Full wwPDB X-ray Structure Validation Report (i)

Oct 9, 2023 – 11:20 AM EDT

PDB ID	:	8DF8
Title	:	Structure of M. kandleri topoisomerase V in complex with DNA. 40 base pair symmetric DNA complex
Authors	:	Osterman, A.; Mondragon, A.
Deposited on	:	2022-06-21
Resolution	:	2.92 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 (i) 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 (i)) were used in the production of this report:

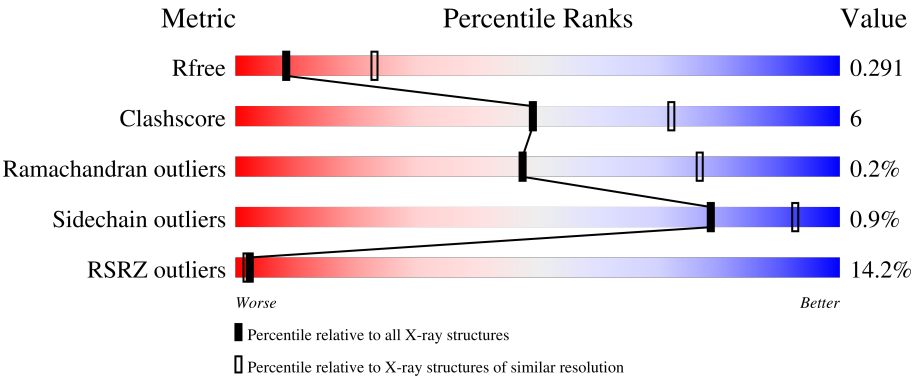
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.92 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	2307 (2.94-2.90)
Clashscore	141614	2531 (2.94-2.90)
Ramachandran outliers	138981	2462 (2.94-2.90)
Sidechain outliers	138945	2464 (2.94-2.90)
RSRZ outliers	127900	2248 (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 <=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	854	12% 85% 14%
1	B	854	17% 84% 15%
2	U	42	52% 40% 7%
3	V	42	2% 45% 43% · 10%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 15241 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 Topoisomerase V.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	850	Total	C	N	O	S	0	1	0
			6807	4259	1222	1315	11			
1	B	850	Total	C	N	O	S	0	1	0
			6807	4259	1222	1315	11			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	809	ALA	LYS	engineered mutation	UNP Q977W1
A	820	ALA	LYS	engineered mutation	UNP Q977W1
A	831	ALA	LYS	engineered mutation	UNP Q977W1
A	835	ALA	LYS	engineered mutation	UNP Q977W1
A	846	ALA	LYS	engineered mutation	UNP Q977W1
A	851	ALA	LYS	engineered mutation	UNP Q977W1
B	809	ALA	LYS	engineered mutation	UNP Q977W1
B	820	ALA	LYS	engineered mutation	UNP Q977W1
B	831	ALA	LYS	engineered mutation	UNP Q977W1
B	835	ALA	LYS	engineered mutation	UNP Q977W1
B	846	ALA	LYS	engineered mutation	UNP Q977W1
B	851	ALA	LYS	engineered mutation	UNP Q977W1

- Molecule 2 is a DNA chain called DNA (42-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	U	39	Total	C	N	O	P	0	1	0
			805	383	144	238	40			

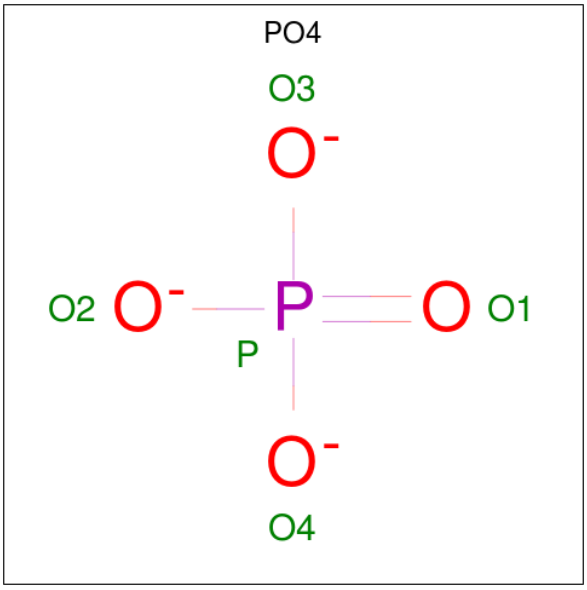
- Molecule 3 is a DNA chain called DNA (42-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	V	38	Total	C	N	O	P	0	2	0
			790	376	137	237	40			

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K).

