



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 10:50 AM UTC

PDB ID : 6I4Y / pdb_00006i4y
Title : X-ray structure of the human mitochondrial PRELID3b-TRIAP1 complex
Authors : Miliara, X.; Berry, J.-L.; Morgan, R.M.L.; Matthews, S.J.
Deposited on : 2018-11-12
Resolution : 2.91 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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	:	4-5-2 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

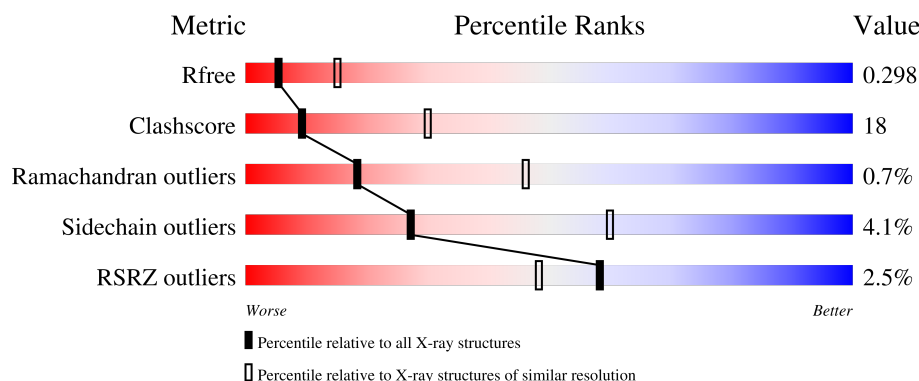
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.91 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	2995 (2.94-2.90)
Clashscore	190562	3213 (2.94-2.90)
Ramachandran outliers	187476	3128 (2.94-2.90)
Sidechain outliers	187428	3130 (2.94-2.90)
RSRZ outliers	180081	2995 (2.94-2.90)

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 $\leq 5\%$. 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	446	% 70% 24% • •
2	B	207	5% 58% 22% • 16%
3	C	2	50% 50%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4524 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 transport system, substrate-binding protein,TP53-regulated inhibitor of apoptosis 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	429	Total	C	N	O	S	0	0	0
			3181	2036	512	622	11			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP A0A376KDN7
A	82	ALA	ASP	conflict	UNP A0A376KDN7
A	83	ALA	LYS	conflict	UNP A0A376KDN7
A	172	ALA	GLU	conflict	UNP A0A376KDN7
A	173	ALA	ASN	conflict	UNP A0A376KDN7
A	239	ALA	LYS	conflict	UNP A0A376KDN7
A	362	ALA	LYS	conflict	UNP A0A376KDN7
A	363	ALA	ASP	conflict	UNP A0A376KDN7
A	367	ASN	ARG	conflict	UNP A0A376KDN7
A	368	ALA	-	linker	UNP A0A376KDN7
A	369	ALA	-	linker	UNP A0A376KDN7
A	370	ALA	-	linker	UNP A0A376KDN7
A	371	ASN	-	linker	UNP A0A376KDN7
A	372	SER	-	linker	UNP A0A376KDN7

- Molecule 2 is a protein called PRELI domain containing protein 3B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	173	Total	C	N	O	S	0	0	0
			1304	821	220	257	6			

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-12	MET	-	initiating methionine	UNP Q9Y3B1

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	-11	ALA	-	expression tag	UNP Q9Y3B1
B	-10	HIS	-	expression tag	UNP Q9Y3B1
B	-9	HIS	-	expression tag	UNP Q9Y3B1
B	-8	HIS	-	expression tag	UNP Q9Y3B1
B	-7	HIS	-	expression tag	UNP Q9Y3B1
B	-6	HIS	-	expression tag	UNP Q9Y3B1
B	-5	HIS	-	expression tag	UNP Q9Y3B1
B	-4	VAL	-	expression tag	UNP Q9Y3B1
B	-3	ASP	-	expression tag	UNP Q9Y3B1
B	-2	ASP	-	expression tag	UNP Q9Y3B1
B	-1	ASP	-	expression tag	UNP Q9Y3B1
B	0	LYS	-	expression tag	UNP Q9Y3B1

