	NAG	G	1	1,2	14,14,15	0.25	0	17,19,21	0.47	0
2	NAG	G	2	2	14,14,15	0.29	0	17,19,21	0.40	0
4	NAG	H	1	1,4	14,14,15	0.30	0	17,19,21	0.44	0
4	NAG	H	2	4	14,14,15	0.30	0	17,19,21	0.39	0
4	BMA	H	3	4	11,11,12	0.62	0	15,15,17	0.75	0
4	MAN	H	4	4	11,11,12	0.70	0	15,15,17	1.09	2 (13%)
4	MAN	H	5	4	11,11,12	0.67	0	15,15,17	0.99	2 (13%)
4	MAN	H	6	4	11,11,12	0.71	0	15,15,17	1.04	1 (6%)
4	MAN	H	7	4	11,11,12	0.65	0	15,15,17	0.92	2 (13%)
4	MAN	H	8	4	11,11,12	0.73	0	15,15,17	0.92	2 (13%)
5	NAG	I	1	1,5	14,14,15	0.16	0	17,19,21	0.35	0
5	NAG	I	2	5	14,14,15	0.27	0	17,19,21	0.45	0
5	BMA	I	3	5	11,11,12	0.59	0	15,15,17	0.73	0
6	NAG	J	1	1,6	14,14,15	0.25	0	17,19,21	0.36	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	NAG	J	2	6	14,14,15	0.25	0	17,19,21	0.44	0
6	BMA	J	3	6	11,11,12	0.57	0	15,15,17	0.69	0
6	MAN	J	4	6	11,11,12	0.76	0	15,15,17	1.05	1 (6%)
6	MAN	J	5	6	11,11,12	0.72	0	15,15,17	0.95	2 (13%)
6	MAN	J	6	6	11,11,12	0.71	0	15,15,17	0.98	2 (13%)
6	MAN	J	7	6	11,11,12	0.67	0	15,15,17	1.00	2 (13%)
2	NAG	K	1	1,2	14,14,15	0.41	0	17,19,21	0.53	0
2	NAG	K	2	2	14,14,15	0.21	0	17,19,21	0.46	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
2	NAG	C	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	NAG	D	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
3	NAG	E	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	0/6/23/26	0/1/1/1
3	BMA	E	3	3	-	0/2/19/22	0/1/1/1
3	MAN	E	4	3	-	2/2/19/22	0/1/1/1
3	MAN	E	5	3	-	2/2/19/22	0/1/1/1
3	MAN	E	6	3	-	0/2/19/22	0/1/1/1
3	NAG	F	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	F	2	3	-	0/6/23/26	0/1/1/1
3	BMA	F	3	3	-	0/2/19/22	0/1/1/1
3	MAN	F	4	3	-	2/2/19/22	0/1/1/1
3	MAN	F	5	3	-	1/2/19/22	0/1/1/1
3	MAN	F	6	3	-	0/2/19/22	0/1/1/1
2	NAG	G	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	G	2	2	-	0/6/23/26	0/1/1/1
4	NAG	H	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	H	2	4	-	0/6/23/26	0/1/1/1
4	BMA	H	3	4	-	0/2/19/22	0/1/1/1
4	MAN	H	4	4	-	0/2/19/22	0/1/1/1
4	MAN	H	5	4	-	0/2/19/22	0/1/1/1
4	MAN	H	6	4	-	0/2/19/22	0/1/1/1
4	MAN	H	7	4	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	MAN	H	8	4	-	0/2/19/22	0/1/1/1
5	NAG	I	1	1,5	-	0/6/23/26	0/1/1/1
5	NAG	I	2	5	-	0/6/23/26	0/1/1/1
5	BMA	I	3	5	-	2/2/19/22	0/1/1/1
6	NAG	J	1	1,6	-	2/6/23/26	0/1/1/1
6	NAG	J	2	6	-	0/6/23/26	0/1/1/1
6	BMA	J	3	6	-	0/2/19/22	0/1/1/1
6	MAN	J	4	6	-	0/2/19/22	0/1/1/1
6	MAN	J	5	6	-	2/2/19/22	0/1/1/1
6	MAN	J	6	6	-	1/2/19/22	0/1/1/1
6	MAN	J	7	6	-	0/2/19/22	0/1/1/1
2	NAG	K	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	K	2	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	4	MAN	C1-O5-C5	2.88	116.05	112.19
4	H	6	MAN	C1-O5-C5	2.82	115.97	112.19
6	J	7	MAN	C1-O5-C5	2.66	115.76	112.19
6	J	4	MAN	C1-O5-C5	2.60	115.67	112.19
3	F	4	MAN	C1-O5-C5	2.52	115.56	112.19

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	5	MAN	O5-C5-C6-O6
3	E	5	MAN	C4-C5-C6-O6
2	G	1	NAG	C8-C7-N2-C2
2	G	1	NAG	O7-C7-N2-C2
5	I	3	BMA	O5-C5-C6-O6

There are no ring outliers.

6 monomers are involved in 5 short contacts:

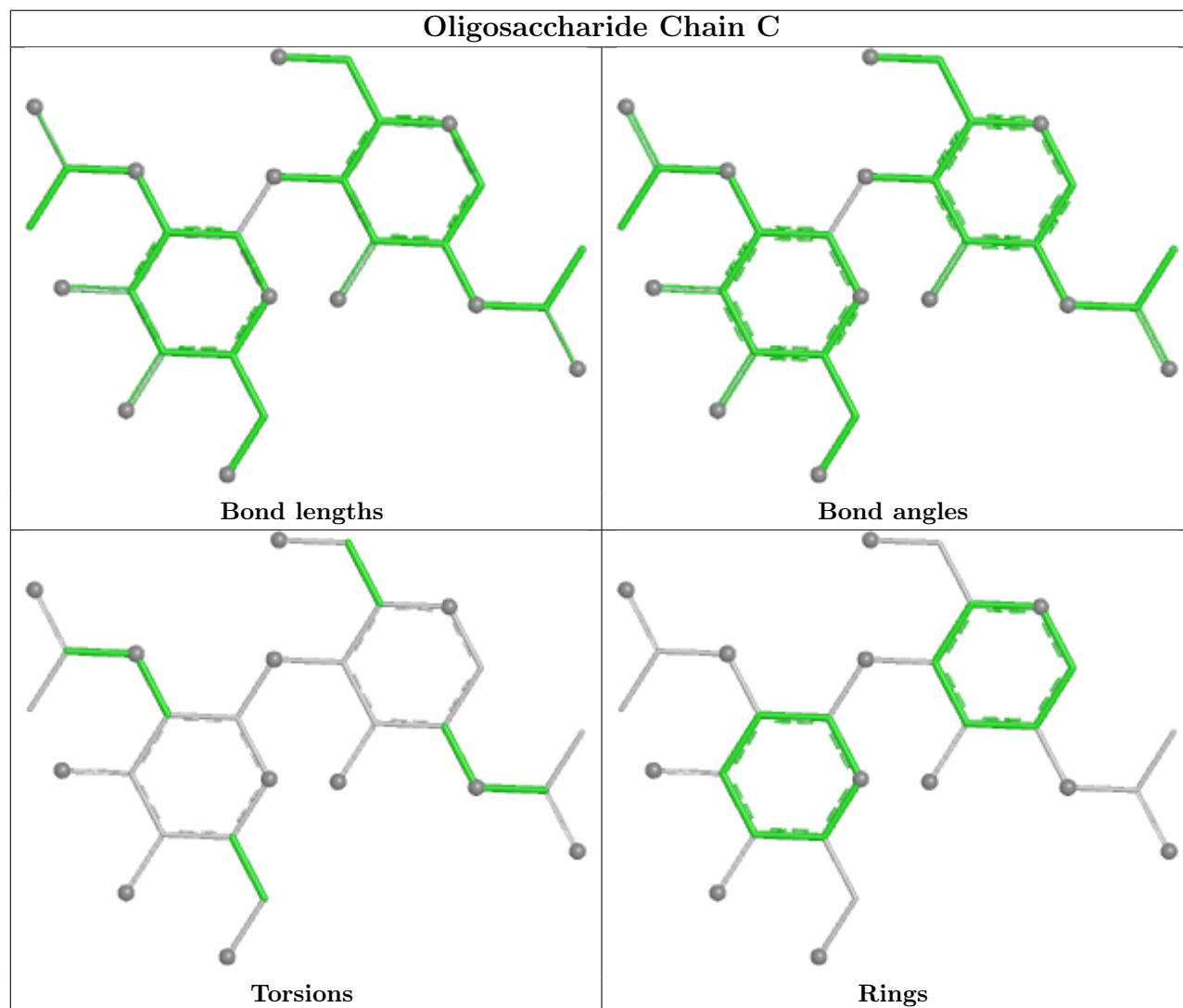
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	I	3	BMA	1	0
3	E	6	MAN	1	0