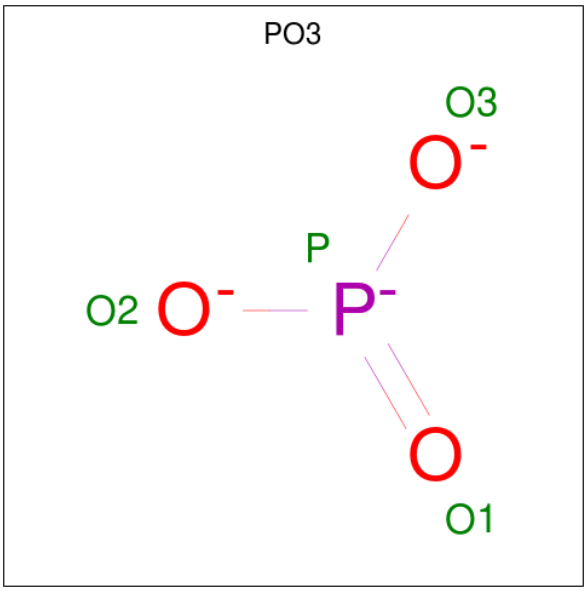
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	2	Total K 2 2	0	0
4	B	2	Total K 2 2	0	0

- Molecule 5 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total O P 5 4 1	0	0
5	B	1	Total O P 5 4 1	0	0
5	U	1	Total O P 5 4 1	0	0
5	U	1	Total O P 5 4 1	0	0

- Molecule 6 is PHOSPHITE ION (three-letter code: PO3) (formula: O_3P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	U	1	Total O P 4 3 1	0	0
6	V	1	Total O P 4 3 1	0	0

3 Residue-property plots (i)

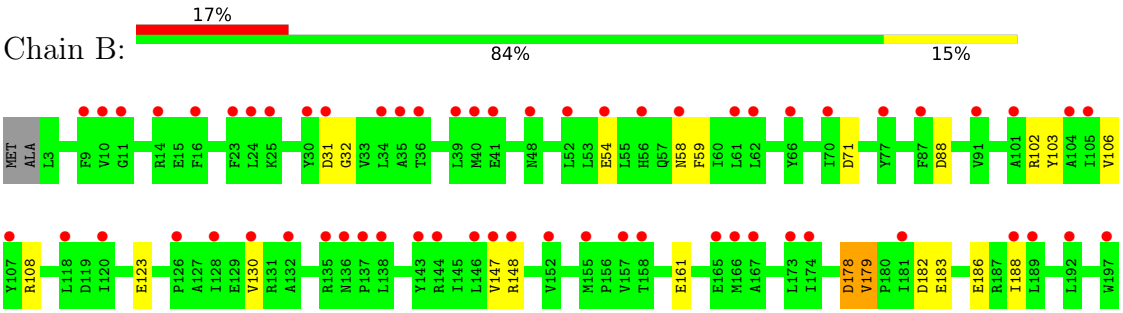
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

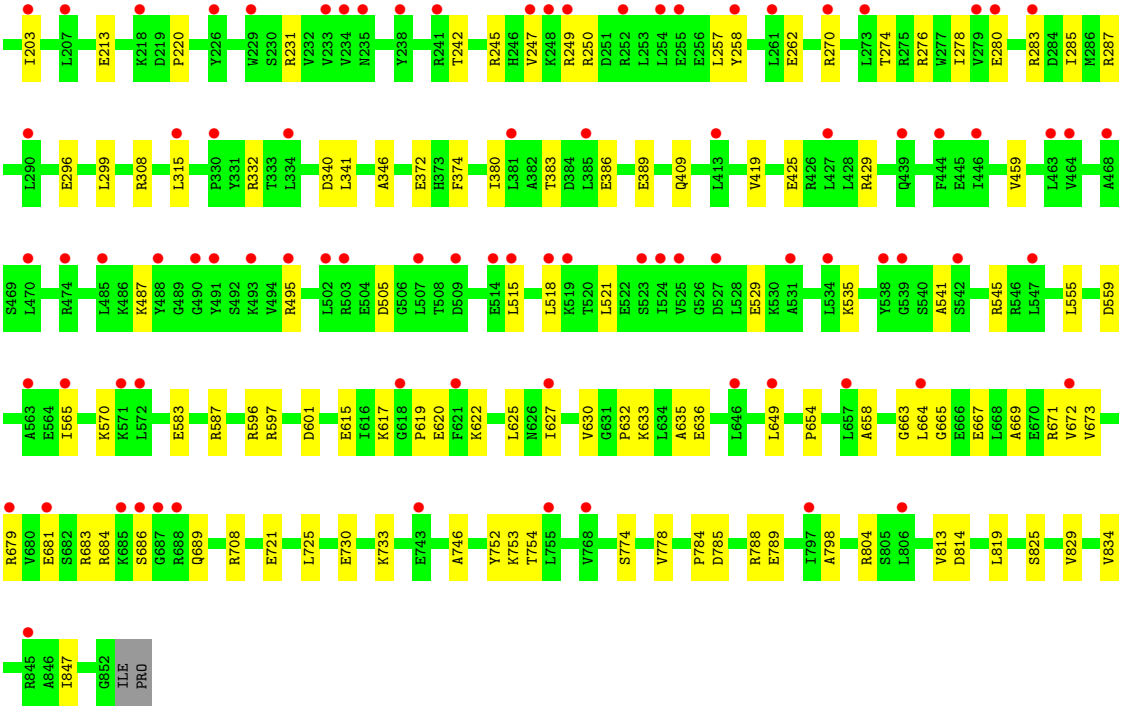
• Molecule 1: Topoisomerase V

Chain A:

