



# Full wwPDB X-ray Structure Validation Report

Mar 8, 2018 – 06:56 pm GMT

PDB ID : 3I2D  
Title : Crystal Structure of *S. Cerevisiae* SUMO E3 Ligase SIZ1  
Authors : Lima, C.D.; Yunus, A.A.  
Deposited on : 2009-06-29  
Resolution : 2.60 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 : trunk30967  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk30967

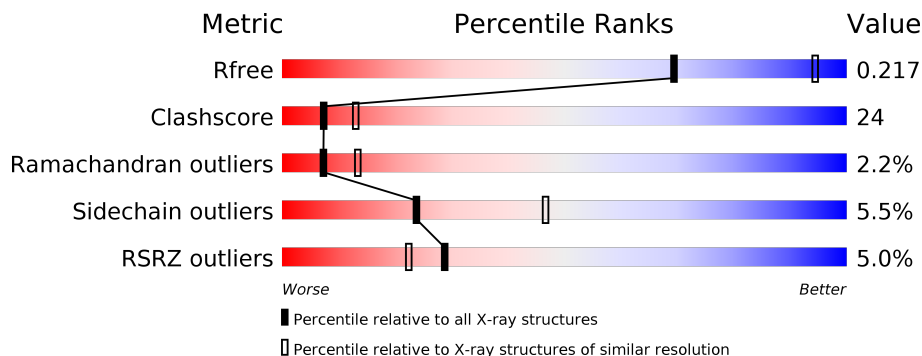
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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))
$R_{free}$	111664	2767 (2.60-2.60)
Clashscore	122126	3110 (2.60-2.60)
Ramachandran outliers	120053	3062 (2.60-2.60)
Sidechain outliers	120020	3062 (2.60-2.60)
RSRZ outliers	108989	2706 (2.60-2.60)

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. 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	371	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2302 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 E3 SUMO-protein ligase SIZ1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	280	2235	1430	376	415	14	0	0	0

There are 17 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	110	SER	-	EXPRESSION TAG	UNP Q04195
A	111	LEU	-	EXPRESSION TAG	UNP Q04195
A	466	LEU	-	EXPRESSION TAG	UNP Q04195
A	467	GLY	-	EXPRESSION TAG	UNP Q04195
A	468	GLU	-	EXPRESSION TAG	UNP Q04195
A	469	GLY	-	EXPRESSION TAG	UNP Q04195
A	470	ALA	-	EXPRESSION TAG	UNP Q04195
A	471	ALA	-	EXPRESSION TAG	UNP Q04195
A	472	ALA	-	EXPRESSION TAG	UNP Q04195
A	473	LEU	-	EXPRESSION TAG	UNP Q04195
A	474	GLU	-	EXPRESSION TAG	UNP Q04195
A	475	HIS	-	EXPRESSION TAG	UNP Q04195
A	476	HIS	-	EXPRESSION TAG	UNP Q04195
A	477	HIS	-	EXPRESSION TAG	UNP Q04195
A	478	HIS	-	EXPRESSION TAG	UNP Q04195
A	479	HIS	-	EXPRESSION TAG	UNP Q04195
A	480	HIS	-	EXPRESSION TAG	UNP Q04195

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		

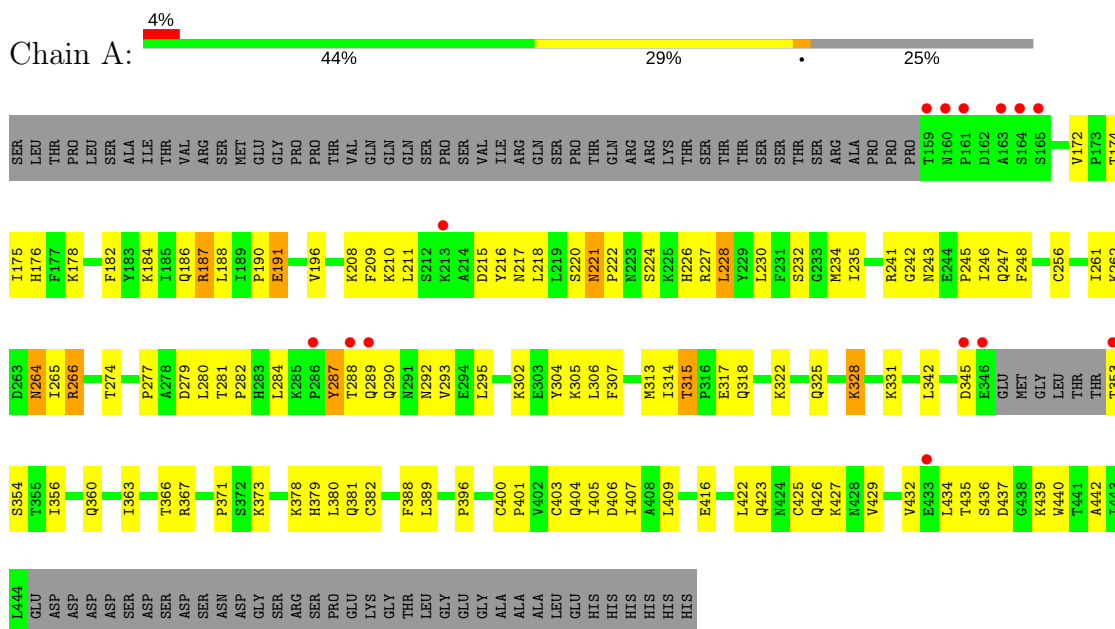
- Molecule 3 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>	<b>ZeroOcc</b>	<b>AltConf</b>
3	A	66	Total O 66 66	0	0

