WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Dec 17, 2023 – 04:02 PM EST

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PDB ID	:	4PK0
Title	:	CRYSTAL STRUCTURE OF T4 LYSOZYME-PEPTIDE IN COMPLEX WITH TEICOPLANIN-A2-2
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Deposited on	:	2014-05-13
Resolution	:	2.30 Å(reported)

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 2.30 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.
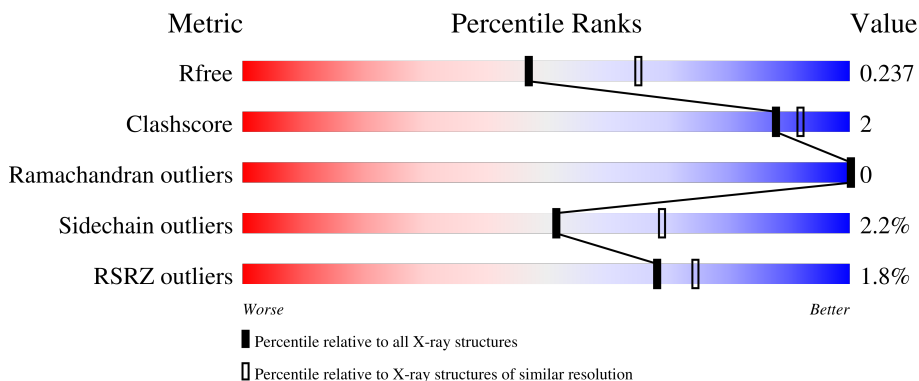
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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 <=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	B	7	71% 29%
2	A	171	2% 95% 5% •

2 Entry composition ⓘ

There are 11 unique types of molecules in this entry. The entry contains 1610 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 TEICOPLANIN-A2-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	7	Total	C	Cl	N	O	0	0	0
			85	58	2	7	18			

- Molecule 2 is a protein called Lysozyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	171	Total	C	N	O	S	0	3	0
			1363	856	247	253	7			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	54	THR	CYS	engineered mutation	UNP D9IEF7
A	97	ALA	CYS	engineered mutation	UNP D9IEF7
A	165	CCS	-	insertion	UNP D9IEF7
A	166	ALA	-	insertion	UNP D9IEF7
A	167	MHS	-	insertion	UNP D9IEF7
A	168	DPR	-	insertion	UNP D9IEF7
A	169	AIB	-	insertion	UNP D9IEF7
A	170	DAL	-	insertion	UNP D9IEF7
A	171	DAL	-	insertion	UNP D9IEF7

- Molecule 3 is 2-amino-2-deoxy-beta-D-glucopyranose (three-letter code: GCS) (formula: $C_6H_{13}NO_5$).
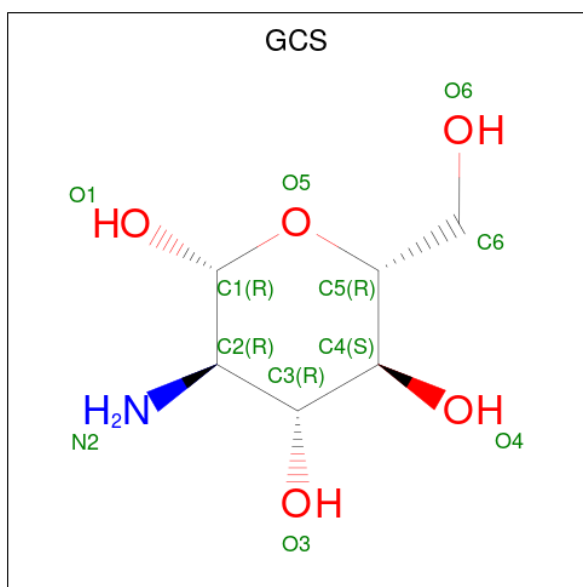
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	B	1	Total 11	C 6	N 1	O 4	0	0

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total 14	C 8	N 1	O 5	0	0

- Molecule 5 is alpha-D-mannopyranose (three-letter code: MAN) (formula: $C_6H_{12}O_6$).