• Molecule 1: Topoisomerase V

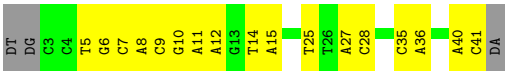
Chain B:





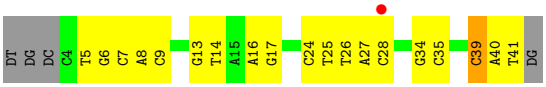
• Molecule 2: DNA (42-MER)

Chain U:



• Molecule 3: DNA (42-MER)

Chain V:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	120.94Å 120.94Å 497.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	58.76 – 2.92 108.77 – 2.92	Depositor EDS
% Data completeness (in resolution range)	68.9 (58.76-2.92) 69.0 (108.77-2.92)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	7.33 (at 2.91Å)	Xtriage
Refinement program	BUSTER, PHENIX 1.19.1_4122	Depositor
R, R_{free}	0.257 , 0.288 0.265 , 0.291	Depositor DCC
R_{free} test set	2846 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	98.8	Xtriage
Anisotropy	0.058	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 66.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.89	EDS
Total number of atoms	15241	wwPDB-VP
Average B, all atoms (Å^2)	98.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.10% of the height of the origin peak. No significant pseudotranslation is detected.*

[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: K, PO3, PO4

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	0.24	0/6906	0.51	0/9302
1	B	0.24	0/6906	0.51	0/9302
2	U	0.48	0/901	0.90	0/1386
3	V	0.47	0/894	0.93	1/1376 (0.1%)
All	All	0.28	0/15607	0.58	1/21366 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	V	39	DC	O4'-C1'-N1	5.13	111.59	108.00

