



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 3, 2026 – 10:09 AM EDT

PDB ID : 9PLV / pdb_00009plv
Title : X-ray crystal structure of the beta-carotene oxygenase like g (BCOLg) from
Lancelet floridae
Authors : Uppal, S.; Govindarajan, G.; Poliakov, E.; Gittis, A.; Garboczi, D.
Deposited on : 2025-07-16
Resolution : 2.40 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 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

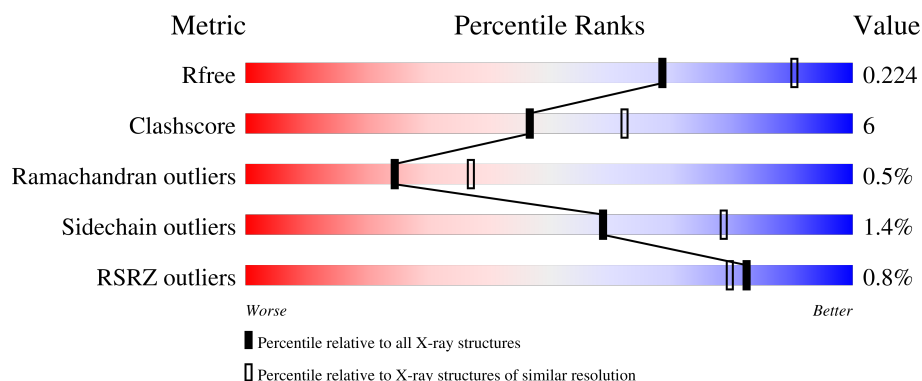
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	576	% 75% 11% 14%
1	B	576	% 75% 10% 14%
2	C	2	100%
2	D	2	50% 50%
2	E	2	50% 50%

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

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	EDO	B	615	-	-	X	-
7	ACT	B	620	-	-	X	-
8	PEG	A	626	-	-	X	-

2 Entry composition

There are 11 unique types of molecules in this entry. The entry contains 8269 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 Beta-carotene oxygenase like g (BCOLg).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	498	Total	C	N	O	S	0	1	0
			3815	2470	628	704	13			
1	B	493	Total	C	N	O	S	0	2	0
			3814	2476	621	705	12			

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	532	LYS	-	expression tag	UNP C3YQV9
A	533	GLY	-	expression tag	UNP C3YQV9
A	534	ASN	-	expression tag	UNP C3YQV9
A	535	SER	-	expression tag	UNP C3YQV9
A	536	ALA	-	expression tag	UNP C3YQV9
A	537	ASP	-	expression tag	UNP C3YQV9
A	538	ILE	-	expression tag	UNP C3YQV9
A	539	GLN	-	expression tag	UNP C3YQV9
A	540	HIS	-	expression tag	UNP C3YQV9
A	541	SER	-	expression tag	UNP C3YQV9
A	542	GLY	-	expression tag	UNP C3YQV9
A	543	GLY	-	expression tag	UNP C3YQV9
A	544	ARG	-	expression tag	UNP C3YQV9
A	545	SER	-	expression tag	UNP C3YQV9
A	546	SER	-	expression tag	UNP C3YQV9
A	547	LEU	-	expression tag	UNP C3YQV9
A	548	GLU	-	expression tag	UNP C3YQV9
A	549	GLY	-	expression tag	UNP C3YQV9
A	550	PRO	-	expression tag	UNP C3YQV9
A	551	ARG	-	expression tag	UNP C3YQV9
A	552	PHE	-	expression tag	UNP C3YQV9
A	553	GLU	-	expression tag	UNP C3YQV9
A	554	GLY	-	expression tag	UNP C3YQV9
A	555	LYS	-	expression tag	UNP C3YQV9
A	556	PRO	-	expression tag	UNP C3YQV9

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Chain	Residue	Modelled	Actual	Comment	Reference
A	557	ILE	-	expression tag	UNP C3YQV9
A	558	PRO	-	expression tag	UNP C3YQV9
A	559	ASN	-	expression tag	UNP C3YQV9
A	560	PRO	-	expression tag	UNP C3YQV9
A	561	LEU	-	expression tag	UNP C3YQV9
A	562	LEU	-	expression tag	UNP C3YQV9
A	563	GLY	-	expression tag	UNP C3YQV9
A	564	LEU	-	expression tag	UNP C3YQV9
A	565	ASP	-	expression tag	UNP C3YQV9
A	566	SER	-	expression tag	UNP C3YQV9
A	567	THR	-	expression tag	UNP C3YQV9
A	568	ARG	-	expression tag	UNP C3YQV9
A	569	THR	-	expression tag	UNP C3YQV9
A	570	GLY	-	expression tag	UNP C3YQV9
A	571	HIS	-	expression tag	UNP C3YQV9
A	572	HIS	-	expression tag	UNP C3YQV9
A	573	HIS	-	expression tag	UNP C3YQV9
A	574	HIS	-	expression tag	UNP C3YQV9
A	575	HIS	-	expression tag	UNP C3YQV9
A	576	HIS	-	expression tag	UNP C3YQV9
B	532	LYS	-	expression tag	UNP C3YQV9
B	533	GLY	-	expression tag	UNP C3YQV9
B	534	ASN	-	expression tag	UNP C3YQV9
B	535	SER	-	expression tag	UNP C3YQV9
B	536	ALA	-	expression tag	UNP C3YQV9
B	537	ASP	-	expression tag	UNP C3YQV9
B	538	ILE	-	expression tag	UNP C3YQV9
B	539	GLN	-	expression tag	UNP C3YQV9
B	540	HIS	-	expression tag	UNP C3YQV9
B	541	SER	-	expression tag	UNP C3YQV9
B	542	GLY	-	expression tag	UNP C3YQV9
B	543	GLY	-	expression tag	UNP C3YQV9
B	544	ARG	-	expression tag	UNP C3YQV9
B	545	SER	-	expression tag	UNP C3YQV9
B	546	SER	-	expression tag	UNP C3YQV9
B	547	LEU	-	expression tag	UNP C3YQV9
B	548	GLU	-	expression tag	UNP C3YQV9
B	549	GLY	-	expression tag	UNP C3YQV9
B	550	PRO	-	expression tag	UNP C3YQV9
B	551	ARG	-	expression tag	UNP C3YQV9
B	552	PHE	-	expression tag	UNP C3YQV9
B	553	GLU	-	expression tag	UNP C3YQV9

