



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 12:54 PM UTC

PDB ID : 3N9R / pdb_00003n9r
Title : Class II fructose-1,6-bisphosphate aldolase from helicobacter pylori in complex with N-(4-hydroxybutyl)-phosphoglycolohydroxamic acid, a competitive inhibitor
Authors : Coincon, M.; Sygusch, S.
Deposited on : 2010-05-31
Resolution : 1.80 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

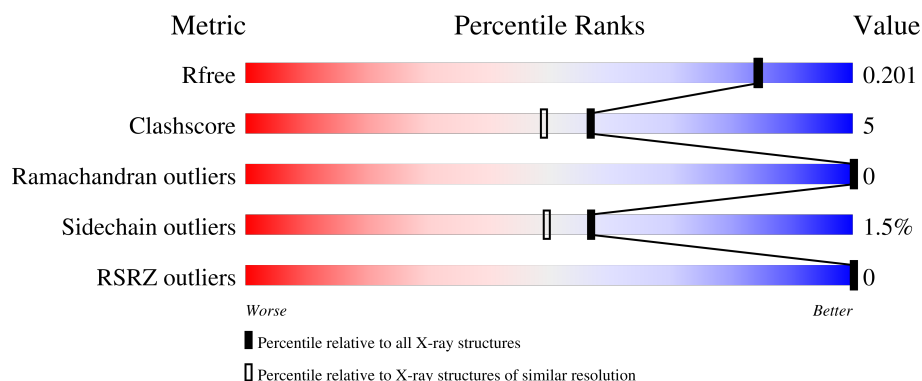
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	307	
1	B	307	
1	K	307	
1	P	307	
1	U	307	

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Mol	Chain	Length	Quality of chain
1	Z	307	 89% 7% .
1	e	307	 87% 8% . .
1	j	307	 90% 6% . .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	CL	A	310	-	-	X	-
4	CL	B	310	-	-	X	-
4	CL	K	310	-	-	X	-
4	CL	P	310	-	-	X	-
4	CL	U	310	-	-	X	-
4	CL	Z	310	-	-	X	-
4	CL	e	310	-	-	X	-
4	CL	j	310	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 39794 atoms, of which 18531 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 Fructose-bisphosphate aldolase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	297	Total	C	H	N	O	S	0	0	0
			4609	1463	2317	392	425	12			
1	B	297	Total	C	H	N	O	S	0	0	0
			4608	1463	2316	392	425	12			
1	K	297	Total	C	H	N	O	S	0	0	0
			4608	1463	2316	392	425	12			
1	P	297	Total	C	H	N	O	S	0	0	0
			4609	1463	2317	392	425	12			
1	U	297	Total	C	H	N	O	S	0	0	0
			4608	1463	2316	392	425	12			
1	Z	297	Total	C	H	N	O	S	0	0	0
			4608	1463	2316	392	425	12			
1	e	297	Total	C	H	N	O	S	0	0	0
			4609	1463	2317	392	425	12			
1	j	297	Total	C	H	N	O	S	0	0	0
			4608	1463	2316	392	425	12			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	218	ASN	ASP	conflict	UNP D0IR47
B	218	ASN	ASP	conflict	UNP D0IR47
K	218	ASN	ASP	conflict	UNP D0IR47
P	218	ASN	ASP	conflict	UNP D0IR47
U	218	ASN	ASP	conflict	UNP D0IR47
Z	218	ASN	ASP	conflict	UNP D0IR47
e	218	ASN	ASP	conflict	UNP D0IR47
j	218	ASN	ASP	conflict	UNP D0IR47

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Zn 1 1	0	0
2	B	1	Total Zn 1 1	0	0
2	K	1	Total Zn 1 1	0	0
2	P	1	Total Zn 1 1	0	0
2	U	1	Total Zn 1 1	0	0
2	Z	1	Total Zn 1 1	0	0
2	e	1	Total Zn 1 1	0	0
2	j	1	Total Zn 1 1	0	0

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Na 1 1	0	0
3	B	1	Total Na 1 1	0	0
3	K	1	Total Na 1 1	0	0
3	P	1	Total Na 1 1	0	0
3	U	1	Total Na 1 1	0	0
3	Z	1	Total Na 1 1	0	0
3	e	1	Total Na 1 1	0	0
3	j	1	Total Na 1 1	0	0

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

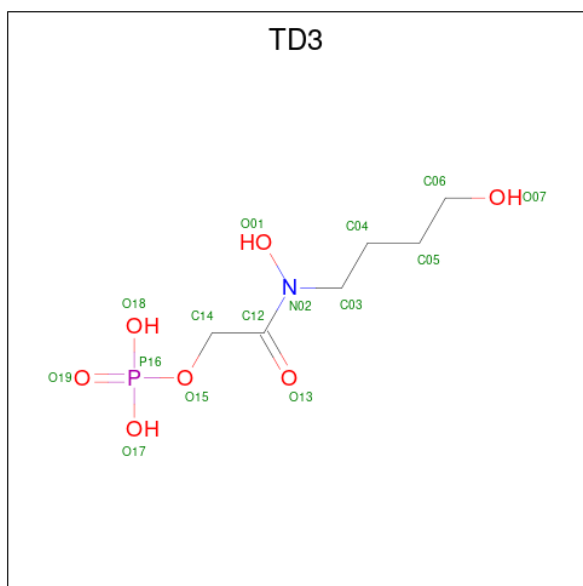
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Cl 1 1	0	0
4	B	1	Total Cl 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	K	1	Total	Cl	0	0
			1	1		
4	P	1	Total	Cl	0	0
			1	1		
4	U	1	Total	Cl	0	0
			1	1		
4	Z	1	Total	Cl	0	0
			1	1		
4	e	1	Total	Cl	0	0
			1	1		
4	j	1	Total	Cl	0	0
			1	1		