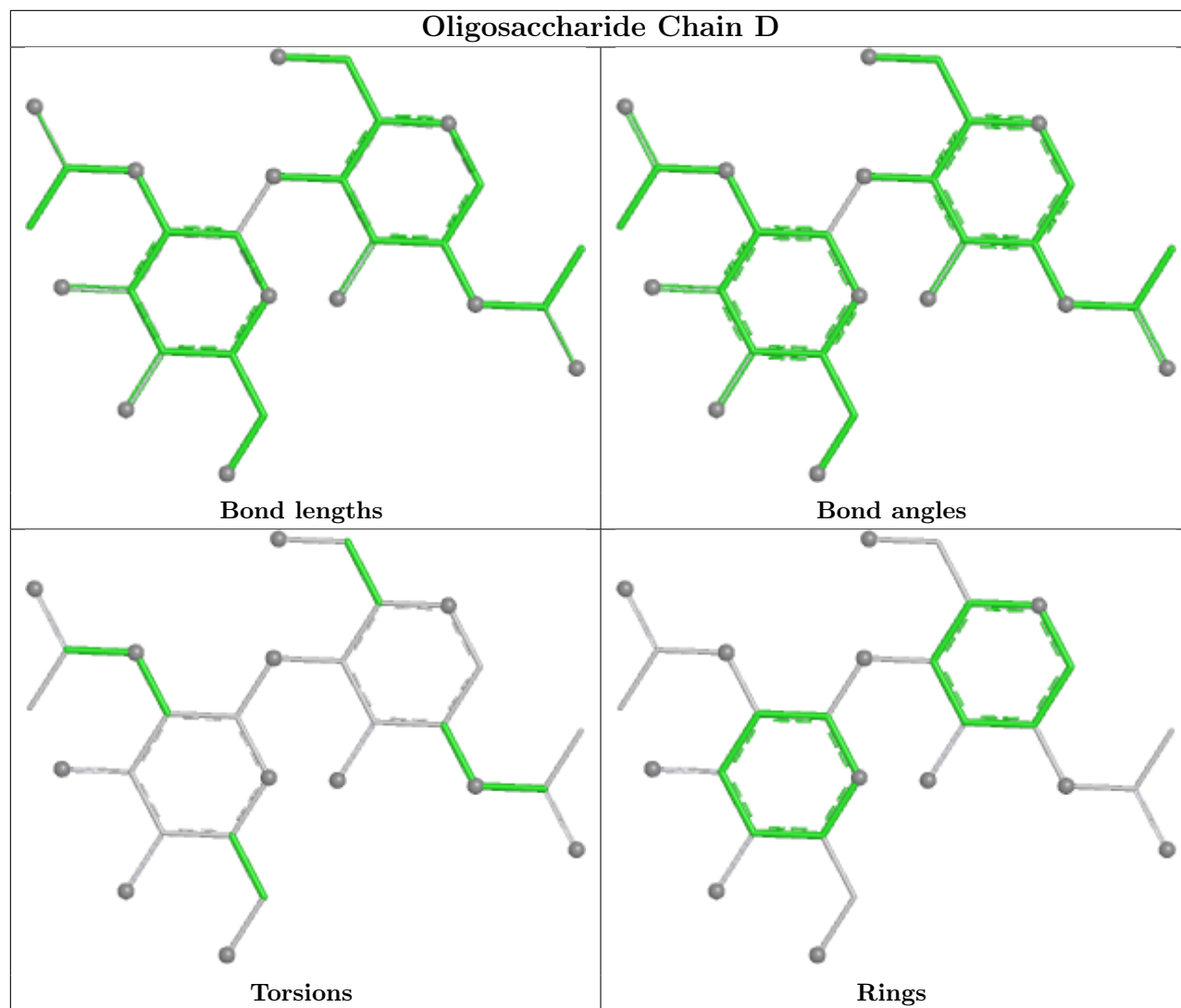
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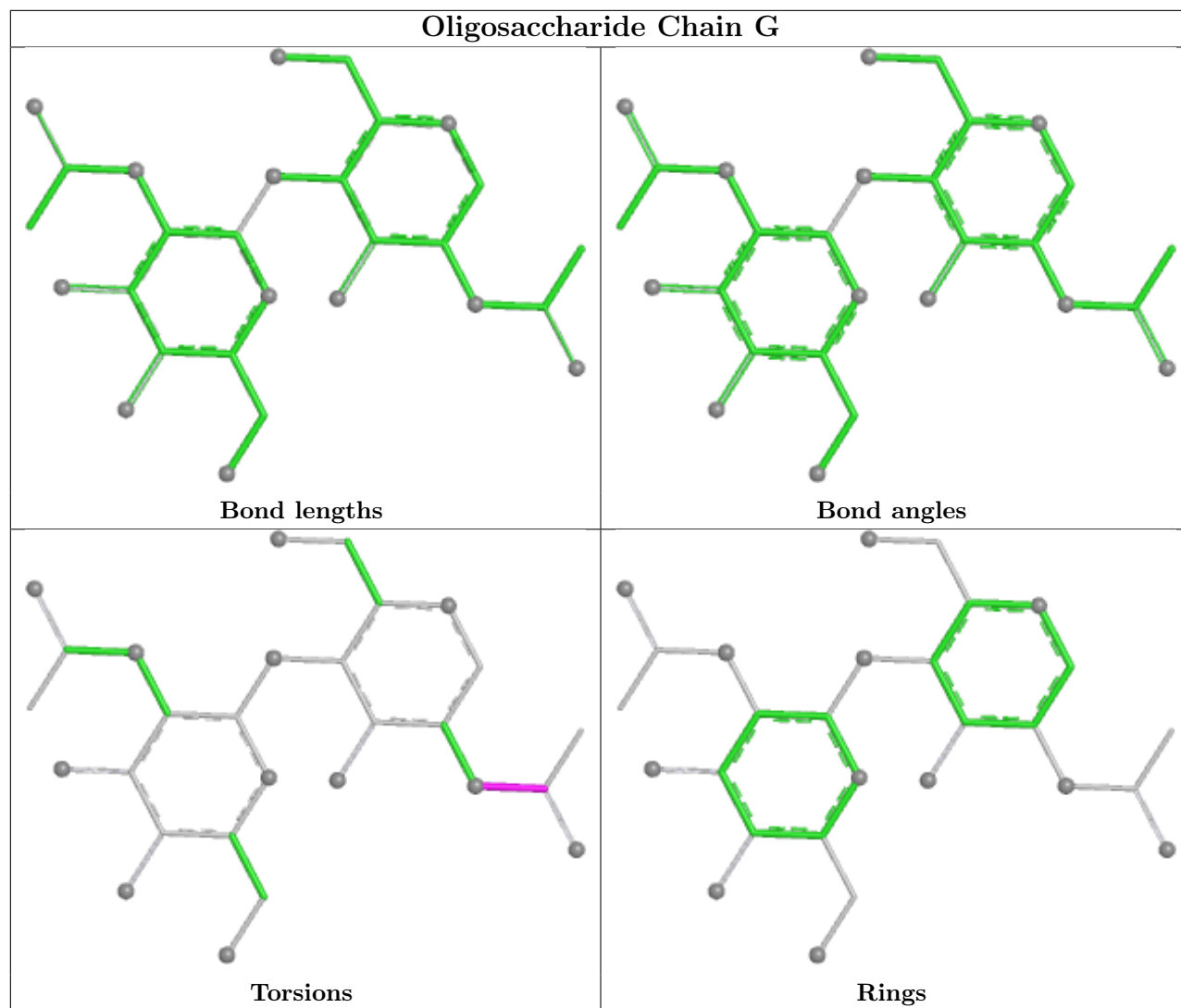
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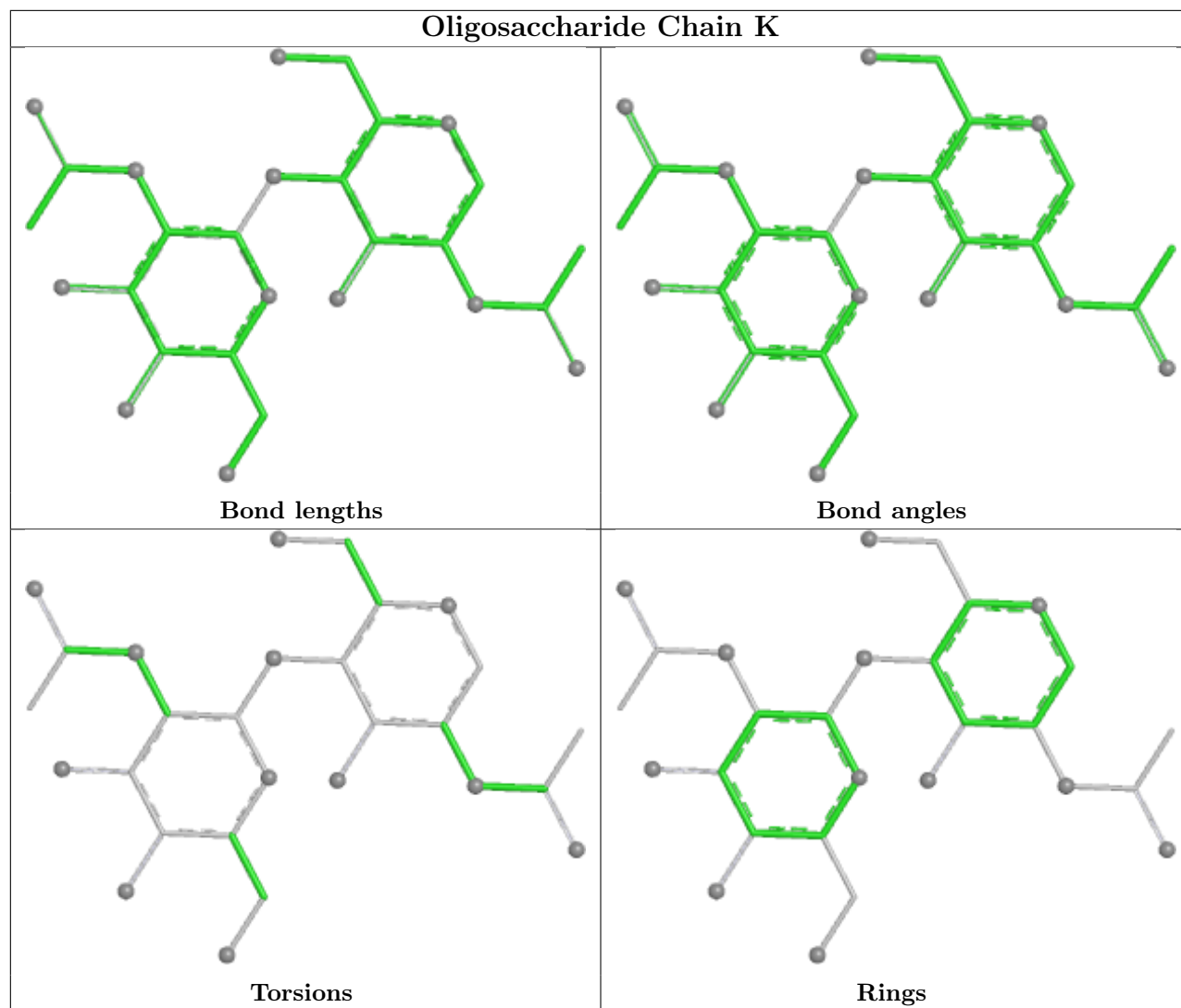
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	4	MAN	1	0
3	E	5	MAN	1	0
5	I	1	NAG	1	0
3	F	4	MAN	1	0

