



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 10:49 AM UTC

PDB ID : 6TZC / pdb\_00006tzc  
Title : Crystal Structure of African Swine Fever Virus A179L with the Autophagy Regulator Beclin  
Authors : Banjara, S.; Kvensakul, M.; Hinds, M.G.  
Deposited on : 2019-08-12  
Resolution : 2.41 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 : 4-5-2 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 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

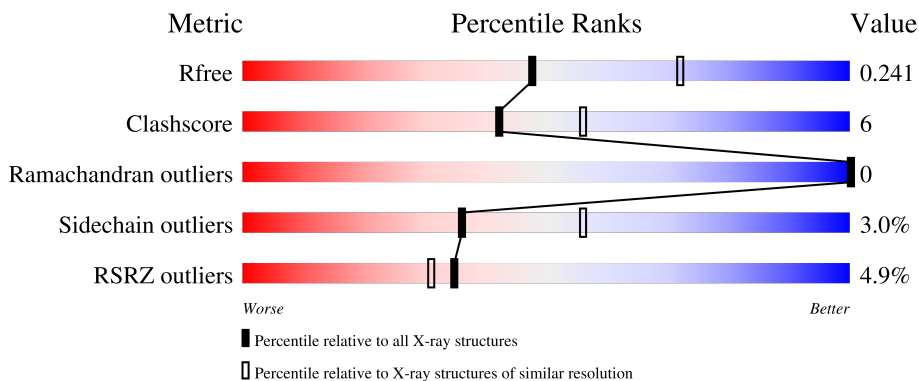
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.41 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	6062 (2.44-2.40)
Clashscore	190562	6562 (2.44-2.40)
Ramachandran outliers	187476	6481 (2.44-2.40)
Sidechain outliers	187428	6482 (2.44-2.40)
RSRZ outliers	180081	6066 (2.44-2.40)

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  $\geq 3$ , 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	371	
2	B	154	
3	C	26	
4	D	2	

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 8408 atoms, of which 4089 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/maltodextrin-binding periplasmic protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	367	5569	1824	2740	453	546	6	0	6	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	26	GLY	-	expression tag	UNP P0AEX9
A	393	ASN	-	expression tag	UNP P0AEX9
A	394	SER	-	expression tag	UNP P0AEX9
A	395	SER	-	expression tag	UNP P0AEX9
A	396	SER	-	expression tag	UNP P0AEX9

- Molecule 2 is a protein called Apoptosis regulator Bcl-2 homolog.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
2	B	144	2343	767	1162	187	220	7	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	149	HIS	-	expression tag	UNP P42485
B	150	HIS	-	expression tag	UNP P42485
B	151	HIS	-	expression tag	UNP P42485
B	152	HIS	-	expression tag	UNP P42485
B	153	HIS	-	expression tag	UNP P42485
B	154	HIS	-	expression tag	UNP P42485

- Molecule 3 is a protein called Beclin-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
3	C	20	325	99	165	28	31	2	0	0	0

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	H	O			
4	D	2	45	12	22	11	0	0	0

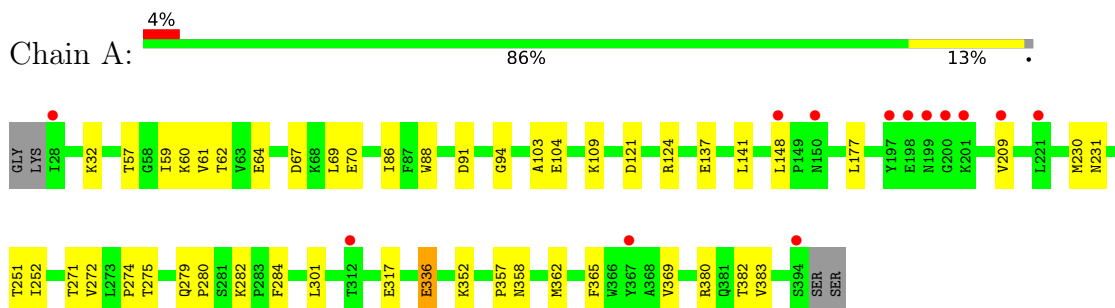
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	76	Total	O	0	0
			76	76		
5	B	49	Total	O	0	0
			49	49		
5	C	1	Total	O	0	0
			1	1		

