



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 24, 2025 – 02:13 AM JST

PDB ID : 5GLR / pdb_00005glr
Title : Crystal structure of CoXyl43, GH43 beta-xylosidase/alpha-arabinofuranosidase from a compostmicrobial metagenome in complex with l-arabinose and xylotriose, calcium-bound form
Authors : Matsuzawa, T.; Kishine, N.; Fujimoto, Z.; Yaoi, K.
Deposited on : 2016-07-12
Resolution : 1.70 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	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0rc1
EDS	:	FAILED
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.42

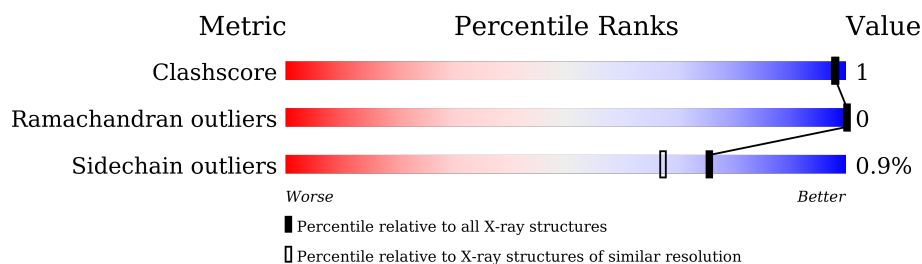
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	180529	5671 (1.70-1.70)
Ramachandran outliers	177936	5594 (1.70-1.70)
Sidechain outliers	177891	5594 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	344	
1	B	344	
2	C	3	
2	D	3	

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 5941 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 Glycoside hydrolase family 43.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	330	Total	C	N	O	S	0	9	0
			2642	1691	431	510	10			
1	B	325	Total	C	N	O	S	0	8	0
			2610	1672	427	501	10			

There are 42 discrepancies between the modelled and reference sequences:

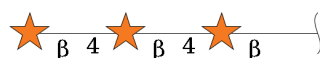
Chain	Residue	Modelled	Actual	Comment	Reference
A	26	MET	-	expression tag	UNP A0A0H5BL38
A	27	GLY	-	expression tag	UNP A0A0H5BL38
A	28	SER	-	expression tag	UNP A0A0H5BL38
A	29	SER	-	expression tag	UNP A0A0H5BL38
A	30	HIS	-	expression tag	UNP A0A0H5BL38
A	31	HIS	-	expression tag	UNP A0A0H5BL38
A	32	HIS	-	expression tag	UNP A0A0H5BL38
A	33	HIS	-	expression tag	UNP A0A0H5BL38
A	34	HIS	-	expression tag	UNP A0A0H5BL38
A	35	HIS	-	expression tag	UNP A0A0H5BL38
A	36	SER	-	expression tag	UNP A0A0H5BL38
A	37	SER	-	expression tag	UNP A0A0H5BL38
A	38	GLY	-	expression tag	UNP A0A0H5BL38
A	39	LEU	-	expression tag	UNP A0A0H5BL38
A	40	VAL	-	expression tag	UNP A0A0H5BL38
A	41	PRO	-	expression tag	UNP A0A0H5BL38
A	42	ARG	-	expression tag	UNP A0A0H5BL38
A	43	GLY	-	expression tag	UNP A0A0H5BL38
A	44	SER	-	expression tag	UNP A0A0H5BL38
A	45	HIS	-	expression tag	UNP A0A0H5BL38
A	46	MET	-	expression tag	UNP A0A0H5BL38
B	26	MET	-	expression tag	UNP A0A0H5BL38
B	27	GLY	-	expression tag	UNP A0A0H5BL38
B	28	SER	-	expression tag	UNP A0A0H5BL38
B	29	SER	-	expression tag	UNP A0A0H5BL38