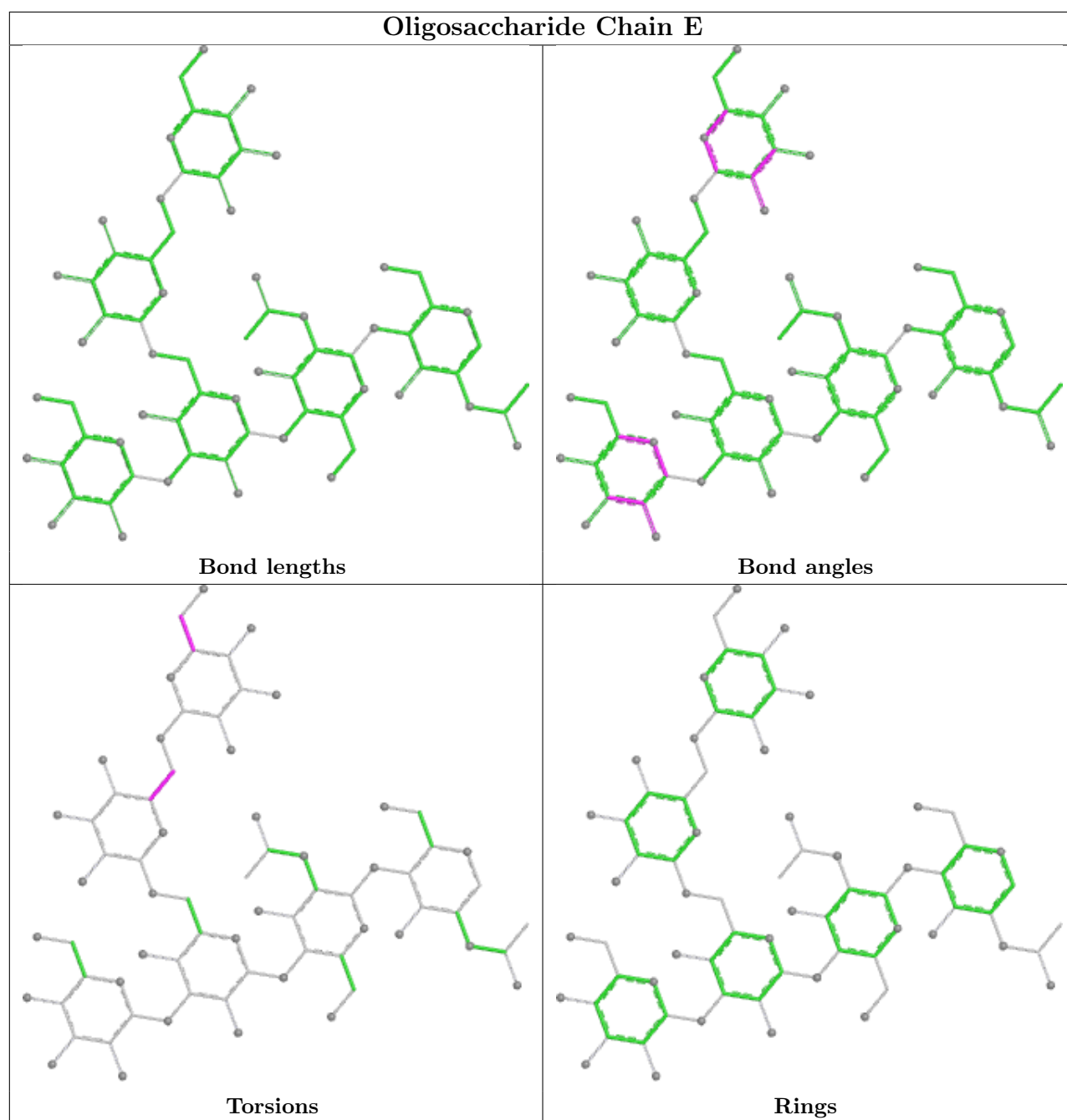
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