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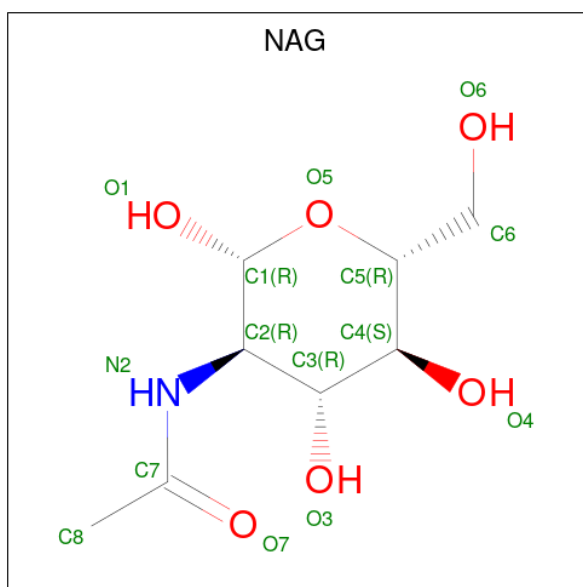
Chain	Residue	Modelled	Actual	Comment	Reference
B	554	GLY	-	expression tag	UNP C3YQV9
B	555	LYS	-	expression tag	UNP C3YQV9
B	556	PRO	-	expression tag	UNP C3YQV9
B	557	ILE	-	expression tag	UNP C3YQV9
B	558	PRO	-	expression tag	UNP C3YQV9
B	559	ASN	-	expression tag	UNP C3YQV9
B	560	PRO	-	expression tag	UNP C3YQV9
B	561	LEU	-	expression tag	UNP C3YQV9
B	562	LEU	-	expression tag	UNP C3YQV9
B	563	GLY	-	expression tag	UNP C3YQV9
B	564	LEU	-	expression tag	UNP C3YQV9
B	565	ASP	-	expression tag	UNP C3YQV9
B	566	SER	-	expression tag	UNP C3YQV9
B	567	THR	-	expression tag	UNP C3YQV9
B	568	ARG	-	expression tag	UNP C3YQV9
B	569	THR	-	expression tag	UNP C3YQV9
B	570	GLY	-	expression tag	UNP C3YQV9
B	571	HIS	-	expression tag	UNP C3YQV9
B	572	HIS	-	expression tag	UNP C3YQV9
B	573	HIS	-	expression tag	UNP C3YQV9
B	574	HIS	-	expression tag	UNP C3YQV9
B	575	HIS	-	expression tag	UNP C3YQV9
B	576	HIS	-	expression tag	UNP C3YQV9

- 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	E	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

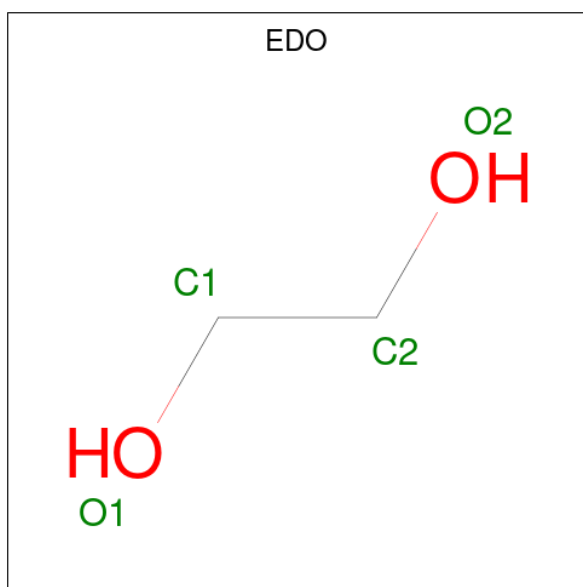
- Molecule 4 is FE (III) ION (CCD ID: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Fe	0	0
			1	1		
4	B	1	Total	Fe	0	0
			1	1		

- Molecule 5 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Na	0	0
			2	2		

- Molecule 6 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



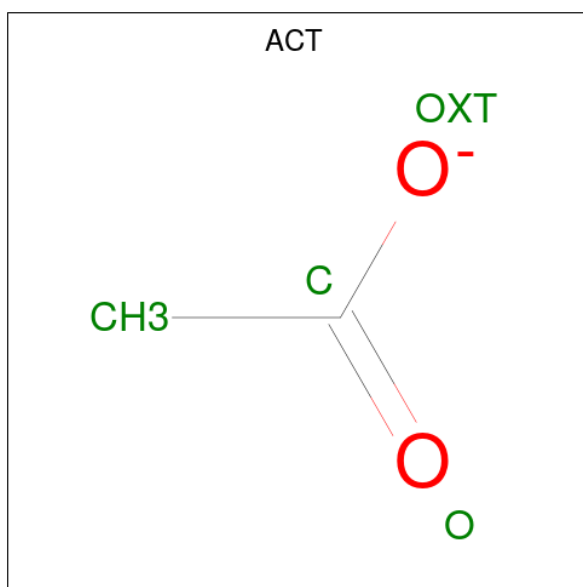
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total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

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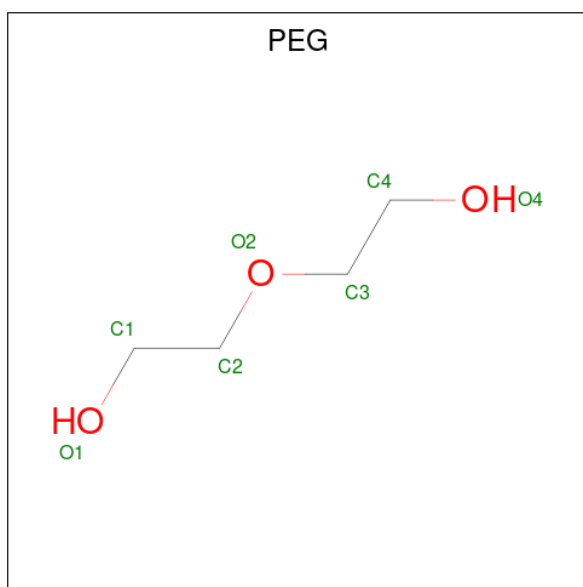
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			4	2	2		
6	A	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total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

- Molecule 7 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



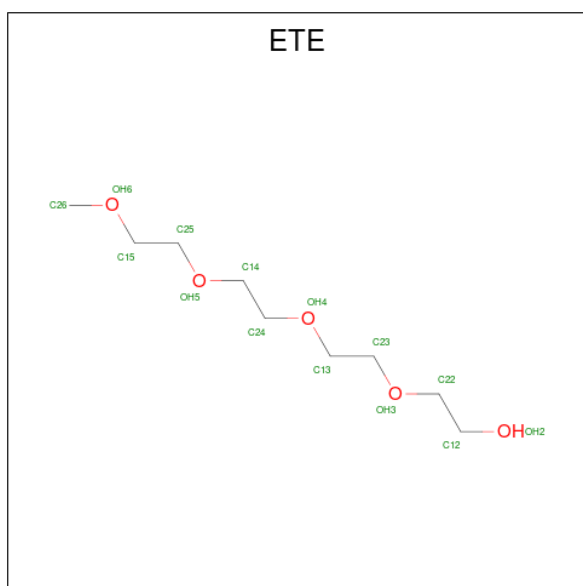
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 8 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: C₄H₁₀O₃).