### 3 Residue-property plots

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: E3 SUMO-protein ligase SIZ1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	44.49Å 88.98Å 105.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.02 – 2.60 34.02 – 2.60	Depositor EDS
% Data completeness (in resolution range)	97.9 (34.02-2.60) 98.0 (34.02-2.60)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.37 (at 2.61Å)	Xtrriage
Refinement program	CNS 1.2	Depositor
R, $R_{free}$	0.211 , 0.259 0.213 , 0.217	Depositor DCC
$R_{free}$ test set	661 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	51.3	Xtrriage
Anisotropy	0.831	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 55.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	2302	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	66.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% 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	0.43	0/2286	0.66	0/3097

There are no bond length outliers.

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	2235	0	2246	107	0
2	A	1	0	0	0	0
3	A	66	0	0	7	0
All	All	2302	0	2246	107	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 24.

All (107) 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:A:265:ILE:HG22	1:A:279:ASP:HB2	1.56	0.88

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:234:MET:CE	1:A:302:LYS:HD3	2.10	0.82
1:A:211:LEU:HD11	1:A:284:LEU:HD13	1.65	0.78
1:A:234:MET:HE1	1:A:302:LYS:HD3	1.67	0.77
1:A:228:LEU:HD13	1:A:280:LEU:HD12	1.65	0.77
1:A:208:LYS:HG2	1:A:292:ASN:ND2	2.01	0.76
1:A:315:THR:HG22	1:A:318:GLN:H	1.52	0.75
1:A:184:LYS:HE3	1:A:314:ILE:HD11	1.70	0.74
1:A:227:ARG:HH21	1:A:281:THR:HB	1.54	0.73
1:A:227:ARG:NH2	1:A:281:THR:HB	2.02	0.73
1:A:315:THR:CG2	1:A:317:GLU:HG2	2.18	0.73
1:A:246:ILE:HD13	1:A:277:PRO:HD3	1.73	0.70
1:A:221:ASN:OD1	1:A:222:PRO:HD2	1.92	0.69
1:A:256:CYS:HB2	1:A:261:ILE:HD11	1.74	0.69
1:A:221:ASN:HB3	1:A:224:SER:HB3	1.74	0.69
1:A:287:TYR:CD2	1:A:288:THR:HG23	2.29	0.68
1:A:396:PRO:HB3	3:A:37:HOH:O	1.94	0.68
1:A:266:ARG:HH11	1:A:266:ARG:HB3	1.58	0.67
1:A:403:CYS:SG	1:A:405:ILE:HG23	2.35	0.67
1:A:210:LYS:HG2	1:A:290:GLN:HA	1.76	0.66
1:A:315:THR:HG22	1:A:318:GLN:HG3	1.79	0.65
1:A:328:LYS:HB3	1:A:328:LYS:NZ	2.12	0.65
1:A:245:PRO:HD2	3:A:28:HOH:O	1.96	0.65
1:A:210:LYS:HZ2	1:A:210:LYS:HB3	1.62	0.64
1:A:367:ARG:HD3	3:A:61:HOH:O	1.96	0.64
1:A:226:HIS:C	1:A:227:ARG:HG2	2.19	0.63
1:A:235:ILE:HD11	1:A:305:LYS:HB2	1.82	0.62
1:A:426:GLN:HB2	1:A:429:VAL:HG23	1.81	0.61
1:A:210:LYS:HB3	1:A:210:LYS:NZ	2.14	0.61
1:A:295:LEU:HD22	1:A:306:LEU:HD21	1.82	0.61
1:A:388:PHE:CZ	1:A:407:ILE:HD11	2.36	0.60
1:A:356:ILE:HD12	1:A:356:ILE:N	2.17	0.60
1:A:360:GLN:NE2	3:A:61:HOH:O	2.34	0.60
1:A:437:ASP:OD2	1:A:439:LYS:HD3	2.00	0.60
1:A:266:ARG:HH11	1:A:266:ARG:CB	2.15	0.60
1:A:262:LYS:HE2	1:A:264:ASN:HD22	1.66	0.60
1:A:287:TYR:HD2	1:A:288:THR:HG23	1.67	0.59
1:A:432:VAL:CG1	1:A:440:TRP:HB2	2.33	0.59
1:A:366:THR:HG22	1:A:367:ARG:N	2.16	0.58
1:A:373:LYS:HE3	3:A:64:HOH:O	2.03	0.58
