



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 5, 2023 – 06:18 PM EDT

PDB ID : 3VD8  
Title : Crystal structure of human AIM2 PYD domain with MBP fusion  
Authors : Jin, T.C.; Perry, A.; Smith, P.; Xiao, T.S.  
Deposited on : 2012-01-04  
Resolution : 2.07 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)  
Xtrriage (Phenix) : 1.13  
EDS : 2.35  
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) : 2.35

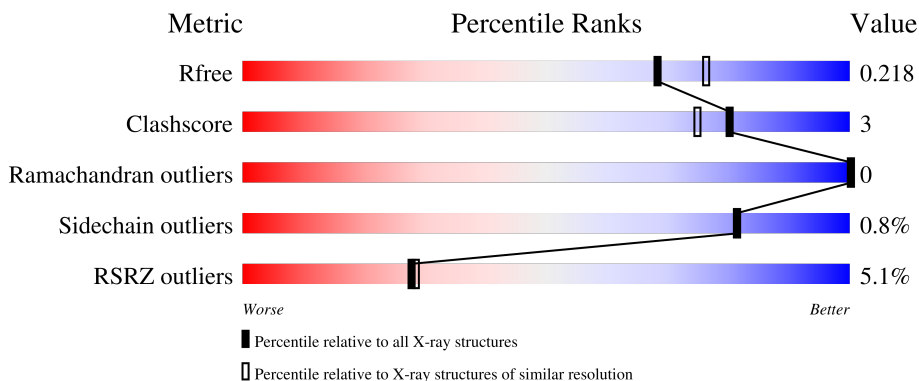
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

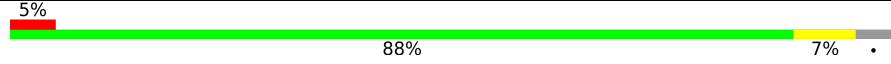
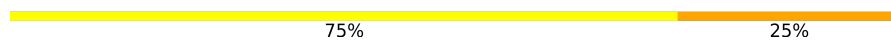
The reported resolution of this entry is 2.07 Å.

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	2684 (2.08-2.04)
Clashscore	141614	2801 (2.08-2.04)
Ramachandran outliers	138981	2768 (2.08-2.04)
Sidechain outliers	138945	2768 (2.08-2.04)
RSRZ outliers	127900	2646 (2.08-2.04)

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	489	 5% 88% 7%
2	B	4	 75% 25%

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4078 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 Maltose-binding periplasmic protein, Interferon-inducible protein AIM2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	467	3688	2370	611	696	11	0	6	0

There are 29 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	expression tag	UNP P0AEY0
A	82	ALA	ASP	engineered mutation	UNP P0AEY0
A	83	ALA	LYS	engineered mutation	UNP P0AEY0
A	172	ALA	GLU	engineered mutation	UNP P0AEY0
A	173	ALA	ASN	engineered mutation	UNP P0AEY0
A	239	ALA	LYS	engineered mutation	UNP P0AEY0
A	359	ALA	-	linker	UNP P0AEY0
A	360	ALA	-	linker	UNP P0AEY0
A	361	LEU	-	linker	UNP P0AEY0
A	362	ALA	-	linker	UNP P0AEY0
A	363	ALA	-	linker	UNP P0AEY0
A	364	ALA	-	linker	UNP P0AEY0
A	365	GLN	-	linker	UNP P0AEY0
A	366	THR	-	linker	UNP P0AEY0
A	367	ASN	-	linker	UNP P0AEY0
A	368	ALA	-	linker	UNP P0AEY0
A	369	VAL	-	linker	UNP P0AEY0
A	370	ASP	-	linker	UNP P0AEY0
A	1108	ALA	-	expression tag	UNP O14862
A	1109	ALA	-	expression tag	UNP O14862
A	1110	ALA	-	expression tag	UNP O14862
A	1111	LEU	-	expression tag	UNP O14862
A	1112	GLU	-	expression tag	UNP O14862
A	1113	HIS	-	expression tag	UNP O14862
A	1114	HIS	-	expression tag	UNP O14862
A	1115	HIS	-	expression tag	UNP O14862