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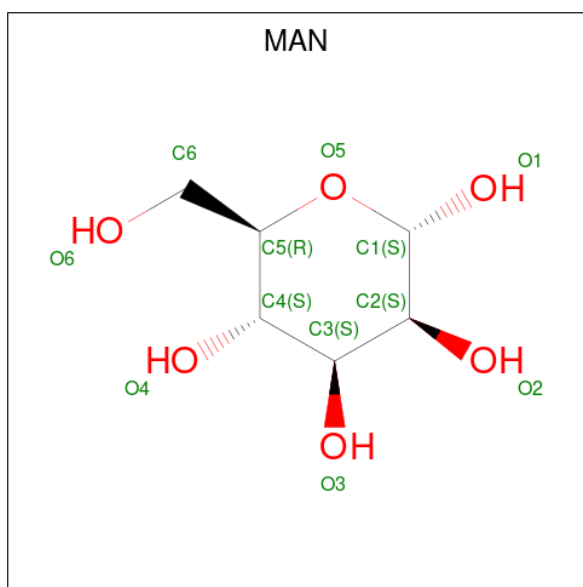
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	B	1	11	6	5	0	0

- Molecule 6 is 8-METHYLNONANOIC ACID (three-letter code: T55) (formula: $C_{10}H_{20}O_2$).

T55
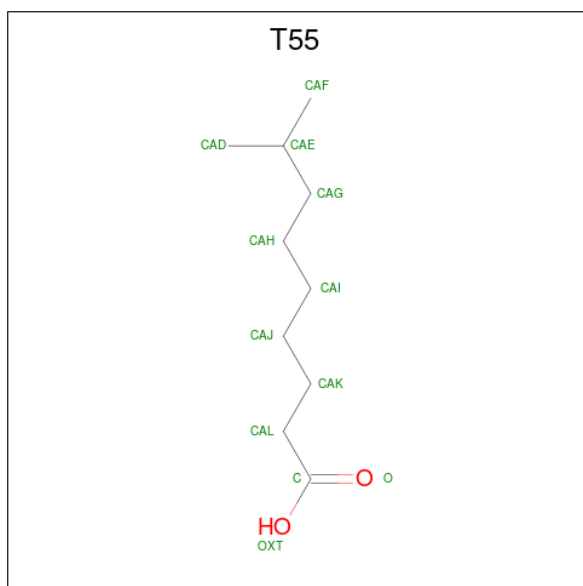
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
6	A	1	11	10	1	0	0

- Molecule 7 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total Cl 1 1		0	0

- Molecule 8 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	1	Total Na 1 1		0	0

- Molecule 9 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).
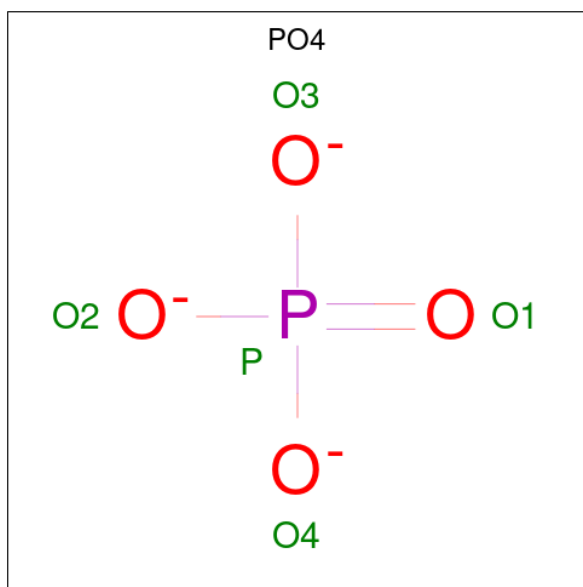
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total O P 5 4 1			0	0

- Molecule 10 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

GOL

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total 6	C 3	O 3	0	0

- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	B	12	Total 12	O 12	0	0
11	A	89	Total 90	O 90	0	1

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: TEICOPLANIN-A2-2

Chain B:

• Molecule 2: Lysozyme

Chain A:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α, β, γ	55.92Å 63.23Å 138.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.30 41.89 – 2.29	Depositor EDS
% Data completeness (in resolution range)	89.0 (50.00-2.30) 88.0 (41.89-2.29)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.37 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.189 , 0.237 0.194 , 0.237	Depositor DCC
R_{free} test set	492 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å^2)	31.8	Xtriage
Anisotropy	0.210	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 42.4	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	1610	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.33% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: GOL, GHP, PO4, AIB, CCS, OMY, 3FG, CL, T55, NA, MHS, 3MY, DPR, NAG, GCS, MAN, DAL

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
2	A	0.44	0/1346	0.61	0/1814

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 ⓘ

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	B	85	0	32	3	0
2	A	1363	0	1357	3	0
3	B	11	0	9	0	0
4	B	14	0	13	0	0
5	B	11	0	10	0	0
6	A	11	0	19	0	0
7	A	1	0	0	0	0
8	A	1	0	0	0	0
9	A	5	0	0	0	0
10	A	6	0	8	0	0
11	A	90	0	0	1	0
11	B	12	0	0	0	0
All	All	1610	0	1448	6	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 2.