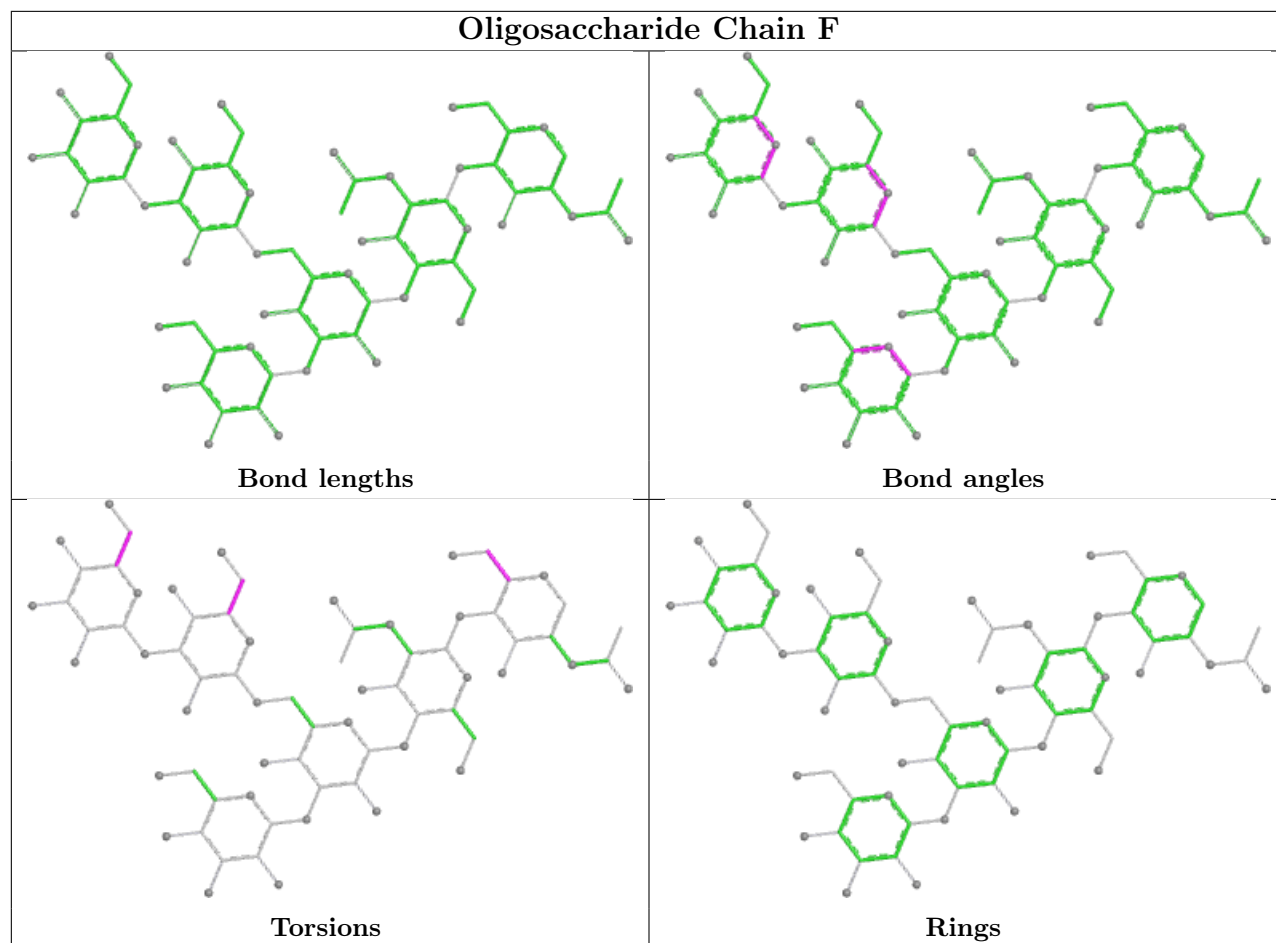


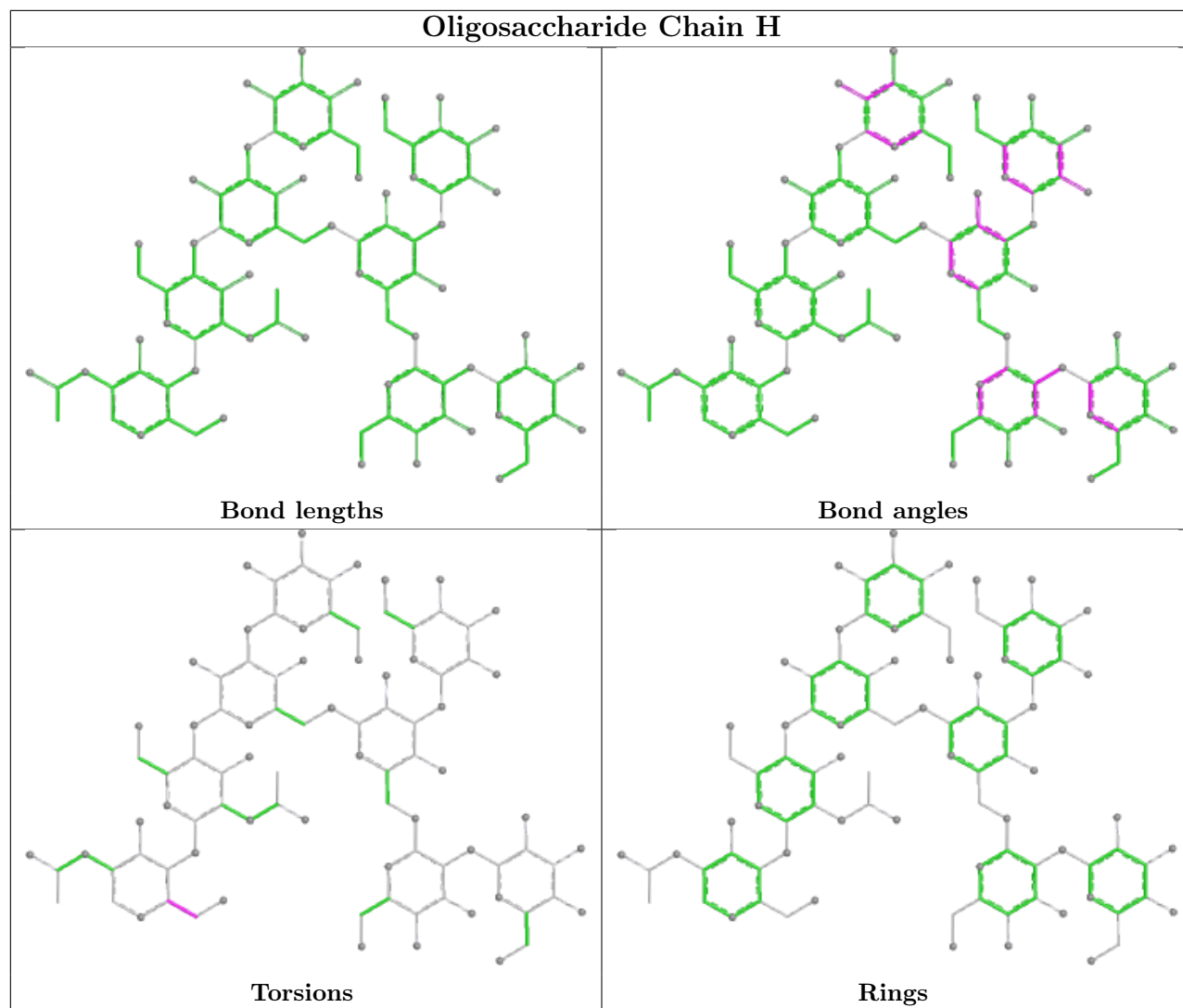


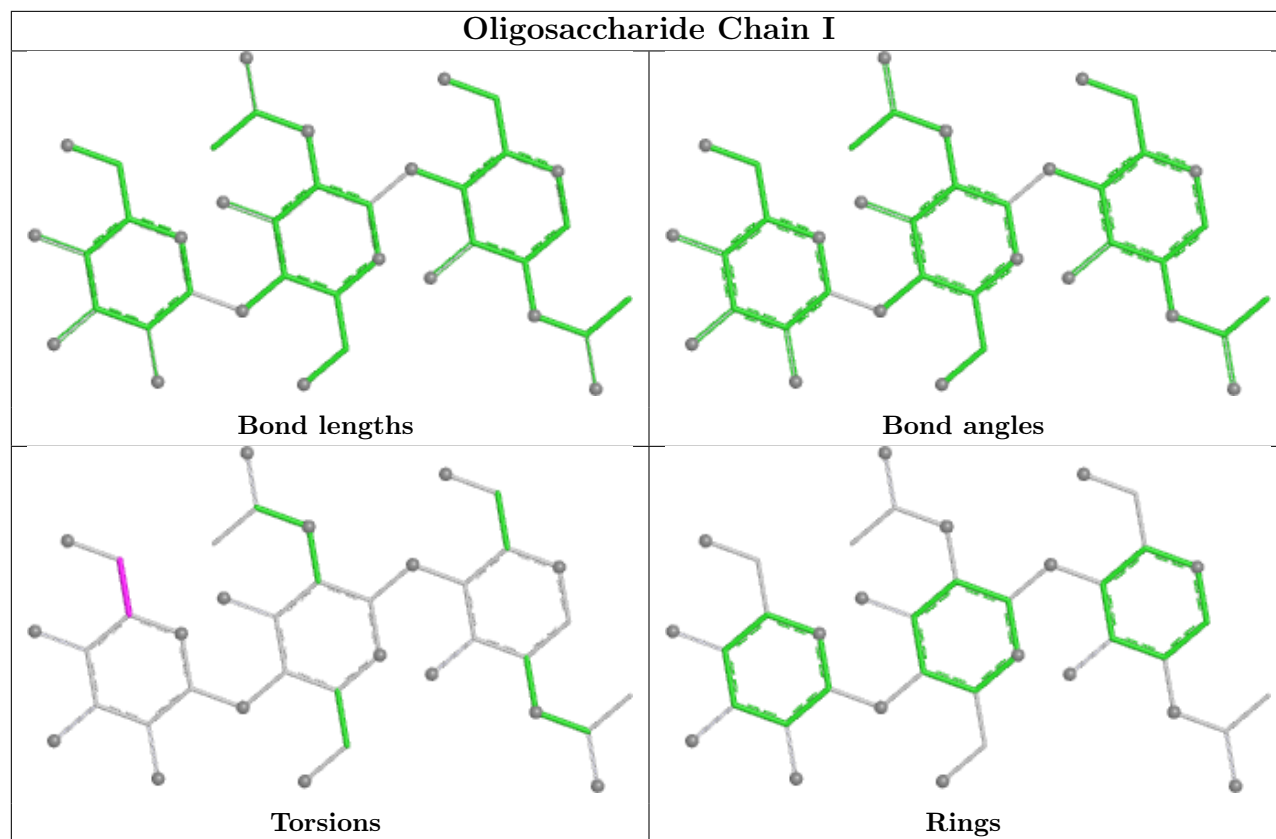


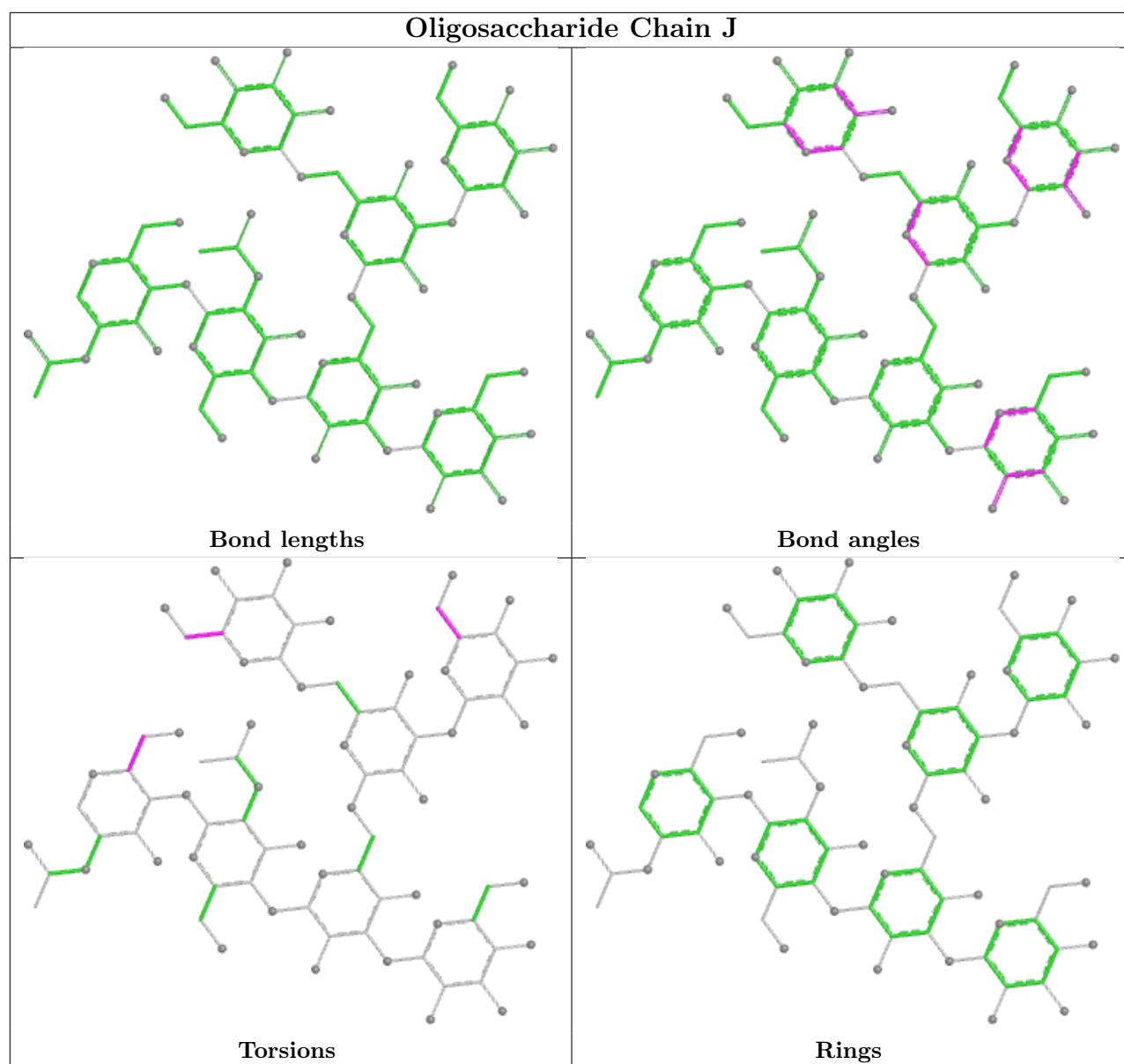












5.6 Ligand geometry [i](#)

Of 24 ligands modelled in this entry, 4 are monoatomic - leaving 20 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
8	EDO	A	721	-	3,3,3	0.42	0	2,2,2	0.34	0
8	EDO	B	726	-	3,3,3	0.42	0	2,2,2	0.31	0
8	EDO	A	727	-	3,3,3	0.41	0	2,2,2	0.39	0
8	EDO	A	720	-	3,3,3	0.46	0	2,2,2	0.31	0
8	EDO	A	725	-	3,3,3	0.38	0	2,2,2	0.36	0
8	EDO	A	723	-	3,3,3	0.45	0	2,2,2	0.35	0
8	EDO	B	730	-	3,3,3	0.42	0	2,2,2	0.26	0
8	EDO	A	728	-	3,3,3	0.42	0	2,2,2	0.30	0
7	NAG	A	717	1	14,14,15	0.28	0	17,19,21	0.42	0
8	EDO	A	726	-	3,3,3	0.41	0	2,2,2	0.22	0
8	EDO	A	724	-	3,3,3	0.49	0	2,2,2	0.25	0
8	EDO	B	729	-	3,3,3	0.33	0	2,2,2	0.44	0
8	EDO	B	725	-	3,3,3	0.41	0	2,2,2	0.36	0
8	EDO	B	728	-	3,3,3	0.44	0	2,2,2	0.40	0
8	EDO	A	722	-	3,3,3	0.48	0	2,2,2	0.19	0
8	EDO	B	724	-	3,3,3	0.45	0	2,2,2	0.36	0
