



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 9, 2022 – 02:07 PM EDT

PDB ID : 7N6O  
Title : The crystal structure of the GH30 subfamily 10 enzyme, AcXbh30A from *Acetivibrio clariflavus* in complex with xylobiose  
Authors : Tan, K.; St John, J.F.  
Deposited on : 2021-06-08  
Resolution : 1.50 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at <http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.29
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.29

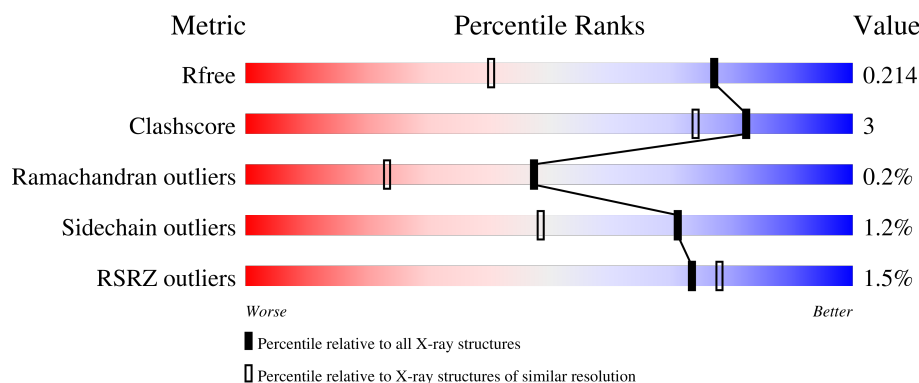
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.50 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	2936 (1.50-1.50)
Clashscore	141614	3144 (1.50-1.50)
Ramachandran outliers	138981	3066 (1.50-1.50)
Sidechain outliers	138945	3064 (1.50-1.50)
RSRZ outliers	127900	2884 (1.50-1.50)

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

Mol	Chain	Length	Quality of chain
1	A	444	<div> <div>%</div> <div> <div></div> <div>90%</div> <div>7%</div> <div>.</div> </div> </div>
1	B	444	<div> <div>2%</div> <div> <div></div> <div>91%</div> <div>6%</div> <div>.</div> </div> </div>
2	C	2	<div> <div></div> <div>100%</div> </div>
2	E	2	<div> <div>50%</div> <div>50%</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	CL	A	504	-	-	X	-

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7585 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 AcXbh30A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	433	Total	C	N	O	S	0	2	0
			3445	2190	569	675	11			
1	B	432	Total	C	N	O	S	0	0	0
			3432	2181	567	673	11			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	28	MET	-	initiating methionine	UNP G8LU16
A	464	LEU	-	expression tag	UNP G8LU16
A	465	GLU	-	expression tag	UNP G8LU16
A	466	HIS	-	expression tag	UNP G8LU16
A	467	HIS	-	expression tag	UNP G8LU16
A	468	HIS	-	expression tag	UNP G8LU16
A	469	HIS	-	expression tag	UNP G8LU16
A	470	HIS	-	expression tag	UNP G8LU16
A	471	HIS	-	expression tag	UNP G8LU16
B	28	MET	-	initiating methionine	UNP G8LU16
B	464	LEU	-	expression tag	UNP G8LU16
B	465	GLU	-	expression tag	UNP G8LU16
B	466	HIS	-	expression tag	UNP G8LU16
B	467	HIS	-	expression tag	UNP G8LU16
B	468	HIS	-	expression tag	UNP G8LU16
B	469	HIS	-	expression tag	UNP G8LU16
B	470	HIS	-	expression tag	UNP G8LU16
B	471	HIS	-	expression tag	UNP G8LU16

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



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	C	2	Total	C	O	0	0	0
			19	10	9			
2	E	2	Total	C	O	0	0	0
			19	10	9			

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	6	Total	Cl	0	0
			6	6		
3	B	5	Total	Cl	0	0
			5	5		

