



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 22, 2016 – 08:20 AM EDT

PDB ID : 5IDS
Title : Crystal Structure of a Glucose-1-phosphate Thymidyltransferase from *Burkholderia vietnamiensis*
Authors : Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on : 2016-02-24
Resolution : 2.30 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 : unknown
Xtriage (Phenix) : 1.9-1692
EDS : rb-20027107
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0122
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : rb-20027107

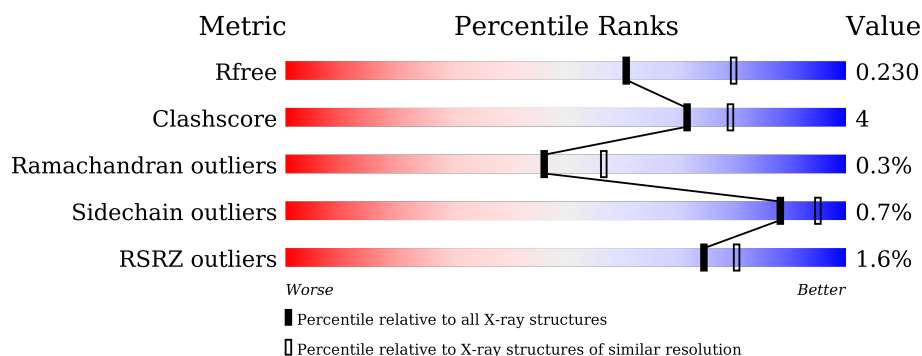
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	91344	3852 (2.30-2.30)
Clashscore	102246	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)
RSRZ outliers	91569	3857 (2.30-2.30)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments 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.

Mol	Chain	Length	Quality of chain
1	A	302	<div> <div>2%</div> <div> <div></div> <div>87%</div> <div>8%</div> <div>••</div> </div> </div>
1	B	302	<div> <div>3%</div> <div> <div></div> <div>84%</div> <div>12%</div> <div>5%</div> </div> </div>
1	C	302	<div> <div>%</div> <div> <div></div> <div>84%</div> <div>10%</div> <div>5%</div> </div> </div>
1	D	302	<div> <div></div> <div> <div></div> <div>85%</div> <div>10%</div> <div>•</div> </div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8693 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 Glucose-1-phosphate thymidyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	289	Total	C	N	O	S	0	2	0
			2167	1384	363	411	9			
1	B	288	Total	C	N	O	S	0	1	0
			2080	1335	344	392	9			
1	C	286	Total	C	N	O	S	0	0	0
			2102	1347	353	395	7			
1	D	289	Total	C	N	O	S	0	1	0
			2149	1375	363	402	9			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	MET	-	initiating methionine	UNP A4JIV2
A	-6	ALA	-	expression tag	UNP A4JIV2
A	-5	HIS	-	expression tag	UNP A4JIV2
A	-4	HIS	-	expression tag	UNP A4JIV2
A	-3	HIS	-	expression tag	UNP A4JIV2
A	-2	HIS	-	expression tag	UNP A4JIV2
A	-1	HIS	-	expression tag	UNP A4JIV2
A	0	HIS	-	expression tag	UNP A4JIV2
B	-7	MET	-	initiating methionine	UNP A4JIV2
B	-6	ALA	-	expression tag	UNP A4JIV2
B	-5	HIS	-	expression tag	UNP A4JIV2
B	-4	HIS	-	expression tag	UNP A4JIV2
B	-3	HIS	-	expression tag	UNP A4JIV2
B	-2	HIS	-	expression tag	UNP A4JIV2
B	-1	HIS	-	expression tag	UNP A4JIV2
B	0	HIS	-	expression tag	UNP A4JIV2
C	-7	MET	-	initiating methionine	UNP A4JIV2
C	-6	ALA	-	expression tag	UNP A4JIV2
C	-5	HIS	-	expression tag	UNP A4JIV2
C	-4	HIS	-	expression tag	UNP A4JIV2
C	-3	HIS	-	expression tag	UNP A4JIV2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	HIS	-	expression tag	UNP A4JIV2
C	-1	HIS	-	expression tag	UNP A4JIV2
C	0	HIS	-	expression tag	UNP A4JIV2
D	-7	MET	-	initiating methionine	UNP A4JIV2
D	-6	ALA	-	expression tag	UNP A4JIV2
D	-5	HIS	-	expression tag	UNP A4JIV2
D	-4	HIS	-	expression tag	UNP A4JIV2
D	-3	HIS	-	expression tag	UNP A4JIV2
D	-2	HIS	-	expression tag	UNP A4JIV2
D	-1	HIS	-	expression tag	UNP A4JIV2
D	0	HIS	-	expression tag	UNP A4JIV2