8	EDO	B	727	-	3,3,3	0.42	0	2,2,2	0.46	0
7	NAG	B	721	1	14,14,15	0.24	0	17,19,21	0.45	0
8	EDO	A	718	-	3,3,3	0.38	0	2,2,2	0.56	0
8	EDO	A	719	-	3,3,3	0.43	0	2,2,2	0.44	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
8	EDO	A	721	-	-	1/1/1/1	-
8	EDO	B	726	-	-	0/1/1/1	-
8	EDO	A	727	-	-	0/1/1/1	-
8	EDO	A	720	-	-	0/1/1/1	-
8	EDO	A	725	-	-	1/1/1/1	-
8	EDO	A	723	-	-	0/1/1/1	-
8	EDO	B	730	-	-	0/1/1/1	-
8	EDO	A	728	-	-	1/1/1/1	-
7	NAG	A	717	1	-	2/6/23/26	0/1/1/1
8	EDO	A	726	-	-	0/1/1/1	-
8	EDO	A	724	-	-	0/1/1/1	-
8	EDO	B	729	-	-	1/1/1/1	-
8	EDO	B	725	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	EDO	B	728	-	-	0/1/1/1	-
8	EDO	A	722	-	-	1/1/1/1	-
8	EDO	B	724	-	-	0/1/1/1	-
8	EDO	B	727	-	-	0/1/1/1	-
7	NAG	B	721	1	-	2/6/23/26	0/1/1/1
8	EDO	A	718	-	-	1/1/1/1	-
8	EDO	A	719	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	721	NAG	O5-C5-C6-O6
7	A	717	NAG	O5-C5-C6-O6
7	B	721	NAG	C4-C5-C6-O6
7	A	717	NAG	C4-C5-C6-O6
8	A	725	EDO	O1-C1-C2-O2

There are no ring outliers.