The worst 5 of 6 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:A:116:ASN:OD1	2:A:119:ARG:NH2	2.36	0.59
1:B:1:GHP:C2	1:B:3:3FG:CG1	2.87	0.47
2:A:98:ALA:HB3	2:A:153:PHE:CE1	2.51	0.46
1:B:6:OMY:CD2	1:B:6:OMY:N	2.81	0.43
1:B:1:GHP:C2	1:B:3:3FG:HG1	2.49	0.42

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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
2	A	166/171 (97%)	162 (98%)	4 (2%)	0	100 100

There are no Ramachandran outliers to report.

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
2	A	137/137 (100%)	134 (98%)	3 (2%)	52 69

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

Mol	Chain	Res	Type
2	A	26	THR
2	A	80	ARG
2	A	122	GLN

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

Mol	Chain	Res	Type
2	A	132	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

15 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 Counts	Bond lengths RMSZ	Bond lengths #$|Z|$ > 2	Bond angles Counts	Bond angles RMSZ	Bond angles #$|Z|$ > 2
1	3FG	B	7	5,1	12,13,13	1.16	2 (16%)	14,18,18	1.30	1 (7%)
1	GHP	B	1	1	10,11,12	0.91	0	11,14,16	0.53	0
1	GHP	B	5	1	10,11,12	0.98	1 (10%)	11,14,16	1.27	1 (9%)
2	AIB	A	169	2	1,5,6	0.72	0	2,7,9	0.86	0
1	3MY	B	2	1	12,13,14	3.16	2 (16%)	14,17,19	1.18	3 (21%)
1	GHP	B	4	3,1	10,11,12	1.36	1 (10%)	11,14,16	0.61	0
2	CCS	A	165	2	5,6,10	1.13	1 (20%)	2,6,12	1.42	0
1	OMY	B	6	4,1	12,14,15	2.76	2 (16%)	17,19,21	2.34	3 (17%)
2	MHS	A	167	2	7,11,12	0.87	0	6,14,16	1.31	1 (16%)
1	3FG	B	3	1	11,12,13	1.09	1 (9%)	13,16,18	0.91	0
4	NAG	B	102	1	14,14,15	0.55	0	17,19,21	1.13	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
5	MAN	B	103	1	11,11,12	0.59	0	15,15,17	0.97	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
1	3FG	B	7	5,1	-	2/8/8/8	0/1/1/1
1	GHP	B	1	1	-	2/4/6/8	0/1/1/1
1	GHP	B	5	1	-	0/4/6/8	0/1/1/1
2	AIB	A	169	2	-	0/2/3/6	-
1	3MY	B	2	1	-	0/5/6/8	0/1/1/1
1	GHP	B	4	3,1	-	2/4/6/8	0/1/1/1
2	CCS	A	165	2	-	0/3/5/10	-
1	OMY	B	6	4,1	-	1/9/10/12	0/1/1/1
2	MHS	A	167	2	-	0/5/6/8	0/1/1/1
1	3FG	B	3	1	-	0/4/6/8	0/1/1/1
4	NAG	B	102	1	-	2/6/23/26	0/1/1/1
5	MAN	B	103	1	-	0/2/19/22	0/1/1/1

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	2	3MY	CZ-CE2	10.61	1.49	1.39
1	B	6	OMY	CZ-CE1	8.79	1.47	1.39
1	B	7	3FG	CB-CA	-2.79	1.49	1.52
1	B	3	3FG	CB-CA	-2.77	1.49	1.52
1	B	6	OMY	CG-CB	-2.62	1.48	1.51

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	6	OMY	CG-CB-CA	-7.85	100.98	111.49
1	B	7	3FG	OXT-C-O	-3.14	116.96	124.09
1	B	6	OMY	CD1-CG-CB	-2.66	115.02	119.55
1	B	5	GHP	C1-CA-N	2.50	118.38	112.40
4	B	102	NAG	C1-O5-C5	2.32	115.34	112.19

