



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 17, 2024 – 12:29 AM EDT

PDB ID : 5GRA  
Title : Crystal structure of TrmJ from *Z. mobilis* ZM4  
Authors : Gu, D.-H.; Kim, J.-S.  
Deposited on : 2016-08-09  
Resolution : 3.00 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	:	2.37.1
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)	:	2.37.1

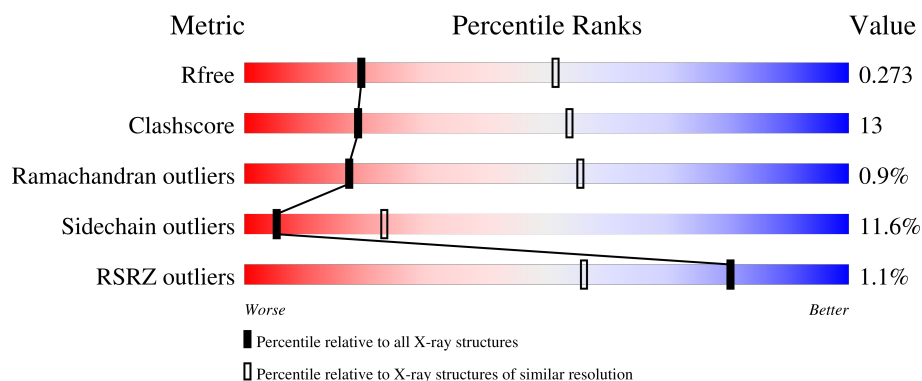
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.00 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	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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	243	 61% 26% 5% 8%
1	B	243	 2% 59% 27% 6% 8%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3553 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 tRNA (cytidine/uridine-2'-O-)-methyltransferase TrmJ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	224	Total	C	N	O	S	0	0	0
			1712	1085	303	317	7			
1	B	223	Total	C	N	O	S	0	0	0
			1703	1080	302	315	6			

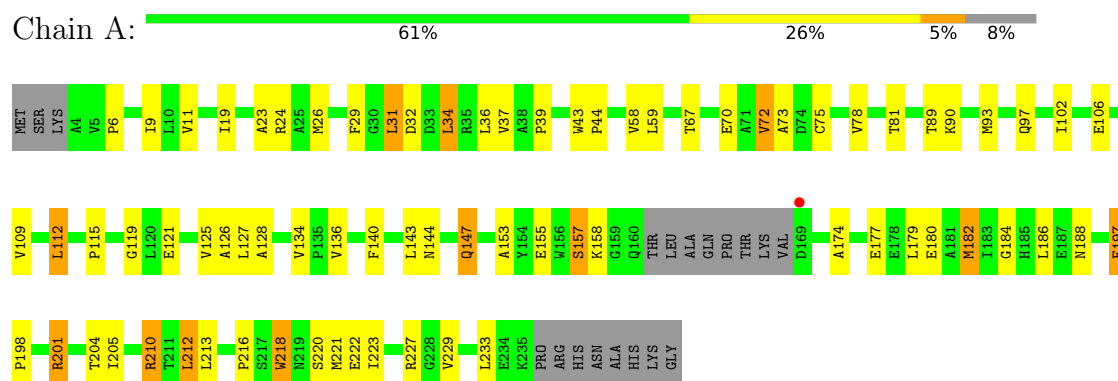
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	88	Total	O	0	0
			88	88		
2	B	50	Total	O	0	0
			50	50		