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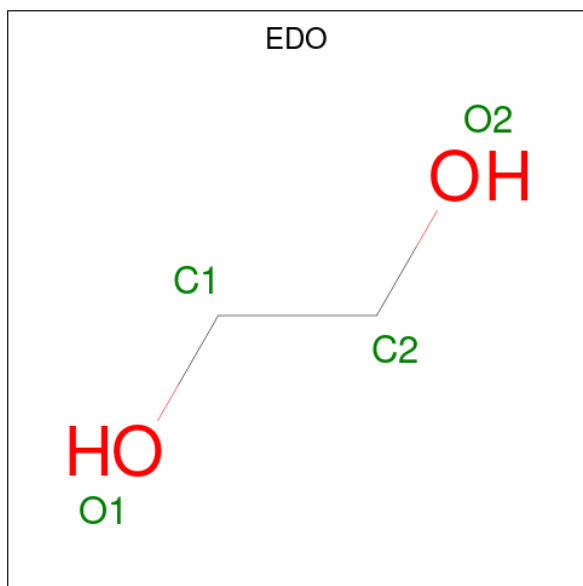
Chain	Residue	Modelled	Actual	Comment	Reference
A	1116	HIS	-	expression tag	UNP O14862
A	1117	HIS	-	expression tag	UNP O14862
A	1118	HIS	-	expression tag	UNP O14862

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	B	4	45	24	21	0	0	0

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



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

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	4	Total K 4 4	0	0

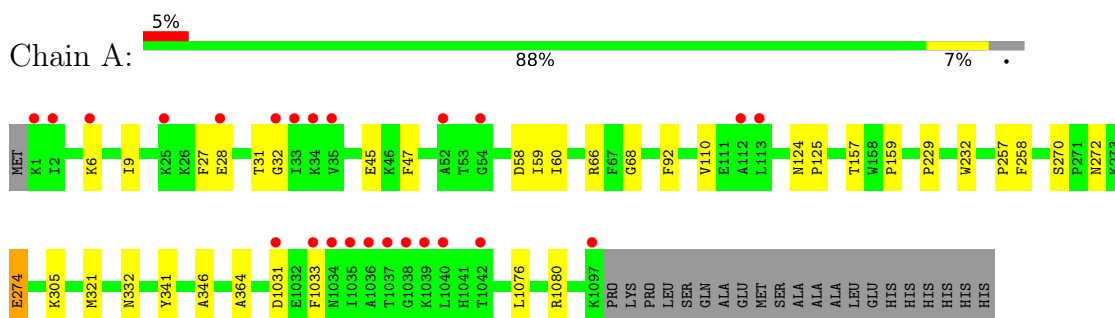
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	325	Total O 325 325	0	0

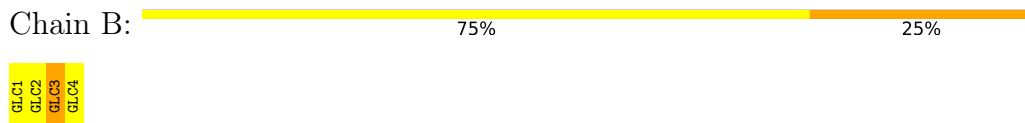
### 3 Residue-property plots [i](#)

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

- Molecule 1: Maltose-binding periplasmic protein, Interferon-inducible protein AIM2



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.60Å 91.93Å 100.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.89 – 2.07 38.89 – 2.07	Depositor EDS
% Data completeness (in resolution range)	98.3 (38.89-2.07) 98.3 (38.89-2.07)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.87 (at 2.06Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: dev_947)	Depositor
R, $R_{free}$	0.182 , 0.221 0.180 , 0.218	Depositor DCC
$R_{free}$ test set	1741 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	32.6	Xtrriage
Anisotropy	0.060	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 51.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	4078	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.49% 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: GLC, EDO, K

