



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2024 – 02:10 PM EDT

PDB ID : 5M2H  
Title : Crystal structure of vancomycin-Zn(II)-citrate complex  
Authors : Zarkan, A.; Macklyne, H.-R.; Chirgadze, D.Y.; Bond, A.D.; Hesketh, A.R.;  
Hong, H.-J.  
Deposited on : 2016-10-13  
Resolution : 0.95 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>.

---

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	:	2.37.1
buster-report	:	1.1.7 (2018)
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)	:	2.37.1

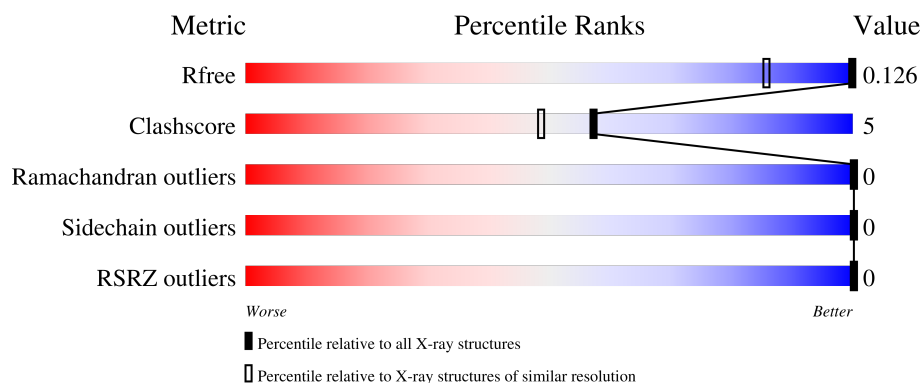
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 0.95 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	1243 (1.06-0.86)
Clashscore	141614	1321 (1.06-0.86)
Ramachandran outliers	138981	1233 (1.06-0.86)
Sidechain outliers	138945	1235 (1.06-0.86)
RSRZ outliers	127900	1209 (1.06-0.86)

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	7	<div> <div style="width: 14%; background-color: red;"></div> <div style="width: 86%; background-color: yellow;"></div> </div> <div>14% 86%</div>
1	B	7	<div> <div style="width: 86%; background-color: yellow;"></div> <div style="width: 14%; background-color: orange;"></div> </div> <div>86% 14%</div>
2	C	2	<div> <div style="width: 50%; background-color: green;"></div> <div style="width: 50%; background-color: yellow;"></div> </div> <div>50% 50%</div>
2	D	2	<div> <div style="width: 100%; background-color: yellow;"></div> </div> <div>100%</div>

## 2 Entry composition [i](#)

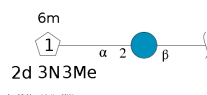
There are 6 unique types of molecules in this entry. The entry contains 320 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Vancomycin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	7	Total	C	Cl	N	O	0	0	0
			80	53	2	8	17			
1	B	7	Total	C	Cl	N	O	0	0	0
			80	53	2	8	17			

- Molecule 2 is an oligosaccharide called vancosamine-(1-2)-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			21	13	1	7			
2	D	2	Total	C	N	O	0	0	0
			21	13	1	7			

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

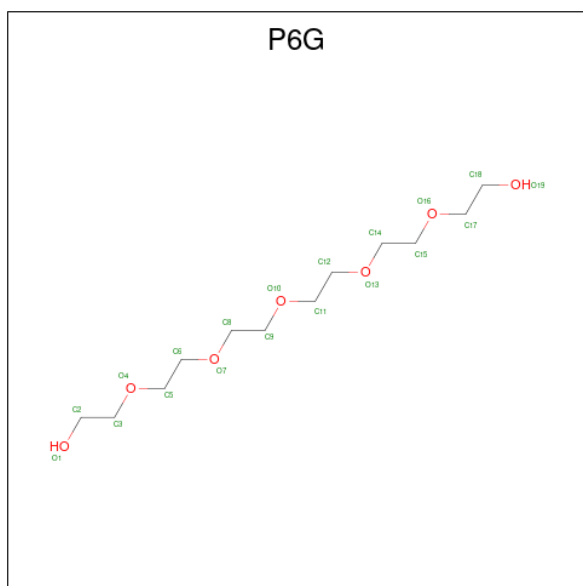
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Zn	0	0
			1	1		

- Molecule 4 is CITRIC ACID (three-letter code: CIT) (formula: C<sub>6</sub>H<sub>8</sub>O<sub>7</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			13	6	7		
4	A	1	Total	C	O	0	0
			13	6	7		

- Molecule 5 is HEXAETHYLENE GLYCOL (three-letter code: P6G) (formula:  $C_{12}H_{26}O_7$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			17	11	6		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	45	Total 45	O 45	0	0
6	B	29	Total 29	O 29	0	0

