



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 17, 2026 – 06:17 PM UTC

PDB ID : 7MK7 / pdb_00007mk7
Title : Augmentor domain of augmentor-beta
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Deposited on : 2021-04-21
Resolution : 2.43 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

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

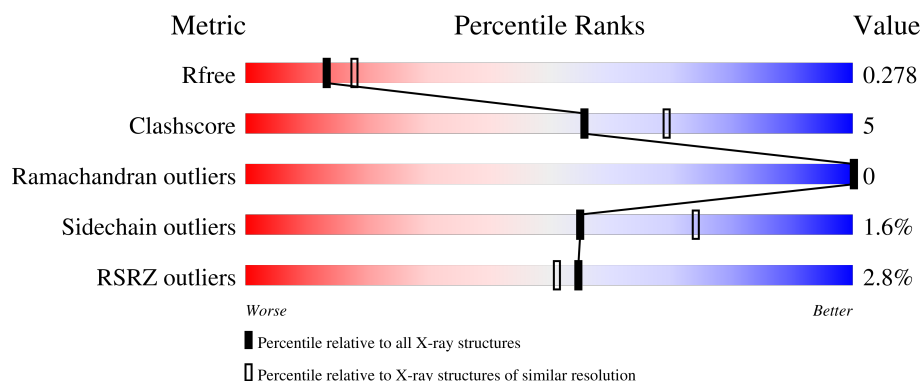
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.43 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 ≥ 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	421	2% 77% 10% 12%
1	B	421	3% 78% 9% 13%
2	C	2	50% 50%
2	F	2	50% 50%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5441 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 ALK and LTK ligand 1,Maltodextrin-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	369	Total	C	N	O	S	0	0	0
			2696	1754	438	494	10			
1	B	368	Total	C	N	O	S	0	0	0
			2685	1746	436	493	10			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	206	ALA	ASP	engineered mutation	UNP A0A2Y0TBT9
A	207	ALA	LYS	engineered mutation	UNP A0A2Y0TBT9
A	296	ALA	GLU	engineered mutation	UNP A0A2Y0TBT9
A	297	ALA	ASN	engineered mutation	UNP A0A2Y0TBT9
A	339	HIS	ALA	engineered mutation	UNP A0A2Y0TBT9
A	343	HIS	LYS	engineered mutation	UNP A0A2Y0TBT9
A	363	ALA	LYS	engineered mutation	UNP A0A2Y0TBT9
A	436	VAL	ALA	engineered mutation	UNP A0A2Y0TBT9
A	441	VAL	ILE	engineered mutation	UNP A0A2Y0TBT9
B	206	ALA	ASP	engineered mutation	UNP A0A2Y0TBT9
B	207	ALA	LYS	engineered mutation	UNP A0A2Y0TBT9
B	296	ALA	GLU	engineered mutation	UNP A0A2Y0TBT9
B	297	ALA	ASN	engineered mutation	UNP A0A2Y0TBT9
B	339	HIS	ALA	engineered mutation	UNP A0A2Y0TBT9
B	343	HIS	LYS	engineered mutation	UNP A0A2Y0TBT9
B	363	ALA	LYS	engineered mutation	UNP A0A2Y0TBT9
B	436	VAL	ALA	engineered mutation	UNP A0A2Y0TBT9
B	441	VAL	ILE	engineered mutation	UNP A0A2Y0TBT9

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



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

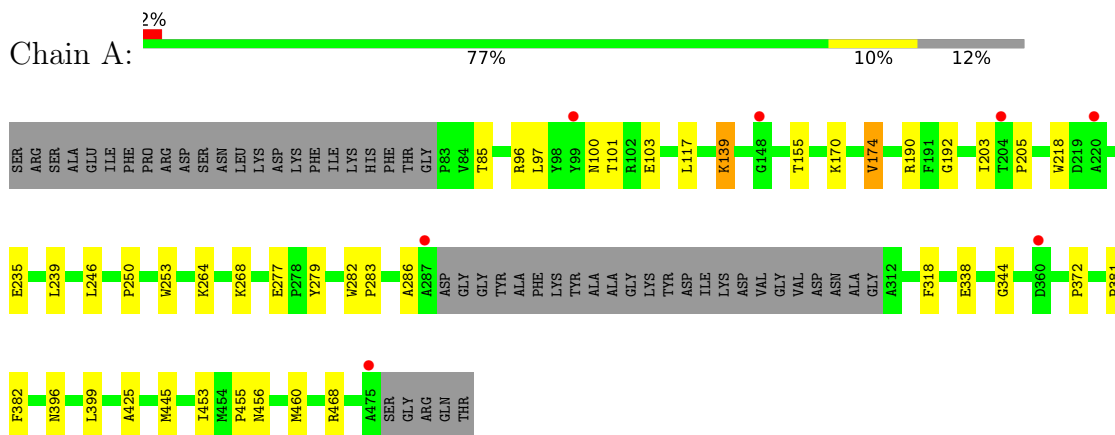
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	7	Total	O	0	0
			7	7		
3	B	7	Total	O	0	0
			7	7		