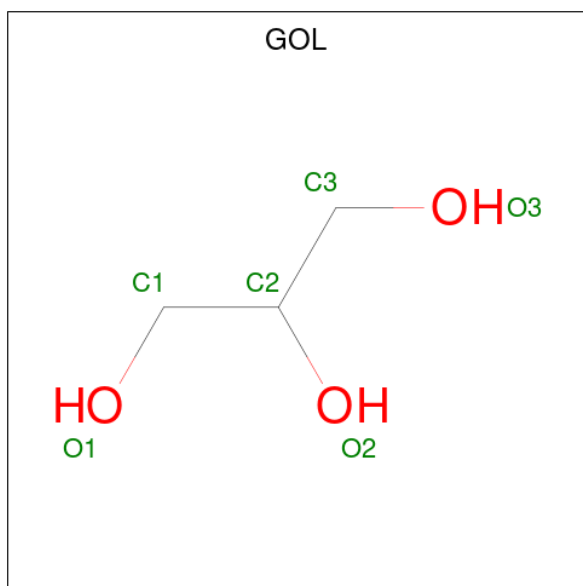
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			7	4	3		
8	B	1	Total	C	O	0	0
			7	4	3		
8	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 9 is 2-{2-[2-2-(METHOXY-ETHOXY)-ETHOXY]-ETHOXY}-ETHANOL (CCD ID: ETE) (formula: C₉H₂₀O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			14	9	5		

- Molecule 10 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

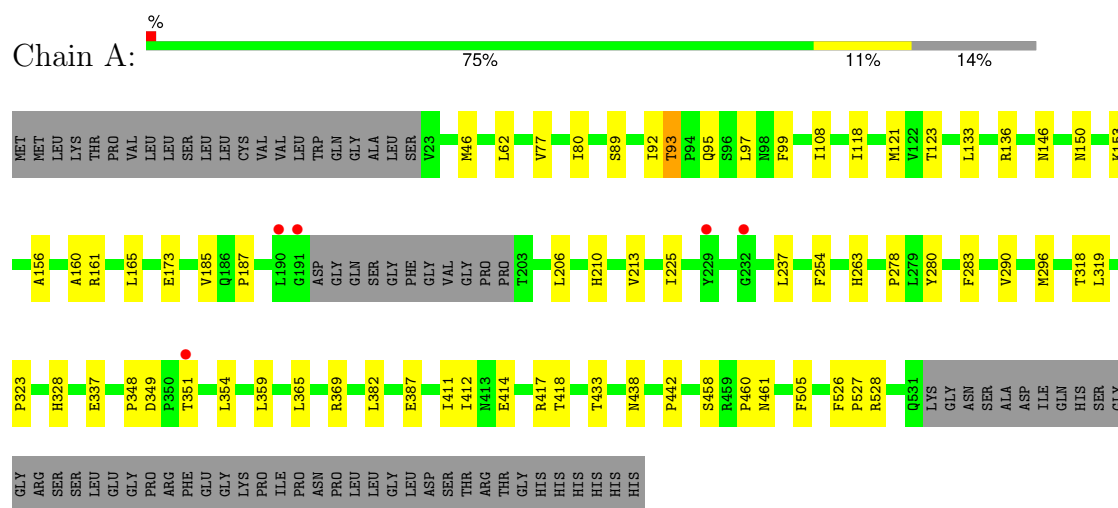
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	134	Total	O	0	3
			137	137		
11	B	137	Total	O	0	1
			138	138		

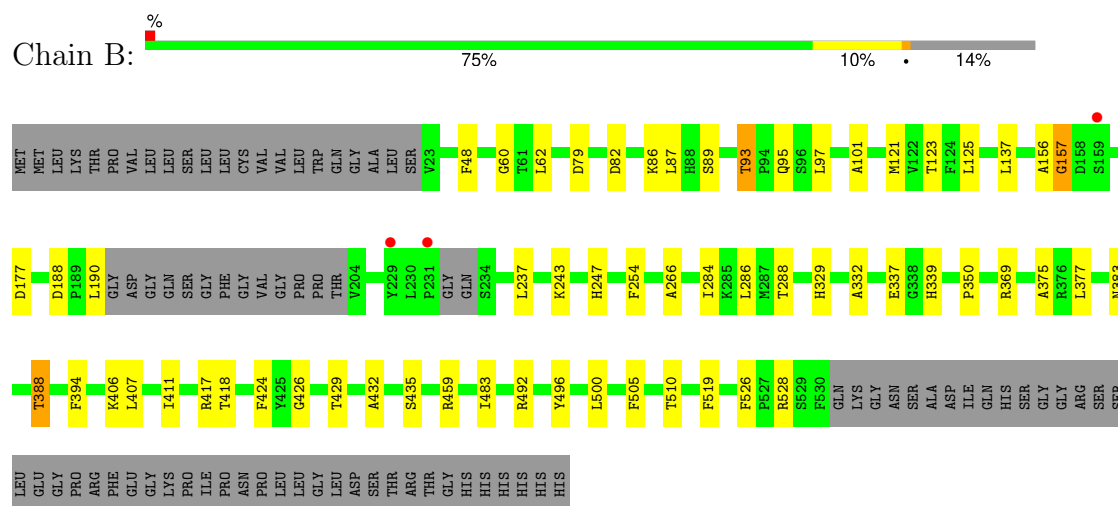
3 Residue-property plots [i](#)

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: Beta-carotene oxygenase like g (BCOLg)



- Molecule 1: Beta-carotene oxygenase like g (BCOLg)



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



MAG1
MAG2

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

Chain D:  50% 50%

MAG1
MAG2

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

Chain E:  50% 50%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	98.46Å 139.91Å 93.76Å 90.00° 98.26° 90.00°	Depositor
Resolution (Å)	24.56 – 2.40 24.56 – 2.40	Depositor EDS
% Data completeness (in resolution range)	98.2 (24.56-2.40) 98.1 (24.56-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.70 (at 2.41Å)	Xtriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, R_{free}	0.175 , 0.224 0.175 , 0.224	Depositor DCC
R_{free} test set	2000 reflections (4.16%)	wwPDB-VP
Wilson B-factor (Å ²)	33.4	Xtriage
Anisotropy	0.250	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8269	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.20% 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: FE, PEG, EDO, GOL, ETE, NA, ACT, NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.38	0/3929	0.58	0/5369
1	B	0.38	0/3926	0.60	1/5364 (0.0%)
All	All	0.38	0/7855	0.59	1/10733 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	82	ASP	N-CA-C	-7.03	104.31	113.17

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	3815	0	3563	44	0
1	B	3814	0	3589	42	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
2	E	28	0	25	2	0
3	A	28	0	26	0	0
3	B	42	0	39	0	0
4	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	1	0	0	0	0
5	A	2	0	0	0	0
6	A	64	0	96	8	0
6	B	60	0	90	10	0
7	A	16	0	12	0	0
7	B	20	0	15	3	0
8	A	7	0	10	4	0
8	B	14	0	20	3	0
9	A	14	0	20	4	0
10	A	6	0	8	1	0
10	B	6	0	8	0	0
11	A	137	0	0	2	0
11	B	138	0	0	1	0
All	All	8269	0	7571	89	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

The worst 5 of 89 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:173:GLU:CB	6:A:621:EDO:H12	1.91	1.01
1:B:93:THR:HG22	1:B:95:GLN:H	1.31	0.96
1:A:161:ARG:CD	6:A:621:EDO:H22	2.03	0.89
1:B:329:HIS:HB3	6:B:615:EDO:H11	1.64	0.79
1:A:411:ILE:HD13	8:A:626:PEG:H11	1.66	0.76

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	495/576 (86%)	479 (97%)	14 (3%)	2 (0%)	30	43
1	B	489/576 (85%)	471 (96%)	15 (3%)	3 (1%)	21	32
All	All	984/1152 (85%)	950 (96%)	29 (3%)	5 (0%)	24	37

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	337	GLU
1	B	337	GLU
1	B	157	GLY
1	B	350	PRO
1	A	290	VAL

