



# Full wwPDB X-ray Structure Validation Report ⓘ

May 29, 2020 – 08:58 am BST

PDB ID : 5XGW  
Title : Isoaspartyl dipeptidase from *Colwellia psychrerythraea* strain 34H  
Authors : Lee, J.H.; Lee, C.W.; Park, S.H.  
Deposited on : 2017-04-18  
Resolution : 1.85 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.

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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	:	2.11
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)	:	2.11

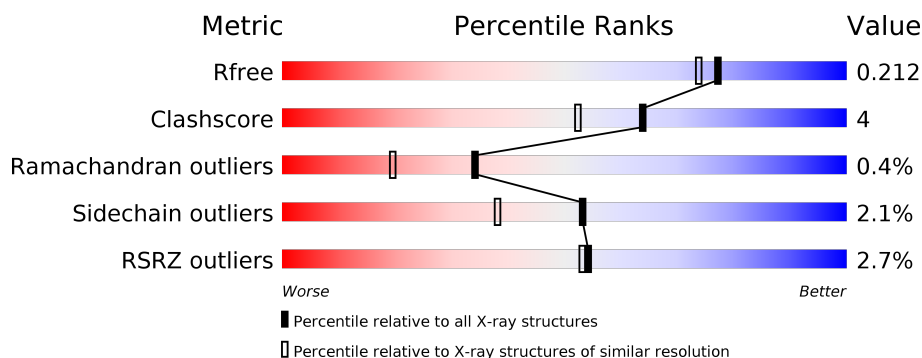
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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  $\geq 3$ , 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	395	
1	B	395	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6438 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 Isoaspartyl dipeptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	374	Total	C	N	O	S	0	0	0
			2836	1797	486	542	11			
1	B	374	Total	C	N	O	S	0	0	0
			2836	1797	486	542	11			

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	2	Total	Zn	0	0
			2	2		
2	A	2	Total	Zn	0	0
			2	2		

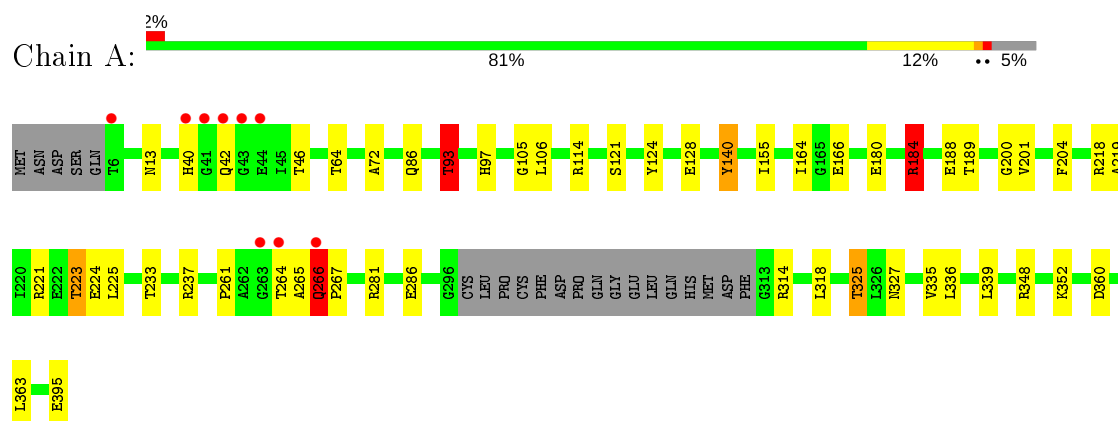
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	389	Total	O	0	0
			389	389		
3	B	373	Total	O	0	0
			373	373		