### 3 Residue-property plots


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

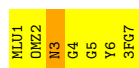
- Molecule 1: Vancomycin

Chain A:  14% 86%



- Molecule 1: Vancomycin

Chain B:  86% 14%



- Molecule 2: vancosamine-(1-2)-beta-D-glucopyranose

Chain C:  50% 50%



- Molecule 2: vancosamine-(1-2)-beta-D-glucopyranose

Chain D:  100%



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	49.04Å 57.48Å 21.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.31 – 0.95 37.31 – 0.95	Depositor EDS
% Data completeness (in resolution range)	98.0 (37.31-0.95) 98.0 (37.31-0.95)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	9.02 (at 0.95Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, $R_{free}$	0.105 , 0.118 0.112 , 0.126	Depositor DCC
$R_{free}$ test set	1939 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	5.0	Xtriage
Anisotropy	0.084	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 45.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	320	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	8.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.92% 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: OMY, P6G, BGC, GHP, RER, 3FG, MLU, CIT, OMZ, ZN

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	0.92	0/7	0.99	0/8
1	B	3.80	2/7 (28.6%)	0.84	0/8
All	All	2.76	2/14 (14.3%)	0.92	0/16

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	3	ASN	CG-OD1	7.05	1.39	1.24
1	B	3	ASN	CG-ND2	-6.42	1.16	1.32

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	1	MLU	Mainchain

### 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	80	0	46	0	0
1	B	80	0	47	1	0
2	C	21	0	22	0	0
2	D	21	0	22	0	0
3	A	1	0	0	0	0
4	A	26	0	8	0	0
5	B	17	0	21	1	0
6	A	45	0	0	0	2
6	B	29	0	0	2	1
All	All	320	0	166	2	3

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

All (2) 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)
5:B:103:P6G:C3	6:B:202:HOH:O	1.90	1.19
1:B:3:ASN:OD1	6:B:201:HOH:O	2.01	0.79

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:A:234:HOH:O	6:A:234:HOH:O[3_654]	1.83	0.37
6:A:203:HOH:O	6:A:203:HOH:O[3_654]	1.92	0.28
6:B:204:HOH:O	6:B:204:HOH:O[4_543]	2.00	0.20

## 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	1/7 (14%)	1 (100%)	0	0	100	100
1	B	1/7 (14%)	0	1 (100%)	0	100	100
All	All	2/14 (14%)	1 (50%)	1 (50%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	1/1 (100%)	1 (100%)	0	100	100
1	B	1/1 (100%)	1 (100%)	0	100	100
All	All	2/2 (100%)	2 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

Mol	Chain	Res	Type
1	B	3	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

12 non-standard protein/DNA/RNA residues 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	$\# Z  > 2$
1	OMZ	B	2	1	12,14,15	1.68	3 (25%)	17,19,21	1.19	2 (11%)
1	GHP	A	4	1,2	10,11,12	1.71	2 (20%)	11,14,16	1.32	1 (9%)
1	GHP	A	5	1	10,11,12	1.61	3 (30%)	11,14,16	0.92	1 (9%)
1	GHP	B	5	1	10,11,12	1.49	1 (10%)	11,14,16	0.81	0
1	3FG	B	7	1	12,13,13	1.81	5 (41%)	14,18,18	1.07	1 (7%)
1	MLU	B	1	1	7,8,9	0.39	0	6,9,11	1.12	0
1	MLU	A	1	1	7,8,9	1.18	1 (14%)	6,9,11	1.77	2 (33%)
1	GHP	B	4	1,2	10,11,12	1.71	3 (30%)	11,14,16	0.88	0
1	OMY	A	6	1	12,14,15	1.89	3 (25%)	17,19,21	1.55	3 (17%)
1	3FG	A	7	1	12,13,13	1.74	2 (16%)	14,18,18	1.38	1 (7%)
1	OMY	B	6	1	12,14,15	1.51	3 (25%)	17,19,21	1.36	2 (11%)
1	OMZ	A	2	1	12,14,15	1.32	2 (16%)	17,19,21	0.83	1 (5%)

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
1	OMZ	B	2	1	-	1/9/10/12	0/1/1/1
1	GHP	A	4	1,2	-	2/4/6/8	0/1/1/1
1	GHP	A	5	1	-	0/4/6/8	0/1/1/1
1	GHP	B	5	1	-	0/4/6/8	0/1/1/1
1	3FG	B	7	1	-	2/8/8/8	0/1/1/1
1	MLU	B	1	1	-	1/5/8/10	-
1	MLU	A	1	1	-	0/5/8/10	-
1	GHP	B	4	1,2	-	2/4/6/8	0/1/1/1
1	OMY	A	6	1	-	1/9/10/12	0/1/1/1
1	3FG	A	7	1	-	2/8/8/8	0/1/1/1
1	OMY	B	6	1	-	1/9/10/12	0/1/1/1
1	OMZ	A	2	1	-	1/9/10/12	0/1/1/1

