



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2018 – 07:11 am GMT

PDB ID : 5K5W
Title : Crystal structure of limiting CO₂-inducible protein LCIB
Authors : Jin, S.; Sun, J.; Wunder, T.; Tang, D.; Mueller-Cajar, O.M.; Gao, Y.
Deposited on : 2016-05-24
Resolution : 2.59 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 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

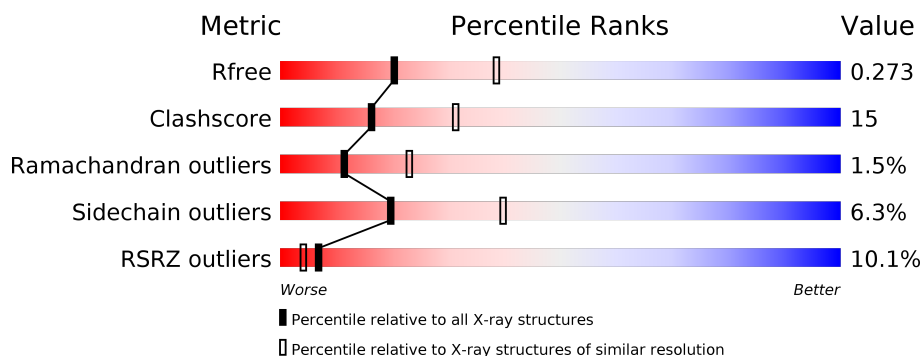
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.59 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 ≥ 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	297	<div> <div>9%</div> <div>40%</div> <div>24%</div> <div>•</div> <div>33%</div> </div>
1	B	297	<div> <div>5%</div> <div>55%</div> <div>18%</div> <div>•</div> <div>24%</div> </div>

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3293 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 limiting CO₂-inducible protein LCIB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	198	Total	C	N	O	S	1	0	0
			1504	965	251	279	9			
1	B	226	Total	C	N	O	S	0	0	0
			1723	1097	289	327	10			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	50	GLY	-	expression tag	UNP Q0ZAI6
A	51	HIS	-	expression tag	UNP Q0ZAI6
A	52	MET	-	expression tag	UNP Q0ZAI6
B	50	GLY	-	expression tag	UNP Q0ZAI6
B	51	HIS	-	expression tag	UNP Q0ZAI6
B	52	MET	-	expression tag	UNP Q0ZAI6

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

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

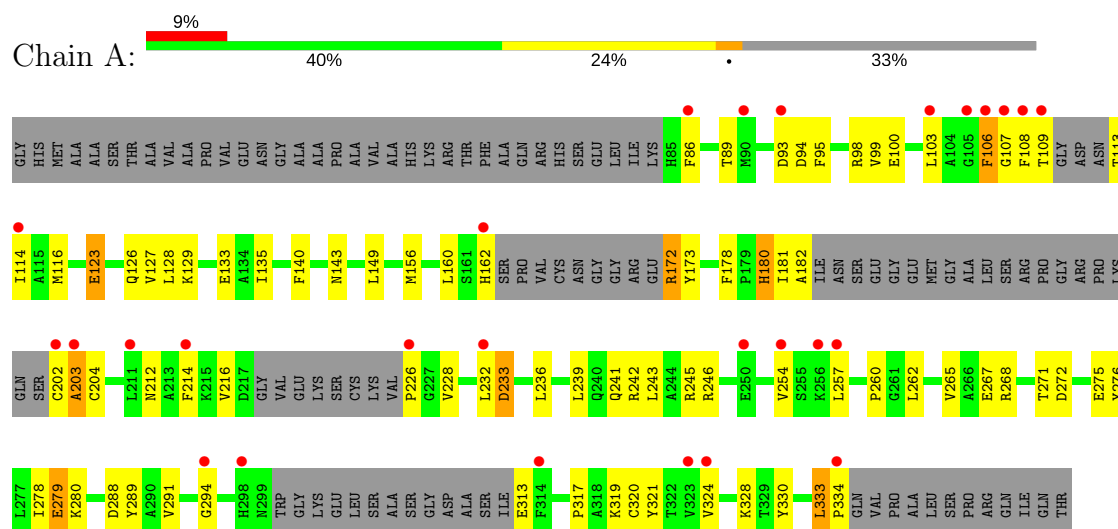
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	30	Total	O	0	0
			30	30		
3	B	34	Total	O	0	0
			34	34		