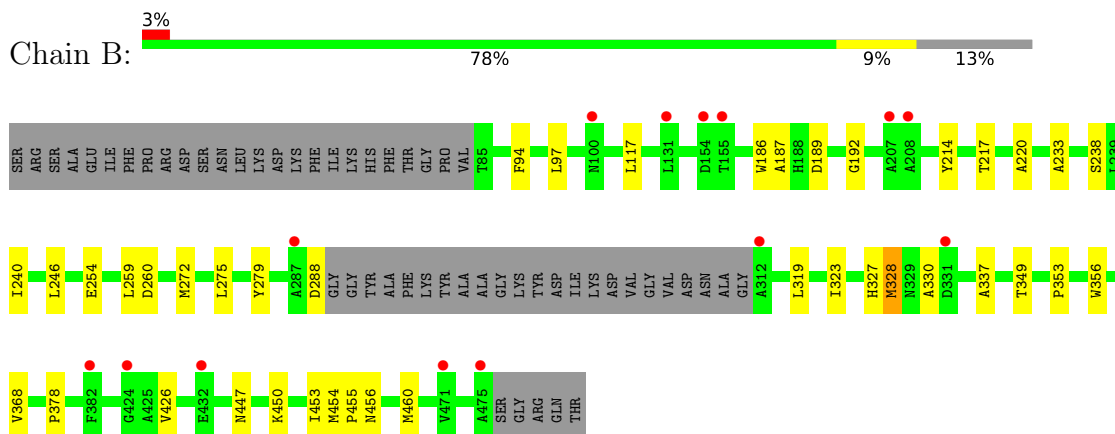
3 Residue-property plots [i](#)

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: ALK and LTK ligand 1,Maltodextrin-binding protein



- Molecule 1: ALK and LTK ligand 1,Maltodextrin-binding protein



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



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





4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	53.57Å 56.77Å 94.41Å 75.60° 77.35° 61.78°	Depositor
Resolution (Å)	46.87 – 2.43 46.87 – 2.43	Depositor EDS
% Data completeness (in resolution range)	94.8 (46.87-2.43) 94.9 (46.87-2.43)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.96 (at 2.42Å)	Xtriage
Refinement program	PHENIX 1.11.1_2575	Depositor
R, R_{free}	0.214 , 0.273 0.218 , 0.278	Depositor DCC
R_{free} test set	1689 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	58.3	Xtriage
Anisotropy	0.454	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 59.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5441	wwPDB-VP
Average B, all atoms (Å ²)	64.0	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.*

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 [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	0.23	0/2773	0.42	0/3813
1	B	0.22	0/2762	0.40	0/3798
All	All	0.23	0/5535	0.41	0/7611

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	2696	0	2491	26	0
1	B	2685	0	2462	23	0
2	C	23	0	21	1	0
2	F	23	0	21	2	0
3	A	7	0	0	0	0
3	B	7	0	0	0	0
All	All	5441	0	4995	49	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 5.