- Molecule 5 is 2-[hydroxy(4-hydroxybutyl)amino]-2-oxoethyl dihydrogen phosphate (CCD ID: TD3) (formula: C₆H₁₄NO₇P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	B	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	K	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	P	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	U	1	Total	C	N	O	P	0	0
			15	6	1	7	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	Z	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	e	1	Total	C	N	O	P	0	0
			15	6	1	7	1		
5	j	1	Total	C	N	O	P	0	0
			15	6	1	7	1		

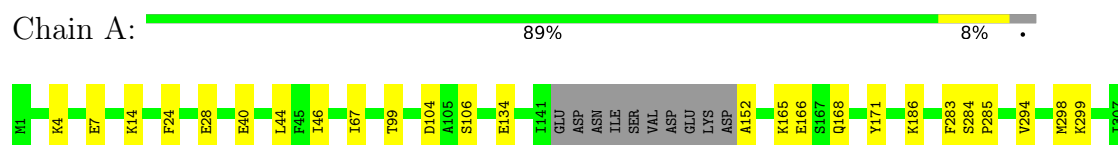
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	394	Total	O	0	0
			394	394		
6	B	403	Total	O	0	0
			403	403		
6	K	417	Total	O	0	0
			417	417		
6	P	417	Total	O	0	0
			417	417		
6	U	261	Total	O	0	0
			261	261		
6	Z	314	Total	O	0	0
			314	314		
6	e	276	Total	O	0	0
			276	276		
6	j	301	Total	O	0	0
			301	301		

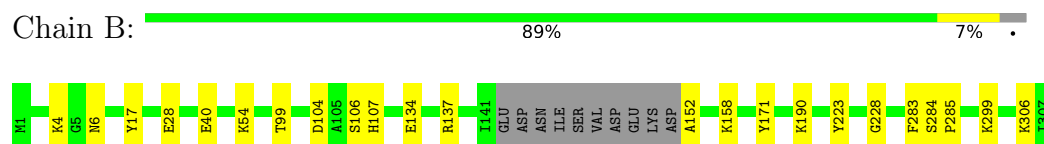
3 Residue-property plots [i](#)

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.

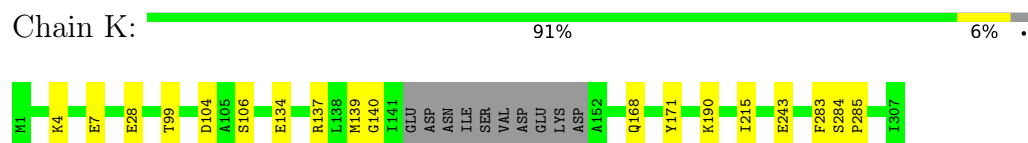
- Molecule 1: Fructose-bisphosphate aldolase



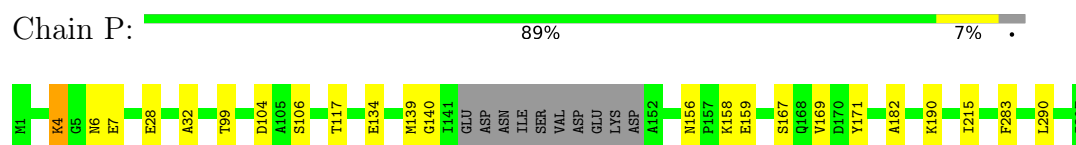
- Molecule 1: Fructose-bisphosphate aldolase



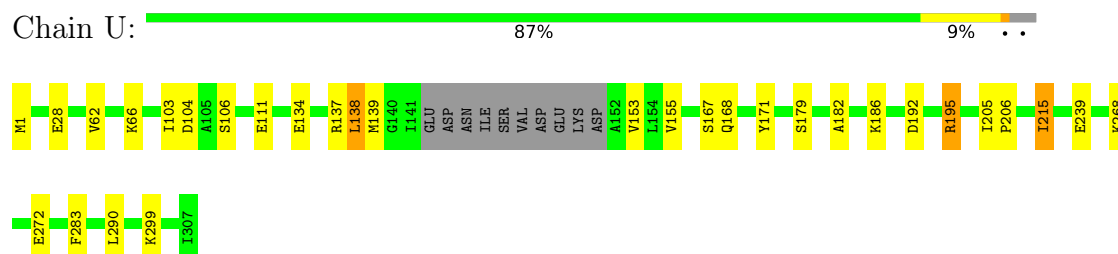
- Molecule 1: Fructose-bisphosphate aldolase



- Molecule 1: Fructose-bisphosphate aldolase

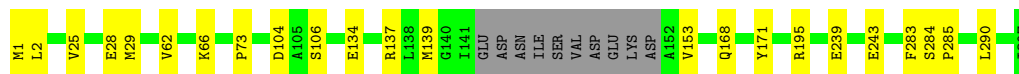


- Molecule 1: Fructose-bisphosphate aldolase



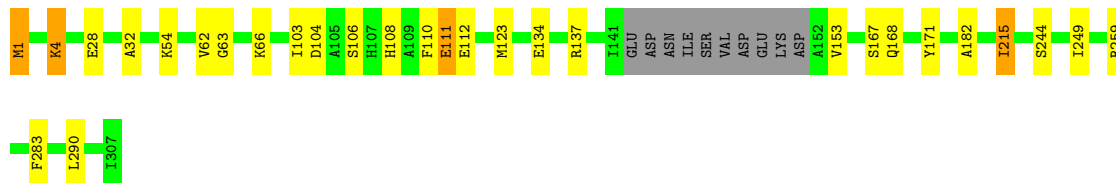
- Molecule 1: Fructose-bisphosphate aldolase

Chain Z:  89% 7% .