- Molecule 3 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
3	C	2	Total	C	O	0	0	0
			23	12	11			

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

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

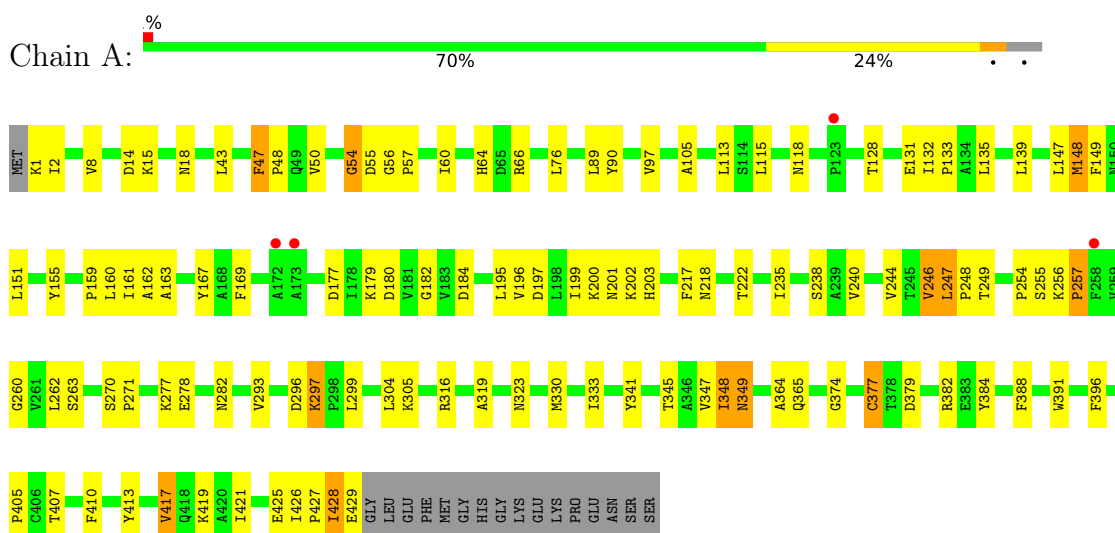
- Molecule 5 is water.

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

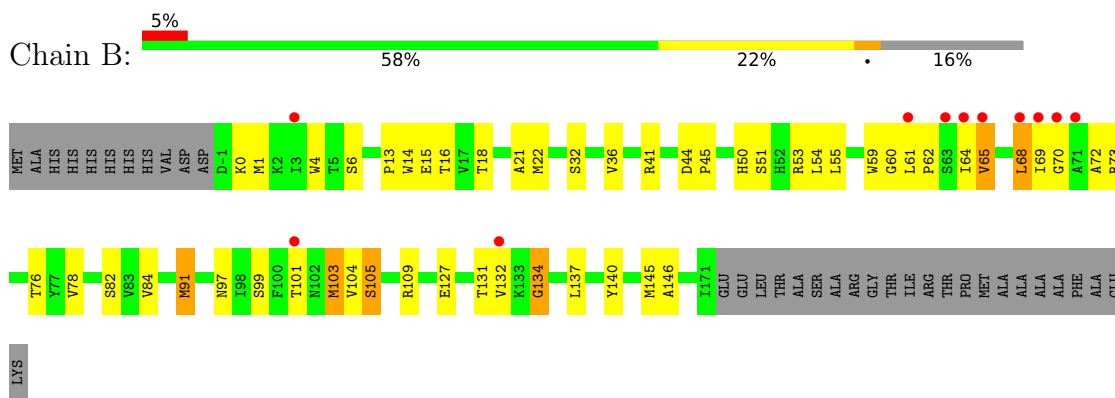
3 Residue-property plots

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: Maltose transport system, substrate-binding protein,TP53-regulated inhibitor of apoptosis 1