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	391/497 (79%)	385 (98%)	6 (2%)	57	77
1	B	397/497 (80%)	392 (99%)	5 (1%)	61	80
All	All	788/994 (79%)	777 (99%)	11 (1%)	59	79

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	137	LEU
1	B	388	THR
1	B	505	PHE
1	B	435	SER
1	A	382	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	186	GLN

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Mol	Chain	Res	Type
1	B	247	HIS
1	B	367	HIS

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 ⓘ

6 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	2,1	14,14,15	0.87	1 (7%)	17,19,21	1.18	1 (5%)
2	NAG	C	2	2	14,14,15	0.69	0	17,19,21	0.93	1 (5%)
2	NAG	D	1	2,1	14,14,15	0.75	0	17,19,21	0.88	0
2	NAG	D	2	2	14,14,15	0.70	0	17,19,21	1.34	1 (5%)
2	NAG	E	1	2,1	14,14,15	0.69	0	17,19,21	1.90	5 (29%)
2	NAG	E	2	2	14,14,15	0.73	0	17,19,21	0.97	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	2,1	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	D	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
2	NAG	E	1	2,1	-	1/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	NAG	O5-C1	-2.02	1.40	1.43

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	2	NAG	C1-O5-C5	4.12	117.71	112.19
2	E	1	NAG	C1-O5-C5	3.65	117.08	112.19
2	E	1	NAG	C1-C2-N2	3.60	116.10	110.43
2	E	1	NAG	C2-N2-C7	3.07	127.01	122.90
2	E	1	NAG	C4-C3-C2	2.96	115.36	111.02

There are no chirality outliers.

All (3) torsion outliers are listed below:

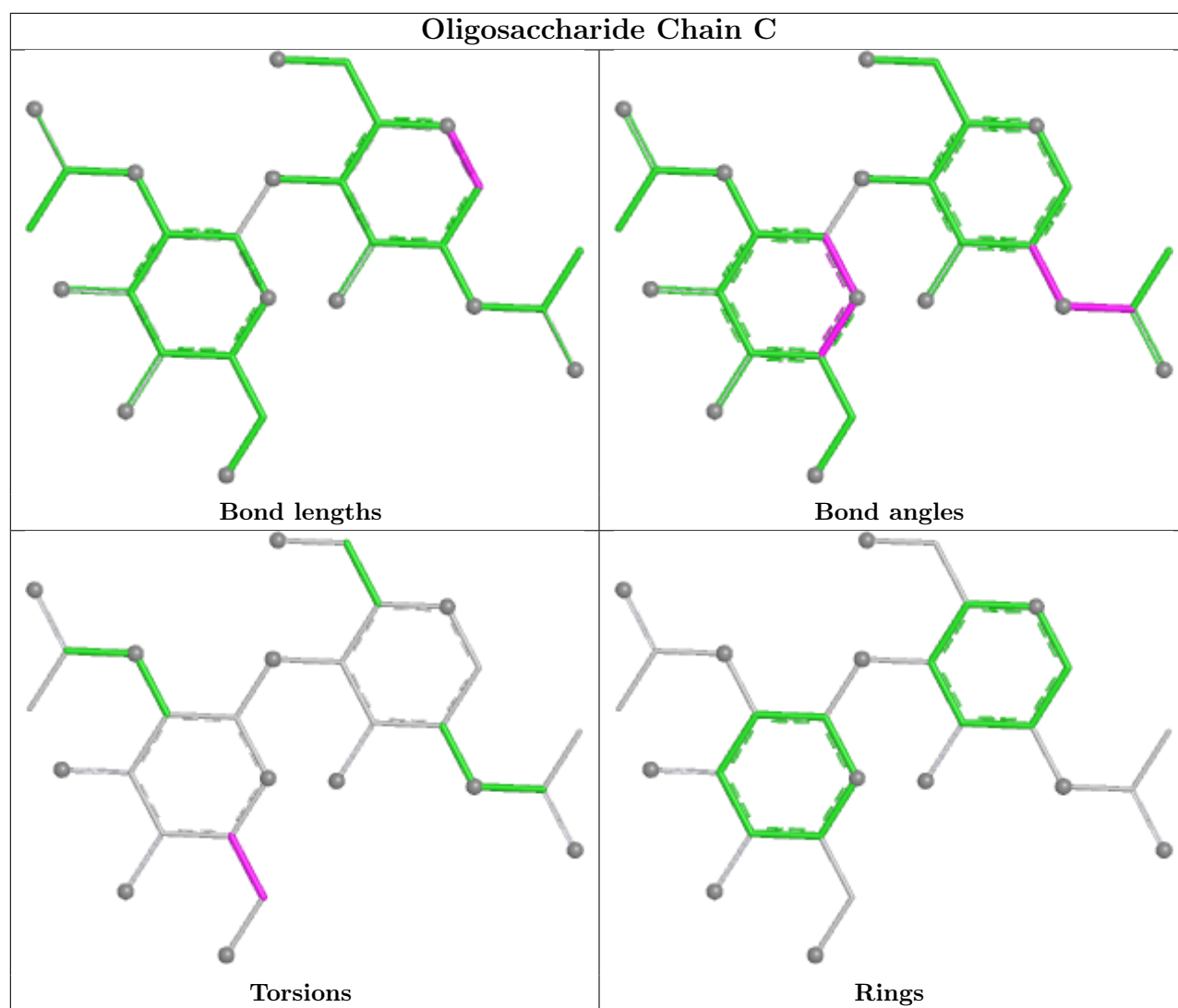
Mol	Chain	Res	Type	Atoms
2	C	2	NAG	O5-C5-C6-O6
2	E	1	NAG	C4-C5-C6-O6
2	C	2	NAG	C4-C5-C6-O6