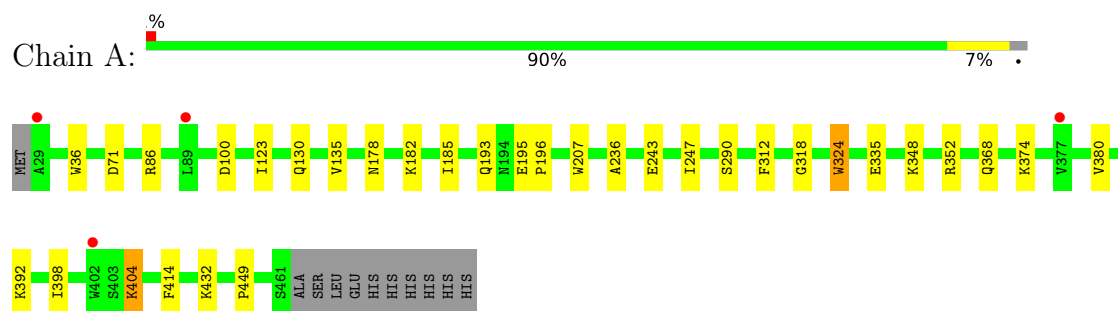
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	339	Total	O	0	1
			340	340		
4	B	317	Total	O	0	2
			319	319		

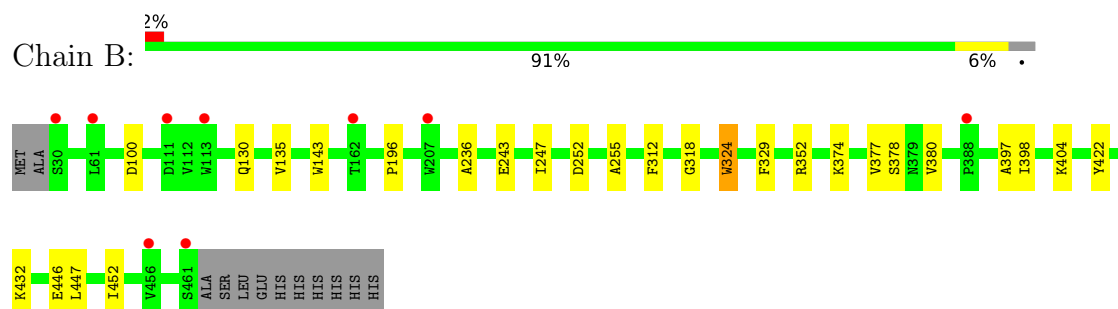
### 3 Residue-property plots [i](#)

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: AcXbh30A



- Molecule 1: AcXbh30A



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



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



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.13Å 107.49Å 66.86Å 90.00° 89.88° 90.00°	Depositor
Resolution (Å)	34.20 – 1.50 34.20 – 1.50	Depositor EDS
% Data completeness (in resolution range)	93.7 (34.20-1.50) 93.2 (34.20-1.50)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	33.43 (at 1.50Å)	Xtriage
Refinement program	PHENIX (1.19_4092: ???)	Depositor
R, $R_{free}$	0.165 , 0.214 0.166 , 0.214	Depositor DCC
$R_{free}$ test set	5961 reflections (4.77%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.2	Xtriage
Anisotropy	0.910	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 26.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	0.340 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7585	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	16.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.76% of the height of the origin peak. No significant pseudotranslation is detected.*

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

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, XYP

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	0.27	0/3535	0.50	0/4809
1	B	0.27	0/3522	0.49	0/4791
All	All	0.27	0/7057	0.50	0/9600

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

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	3445	0	3286	19	0
1	B	3432	0	3272	14	0
2	C	19	0	0	1	0
2	E	19	0	0	2	0
3	A	6	0	0	4	0
3	B	5	0	0	3	0
4	A	340	0	0	2	0
4	B	319	0	0	1	0
All	All	7585	0	6558	34	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.