9 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	721	EDO	1	0
8	B	726	EDO	3	0
8	A	727	EDO	1	0
8	A	725	EDO	3	0
8	A	728	EDO	2	0
8	A	726	EDO	3	0
8	A	724	EDO	1	0
8	B	729	EDO	1	0
8	A	718	EDO	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	620/657 (94%)	0.19	33 (5%) 32 37	17, 33, 65, 107	0
1	B	619/657 (94%)	0.39	40 (6%) 25 28	20, 40, 75, 122	0
All	All	1239/1314 (94%)	0.29	73 (5%) 28 32	17, 36, 71, 122	0

The worst 5 of 73 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	476	TYR	5.0
1	A	31	TRP	4.8
1	B	663	ALA	4.8
1	A	664	HIS	4.7
1	A	35	TYR	4.6

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	F	6	11/12	0.16	0.18	95,101,106,108	0
3	MAN	E	5	11/12	0.25	0.14	99,106,108,108	0
3	MAN	E	4	11/12	0.29	0.18	94,96,98,101	0
4	MAN	H	7	11/12	0.43	0.15	101,104,110,111	0
2	NAG	G	2	14/15	0.49	0.16	79,94,98,101	0

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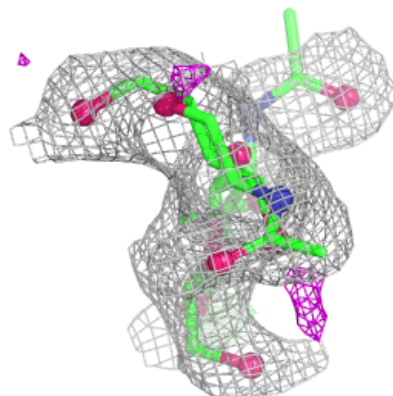
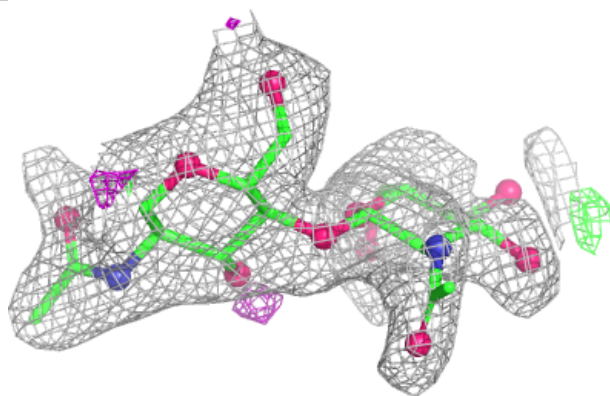
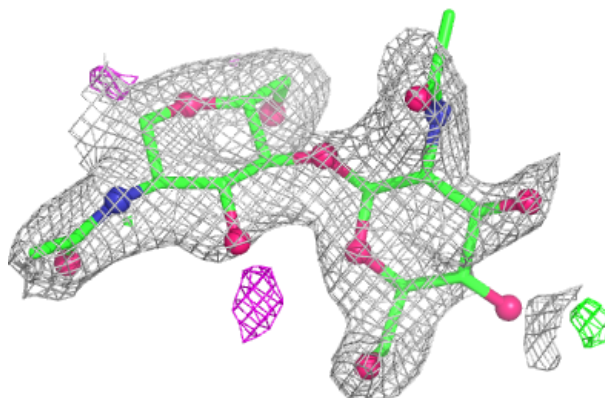
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	BMA	I	3	11/12	0.49	0.15	81,85,89,91	0
6	MAN	J	7	11/12	0.49	0.16	82,84,87,88	0
4	MAN	H	8	11/12	0.52	0.15	91,96,100,102	0
3	MAN	E	6	11/12	0.64	0.16	101,103,105,105	0
2	NAG	D	2	14/15	0.64	0.14	81,88,92,93	0
4	BMA	H	3	11/12	0.66	0.14	85,107,108,108	0
2	NAG	G	1	14/15	0.69	0.15	76,85,99,119	0
6	MAN	J	6	11/12	0.70	0.22	99,104,106,108	0
4	NAG	H	2	14/15	0.70	0.13	61,73,84,94	0
3	MAN	F	4	11/12	0.71	0.15	78,80,81,83	0
3	BMA	E	3	11/12	0.72	0.15	78,94,99,101	0
6	MAN	J	5	11/12	0.72	0.17	92,96,99,99	0
2	NAG	C	2	14/15	0.74	0.12	62,73,77,84	0
2	NAG	K	2	14/15	0.76	0.12	73,80,83,85	0
6	MAN	J	4	11/12	0.78	0.15	91,97,98,98	0
3	MAN	F	5	11/12	0.81	0.16	64,76,80,80	0
6	BMA	J	3	11/12	0.82	0.12	65,79,92,93	0
4	MAN	H	4	11/12	0.84	0.11	60,75,82,91	0
4	NAG	H	1	14/15	0.85	0.10	41,54,62,73	0
3	BMA	F	3	11/12	0.85	0.12	59,69,76,89	0
2	NAG	C	1	14/15	0.86	0.10	36,44,61,61	0
5	NAG	I	2	14/15	0.87	0.11	33,40,55,68	0
2	NAG	K	1	14/15	0.88	0.10	42,50,57,66	0
4	MAN	H	6	11/12	0.89	0.11	41,47,59,64	0
2	NAG	D	1	14/15	0.89	0.09	38,49,58,69	0
3	NAG	E	2	14/15	0.91	0.10	30,41,52,63	0
6	NAG	J	1	14/15	0.92	0.08	19,26,33,38	0
4	MAN	H	5	11/12	0.94	0.09	41,46,51,53	0
3	NAG	F	2	14/15	0.94	0.07	32,35,40,51	0
6	NAG	J	2	14/15	0.95	0.07	34,39,42,49	0
3	NAG	F	1	14/15	0.95	0.07	20,25,44,47	0
5	NAG	I	1	14/15	0.97	0.06	21,28,31,33	0
3	NAG	E	1	14/15	0.97	0.05	19,26,30,31	0

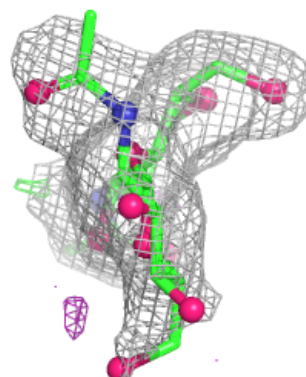
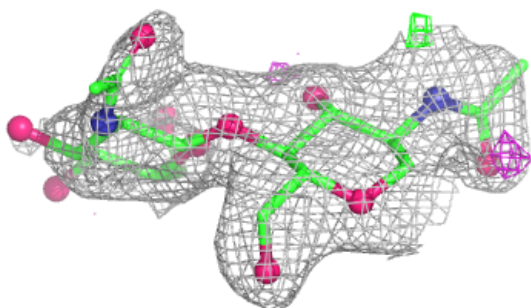
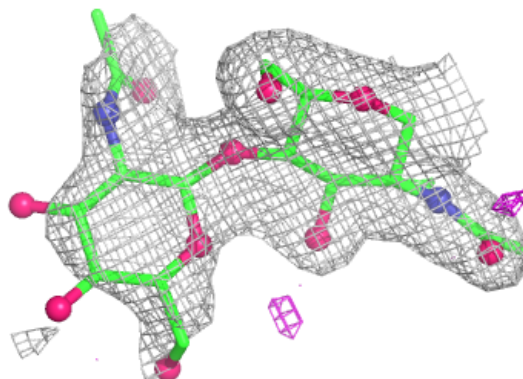
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain C:

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

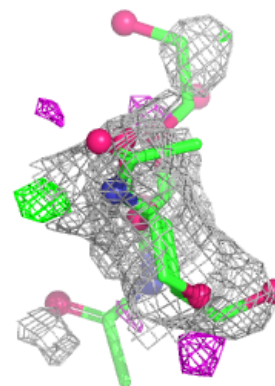
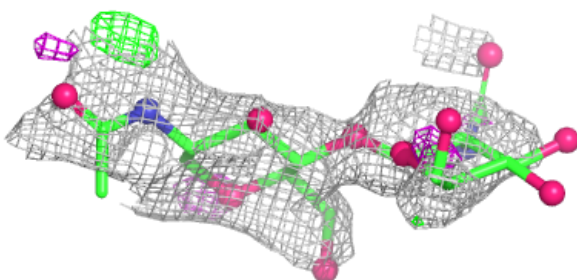
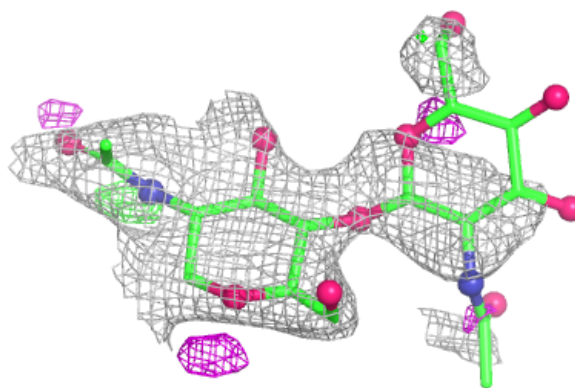
**Electron density around Chain D:**

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

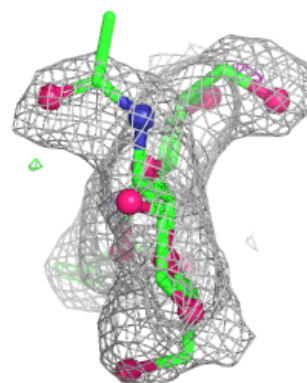
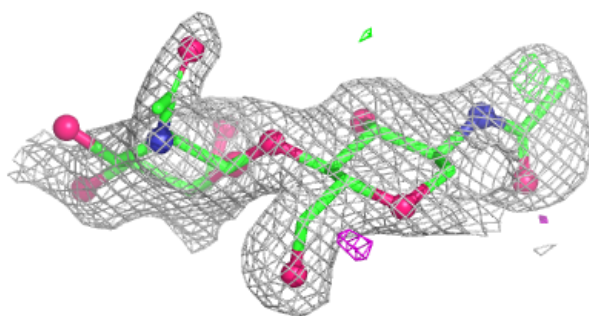
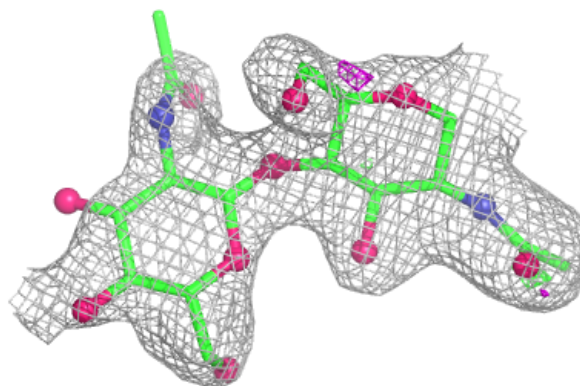


Electron density around Chain G:

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

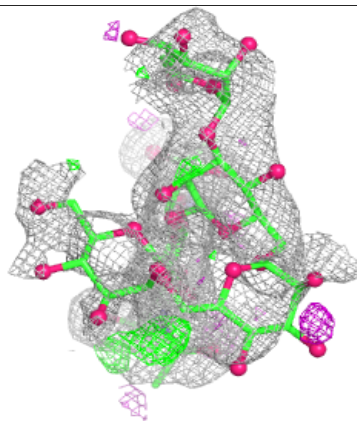
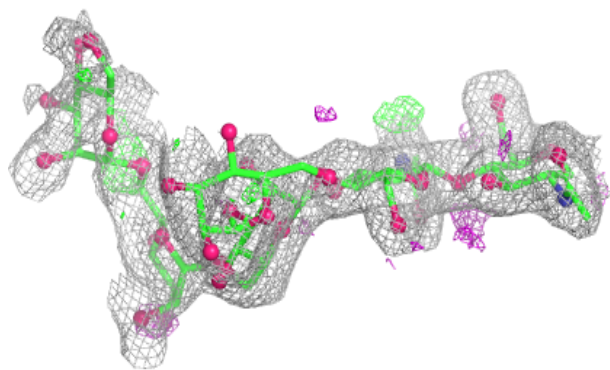
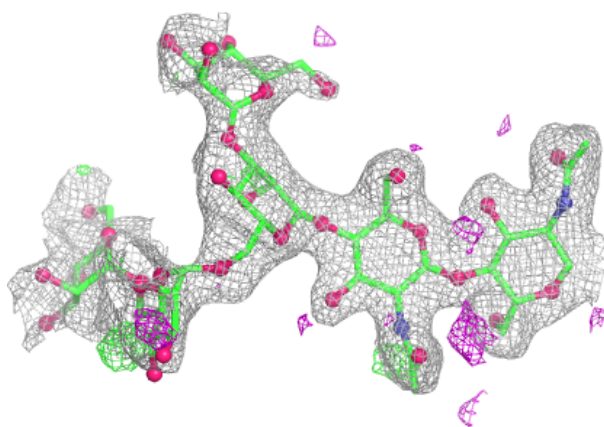
**Electron density around Chain K:**

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



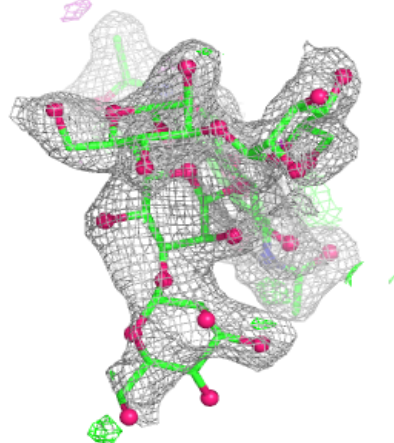
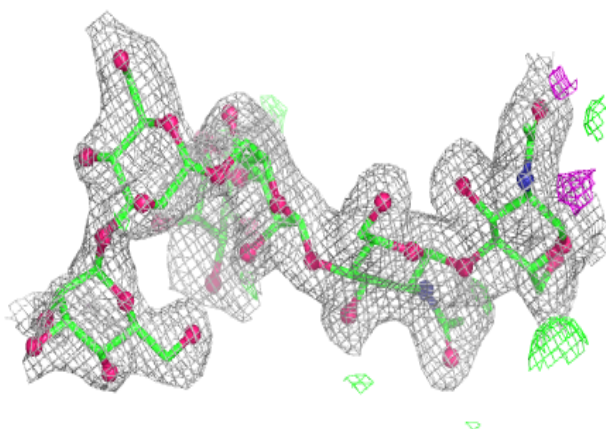
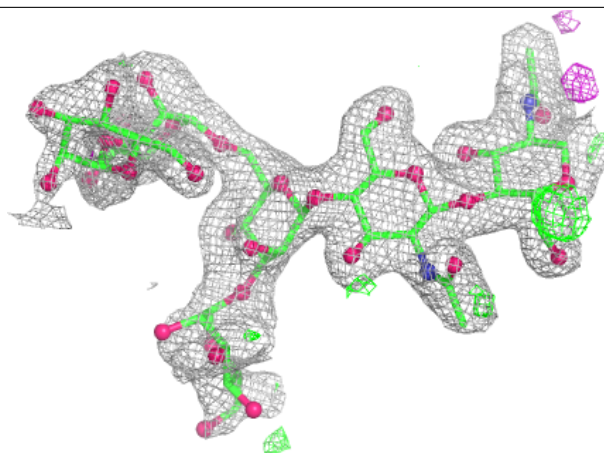
Electron density around Chain E:

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

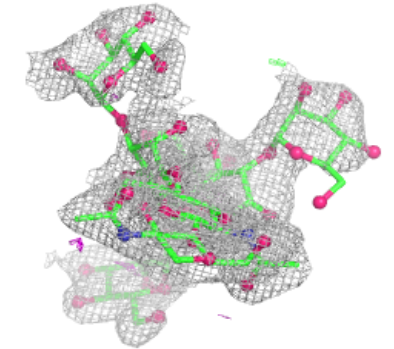
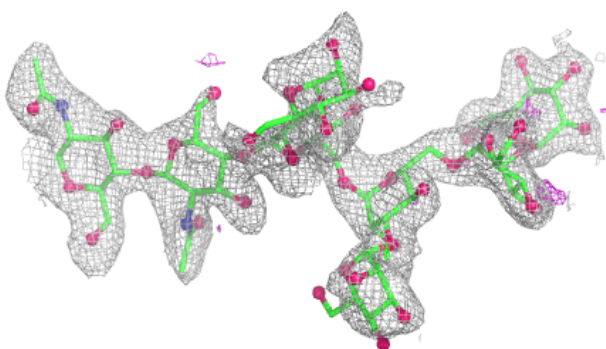
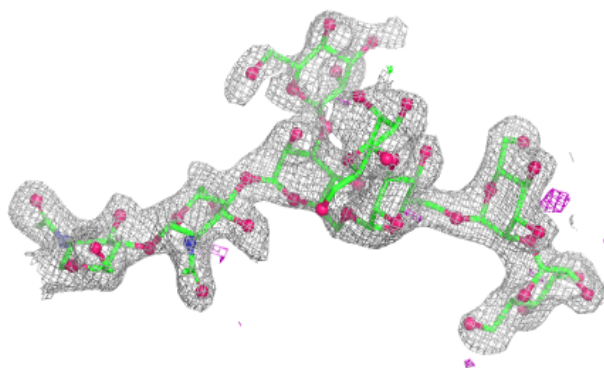