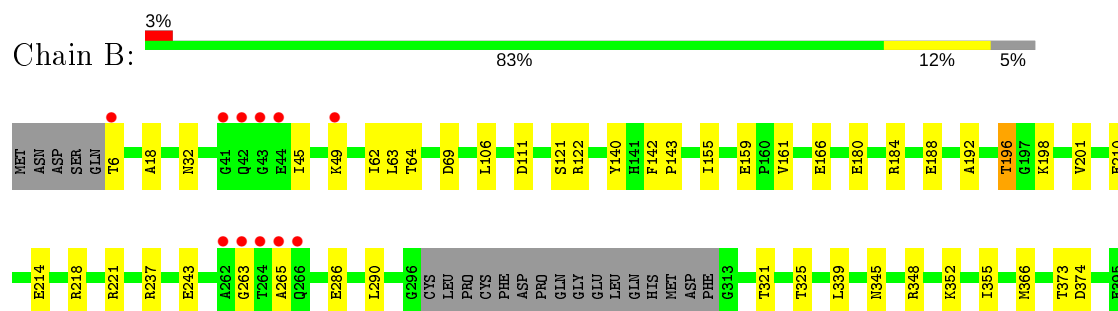
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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: Isoaspartyl dipeptidase



- Molecule 1: Isoaspartyl dipeptidase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 4 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	108.00Å 108.00Å 156.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.01 – 1.85 30.37 – 1.85	Depositor EDS
% Data completeness (in resolution range)	97.3 (50.01-1.85) 97.4 (30.37-1.85)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	6.14 (at 1.85Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, $R_{free}$	0.163 , 0.201 0.176 , 0.212	Depositor DCC
$R_{free}$ test set	3814 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	21.1	Xtriage
Anisotropy	0.028	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 48.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.36$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	6438	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.93% 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: ZN

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	1.13	12/2892 (0.4%)	1.32	17/3928 (0.4%)
1	B	1.14	10/2892 (0.3%)	1.09	14/3928 (0.4%)
All	All	1.13	22/5784 (0.4%)	1.21	31/7856 (0.4%)

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	2	2
1	B	1	2
All	All	3	4

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	180	GLU	CD-OE1	12.07	1.39	1.25
1	B	243	GLU	CD-OE1	9.46	1.36	1.25
1	B	188	GLU	CD-OE1	8.77	1.35	1.25
1	B	121	SER	CB-OG	-7.82	1.32	1.42
1	A	180	GLU	CD-OE2	7.50	1.33	1.25
1	A	348	ARG	CZ-NH2	6.75	1.41	1.33
1	A	121	SER	CB-OG	-6.60	1.33	1.42
1	A	86	GLN	CD-OE1	6.55	1.38	1.24
1	B	159	GLU	CG-CD	6.17	1.61	1.51
1	B	180	GLU	CG-CD	6.08	1.61	1.51
1	A	128	GLU	CD-OE1	6.00	1.32	1.25
1	A	188	GLU	CD-OE1	5.89	1.32	1.25
1	B	201	VAL	CB-CG2	-5.83	1.40	1.52
1	A	223	THR	CB-CG2	-5.77	1.33	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	224	GLU	CD-OE1	5.69	1.31	1.25
1	A	93	THR	CB-CG2	-5.58	1.33	1.52
1	B	196	THR	CB-CG2	-5.55	1.34	1.52
1	B	348	ARG	CZ-NH2	5.54	1.40	1.33
1	A	286	GLU	CD-OE2	5.53	1.31	1.25
1	B	140	TYR	CG-CD2	-5.45	1.32	1.39
1	A	124	TYR	CE2-CZ	-5.21	1.31	1.38
1	A	140	TYR	CG-CD2	-5.14	1.32	1.39