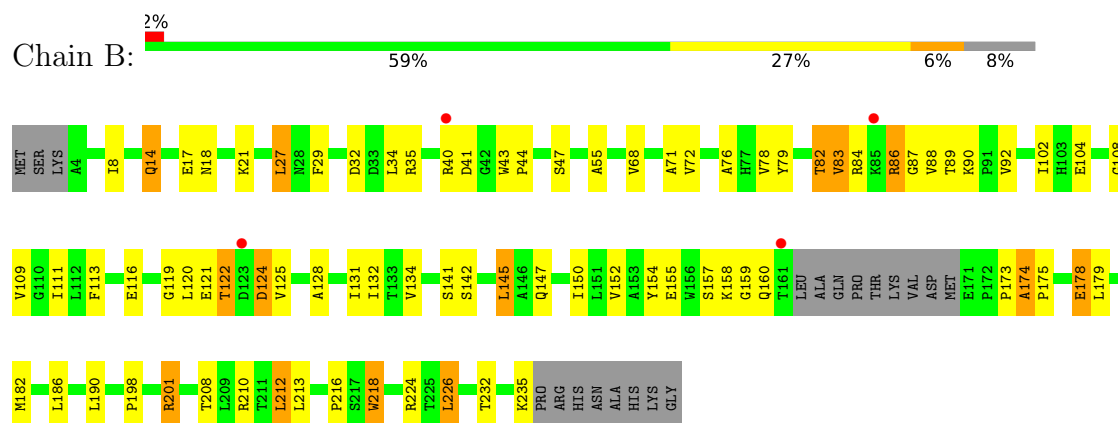
### 3 Residue-property plots

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: tRNA (cytidine/uridine-2'-O-)-methyltransferase TrmJ



- Molecule 1: tRNA (cytidine/uridine-2'-O-)-methyltransferase TrmJ



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	174.23Å 41.81Å 72.63Å 90.00° 91.46° 90.00°	Depositor
Resolution (Å)	40.66 – 3.00 40.66 – 3.01	Depositor EDS
% Data completeness (in resolution range)	99.2 (40.66-3.00) 99.2 (40.66-3.01)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.79 (at 3.01Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.232 , 0.269 0.234 , 0.273	Depositor DCC
$R_{free}$ test set	535 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	46.7	Xtriage
Anisotropy	0.566	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 36.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	3553	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.42% 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](#)

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	0/1747	0.45	0/2380
1	B	0.25	0/1738	0.49	0/2369
All	All	0.24	0/3485	0.47	0/4749

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	197	PHE	Peptide

### 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	1712	0	1743	42	0
1	B	1703	0	1737	54	0
2	A	88	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	50	0	0	1	0
All	All	3553	0	3480	90	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 13.