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	6	OMY	CZ-CE1	4.67	1.44	1.39

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	2	OMZ	CZ-CE1	3.95	1.43	1.39
1	A	7	3FG	CZ-CD2	3.79	1.44	1.39
1	B	5	GHP	CA-C	3.33	1.57	1.51
1	A	5	GHP	CA-C	2.86	1.56	1.51
1	B	6	OMY	CZ-CE1	2.78	1.42	1.39
1	A	6	OMY	CD1-CG	2.76	1.43	1.39
1	A	5	GHP	C5-C4	2.72	1.44	1.38
1	B	7	3FG	O-C	2.67	1.30	1.22
1	B	7	3FG	CG2-CD2	2.64	1.43	1.39
1	B	2	OMZ	CD1-CG	2.62	1.43	1.39
1	A	6	OMY	OCZ-CZ	2.56	1.41	1.36
1	A	4	GHP	CA-C	2.55	1.56	1.51
1	A	4	GHP	C1-CA	2.55	1.55	1.52
1	B	4	GHP	C1-CA	2.42	1.55	1.52
1	B	7	3FG	CZ-CD1	2.40	1.42	1.39
1	A	2	OMZ	CD2-CG	2.34	1.42	1.39
1	B	2	OMZ	OH-CZ	2.27	1.41	1.36
1	B	6	OMY	OCZ-CZ	2.25	1.41	1.36
1	B	7	3FG	CG1-CD1	2.25	1.42	1.39
1	A	5	GHP	C1-CA	2.19	1.54	1.52
1	A	2	OMZ	CZ-CE1	2.17	1.41	1.39
1	B	4	GHP	CA-C	2.16	1.55	1.51
1	A	7	3FG	CB-CA	2.14	1.55	1.52
1	B	6	OMY	CD1-CG	2.14	1.42	1.39
1	A	1	MLU	CN-N	2.13	1.52	1.46
1	B	7	3FG	CG2-CB	2.13	1.42	1.39
1	B	4	GHP	C6-C1	2.01	1.42	1.39

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	6	OMY	CD1-CE1-CZ	-3.80	118.71	120.91
1	B	6	OMY	CG-CB-CA	-3.70	106.54	111.49
1	A	1	MLU	CG-CB-CA	3.13	123.14	115.34
1	A	6	OMY	CG-CB-CA	-3.13	107.30	111.49
1	A	7	3FG	CD1-CG1-CB	-2.96	117.57	120.11
1	B	2	OMZ	O-C-CA	-2.86	117.29	124.78
1	A	1	MLU	O-C-CA	-2.77	117.51	124.78
1	A	2	OMZ	O-C-CA	-2.36	118.60	124.78
1	A	4	GHP	C3-C2-C1	-2.32	118.86	121.20
1	B	2	OMZ	CD1-CE1-CZ	-2.28	119.59	120.91
1	B	7	3FG	CB-CA-C	2.25	115.05	109.96

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	5	GHP	C1-CA-N	2.25	117.78	112.40
1	A	6	OMY	CE2-CZ-CE1	2.20	120.69	118.55
1	B	6	OMY	CZ-CE1-CL	2.02	123.33	119.53

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	6	OMY	O-C-CA-CB
1	B	6	OMY	O-C-CA-CB
1	A	7	3FG	C-CA-CB-CG1
1	A	7	3FG	C-CA-CB-CG2
1	B	7	3FG	C-CA-CB-CG1
1	B	7	3FG	C-CA-CB-CG2
1	A	4	GHP	C2-C1-CA-N
1	B	4	GHP	C2-C1-CA-N
1	A	2	OMZ	O-C-CA-CB
1	B	2	OMZ	O-C-CA-CB
1	A	4	GHP	C6-C1-CA-N
1	B	4	GHP	C6-C1-CA-N
1	B	1	MLU	N-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

## 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	BGC	C	1	1,2	11,11,12	1.07	0	15,15,17	0.72	0
2	RER	C	2	2	6,10,11	1.33	1 (16%)	6,15,17	0.72	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	BGC	D	1	1,2	11,11,12	1.09	1 (9%)	15,15,17	0.80	0
2	RER	D	2	2	6,10,11	1.08	0	6,15,17	1.24	1 (16%)

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	BGC	C	1	1,2	-	0/2/19/22	0/1/1/1
2	RER	C	2	2	-	-	0/1/1/1
2	BGC	D	1	1,2	-	2/2/19/22	0/1/1/1
2	RER	D	2	2	-	-	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	2	RER	O5-C5	2.14	1.48	1.43
2	D	1	BGC	C2-C3	2.10	1.55	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	2	RER	O5-C1-C2	2.12	114.37	111.38

There are no chirality outliers.