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Chain	Residue	Modelled	Actual	Comment	Reference
B	30	HIS	-	expression tag	UNP A0A0H5BL38
B	31	HIS	-	expression tag	UNP A0A0H5BL38
B	32	HIS	-	expression tag	UNP A0A0H5BL38
B	33	HIS	-	expression tag	UNP A0A0H5BL38
B	34	HIS	-	expression tag	UNP A0A0H5BL38
B	35	HIS	-	expression tag	UNP A0A0H5BL38
B	36	SER	-	expression tag	UNP A0A0H5BL38
B	37	SER	-	expression tag	UNP A0A0H5BL38
B	38	GLY	-	expression tag	UNP A0A0H5BL38
B	39	LEU	-	expression tag	UNP A0A0H5BL38
B	40	VAL	-	expression tag	UNP A0A0H5BL38
B	41	PRO	-	expression tag	UNP A0A0H5BL38
B	42	ARG	-	expression tag	UNP A0A0H5BL38
B	43	GLY	-	expression tag	UNP A0A0H5BL38
B	44	SER	-	expression tag	UNP A0A0H5BL38
B	45	HIS	-	expression tag	UNP A0A0H5BL38
B	46	MET	-	expression tag	UNP A0A0H5BL38

- Molecule 2 is an oligosaccharide called beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	3	Total	C	O	0	0	0
			28	15	13			
2	D	3	Total	C	O	0	0	0
			28	15	13			

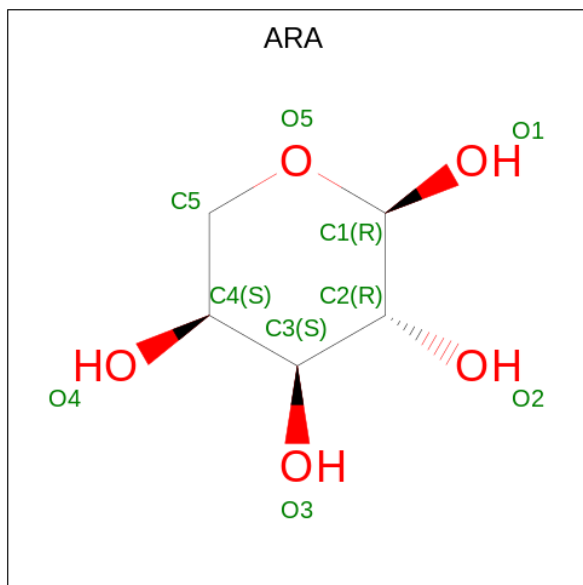
- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		
3	B	1	Total	Ca	0	0
			1	1		

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

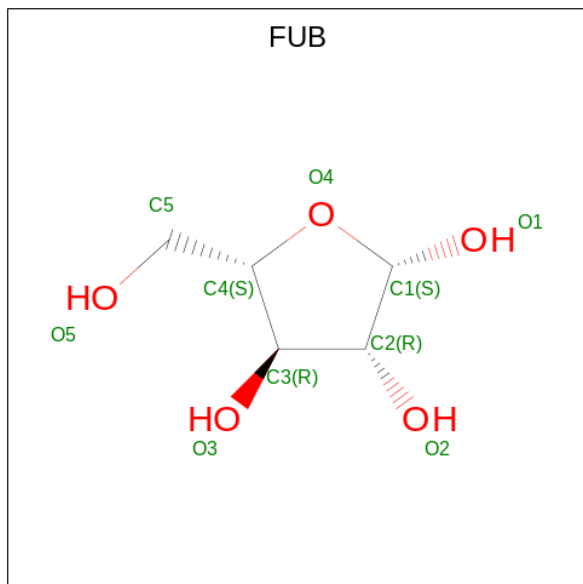
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Na	0	0
			1	1		
4	B	1	Total	Na	0	0
			1	1		

- Molecule 5 is alpha-L-arabinopyranose (CCD ID: ARA) (formula: C₅H₁₀O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	1
			10	5	5		

- Molecule 6 is beta-L-arabinofuranose (CCD ID: FUB) (formula: C₅H₁₀O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	1
			10	5	5		
6	B	1	Total	C	O	0	1
			13	7	6		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	352	Total	O	0	0
			352	352		
7	B	244	Total	O	0	0
			244	244		

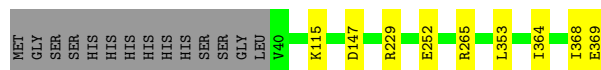
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS failed to run properly.