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	184	ARG	NE-CZ-NH1	-34.37	103.11	120.30
1	A	184	ARG	NE-CZ-NH2	23.57	132.08	120.30
1	A	184	ARG	CD-NE-CZ	16.04	146.06	123.60
1	A	348	ARG	NE-CZ-NH1	-9.01	115.79	120.30
1	B	221	ARG	NE-CZ-NH2	7.59	124.10	120.30
1	A	348	ARG	NE-CZ-NH2	7.24	123.92	120.30
1	B	237	ARG	NE-CZ-NH1	7.23	123.91	120.30
1	A	93	THR	OG1-CB-CG2	7.19	126.55	110.00
1	A	218	ARG	NE-CZ-NH2	-6.98	116.81	120.30
1	B	218	ARG	NE-CZ-NH1	-6.98	116.81	120.30
1	B	184	ARG	NE-CZ-NH1	6.94	123.77	120.30
1	B	69	ASP	CB-CG-OD1	6.66	124.29	118.30
1	A	221	ARG	NE-CZ-NH2	6.62	123.61	120.30
1	A	223	THR	OG1-CB-CG2	6.49	124.92	110.00
1	A	360	ASP	CB-CG-OD1	6.37	124.03	118.30
1	B	159	GLU	OE1-CD-OE2	-6.21	115.85	123.30
1	B	352	LYS	CD-CE-NZ	-5.91	98.10	111.70
1	B	184	ARG	NE-CZ-NH2	-5.88	117.36	120.30
1	B	122	ARG	NE-CZ-NH1	5.71	123.15	120.30
1	B	196	THR	OG1-CB-CG2	5.69	123.09	110.00
1	B	140	TYR	CD1-CE1-CZ	-5.59	114.77	119.80
1	A	352	LYS	CD-CE-NZ	-5.56	98.91	111.70
1	A	314	ARG	NE-CZ-NH2	5.52	123.06	120.30
1	B	196	THR	N-CA-CB	-5.48	99.89	110.30
1	A	266	GLN	N-CA-C	-5.45	96.28	111.00
1	A	114	ARG	NE-CZ-NH1	5.31	122.95	120.30
1	A	237	ARG	NE-CZ-NH1	5.25	122.92	120.30
1	B	218	ARG	NE-CZ-NH2	5.24	122.92	120.30
1	B	348	ARG	NE-CZ-NH1	-5.21	117.70	120.30
1	A	266	GLN	C-N-CD	5.08	139.07	128.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	140	TYR	CD1-CE1-CZ	-5.07	115.24	119.80

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	93	THR	CB
1	A	223	THR	CB
1	B	196	THR	CB

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	184	ARG	Sidechain
1	A	265	ALA	Peptide
1	B	263	GLY	Peptide
1	B	265	ALA	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	2836	0	2829	26	0
1	B	2836	0	2829	22	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	389	0	0	1	0
3	B	373	0	0	5	0
All	All	6438	0	5658	48	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 (48) 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:345:ASN:HB2	3:B:729:HOH:O	1.64	0.96

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:373:THR:HG23	1:B:374:ASP:OD1	1.77	0.84
1:A:223:THR:HG23	1:A:225:LEU:H	1.44	0.81
1:B:290:LEU:HD23	1:B:339:LEU:HD21	1.66	0.77
1:B:63:LEU:HD23	1:B:355:ILE:HD13	1.68	0.76
1:B:196:THR:HG23	1:B:198:LYS:H	1.54	0.73
1:A:189:THR:HG21	1:A:201:VAL:O	1.93	0.69
1:A:266:GLN:HB3	1:A:267:PRO:CD	2.25	0.65
1:A:281:ARG:HG3	3:A:676:HOH:O	1.97	0.64
1:A:264:THR:O	1:A:266:GLN:HG2	1.99	0.62
1:A:189:THR:HG22	1:A:200:GLY:HA2	1.83	0.60
1:A:325:THR:CG2	1:A:335:VAL:HG21	2.31	0.60
1:A:266:GLN:HB3	1:A:267:PRO:HD3	1.85	0.58
1:B:196:THR:HG23	1:B:198:LYS:HG3	1.84	0.58
1:A:93:THR:HG22	1:A:395:GLU:OE2	2.03	0.58
1:B:32:ASN:OD1	3:B:501:HOH:O	2.17	0.57
1:A:325:THR:HG21	1:A:335:VAL:HG11	1.86	0.57
1:B:62:ILE:HG21	1:B:366:MET:CE	2.35	0.57
1:A:223:THR:CG2	1:A:225:LEU:H	2.16	0.57
1:A:261:PRO:O	1:A:264:THR:HB	2.05	0.56
1:A:325:THR:HG21	1:A:335:VAL:HG21	1.86	0.56
1:B:155:ILE:HD12	1:B:161:VAL:HG12	1.88	0.54
1:B:63:LEU:CD2	1:B:355:ILE:HD13	2.36	0.53
1:B:155:ILE:CD1	1:B:161:VAL:HG12	2.40	0.51
1:A:318:LEU:HD22	1:A:339:LEU:HD21	1.93	0.50
1:B:64:THR:C	1:B:355:ILE:HD11	2.32	0.49
1:A:155:ILE:HD13	1:A:189:THR:HG23	1.93	0.49
1:B:196:THR:CG2	1:B:198:LYS:H	2.24	0.49
1:A:266:GLN:CB	1:A:267:PRO:CD	2.90	0.48
1:B:286:GLU:OE2	3:B:502:HOH:O	2.20	0.48
1:A:219:ALA:O	1:A:223:THR:HB	2.14	0.48
1:A:204:PHE:O	1:A:233:THR:HG22	2.16	0.46
1:A:325:THR:HG23	1:A:335:VAL:HG21	1.98	0.45
1:B:214:GLU:OE1	3:B:503:HOH:O	2.21	0.45
1:B:142:PHE:HA	1:B:143:PRO:C	2.38	0.44
1:A:363:LEU:C	1:A:363:LEU:HD12	2.38	0.43
1:B:63:LEU:HD23	1:B:355:ILE:CD1	2.44	0.43
1:B:192:ALA:O	1:B:196:THR:HG22	2.19	0.42
1:B:62:ILE:HG21	1:B:366:MET:HE3	2.01	0.42
1:A:13:ASN:HB2	1:A:40:HIS:CE1	2.55	0.42
1:A:72:ALA:O	1:A:105:GLY:HA2	2.20	0.42
1:B:166:GLU:O	1:B:166:GLU:HG3	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:64:THR:HB	1:A:336:LEU:HD21	2.02	0.42
1:B:321:THR:O	1:B:325:THR:HG23	2.20	0.41
1:A:140:TYR:HA	1:A:166:GLU:O	2.21	0.41
1:A:164:ILE:HD12	1:A:189:THR:OG1	2.21	0.41
1:A:166:GLU:HG3	1:A:166:GLU:O	2.21	0.40
1:B:111:ASP:O	3:B:504: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	370/395 (94%)	360 (97%)	9 (2%)	1 (0%)	41	26
1	B	370/395 (94%)	361 (98%)	7 (2%)	2 (0%)	29	15
All	All	740/790 (94%)	721 (97%)	16 (2%)	3 (0%)	34	19