All (2) torsion outliers are listed below:

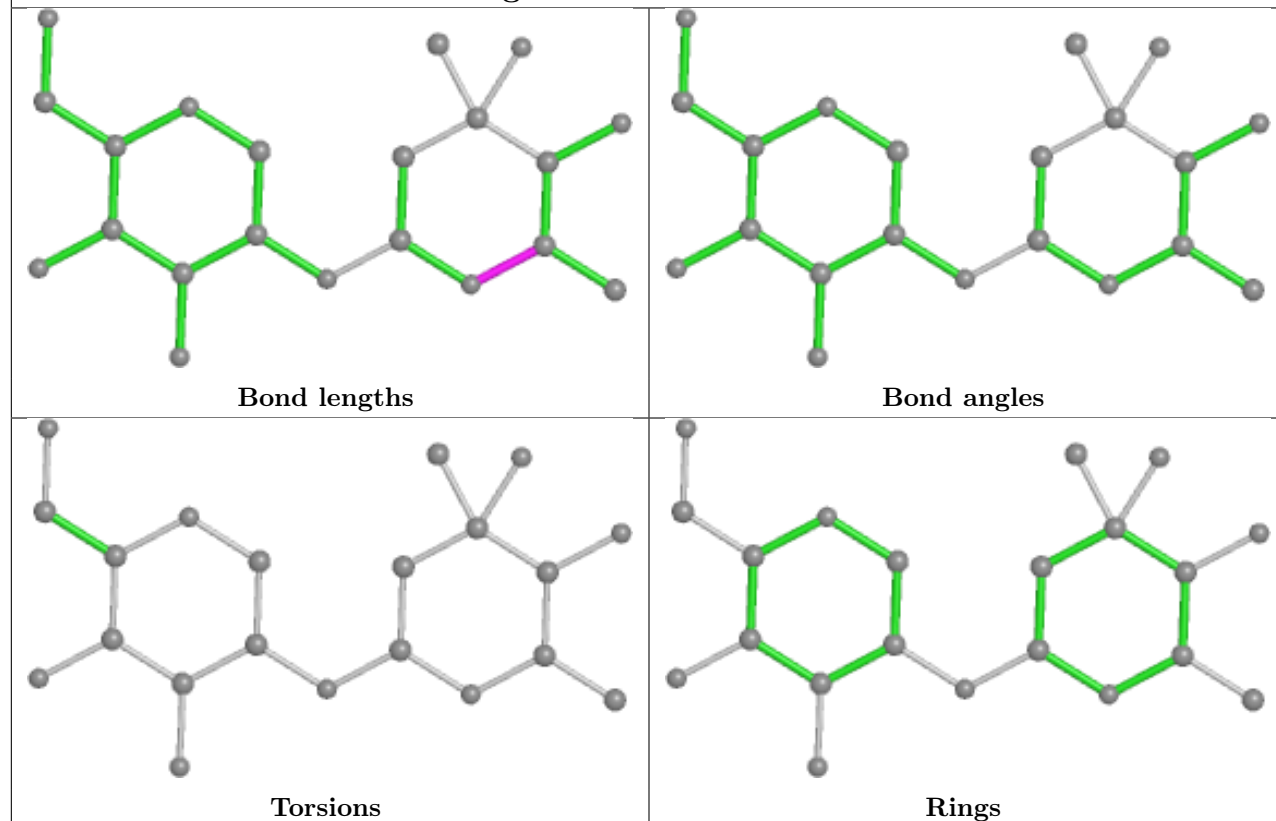
Mol	Chain	Res	Type	Atoms
2	D	1	BGC	O5-C5-C6-O6
2	D	1	BGC	C4-C5-C6-O6

There are no ring outliers.