- Molecule 1: Fructose-bisphosphate aldolase

Chain e:  87% 8% . .



- Molecule 1: Fructose-bisphosphate aldolase

Chain j:  90% 6% . .



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	51.40Å 104.40Å 111.90Å 98.50° 90.00° 90.00°	Depositor
Resolution (Å)	41.53 – 1.80 41.53 – 1.80	Depositor EDS
% Data completeness (in resolution range)	93.5 (41.53-1.80) 95.5 (41.53-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.52 (at 1.79Å)	Xtriage
Refinement program	PHENIX dev_378	Depositor
R, R_{free}	0.158 , 0.203 0.158 , 0.201	Depositor DCC
R_{free} test set	16300 reflections (8.00%)	wwPDB-VP
Wilson B-factor (Å ²)	17.7	Xtriage
Anisotropy	0.386	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.42 , 44.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.470 for h,-k,-l	Xtriage
F_o, F_c correlation	0.99	EDS
Total number of atoms	39794	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 90.43 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.3013e-08. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: ZN, NA, CL, TD3

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	0.51	0/2332	0.72	0/3134
1	B	0.48	0/2332	0.71	0/3134
1	K	0.49	0/2332	0.71	0/3134
1	P	0.50	0/2332	0.73	0/3134
1	U	0.43	0/2332	0.71	2/3134 (0.1%)
1	Z	0.44	0/2332	0.69	0/3134
1	e	0.43	0/2332	0.70	2/3134 (0.1%)
1	j	0.44	0/2332	0.70	0/3134
All	All	0.47	0/18656	0.71	4/25072 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	U	215	ILE	CA-C-N	5.79	125.74	119.78
1	U	215	ILE	C-N-CA	5.79	125.74	119.78
1	e	215	ILE	CA-C-N	5.32	125.25	119.78
1	e	215	ILE	C-N-CA	5.32	125.25	119.78

