



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 01:20 AM UTC

PDB ID : 5ZUM / pdb_00005zum
Title : Structure of dipeptidyl-peptidase III from *Corallococcus* sp. strain EGB
Authors : Zhang, H.; Duan, Y.J.; Li, Z.K.; Liu, W.D.; Huang, Y.; Cui, Z.L.
Deposited on : 2018-05-08
Resolution : 1.90 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

<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>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

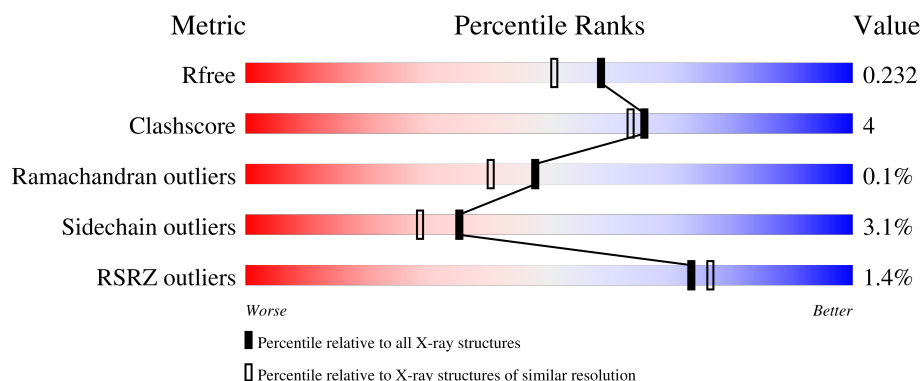
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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 ≥ 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	537	2% 86% 12% ..
1	B	537	% 87% 12% .

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9238 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 dipeptidyl-peptidase III.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	533	Total	C	N	O	Se	0	0	0
			4137	2638	714	775	10			
1	B	537	Total	C	N	O	Se	0	0	0
			4165	2656	718	781	10			

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

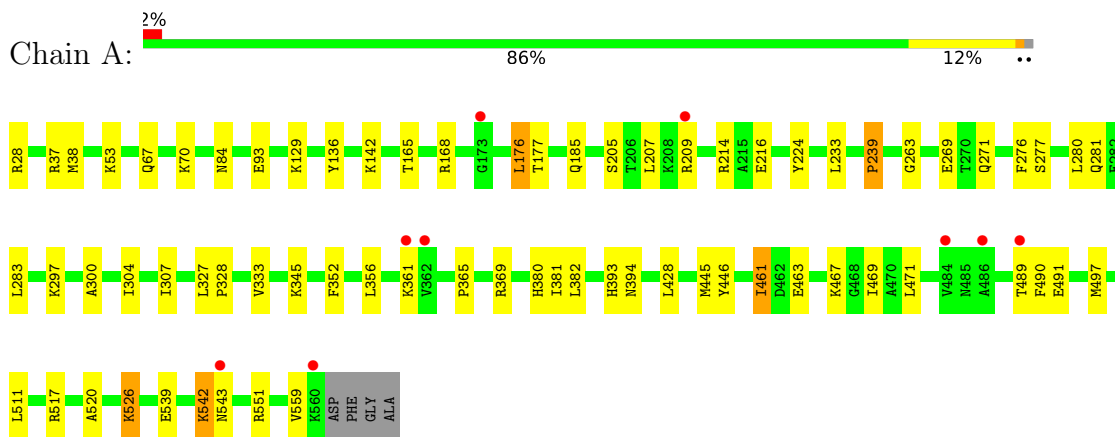
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	516	Total	O	0	0
			516	516		
3	B	418	Total	O	0	0
			418	418		