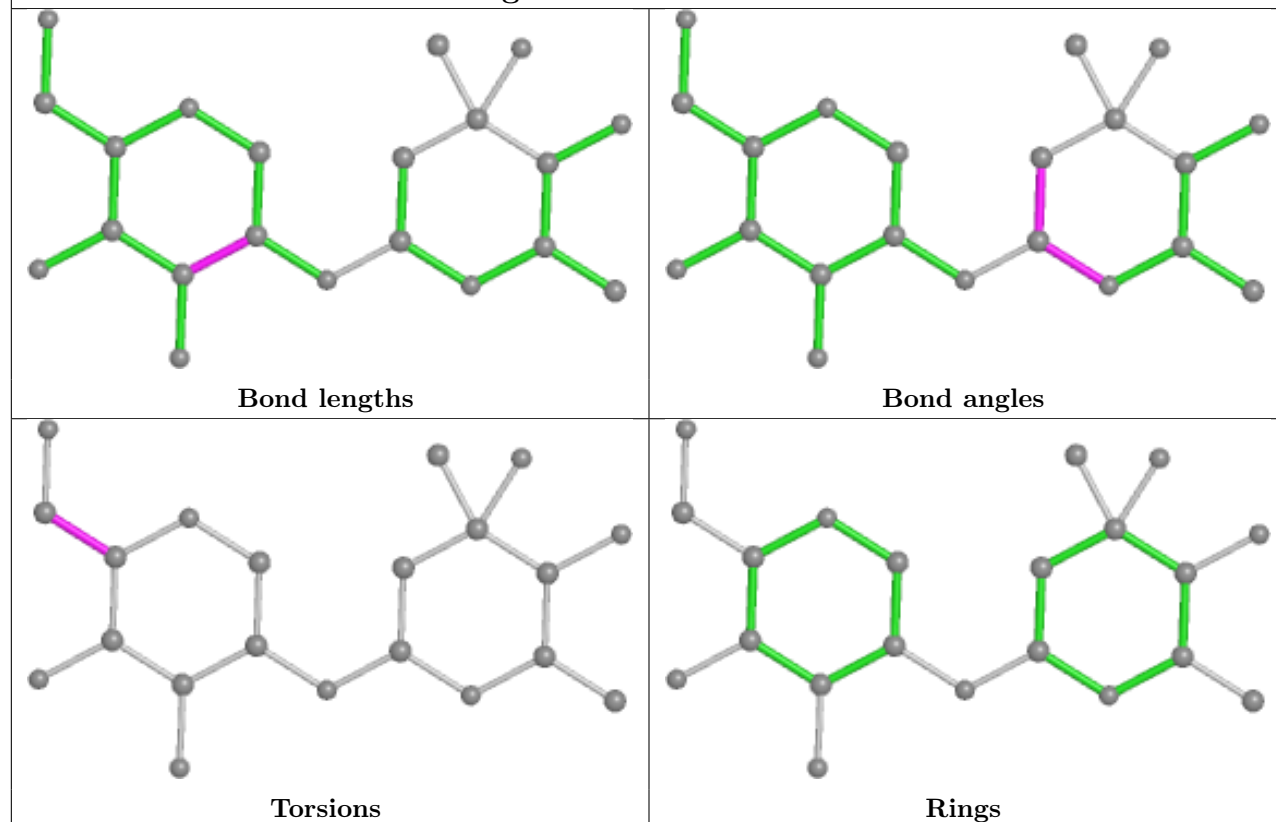
No monomer is involved in short contacts.

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

## Oligosaccharide Chain C



## Oligosaccharide Chain D



## 5.6 Ligand geometry

Of 4 ligands modelled in this entry, 1 is monoatomic - leaving 3 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
5	P6G	B	103	-	16,16,18	1.08	2 (12%)	15,15,17	1.08	2 (13%)
4	CIT	A	104	3	12,12,12	1.79	1 (8%)	17,17,17	1.21	2 (11%)
4	CIT	A	105	3	12,12,12	1.50	2 (16%)	17,17,17	1.37	2 (11%)

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
5	P6G	B	103	-	-	1/14/14/16	-
4	CIT	A	104	3	-	13/16/16/16	-
4	CIT	A	105	3	-	0/16/16/16	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	104	CIT	C3-C6	5.46	1.59	1.53
5	B	103	P6G	O4-C3	-2.83	1.27	1.42
4	A	105	CIT	C3-C6	2.76	1.56	1.53
4	A	105	CIT	O3-C5	2.42	1.30	1.22
5	B	103	P6G	C15-C14	2.18	1.60	1.49

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	105	CIT	O5-C6-C3	-3.18	117.75	122.25
4	A	105	CIT	O6-C6-C3	3.10	118.43	113.05
4	A	104	CIT	O6-C6-C3	3.07	118.38	113.05
5	B	103	P6G	O10-C9-C8	-2.78	97.87	110.39

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	103	P6G	C17-O16-C15	-2.38	102.96	113.29
4	A	104	CIT	O5-C6-C3	-2.31	118.98	122.25

There are no chirality outliers.