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	2292	2317	2325	22	0
1	B	2292	2316	2325	21	0
1	K	2292	2316	2325	13	0
1	P	2292	2317	2325	17	0
1	U	2292	2316	2325	22	0
1	Z	2292	2316	2325	17	0
1	e	2292	2317	2325	22	0
1	j	2292	2316	2325	15	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	K	1	0	0	0	0
2	P	1	0	0	0	0
2	U	1	0	0	0	0
2	Z	1	0	0	0	0
2	e	1	0	0	0	0
2	j	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	K	1	0	0	0	0
3	P	1	0	0	0	0
3	U	1	0	0	0	0
3	Z	1	0	0	0	0
3	e	1	0	0	0	0
3	j	1	0	0	0	0
4	A	1	0	0	8	0
4	B	1	0	0	9	0
4	K	1	0	0	9	0
4	P	1	0	0	8	0
4	U	1	0	0	4	0
4	Z	1	0	0	8	0
4	e	1	0	0	5	0
4	j	1	0	0	7	0
5	A	15	0	11	1	0
5	B	15	0	11	1	0
5	K	15	0	11	0	0
5	P	15	0	11	0	0
5	U	15	0	11	1	0
5	Z	15	0	11	1	0
5	e	15	0	11	0	0
5	j	15	0	11	2	0
6	A	394	0	0	8	0
6	B	403	0	0	8	0
6	K	417	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	P	417	0	0	4	0
6	U	261	0	0	1	0
6	Z	314	0	0	5	0
6	e	276	0	0	4	0
6	j	301	0	0	3	0
All	All	21263	18531	18688	169	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 (169) 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:P:167:SER:OG	1:P:169:VAL:HG23	1.74	0.86
4:P:310:CL:CL	6:P:339:HOH:O	2.33	0.82
1:B:107:HIS:HB2	1:K:243:GLU:HG3	1.62	0.80
1:B:306:LYS:HD3	6:B:2231:HOH:O	1.80	0.79
1:K:134:GLU:OE1	4:K:310:CL:CL	2.37	0.79
4:K:310:CL:CL	6:K:330:HOH:O	2.39	0.77
1:A:104:ASP:OD2	4:A:310:CL:CL	2.40	0.76
1:U:134:GLU:OE1	4:U:310:CL:CL	2.40	0.76
4:A:310:CL:CL	6:A:328:HOH:O	2.38	0.76
4:j:310:CL:CL	6:j:1427:HOH:O	2.40	0.75
1:K:104:ASP:OD2	4:K:310:CL:CL	2.42	0.74
1:j:104:ASP:OD2	4:j:310:CL:CL	2.43	0.74
1:B:104:ASP:OD2	4:B:310:CL:CL	2.42	0.74
1:B:134:GLU:OE1	4:B:310:CL:CL	2.44	0.73
1:P:104:ASP:OD2	4:P:310:CL:CL	2.44	0.73
1:Z:104:ASP:OD2	4:Z:310:CL:CL	2.43	0.73
4:Z:310:CL:CL	6:Z:324:HOH:O	2.44	0.72
1:A:134:GLU:OE1	4:A:310:CL:CL	2.45	0.72
1:P:134:GLU:OE1	4:P:310:CL:CL	2.44	0.72
4:P:310:CL:CL	6:P:1789:HOH:O	2.45	0.71
1:Z:134:GLU:OE1	4:Z:310:CL:CL	2.46	0.71
4:Z:310:CL:CL	6:Z:1875:HOH:O	2.46	0.71
4:B:310:CL:CL	6:B:336:HOH:O	2.47	0.70
4:A:310:CL:CL	6:A:657:HOH:O	2.48	0.68
1:K:106:SER:OG	4:K:310:CL:CL	2.45	0.68
1:P:104:ASP:OD1	4:P:310:CL:CL	2.49	0.68
4:K:310:CL:CL	6:K:1565:HOH:O	2.48	0.68
1:j:106:SER:OG	4:j:310:CL:CL	2.49	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:Z:104:ASP:OD1	4:Z:310:CL:CL	2.50	0.67
4:A:310:CL:CL	6:A:1126:HOH:O	2.50	0.66
1:K:104:ASP:OD1	4:K:310:CL:CL	2.51	0.66
1:A:104:ASP:OD1	4:A:310:CL:CL	2.51	0.66
1:B:104:ASP:OD1	4:B:310:CL:CL	2.51	0.65
4:j:310:CL:CL	6:j:943:HOH:O	2.51	0.65
1:B:17:TYR:CE2	1:B:306:LYS:HE2	2.32	0.65
1:j:104:ASP:OD1	4:j:310:CL:CL	2.52	0.65
1:A:106:SER:OG	4:A:310:CL:CL	2.51	0.64
1:e:137:ARG:HB2	1:e:153:VAL:HG13	1.80	0.64
1:Z:106:SER:OG	4:Z:310:CL:CL	2.52	0.63
1:A:104:ASP:CG	4:A:310:CL:CL	2.78	0.62
1:K:104:ASP:CG	4:K:310:CL:CL	2.79	0.62
1:Z:104:ASP:CG	4:Z:310:CL:CL	2.80	0.62
1:B:104:ASP:CG	4:B:310:CL:CL	2.80	0.62
1:K:4:LYS:HA	1:K:99:THR:HB	1.82	0.62
1:P:104:ASP:CG	4:P:310:CL:CL	2.79	0.62
1:j:104:ASP:CG	4:j:310:CL:CL	2.80	0.62
1:P:106:SER:OG	4:P:310:CL:CL	2.52	0.61
1:A:4:LYS:HG3	1:A:7:GLU:HG3	1.82	0.61
1:U:182:ALA:HA	1:U:215:ILE:HD11	1.83	0.61
1:e:182:ALA:HA	1:e:215:ILE:HD11	1.83	0.60
4:Z:310:CL:CL	6:Z:1520:HOH:O	2.54	0.59
1:j:134:GLU:OE1	4:j:310:CL:CL	2.58	0.59
1:e:1:MET:HB3	6:e:373:HOH:O	2.02	0.59
1:j:280:ARG:HH11	1:j:280:ARG:HG3	1.68	0.58
4:B:310:CL:CL	6:B:814:HOH:O	2.53	0.58
4:B:310:CL:CL	6:B:1010:HOH:O	2.54	0.57
4:P:310:CL:CL	6:P:397:HOH:O	2.54	0.57
1:A:40:GLU:OE1	1:A:299:LYS:HE3	2.04	0.57
1:Z:137:ARG:NH2	1:Z:139:MET:HG3	2.19	0.57
1:U:167:SER:O	1:U:168:GLN:HB2	2.04	0.57
1:e:104:ASP:OD2	4:e:310:CL:CL	2.60	0.56
1:P:4:LYS:HG3	1:P:7:GLU:HG3	1.87	0.56
1:A:166:GLU:HB3	6:A:2400:HOH:O	2.06	0.56
1:e:104:ASP:OD1	4:e:310:CL:CL	2.61	0.56
1:A:165:LYS:O	1:Z:1:MET:HE3	2.06	0.56
1:Z:62:VAL:CG1	1:Z:66:LYS:HE2	2.36	0.55
1:A:24:PHE:CD2	1:A:46:ILE:HD11	2.41	0.55
1:j:255:ASP:OD2	5:j:311:TD3:H205	2.07	0.55
1:e:106:SER:OG	4:e:310:CL:CL	2.62	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:K:310:CL:CL	6:K:589:HOH:O	2.56	0.54
1:B:28:GLU:HG2	1:B:283:PHE:HB3	1.90	0.54
1:P:158:LYS:HE3	6:e:2317:HOH:O	2.07	0.54
1:Z:137:ARG:HB3	1:Z:153:VAL:HG13	1.90	0.54
1:P:139:MET:HE3	1:P:140:GLY:H	1.73	0.53
1:B:40:GLU:CD	1:B:299:LYS:HE3	2.34	0.53
1:B:40:GLU:OE1	1:B:299:LYS:HE3	2.08	0.53
1:e:167:SER:O	1:e:168:GLN:HB2	2.08	0.53
1:B:54:LYS:HE3	6:B:2032:HOH:O	2.09	0.52
1:U:138:LEU:HD22	1:U:179:SER:HA	1.90	0.52
1:Z:168:GLN:HG3	6:Z:1444:HOH:O	2.10	0.52
1:e:134:GLU:OE1	4:e:310:CL:CL	2.64	0.52
1:B:106:SER:OG	4:B:310:CL:CL	2.53	0.52
1:e:259:ARG:HD2	6:e:2006:HOH:O	2.09	0.52
1:Z:62:VAL:HG12	1:Z:66:LYS:HE2	1.93	0.51