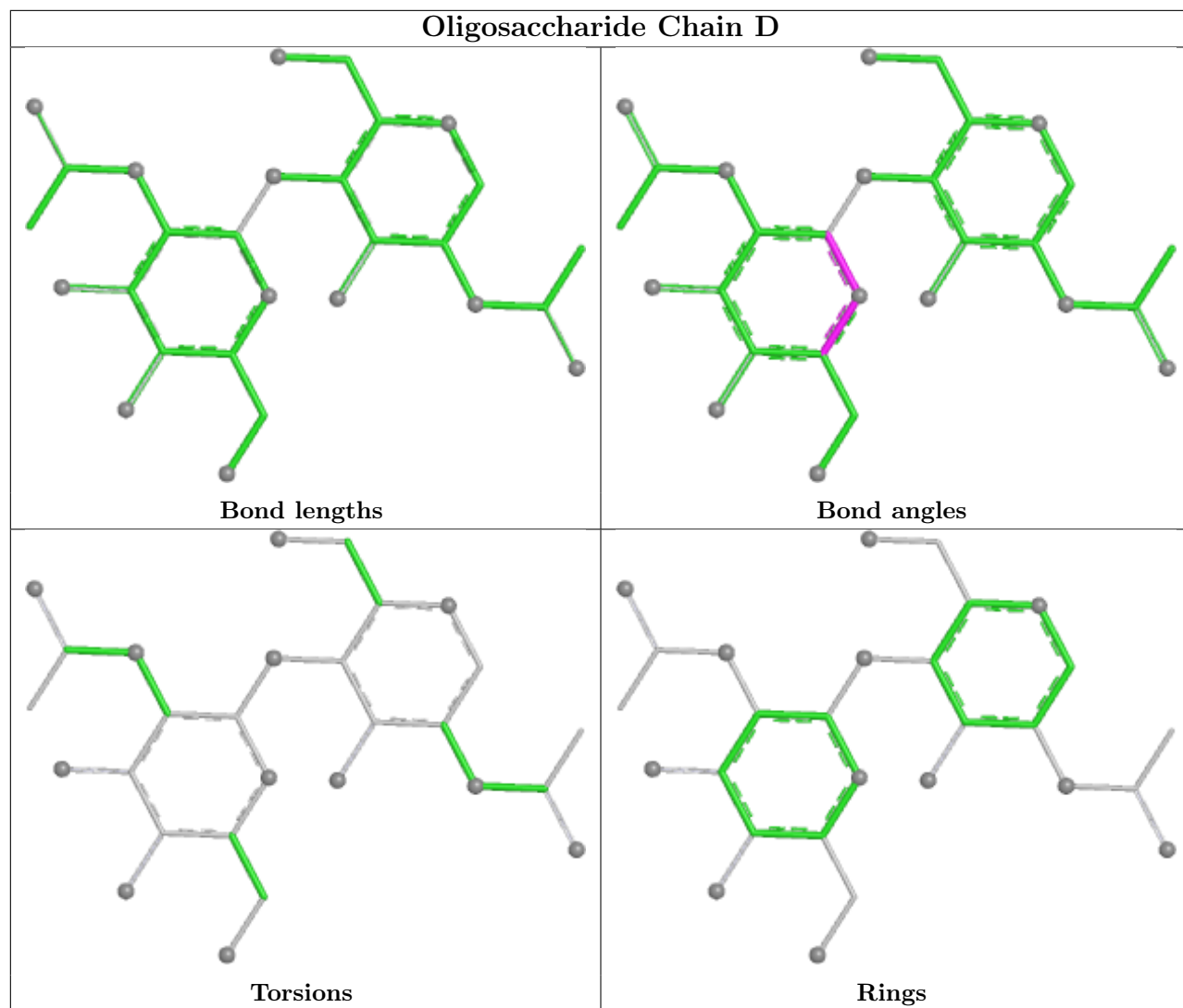
There are no ring outliers.

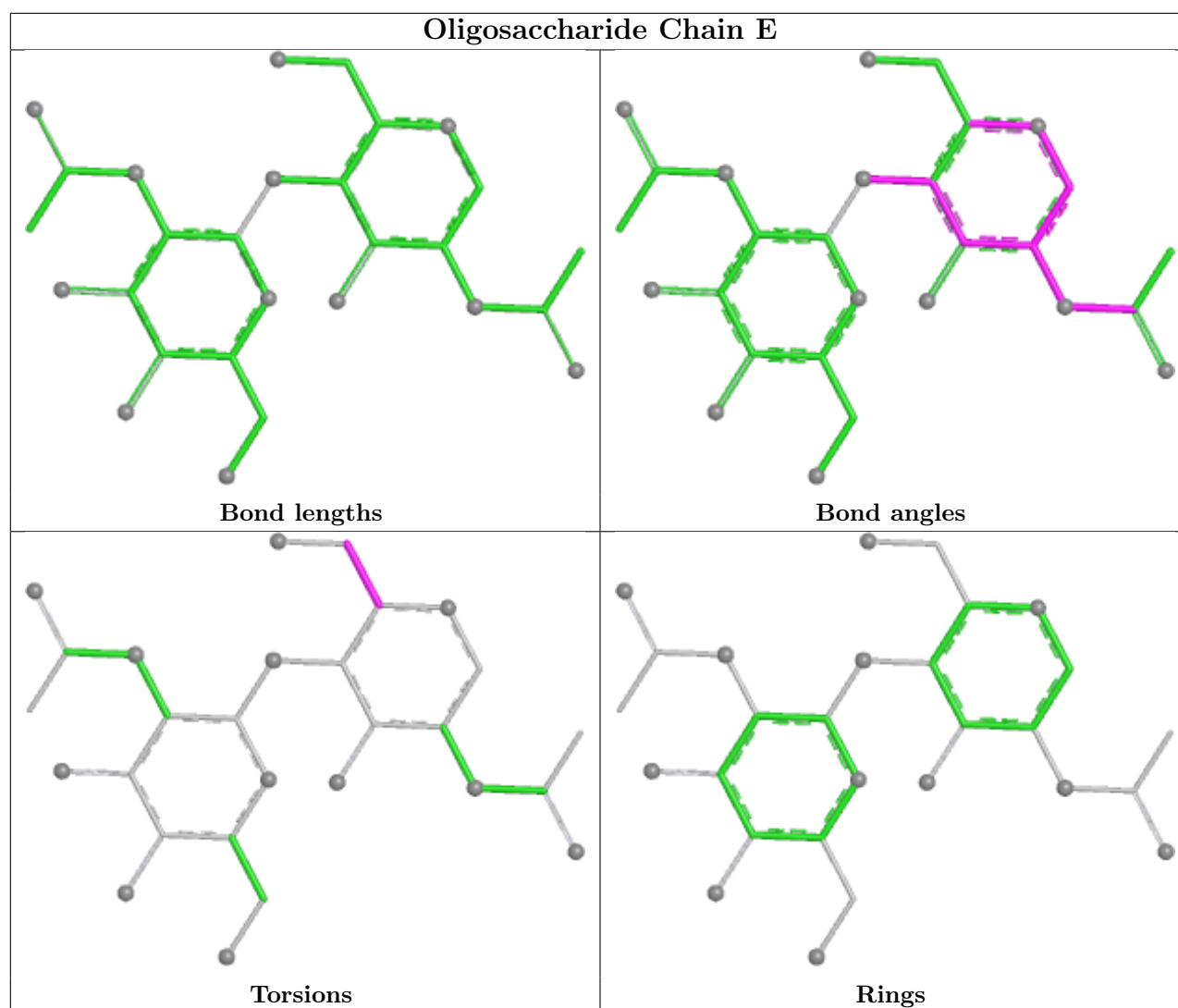
1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1	NAG	2	0