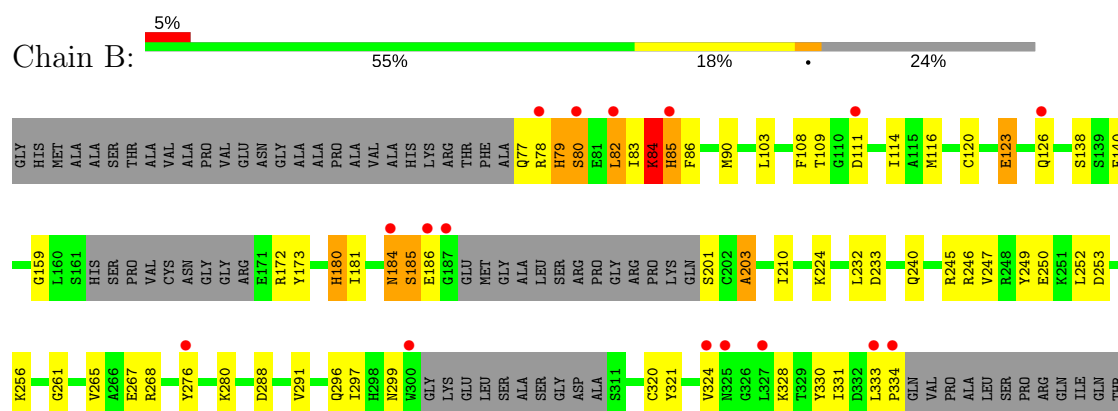
3 Residue-property plots [i](#)

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: limiting CO₂-inducible protein LCIB



- Molecule 1: limiting CO₂-inducible protein LCIB



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	43.84Å 80.22Å 143.75Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.93 – 2.59 41.93 – 2.59	Depositor EDS
% Data completeness (in resolution range)	97.4 (41.93-2.59) 97.4 (41.93-2.59)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.19 (at 2.58Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.269 , 0.272 0.270 , 0.273	Depositor DCC
R_{free} test set	814 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	49.7	Xtriage
Anisotropy	0.117	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 58.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	3293	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.63% 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 [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	0.51	0/1529	0.62	0/2070
1	B	0.57	0/1752	0.68	1/2372 (0.0%)
All	All	0.54	0/3281	0.65	1/4442 (0.0%)

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.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	B	82	LEU	N-CA-C	-5.58	95.93	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	279	GLU	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	1504	0	1503	58	0
1	B	1723	0	1719	47	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	30	0	0	2	0
3	B	34	0	0	3	0
All	All	3293	0	3222	99	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 15.