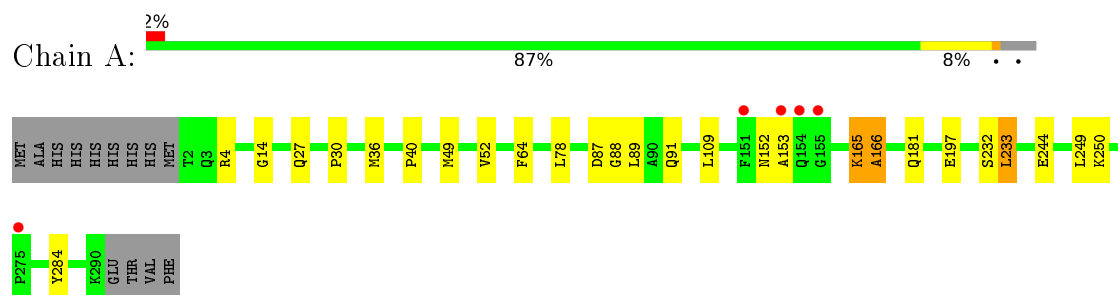
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	63	Total O 63 63	0	0
2	B	28	Total O 28 28	0	0
2	C	55	Total O 55 55	0	0
2	D	49	Total O 49 49	0	0

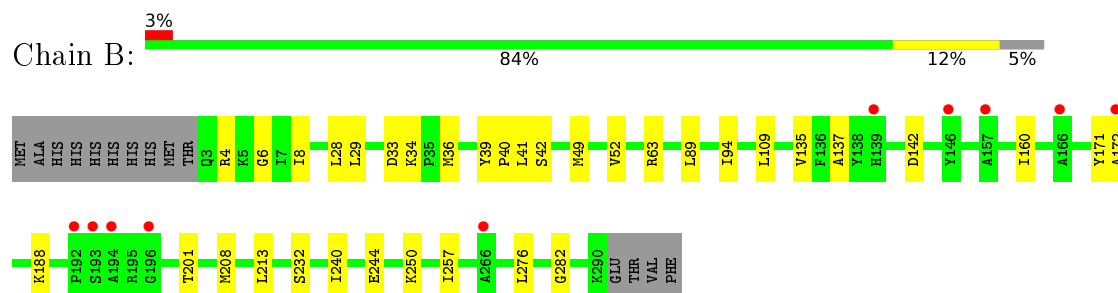
3 Residue-property plots [i](#)

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.

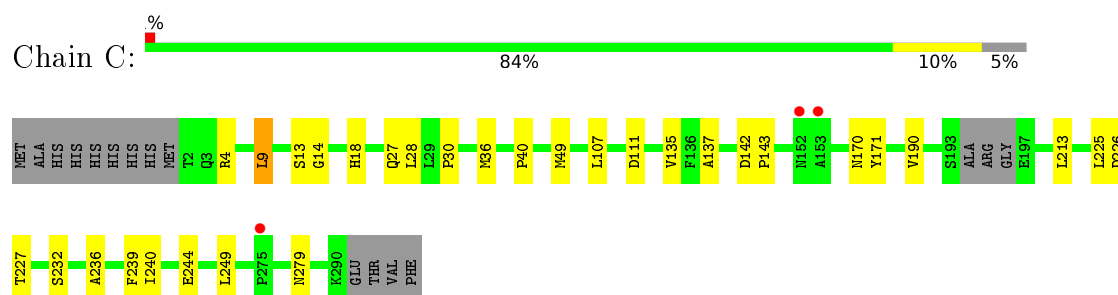
- Molecule 1: Glucose-1-phosphate thymidyltransferase



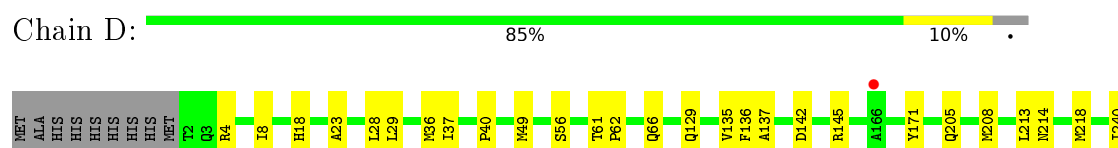
- Molecule 1: Glucose-1-phosphate thymidyltransferase



- Molecule 1: Glucose-1-phosphate thymidyltransferase



- Molecule 1: Glucose-1-phosphate thymidyltransferase



E244	L269	M279	L289	K290	GLU	THR	VAL	PHE
------	------	------	------	------	-----	-----	-----	-----

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	112.41Å 115.58Å 95.81Å 90.00° 90.36° 90.00°	Depositor
Resolution (Å)	48.61 – 2.30 48.61 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.9 (48.61-2.30) 99.9 (48.61-2.30)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.50 (at 2.29Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.176 , 0.231 0.174 , 0.230	Depositor DCC
R_{free} test set	2085 reflections (3.84%)	DCC
Wilson B-factor (Å ²)	41.6	Xtriage
Anisotropy	0.091	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 36.3	EDS
Estimated twinning fraction	0.016 for k,h,-l 0.015 for -k,-h,-l 0.021 for -h,-k,l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	1 of 54334 reflections (0.002%)	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8693	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.53% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