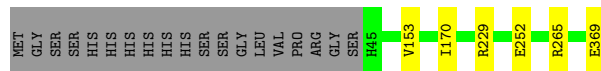
- Molecule 1: Glycoside hydrolase family 43

Chain A:  93%

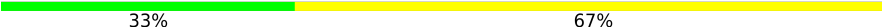


- Molecule 1: Glycoside hydrolase family 43

Chain B:  93% 6%



- Molecule 2: beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain C:  33% 67%



- Molecule 2: beta-D-xylopyranose-(1-4)-beta-D-xylopyranose-(1-4)-beta-D-xylopyranose

Chain D:  67% 33%



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	74.93Å 61.34Å 79.00Å 90.00° 95.79° 90.00°	Depositor
Resolution (Å)	78.60 – 1.70	Depositor
% Data completeness (in resolution range)	99.8 (78.60-1.70)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.64 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.8.0124	Depositor
R, R_{free}	0.151 , 0.175	Depositor
Wilson B-factor (Å ²)	15.9	Xtriage
Anisotropy	0.035	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5941	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.32% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: XYP, CA, FUB, NA, ARA

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	0.46	0/2771	0.71	4/3772 (0.1%)
1	B	0.43	0/2731	0.67	1/3716 (0.0%)
All	All	0.44	0/5502	0.69	5/7488 (0.1%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	229	ARG	NE-CZ-NH1	6.25	123.42	120.30
1	B	229	ARG	NE-CZ-NH1	5.66	123.13	120.30
1	A	115[A]	LYS	CB-CA-C	5.33	121.06	110.40
1	A	115[C]	LYS	CB-CA-C	5.33	121.06	110.40
1	A	229	ARG	NE-CZ-NH2	-5.14	117.73	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2642	0	2464	4	0
1	B	2610	0	2445	2	0
2	C	28	0	0	0	0
2	D	28	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	10	0	10	0	0
6	A	10	0	0	0	0
6	B	13	0	0	0	0
7	A	352	0	0	0	0
7	B	244	0	0	0	0
All	All	5941	0	4919	6	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 1.

All (6) 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:353[A]:LEU:HD12	1:A:364[A]:ILE:HD11	1.79	0.65
1:B:153[A]:VAL:CG2	1:B:170:ILE:HD11	2.36	0.55
1:B:153[A]:VAL:HG22	1:B:170:ILE:HD11	1.88	0.54
1:A:353[A]:LEU:CD1	1:A:364[A]:ILE:HD11	2.39	0.51
1:A:252:GLU:CD	1:A:252:GLU:H	2.20	0.45
1:A:368:ILE:O	1:A:369:GLU:HB2	2.20	0.42

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	337/344 (98%)	320 (95%)	17 (5%)	0	100	100
1	B	331/344 (96%)	317 (96%)	14 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	668/688 (97%)	637 (95%)	31 (5%)	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	285/288 (99%)	283 (99%)	2 (1%)	81	75
1	B	279/288 (97%)	276 (99%)	3 (1%)	70	60
All	All	564/576 (98%)	559 (99%)	5 (1%)	75	67

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

Mol	Chain	Res	Type
1	A	147	ASP
1	A	265	ARG
1	B	252	GLU
1	B	265	ARG
1	B	369	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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	XYP	C	1	2	10,10,10	0.72	0	14,14,14	0.87	1 (7%)
2	XYP	C	2	2	9,9,10	0.54	0	10,12,14	1.56	2 (20%)
2	XYP	C	3	2	9,9,10	0.53	0	10,12,14	0.81	0
2	XYP	D	1	2	10,10,10	0.65	0	14,14,14	0.81	0
2	XYP	D	2	2	9,9,10	0.32	0	10,12,14	1.28	2 (20%)
2	XYP	D	3	2	9,9,10	0.28	0	10,12,14	1.01	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	XYP	C	1	2	-	-	0/1/1/1
2	XYP	C	2	2	-	-	0/1/1/1
2	XYP	C	3	2	-	-	0/1/1/1
2	XYP	D	1	2	-	-	0/1/1/1
2	XYP	D	2	2	-	-	0/1/1/1
2	XYP	D	3	2	-	-	0/1/1/1

