



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2024 – 09:10 AM EDT

PDB ID : 4R1D  
Title : The crystal structure of Tle4-Tli4 complex  
Authors : Lu, D.  
Deposited on : 2014-08-05  
Resolution : 1.75 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](mailto: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>.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

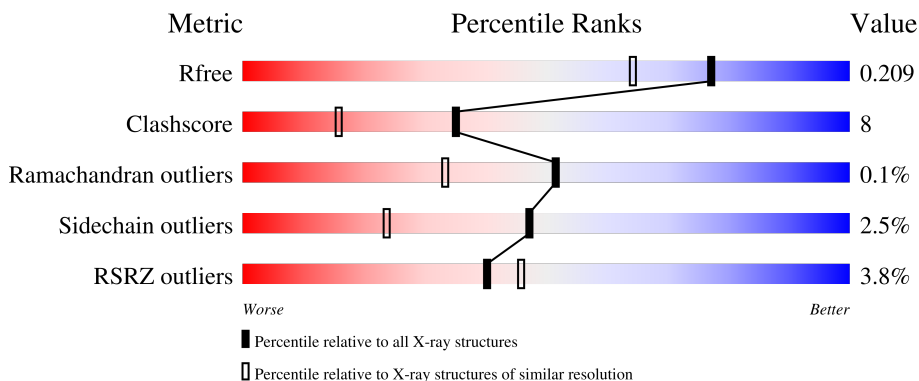
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.75 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	3764 (1.76-1.72)
Clashscore	141614	3923 (1.76-1.72)
Ramachandran outliers	138981	3878 (1.76-1.72)
Sidechain outliers	138945	3878 (1.76-1.72)
RSRZ outliers	127900	3705 (1.76-1.72)

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  $\geq 3$ , 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	569	 4% 78% 12% • 9%
2	B	348	 3% 75% 11% • 14%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7491 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	517	4111	2579	731	785	16	0	9	0

- Molecule 2 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	301	2419	1537	423	452	7	0	3	0

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		

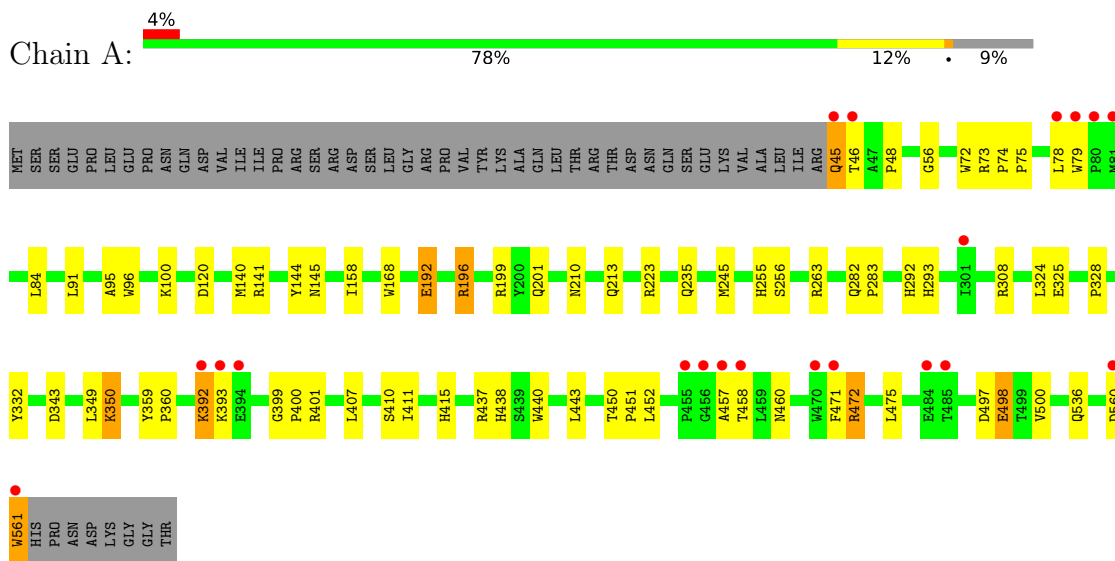
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	597	Total	O	0	0
			597	597		
4	B	363	Total	O	0	0
			363	363		

