



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 10:57 PM GMT

PDB ID : 1VZU
Title : ROLES OF ACTIVE SITE TRYPTOPHANS IN SUBSTRATE BINDING
AND CATALYSIS BY ALPHA-1,3 GALACTOSYLTRANSFERASE
Authors : Zhang, Y.; Deshpande, A.; Xie, Z.; Natesh, R.; Acharya, K.R.; Brew, K.
Deposited on : 2004-05-27
Resolution : 1.97 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

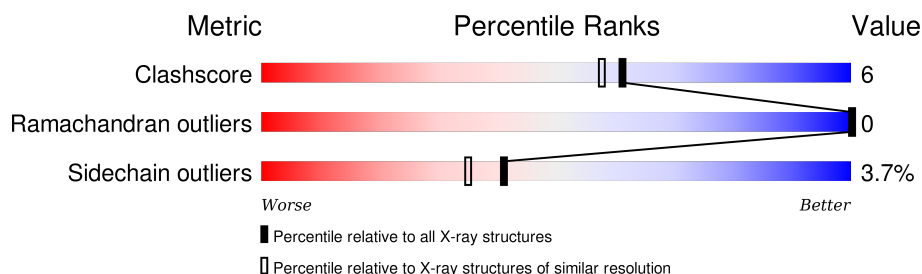
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.97 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))
Clashscore	102246	9905 (2.00-1.96)
Ramachandran outliers	100387	9792 (2.00-1.96)
Sidechain outliers	100360	9791 (2.00-1.96)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	289	 82% 15% ..
1	B	289	 81% 16% ..

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 5788 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 N-ACETYLLACTOSAMINIDE ALPHA-1,3-GALACTOSYL TRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	287	Total	C	N	O	S	0	4	0
			2414	1583	396	423	12			
1	B	287	Total	C	N	O	S	0	2	0
			2401	1571	395	423	12			

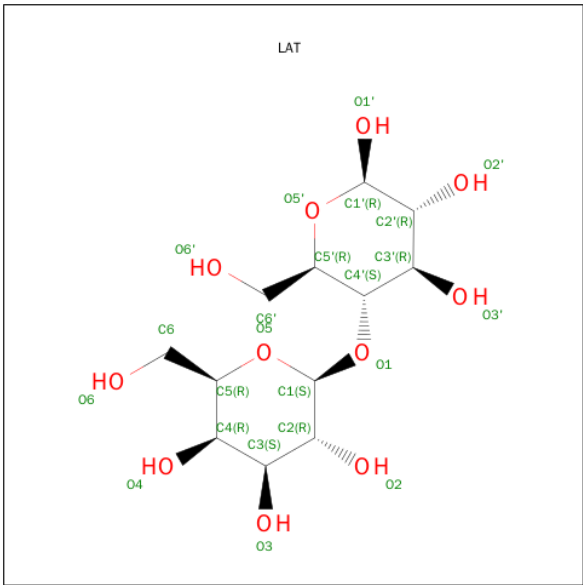
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	314	TYR	TRP	ENGINEERED MUTATION	UNP P14769
B	1314	TYR	TRP	ENGINEERED MUTATION	UNP P14769

- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

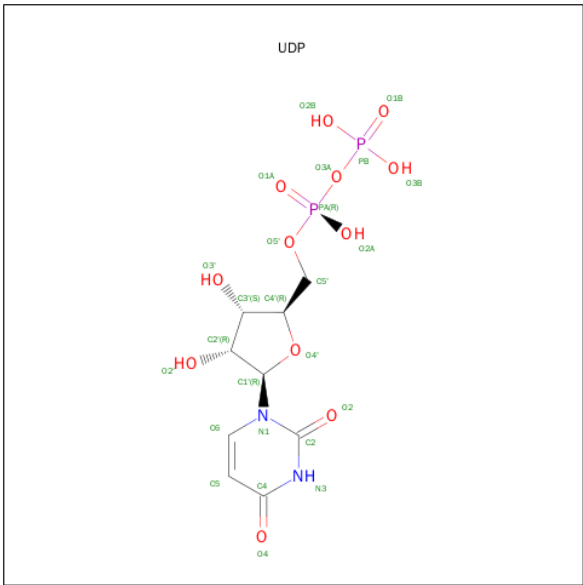
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Mn	0	0
			1	1		
2	A	1	Total	Mn	0	0
			1	1		

- Molecule 3 is SUGAR (BETA-LACTOSE) (three-letter code: LAT) (formula: C₁₂H₂₂O₁₁).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			23	12	11		
3	B	1	Total	C	O	0	0
			23	12	11		

- Molecule 4 is URIDINE-5'-DIPHOSPHATE (three-letter code: UDP) (formula: C₉H₁₄N₂O₁₂P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			25	9	2	12	2		
4	B	1	Total	C	N	O	P	0	0
			25	9	2	12	2		

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

- Molecule 6 is water.