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	6807	0	6873	81	0
1	B	6807	0	6873	77	0
2	U	805	0	444	18	0
3	V	790	0	431	17	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	10	0	0	0	0
5	U	10	0	0	0	0
6	U	4	0	0	0	0
6	V	4	0	0	1	0
All	All	15241	0	14621	174	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 (174) 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)
3:V:24:DC:H2"	3:V:25:DT:H5"	1.64	0.78
1:A:220:PRO:HB3	1:A:231:ARG:HG3	1.66	0.78
1:A:285:ILE:HD11	2:U:5:DT:P	2.26	0.75
1:A:542:SER:HB2	2:U:28[A]:DC:H5"	1.70	0.73
3:V:39:DC:H2"	3:V:40:DA:H5'	1.72	0.70
1:A:288:ARG:NH2	3:V:34:DG:N7	2.39	0.69
1:B:601:ASP:OD2	1:B:633:LYS:NZ	2.24	0.69
3:V:27:DA:H4'	3:V:28:DC:H5'	1.73	0.69
1:A:184:LYS:HE3	1:A:209:LEU:HD13	1.77	0.67
1:A:287:ARG:HD3	1:A:292:GLN:HB3	1.77	0.66
1:B:287:ARG:HH22	1:B:296:GLU:HG3	1.61	0.65
2:U:27:DA:O3'	2:U:28[B]:DC:P	2.56	0.64
1:B:784:PRO:HB2	1:B:788:ARG:HH21	1.64	0.62
3:V:26:DT:H2"	3:V:27:DA:C8	2.35	0.62
1:A:3:LEU:HG	1:A:4:VAL:HG23	1.81	0.62
1:A:240:GLU:HG3	1:A:244:LYS:HE3	1.82	0.62
1:A:834:VAL:HG13	1:A:847:ILE:HG21	1.82	0.62
1:A:123:GLU:O	1:A:283:ARG:NH2	2.34	0.61
1:A:542:SER:HB2	2:U:28[B]:DC:H5'	1.82	0.61
1:A:615:GLU:HG2	1:A:622:LYS:HD3	1.81	0.61
1:B:130:VAL:HG21	1:B:147:VAL:HG11	1.83	0.60
1:A:389:GLU:OE2	1:A:429:ARG:NH2	2.34	0.60
1:B:242:THR:HG22	1:B:245:ARG:HH21	1.67	0.59
1:B:220:PRO:HB3	1:B:231:ARG:HG3	1.83	0.59
1:A:784:PRO:HB2	1:A:788:ARG:HH21	1.69	0.58
1:B:658:ALA:HA	1:B:664:LEU:HD23	1.84	0.58
1:A:332:ARG:NH2	1:A:372:GLU:OE2	2.34	0.57
1:B:188:ILE:HG23	1:B:203:ILE:HG21	1.87	0.57
1:A:591:LEU:N	3:V:9:DC:OP1	2.37	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:U:27:DA:H4'	2:U:28[B]:DC:P	2.45	0.57
1:B:276:ARG:O	1:B:280:GLU:HG2	2.06	0.56
1:A:54:GLU:O	1:A:58:ASN:ND2	2.37	0.56
1:B:518:LEU:HD21	1:B:535:LYS:HD2	1.89	0.55
1:B:583:GLU:OE2	1:B:587:ARG:NH2	2.40	0.54
1:B:161:GLU:OE2	1:B:249:ARG:NH1	2.39	0.54
1:B:419:VAL:HG22	1:B:459:VAL:HG13	1.89	0.54
1:A:74:GLU:OE2	1:A:102:ARG:NH2	2.41	0.54
1:A:319:PHE:HE1	1:A:337:VAL:HG21	1.71	0.54
1:B:341:LEU:HD21	1:B:346:ALA:HB2	1.90	0.54
1:B:804:ARG:NH1	3:V:26:DT:OP1	2.35	0.54
1:B:308:ARG:NH2	1:B:340:ASP:O	2.38	0.53
1:B:730:GLU:HB3	1:B:733:LYS:HD3	1.91	0.53
1:A:624:LEU:HB3	1:A:630:VAL:HG21	1.91	0.53
1:B:615:GLU:HG2	1:B:622:LYS:HD3	1.91	0.53
1:A:626:ASN:O	1:A:626:ASN:ND2	2.38	0.52
2:U:35:DC:H2"	2:U:36:DA:H5'	1.90	0.52
2:U:5:DT:H1'	2:U:6:DG:C8	2.45	0.52
1:A:213:GLU:OE1	1:A:213:GLU:N	2.42	0.52
1:A:419:VAL:HG22	1:A:459:VAL:HG13	1.92	0.52
1:B:545:ARG:HG2	1:B:565:ILE:HG23	1.92	0.52
2:U:14:DT:H2"	2:U:15:DA:C8	2.45	0.52
1:A:283:ARG:O	1:A:287:ARG:HG2	2.10	0.52
1:A:526:GLY:HA3	1:B:274:THR:HG21	1.92	0.52
1:A:627:ILE:HD11	1:A:630:VAL:HG13	1.91	0.51
1:B:213:GLU:N	1:B:213:GLU:OE1	2.43	0.51
1:B:617:LYS:NZ	1:B:636:GLU:OE2	2.35	0.51
1:A:287:ARG:HH11	1:A:292:GLN:HB3	1.76	0.51
1:A:106:VAL:HG11	1:A:148:ARG:HB3	1.92	0.51
1:A:341:LEU:HD21	1:A:346:ALA:HB2	1.93	0.50
1:A:474:ARG:HH22	1:B:299:LEU:HD22	1.76	0.50
1:A:283:ARG:HG3	1:A:287:ARG:HE	1.76	0.50
1:A:276:ARG:O	1:A:280:GLU:HG2	2.11	0.50
1:B:619:PRO:HA	1:B:622:LYS:HE3	1.92	0.50
1:B:570:LYS:N	2:U:7:DC:OP1	2.34	0.50
1:B:71:ASP:O	1:B:102:ARG:NH1	2.45	0.50
1:A:518:LEU:HD21	1:A:535:LYS:HD2	1.93	0.50
1:A:684:ARG:O	1:A:688:ARG:HB2	2.11	0.50
1:A:112:ARG:HH22	1:A:292:GLN:HG2	1.77	0.49
1:A:130:VAL:HG21	1:A:147:VAL:HG11	1.94	0.49
1:B:389:GLU:OE2	1:B:429:ARG:NH2	2.42	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:788:ARG:NH2	1:A:814:ASP:OD1	2.41	0.49
1:B:487:LYS:NZ	1:B:505:ASP:OD1	2.45	0.49
1:B:788:ARG:NH2	1:B:814:ASP:OD1	2.36	0.49
1:A:619:PRO:HA	1:A:622:LYS:HE3	1.95	0.49
1:B:834:VAL:HG13	1:B:847:ILE:HG21	1.93	0.49
1:B:686:SER:O	1:B:689:GLN:NE2	2.42	0.48
1:B:774:SER:O	1:B:778:VAL:HG23	2.14	0.48
1:A:74:GLU:HG2	1:A:99:SER:HB2	1.95	0.48
1:A:774:SER:O	1:A:778:VAL:HG23	2.13	0.48
3:V:8:DA:H1'	3:V:9:DC:H5'	1.96	0.48
1:A:804:ARG:HD3	2:U:25:DT:H5"	1.95	0.47
1:B:746:ALA:HA	1:B:752:TYR:HB3	1.96	0.47
1:B:54:GLU:O	1:B:58:ASN:ND2	2.44	0.47
1:A:133:VAL:HG21	3:V:41:DT:H3'	1.95	0.47