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	0.42	0/2224	0.59	1/3034 (0.0%)
1	B	0.37	0/2133	0.54	0/2922
1	C	0.47	1/2151 (0.0%)	0.60	1/2942 (0.0%)
1	D	0.40	0/2202	0.57	0/3008
All	All	0.42	1/8710 (0.0%)	0.57	2/11906 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	190	VAL	C-N	6.50	1.49	1.34

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	C	190	VAL	C-N-CA	-7.17	103.78	121.70
1	A	165	LYS	C-N-CA	6.95	139.07	121.70

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	2167	0	2061	18	0
1	B	2080	0	1913	20	0
1	C	2102	0	1970	18	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2149	0	2047	19	0
2	A	63	0	0	2	0
2	B	28	0	0	0	0
2	C	55	0	0	1	0
2	D	49	0	0	0	0
All	All	8693	0	7991	70	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 4.

All (70) 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:C:9:LEU:HD22	1:C:107:LEU:HD11	1.61	0.81
1:C:226:ASP:O	1:C:232:SER:OG	2.00	0.80
1:B:137:ALA:HB1	1:B:171:TYR:HB3	1.63	0.79
1:D:135:VAL:HG13	1:D:213:LEU:HD11	1.77	0.65
1:B:208:MET:HE2	1:B:213:LEU:HD23	1.80	0.62
1:C:225:LEU:HD13	1:C:236:ALA:HA	1.84	0.59
1:B:33:ASP:OD2	1:B:250:LYS:NZ	2.33	0.59
1:C:30:PRO:HG3	1:D:29:LEU:HD22	1.87	0.56
1:C:28:LEU:HD22	1:D:23:ALA:HB1	1.87	0.56
1:A:14:GLY:O	2:A:301:HOH:O	2.18	0.55
1:A:165:LYS:H	1:A:166:ALA:HB3	1.72	0.54
1:D:142:ASP:OD2	1:D:145:ARG:NH1	2.41	0.54
1:D:137:ALA:HB1	1:D:171:TYR:HB3	1.89	0.54
1:C:137:ALA:HB1	1:C:171:TYR:HB3	1.89	0.54
1:D:136:PHE:HB3	1:D:218:MET:HE3	1.90	0.53
1:D:208:MET:HE2	1:D:213:LEU:HD23	1.91	0.53
1:B:28:LEU:HD11	1:B:63:ARG:HB3	1.92	0.52
1:C:18:HIS:O	1:D:279:ASN:ND2	2.43	0.51
1:A:27:GLN:HB2	1:A:64:PHE:HZ	1.74	0.51
1:A:30:PRO:HG3	1:B:29:LEU:HD22	1.92	0.50
1:D:4:ARG:O	1:D:49:MET:HG2	2.12	0.49
1:B:94:ILE:HD12	1:B:188:LYS:HG2	1.94	0.49
1:D:240:ILE:O	1:D:244:GLU:HG3	2.13	0.48
1:C:27:GLN:NE2	2:C:303:HOH:O	2.46	0.48
1:A:181:GLN:N	1:A:181:GLN:OE1	2.47	0.47
1:B:160:ILE:HD12	1:B:208:MET:CE	2.43	0.47
1:C:244:GLU:HG2	1:C:249:LEU:O	2.13	0.47
1:A:4:ARG:O	1:A:49:MET:HG2	2.15	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:135:VAL:HG13	1:B:213:LEU:HD11	1.96	0.47
1:C:279:ASN:ND2	1:D:18:HIS:O	2.46	0.47
1:B:36:MET:O	1:B:40:PRO:HD2	2.15	0.47
1:B:160:ILE:HD12	1:B:208:MET:HE1	1.96	0.47
1:C:143:PRO:HG3	1:C:170:ASN:HA	1.97	0.46
1:B:89:LEU:HD21	1:B:109:LEU:HD11	1.97	0.46
1:A:152:ASN:HA	2:A:356:HOH:O	2.16	0.46
1:C:142:ASP:N	1:C:142:ASP:OD1	2.46	0.46
1:B:6:GLY:O	1:B:52:VAL:HA	2.15	0.46
1:D:8:ILE:HG21	1:D:37:ILE:HD11	1.98	0.46
1:C:36:MET:O	1:C:40:PRO:HD2	2.15	0.45
1:C:135:VAL:HG13	1:C:213:LEU:HD11	1.98	0.45
1:D:269:LEU:HD23	1:D:289:LEU:HD21	1.99	0.45
1:D:62:PRO:O	1:D:66:GLN:HG3	2.17	0.44
1:A:89:LEU:HD21	1:A:109:LEU:HD11	2.00	0.44
1:D:56:SER:HB3	1:D:61:THR:OG1	2.18	0.44
1:A:250:LYS:HE3	1:A:284:TYR:CG	2.53	0.43
1:B:142:ASP:OD1	1:B:142:ASP:N	2.51	0.43
1:C:111:ASP:HB2	1:C:227:THR:OG1	2.19	0.43
1:D:129:GLN:HE22	1:D:214:ASN:CG	2.21	0.43
1:A:250:LYS:HE3	1:A:284:TYR:CD2	2.53	0.43
1:B:34:LYS:HG3	1:B:39:TYR:CE1	2.53	0.43
1:C:225:LEU:HD11	1:C:239:PHE:CD2	2.54	0.43
1:A:165:LYS:N	1:A:166:ALA:HB3	2.33	0.42
1:A:244:GLU:HG2	1:A:249:LEU:O	2.19	0.42
1:B:240:ILE:O	1:B:244:GLU:HG3	2.20	0.42
1:B:8:ILE:HD11	1:B:41:LEU:HA	2.02	0.42
1:B:42:SER:HB2	1:B:257:ILE:CD1	2.50	0.42
1:A:87:ASP:HB2	1:A:91:GLN:OE1	2.20	0.42
1:D:36:MET:O	1:D:40:PRO:HD2	2.20	0.42
1:B:137:ALA:HA	1:B:172:ALA:O	2.20	0.42
1:B:4:ARG:O	1:B:49:MET:HG2	2.20	0.42
1:A:152:ASN:O	1:A:153:ALA:HB3	2.20	0.41
1:C:4:ARG:O	1:C:49:MET:HG2	2.20	0.41
1:C:240:ILE:O	1:C:244:GLU:HG3	2.21	0.41
1:A:88:GLY:HA2	1:A:197:GLU:HG2	2.03	0.41
1:A:233:LEU:HA	1:A:233:LEU:HD12	1.84	0.41
1:D:28:LEU:HA	1:D:28:LEU:HD23	1.97	0.41
1:A:52:VAL:HB	1:A:78:LEU:CD2	2.51	0.40
1:D:142:ASP:OD1	1:D:142:ASP:N	2.55	0.40
1:A:36:MET:O	1:A:40:PRO:HD2	2.21	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:276:LEU:O	1:B:282:GLY:HA3	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	289/302 (96%)	284 (98%)	4 (1%)	1 (0%)	46	57
1	B	287/302 (95%)	284 (99%)	3 (1%)	0	100	100
1	C	282/302 (93%)	276 (98%)	4 (1%)	2 (1%)	26	31
1	D	288/302 (95%)	282 (98%)	6 (2%)	0	100	100
All	All	1146/1208 (95%)	1126 (98%)	17 (2%)	3 (0%)	46	57