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	XYP	C5-C4-C3	3.85	114.40	109.67
2	C	1	XYP	C5-C4-C3	2.60	112.87	109.67
2	C	2	XYP	C5-O5-C1	2.57	115.47	111.52
2	D	2	XYP	O3-C3-C4	-2.27	105.65	109.99
2	D	2	XYP	C1-C2-C3	2.16	112.32	109.67

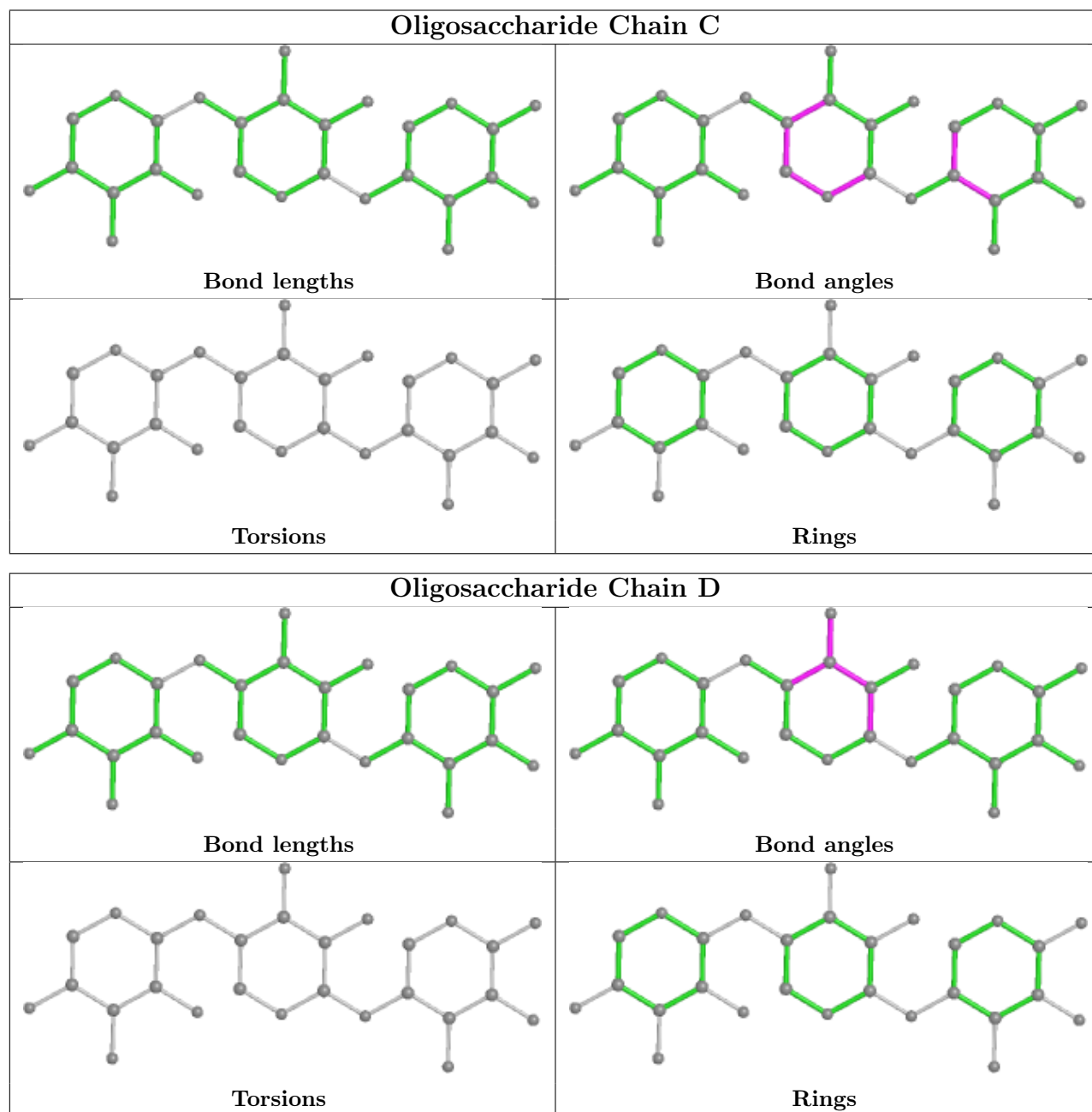
There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	FUB	B	403[A]	-	10,10,10	1.04	0	13,14,14	1.39	1 (7%)
6	FUB	A	404[B]	-	10,10,10	0.66	0	13,14,14	1.22	1 (7%)
5	ARA	A	403[A]	-	10,10,10	0.54	0	14,14,14	0.90	0
6	FUB	B	403[B]	-	10,10,10	1.05	0	13,14,14	1.43	1 (7%)