- Molecule 2: PRELI domain containing protein 3B



- Molecule 3: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	93.02Å 133.00Å 146.05Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	76.23 – 2.91 76.23 – 2.91	Depositor EDS
% Data completeness (in resolution range)	99.6 (76.23-2.91) 99.6 (76.23-2.91)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 2.91Å)	Xtriage
Refinement program	REFMAC 5.8.0189	Depositor
R, R_{free}	0.210 , 0.296 0.230 , 0.298	Depositor DCC
R_{free} test set	972 reflections (4.82%)	wwPDB-VP
Wilson B-factor (Å ²)	80.1	Xtriage
Anisotropy	0.668	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 76.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4524	wwPDB-VP
Average B, all atoms (Å ²)	89.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.52% 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: NA, 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	0.72	0/3259	1.00	9/4459 (0.2%)
2	B	0.74	0/1335	1.04	6/1827 (0.3%)
All	All	0.73	0/4594	1.01	15/6286 (0.2%)

There are no bond length outliers.

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	134	GLY	N-CA-C	-8.86	103.09	115.32
2	B	68	LEU	N-CA-C	6.81	118.70	111.28
1	A	347	VAL	N-CA-C	6.80	116.95	110.42
2	B	70	GLY	N-CA-C	-6.78	104.63	112.50
2	B	103	MET	N-CA-C	6.46	118.11	111.14

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	3181	0	2937	100	0
2	B	1304	0	1224	59	0
3	C	23	0	21	2	0
4	B	1	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	10	0	0	1	0
5	B	5	0	0	0	0
All	All	4524	0	4182	157	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 18.

The worst 5 of 157 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:0:LYS:O	2:B:1:MET:CE	1.85	1.24
2:B:61:LEU:HD12	2:B:61:LEU:O	1.43	1.17
2:B:0:LYS:O	2:B:1:MET:HE2	1.44	1.13
2:B:59:TRP:HE1	2:B:76:THR:HG21	1.27	0.98
1:A:1:LYS:HE2	1:A:55:ASP:OD1	1.63	0.97

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	427/446 (96%)	405 (95%)	18 (4%)	4 (1%)	14	40
2	B	171/207 (83%)	158 (92%)	13 (8%)	0	100	100
All	All	598/653 (92%)	563 (94%)	31 (5%)	4 (1%)	18	46

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	162	ALA
1	A	201	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	257	PRO
1	A	427	PRO

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	301/353 (85%)	287 (95%)	14 (5%)	23	55
2	B	139/182 (76%)	135 (97%)	4 (3%)	37	69
All	All	440/535 (82%)	422 (96%)	18 (4%)	27	60

5 of 18 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	32	SER
2	B	91	MET
2	B	78	VAL
1	A	297	LYS
1	A	426	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	118	ASN
1	A	282	ASN
1	A	355	GLN
2	B	126	GLN
2	B	165	HIS

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 ⓘ

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	$\# Z > 2$
3	GLC	C	1	3	12,12,12	0.77	0	17,17,17	2.41	5 (29%)
3	GLC	C	2	3	11,11,12	0.58	0	15,15,17	1.93	5 (33%)

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	GLC	C	1	3	-	0/2/22/22	0/1/1/1
3	GLC	C	2	3	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	1	GLC	C4-C3-C2	-6.72	99.04	110.83
3	C	2	GLC	C1-O5-C5	5.47	119.52	112.19
3	C	1	GLC	O1-C1-C2	4.14	120.99	108.98
3	C	1	GLC	O2-C2-C1	3.17	116.57	109.25
3	C	1	GLC	O1-C1-O5	-3.07	101.29	110.41

There are no chirality outliers.

All (2) torsion outliers are listed below:

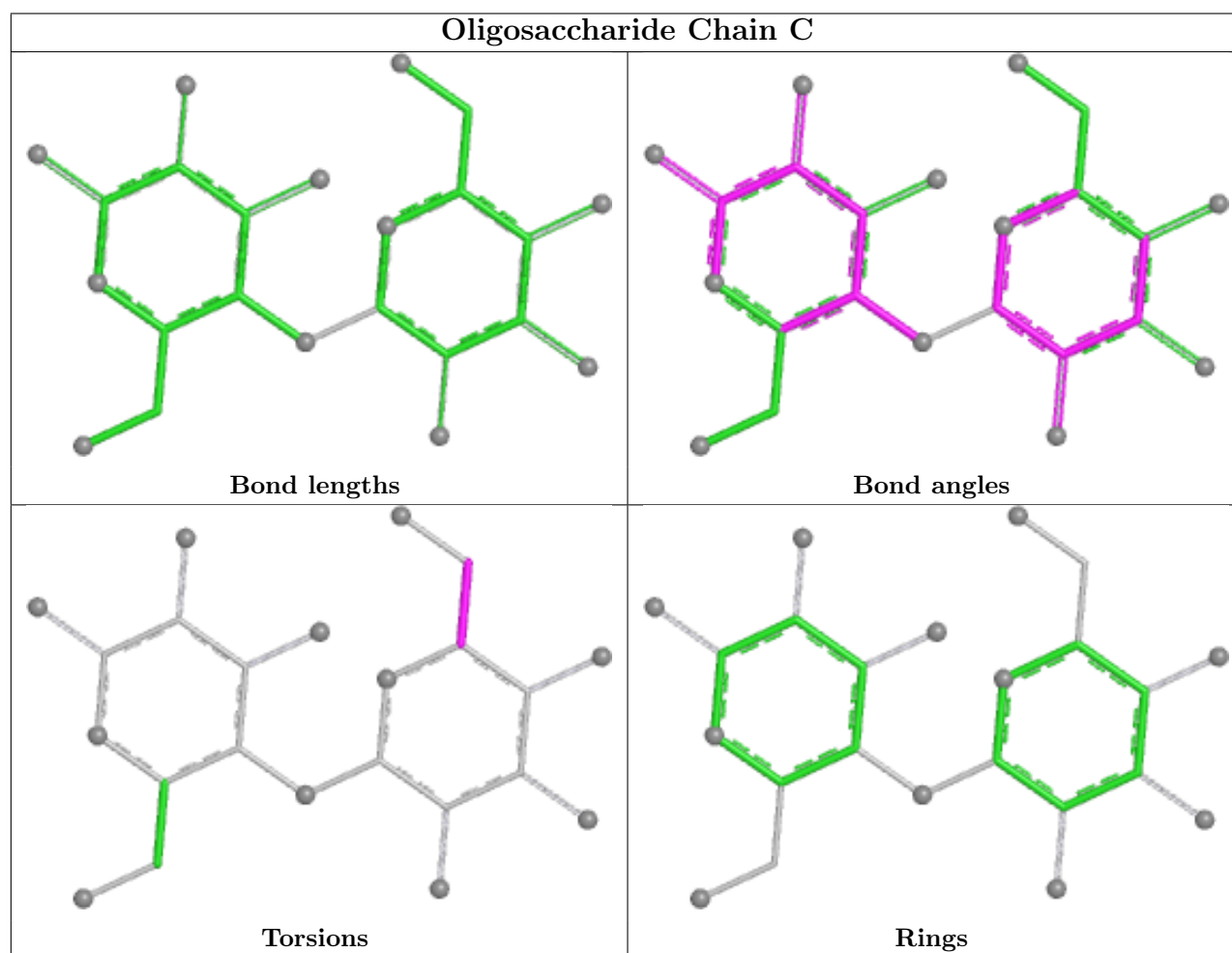
Mol	Chain	Res	Type	Atoms
3	C	2	GLC	O5-C5-C6-O6
3	C	2	GLC	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	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](#)

Of 1 ligands modelled in this entry, 1 is 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, 95th 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 ²)	Q<0.9
1	A	429/446 (96%)	-0.13	4 (0%) 81 74	49, 86, 115, 136	0
2	B	173/207 (83%)	0.42	11 (6%) 25 20	56, 89, 160, 208	0
All	All	602/653 (92%)	0.03	15 (2%) 58 48	49, 87, 126, 208	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	71	ALA	3.9
2	B	64	ILE	3.8
1	A	173	ALA	3.6
1	A	123	PRO	3.6
2	B	132	VAL	3.5