1:Z:1:MET:HE2	1:Z:73:PRO:HB3	1.92	0.51
1:K:28:GLU:HG2	1:K:283:PHE:HB3	1.93	0.51
1:K:4:LYS:HG2	1:K:7:GLU:HG3	1.93	0.51
1:e:244:SER:HB3	1:e:249:ILE:HG13	1.92	0.51
1:U:62:VAL:CG1	1:U:66:LYS:HE2	2.41	0.51
1:K:139:MET:HE3	1:K:140:GLY:H	1.76	0.50
1:P:117:THR:HG21	1:P:169:VAL:HG21	1.93	0.50
1:B:4:LYS:HA	1:B:99:THR:HB	1.94	0.50
1:e:28:GLU:HG2	1:e:283:PHE:HB3	1.93	0.50
4:B:310:CL:CL	6:B:971:HOH:O	2.57	0.49
1:Z:239:GLU:O	1:Z:243:GLU:HG2	2.13	0.49
1:P:182:ALA:HA	1:P:215:ILE:HD11	1.95	0.49
1:U:137:ARG:NH2	1:U:139:MET:HG3	2.28	0.49
1:A:168:GLN:NE2	6:A:370:HOH:O	2.43	0.48
4:K:310:CL:CL	6:K:1424:HOH:O	2.57	0.48
1:A:284:SER:HB2	1:A:285:PRO:HD3	1.96	0.48
1:U:239:GLU:H	1:U:239:GLU:CD	2.21	0.48
1:B:306:LYS:HA	1:B:306:LYS:HD2	1.65	0.48
1:U:28:GLU:HG2	1:U:283:PHE:HB3	1.95	0.48
1:U:155:VAL:HG12	1:U:195:ARG:HD3	1.95	0.48
1:B:137:ARG:HD2	1:K:243:GLU:OE1	2.14	0.48
1:e:111:GLU:H	1:e:111:GLU:CD	2.22	0.48
1:e:32:ALA:HB3	1:e:290:LEU:HD22	1.96	0.47
6:P:2035:HOH:O	1:U:299:LYS:HE2	2.14	0.47
1:e:104:ASP:CG	4:e:310:CL:CL	2.95	0.47
1:e:112:GLU:HA	1:e:112:GLU:OE1	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:152:ALA:HB3	6:A:2429:HOH:O	2.16	0.46
1:e:103:ILE:O	1:e:103:ILE:HG23	2.15	0.46
1:e:108:HIS:HB3	1:e:112:GLU:HB2	1.98	0.46
1:A:28:GLU:HG2	1:A:283:PHE:HB3	1.98	0.46
1:B:134:GLU:CD	6:B:1459:HOH:O	2.58	0.46
1:P:32:ALA:HB3	1:P:290:LEU:HD22	1.97	0.46
5:B:311:TD3:H114	5:B:311:TD3:H203	1.83	0.46
1:U:137:ARG:HB3	1:U:153:VAL:HG13	1.98	0.45
1:j:182:ALA:HA	1:j:215:ILE:HD11	1.99	0.45
1:K:137:ARG:HH12	1:K:139:MET:HG3	1.81	0.45
1:j:28:GLU:HG2	1:j:283:PHE:HB3	1.99	0.45
1:e:110:PHE:CD2	1:e:110:PHE:C	2.95	0.44
1:A:40:GLU:CD	1:A:299:LYS:HE3	2.42	0.44
1:P:167:SER:CB	1:P:169:VAL:HG23	2.47	0.44
1:j:161:GLU:O	1:j:165:LYS:HG3	2.16	0.44
5:j:311:TD3:H203	5:j:311:TD3:H114	1.78	0.44
1:U:106:SER:OG	4:U:310:CL:CL	2.69	0.44
1:K:284:SER:N	1:K:285:PRO:CD	2.81	0.44
1:U:290:LEU:C	1:U:290:LEU:HD23	2.43	0.44
1:U:192:ASP:OD2	1:U:195:ARG:NH1	2.51	0.44
1:A:4:LYS:HA	1:A:99:THR:HB	2.00	0.44
1:A:284:SER:N	1:A:285:PRO:CD	2.81	0.43
1:B:284:SER:N	1:B:285:PRO:CD	2.80	0.43
5:Z:311:TD3:H114	5:Z:311:TD3:H203	1.67	0.43
1:B:158:LYS:HE3	6:Z:348:HOH:O	2.19	0.43
1:j:200:LYS:HG2	1:j:248:GLY:HA3	2.01	0.43
1:U:1:MET:HE3	1:U:1:MET:HB2	1.84	0.43
1:U:104:ASP:OD2	4:U:310:CL:CL	2.74	0.43
1:P:4:LYS:HA	1:P:99:THR:HB	2.01	0.43
1:Z:284:SER:HB2	1:Z:285:PRO:HD3	2.00	0.43
1:B:152:ALA:HB3	6:B:2541:HOH:O	2.18	0.43
5:U:311:TD3:H105	5:U:311:TD3:H114	2.00	0.43
1:j:32:ALA:HB3	1:j:290:LEU:HD22	2.01	0.42
5:A:311:TD3:H114	5:A:311:TD3:H203	1.87	0.42
1:j:268:LYS:O	1:j:272:GLU:HG3	2.19	0.42
1:P:28:GLU:HG2	1:P:283:PHE:HB3	2.02	0.42
1:U:62:VAL:HG12	1:U:66:LYS:HE2	2.02	0.42
1:U:104:ASP:OD1	4:U:310:CL:CL	2.74	0.42
1:A:294:VAL:CG1	1:A:298:MET:HE3	2.50	0.42
1:e:123:MET:HE3	1:e:123:MET:HB3	1.96	0.42
1:P:156:ASN:HB3	1:P:159:GLU:HB2	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:P:290:LEU:C	1:P:290:LEU:HD23	2.44	0.41
1:U:103:ILE:HG23	1:U:103:ILE:O	2.19	0.41
1:e:62:VAL:CG1	1:e:66:LYS:HE2	2.50	0.41
1:B:223:TYR:CE2	1:B:228:GLY:HA3	2.56	0.41
1:Z:25:VAL:HG22	1:Z:29:MET:SD	2.60	0.41
1:Z:28:GLU:HG2	1:Z:283:PHE:HB3	2.02	0.41
1:Z:290:LEU:C	1:Z:290:LEU:HD23	2.46	0.41
1:j:188:GLU:HA	1:j:189:PRO:HD3	1.91	0.41
1:U:205:ILE:HB	1:U:206:PRO:HD2	2.03	0.41
1:U:268:LYS:HE3	1:U:272:GLU:OE2	2.21	0.41
1:j:280:ARG:NH1	6:j:333:HOH:O	2.54	0.41
1:e:4:LYS:HG2	6:e:337:HOH:O	2.20	0.40
1:A:67:ILE:HD11	1:e:63:GLY:HA3	2.03	0.40
1:A:44:LEU:HD21	1:A:298:MET:CE	2.52	0.40
1:B:54:LYS:HB2	1:B:54:LYS:HE2	1.89	0.40
1:A:14:LYS:HE3	6:A:2409:HOH:O	2.22	0.40
1:A:186:LYS:NZ	6:A:1677:HOH:O	2.54	0.40
1:U:1:MET:HB3	6:U:2002:HOH:O	2.22	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	293/307 (95%)	288 (98%)	5 (2%)	0	100	100
1	B	293/307 (95%)	288 (98%)	5 (2%)	0	100	100
1	K	293/307 (95%)	288 (98%)	5 (2%)	0	100	100
1	P	293/307 (95%)	288 (98%)	5 (2%)	0	100	100
1	U	293/307 (95%)	288 (98%)	5 (2%)	0	100	100
1	Z	293/307 (95%)	290 (99%)	3 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	e	293/307 (95%)	287 (98%)	6 (2%)	0	100	100
1	j	293/307 (95%)	287 (98%)	6 (2%)	0	100	100
All	All	2344/2456 (95%)	2304 (98%)	40 (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	
1	A	244/254 (96%)	243 (100%)	1 (0%)	84	83
1	B	244/254 (96%)	241 (99%)	3 (1%)	63	57
1	K	244/254 (96%)	240 (98%)	4 (2%)	55	47
1	P	244/254 (96%)	240 (98%)	4 (2%)	55	47
1	U	244/254 (96%)	239 (98%)	5 (2%)	48	38
1	Z	244/254 (96%)	241 (99%)	3 (1%)	63	57
1	e	244/254 (96%)	239 (98%)	5 (2%)	48	38
1	j	244/254 (96%)	240 (98%)	4 (2%)	55	47
All	All	1952/2032 (96%)	1923 (98%)	29 (2%)	57	49