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	166	ALA
1	C	13	SER
1	C	14	GLY

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	214/246 (87%)	212 (99%)	2 (1%)	84	93
1	B	191/246 (78%)	189 (99%)	2 (1%)	82	91
1	C	201/246 (82%)	200 (100%)	1 (0%)	92	97
1	D	210/246 (85%)	209 (100%)	1 (0%)	92	97
All	All	816/984 (83%)	810 (99%)	6 (1%)	88	95

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	232	SER
1	A	233	LEU
1	B	201	THR
1	B	232	SER
1	C	9	LEU
1	D	205	GLN

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

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	289/302 (95%)	-0.13	5 (1%) 73 79	32, 48, 82, 129	0
1	B	288/302 (95%)	0.01	10 (3%) 48 56	35, 64, 97, 121	0
1	C	286/302 (94%)	-0.03	3 (1%) 84 88	31, 50, 90, 121	0
1	D	289/302 (95%)	-0.26	1 (0%) 94 96	33, 52, 83, 135	0
All	All	1152/1208 (95%)	-0.10	19 (1%) 74 80	31, 53, 91, 135	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	153	ALA	4.2
1	A	153	ALA	3.7
1	A	155	GLY	3.5
1	A	275	PRO	3.3
1	A	151	PHE	3.2
1	B	193	SER	2.9
1	B	194	ALA	2.8
1	C	152	ASN	2.6
1	B	196	GLY	2.6
1	B	172	ALA	2.6
1	B	192	PRO	2.5
1	B	157	ALA	2.3
1	B	166	ALA	2.3
1	B	139	HIS	2.1
1	B	266	ALA	2.1
1	A	154	GLN	2.1
1	B	146	TYR	2.1
1	D	166	ALA	2.1
1	C	275	PRO	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 carbohydrates in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.