Electron density around Chain F:

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

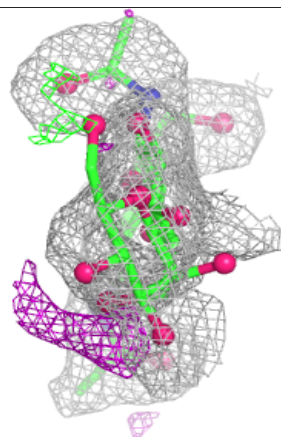
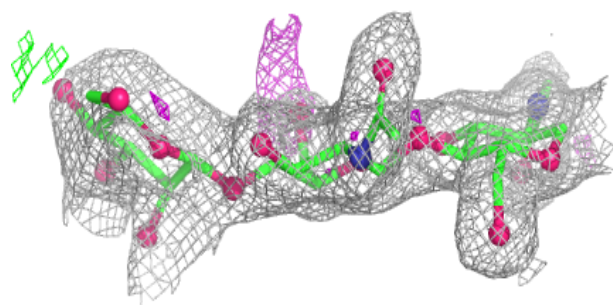
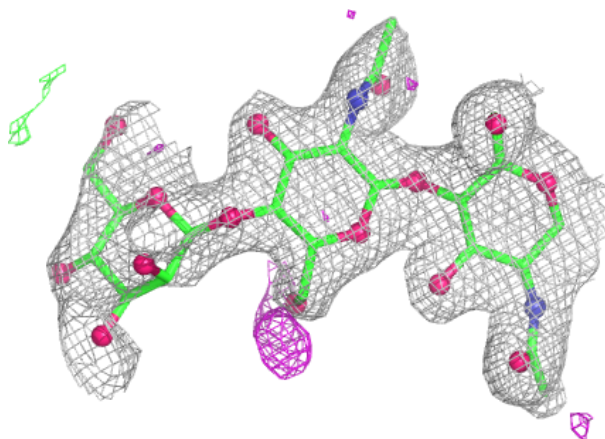
**Electron density around Chain H:**

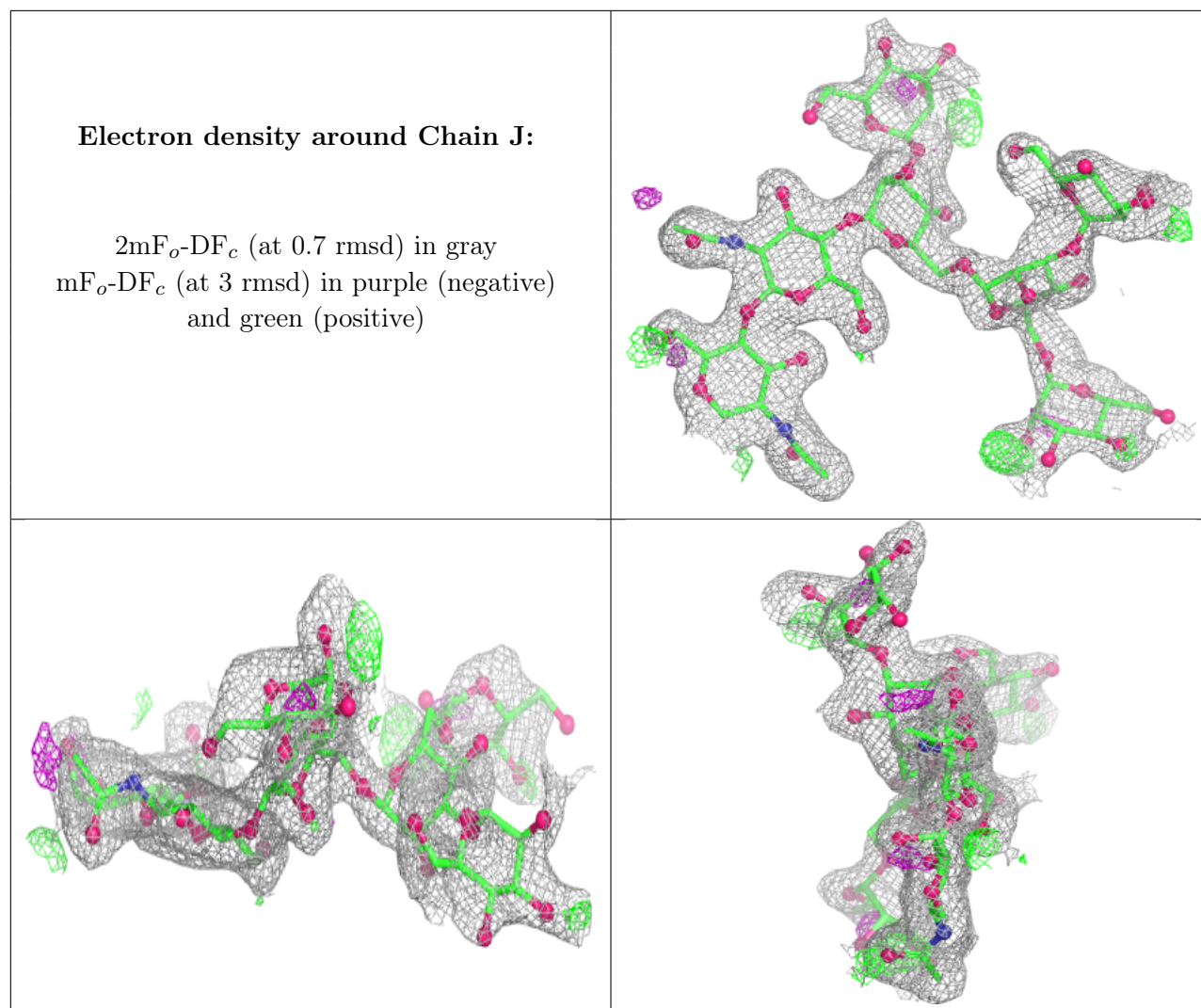
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



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)





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	B	721	14/15	0.72	0.13	64,77,81,81	0
8	EDO	A	724	4/4	0.80	0.22	42,49,53,55	0
7	NAG	A	717	14/15	0.82	0.13	45,60,69,70	0
8	EDO	A	727	4/4	0.82	0.14	42,46,53,63	0
8	EDO	A	728	4/4	0.82	0.17	54,56,60,61	0
8	EDO	A	718	4/4	0.84	0.14	29,35,36,39	0
8	EDO	A	722	4/4	0.90	0.12	33,40,42,47	0
8	EDO	A	725	4/4	0.90	0.24	29,32,33,34	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
8	EDO	B	728	4/4	0.90	0.09	37,39,42,46	0
8	EDO	B	730	4/4	0.90	0.12	44,44,48,53	0
9	CL	B	731	1/1	0.90	0.16	78,78,78,78	0
9	CL	B	732	1/1	0.90	0.30	89,89,89,89	0
8	EDO	A	726	4/4	0.91	0.16	45,48,49,50	0
8	EDO	B	727	4/4	0.92	0.14	50,51,54,56	0
8	EDO	B	729	4/4	0.93	0.20	23,27,33,33	0
8	EDO	B	726	4/4	0.93	0.29	49,51,51,52	0
8	EDO	A	721	4/4	0.94	0.14	33,34,36,47	0
8	EDO	B	724	4/4	0.95	0.08	31,37,40,44	0
8	EDO	A	719	4/4	0.95	0.08	32,34,34,38	0
8	EDO	B	725	4/4	0.96	0.07	23,30,32,35	0
9	CL	A	729	1/1	0.97	0.22	52,52,52,52	0
8	EDO	A	720	4/4	0.97	0.08	28,29,29,33	0
8	EDO	A	723	4/4	0.97	0.07	36,37,38,39	0
9	CL	A	730	1/1	0.98	0.07	43,43,43,43	0

6.5 Other polymers

There are no such residues in this entry.