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







5.6 Ligand geometry [i](#)

Of 55 ligands modelled in this entry, 4 are monoatomic - leaving 51 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	$\# Z > 2$
6	EDO	A	610	-	3,3,3	0.29	0	2,2,2	0.22	0
6	EDO	B	614	-	3,3,3	0.11	0	2,2,2	0.25	0
6	EDO	B	616	-	3,3,3	0.13	0	2,2,2	0.07	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
10	GOL	A	628	-	5,5,5	0.08	0	5,5,5	0.33	0
6	EDO	B	606	-	3,3,3	0.17	0	2,2,2	0.09	0
8	PEG	B	626	-	6,6,6	0.29	0	5,5,5	0.81	0
6	EDO	A	612	-	3,3,3	0.23	0	2,2,2	0.30	0
6	EDO	A	619	-	3,3,3	0.13	0	2,2,2	0.19	0
10	GOL	B	627	-	5,5,5	0.08	0	5,5,5	0.30	0
7	ACT	B	622	-	3,3,3	1.21	0	3,3,3	0.91	0
6	EDO	A	615	-	3,3,3	0.16	0	2,2,2	0.12	0
6	EDO	A	618	-	3,3,3	0.08	0	2,2,2	0.23	0
8	PEG	A	626	-	6,6,6	0.12	0	5,5,5	0.10	0
6	EDO	A	611	-	3,3,3	0.11	0	2,2,2	0.14	0
6	EDO	A	613	-	3,3,3	0.16	0	2,2,2	0.06	0
7	ACT	B	621	-	3,3,3	1.16	0	3,3,3	1.11	0
7	ACT	B	624	-	3,3,3	1.31	0	3,3,3	0.84	0
6	EDO	A	609	-	3,3,3	0.26	0	2,2,2	0.08	0
6	EDO	A	617	-	3,3,3	0.15	0	2,2,2	0.17	0
3	NAG	A	601	1	14,14,15	0.80	0	17,19,21	1.21	1 (5%)
3	NAG	B	602	1	14,14,15	0.62	0	17,19,21	1.09	0
6	EDO	B	607	-	3,3,3	0.28	0	2,2,2	0.42	0
6	EDO	B	608	-	3,3,3	0.13	0	2,2,2	0.04	0
3	NAG	B	601	1	14,14,15	0.71	0	17,19,21	1.16	1 (5%)
6	EDO	B	618	-	3,3,3	0.07	0	2,2,2	0.08	0
6	EDO	B	609	-	3,3,3	0.16	0	2,2,2	0.15	0
7	ACT	A	624	-	3,3,3	1.17	0	3,3,3	1.06	0
7	ACT	A	622	-	3,3,3	0.99	0	3,3,3	0.81	0
9	ETE	A	627	-	13,13,13	0.31	0	12,12,12	0.60	0
6	EDO	B	612	-	3,3,3	0.12	0	2,2,2	0.12	0
6	EDO	A	606	-	3,3,3	0.24	0	2,2,2	0.65	0
6	EDO	B	613	-	3,3,3	0.16	0	2,2,2	0.33	0
6	EDO	A	607	-	3,3,3	0.29	0	2,2,2	0.58	0
6	EDO	B	610	-	3,3,3	0.26	0	2,2,2	0.50	0
6	EDO	A	616	-	3,3,3	0.15	0	2,2,2	0.09	0
7	ACT	B	623	-	3,3,3	1.21	0	3,3,3	1.03	0
6	EDO	A	620	-	3,3,3	0.12	0	2,2,2	0.35	0
6	EDO	A	614	-	3,3,3	0.18	0	2,2,2	0.12	0
6	EDO	B	619	-	3,3,3	0.13	0	2,2,2	0.07	0
6	EDO	B	617	-	3,3,3	0.08	0	2,2,2	0.14	0
6	EDO	B	615	-	3,3,3	0.09	0	2,2,2	0.53	0
7	ACT	A	623	-	3,3,3	1.26	0	3,3,3	0.97	0
7	ACT	A	625	-	3,3,3	1.32	0	3,3,3	0.65	0
8	PEG	B	625	-	6,6,6	0.31	0	5,5,5	0.46	0
6	EDO	A	608	-	3,3,3	0.28	0	2,2,2	0.39	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	B	603	1	14,14,15	0.68	0	17,19,21	1.37	3 (17%)
3	NAG	A	602	1	14,14,15	0.67	0	17,19,21	0.95	1 (5%)
6	EDO	B	611	-	3,3,3	0.13	0	2,2,2	0.16	0
6	EDO	B	605	-	3,3,3	0.15	0	2,2,2	0.09	0
6	EDO	A	621	-	3,3,3	0.07	0	2,2,2	0.13	0
7	ACT	B	620	-	3,3,3	0.95	0	3,3,3	1.56	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
6	EDO	A	610	-	-	0/1/1/1	-
6	EDO	B	614	-	-	1/1/1/1	-
6	EDO	B	616	-	-	1/1/1/1	-
10	GOL	A	628	-	-	4/4/4/4	-
6	EDO	B	606	-	-	1/1/1/1	-
8	PEG	B	626	-	-	3/4/4/4	-
6	EDO	A	612	-	-	1/1/1/1	-
6	EDO	A	619	-	-	0/1/1/1	-
10	GOL	B	627	-	-	2/4/4/4	-
6	EDO	A	615	-	-	1/1/1/1	-
6	EDO	A	618	-	-	0/1/1/1	-
8	PEG	A	626	-	-	2/4/4/4	-
6	EDO	A	611	-	-	0/1/1/1	-
6	EDO	A	613	-	-	1/1/1/1	-
6	EDO	A	609	-	-	0/1/1/1	-
6	EDO	A	617	-	-	0/1/1/1	-
3	NAG	A	601	1	-	0/6/23/26	0/1/1/1
3	NAG	B	602	1	-	0/6/23/26	0/1/1/1
6	EDO	B	607	-	-	1/1/1/1	-
6	EDO	B	608	-	-	0/1/1/1	-
3	NAG	B	601	1	-	0/6/23/26	0/1/1/1
6	EDO	B	618	-	-	1/1/1/1	-
6	EDO	B	609	-	-	1/1/1/1	-
9	ETE	A	627	-	-	6/11/11/11	-
6	EDO	B	612	-	-	1/1/1/1	-
6	EDO	A	606	-	-	1/1/1/1	-
6	EDO	B	613	-	-	1/1/1/1	-
6	EDO	A	607	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	EDO	B	610	-	-	1/1/1/1	-
6	EDO	A	616	-	-	1/1/1/1	-
6	EDO	A	620	-	-	1/1/1/1	-
6	EDO	A	614	-	-	0/1/1/1	-
6	EDO	B	619	-	-	0/1/1/1	-
6	EDO	B	617	-	-	1/1/1/1	-
6	EDO	B	615	-	-	0/1/1/1	-
8	PEG	B	625	-	-	2/4/4/4	-
6	EDO	A	608	-	-	1/1/1/1	-
3	NAG	B	603	1	-	0/6/23/26	0/1/1/1
3	NAG	A	602	1	-	2/6/23/26	0/1/1/1
6	EDO	B	611	-	-	1/1/1/1	-
6	EDO	B	605	-	-	0/1/1/1	-
6	EDO	A	621	-	-	1/1/1/1	-

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	603	NAG	C1-O5-C5	3.20	116.48	112.19
3	B	601	NAG	C1-O5-C5	2.71	115.82	112.19
3	A	602	NAG	C1-O5-C5	2.29	115.25	112.19
3	B	603	NAG	C4-C3-C2	-2.29	107.67	111.02
3	A	601	NAG	C1-O5-C5	2.28	115.24	112.19

There are no chirality outliers.

5 of 40 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	B	626	PEG	C1-C2-O2-C3
3	A	602	NAG	O5-C5-C6-O6
3	A	602	NAG	C4-C5-C6-O6
9	A	627	ETE	OH6-C15-C25-OH5
9	A	627	ETE	OH5-C14-C24-OH4

There are no ring outliers.