1:B:374:PHE:HE1	1:B:383:THR:HG21	1.79	0.47
1:A:374:PHE:HE1	1:A:383:THR:HG21	1.80	0.47
1:B:754:THR:OG1	2:U:12:DA:OP2	2.24	0.47
1:B:679:ARG:HH22	1:B:683:ARG:NH2	2.13	0.47
1:B:627:ILE:HD11	1:B:672:VAL:HG12	1.96	0.46
1:A:285:ILE:HD11	2:U:5:DT:O5'	2.16	0.46
1:B:785:ASP:O	1:B:789:GLU:HG2	2.16	0.46
1:A:654:PRO:HG2	1:A:670:GLU:HG2	1.96	0.46
1:B:31:ASP:HB3	1:B:278:ILE:HG21	1.98	0.46
1:A:804:ARG:HD2	2:U:25:DT:OP1	2.15	0.46
1:B:667:GLU:O	1:B:671:ARG:HG2	2.15	0.46
1:B:178:ASP:O	1:B:179:VAL:HG22	2.16	0.46
1:B:425:GLU:O	1:B:429:ARG:HG2	2.16	0.46
1:B:819:LEU:HD13	1:B:829:VAL:HG11	1.98	0.46
1:A:487:LYS:NZ	1:A:505:ASP:OD1	2.45	0.45
1:A:104:ALA:O	1:A:110:GLY:HA3	2.17	0.45
1:A:519:LYS:NZ	1:B:123:GLU:OE2	2.48	0.45
1:A:31:ASP:HB3	1:A:278:ILE:HG21	1.99	0.45
2:U:8:DA:H1'	2:U:9:DC:H5'	1.99	0.45
1:B:258:TYR:O	1:B:262:GLU:HG2	2.17	0.45
1:B:283:ARG:O	1:B:287:ARG:HG2	2.17	0.45
1:B:625:LEU:HD21	1:B:632:PRO:HG3	1.98	0.45
1:A:650:ALA:HA	1:A:673:VAL:HG13	1.99	0.45
1:A:746:ALA:HB1	1:A:753:LYS:HB2	1.99	0.45
1:B:825:SER:O	1:B:829:VAL:HG23	2.17	0.44
1:A:657:LEU:O	1:A:661:VAL:HG12	2.16	0.44
1:B:746:ALA:HB1	1:B:753:LYS:HB2	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:V:34:DG:H2"	3:V:35:DC:OP2	2.18	0.44
1:B:386:GLU:OE1	1:B:386:GLU:N	2.46	0.44
1:B:665:GLY:O	1:B:669:ALA:N	2.42	0.44
1:A:189:LEU:O	1:A:193:ARG:HG3	2.17	0.44
3:V:6:DG:H2"	3:V:7:DC:H5'	1.99	0.44
1:B:529:GLU:OE1	1:B:529:GLU:N	2.48	0.44
1:A:785:ASP:O	1:A:789:GLU:HG2	2.18	0.44
1:B:380:ILE:O	1:B:409:GLN:NE2	2.44	0.44
1:B:545:ARG:NH1	1:B:565:ILE:O	2.50	0.44
1:A:386:GLU:OE1	1:A:386:GLU:N	2.46	0.43
1:A:584:LEU:HB3	1:A:594:ILE:HD12	2.00	0.43
3:V:7:DC:H1'	3:V:8:DA:C8	2.53	0.43
3:V:16:DA:H2"	3:V:17:DG:C8	2.52	0.43
1:A:50:GLU:O	1:A:54:GLU:HG2	2.18	0.43
1:A:513:ARG:HD3	1:A:522:GLU:OE1	2.19	0.43
1:B:596:ARG:HH22	1:B:597:ARG:HH11	1.67	0.43
2:U:10:DG:H1'	2:U:11:DA:H5'	2.01	0.43
1:B:247:VAL:HA	1:B:250:ARG:HE	1.84	0.43
1:B:630:VAL:HG23	1:B:635:ALA:HB2	2.01	0.43
1:B:798:ALA:HB2	1:B:813:VAL:HG12	2.00	0.43
2:U:40:DA:H2"	2:U:41:DC:H5"	2.01	0.42
3:V:24:DC:C2'	3:V:25:DT:H5"	2.42	0.42
1:A:210:SER:HB3	1:A:213:GLU:OE1	2.20	0.42
1:B:182:ASP:OD1	1:B:183:GLU:N	2.51	0.42
1:A:627:ILE:O	1:A:629:GLY:N	2.44	0.42
1:A:667:GLU:O	1:A:671:ARG:HG2	2.20	0.42
1:B:285:ILE:HD11	3:V:5:DT:H3'	2.00	0.42
1:B:332:ARG:NH2	1:B:372:GLU:OE2	2.52	0.42
1:A:287:ARG:NH2	1:A:296:GLU:OE2	2.52	0.42
1:B:106:VAL:HG11	1:B:148:ARG:HB3	2.01	0.42
1:A:679:ARG:NH2	2:U:36:DA:OP1	2.51	0.42
3:V:16:DA:H2"	3:V:17:DG:H5"	2.02	0.42
1:B:103:TYR:HD1	1:B:148:ARG:HE	1.67	0.42
1:B:721:GLU:O	1:B:725:LEU:HG	2.20	0.42
1:A:525:VAL:HG11	1:A:530:LYS:HB2	2.02	0.41
1:B:654:PRO:HD3	1:B:673:VAL:HG11	2.01	0.41
1:A:646:LEU:HD21	1:A:679:ARG:HB2	2.01	0.41
1:B:123:GLU:O	1:B:283:ARG:NH2	2.53	0.41
3:V:13[B]:DG:H2"	3:V:14[B]:DT:H5"	2.03	0.41
1:A:30:TYR:CE1	1:A:129:GLU:HB2	2.56	0.41
1:A:282:LYS:HA	1:A:285:ILE:HG22	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:552:LEU:O	1:A:556:GLY:HA3	2.20	0.41
1:B:620:GLU:OE1	1:B:620:GLU:N	2.45	0.41
1:A:16:PHE:CE2	1:A:20:ARG:HD2	2.56	0.41
1:A:290:LEU:O	1:A:294:ILE:HG13	2.20	0.41
1:A:542:SER:HB2	2:U:28[B]:DC:C5'	2.45	0.41
1:A:703:LYS:HA	1:A:703:LYS:HD3	1.92	0.41
1:B:32:GLY:HA3	1:B:59:PHE:CE1	2.56	0.41
1:B:182:ASP:O	1:B:186:GLU:HG3	2.21	0.41
1:B:315:LEU:HD11	1:B:341:LEU:HD13	2.02	0.41
1:A:131:ARG:NH2	6:V:101:PO3:O1	2.53	0.41
1:A:177:TYR:CZ	1:A:236:ILE:HG12	2.56	0.41
1:A:325[A]:MET:HE2	1:B:708:ARG:HH22	1.86	0.41
1:A:513:ARG:HD2	1:A:519:LYS:HA	2.03	0.41
1:A:753:LYS:NZ	1:A:757:ASP:OD1	2.51	0.41
1:B:495:ARG:NH1	1:B:515:LEU:O	2.53	0.41
1:B:521:LEU:HG	1:B:541:ALA:HB2	2.02	0.41
1:B:627:ILE:O	1:B:627:ILE:HG13	2.21	0.41
1:A:627:ILE:C	1:A:629:GLY:H	2.24	0.40
1:A:529:GLU:OE1	1:A:529:GLU:N	2.50	0.40
1:A:258:TYR:O	1:A:262:GLU:HG2	2.21	0.40
1:B:58:ASN:HB3	1:B:257:LEU:HD11	2.03	0.40
1:B:681:GLU:O	1:B:684:ARG:HG2	2.21	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	849/854 (99%)	828 (98%)	19 (2%)	2 (0%)	47 77
1	B	849/854 (99%)	828 (98%)	19 (2%)	2 (0%)	47 77
All	All	1698/1708 (99%)	1656 (98%)	38 (2%)	4 (0%)	47 77