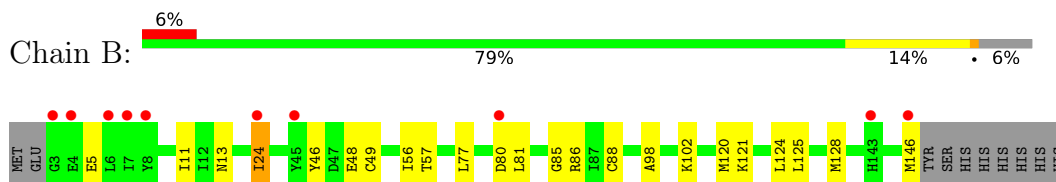
### 3 Residue-property plots [i](#)

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.

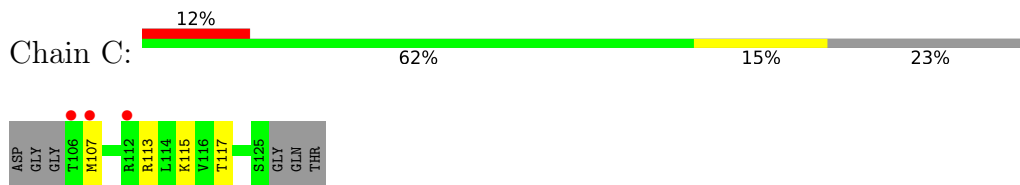
- Molecule 1: Maltose/maltodextrin-binding periplasmic protein



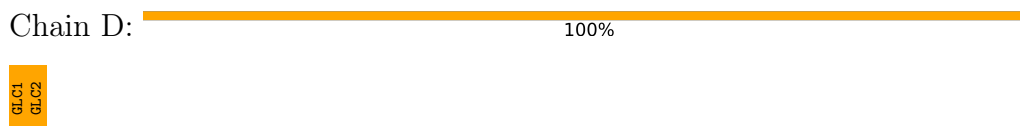
- Molecule 2: Apoptosis regulator Bcl-2 homolog



- Molecule 3: Beclin-1



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



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	54.56Å 44.35Å 129.02Å 90.00° 94.53° 90.00°	Depositor
Resolution (Å)	51.58 – 2.41 51.58 – 2.41	Depositor EDS
% Data completeness (in resolution range)	98.9 (51.58-2.41) 99.0 (51.58-2.41)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.09 (at 2.39Å)	Xtrriage
Refinement program	AMBER 1.17.1_3660, PHENIX 1.17.1_3660	Depositor
R, $R_{free}$	0.214 , 0.253 (Not available) , 0.241	Depositor DCC
$R_{free}$ test set	1183 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	34.1	Xtrriage
Anisotropy	0.551	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 50.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	8408	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.25% 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

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	0.18	0/2919	0.30	0/3978
2	B	0.20	0/1209	0.31	0/1636
3	C	0.23	0/160	0.36	0/212
All	All	0.18	0/4288	0.31	0/5826

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	2829	2740	2733	31	0
2	B	1181	1162	1161	19	0
3	C	160	165	165	4	0
4	D	23	22	21	3	0
5	A	76	0	0	8	0
5	B	49	0	0	4	0
5	C	1	0	0	1	0
All	All	4319	4089	4080	52	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.