1:A:429:VAL:HG11	1:A:442:ALA:HB1	1.84	0.58
1:A:187:ARG:HH11	1:A:187:ARG:HG2	1.70	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:209:PHE:HE2	1:A:293:VAL:HG23	1.69	0.57
1:A:353:THR:HG22	1:A:354:SER:N	2.20	0.57
1:A:325:GLN:O	1:A:325:GLN:HG2	2.04	0.57
1:A:328:LYS:HD3	1:A:416:GLU:HB2	1.88	0.56
1:A:234:MET:HE2	1:A:302:LYS:HD3	1.84	0.56
1:A:226:HIS:O	1:A:227:ARG:HG2	2.06	0.56
1:A:210:LYS:HE2	1:A:289:GLN:N	2.20	0.56
1:A:363:ILE:HD11	1:A:401:PRO:HG2	1.88	0.56
1:A:342:LEU:HD12	1:A:436:SER:HA	1.89	0.55
1:A:381:GLN:NE2	1:A:382:CYS:O	2.41	0.54
1:A:211:LEU:CD1	1:A:284:LEU:HD13	2.37	0.54
1:A:322:LYS:NZ	1:A:322:LYS:HB3	2.23	0.54
1:A:315:THR:HG23	1:A:317:GLU:HG2	1.86	0.54
1:A:426:GLN:HB2	1:A:429:VAL:CG2	2.38	0.53
1:A:306:LEU:N	1:A:306:LEU:HD12	2.23	0.53
1:A:371:PRO:HG3	1:A:422:LEU:CD2	2.39	0.52
1:A:187:ARG:NH2	1:A:218:LEU:HD11	2.24	0.52
1:A:217:ASN:ND2	3:A:34:HOH:O	2.43	0.52
1:A:315:THR:HG21	1:A:317:GLU:HG2	1.92	0.52
1:A:208:LYS:HE3	1:A:292:ASN:HD21	1.75	0.51
1:A:366:THR:CG2	1:A:367:ARG:N	2.74	0.50
1:A:187:ARG:NH1	1:A:215:ASP:OD1	2.44	0.49
1:A:211:LEU:HD11	1:A:284:LEU:CD1	2.39	0.49
1:A:208:LYS:HE3	1:A:292:ASN:ND2	2.28	0.49
1:A:315:THR:CG2	1:A:318:GLN:HG3	2.42	0.48
1:A:328:LYS:HZ3	1:A:328:LYS:HB3	1.78	0.48
1:A:175:ILE:HG13	1:A:241:ARG:NH2	2.29	0.48
1:A:196:VAL:HB	1:A:304:TYR:HB2	1.96	0.48
1:A:227:ARG:HH21	1:A:281:THR:CB	2.24	0.48
1:A:262:LYS:HE2	1:A:264:ASN:ND2	2.29	0.47
1:A:315:THR:HG22	1:A:318:GLN:N	2.26	0.47
1:A:371:PRO:HG3	1:A:422:LEU:HD22	1.97	0.46
1:A:218:LEU:HB3	1:A:226:HIS:CG	2.50	0.46
1:A:182:PHE:HB3	1:A:266:ARG:HH22	1.79	0.46
1:A:331:LYS:HG3	1:A:416:GLU:OE1	2.15	0.46
1:A:230:LEU:HD12	1:A:307:PHE:O	2.15	0.46
1:A:322:LYS:HZ1	1:A:322:LYS:HB3	1.81	0.46
1:A:184:LYS:CE	1:A:314:ILE:HD11	2.43	0.45
1:A:247:GLN:CD	3:A:29:HOH:O	2.56	0.44
1:A:265:ILE:HD13	1:A:277:PRO:O	2.16	0.44
1:A:217:ASN:N	1:A:217:ASN:ND2	2.66	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:426:GLN:O	1:A:429:VAL:HG23	2.19	0.43
1:A:232:SER:HB3	1:A:248:PHE:CD1	2.54	0.42
1:A:315:THR:HB	1:A:318:GLN:HE21	1.83	0.42
1:A:328:LYS:HB3	1:A:328:LYS:HZ2	1.84	0.42
1:A:178:LYS:HG2	1:A:243:ASN:ND2	2.34	0.42
1:A:389:LEU:HD21	1:A:409:LEU:HD21	2.01	0.42
1:A:190:PRO:HG2	1:A:191:GLU:HG2	2.02	0.42
1:A:227:ARG:NH2	1:A:282:PRO:HD3	2.34	0.42
1:A:378:LYS:O	1:A:379:HIS:HB3	2.20	0.42
1:A:217:ASN:N	1:A:217:ASN:HD22	2.16	0.42
1:A:210:LYS:HE2	1:A:289:GLN:H	1.85	0.41
1:A:210:LYS:HZ1	1:A:288:THR:HA	1.85	0.41
1:A:313:MET:HA	1:A:313:MET:CE	2.50	0.41
1:A:435:THR:C	1:A:437:ASP:N	2.73	0.41
1:A:315:THR:HG23	1:A:317:GLU:H	1.85	0.41
1:A:400:CYS:O	1:A:404:GLN:HA	2.19	0.41
1:A:211:LEU:HD23	1:A:211:LEU:HA	1.92	0.41
1:A:354:SER:HB2	1:A:434:LEU:O	2.21	0.41
1:A:184:LYS:HE3	1:A:184:LYS:HB2	1.88	0.40
1:A:191:GLU:HB2	1:A:209:PHE:HB3	2.03	0.40
1:A:353:THR:CG2	1:A:354:SER:N	2.84	0.40
1:A:176:HIS:HB3	1:A:242:GLY:O	2.21	0.40
1:A:247:GLN:HA	1:A:274:THR:O	2.21	0.40
1:A:425:CYS:SG	1:A:429:VAL:HB	2.61	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	276/371 (74%)	238 (86%)	32 (12%)	6 (2%)	<b>7</b>   <b>13</b>