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	628	GLU
1	B	663	GLY
1	B	178	ASP
1	A	627	ILE

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	713/715 (100%)	706 (99%)	7 (1%)	76	91
1	B	713/715 (100%)	706 (99%)	7 (1%)	76	91
All	All	1426/1430 (100%)	1412 (99%)	14 (1%)	78	91

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	88	ASP
1	A	179	VAL
1	A	325[A]	MET
1	A	325[B]	MET
1	A	555	LEU
1	A	559	ASP
1	A	626	ASN
1	B	88	ASP
1	B	108	ARG
1	B	179	VAL
1	B	270	ARG
1	B	555	LEU
1	B	559	ASP
1	B	649	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 10 ligands modelled in this entry, 4 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	$\#\|Z\| > 2$
5	PO4	U	103	-	4,4,4	0.66	0	6,6,6	0.43	0
5	PO4	B	901	-	4,4,4	0.65	0	6,6,6	0.43	0
5	PO4	U	101	-	4,4,4	0.66	0	6,6,6	0.43	0
5	PO4	B	904	-	4,4,4	0.67	0	6,6,6	0.43	0
6	PO3	V	101	3	0,3,3	-	-	0,3,3	-	-
6	PO3	U	102	2	0,3,3	-	-	0,3,3	-	-

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	V	101	PO3	1	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	U	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	U	27:DA	O3'	28[B]:DC	P	2.55

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, 95^{th} 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	850/854 (99%)	0.94	104 (12%) 4 3	26, 93, 145, 176	0
1	B	850/854 (99%)	1.14	148 (17%) 1 1	29, 96, 168, 351	0
2	U	39/42 (92%)	0.28	0 100 100	84, 110, 166, 167	0
3	V	38/42 (90%)	0.28	1 (2%) 56 53	55, 111, 136, 145	0
All	All	1777/1792 (99%)	1.00	253 (14%) 2 2	26, 96, 158, 351	0