All (14) torsion outliers are listed below:

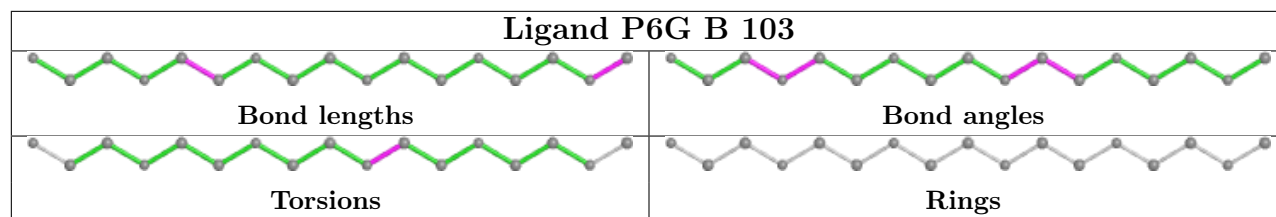
Mol	Chain	Res	Type	Atoms
4	A	104	CIT	C1-C2-C3-O7
4	A	104	CIT	C2-C3-C6-O6
4	A	104	CIT	C4-C3-C6-O5
4	A	104	CIT	C4-C3-C6-O6
4	A	104	CIT	C1-C2-C3-C6
4	A	104	CIT	C3-C4-C5-O3
4	A	104	CIT	C2-C3-C6-O5
4	A	104	CIT	C3-C4-C5-O4
4	A	104	CIT	C1-C2-C3-C4
4	A	104	CIT	O7-C3-C6-O5
4	A	104	CIT	O7-C3-C6-O6
5	B	103	P6G	C8-C9-O10-C11
4	A	104	CIT	O1-C1-C2-C3
4	A	104	CIT	O2-C1-C2-C3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	103	P6G	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 all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



## 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, 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	1/7 (14%)	-0.60	0 100 100	5, 5, 5, 5	0
1	B	1/7 (14%)	0.32	0 100 100	6, 6, 6, 6	0
All	All	2/14 (14%)	-0.14	0 100 100	5, 5, 5, 6	0

There are no RSRZ outliers to report.

### 6.2 Non-standard residues in protein, DNA, RNA chains [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.

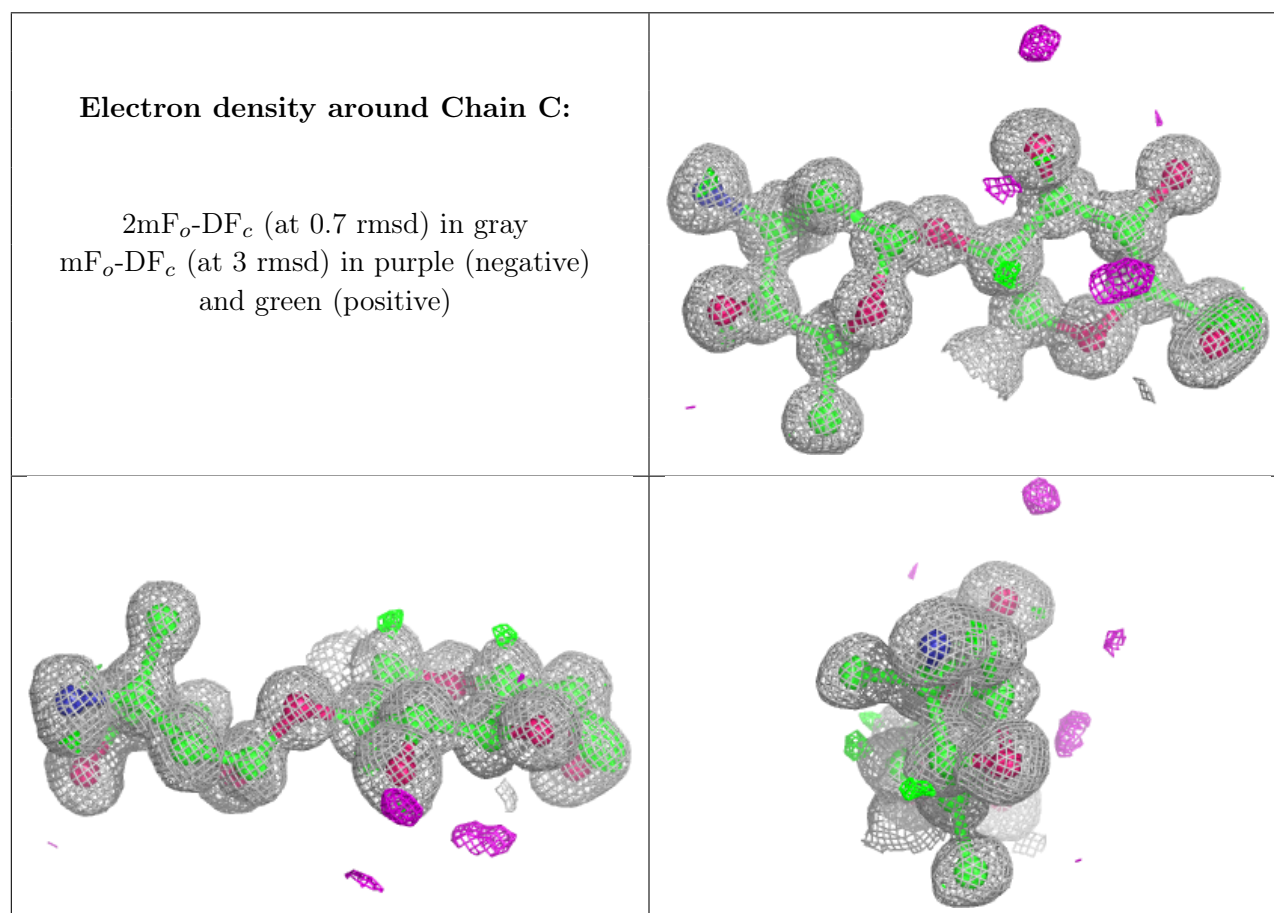
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
1	MLU	B	1	9/10	0.87	0.14	5,8,13,14	0
1	MLU	A	1	9/10	0.97	0.09	5,6,10,13	0
1	OMZ	B	2	14/15	0.98	0.07	3,3,5,5	1
1	3FG	A	7	13/13	0.98	0.07	4,6,10,12	0
1	GHP	B	4	11/12	0.99	0.07	2,3,3,3	0
1	GHP	A	5	11/12	0.99	0.06	2,3,5,7	0
1	GHP	B	5	11/12	0.99	0.06	2,3,3,4	0
1	OMY	A	6	14/15	0.99	0.06	3,3,4,5	0
1	OMY	B	6	14/15	0.99	0.06	2,3,4,5	0
1	OMZ	A	2	14/15	0.99	0.07	3,4,5,6	0
1	3FG	B	7	13/13	0.99	0.06	3,4,6,7	0
1	GHP	A	4	11/12	1.00	0.05	2,2,3,3	0