All (34) 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:404:LYS:HG2	1:A:449:PRO:HD3	1.74	0.70
3:B:505:CL:CL	4:B:774:HOH:O	2.51	0.65
1:A:86:ARG:HD3	3:A:504:CL:CL	2.40	0.59
1:A:195:GLU:OE2	2:E:1:XYP:O1	2.21	0.59
1:A:196:PRO:HG3	1:A:236:ALA:HB1	1.88	0.56
1:B:252:ASP:HB3	1:B:255:ALA:HB3	1.87	0.56
1:A:312:PHE:CZ	1:A:318:GLY:HA3	2.44	0.53
1:A:352:ARG:NH2	3:A:506:CL:CL	2.78	0.53
1:B:196:PRO:HG3	1:B:236:ALA:HB1	1.91	0.52
1:B:100:ASP:OD2	2:C:2:XYP:O3	2.30	0.50
1:A:352:ARG:N	3:A:502:CL:CL	2.82	0.49
1:A:123:ILE:HG23	1:A:185:ILE:HD11	1.94	0.48
1:A:100:ASP:OD2	2:E:2:XYP:O3	2.32	0.48
1:A:290:SER:HB2	1:A:335:GLU:HA	1.94	0.48
1:B:312:PHE:CZ	1:B:318:GLY:HA3	2.48	0.48
1:A:193:GLN:HG2	1:A:207:TRP:CD1	2.50	0.47
1:A:178:ASN:OD1	1:A:182:LYS:NZ	2.48	0.47
1:A:86:ARG:NH1	3:A:504:CL:CL	2.83	0.47
1:B:352:ARG:N	3:B:503:CL:CL	2.85	0.47
1:A:36:TRP:HB2	1:A:414:PHE:CD1	2.52	0.45
1:A:380:VAL:HA	1:A:398:ILE:O	2.17	0.45
1:B:398:ILE:HG12	1:B:452:ILE:HD12	1.98	0.45
1:A:130:GLN:HG2	1:A:135:VAL:O	2.17	0.44
1:B:422:TYR:OH	1:B:432:LYS:HE2	2.17	0.44
1:B:380:VAL:HA	1:B:398:ILE:O	2.18	0.42
1:A:392:LYS:HB3	4:A:746:HOH:O	2.20	0.42
1:B:143:TRP:N	3:B:502:CL:CL	2.87	0.41
1:B:377:VAL:HG22	1:B:378:SER:H	1.85	0.41
1:B:397:ALA:HB1	1:B:447:LEU:HD11	2.02	0.41
1:A:368:GLN:HB2	4:A:641:HOH:O	2.21	0.41
1:A:243:GLU:O	1:A:247:ILE:HG13	2.20	0.41
1:B:130:GLN:HG2	1:B:135:VAL:O	2.20	0.41
1:B:404:LYS:HE2	1:B:446:GLU:CD	2.42	0.41
1:B:243:GLU:O	1:B:247:ILE:HG13	2.19	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	432/444 (97%)	416 (96%)	15 (4%)	1 (0%)	47	23
1	B	430/444 (97%)	414 (96%)	15 (4%)	1 (0%)	47	23
All	All	862/888 (97%)	830 (96%)	30 (4%)	2 (0%)	47	23

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	324	TRP
1	B	324	TRP

### 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	374/384 (97%)	368 (98%)	6 (2%)	62	36
1	B	373/384 (97%)	370 (99%)	3 (1%)	81	66
All	All	747/768 (97%)	738 (99%)	9 (1%)	71	48

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	71	ASP
1	A	324	TRP
1	A	348	LYS
1	A	374	LYS

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Mol	Chain	Res	Type
1	A	404	LYS
1	A	432	LYS
1	B	324	TRP
1	B	329	PHE
1	B	374	LYS

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

Mol	Chain	Res	Type
1	A	358	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

4 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	1.22	1 (10%)	14,14,14	1.38	2 (14%)
2	XYP	C	2	2	9,9,10	0.19	0	10,12,14	0.73	0
2	XYP	E	1	2	10,10,10	0.12	0	14,14,14	0.37	0
2	XYP	E	2	2	9,9,10	0.18	0	10,12,14	0.93	1 (10%)

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	E	1	2	-	-	0/1/1/1
2	XYP	E	2	2	-	-	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	XYP	O1-C1	-2.97	1.30	1.39

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	XYP	O5-C1-C2	3.24	114.25	109.43
2	E	2	XYP	C1-C2-C3	2.46	112.69	109.67
2	C	1	XYP	O4-C4-C5	-2.29	104.46	109.15

There are no chirality outliers.