All (49) 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:B:220:ALA:HB2	1:B:453:ILE:HD11	1.71	0.71
1:A:445:MET:HE2	1:A:445:MET:HA	1.79	0.65
1:B:192:GLY:HA3	1:B:456:ASN:O	1.99	0.62
1:B:272:MET:HE2	1:B:337:ALA:HA	1.85	0.58
1:A:283:PRO:HB3	1:A:381:PRO:HB3	1.87	0.56
1:A:139:LYS:NZ	1:A:235:GLU:OE2	2.40	0.55
1:A:101:THR:HG22	1:A:103:GLU:H	1.73	0.54
1:B:233:ALA:HA	1:B:426:VAL:HA	1.89	0.54
1:A:203:ILE:HG13	1:A:205:PRO:HD3	1.88	0.54
1:B:323:ILE:HG21	1:B:330:ALA:HB2	1.90	0.53
1:A:277:GLU:OE1	2:F:2:GLC:O6	2.26	0.53
1:A:396:ASN:HB3	1:A:399:LEU:HD22	1.90	0.53
1:B:378:PRO:HB3	1:B:450:LYS:HD3	1.91	0.52
1:A:192:GLY:HA3	1:A:456:ASN:O	2.09	0.52
1:B:460:MET:HA	1:B:460:MET:HE2	1.93	0.51
1:A:85:THR:OG1	1:A:155:THR:O	2.28	0.51
1:A:455:PRO:HG2	1:A:460:MET:SD	2.52	0.50
1:A:101:THR:HG22	1:A:103:GLU:N	2.26	0.50
1:A:246:LEU:HD21	1:A:250:PRO:HD3	1.94	0.50
1:B:260:ASP:HB3	1:B:327:HIS:HD2	1.78	0.49
1:B:279:TYR:HB2	2:C:2:GLC:H61	1.94	0.49
1:B:238:SER:OG	1:B:447:ASN:ND2	2.45	0.48
1:B:455:PRO:HG2	1:B:460:MET:SD	2.53	0.48
1:B:97:LEU:HD23	1:B:117:LEU:HD23	1.94	0.48
1:A:268:LYS:NZ	1:A:344:GLY:O	2.37	0.48
1:A:282:TRP:N	1:A:283:PRO:HD2	2.30	0.46
1:B:240:ILE:HG12	1:B:368:VAL:HG22	1.98	0.46
1:A:96:ARG:HG3	1:A:100:ASN:HD22	1.81	0.45
1:B:189:ASP:HB3	1:B:454:MET:SD	2.56	0.45
1:B:240:ILE:HB	1:B:349:THR:HG22	1.99	0.45
1:A:96:ARG:O	1:A:100:ASN:HB2	2.17	0.45
1:B:353:PRO:HA	1:B:356:TRP:CE2	2.53	0.44
1:A:190:ARG:HA	1:A:190:ARG:HD3	1.76	0.44
1:B:275:LEU:HD11	1:B:328:MET:HE3	2.00	0.44
1:A:97:LEU:HD23	1:A:117:LEU:HD23	1.99	0.44
1:B:214:TYR:O	1:B:217:THR:OG1	2.28	0.44
1:A:282:TRP:CE2	1:A:286:ALA:HB2	2.53	0.43
1:B:186:TRP:CD1	1:B:187:ALA:H	2.36	0.43
1:A:170:LYS:O	1:A:174:VAL:HB	2.18	0.43
1:A:425:ALA:HB3	1:A:445:MET:HE3	1.99	0.43
1:B:94:PHE:CE1	1:B:117:LEU:HD22	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:239:LEU:HD22	1:A:372:PRO:HD3	1.99	0.43
1:A:279:TYR:HB2	2:F:2:GLC:H61	2.00	0.43
1:A:203:ILE:HD11	1:A:218:TRP:HZ3	1.85	0.42
1:A:264:LYS:HA	1:A:268:LYS:O	2.19	0.42
1:B:246:LEU:HD21	1:B:259:LEU:HD21	2.03	0.41
1:B:254:GLU:OE1	1:B:254:GLU:N	2.48	0.41
1:B:319:LEU:HD11	1:B:328:MET:HE1	2.04	0.40
1:A:253:TRP:HB3	1:A:318:PHE:CE2	2.57	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	365/421 (87%)	355 (97%)	10 (3%)	0	100	100
1	B	364/421 (86%)	357 (98%)	7 (2%)	0	100	100
All	All	729/842 (87%)	712 (98%)	17 (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	251/343 (73%)	245 (98%)	6 (2%)	43	63

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	248/343 (72%)	246 (99%)	2 (1%)	73	85
All	All	499/686 (73%)	491 (98%)	8 (2%)	55	74