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	6	OMY	O-C-CA-CB
4	B	102	NAG	C4-C5-C6-O6
1	B	1	GHP	C2-C1-CA-C
1	B	1	GHP	C6-C1-CA-C
4	B	102	NAG	O5-C5-C6-O6

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	1	GHP	2	0
1	B	6	OMY	1	0
1	B	3	3FG	2	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 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	$\#|Z| > 2$
6	T55	A	201	3	10,10,11	0.28	0	10,10,12	0.67	0
3	GCS	B	101	6,1	11,11,12	0.41	0	12,15,17	1.25	1 (8%)
10	GOL	A	205	-	5,5,5	0.59	0	5,5,5	0.60	0
9	PO4	A	204	-	4,4,4	0.65	0	6,6,6	0.76	0
4	NAG	B	102	1	14,14,15	0.55	0	17,19,21	1.13	1 (5%)
5	MAN	B	103	1	11,11,12	0.59	0	15,15,17	0.97	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
10	GOL	A	205	-	-	2/4/4/4	-
6	T55	A	201	3	-	3/7/8/9	-
3	GCS	B	101	6,1	-	0/2/19/22	0/1/1/1
4	NAG	B	102	1	-	2/6/23/26	0/1/1/1
5	MAN	B	103	1	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	101	GCS	C3-C2-N2	-2.74	105.55	110.97
4	B	102	NAG	C1-O5-C5	2.32	115.34	112.19
5	B	103	MAN	C1-O5-C5	2.05	114.97	112.19

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
10	A	205	GOL	C1-C2-C3-O3
4	B	102	NAG	C4-C5-C6-O6
10	A	205	GOL	O2-C2-C3-O3
4	B	102	NAG	O5-C5-C6-O6
6	A	201	T55	CAJ-CAK-CAL-C

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 ⓘ

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, 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(Å²)	Q<0.9
1	B	0/7	-	-			-	-
2	A	165/171 (96%)	-0.20	3 (1%)	68	74	22, 35, 57, 72	0
All	All	165/178 (92%)	-0.20	3 (1%)	68	74	22, 35, 57, 72	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	A	1[A]	MET	3.9
2	A	164	LEU	2.7
2	A	158	TRP	2.1

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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(Å²)	Q<0.9
2	CCS	A	165	7/11	0.86	0.15	53,55,65,69	0
1	OMY	B	6	14/15	0.92	0.12	31,35,41,69	0
2	MHS	A	167	11/12	0.92	0.15	42,57,74,75	0
5	MAN	B	103	11/12	0.94	0.12	30,32,33,34	0
1	3MY	B	2	13/14	0.94	0.10	26,30,33,46	0
1	GHP	B	4	11/12	0.94	0.09	28,33,38,40	0
4	NAG	B	102	14/15	0.95	0.10	32,33,35,35	0
1	3FG	B	7	13/13	0.95	0.09	30,32,34,35	0
1	GHP	B	5	11/12	0.96	0.11	29,31,33,34	0
2	DAL	A	170	5/6	0.96	0.10	29,32,32,32	0
1	3FG	B	3	12/13	0.97	0.10	24,25,26,27	0
2	DPR	A	168	7/8	0.97	0.11	31,38,40,42	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	AIB	A	169	6/7	0.97	0.10	33,34,35,36	0
1	GHP	B	1	11/12	0.97	0.11	28,29,31,35	0
2	DAL	A	171	6/6	0.98	0.10	30,32,32,33	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

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($Å^2$)	Q<0.9
7	CL	A	202	1/1	0.82	0.09	71,71,71,71	0
10	GOL	A	205	6/6	0.83	0.17	44,53,54,54	0
8	NA	A	203	1/1	0.89	0.32	45,45,45,45	0
6	T55	A	201	11/12	0.92	0.17	46,55,67,67	0
3	GCS	B	101	11/12	0.94	0.10	37,42,45,45	0
5	MAN	B	103	11/12	0.94	0.12	30,32,33,34	0
4	NAG	B	102	14/15	0.95	0.10	32,33,35,35	0
9	PO4	A	204	5/5	0.97	0.09	42,43,45,49	0

6.5 Other polymers (i)

There are no such residues in this entry.

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