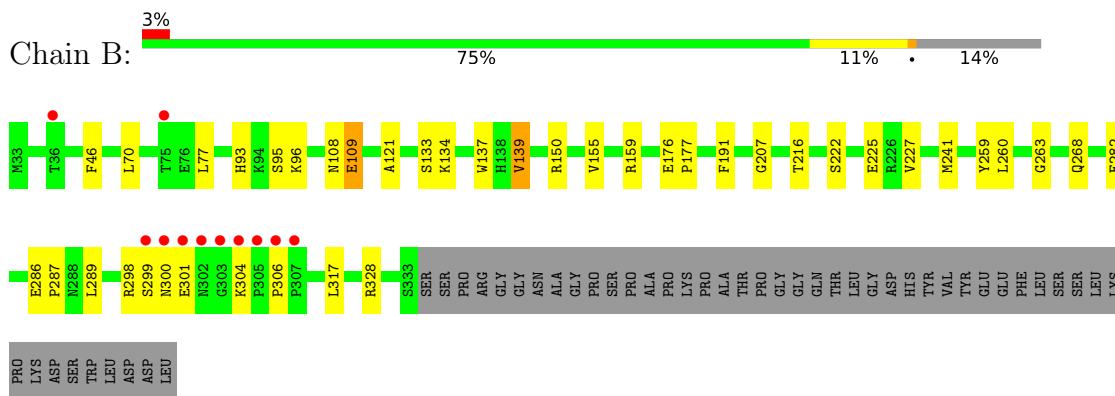
### 3 Residue-property plots [i](#)

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: Uncharacterized protein



- Molecule 2: Uncharacterized protein



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.68Å 135.18Å 62.61Å 90.00° 113.49° 90.00°	Depositor
Resolution (Å)	20.00 – 1.75 20.00 – 1.75	Depositor EDS
% Data completeness (in resolution range)	94.4 (20.00-1.75) 94.4 (20.00-1.75)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.95 (at 1.74Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, $R_{free}$	0.175 , 0.214 0.170 , 0.209	Depositor DCC
$R_{free}$ test set	4331 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	20.5	Xtrriage
Anisotropy	0.040	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 45.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.023 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7491	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.22% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CA

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	0.38	1/4241 (0.0%)	0.54	0/5761
2	B	0.34	0/2490	0.53	0/3372
All	All	0.36	1/6731 (0.0%)	0.54	0/9133

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	192	GLU	CB-CG	-5.11	1.42	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4111	0	3961	66	0
2	B	2419	0	2376	51	0
3	A	1	0	0	0	0
4	A	597	0	0	6	0
4	B	363	0	0	3	0
All	All	7491	0	6337	106	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 8.