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	139	LYS
1	A	174	VAL
1	A	338	GLU
1	A	382	PHE
1	A	453	ILE
1	A	468	ARG
1	B	288	ASP
1	B	328	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	163	HIS
1	A	224	ASN
1	A	276	GLN
1	A	339	HIS
1	B	100	ASN
1	B	128	GLN
1	B	142	ASN
1	B	210	GLN
1	B	224	ASN
1	B	327	HIS
1	B	329	ASN
1	B	342	ASN
1	B	343	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

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	C	1	2	12,12,12	0.53	0	17,17,17	0.84	0
2	GLC	C	2	2	11,11,12	0.75	0	15,15,17	0.66	0
2	GLC	F	1	2	12,12,12	0.57	0	17,17,17	0.87	0
2	GLC	F	2	2	11,11,12	0.73	0	15,15,17	0.70	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
2	GLC	C	1	2	-	0/2/22/22	0/1/1/1
2	GLC	C	2	2	-	2/2/19/22	0/1/1/1
2	GLC	F	1	2	-	0/2/22/22	0/1/1/1
2	GLC	F	2	2	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

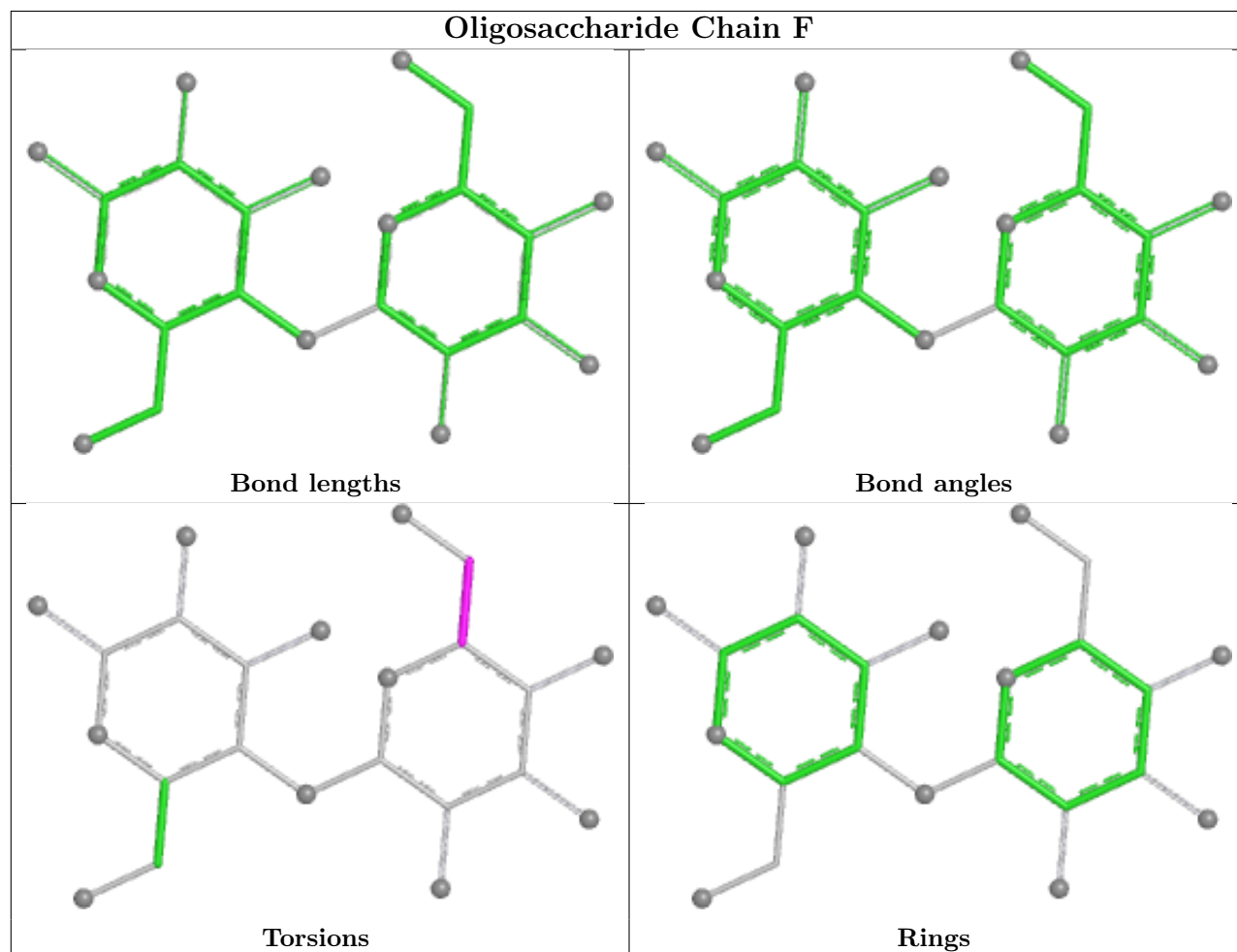
Mol	Chain	Res	Type	Atoms
2	F	2	GLC	O5-C5-C6-O6
2	C	2	GLC	O5-C5-C6-O6
2	C	2	GLC	C4-C5-C6-O6
2	F	2	GLC	C4-C5-C6-O6