All (90) 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:B:87:GLY:H	1:B:88:VAL:HG12	1.40	0.87
1:B:90:LYS:NZ	1:B:125:VAL:O	2.18	0.76
1:A:212:LEU:HD11	1:B:226:LEU:HD13	1.70	0.72
1:B:82:THR:HG23	1:B:131:ILE:HG23	1.72	0.71
1:B:102:ILE:HG23	1:B:109:VAL:HG21	1.74	0.69
1:B:78:VAL:HB	1:B:128:ALA:HA	1.76	0.68
1:A:43:TRP:HH2	1:A:59:LEU:HD23	1.58	0.67
1:B:86:ARG:NH2	1:B:122:THR:OG1	2.29	0.65
1:A:184:GLY:O	1:A:188:ASN:ND2	2.25	0.65
1:A:216:PRO:HB3	1:B:216:PRO:HG3	1.79	0.64
1:B:84:ARG:HG3	1:B:119:GLY:HA3	1.79	0.63
1:A:229:VAL:HG13	1:B:190:LEU:HD21	1.82	0.62
1:B:116:GLU:HB2	1:B:145:LEU:HB3	1.82	0.61
1:A:153:ALA:O	1:A:157:SER:OG	2.19	0.61
1:A:144:ASN:HB3	1:A:147:GLN:HB2	1.83	0.60
1:A:102:ILE:HG12	1:A:109:VAL:HG11	1.84	0.59
1:B:82:THR:O	1:B:82:THR:OG1	2.22	0.58
1:B:158:LYS:O	1:B:160:GLN:N	2.34	0.57
1:B:232:THR:HA	1:B:235:LYS:HE3	1.85	0.57
1:B:18:ASN:HA	1:B:21:LYS:HE2	1.86	0.57
1:A:174:ALA:HB3	1:A:223:ILE:HD12	1.87	0.56
1:B:32:ASP:OD1	1:B:32:ASP:N	2.39	0.55
1:B:216:PRO:HG2	1:B:218:TRP:CZ2	2.43	0.53
1:A:36:LEU:HB3	1:A:39:PRO:HG3	1.90	0.53
1:A:72:VAL:HG11	1:A:127:LEU:HD21	1.89	0.52
1:A:73:ALA:HB1	1:A:177:GLU:HB3	1.91	0.52
1:B:83:VAL:HG12	1:B:134:VAL:H	1.74	0.52
1:A:78:VAL:HB	1:A:128:ALA:HA	1.91	0.52
1:B:198:PRO:HG2	1:B:201:ARG:HG3	1.90	0.52
1:A:26:MET:HB3	1:A:31:LEU:HB3	1.91	0.52
1:B:178:GLU:OE1	1:B:224:ARG:NH1	2.42	0.52
1:B:40:ARG:NH2	2:B:303:HOH:O	2.43	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6:PRO:O	1:A:31:LEU:HD11	2.10	0.51
1:A:43:TRP:CD2	1:A:44:PRO:HA	2.47	0.50
1:B:76:ALA:N	1:B:108:GLY:O	2.44	0.50
1:A:90:LYS:HE3	1:A:126:ALA:HA	1.94	0.50
1:B:27:LEU:HD12	1:B:55:ALA:HA	1.95	0.49
1:A:218:TRP:HB2	1:A:222:GLU:HB2	1.94	0.48
1:B:8:ILE:HG23	1:B:113:PHE:HE2	1.78	0.48
1:A:72:VAL:HG22	1:A:75:CYS:HB2	1.95	0.47
1:A:140:PHE:CD2	1:B:27:LEU:HB3	2.49	0.47
1:B:121:GLU:O	1:B:125:VAL:HG23	2.12	0.47
1:A:34:LEU:HB2	1:A:58:VAL:HG12	1.95	0.47
1:B:68:VAL:O	1:B:72:VAL:HG23	2.14	0.47
1:A:23:ALA:HB1	1:A:58:VAL:HB	1.96	0.47
1:B:79:TYR:CD1	1:B:132:ILE:HD11	2.50	0.47
1:A:67:THR:HB	1:A:70:GLU:HG3	1.97	0.47
1:A:179:LEU:HD13	1:A:223:ILE:HD11	1.96	0.46
1:B:173:PRO:HA	1:B:174:ALA:HA	1.64	0.46
1:B:79:TYR:HB2	1:B:111:ILE:HG12	1.98	0.46
1:A:93:MET:HB2	1:A:97:GLN:HB2	1.97	0.46
1:B:43:TRP:CG	1:B:44:PRO:HA	2.51	0.46
1:A:11:VAL:HA	1:A:37:VAL:HB	1.98	0.45
1:A:134:VAL:HG11	1:A:143:LEU:HD11	1.99	0.45
1:B:14:GLN:HE22	1:B:116:GLU:N	2.13	0.45
1:B:43:TRP:CD2	1:B:44:PRO:HA	2.52	0.45
1:B:86:ARG:HG3	1:B:87:GLY:HA2	1.99	0.45
1:A:155:GLU:OE1	1:B:154:TYR:OH	2.24	0.45
1:B:29:PHE:HB3	1:B:157:SER:HB3	1.98	0.45
1:B:84:ARG:O	1:B:86:ARG:N	2.48	0.45
1:A:158:LYS:NZ	1:B:155:GLU:OE2	2.43	0.45
1:A:182:MET:HA	1:A:227:ARG:HD3	1.98	0.44
1:B:175:PRO:HD2	1:B:178:GLU:CD	2.38	0.44
1:A:9:ILE:HB	1:A:112:LEU:HD12	2.00	0.44
1:B:21:LYS:HE3	1:B:21:LYS:HB2	1.74	0.44
1:A:115:PRO:HD2	1:A:119:GLY:O	2.18	0.43
1:B:17:GLU:O	1:B:21:LYS:HG3	2.18	0.43
1:B:147:GLN:HA	1:B:150:ILE:HG22	2.01	0.43
1:A:180:GLU:OE2	1:A:210:ARG:NH2	2.52	0.43
1:A:136:VAL:HG11	1:A:143:LEU:HG	2.00	0.43
1:B:35:ARG:NH1	1:B:71:ALA:O	2.52	0.43
1:A:174:ALA:HB2	1:A:220:SER:HA	2.00	0.42
1:B:124:ASP:N	1:B:124:ASP:OD1	2.49	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:113:PHE:CZ	1:B:152:VAL:HG21	2.55	0.42
1:A:121:GLU:O	1:A:125:VAL:HG23	2.18	0.42
1:A:201:ARG:O	1:A:205:ILE:HG13	2.20	0.42
1:B:8:ILE:HG23	1:B:113:PHE:CE2	2.54	0.42
1:B:208:THR:O	1:B:212:LEU:HB2	2.20	0.41
1:B:213:LEU:O	1:B:216:PRO:HD2	2.20	0.41
1:A:212:LEU:HD23	1:A:213:LEU:HG	2.03	0.41
1:A:29:PHE:HB3	1:A:157:SER:OG	2.21	0.41
1:A:31:LEU:HA	1:A:31:LEU:HD13	1.86	0.41
1:B:87:GLY:HA3	1:B:88:VAL:HA	1.93	0.41
1:B:92:VAL:HG22	1:B:131:ILE:HB	2.02	0.41
1:B:210:ARG:HE	1:B:210:ARG:HB2	1.75	0.41
1:A:19:ILE:HG21	1:A:36:LEU:HD21	2.03	0.40
1:B:27:LEU:HD23	1:B:27:LEU:HA	1.87	0.40
1:B:141:SER:O	1:B:141:SER:OG	2.23	0.40
1:A:216:PRO:HG2	1:A:218:TRP:CZ2	2.55	0.40
1:B:120:LEU:HB3	1:B:125:VAL:HG22	2.03	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	220/243 (90%)	208 (94%)	11 (5%)	1 (0%)	29	68
1	B	219/243 (90%)	205 (94%)	11 (5%)	3 (1%)	11	43
All	All	439/486 (90%)	413 (94%)	22 (5%)	4 (1%)	17	55