All (52) 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)
2:B:128:MET:SD	5:B:249:HOH:O	2.12	1.04
3:C:113:ARG:NH1	5:C:201:HOH:O	1.94	0.99
2:B:56:ILE:O	5:B:201:HOH:O	1.86	0.94
1:A:103:ALA:O	5:A:501:HOH:O	1.83	0.93
1:A:104:GLU:OE2	5:A:502:HOH:O	1.93	0.85
2:B:24:ILE:HD11	2:B:98:ALA:HB1	1.63	0.81
1:A:336:GLU:OE2	5:A:503:HOH:O	1.99	0.81
2:B:125:LEU:HA	2:B:128:MET:HE3	1.63	0.80
1:A:91:ASP:OD2	4:D:1:GLC:O2	2.00	0.78
3:C:113:ARG:O	3:C:117:THR:HG22	1.85	0.77
1:A:137:GLU:OE2	4:D:2:GLC:O6	2.03	0.75
2:B:120:MET:HG3	2:B:128:MET:HE1	1.70	0.71
1:A:61:VAL:O	5:A:504:HOH:O	2.08	0.70
2:B:5:GLU:OE2	2:B:121:LYS:NZ	2.26	0.68
2:B:48:GLU:OE2	5:B:202:HOH:O	2.12	0.68
1:A:64:GLU:OE2	5:A:505:HOH:O	2.12	0.67
1:A:70:GLU:OE1	1:A:70:GLU:N	2.30	0.64
1:A:59[B]:ILE:HD13	1:A:301:LEU:HD22	1.81	0.63
2:B:24:ILE:HD11	2:B:98:ALA:CB	2.30	0.62
1:A:275:THR:HG22	1:A:280:PRO:HA	1.82	0.61
1:A:380:ARG:NH1	5:A:509:HOH:O	2.35	0.60
1:A:279:GLN:HG3	5:A:516:HOH:O	2.03	0.59
2:B:124:LEU:HB3	2:B:128:MET:HE2	1.89	0.55
1:A:69:LEU:HD11	1:A:86:ILE:CD1	2.39	0.53
1:A:88:TRP:HE1	4:D:1:GLC:H2	1.73	0.52
1:A:94:GLY:HA3	1:A:358:ASN:O	2.11	0.51
1:A:109:LYS:O	1:A:109:LYS:HD3	2.11	0.50
1:A:69:LEU:HD12	1:A:69:LEU:O	2.12	0.49
2:B:11:ILE:HG13	5:B:204:HOH:O	2.11	0.49
2:B:120:MET:CG	2:B:128:MET:HE1	2.42	0.49
2:B:77:LEU:HD12	3:C:115:LYS:HG2	1.96	0.48
2:B:46:TYR:OH	3:C:117:THR:HG23	2.14	0.47
1:A:282:LYS:HG2	1:A:352:LYS:O	2.14	0.47
1:A:57:THR:HB	1:A:59[B]:ILE:HD12	1.97	0.46
2:B:125:LEU:CA	2:B:128:MET:HE3	2.41	0.46
2:B:124:LEU:CB	2:B:128:MET:HE2	2.46	0.46
1:A:251:THR:HG22	1:A:252:ILE:N	2.31	0.46
1:A:177:LEU:HD12	1:A:231:ASN:O	2.16	0.46
1:A:121:ASP:OD1	1:A:124:ARG:NH1	2.48	0.45
1:A:69:LEU:HD12	1:A:69:LEU:C	2.42	0.45

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:279:GLN:NE2	5:A:516:HOH:O	2.51	0.43
1:A:357:PRO:HB2	1:A:362:MET:HE3	1.99	0.43
2:B:81:LEU:C	2:B:81:LEU:HD12	2.43	0.43
1:A:365:PHE:O	1:A:369:VAL:HG23	2.18	0.43
1:A:141:LEU:HD13	1:A:274:PRO:HD3	2.00	0.43
1:A:32:LYS:NZ	1:A:62:THR:OG1	2.50	0.42
2:B:80:ASP:HB3	2:B:86:ARG:HH12	1.83	0.42
1:A:382:THR:HG22	1:A:383:VAL:N	2.33	0.42
2:B:85:GLY:O	2:B:88:CYS:HB2	2.20	0.42
1:A:177:LEU:HD21	1:A:230:MET:HE1	2.02	0.41
2:B:24:ILE:HG23	2:B:102:LYS:HD3	2.03	0.41
1:A:271:THR:OG1	1:A:272:VAL:N	2.53	0.41