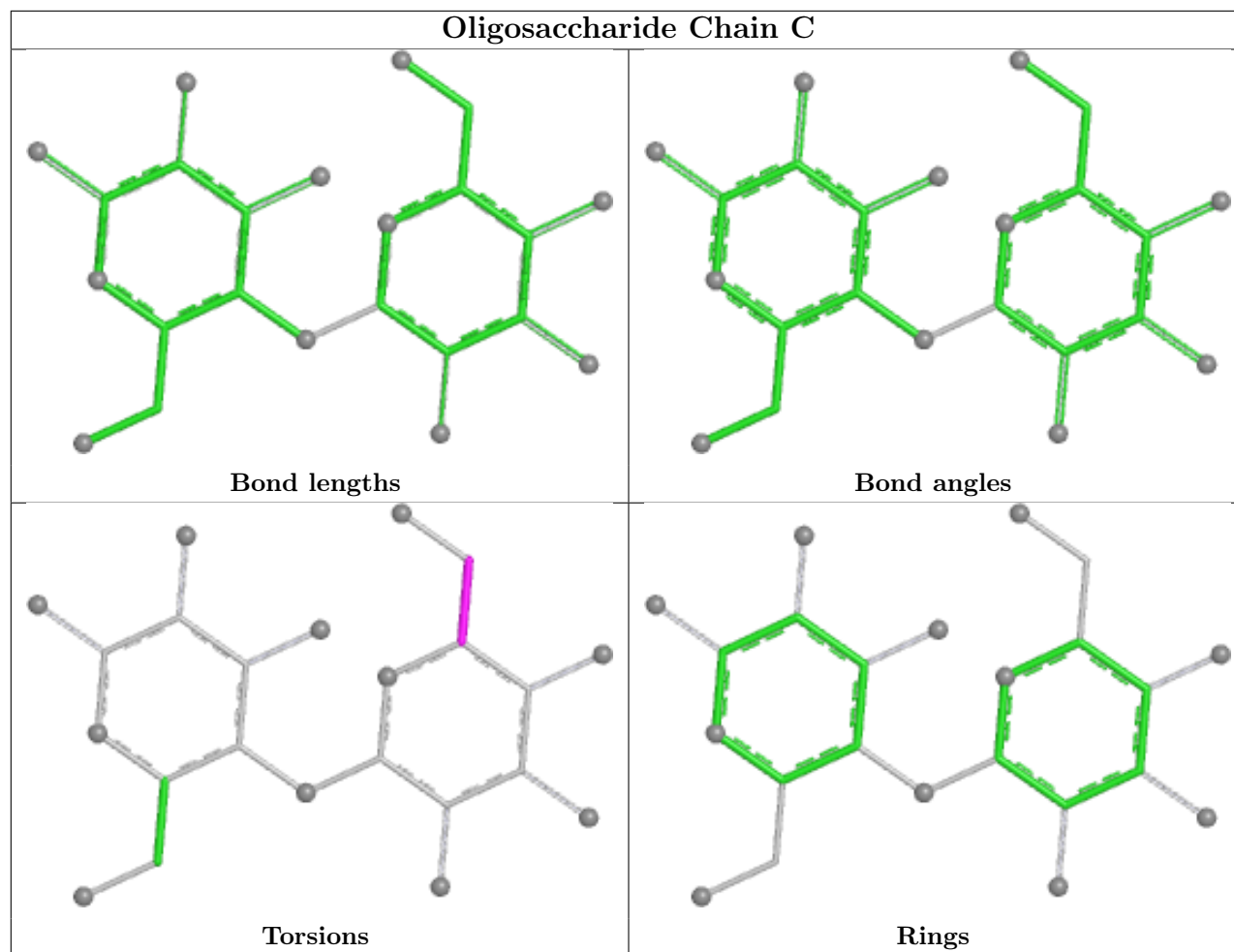
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	2	GLC	1	0
2	F	2	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 [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	369/421 (87%)	0.25	7 (1%) 66 63	40, 61, 83, 95	0
1	B	368/421 (87%)	0.41	14 (3%) 44 40	43, 67, 91, 116	0
All	All	737/842 (87%)	0.33	21 (2%) 55 51	40, 64, 88, 116	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	475	ALA	3.8
1	B	208	ALA	3.6
1	B	154	ASP	3.6
1	B	155	THR	3.1
1	B	312	ALA	3.1
1	B	432	GLU	2.9
1	A	220	ALA	2.8
1	B	475	ALA	2.7
1	A	148	GLY	2.4
1	B	424	GLY	2.4
1	B	207	ALA	2.3
1	A	287	ALA	2.2
1	B	331	ASP	2.2
1	B	131	LEU	2.1
1	B	287	ALA	2.1
1	A	204	THR	2.1
1	A	360	ASP	2.1
1	B	471	VAL	2.0
1	B	100	ASN	2.0
1	A	99	TYR	2.0
1	B	382	PHE	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](#)