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	287	TYR
1	A	427	LYS
1	A	220	SER
1	A	221	ASN
1	A	216	TYR
1	A	172	VAL

### 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	256/338 (76%)	242 (94%)	14 (6%)	24 47

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

Mol	Chain	Res	Type
1	A	174	THR
1	A	186	GLN
1	A	187	ARG
1	A	188	LEU
1	A	191	GLU
1	A	228	LEU
1	A	264	ASN
1	A	266	ARG
1	A	315	THR
1	A	328	LYS
1	A	345	ASP
1	A	380	LEU
1	A	406	ASP
1	A	423	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	217	ASN
1	A	223	ASN
1	A	243	ASN
1	A	260	GLN
1	A	264	ASN
1	A	289	GLN
1	A	292	ASN
1	A	318	GLN
1	A	399	GLN
1	A	411	ASN
1	A	424	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 carbohydrates 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 [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, 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	280/371 (75%)	0.19	14 (5%) <span style="border: 1px solid red; padding: 2px;">29</span> <span style="border: 1px solid red; padding: 2px;">22</span>	39, 61, 106, 135	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	160	ASN	6.0
1	A	288	THR	4.7
1	A	164	SER	4.6
1	A	213	LYS	3.8
1	A	346	GLU	3.8
1	A	289	GLN	3.7
1	A	165	SER	3.4
1	A	345	ASP	2.9
1	A	163	ALA	2.8
1	A	286	PRO	2.7
1	A	161	PRO	2.6
1	A	159	THR	2.5
1	A	353	THR	2.5
1	A	433	GLU	2.0

### 6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates

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(Å <sup>2</sup> )	Q<0.9
2	ZN	A	1	1/1	1.00	0.15	57,57,57,57	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.