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

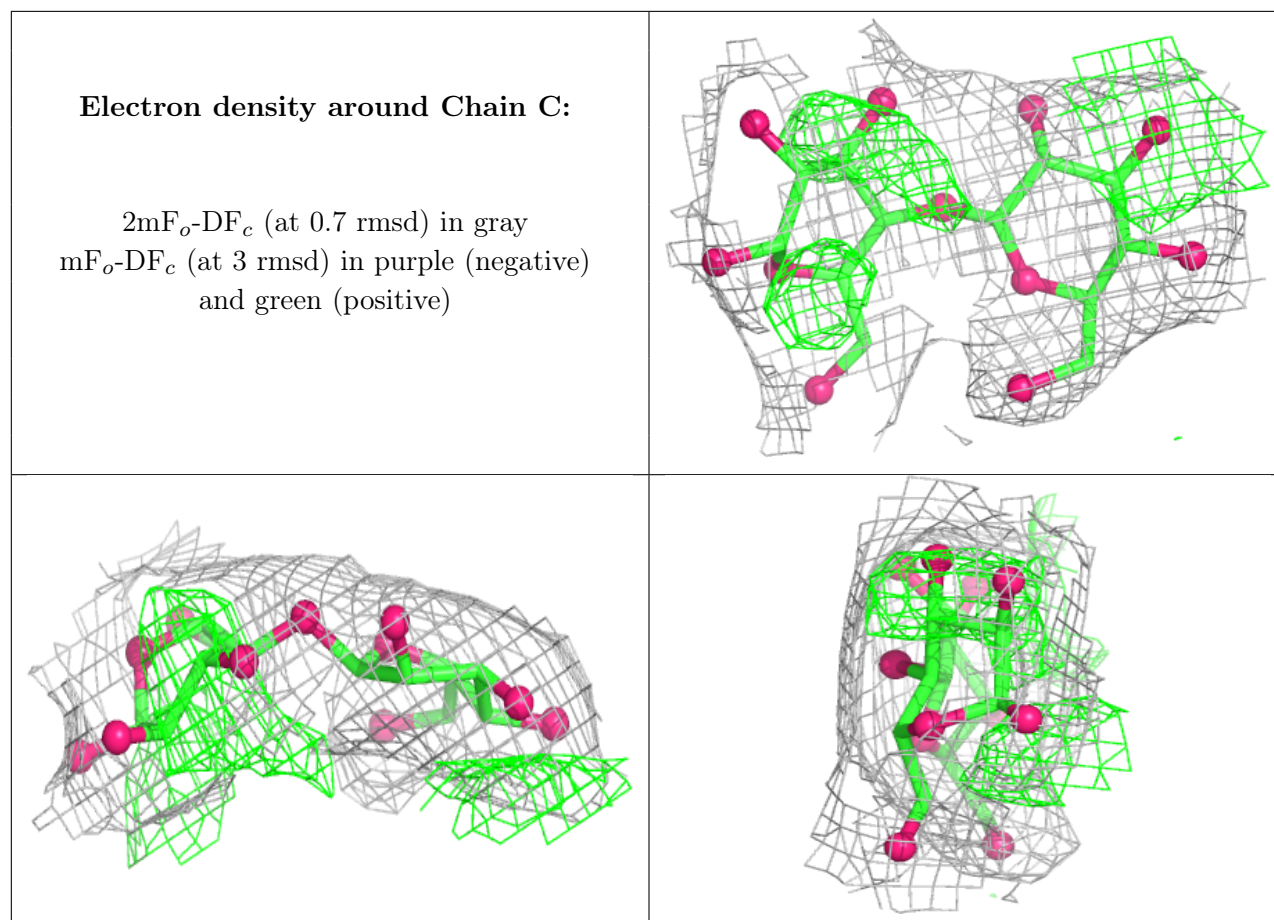
There are no non-standard protein/DNA/RNA residues in this entry.

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, 95th 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 ²)	Q<0.9
3	GLC	C	1	12/12	0.90	0.12	60,74,80,93	0
3	GLC	C	2	11/12	0.94	0.11	58,65,74,74	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, 95th 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
4	NA	B	201	1/1	0.53	0.19	84,84,84,84	0

6.5 Other polymers [i](#)

There are no such residues in this entry.