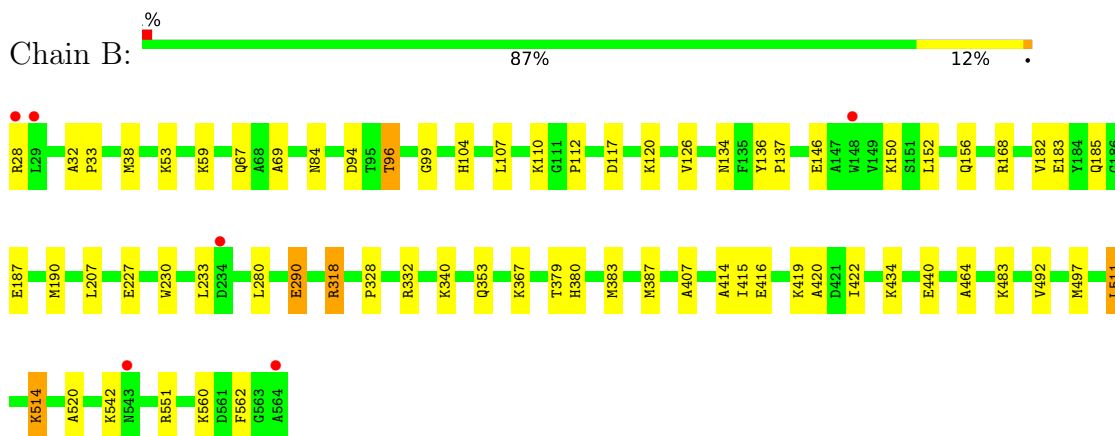
3 Residue-property plots [i](#)

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: dipeptidyl-peptidase III



- Molecule 1: dipeptidyl-peptidase III



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	58.14Å 77.85Å 228.29Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	25.00 – 1.90 25.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.7 (25.00-1.90) 99.7 (25.00-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.68 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.174 , 0.224 0.186 , 0.232	Depositor DCC
R_{free} test set	4061 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	21.9	Xtriage
Anisotropy	0.023	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 33.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9238	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.27% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	1.04	17/4212 (0.4%)	0.99	7/5695 (0.1%)
1	B	1.04	19/4241 (0.4%)	0.96	2/5734 (0.0%)
All	All	1.04	36/8453 (0.4%)	0.97	9/11429 (0.1%)

All (36) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	182	VAL	C-N	14.81	1.54	1.33
1	A	276	PHE	C-N	-10.01	1.20	1.33
1	A	517	ARG	C-N	-9.64	1.21	1.33
1	B	84	ASN	C-O	-8.93	1.15	1.24
1	B	183	GLU	C-N	8.47	1.45	1.33
1	A	84	ASN	C-O	-7.86	1.17	1.24
1	B	380	HIS	C-O	-7.83	1.14	1.24
1	B	420	ALA	C-O	-7.76	1.15	1.24
1	A	382	LEU	C-O	-7.64	1.15	1.24
1	B	67	GLN	C-O	-7.13	1.15	1.24
1	A	381	ILE	C-O	-6.50	1.16	1.24
1	A	283	LEU	C-O	-6.24	1.17	1.24
1	A	281	GLN	C-O	-6.21	1.16	1.24
1	A	142	LYS	C-O	-6.19	1.16	1.24
1	A	393	HIS	C-O	-6.16	1.16	1.24
1	A	380	HIS	C-O	-6.07	1.17	1.24
1	A	304	ILE	C-O	-6.01	1.17	1.24
1	B	416	GLU	C-O	-5.97	1.17	1.24
1	B	414	ALA	C-O	-5.96	1.17	1.24
1	B	415	ILE	C-O	-5.85	1.17	1.24
1	B	422	ILE	C-O	-5.78	1.17	1.24
1	B	379	THR	C-O	-5.74	1.17	1.24
1	B	464	ALA	C-O	-5.65	1.17	1.24
1	B	69	ALA	C-O	-5.62	1.17	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	216	GLU	C-O	-5.54	1.17	1.24
1	B	419	LYS	C-O	-5.46	1.17	1.24
1	A	209	ARG	C-O	-5.45	1.17	1.24
1	B	183	GLU	C-O	-5.41	1.17	1.24
1	A	239	PRO	C-O	-5.36	1.17	1.24
1	B	104	HIS	C-O	-5.21	1.18	1.24
1	A	394	ASN	C-O	-5.17	1.17	1.24
1	B	280	LEU	C-O	-5.16	1.18	1.24
1	A	463	GLU	C-O	-5.15	1.17	1.23
1	B	187	GLU	C-O	-5.13	1.18	1.24
1	A	214	ARG	C-O	-5.13	1.18	1.24
1	B	407	ALA	C-O	-5.12	1.18	1.24