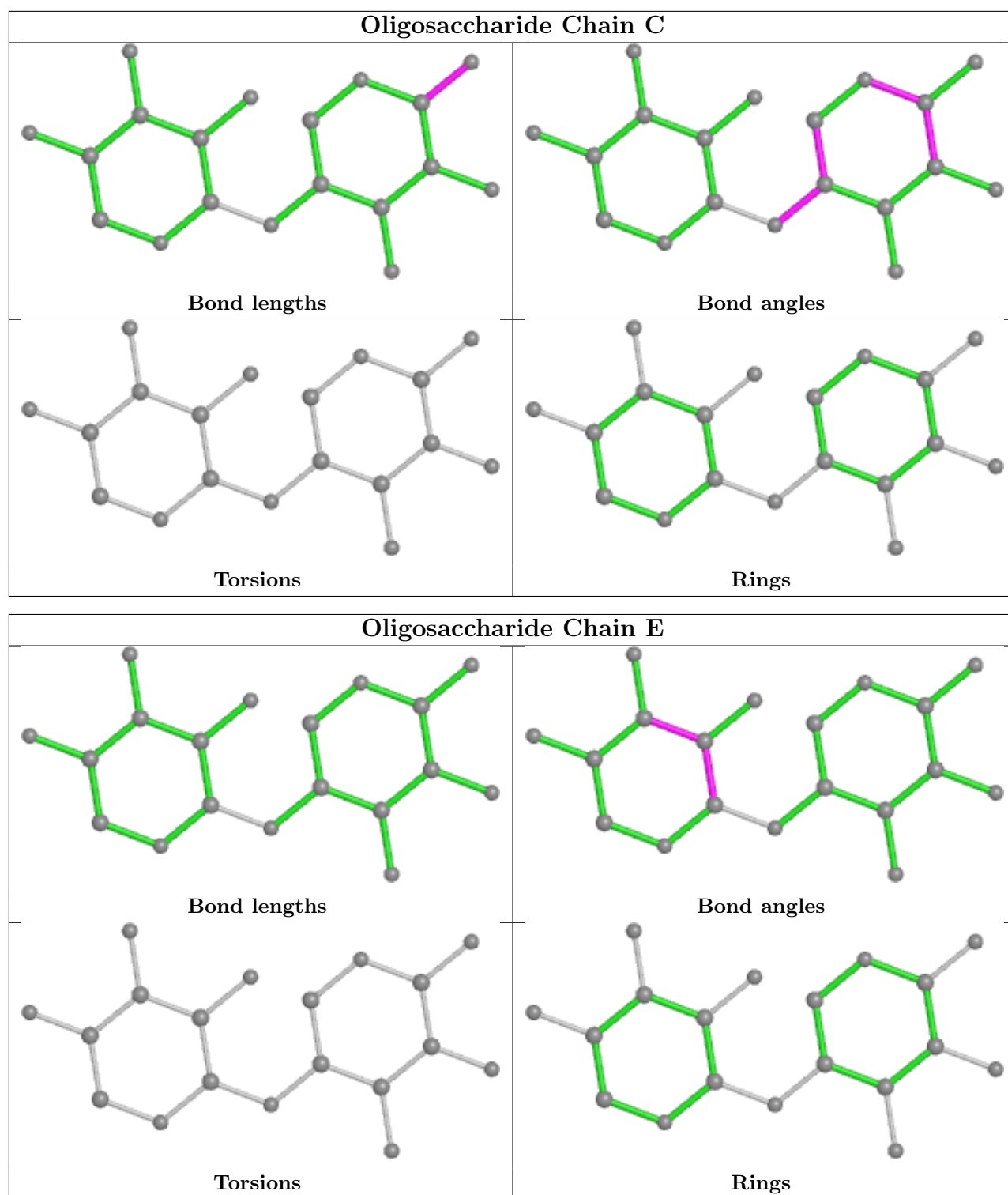
There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	2	XYP	1	0
2	C	2	XYP	1	0
2	E	1	XYP	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 11 ligands modelled in this entry, 11 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

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

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, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	433/444 (97%)	0.55	4 (0%) 84 87	9, 14, 22, 31	0
1	B	432/444 (97%)	0.57	9 (2%) 63 68	9, 14, 23, 33	0
All	All	865/888 (97%)	0.56	13 (1%) 73 78	9, 14, 22, 33	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	113	TRP	4.1
1	B	461	SER	3.6
1	A	29	ALA	3.1
1	B	111	ASP	3.1
1	A	402	TRP	2.6
1	B	162	THR	2.5
1	A	89	LEU	2.4
1	B	207	TRP	2.4
1	B	61	LEU	2.3
1	B	30	SER	2.2
1	B	456	VAL	2.2
1	A	377	VAL	2.2
1	B	388	PRO	2.2