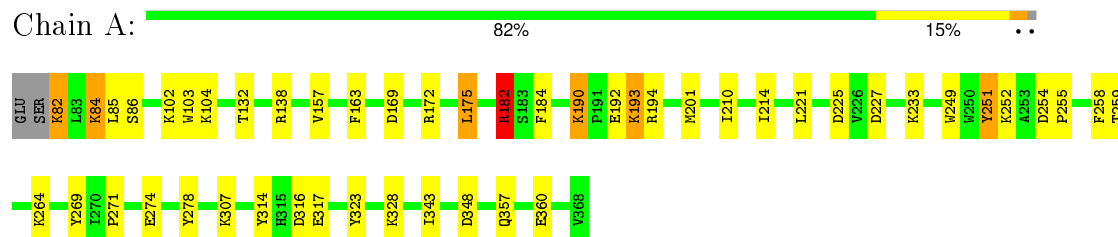
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	419	Total	O	0	0
			419	419		
6	B	444	Total	O	0	0
			444	444		

3 Residue-property plots

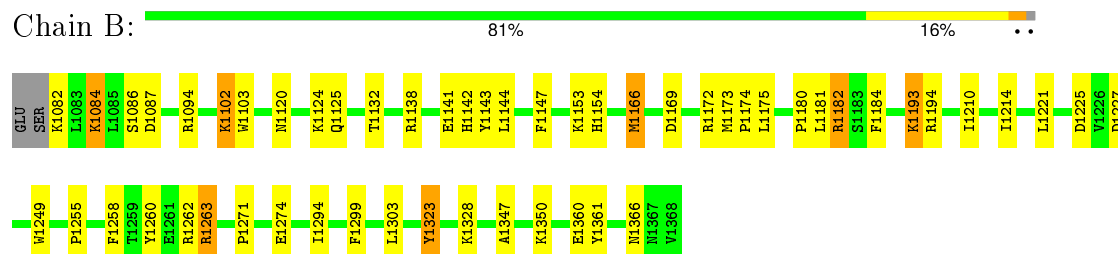
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according 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.

Note EDS was not executed.

- Molecule 1: N-ACETYLLACTOSAMINIDE ALPHA-1,3-GALACTOSYLTRANSFERASE



- Molecule 1: N-ACETYLLACTOSAMINIDE ALPHA-1,3-GALACTOSYLTRANSFERASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	44.86 Å 93.68 Å 93.71 Å 90.00° 99.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.97	Depositor
% Data completeness (in resolution range)	97.5 (50.00-1.97)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.154 , 0.202	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5788	wwPDB-VP
Average B, all atoms (Å ²)	16.0	wwPDB-VP

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: LAT, GOL, UDP, MN

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	0.45	0/2507	1.13	6/3395 (0.2%)
1	B	0.45	0/2484	1.17	15/3362 (0.4%)
All	All	0.45	0/4991	1.15	21/6757 (0.3%)

There are no bond length outliers.

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	138	ARG	CD-NE-CZ	8.37	135.31	123.60
1	B	1323	TYR	CB-CG-CD1	7.65	125.59	121.00
1	B	1263	ARG	NE-CZ-NH1	-7.64	116.48	120.30
1	B	1194	ARG	NE-CZ-NH1	7.22	123.91	120.30
1	B	1323	TYR	CB-CG-CD2	-6.72	116.97	121.00
1	B	1194	ARG	NE-CZ-NH2	-6.58	117.01	120.30
1	A	323	TYR	CB-CG-CD2	-6.50	117.10	121.00
1	B	1169	ASP	CB-CG-OD1	6.37	124.03	118.30
1	A	251	TYR	CB-CG-CD1	-6.13	117.32	121.00
1	B	1094	ARG	NE-CZ-NH2	5.71	123.16	120.30
1	B	1361	TYR	CB-CG-CD1	-5.61	117.64	121.00
1	A	182	ARG	NE-CZ-NH1	-5.60	117.50	120.30
1	B	1143	TYR	CB-CG-CD2	-5.53	117.68	121.00
1	B	1262	ARG	NE-CZ-NH1	5.40	123.00	120.30
1	B	1260	TYR	CB-CG-CD2	5.40	124.24	121.00
1	A	278	TYR	CB-CG-CD2	-5.35	117.79	121.00
1	B	1147	PHE	CB-CG-CD1	-5.25	117.13	120.80
1	A	194	ARG	NE-CZ-NH1	-5.19	117.70	120.30
1	B	1182	ARG	NE-CZ-NH1	-5.14	117.73	120.30
1	B	1087	ASP	CB-CG-OD1	-5.12	113.69	118.30
1	B	1138	ARG	NE-CZ-NH1	-5.02	117.79	120.30