All (253) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	166	MET	9.9
1	B	192	LEU	7.8
1	B	138	LEU	5.9
1	A	557	PHE	5.6
1	A	287	ARG	5.5
1	B	173	LEU	5.5
1	B	229	TRP	5.3
1	B	203	ILE	5.2
1	B	167	ALA	5.2
1	B	130	VAL	5.0
1	B	523	SER	4.9
1	B	188	ILE	4.7
1	B	155	MET	4.7
1	B	649	LEU	4.7
1	B	258	TYR	4.6
1	A	261	LEU	4.6
1	A	258	TYR	4.5
1	B	226	TYR	4.4
1	B	679	ARG	4.3
1	A	283	ARG	4.2
1	B	538	TYR	4.2

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Mol	Chain	Res	Type	RSRZ
1	B	70	ILE	4.1
1	B	23	PHE	4.1
1	B	254	LEU	4.0
1	A	127	ALA	4.0
1	B	255	GLU	4.0
1	B	58	ASN	4.0
1	A	179	VAL	3.9
1	B	491	TYR	3.9
1	B	54	GLU	3.9
1	A	225	ILE	3.9
1	B	157	VAL	3.9
1	B	621	PHE	3.8
1	B	152	VAL	3.8
1	B	165	GLU	3.8
1	A	66	TYR	3.8
1	B	40	MET	3.8
1	A	167	ALA	3.7
1	B	135	ARG	3.7
1	B	39	LEU	3.7
1	A	535	LYS	3.7
1	B	34	LEU	3.6
1	B	30	TYR	3.6
1	B	62	LEU	3.6
1	B	446	ILE	3.6
1	A	296	GLU	3.6
1	A	232	VAL	3.6
1	A	290	LEU	3.6
1	B	144	ARG	3.6
1	A	124	ASP	3.6
1	B	571	LYS	3.5
1	B	147	VAL	3.5
1	B	252	ARG	3.5
1	A	842	LEU	3.5
1	A	147	VAL	3.5
1	B	249	ARG	3.5
1	B	9	PHE	3.5
1	A	427	LEU	3.4
1	A	578	LEU	3.4
1	B	524	ILE	3.4
1	B	509	ASP	3.4
1	B	189	LEU	3.4
1	B	234	VAL	3.4