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	FUB	B	403[A]	-	-	0/2/18/18	0/1/1/1
6	FUB	A	404[B]	-	-	0/2/18/18	0/1/1/1
5	ARA	A	403[A]	-	-	-	0/1/1/1
6	FUB	B	403[B]	-	-	0/2/18/18	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	403[A]	FUB	C5-C4-C3	-3.45	106.77	115.09
6	B	403[B]	FUB	C5-C4-C3	-3.03	107.79	115.09
6	A	404[B]	FUB	C5-C4-C3	-2.42	109.25	115.09

There are no chirality outliers.

There are no torsion outliers.

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 [i](#)

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

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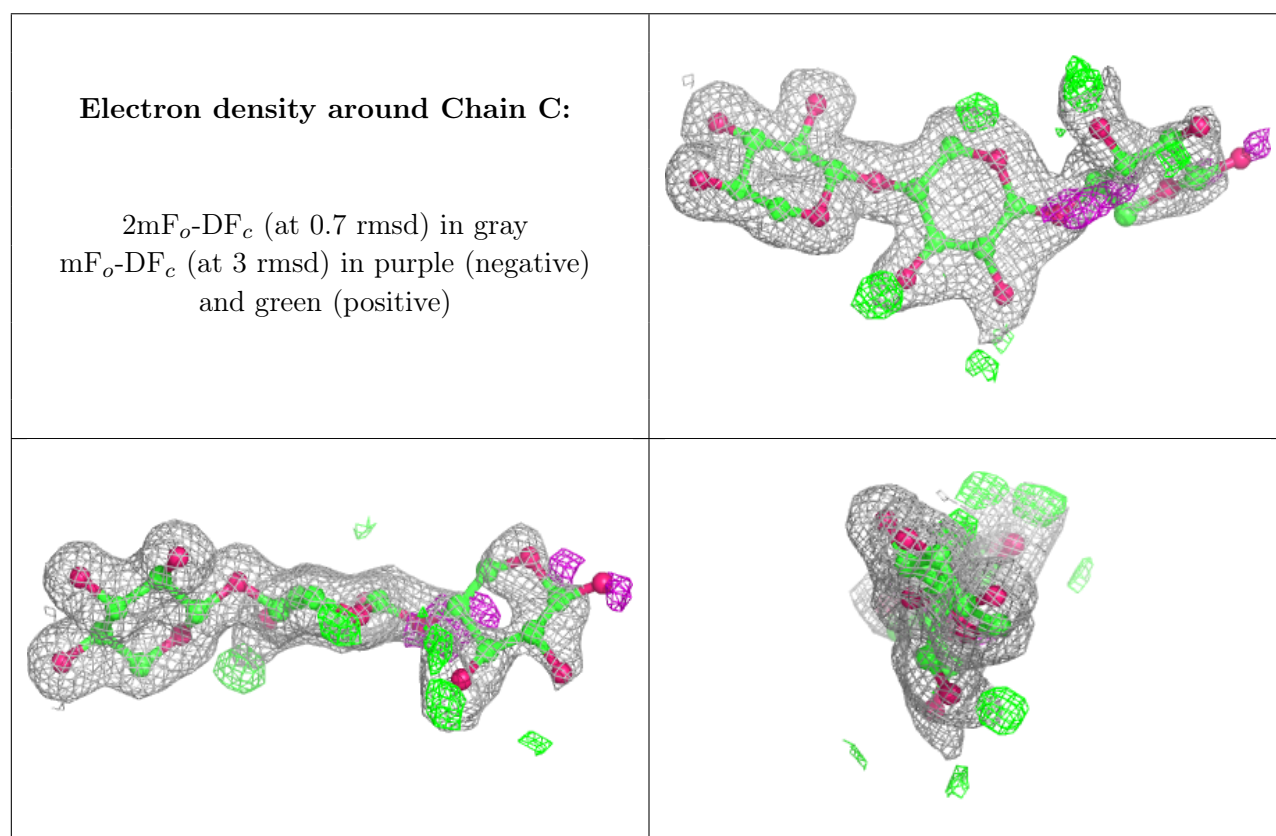
6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