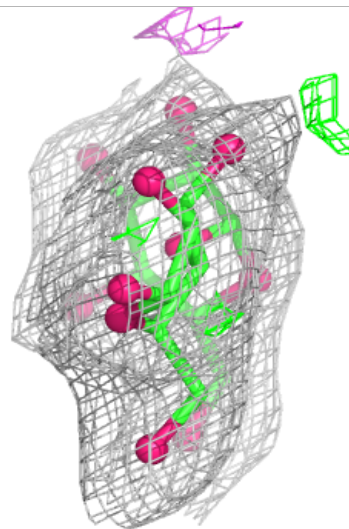
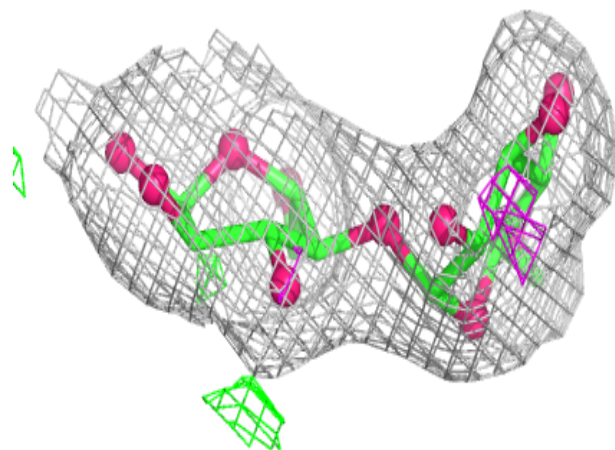
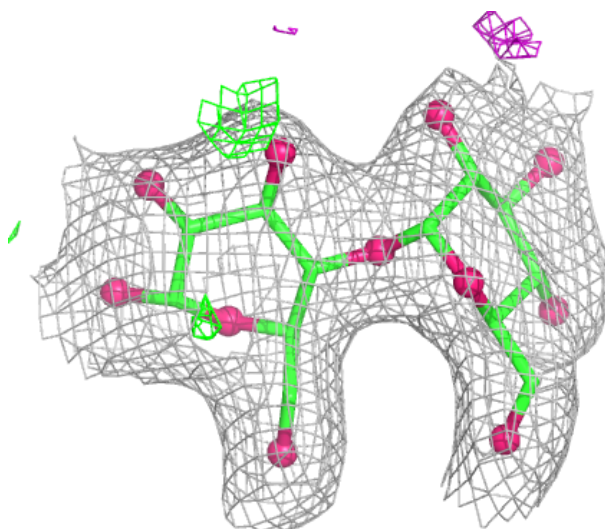
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