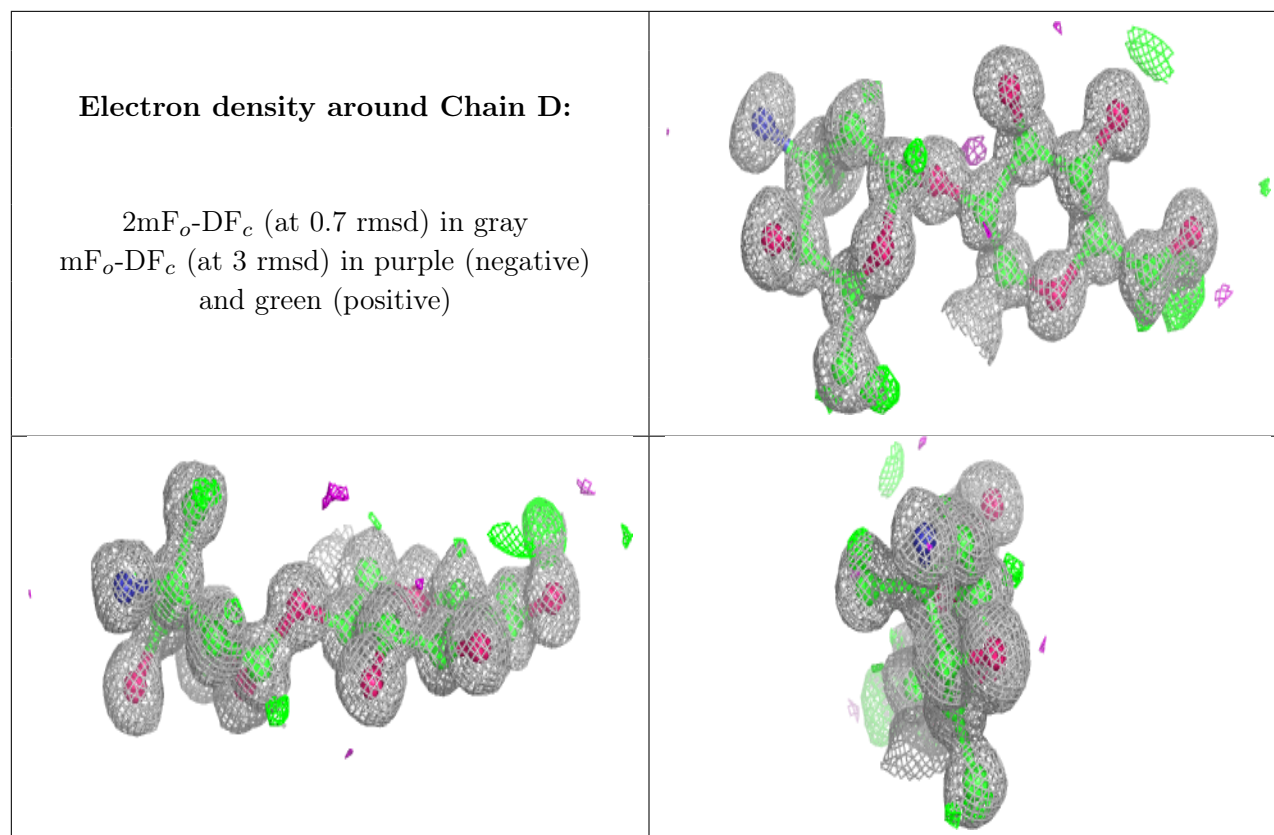
### 6.3 Carbohydrates ⓘ

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	BGC	C	1	11/12	0.99	0.07	2,3,4,7	0
2	RER	C	2	10/11	0.99	0.06	3,4,5,6	0
2	BGC	D	1	11/12	0.99	0.06	3,4,7,9	0
2	RER	D	2	10/11	0.99	0.08	3,4,6,6	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.