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	0.23	0/3766	0.39	0/5100

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3688	0	3700	20	0
2	B	45	0	37	1	0
3	A	16	0	24	2	0
4	A	4	0	0	0	0
5	A	325	0	0	2	0
All	All	4078	0	3761	20	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 (20) 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:1031:ASP:HB2	5:A:1594:HOH:O	1.79	0.81
1:A:6:LYS:O	1:A:272:ASN:ND2	2.34	0.61
1:A:305:LYS:HB3	3:A:1202:EDO:H21	1.83	0.60
1:A:274:GLU:CD	1:A:274:GLU:H	2.05	0.60
1:A:1076:LEU:O	1:A:1080[B]:ARG:HG2	2.04	0.58
1:A:321:MET:HG3	3:A:1204:EDO:H22	1.89	0.53
1:A:157:THR:HG23	5:A:1596:HOH:O	2.09	0.53
1:A:28:GLU:O	1:A:32:GLY:N	2.42	0.51
1:A:68:GLY:HA3	1:A:332:ASN:O	2.11	0.51
1:A:66:ARG:HD3	2:B:3:GLC:O2	2.12	0.48
1:A:92:PHE:CZ	1:A:110:VAL:HG21	2.50	0.46
1:A:27:PHE:O	1:A:31:THR:HG22	2.15	0.46
1:A:45:GLU:OE2	1:A:341:TYR:OH	2.22	0.46
1:A:346:ALA:HB2	1:A:364:ALA:HB2	1.98	0.45
1:A:229:PRO:HA	1:A:232:TRP:CE2	2.53	0.44
1:A:159:PRO:HG3	1:A:257:PRO:HA	1.98	0.43
1:A:47:PHE:CG	1:A:60:ILE:HD12	2.54	0.43
1:A:58:ASP:OD2	1:A:270:SER:OG	2.33	0.42
1:A:9:ILE:HG12	1:A:59:ILE:HB	2.03	0.41
1:A:124:ASN:HA	1:A:125:PRO:HD2	1.95	0.40

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	471/489 (96%)	458 (97%)	13 (3%)	0	<a href="#">100</a> <a href="#">100</a>

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	381/393 (97%)	378 (99%)	3 (1%)	81 81

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	258	PHE
1	A	274	GLU
1	A	1033	PHE

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

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

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	GLC	B	1	2	12,12,12	1.34	2 (16%)	17,17,17	0.97	0
2	GLC	B	2	2	11,11,12	1.82	2 (18%)	15,15,17	0.70	0
2	GLC	B	3	2	11,11,12	1.58	2 (18%)	15,15,17	1.13	1 (6%)
2	GLC	B	4	2	11,11,12	1.75	2 (18%)	15,15,17	1.47	3 (20%)

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	GLC	B	1	2	-	0/2/22/22	0/1/1/1
2	GLC	B	2	2	-	0/2/19/22	0/1/1/1
2	GLC	B	3	2	-	0/2/19/22	0/1/1/1
2	GLC	B	4	2	-	0/2/19/22	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	4	GLC	C2-C3	-4.01	1.46	1.52
2	B	3	GLC	C2-C3	-3.94	1.46	1.52
2	B	2	GLC	C2-C3	-3.46	1.47	1.52
2	B	2	GLC	C6-C5	-2.63	1.43	1.51
2	B	1	GLC	C4-C3	-2.62	1.45	1.52
2	B	4	GLC	C4-C3	-2.52	1.45	1.52
2	B	1	GLC	C3-C2	-2.51	1.45	1.52
2	B	3	GLC	O5-C1	2.17	1.47	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	4	GLC	C1-O5-C5	3.18	116.50	112.19
2	B	4	GLC	C1-C2-C3	2.47	112.70	109.67
2	B	3	GLC	C2-C3-C4	2.37	114.99	110.89
2	B	4	GLC	O6-C6-C5	2.01	118.20	111.29

There are no chirality outliers.