All (106) 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:B:241:MET:CE	2:B:263:GLY:HA3	1.71	1.20
1:A:196:ARG:HH11	1:A:196:ARG:HG2	1.14	1.11
2:B:241:MET:HE2	2:B:263:GLY:CA	1.84	1.07
1:A:84:LEU:HD11	2:B:241:MET:HE3	1.43	1.00
2:B:241:MET:HE2	2:B:263:GLY:HA3	0.94	0.92
1:A:84:LEU:HD21	2:B:241:MET:HE1	1.51	0.91
1:A:196:ARG:HG2	1:A:196:ARG:NH1	1.82	0.86
2:B:93:HIS:HD2	2:B:95:SER:H	1.23	0.86
2:B:77:LEU:HD22	2:B:139:VAL:CG2	2.07	0.85
1:A:45:GLN:HB2	1:A:46:THR:HA	1.58	0.83
1:A:196:ARG:HH11	1:A:196:ARG:CG	1.92	0.82
2:B:70:LEU:HB2	2:B:139:VAL:HG12	1.61	0.81
1:A:74:PRO:HG2	1:A:140[B]:MET:HG2	1.66	0.78
2:B:301:GLU:O	2:B:304:LYS:HG2	1.83	0.78
1:A:325:GLU:HG3	1:A:411[A]:ILE:HD12	1.67	0.77
2:B:77:LEU:HD22	2:B:139:VAL:HG21	1.65	0.76
2:B:108:ASN:O	2:B:109:GLU:HG2	1.89	0.73
1:A:393:LYS:HG2	2:B:150:ARG:HH22	1.56	0.69
1:A:392:LYS:HB2	1:A:392:LYS:NZ	2.08	0.69
2:B:70:LEU:HD12	2:B:139:VAL:CG1	2.25	0.67
2:B:93:HIS:CD2	2:B:96:LYS:H	2.14	0.66
2:B:137:TRP:CZ2	2:B:139:VAL:HG23	2.31	0.65
1:A:263:ARG:HH11	1:A:282:GLN:HE22	1.44	0.65
1:A:472:ARG:HB3	1:A:475:LEU:HD11	1.77	0.65
1:A:56:GLY:HA3	1:A:256:SER:HB3	1.79	0.63
1:A:450:THR:HB	1:A:451:PRO:HD3	1.80	0.63
2:B:77:LEU:HD22	2:B:139:VAL:HG22	1.80	0.63
2:B:155:VAL:O	2:B:159:ARG:HG2	1.98	0.63
1:A:84:LEU:CD1	2:B:241:MET:HE3	2.26	0.63
1:A:100:LYS:HE3	2:B:216:THR:O	1.99	0.63
1:A:144:TYR:OH	1:A:255:HIS:HD2	1.82	0.63
1:A:199:ARG:HD2	1:A:561:TRP:CZ2	2.36	0.60
2:B:77:LEU:HD13	2:B:139:VAL:HG11	1.84	0.60
2:B:93:HIS:CD2	2:B:95:SER:H	2.11	0.60
2:B:304:LYS:HG3	4:B:733:HOH:O	2.01	0.60
1:A:235:GLN:HG2	1:A:245:MET:HE1	1.83	0.59
1:A:120:ASP:HB2	1:A:141:ARG:HD2	1.84	0.59
2:B:287:PRO:HG2	2:B:289[B]:LEU:CD1	2.34	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:74:PRO:CG	1:A:140[B]:MET:HG2	2.32	0.57
1:A:84:LEU:HD21	2:B:241:MET:CE	2.31	0.57
1:A:75:PRO:HB3	1:A:140[A]:MET:HE3	1.87	0.57
1:A:437:ARG:HD3	1:A:498:GLU:HG2	1.86	0.57
2:B:137:TRP:CH2	2:B:139:VAL:HG23	2.42	0.55
1:A:292:HIS:ND1	1:A:293:HIS:HD2	2.05	0.55
1:A:393:LYS:CG	2:B:150:ARG:HH22	2.19	0.55
1:A:144:TYR:OH	1:A:255:HIS:CD2	2.60	0.54
1:A:263:ARG:HH11	1:A:282:GLN:NE2	2.06	0.54
1:A:401:ARG:HD2	4:A:758:HOH:O	2.08	0.54
1:A:392:LYS:HB2	1:A:392:LYS:HZ3	1.73	0.53
2:B:260:LEU:HD23	2:B:317:LEU:CD2	2.39	0.53
1:A:141:ARG:HH11	1:A:141:ARG:HG2	1.74	0.52
2:B:207:GLY:HA2	2:B:298:ARG:HD3	1.91	0.51
1:A:411[A]:ILE:HG22	1:A:415:HIS:CE1	2.46	0.51
1:A:78:LEU:HG	1:A:308:ARG:NH2	2.26	0.50
2:B:93:HIS:HE1	2:B:121:ALA:O	1.95	0.50
1:A:343:ASP:HB3	1:A:349:LEU:HD21	1.94	0.50
1:A:96:TRP:HA	2:B:227:VAL:CG1	2.41	0.49
1:A:438:HIS:CD2	1:A:440:TRP:H	2.29	0.49
2:B:286:GLU:HB3	4:B:707:HOH:O	2.12	0.49
1:A:407[A]:LEU:HD12	4:A:1168:HOH:O	2.12	0.49
1:A:471:PHE:O	1:A:472:ARG:HG2	2.13	0.49
2:B:268:GLN:NE2	2:B:306:PRO:HG3	2.28	0.48
1:A:141:ARG:NH1	4:A:1045:HOH:O	2.47	0.47
2:B:300:ASN:HA	2:B:304:LYS:O	2.15	0.47
1:A:328:PRO:HB3	1:A:332:TYR:CG	2.50	0.47
2:B:287:PRO:HG2	2:B:289[B]:LEU:HD11	1.95	0.47
2:B:301:GLU:O	2:B:304:LYS:CG	2.59	0.47
2:B:191:PHE:CE1	2:B:282:GLU:HA	2.50	0.47
1:A:235:GLN:HB2	1:A:245:MET:SD	2.55	0.47
2:B:46:PHE:CE1	2:B:289[B]:LEU:HD21	2.49	0.47
1:A:536:GLN:NE2	4:A:1216:HOH:O	2.47	0.46
1:A:560:ASP:O	1:A:561:TRP:CB	2.64	0.46
2:B:176:GLU:HG3	2:B:177:PRO:HD2	1.98	0.46
1:A:91:LEU:HA	1:A:95:ALA:HB3	1.97	0.46
1:A:73:ARG:HA	1:A:74:PRO:HD2	1.76	0.46
1:A:210:ASN:O	1:A:213:GLN:HG2	2.16	0.45
2:B:133:SER:O	2:B:134[B]:LYS:HD3	2.17	0.45
1:A:324:LEU:HD12	1:A:407[B]:LEU:CD2	2.47	0.45
2:B:137:TRP:CH2	2:B:139:VAL:CG2	3.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:222:SER:O	2:B:225:GLU:HG2	2.17	0.44
1:A:96:TRP:HA	2:B:227:VAL:HG12	1.99	0.44
1:A:350:LYS:HE3	4:A:896:HOH:O	2.18	0.44
1:A:45:GLN:HB2	1:A:201:GLN:HE22	1.83	0.44
2:B:299:SER:O	2:B:306:PRO:HB3	2.18	0.44
1:A:263:ARG:HD3	1:A:282:GLN:HE22	1.81	0.43
1:A:393:LYS:HD3	2:B:150:ARG:NH2	2.34	0.43
1:A:561:TRP:CD2	1:A:561:TRP:C	2.90	0.43
1:A:359:TYR:HA	1:A:360:PRO:C	2.39	0.43
1:A:46:THR:HG22	1:A:48:PRO:HD3	2.00	0.43
2:B:298:ARG:C	4:B:506:HOH:O	2.57	0.42
2:B:207:GLY:CA	2:B:298:ARG:HD3	2.49	0.42
2:B:93:HIS:HD2	2:B:96:LYS:H	1.63	0.42
1:A:452:LEU:O	1:A:457:ALA:HB1	2.19	0.42
1:A:283:PRO:HB3	1:A:500:VAL:HG22	2.01	0.42
1:A:560:ASP:O	1:A:561:TRP:HB3	2.19	0.42
1:A:497:ASP:O	1:A:498:GLU:CB	2.67	0.41
1:A:399:GLY:HA2	1:A:400:PRO:HD3	1.94	0.41
2:B:70:LEU:HB2	2:B:139:VAL:CG1	2.42	0.41
1:A:393:LYS:HD3	2:B:150:ARG:HH22	1.85	0.41
2:B:287:PRO:HG2	2:B:289[B]:LEU:HD12	2.03	0.41
1:A:460:ASN:HB3	4:A:1012:HOH:O	2.20	0.41
1:A:72:TRP:CD1	1:A:74:PRO:HD3	2.57	0.40
1:A:158:ILE:HA	1:A:168:TRP:CD1	2.57	0.40
2:B:300:ASN:OD1	2:B:306:PRO:HD3	2.21	0.40
1:A:292:HIS:ND1	1:A:293:HIS:CD2	2.89	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	524/569 (92%)	508 (97%)	15 (3%)	1 (0%)	47	29
2	B	302/348 (87%)	298 (99%)	4 (1%)	0	100	100
All	All	826/917 (90%)	806 (98%)	19 (2%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	498	GLU