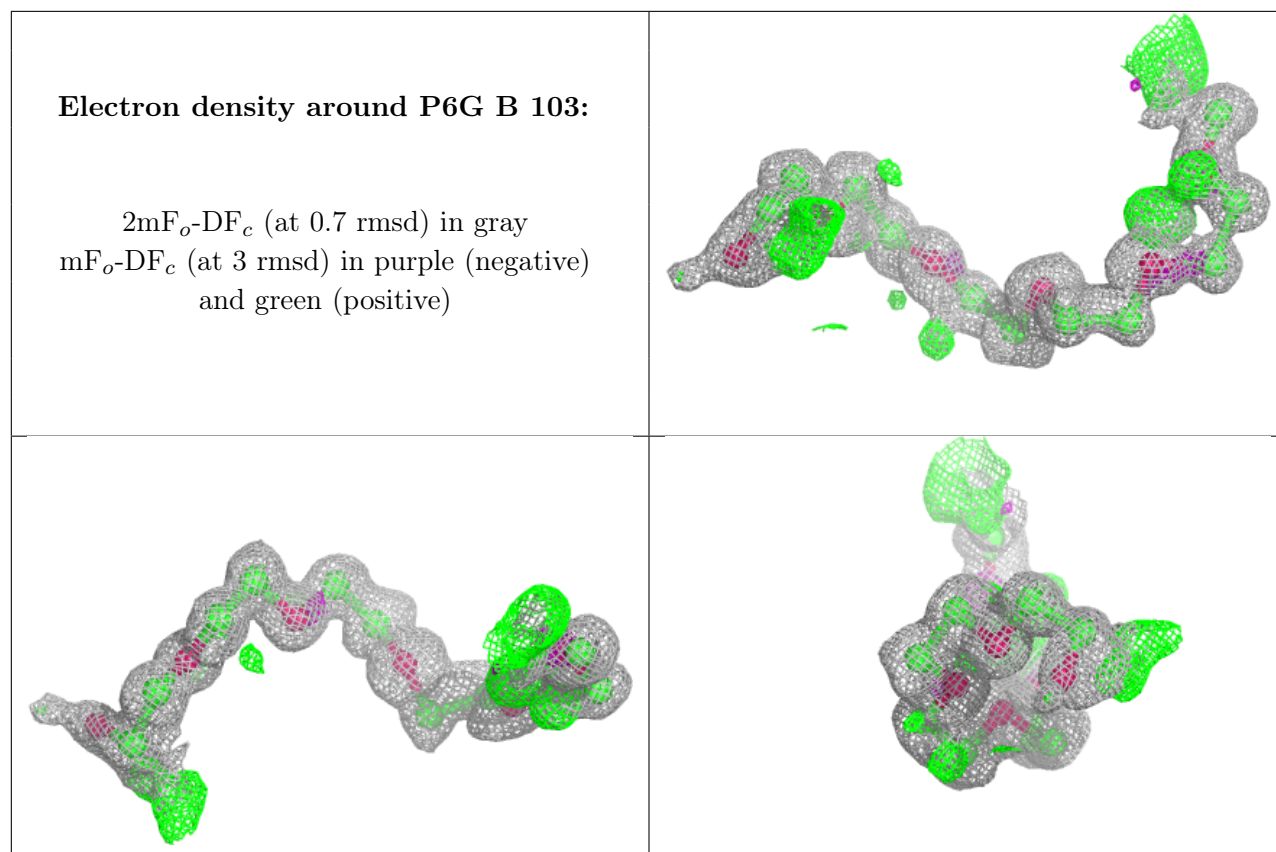


## 6.4 Ligands [i](#)

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
5	P6G	B	103	17/19	0.95	0.12	7,8,15,22	0
4	CIT	A	105	13/13	0.99	0.06	4,4,7,7	0
4	CIT	A	104	13/13	0.99	0.06	4,5,7,9	0
3	ZN	A	103	1/1	1.00	0.03	4,4,4,4	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.