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Mol	Chain	Res	Type	RSRZ
1	B	470	LEU	3.3
1	A	808	ASN	3.3
1	B	688	ARG	3.3
1	A	157	VAL	3.3
1	B	143	TYR	3.3
1	A	94	LEU	3.3
1	B	539	GLY	3.3
1	A	524	ILE	3.3
1	B	11	GLY	3.3
1	A	301	LEU	3.3
1	A	304	ARG	3.2
1	A	826	VAL	3.2
1	A	152	VAL	3.2
1	B	534	LEU	3.2
1	A	528	LEU	3.2
1	B	101	ALA	3.1
1	A	538	TYR	3.1
1	A	229	TRP	3.1
1	B	273	LEU	3.1
1	B	48	ASN	3.1
1	A	850	ILE	3.1
1	B	283	ARG	3.1
1	B	280	GLU	3.1
1	B	77	TYR	3.1
1	B	743	GLU	3.1
1	A	53	LEU	3.0
1	A	299	LEU	3.0
1	A	514	GLU	3.0
1	B	518	LEU	3.0
1	B	41	GLU	3.0
1	B	685	LYS	3.0
1	A	233	VAL	3.0
1	B	627	ILE	3.0
1	B	207	LEU	3.0
1	A	323	ILE	3.0
1	B	233	VAL	3.0
1	B	181	ILE	3.0
1	B	235	ASN	2.9
1	B	490	GLY	2.9
1	A	544	VAL	2.9
1	A	128	ILE	2.9
1	A	188	ILE	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	247	VAL	2.9
1	B	531	ALA	2.9
1	B	646	LEU	2.9
1	B	16	PHE	2.9
1	A	228	LEU	2.9
1	B	126	PRO	2.8
1	B	31	ASP	2.8
1	A	288	ARG	2.8
1	B	261	LEU	2.8
1	A	5	TYR	2.8
1	B	572	LEU	2.8
1	A	125	VAL	2.8
1	B	35	ALA	2.8
1	A	315	LEU	2.8
1	B	105	ILE	2.8
1	A	146	LEU	2.8
1	A	829	VAL	2.8
1	B	515	LEU	2.8
1	B	657	LEU	2.8
1	A	474	ARG	2.7
1	B	474	ARG	2.7
1	A	525	VAL	2.7
1	A	292	GLN	2.7
1	B	25	LYS	2.7
1	A	562	ILE	2.7
1	A	303	ASP	2.7
1	B	128	ILE	2.7
1	B	464	VAL	2.7
1	B	36	THR	2.7
1	B	136	ASN	2.7
1	A	413	LEU	2.6
1	B	148	ARG	2.6
1	B	61	LEU	2.6
1	A	621	PHE	2.6
1	B	444	PHE	2.6
1	B	137	PRO	2.6
1	A	37	ARG	2.6
1	A	80	VAL	2.6
1	B	104	ALA	2.6
1	B	507	LEU	2.6
1	A	106	VAL	2.6
1	B	495	ARG	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	603	LEU	2.5
1	B	618	GLY	2.5
1	B	56	HIS	2.5
1	B	315	LEU	2.5
1	B	542	SER	2.5
1	B	427	LEU	2.5
1	B	502	LEU	2.5
1	B	218	LYS	2.5
1	A	34	LEU	2.5
1	B	381	LEU	2.5
1	B	174	ILE	2.5
1	A	31	ASP	2.5
1	A	87	PHE	2.5
1	B	485	LEU	2.5
1	B	132	ALA	2.5
1	B	158	THR	2.4
1	B	565	ILE	2.4
1	B	413	LEU	2.4
1	A	62	LEU	2.4
1	B	10	VAL	2.4
1	A	463	LEU	2.4
1	A	59	PHE	2.4
1	A	148	ARG	2.4
1	A	254	LEU	2.4
1	A	616	ILE	2.4
1	A	23	PHE	2.3
1	A	464	VAL	2.3
1	B	146	LEU	2.3
1	B	385	LEU	2.3
1	B	14	ARG	2.3
1	A	67	ALA	2.3
1	B	672	VAL	2.3
1	A	405	ALA	2.3
1	B	755	LEU	2.3
1	B	87	PHE	2.3
1	B	248	LYS	2.3
1	B	519	LYS	2.3
1	B	806	LEU	2.3
1	A	485	LEU	2.2
1	B	845	ARG	2.2
1	A	97	GLY	2.2
1	A	522	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	105	ILE	2.2
1	A	494	VAL	2.2
1	A	122	GLU	2.2
1	A	9	PHE	2.2
1	A	803	LEU	2.2
1	A	70	ILE	2.2
1	B	279	VAL	2.2
1	B	768	VAL	2.2
1	B	547	LEU	2.2
1	A	294	ILE	2.2
1	A	401	ALA	2.2
1	A	143	TYR	2.2
1	B	238	TYR	2.2
1	B	66	TYR	2.2
1	A	120	ILE	2.2
1	B	563	ALA	2.2
1	A	123	GLU	2.2
1	A	502	LEU	2.1
1	B	468	ALA	2.1
1	A	435	GLU	2.1
1	A	837	LEU	2.1
1	B	24	LEU	2.1
1	B	52	LEU	2.1
1	A	446	ILE	2.1
1	B	270	ARG	2.1
1	A	381	LEU	2.1
1	B	120	ILE	2.1
1	A	383	THR	2.1
1	B	664	LEU	2.1
1	A	278	ILE	2.1
3	V	28	DC	2.1
1	A	279	VAL	2.1
1	B	525	VAL	2.1
1	A	370	LEU	2.1
1	B	290	LEU	2.1
1	B	514	GLU	2.1
1	A	823	TYR	2.1
1	A	471	ILE	2.1
1	B	687	GLY	2.1
1	B	91	VAL	2.1
1	A	142	LEU	2.1
1	A	806	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	118	LEU	2.1
1	A	77	TYR	2.1
1	A	424	ALA	2.1
1	B	107	TYR	2.1
1	B	488	TYR	2.1
1	B	681	GLU	2.1
1	A	819	LEU	2.0
1	B	463	LEU	2.0
1	B	686	SER	2.0
1	A	307	ILE	2.0
1	A	316	ALA	2.0
1	B	241	ARG	2.0
1	B	493	LYS	2.0
1	B	330	PRO	2.0
1	B	439	GLN	2.0
1	B	527	ASP	2.0
1	B	797	ILE	2.0
1	A	423	THR	2.0
1	B	334	LEU	2.0
1	B	197	TRP	2.0
1	B	503	ARG	2.0
1	A	192	LEU	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)

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, 95^{th} 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
5	PO4	U	103	5/5	0.78	0.20	146,154,157,159	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	K	A	902	1/1	0.80	0.19	109,109,109,109	0
4	K	B	903	1/1	0.84	0.61	114,114,114,114	0
4	K	A	901	1/1	0.85	0.20	95,95,95,95	0
5	PO4	B	904	5/5	0.87	0.47	129,130,146,147	5
5	PO4	B	901	5/5	0.88	0.35	87,99,116,123	5
6	PO3	U	102	4/4	0.88	0.16	153,166,168,173	0
4	K	B	902	1/1	0.90	0.24	89,89,89,89	0
5	PO4	U	101	5/5	0.90	0.13	90,101,123,125	0
6	PO3	V	101	4/4	0.91	0.18	120,133,148,161	0

6.5 Other polymers (i)

There are no such residues in this entry.