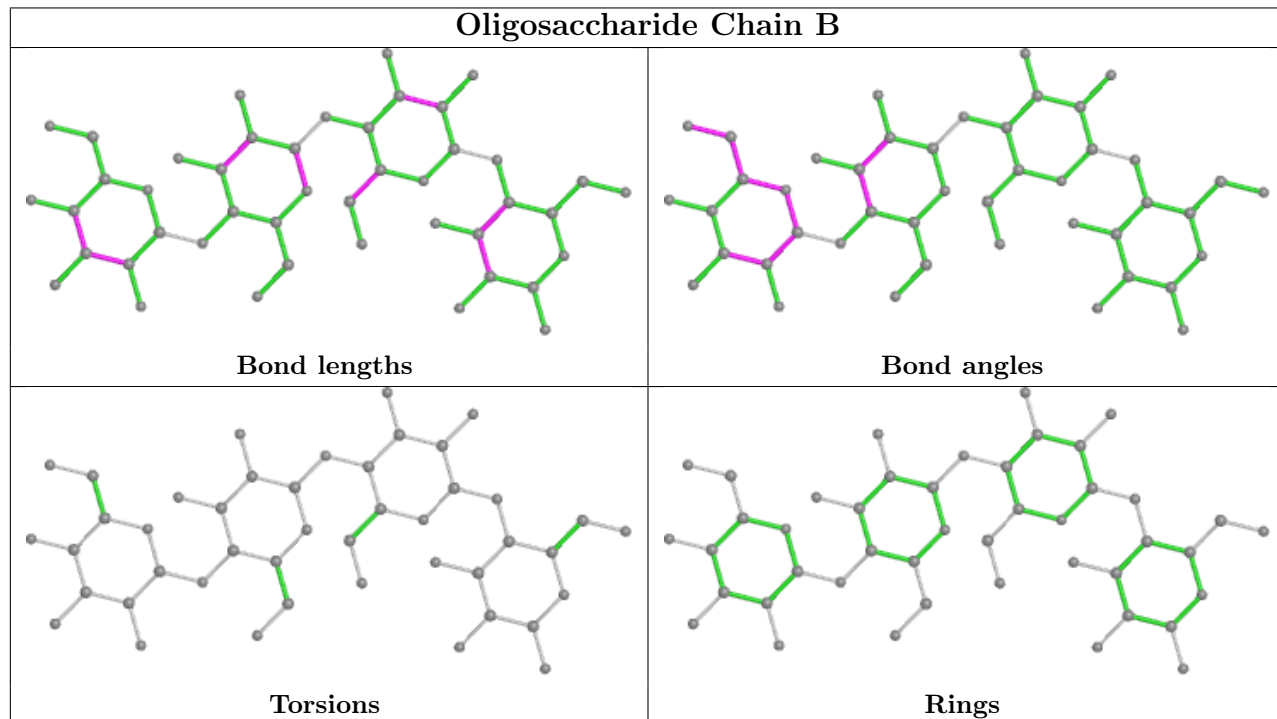
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	3	GLC	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 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	$\# Z  > 2$
3	EDO	A	1203	-	3,3,3	0.47	0	2,2,2	0.29	0
3	EDO	A	1201	-	3,3,3	0.46	0	2,2,2	0.31	0
3	EDO	A	1204	-	3,3,3	0.48	0	2,2,2	0.13	0
3	EDO	A	1202	-	3,3,3	0.48	0	2,2,2	0.20	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
3	EDO	A	1203	-	-	1/1/1/1	-
3	EDO	A	1201	-	-	0/1/1/1	-
3	EDO	A	1204	-	-	1/1/1/1	-
3	EDO	A	1202	-	-	1/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1203	EDO	O1-C1-C2-O2
3	A	1204	EDO	O1-C1-C2-O2
3	A	1202	EDO	O1-C1-C2-O2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1204	EDO	1	0
3	A	1202	EDO	1	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

### 6.1 Protein, DNA and RNA chains

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	467/489 (95%)	-0.03	24 (5%) <span style="border: 1px solid red; padding: 2px;">28</span> <span style="border: 1px solid red; padding: 2px;">28</span>	22, 35, 74, 115	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1034	ASN	8.6
1	A	1037	THR	8.4
1	A	1035	ILE	7.5
1	A	1036	ALA	5.9
1	A	1038	GLY	5.4
1	A	1033	PHE	5.4
1	A	1039	LYS	3.8
1	A	34	LYS	3.5
1	A	33	ILE	3.5
1	A	28	GLU	3.4
1	A	25	LYS	3.4
1	A	2	ILE	3.1
1	A	1040	LEU	3.1
1	A	52	ALA	3.1
1	A	1	LYS	2.9
1	A	1031	ASP	2.7
1	A	1097	LYS	2.6
1	A	54	GLY	2.3
1	A	32	GLY	2.3
1	A	1042	THR	2.2
1	A	112	ALA	2.1
1	A	6	LYS	2.0
1	A	113	LEU	2.0
1	A	35	VAL	2.0