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	171	TYR
1	B	6	ASN
1	B	171	TYR
1	B	190	LYS
1	K	168	GLN
1	K	171	TYR
1	K	190	LYS
1	K	215	ILE
1	P	4	LYS

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Mol	Chain	Res	Type
1	P	6	ASN
1	P	171	TYR
1	P	190	LYS
1	U	111	GLU
1	U	138	LEU
1	U	171	TYR
1	U	186	LYS
1	U	195	ARG
1	Z	2	LEU
1	Z	171	TYR
1	Z	195	ARG
1	e	1	MET
1	e	4	LYS
1	e	54	LYS
1	e	111	GLU
1	e	171	TYR
1	j	2	LEU
1	j	171	TYR
1	j	188	GLU
1	j	200	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	41	ASN
1	A	108	HIS
1	A	305	ASN
1	B	31	ASN
1	B	41	ASN
1	B	287	GLN
1	B	305	ASN
1	K	6	ASN
1	K	31	ASN
1	K	287	GLN
1	P	31	ASN
1	P	287	GLN
1	U	168	GLN
1	U	242	GLN
1	Z	31	ASN
1	Z	168	GLN
1	e	6	ASN
1	e	242	GLN

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Mol	Chain	Res	Type
1	j	31	ASN
1	j	287	GLN

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](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 32 ligands modelled in this entry, 24 are monoatomic - leaving 8 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	$\# Z > 2$
5	TD3	j	311	2	14,14,14	2.50	4 (28%)	12,18,18	1.19	0
5	TD3	B	311	2	14,14,14	2.58	4 (28%)	12,18,18	1.43	2 (16%)
5	TD3	K	311	2	14,14,14	2.66	4 (28%)	12,18,18	1.36	1 (8%)
5	TD3	A	311	2	14,14,14	2.67	4 (28%)	12,18,18	1.24	1 (8%)
5	TD3	P	311	2	14,14,14	2.66	4 (28%)	12,18,18	1.31	2 (16%)
5	TD3	U	311	2	14,14,14	2.59	4 (28%)	12,18,18	1.25	2 (16%)
5	TD3	e	311	2	14,14,14	2.57	4 (28%)	12,18,18	1.38	2 (16%)
5	TD3	Z	311	2	14,14,14	2.55	4 (28%)	12,18,18	1.26	1 (8%)