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	280	LEU	N-CA-C	8.33	119.99	111.07
1	B	280	LEU	N-CA-C	7.70	119.30	111.07
1	B	185	GLN	N-CA-C	7.59	120.22	111.11
1	A	185	GLN	N-CA-C	6.45	118.85	111.11
1	A	497	MSE	N-CA-C	5.29	116.86	111.14
1	A	136	TYR	CA-C-N	-5.16	114.67	120.14
1	A	136	TYR	C-N-CA	-5.16	114.67	120.14
1	A	277	SER	O-C-N	5.11	127.54	122.12
1	A	205	SER	N-CA-C	5.02	117.14	111.11

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	4137	0	4192	37	0
1	B	4165	0	4213	27	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	516	0	0	13	0
3	B	418	0	0	6	0
All	All	9238	0	8405	63	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 (63) 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:94:ASP:OD1	1:B:96:THR:HG22	1.34	1.23
1:A:543:ASN:HB3	3:A:1098:HOH:O	1.61	0.99
1:A:37:ARG:HD3	3:A:1108:HOH:O	1.74	0.85
1:A:361:LYS:HA	1:A:369:ARG:HD3	1.57	0.84
1:A:38:MSE:HE2	3:A:1087:HOH:O	1.85	0.77
1:B:94:ASP:OD1	1:B:96:THR:CG2	2.24	0.77
1:B:290:GLU:HG2	3:B:1092:HOH:O	1.85	0.75
1:B:96:THR:HG23	1:B:99:GLY:H	1.53	0.73
1:A:38:MSE:CE	3:A:1087:HOH:O	2.37	0.73
1:A:300:ALA:HB3	3:A:1033:HOH:O	1.87	0.73
1:A:168:ARG:O	1:A:176:LEU:HD12	1.95	0.67
1:A:559:VAL:HG12	1:A:559:VAL:O	1.94	0.66
1:B:38:MSE:HE3	1:B:117:ASP:OD2	1.99	0.63
1:A:511:LEU:C	1:A:511:LEU:HD23	2.28	0.59
1:A:467:LYS:HE3	3:A:1088:HOH:O	2.04	0.58
1:A:129:LYS:HE2	3:A:1067:HOH:O	2.04	0.58
1:A:526:LYS:HG2	3:A:1074:HOH:O	2.03	0.57
1:A:70:LYS:HD3	3:B:1107:HOH:O	2.04	0.57
1:B:152:LEU:HD13	1:B:156:GLN:HB3	1.85	0.57
1:A:263:GLY:HA3	1:A:307:ILE:HD12	1.89	0.54
1:A:37:ARG:CD	3:A:1108:HOH:O	2.44	0.54
1:B:227:GLU:OE2	1:B:328:PRO:HB3	2.09	0.53
1:B:134:ASN:ND2	3:B:703:HOH:O	2.35	0.53
1:B:290:GLU:CG	3:B:1092:HOH:O	2.51	0.52
1:A:269:GLU:HG3	1:A:345:LYS:HE2	1.93	0.51
1:A:168:ARG:O	1:A:176:LEU:CD1	2.59	0.50
1:A:207:LEU:HA	1:A:233:LEU:HD21	1.94	0.50
1:B:96:THR:HG23	1:B:99:GLY:N	2.25	0.49
1:A:165:THR:HB	1:A:177:THR:HG23	1.93	0.49
1:A:129:LYS:CE	3:A:1067:HOH:O	2.61	0.48
1:A:271:GLN:HG3	3:A:1060:HOH:O	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:511:LEU:HD21	1:A:520:ALA:HB2	1.97	0.47
1:B:492:VAL:HG13	1:B:497:MSE:HE2	1.96	0.47
1:A:352:PHE:CD1	1:A:356:LEU:HD23	2.49	0.47
1:A:93:GLU:OE2	1:B:107:LEU:HD13	2.14	0.47
1:A:511:LEU:HD23	1:A:511:LEU:O	2.14	0.47
1:B:514:LYS:HD2	1:B:514:LYS:N	2.30	0.47
1:B:59:LYS:HE3	1:B:562:PHE:CZ	2.51	0.46
1:B:110:LYS:HG3	1:B:318:ARG:HB3	1.96	0.46
1:B:511:LEU:HD21	1:B:520:ALA:HB2	1.96	0.46
1:A:224:TYR:CD2	1:A:333:VAL:HG22	2.51	0.46
1:B:332:ARG:NH2	3:B:715:HOH:O	2.49	0.45
1:A:365:PRO:HG3	1:A:491:GLU:OE1	2.16	0.45
1:B:136:TYR:HB3	1:B:137:PRO:CD	2.46	0.45
1:B:207:LEU:HA	1:B:233:LEU:HD21	1.99	0.44
1:A:461:ILE:HD12	1:A:461:ILE:HA	1.86	0.44
1:A:445:MSE:HG3	1:A:446:TYR:N	2.33	0.43
1:B:383:MSE:O	1:B:387:MSE:HG2	2.18	0.43
1:B:511:LEU:C	1:B:511:LEU:HD23	2.43	0.43
1:B:112:PRO:CG	1:B:126:VAL:HG11	2.49	0.42
1:B:190:MSE:HE2	1:B:190:MSE:HB3	1.97	0.42
1:A:67:GLN:OE1	3:A:701:HOH:O	2.22	0.42
1:A:365:PRO:HD2	1:A:490:PHE:O	2.19	0.42
1:A:539:GLU:O	1:A:542:LYS:HG3	2.20	0.42
1:B:146:GLU:HG2	1:B:150:LYS:HE3	2.02	0.42
1:A:471:LEU:C	1:A:471:LEU:HD23	2.45	0.41
1:A:327:LEU:HB3	1:A:328:PRO:HA	2.03	0.41
1:A:559:VAL:O	1:A:559:VAL:CG1	2.65	0.41
1:B:230:TRP:CZ3	1:B:340:LYS:HB3	2.56	0.41
1:A:70:LYS:HE2	3:B:820:HOH:O	2.20	0.41
1:A:365:PRO:HD3	1:A:489:THR:HB	2.02	0.41
3:A:1148:HOH:O	1:B:190:MSE:HE1	2.21	0.41
1:B:32:ALA:N	1:B:33:PRO:HD2	2.36	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	531/537 (99%)	516 (97%)	14 (3%)	1 (0%)	43	36
1	B	535/537 (100%)	524 (98%)	11 (2%)	0	100	100
All	All	1066/1074 (99%)	1040 (98%)	25 (2%)	1 (0%)	48	40