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

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

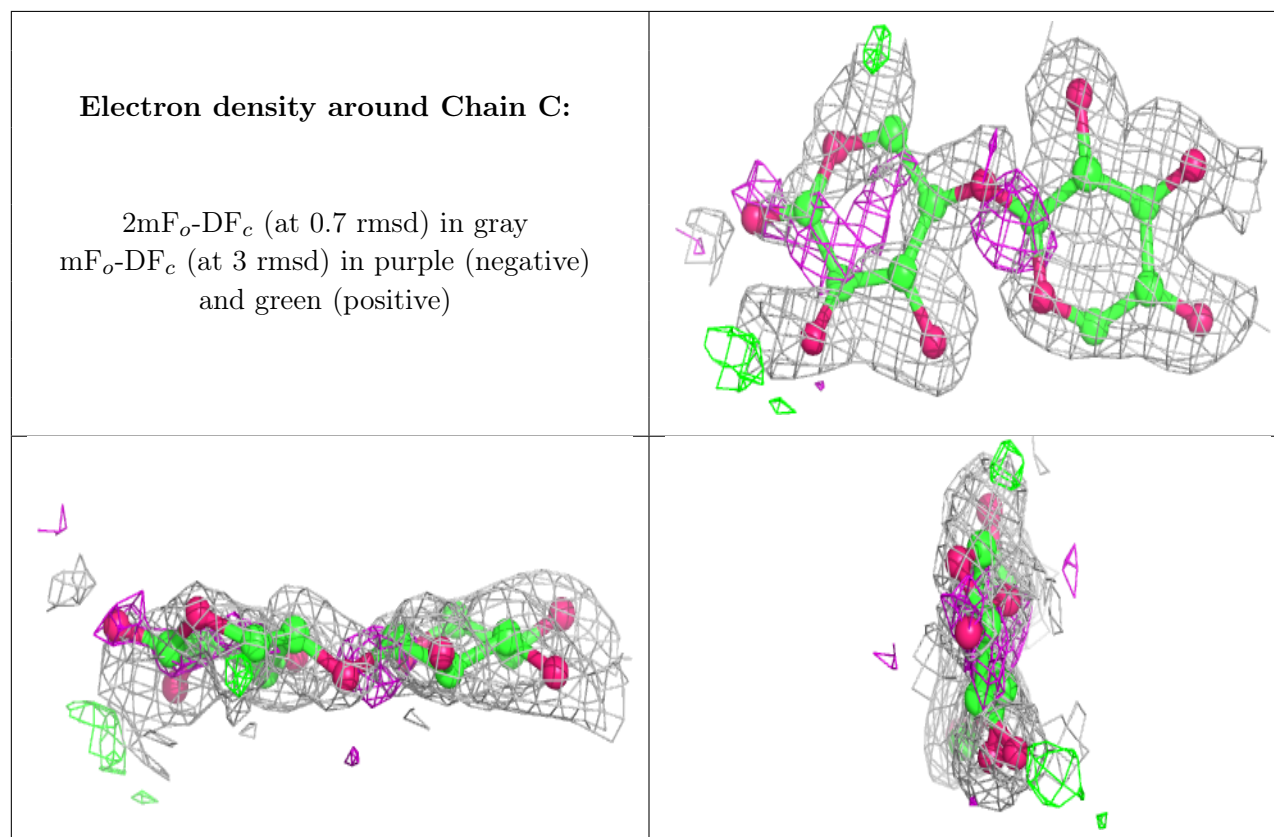
### 6.3 Carbohydrates [i](#)