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	198	PRO

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Mol	Chain	Res	Type
1	B	159	GLY
1	B	174	ALA
1	B	83	VAL

### 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	182/198 (92%)	161 (88%)	21 (12%)	5	24
1	B	181/198 (91%)	160 (88%)	21 (12%)	5	23
All	All	363/396 (92%)	321 (88%)	42 (12%)	5	23

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	24	ARG
1	A	31	LEU
1	A	32	ASP
1	A	34	LEU
1	A	72	VAL
1	A	81	THR
1	A	89	THR
1	A	106	GLU
1	A	112	LEU
1	A	147	GLN
1	A	157	SER
1	A	182	MET
1	A	186	LEU
1	A	197	PHE
1	A	201	ARG
1	A	204	THR
1	A	210	ARG
1	A	212	LEU
1	A	218	TRP
1	A	221	MET

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Mol	Chain	Res	Type
1	A	233	LEU
1	B	14	GLN
1	B	27	LEU
1	B	34	LEU
1	B	41	ASP
1	B	47	SER
1	B	82	THR
1	B	86	ARG
1	B	89	THR
1	B	104	GLU
1	B	122	THR
1	B	124	ASP
1	B	142	SER
1	B	145	LEU
1	B	178	GLU
1	B	179	LEU
1	B	182	MET
1	B	186	LEU
1	B	201	ARG
1	B	212	LEU
1	B	218	TRP
1	B	226	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	14	GLN

### 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

There are no ligands in this entry.

## 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 [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, 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	224/243 (92%)	-0.38	1 (0%) 92 79	21, 32, 62, 123	0
1	B	223/243 (91%)	-0.05	4 (1%) 68 40	27, 44, 91, 133	0
All	All	447/486 (91%)	-0.22	5 (1%) 80 56	21, 37, 81, 133	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	85	LYS	3.7
1	B	40	ARG	3.0
1	B	161	THR	2.6
1	B	123	ASP	2.5
1	A	169	ASP	2.4

### 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](#)

There are no ligands in this entry.

### 6.5 Other polymers [i](#)

There are no such residues in this entry.