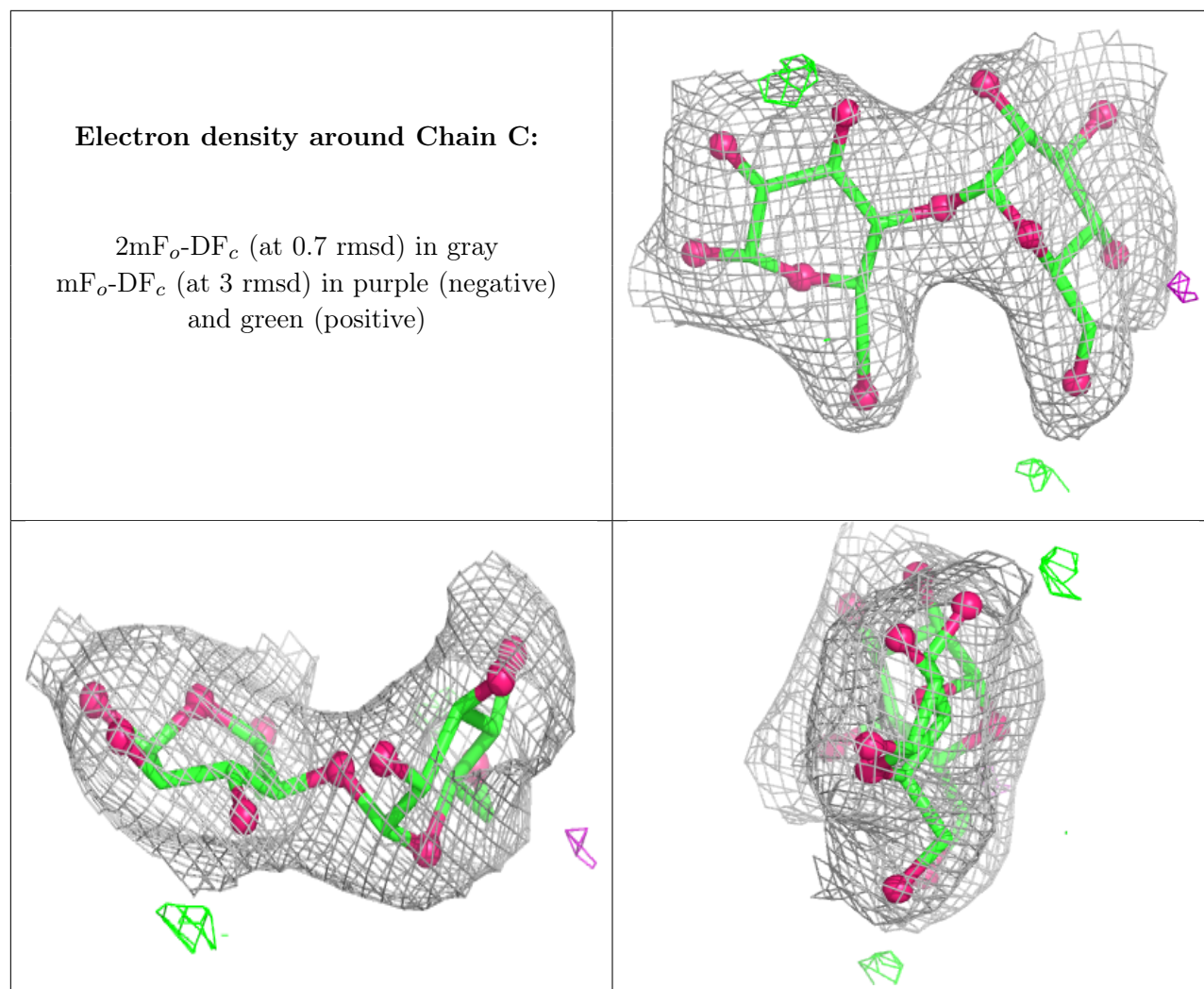
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GLC	F	1	12/12	-	-	52,56,59,61	0
2	GLC	F	2	11/12	-	-	47,51,55,58	0
2	GLC	C	2	11/12	0.93	0.10	54,58,60,60	0
2	GLC	C	1	12/12	0.94	0.08	57,62,64,65	0

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.

Electron density around Chain F:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.