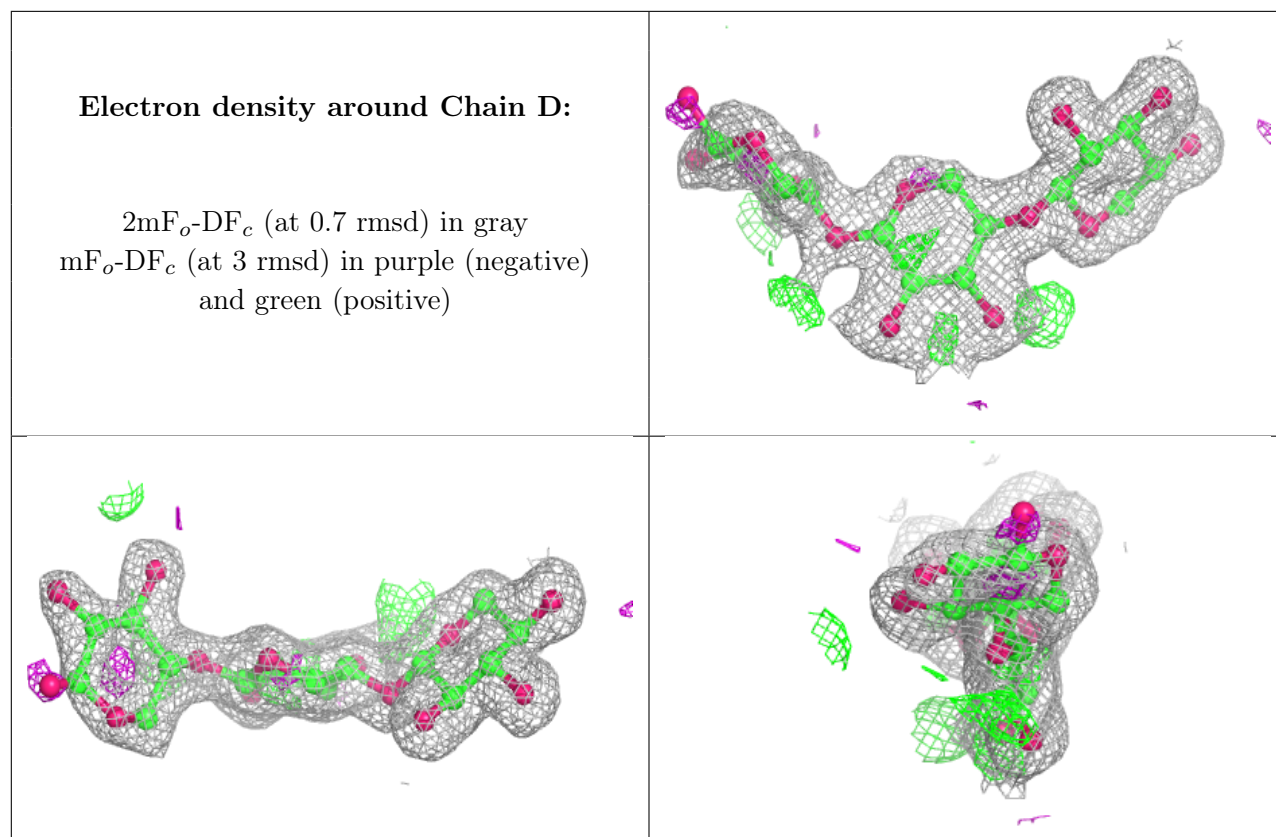
EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS failed to run properly - this section is therefore empty.

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.





6.4 Ligands [i](#)

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers [i](#)

EDS failed to run properly - this section is therefore empty.