### 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	428/466 (92%)	415 (97%)	13 (3%)	41	17
2	B	260/295 (88%)	256 (98%)	4 (2%)	65	47
All	All	688/761 (90%)	671 (98%)	17 (2%)	47	24

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	GLN
1	A	79	TRP
1	A	145	ASN
1	A	192	GLU
1	A	196	ARG
1	A	223	ARG
1	A	350	LYS
1	A	392	LYS
1	A	410	SER
1	A	443	LEU
1	A	458	THR
1	A	472	ARG
1	A	561	TRP
2	B	109	GLU
2	B	139	VAL

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Mol	Chain	Res	Type
2	B	259	TYR
2	B	328	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	45	GLN
1	A	165	GLN
1	A	215	ASN
1	A	255	HIS
1	A	282	GLN
1	A	293	HIS
1	A	319	ASN
1	A	345	GLN
1	A	347	GLN
1	A	361	GLN
1	A	536	GLN
1	A	540	ASN
1	A	557	GLN
2	B	93	HIS
2	B	108	ASN

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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.

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	517/569 (90%)	-0.15	20 (3%) 39 45	13, 19, 37, 65	0
2	B	301/348 (86%)	-0.08	11 (3%) 41 47	13, 23, 41, 78	0
All	All	818/917 (89%)	-0.13	31 (3%) 40 46	13, 21, 40, 78	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	79	TRP	11.9
1	A	561	TRP	9.4
2	B	302	ASN	7.8
1	A	457	ALA	6.0
1	A	46	THR	5.9
1	A	471	PHE	5.1
1	A	45	GLN	5.1
2	B	305	PRO	5.1
2	B	306	PRO	4.6
2	B	303	GLY	4.5
2	B	300	ASN	4.0
1	A	393	LYS	3.7
1	A	394	GLU	3.6
2	B	304	LYS	3.6
2	B	301	GLU	3.6
2	B	299	SER	3.4
1	A	456	GLY	3.2
1	A	470	TRP	3.1
1	A	78	LEU	3.0
1	A	392	LYS	3.0
2	B	36	THR	2.8
1	A	455	PRO	2.8
1	A	80	PRO	2.8
1	A	484	GLU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	485	THR	2.4
1	A	560	ASP	2.3
2	B	307	PRO	2.3
1	A	301	ILE	2.2
1	A	458	THR	2.2
1	A	81	MET	2.1
2	B	75	THR	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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	CA	A	601	1/1	1.00	0.05	22,22,22,22	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.