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	239	PRO

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	435/427 (102%)	425 (98%)	10 (2%)	44	40
1	B	437/427 (102%)	420 (96%)	17 (4%)	28	21
All	All	872/854 (102%)	845 (97%)	27 (3%)	35	29

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	ARG
1	A	53	LYS
1	A	176	LEU
1	A	297	LYS
1	A	428	LEU
1	A	461	ILE
1	A	469	ILE
1	A	526	LYS
1	A	542	LYS
1	A	551	ARG
1	B	28	ARG

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Mol	Chain	Res	Type
1	B	53	LYS
1	B	96	THR
1	B	120	LYS
1	B	168	ARG
1	B	290	GLU
1	B	318	ARG
1	B	353	GLN
1	B	367	LYS
1	B	434	LYS
1	B	440	GLU
1	B	483	LYS
1	B	511	LEU
1	B	514	LYS
1	B	542	LYS
1	B	551	ARG
1	B	560	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	406	GLN
1	A	429	GLN
1	A	442	GLN
1	A	485	ASN
1	A	535	GLN
1	B	203	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 2 ligands modelled in this entry, 2 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 [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, 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	523/537 (97%)	-0.11	9 (1%) 69 72	11, 21, 42, 73	0
1	B	527/537 (98%)	-0.09	6 (1%) 78 80	11, 23, 43, 79	0
All	All	1050/1074 (97%)	-0.10	15 (1%) 73 76	11, 22, 43, 79	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	361	LYS	3.5
1	B	564	ALA	3.5
1	A	489	THR	3.0
1	B	148	TRP	2.9
1	A	543	ASN	2.9
1	A	209	ARG	2.7
1	A	486	ALA	2.7
1	A	560	LYS	2.5
1	A	362	VAL	2.5
1	B	234	ASP	2.5
1	B	28	ARG	2.2
1	A	173	GLY	2.2
1	B	29	LEU	2.1
1	A	484	VAL	2.1
1	B	543	ASN	2.1

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 oligosaccharides 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, 95th 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 ²)	Q<0.9
2	ZN	B	601	1/1	0.98	0.08	30,30,30,30	0
2	ZN	A	601	1/1	1.00	0.07	28,28,28,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.