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	371/371 (100%)	364 (98%)	7 (2%)	0	100	100
2	B	142/154 (92%)	141 (99%)	1 (1%)	0	100	100
3	C	18/26 (69%)	18 (100%)	0	0	100	100
All	All	531/551 (96%)	523 (98%)	8 (2%)	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	288/297 (97%)	281 (98%)	7 (2%)	43	63
2	B	132/142 (93%)	127 (96%)	5 (4%)	29	47
3	C	19/22 (86%)	18 (95%)	1 (5%)	20	34
All	All	439/461 (95%)	426 (97%)	13 (3%)	36	56

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	60	LYS
1	A	67	ASP
1	A	148	LEU
1	A	209	VAL
1	A	284	PHE
1	A	317	GLU
1	A	336	GLU
2	B	13	ASN
2	B	24	ILE
2	B	49	CYS
2	B	57	THR
2	B	146	MET
3	C	107	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	279	GLN
2	B	13	ASN
2	B	37	GLN
2	B	53	GLN
2	B	122	HIS
2	B	123	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](#)

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

## 5.5 Carbohydrates [i](#)

2 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
4	GLC	D	1	4	12,12,12	1.15	3 (25%)	17,17,17	1.67	5 (29%)
4	GLC	D	2	4	11,11,12	0.87	1 (9%)	15,15,17	1.22	1 (6%)

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
4	GLC	D	1	4	-	0/2/22/22	0/1/1/1
4	GLC	D	2	4	-	1/2/19/22	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	1	GLC	C6-C5	2.21	1.59	1.51
4	D	2	GLC	O5-C1	-2.11	1.40	1.43
4	D	1	GLC	O4-C4	-2.10	1.37	1.43
4	D	1	GLC	C4-C5	-2.00	1.48	1.53

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	GLC	O5-C1-C2	2.70	115.04	110.30
4	D	1	GLC	C1-O5-C5	-2.35	109.10	113.65
4	D	1	GLC	O5-C5-C4	2.29	113.83	109.70

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	GLC	C6-C5-C4	2.24	118.52	113.02
4	D	2	GLC	O2-C2-C3	-2.22	105.55	110.15
4	D	1	GLC	O3-C3-C4	2.13	115.41	110.38

There are no chirality outliers.

All (1) torsion outliers are listed below:

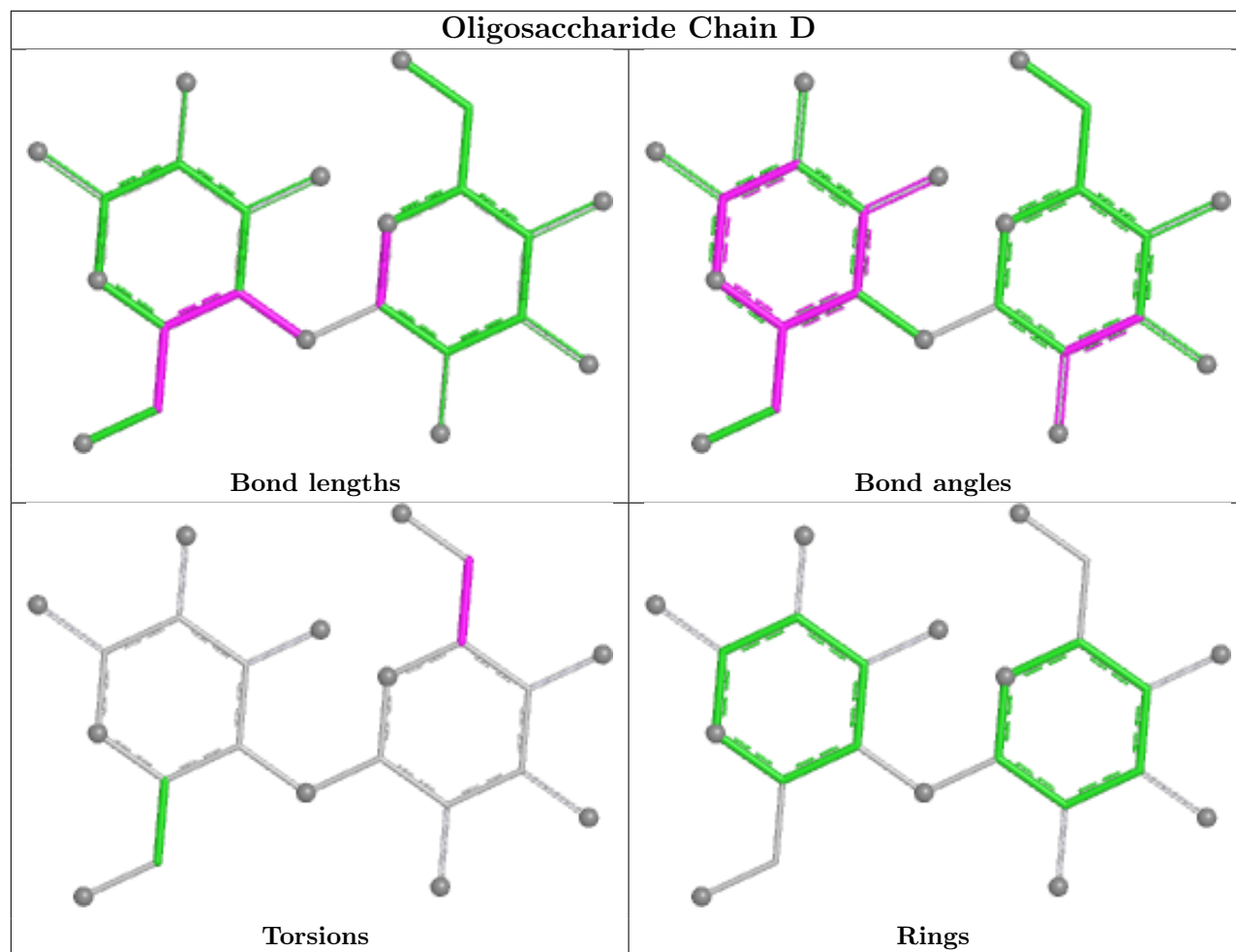
Mol	Chain	Res	Type	Atoms
4	D	2	GLC	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	2	GLC	1	0
4	D	1	GLC	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](#)

There are no ligands in this entry.

## 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	367/371 (98%)	0.31	13 (3%) 47 43	19, 51, 79, 116	5 (1%)
2	B	144/154 (93%)	0.00	10 (6%) 23 19	17, 33, 67, 130	0
3	C	20/26 (76%)	0.54	3 (15%) 5 4	29, 42, 92, 99	0
All	All	531/551 (96%)	0.24	26 (4%) 35 31	17, 46, 79, 130	5 (0%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	28	ILE	6.2
2	B	146	MET	5.7
3	C	112	ARG	4.1
1	A	197	TYR	3.7
1	A	201	LYS	3.6
2	B	7	ILE	3.6
2	B	4	GLU	3.4
1	A	367	TYR	3.2
1	A	198	GLU	2.9
1	A	209	VAL	2.9
2	B	143	HIS	2.7
2	B	8	TYR	2.6
1	A	200	GLY	2.6
2	B	45	TYR	2.5
1	A	394	SER	2.5
2	B	80	ASP	2.5
3	C	106	THR	2.4
2	B	24	ILE	2.4
1	A	148	LEU	2.4
2	B	6	LEU	2.4
1	A	312	THR	2.2
1	A	150	ASN	2.1
1	A	221	LEU	2.1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
2	B	3	GLY	2.1
1	A	199	ASN	2.1
3	C	107	MET	2.0