18 monomers are involved in 33 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
10	A	628	GOL	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	626	PEG	2	0
6	A	612	EDO	1	0
8	A	626	PEG	4	0
6	A	613	EDO	1	0
6	A	609	EDO	1	0
6	A	617	EDO	2	0
6	B	607	EDO	2	0
6	B	618	EDO	1	0
9	A	627	ETE	4	0
6	B	610	EDO	1	0
6	A	620	EDO	1	0
6	A	614	EDO	1	0
6	B	615	EDO	5	0
8	B	625	PEG	1	0
6	B	605	EDO	1	0
6	A	621	EDO	2	0
7	B	620	ACT	3	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

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

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

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	498/576 (86%)	-0.42	5 (1%) 79 76	13, 33, 51, 67	1 (0%)
1	B	493/576 (85%)	-0.52	3 (0%) 85 83	15, 31, 45, 81	2 (0%)
All	All	991/1152 (86%)	-0.47	8 (0%) 82 80	13, 32, 49, 81	3 (0%)

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	232	GLY	3.4
1	A	191	GLY	2.8
1	B	229	TYR	2.5
1	A	229	TYR	2.4
1	A	190	LEU	2.3

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.

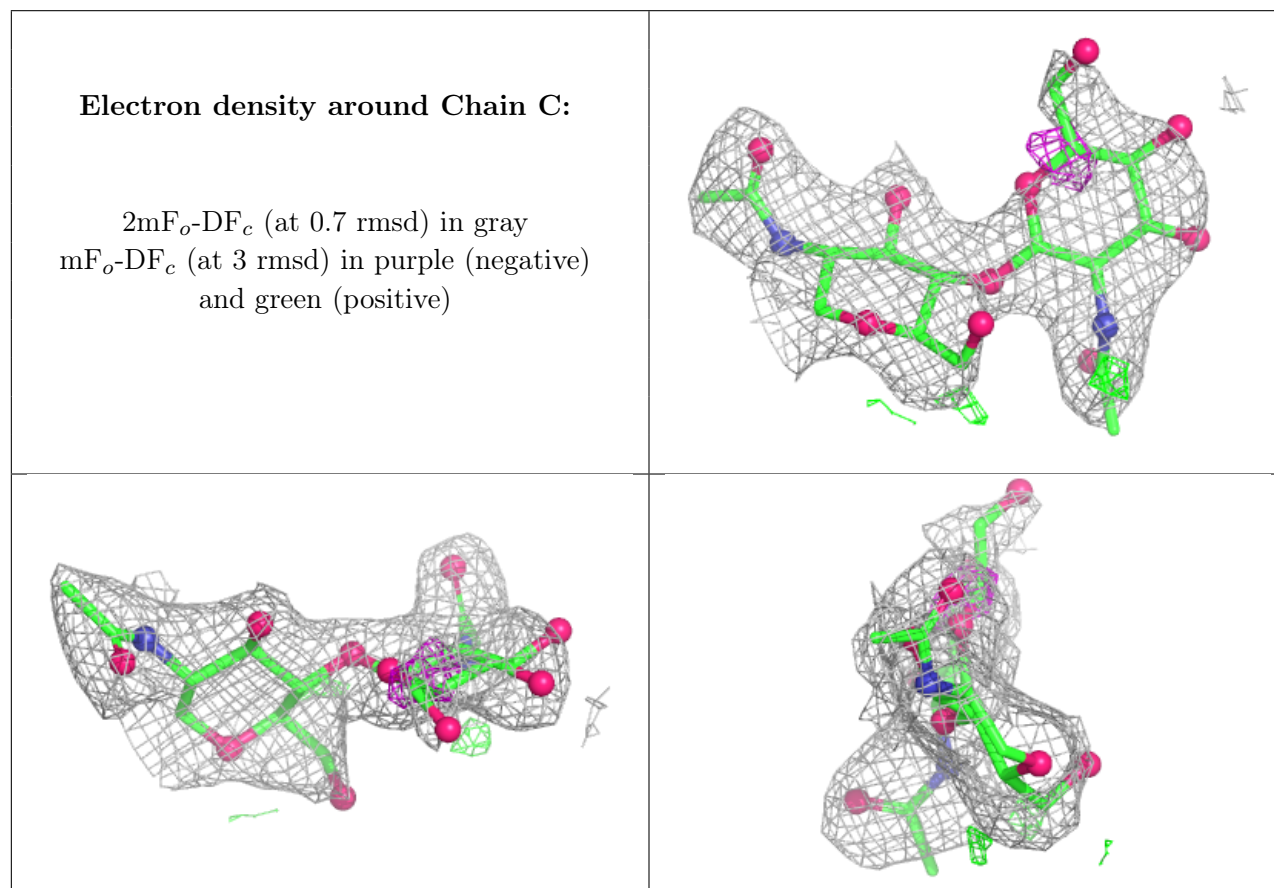
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	D	2	14/15	0.63	0.15	54,75,86,86	0
2	NAG	E	2	14/15	0.69	0.15	68,77,85,94	0
2	NAG	C	2	14/15	0.72	0.13	62,68,80,86	0
2	NAG	E	1	14/15	0.82	0.12	58,70,75,77	0
2	NAG	D	1	14/15	0.82	0.11	54,60,70,76	0

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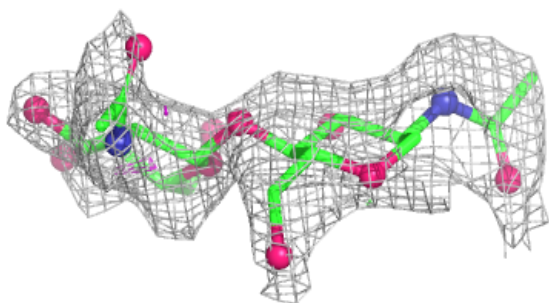
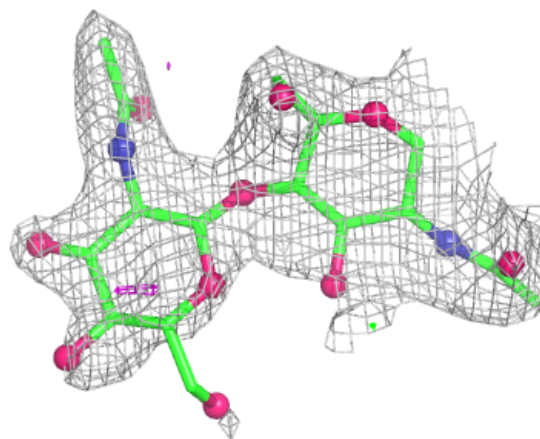
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	C	1	14/15	0.90	0.08	37,48,62,62	0