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
5	TD3	j	311	2	-	9/15/15/15	-
5	TD3	B	311	2	-	8/15/15/15	-
5	TD3	K	311	2	-	7/15/15/15	-
5	TD3	A	311	2	-	7/15/15/15	-
5	TD3	P	311	2	-	8/15/15/15	-
5	TD3	U	311	2	-	4/15/15/15	-
5	TD3	e	311	2	-	6/15/15/15	-
5	TD3	Z	311	2	-	8/15/15/15	-

All (32) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	K	311	TD3	C12-N02	8.42	1.46	1.35
5	A	311	TD3	C12-N02	8.18	1.46	1.35
5	P	311	TD3	C12-N02	8.05	1.46	1.35
5	B	311	TD3	C12-N02	8.04	1.46	1.35
5	Z	311	TD3	C12-N02	7.96	1.45	1.35
5	U	311	TD3	C12-N02	7.94	1.45	1.35
5	e	311	TD3	C12-N02	7.84	1.45	1.35
5	j	311	TD3	C12-N02	7.66	1.45	1.35
5	P	311	TD3	O15-C14	-3.82	1.39	1.43
5	A	311	TD3	O15-C14	-3.74	1.39	1.43
5	B	311	TD3	O15-C14	-3.46	1.39	1.43
5	K	311	TD3	O15-C14	-3.40	1.40	1.43
5	U	311	TD3	O15-C14	-2.94	1.40	1.43
5	e	311	TD3	O15-C14	-2.92	1.40	1.43
5	Z	311	TD3	O15-C14	-2.81	1.40	1.43
5	j	311	TD3	O15-C14	-2.79	1.40	1.43
5	U	311	TD3	P16-O18	2.62	1.64	1.54
5	e	311	TD3	P16-O18	2.57	1.64	1.54
5	U	311	TD3	P16-O17	2.55	1.64	1.54
5	P	311	TD3	P16-O18	2.54	1.64	1.54
5	e	311	TD3	P16-O17	2.50	1.64	1.54
5	j	311	TD3	P16-O18	2.46	1.63	1.54
5	Z	311	TD3	P16-O18	2.41	1.63	1.54
5	A	311	TD3	P16-O18	2.41	1.63	1.54
5	Z	311	TD3	P16-O17	2.38	1.63	1.54
5	j	311	TD3	P16-O17	2.35	1.63	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	311	TD3	P16-O17	2.34	1.63	1.54
5	K	311	TD3	P16-O18	2.29	1.63	1.54
5	A	311	TD3	P16-O17	2.25	1.63	1.54
5	P	311	TD3	P16-O17	2.17	1.62	1.54
5	B	311	TD3	P16-O18	2.12	1.62	1.54
5	K	311	TD3	P16-O17	2.06	1.62	1.54

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	K	311	TD3	C04-C03-N02	3.37	118.04	111.11
5	B	311	TD3	C04-C03-N02	3.28	117.86	111.11
5	e	311	TD3	C04-C03-N02	3.25	117.81	111.11
5	P	311	TD3	C04-C03-N02	2.74	116.76	111.11
5	Z	311	TD3	C04-C03-N02	2.72	116.72	111.11
5	A	311	TD3	C04-C03-N02	2.65	116.56	111.11
5	U	311	TD3	C04-C03-N02	2.59	116.45	111.11
5	e	311	TD3	O01-N02-C03	2.56	119.75	113.76
5	U	311	TD3	O01-N02-C03	2.28	119.11	113.76
5	B	311	TD3	O01-N02-C03	2.21	118.93	113.76
5	P	311	TD3	O01-N02-C03	2.18	118.86	113.76

There are no chirality outliers.

All (57) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	311	TD3	N02-C03-C04-C05
5	A	311	TD3	C14-O15-P16-O17
5	A	311	TD3	C14-O15-P16-O18
5	A	311	TD3	C14-O15-P16-O19
5	B	311	TD3	C14-C12-N02-O01
5	B	311	TD3	N02-C03-C04-C05
5	B	311	TD3	C14-O15-P16-O17
5	B	311	TD3	C14-O15-P16-O18
5	B	311	TD3	C14-O15-P16-O19
5	K	311	TD3	N02-C03-C04-C05
5	K	311	TD3	C14-O15-P16-O17
5	K	311	TD3	C14-O15-P16-O18
5	K	311	TD3	C14-O15-P16-O19
5	P	311	TD3	N02-C03-C04-C05
5	P	311	TD3	C14-O15-P16-O17
5	P	311	TD3	C14-O15-P16-O18