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

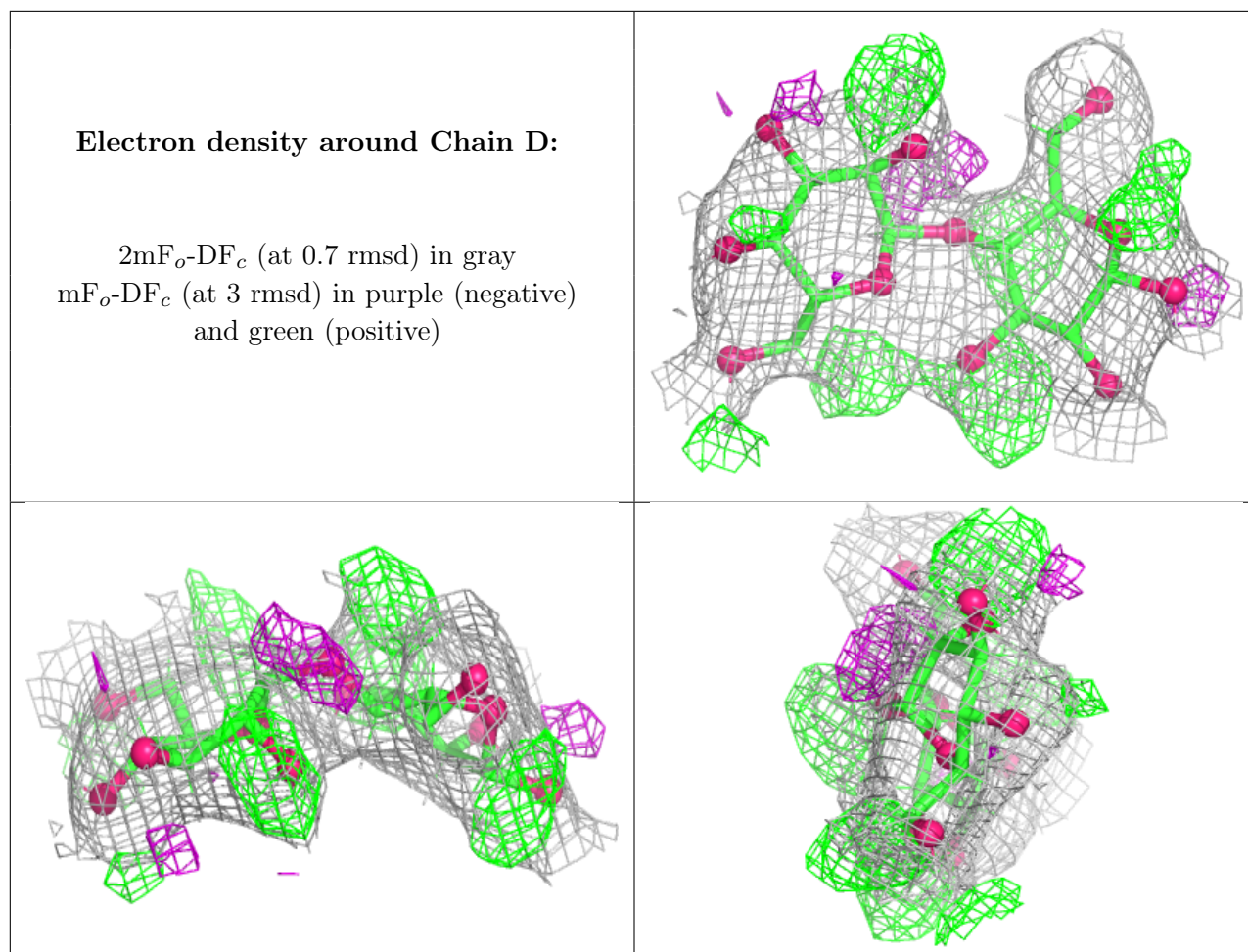
There are no non-standard protein/DNA/RNA residues in this entry.

## 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
4	GLC	D	2	11/12	0.77	0.17	28,44,55,58	0
4	GLC	D	1	12/12	0.78	0.19	21,52,72,86	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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.