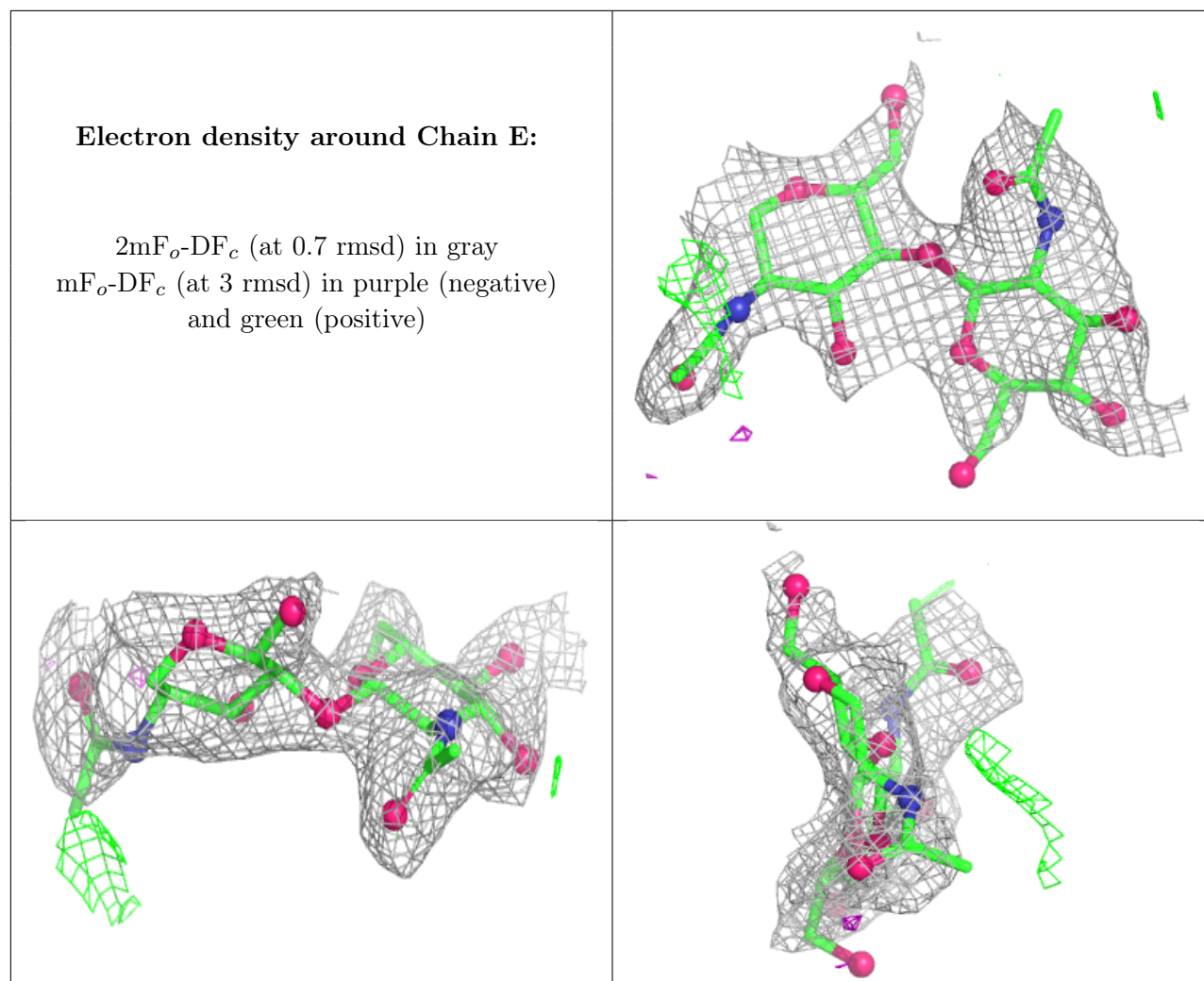
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



Electron density around Chain D:

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





6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
7	ACT	B	622	4/4	0.65	0.17	46,51,52,55	0
6	EDO	A	611	4/4	0.69	0.17	35,36,39,42	4
7	ACT	B	623	4/4	0.73	0.17	33,38,39,40	4
7	ACT	A	622	4/4	0.76	0.17	27,28,30,35	4
8	PEG	A	626	7/7	0.76	0.19	19,21,30,32	7
7	ACT	A	625	4/4	0.77	0.16	27,31,34,34	4
6	EDO	B	614	4/4	0.77	0.16	31,31,34,46	4
6	EDO	B	618	4/4	0.78	0.15	54,54,57,60	0
6	EDO	A	621	4/4	0.79	0.14	41,43,45,49	4

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	EDO	A	620	4/4	0.79	0.23	20,22,27,28	4
3	NAG	B	603	14/15	0.80	0.12	41,65,72,77	0
6	EDO	A	618	4/4	0.81	0.13	49,49,53,57	0
6	EDO	A	606	4/4	0.82	0.11	33,34,36,37	0
7	ACT	A	623	4/4	0.82	0.13	32,39,41,42	4
6	EDO	B	619	4/4	0.82	0.14	31,31,33,35	4
10	GOL	A	628	6/6	0.82	0.13	52,55,60,62	6
6	EDO	A	616	4/4	0.83	0.14	34,35,40,50	0
3	NAG	A	602	14/15	0.83	0.10	46,60,66,68	0
6	EDO	A	614	4/4	0.84	0.13	28,30,38,46	0
10	GOL	B	627	6/6	0.84	0.15	37,48,52,57	6
3	NAG	A	601	14/15	0.85	0.11	38,48,66,68	0
6	EDO	B	617	4/4	0.85	0.13	34,37,39,42	4
7	ACT	A	624	4/4	0.85	0.13	47,57,58,59	0
9	ETE	A	627	14/14	0.86	0.15	19,32,33,36	14
3	NAG	B	602	14/15	0.86	0.10	43,47,61,62	0
6	EDO	B	615	4/4	0.86	0.18	22,23,28,28	4
7	ACT	B	624	4/4	0.87	0.12	24,36,37,47	4
6	EDO	A	609	4/4	0.88	0.10	37,38,38,43	0
6	EDO	B	611	4/4	0.89	0.10	30,30,34,34	4
6	EDO	B	612	4/4	0.89	0.12	37,40,45,49	4
6	EDO	A	617	4/4	0.89	0.12	24,27,27,29	4
8	PEG	B	625	7/7	0.89	0.14	34,34,40,43	0
8	PEG	B	626	7/7	0.89	0.13	25,28,30,35	7
6	EDO	A	608	4/4	0.89	0.10	25,26,31,32	4
6	EDO	A	615	4/4	0.89	0.11	40,41,46,50	0
6	EDO	A	613	4/4	0.89	0.12	26,28,31,32	4
6	EDO	B	607	4/4	0.90	0.13	25,30,37,42	4
6	EDO	B	609	4/4	0.90	0.16	23,26,29,31	4
6	EDO	B	610	4/4	0.90	0.11	24,27,33,38	4
6	EDO	B	616	4/4	0.90	0.12	36,36,40,46	4
6	EDO	A	619	4/4	0.90	0.13	33,33,36,41	4
6	EDO	B	613	4/4	0.91	0.12	23,26,31,31	4
6	EDO	B	605	4/4	0.91	0.09	29,29,29,32	0
3	NAG	B	601	14/15	0.92	0.07	28,43,55,55	0
6	EDO	B	608	4/4	0.92	0.09	29,29,31,38	4
7	ACT	B	621	4/4	0.93	0.09	32,37,37,41	0
6	EDO	A	610	4/4	0.93	0.08	27,30,31,34	4
6	EDO	A	612	4/4	0.94	0.07	34,34,35,40	4
5	NA	A	604	1/1	0.95	0.05	48,48,48,48	0
7	ACT	B	620	4/4	0.95	0.09	29,30,31,33	4
6	EDO	B	606	4/4	0.95	0.07	30,31,32,36	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	EDO	A	607	4/4	0.95	0.07	29,29,31,32	0
5	NA	A	605	1/1	0.98	0.04	33,33,33,33	0
4	FE	A	603	1/1	1.00	0.03	20,20,20,20	0
4	FE	B	604	1/1	1.00	0.04	20,20,20,20	0

6.5 Other polymers [i](#)

There are no such residues in this entry.