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	2414	0	2376	31	0
1	B	2401	0	2361	23	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	23	0	18	1	0
3	B	23	0	22	1	0
4	A	25	0	11	0	0
4	B	25	0	11	0	0
5	A	6	0	8	1	0
5	B	6	0	8	0	0
6	A	419	0	0	4	0
6	B	444	0	0	1	0
All	All	5788	0	4815	54	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 (54) 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:254:ASP:HB3	6:A:2266:HOH:O	1.86	0.74
1:A:317:GLU:OE1	3:A:1370:LAT:H62	1.93	0.69
1:A:271:PRO:HG2	1:A:274:GLU:OE1	1.95	0.67
1:A:190:LYS:HD3	1:A:192:GLU:OE1	2.02	0.60
1:A:255:PRO:HA	1:A:258:PHE:CD1	2.36	0.59
1:A:84:LYS:HE2	1:A:85:LEU:N	2.19	0.57
1:B:1166:MET:N	1:B:1166:MET:HE2	2.20	0.56
1:B:1255:PRO:HA	1:B:1258:PHE:CD1	2.40	0.55
1:B:1263:ARG:HD2	6:B:4279:HOH:O	2.07	0.55
1:A:193:LYS:HD2	6:A:2191:HOH:O	2.09	0.53
1:A:193:LYS:HE3	6:A:2191:HOH:O	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:132:THR:HG23	1:A:221:LEU:HD11	1.91	0.53
1:B:1102:LYS:HG2	1:B:1102:LYS:O	2.09	0.52
1:A:210:ILE:HA	1:A:214:ILE:HB	1.93	0.51
1:B:1132:THR:HG23	1:B:1221:LEU:HD11	1.93	0.51
1:A:255:PRO:HA	1:A:258:PHE:CE1	2.47	0.50
1:A:252:LYS:HE2	1:A:348:ASP:OD2	2.13	0.49
1:B:1141:GLU:OE2	1:B:1172:ARG:HD2	2.12	0.49
1:B:1084[A]:LYS:HE2	1:B:1086:SER:OG	2.13	0.49
1:B:1255:PRO:HA	1:B:1258:PHE:CE1	2.49	0.48
1:A:264:LYS:HA	1:A:269:TYR:CG	2.48	0.48
1:A:175:LEU:HA	1:A:175:LEU:HD23	1.59	0.47
1:A:251:TYR:CE1	1:A:252:LYS:HG3	2.50	0.47
1:A:163:PHE:HB2	1:A:184[B]:PHE:HB3	1.95	0.47
1:A:103:TRP:CE2	1:A:328:LYS:HB3	2.50	0.47
1:A:84:LYS:HE2	1:A:85:LEU:H	1.77	0.47
1:B:1210:ILE:HA	1:B:1214:ILE:HB	1.97	0.46
1:A:360:GLU:OE1	5:A:1372:GOL:H2	2.16	0.46
1:B:1193:LYS:HE3	1:B:1193:LYS:O	2.15	0.46
1:B:1120:ASN:O	1:B:1124:LYS:HG3	2.17	0.45
1:A:157:VAL:HG21	1:A:233:LYS:HE3	1.98	0.45
1:A:103:TRP:O	1:A:104:LYS:HB2	2.17	0.45
1:B:1271:PRO:HG2	1:B:1274:GLU:CD	2.38	0.44
1:B:1175:LEU:HD23	1:B:1175:LEU:HA	1.79	0.44
1:B:1294:ILE:HG12	1:B:1323:TYR:CE1	2.53	0.44
1:A:307:LYS:HE2	6:A:2322:HOH:O	2.17	0.43
1:B:1180:PRO:O	1:B:1181:LEU:HB2	2.17	0.43
1:B:1103:TRP:CE2	1:B:1328:LYS:HB3	2.54	0.43
1:B:1347:ALA:O	1:B:1350:LYS:HD3	2.19	0.43
1:A:82:LYS:O	1:A:82:LYS:HG3	2.19	0.43
1:B:1142:HIS:HE1	1:B:1360:GLU:OE2	2.02	0.42
1:A:249[B]:TRP:HD1	1:A:343:ILE:HD11	1.84	0.42
1:A:259:THR:HB	1:A:314:TYR:CE1	2.54	0.42
1:B:1153:LYS:HE2	1:B:1154:HIS:CE1	2.55	0.42
1:A:201:MET:HE3	1:A:201:MET:HB2	1.92	0.41
1:A:84:LYS:NZ	1:A:86:SER:H	2.18	0.41
1:B:1225:ASP:HB3	1:B:1227:ASP:OD1	2.20	0.41
1:A:169:ASP:OD2	1:A:172:ARG:HD3	2.19	0.41
1:A:271:PRO:HG2	1:A:274:GLU:CD	2.40	0.41
1:B:1144:LEU:HD23	1:B:1174:PRO:HD2	2.02	0.40
1:B:1249:TRP:CG	3:B:2370:LAT:H3'	2.56	0.40
1:A:225:ASP:HB3	1:A:227:ASP:OD1	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1299:PHE:CE2	1:B:1303:LEU:HD11	2.56	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	289/289 (100%)	283 (98%)	6 (2%)	0	100	100
1	B	287/289 (99%)	283 (99%)	4 (1%)	0	100	100
All	All	576/578 (100%)	566 (98%)	10 (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	262/260 (101%)	253 (97%)	9 (3%)	44	39
1	B	260/260 (100%)	248 (95%)	12 (5%)	33	25
All	All	522/520 (100%)	501 (96%)	21 (4%)	41	31