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Mol	Chain	Res	Type	Atoms
5	P	311	TD3	C14-O15-P16-O19
5	U	311	TD3	C14-O15-P16-O17
5	Z	311	TD3	N02-C03-C04-C05
5	Z	311	TD3	C14-O15-P16-O17
5	Z	311	TD3	C14-O15-P16-O18
5	Z	311	TD3	C14-O15-P16-O19
5	e	311	TD3	C14-O15-P16-O17
5	e	311	TD3	C14-O15-P16-O18
5	j	311	TD3	N02-C03-C04-C05
5	j	311	TD3	C14-O15-P16-O17
5	j	311	TD3	C14-O15-P16-O18
5	j	311	TD3	C14-O15-P16-O19
5	Z	311	TD3	C03-C04-C05-C06
5	U	311	TD3	C03-C04-C05-C06
5	e	311	TD3	C03-C04-C05-C06
5	j	311	TD3	C03-C04-C05-C06
5	e	311	TD3	C04-C05-C06-O07
5	B	311	TD3	C04-C05-C06-O07
5	A	311	TD3	C04-C05-C06-O07
5	P	311	TD3	C04-C05-C06-O07
5	U	311	TD3	C04-C05-C06-O07
5	j	311	TD3	C04-C05-C06-O07
5	A	311	TD3	O13-C12-C14-O15
5	B	311	TD3	O13-C12-C14-O15
5	K	311	TD3	O13-C12-C14-O15
5	P	311	TD3	O13-C12-C14-O15
5	j	311	TD3	N02-C12-C14-O15
5	Z	311	TD3	N02-C12-C14-O15
5	j	311	TD3	O13-C12-C14-O15
5	Z	311	TD3	O13-C12-C14-O15
5	K	311	TD3	C04-C05-C06-O07
5	e	311	TD3	C04-C03-N02-O01
5	P	311	TD3	N02-C12-C14-O15
5	A	311	TD3	O13-C12-N02-O01
5	B	311	TD3	O13-C12-N02-O01
5	K	311	TD3	O13-C12-N02-O01
5	P	311	TD3	O13-C12-N02-O01
5	U	311	TD3	O13-C12-N02-O01
5	Z	311	TD3	O13-C12-N02-O01
5	e	311	TD3	O13-C12-N02-O01
5	j	311	TD3	O13-C12-N02-O01

There are no ring outliers.

5 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	j	311	TD3	2	0
5	B	311	TD3	1	0
5	A	311	TD3	1	0
5	U	311	TD3	1	0
5	Z	311	TD3	1	0

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	297/307 (96%)	-1.68	0 100 100	11, 18, 39, 79	0
1	B	297/307 (96%)	-1.66	0 100 100	12, 20, 41, 75	0
1	K	297/307 (96%)	-1.67	0 100 100	12, 20, 40, 70	0
1	P	297/307 (96%)	-1.69	0 100 100	11, 19, 39, 70	0
1	U	297/307 (96%)	-1.42	0 100 100	12, 29, 69, 112	0
1	Z	297/307 (96%)	-1.49	0 100 100	12, 26, 60, 113	0
1	e	297/307 (96%)	-1.42	0 100 100	12, 29, 67, 124	0
1	j	297/307 (96%)	-1.47	0 100 100	12, 25, 64, 111	0
All	All	2376/2456 (96%)	-1.57	0 100 100	11, 23, 57, 124	0

There are no RSRZ outliers to report.

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](#)

There are no oligosaccharides 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($\text{\AA}^2$)	Q<0.9
3	NA	U	309	1/1	0.99	0.03	39,39,39,39	0
3	NA	Z	309	1/1	0.99	0.04	34,34,34,34	0
3	NA	e	309	1/1	0.99	0.03	36,36,36,36	0
2	ZN	P	308	1/1	1.00	0.01	13,13,13,13	0
2	ZN	U	308	1/1	1.00	0.01	27,27,27,27	0
2	ZN	Z	308	1/1	1.00	0.01	23,23,23,23	0
2	ZN	e	308	1/1	1.00	0.01	26,26,26,26	0
2	ZN	j	308	1/1	1.00	0.01	24,24,24,24	0
3	NA	A	309	1/1	1.00	0.02	27,27,27,27	0
3	NA	B	309	1/1	1.00	0.02	25,25,25,25	0
3	NA	K	309	1/1	1.00	0.03	26,26,26,26	0
3	NA	P	309	1/1	1.00	0.03	30,30,30,30	0
2	ZN	A	308	1/1	1.00	0.01	15,15,15,15	0
2	ZN	B	308	1/1	1.00	0.01	14,14,14,14	0
2	ZN	K	308	1/1	1.00	0.01	17,17,17,17	0
3	NA	j	309	1/1	1.00	0.02	33,33,33,33	0
4	CL	A	310	1/1	1.00	0.01	13,13,13,13	0
4	CL	B	310	1/1	1.00	0.01	14,14,14,14	0
4	CL	K	310	1/1	1.00	0.01	13,13,13,13	0
4	CL	P	310	1/1	1.00	0.01	13,13,13,13	0
4	CL	U	310	1/1	1.00	0.02	39,39,39,39	0
4	CL	Z	310	1/1	1.00	0.01	27,27,27,27	0
4	CL	e	310	1/1	1.00	0.02	39,39,39,39	0
4	CL	j	310	1/1	1.00	0.01	27,27,27,27	0
5	TD3	A	311	15/15	1.00	0.03	13,19,43,45	0
5	TD3	B	311	15/15	1.00	0.03	13,18,39,43	0
5	TD3	K	311	15/15	1.00	0.03	13,22,37,41	0
5	TD3	P	311	15/15	1.00	0.02	12,19,38,40	0
5	TD3	U	311	15/15	1.00	0.03	19,35,44,45	0
5	TD3	Z	311	15/15	1.00	0.03	21,32,52,57	0
5	TD3	e	311	15/15	1.00	0.03	22,34,45,47	0
5	TD3	j	311	15/15	1.00	0.03	21,32,49,52	0

6.5 Other polymers [i](#)

There are no such residues in this entry.