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	266	GLN
1	B	45	ILE
1	B	18	ALA

### 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	304/324 (94%)	295 (97%)	9 (3%)	41	24
1	B	304/324 (94%)	300 (99%)	4 (1%)	69	58
All	All	608/648 (94%)	595 (98%)	13 (2%)	53	38

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	42	GLN
1	A	46	THR
1	A	93	THR
1	A	97	HIS
1	A	106	LEU
1	A	184	ARG
1	A	266	GLN
1	A	325	THR
1	A	327	ASN
1	B	6	THR
1	B	49	LYS
1	B	106	LEU
1	B	210	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	42	GLN
1	B	57	ASN

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry

Of 4 ligands modelled in this entry, 4 are 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	374/395 (94%)	-0.27	9 (2%) 59 57	14, 21, 44, 131	0
1	B	374/395 (94%)	-0.27	11 (2%) 51 50	15, 22, 44, 88	0
All	All	748/790 (94%)	-0.27	20 (2%) 54 53	14, 22, 44, 131	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	42	GLN	11.5
1	A	43	GLY	7.5
1	A	41	GLY	6.7
1	B	266	GLN	5.0
1	B	43	GLY	4.7
1	B	42	GLN	4.5
1	B	263	GLY	4.0
1	A	44	GLU	3.9
1	B	44	GLU	3.5
1	B	265	ALA	3.5
1	A	6	THR	3.3
1	A	263	GLY	3.2
1	A	264	THR	2.8
1	A	266	GLN	2.8
1	B	262	ALA	2.6
1	B	49	LYS	2.5
1	A	40	HIS	2.4
1	B	6	THR	2.3
1	B	41	GLY	2.2
1	B	264	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 carbohydrates 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( $\text{\AA}^2$ )	Q<0.9
2	ZN	A	402	1/1	0.99	0.03	24,24,24,24	0
2	ZN	A	401	1/1	0.99	0.09	31,31,31,31	0
2	ZN	B	401	1/1	0.99	0.07	38,38,38,38	0
2	ZN	B	402	1/1	1.00	0.01	24,24,24,24	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.