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

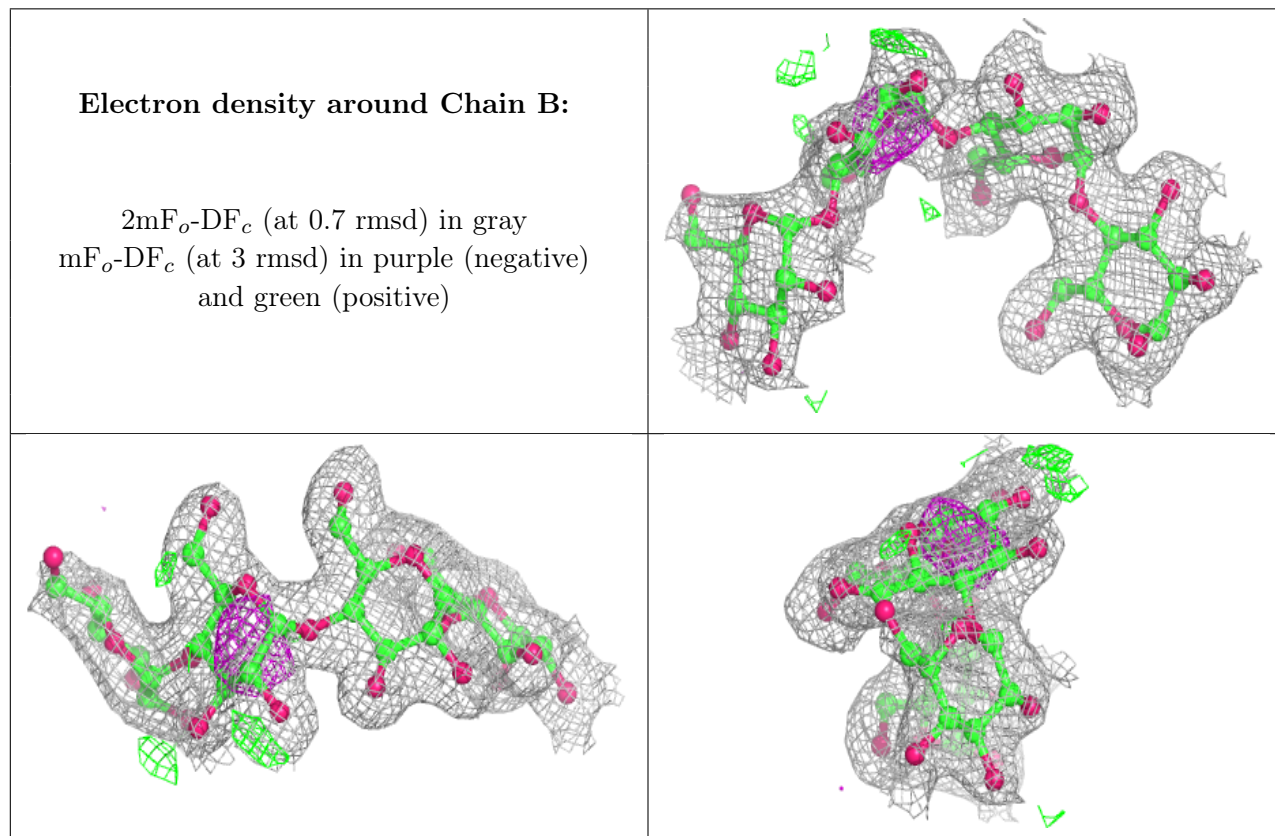
There are no non-standard protein/DNA/RNA residues in this entry.

## 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(Å <sup>2</sup> )	Q<0.9
2	GLC	B	3	11/12	0.83	0.17	35,42,50,52	0
2	GLC	B	4	11/12	0.93	0.18	57,64,68,68	0
2	GLC	B	1	12/12	0.96	0.16	27,30,35,35	0
2	GLC	B	2	11/12	0.97	0.14	22,25,28,29	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(Å <sup>2</sup> )	Q<0.9
3	EDO	A	1204	4/4	0.41	0.31	53,56,57,59	0
3	EDO	A	1202	4/4	0.83	0.25	43,44,45,58	0
3	EDO	A	1203	4/4	0.91	0.14	46,48,57,57	0
3	EDO	A	1201	4/4	0.91	0.29	38,49,56,65	0
4	K	A	1206	1/1	0.93	0.05	50,50,50,50	0
4	K	A	1208	1/1	0.94	0.29	62,62,62,62	0
4	K	A	1207	1/1	0.98	0.33	53,53,53,53	0
4	K	A	1209	1/1	0.98	0.39	54,54,54,54	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.