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	82	LYS
1	A	84	LYS
1	A	102	LYS
1	A	175	LEU
1	A	182	ARG
1	A	190	LYS
1	A	193	LYS
1	A	316	ASP
1	A	357	GLN
1	B	1082	LYS
1	B	1084[A]	LYS
1	B	1084[B]	LYS
1	B	1102	LYS
1	B	1125	GLN
1	B	1166	MET
1	B	1173	MET
1	B	1182	ARG
1	B	1184[A]	PHE
1	B	1184[B]	PHE
1	B	1193	LYS
1	B	1366	ASN

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

Mol	Chain	Res	Type
1	A	296	GLN
1	A	313	GLN
1	B	1142	HIS
1	B	1231	GLN
1	B	1313	GLN
1	B	1342	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 [i](#)

There are no carbohydrates 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
3	LAT	A	1370	-	24,24,24	0.94	1 (4%)	35,35,35	1.20	1 (2%)
4	UDP	A	1371	2	18,26,26	2.02	4 (22%)	26,40,40	2.20	5 (19%)
5	GOL	A	1372	-	5,5,5	1.16	0	5,5,5	0.84	0
3	LAT	B	2370	-	24,24,24	0.95	1 (4%)	35,35,35	1.04	1 (2%)
4	UDP	B	2371	2	18,26,26	2.13	4 (22%)	26,40,40	2.10	5 (19%)
5	GOL	B	2372	-	5,5,5	1.21	1 (20%)	5,5,5	0.92	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	LAT	A	1370	-	-	0/8/48/48	0/2/2/2
4	UDP	A	1371	2	-	0/12/32/32	0/2/2/2
5	GOL	A	1372	-	-	0/4/4/4	0/0/0/0
3	LAT	B	2370	-	-	0/8/48/48	0/2/2/2
4	UDP	B	2371	2	-	0/12/32/32	0/2/2/2
5	GOL	B	2372	-	-	0/4/4/4	0/0/0/0

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	2372	GOL	C3-C2	-2.23	1.43	1.52
4	B	2371	UDP	PB-O1B	2.12	1.58	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	2370	LAT	C4-C5	2.36	1.58	1.53
4	A	1371	UDP	PB-O1B	2.41	1.59	1.51
4	A	1371	UDP	O4'-C1'	2.57	1.44	1.41
3	A	1370	LAT	C4-C5	2.63	1.58	1.53
4	A	1371	UDP	C6-N1	4.12	1.41	1.35
4	B	2371	UDP	O4'-C1'	4.14	1.46	1.41
4	B	2371	UDP	C6-N1	4.30	1.41	1.35
4	B	2371	UDP	C4-N3	5.67	1.43	1.33
4	A	1371	UDP	C4-N3	5.84	1.43	1.33

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1370	LAT	C3-C4-C5	-4.48	102.39	110.20
4	A	1371	UDP	C5-C4-N3	-4.05	112.74	123.12
4	B	2371	UDP	PA-O3A-PB	-3.27	121.70	132.67
4	A	1371	UDP	PA-O3A-PB	-3.06	122.40	132.67
4	B	2371	UDP	C5-C4-N3	-2.88	115.73	123.12
4	B	2371	UDP	O3'-C3'-C2'	-2.29	104.37	111.83
4	A	1371	UDP	O4'-C4'-C3'	-2.05	101.02	105.15
3	B	2370	LAT	O5'-C1'-C2'	2.19	113.29	109.80
4	B	2371	UDP	O3B-PB-O2B	2.78	117.97	107.38
4	A	1371	UDP	O3B-PB-O2B	3.01	118.86	107.38
4	B	2371	UDP	C4-N3-C2	8.53	122.59	114.14
4	A	1371	UDP	C4-N3-C2	8.70	122.76	114.14

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1370	LAT	1	0
5	A	1372	GOL	1	0
3	B	2370	LAT	1	0

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

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates

EDS was not executed - this section will therefore be empty.

6.4 Ligands

EDS was not executed - this section will therefore be empty.

6.5 Other polymers

EDS was not executed - this section will therefore be empty.