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,

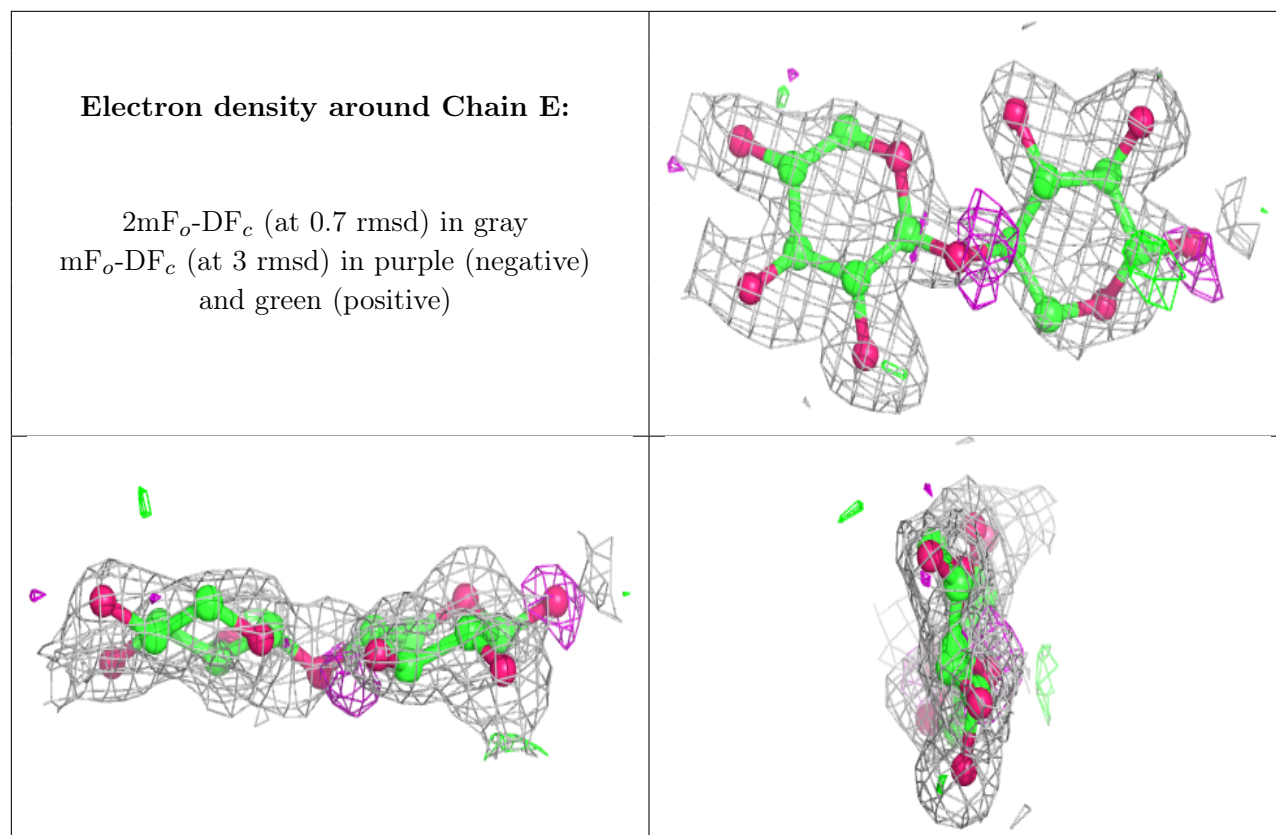
median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	XYP	C	1	10/10	0.66	0.35	26,29,32,34	0
2	XYP	E	1	10/10	0.73	0.28	26,28,31,33	0
2	XYP	C	2	9/10	0.82	0.20	19,20,23,24	0
2	XYP	E	2	9/10	0.87	0.18	18,19,22,23	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.







## 6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	CL	B	505	1/1	0.83	0.17	31,31,31,31	0
3	CL	A	506	1/1	0.92	0.14	40,40,40,40	0
3	CL	A	504	1/1	0.92	0.10	30,30,30,30	0
3	CL	A	501	1/1	0.93	0.11	47,47,47,47	0
3	CL	B	504	1/1	0.94	0.09	31,31,31,31	0
3	CL	A	502	1/1	0.95	0.16	31,31,31,31	0
3	CL	B	502	1/1	0.96	0.09	28,28,28,28	0
3	CL	B	503	1/1	0.96	0.11	24,24,24,24	0
3	CL	A	503	1/1	0.97	0.17	25,25,25,25	0
3	CL	B	501	1/1	0.97	0.09	25,25,25,25	0
3	CL	A	505	1/1	0.98	0.05	33,33,33,33	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.