All (99) 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:123:GLU:OE2	3:B:601:HOH:O	1.85	0.93
1:B:90:MET:HE3	1:B:333:LEU:HB2	1.54	0.90
1:A:232:LEU:HD13	1:B:276:TYR:CE2	2.09	0.88
1:A:214:PHE:O	1:A:254:VAL:HG11	1.75	0.86
1:A:108:PHE:O	1:A:109:THR:OG1	1.95	0.84
1:B:253:ASP:OD2	1:B:256:LYS:HD2	1.78	0.82
1:A:181:ILE:HA	1:A:203:ALA:HB1	1.65	0.79
1:A:232:LEU:HD13	1:B:276:TYR:HE2	1.45	0.79
1:A:94:ASP:OD2	3:A:601:HOH:O	2.01	0.78
1:B:210:ILE:HG12	1:B:240:GLN:HG2	1.65	0.78
1:A:271:THR:HG21	1:A:319:LYS:HD2	1.66	0.77
1:A:98:ARG:NH2	3:A:601:HOH:O	2.19	0.76
1:A:232:LEU:CD1	1:B:276:TYR:CE2	2.70	0.75
1:B:85:HIS:NE2	1:B:186:GLU:OE1	2.26	0.68
1:B:120:CYS:HB3	1:B:180:HIS:HD2	1.59	0.68
1:B:224:LYS:O	1:B:245:ARG:NH1	2.26	0.68
1:B:82:LEU:HD12	1:B:82:LEU:O	1.94	0.67
1:A:232:LEU:HD21	1:B:280:LYS:HG3	1.76	0.66
1:B:267:GLU:OE2	3:B:602:HOH:O	2.13	0.65
1:B:82:LEU:HD12	1:B:82:LEU:C	2.18	0.65
1:B:333:LEU:HG	1:B:334:PRO:HD3	1.79	0.64
1:A:228:VAL:O	1:A:241:GLN:NE2	2.30	0.62
1:B:120:CYS:HB3	1:B:180:HIS:CD2	2.34	0.62
1:A:182:ALA:H	1:A:203:ALA:CB	2.14	0.60
1:B:109:THR:OG1	1:B:111:ASP:HB3	2.00	0.60
1:A:106:PHE:HB3	1:A:324:VAL:HG21	1.84	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:95:PHE:CZ	1:A:99:VAL:HG21	2.37	0.59
1:A:180:HIS:CD2	1:A:204:CYS:HB2	2.38	0.59
1:B:180:HIS:HE1	1:B:203:ALA:O	1.85	0.59
1:A:246:ARG:HG2	1:A:265:VAL:HG13	1.85	0.57
1:B:90:MET:CE	1:B:333:LEU:HB2	2.31	0.57
1:A:267:GLU:OE2	1:A:319:LYS:NZ	2.38	0.56
1:B:83:ILE:HG22	1:B:83:ILE:O	2.06	0.56
1:A:173:TYR:O	1:A:289:TYR:HA	2.08	0.54
1:A:333:LEU:N	1:A:333:LEU:HD12	2.22	0.54
1:A:127:VAL:HG23	1:A:128:LEU:H	1.72	0.54
1:B:186:GLU:HG2	1:B:186:GLU:O	2.06	0.54
1:A:182:ALA:H	1:A:203:ALA:HB2	1.72	0.53
1:A:100:GLU:HB3	1:A:135:ILE:HD13	1.90	0.53
1:A:114:ILE:HD11	1:A:162:HIS:ND1	2.24	0.52
1:B:184:ASN:O	1:B:185:SER:OG	2.20	0.51
1:A:232:LEU:CD1	1:B:276:TYR:HE2	2.13	0.50
1:B:261:GLY:O	1:B:265:VAL:HG23	2.10	0.50
1:A:280:LYS:HE3	1:B:232:LEU:HD12	1.92	0.50
1:A:103:LEU:O	1:A:107:GLY:O	2.28	0.50
1:A:86:PHE:O	1:A:89:THR:OG1	2.21	0.50
1:B:249:TYR:CD2	1:B:250:GLU:HG2	2.47	0.49
1:A:109:THR:OG1	1:A:113:THR:N	2.45	0.49
1:A:126:GLN:HG3	1:A:129:LYS:HE2	1.94	0.49
1:A:172:ARG:HH11	1:A:172:ARG:HG2	1.77	0.48
1:B:116:MET:HB2	1:B:140:PHE:CZ	2.48	0.48
1:A:116:MET:HB2	1:A:140:PHE:CZ	2.48	0.48
1:A:156:MET:O	1:A:160:LEU:HG	2.13	0.48
1:A:278:ILE:HG22	1:A:279:GLU:N	2.29	0.48
1:B:321:TYR:CD1	1:B:328:LYS:HE3	2.49	0.47
1:B:291:VAL:O	1:B:320:CYS:HA	2.14	0.47
1:A:276:TYR:CE2	1:A:280:LYS:HE2	2.49	0.47
1:A:108:PHE:C	1:A:109:THR:HG1	2.05	0.47
1:A:333:LEU:HA	1:A:334:PRO:HA	1.61	0.47
1:A:257:LEU:HD21	1:A:262:LEU:HD13	1.97	0.47
1:A:86:PHE:CE2	1:A:260:PRO:HB3	2.50	0.46
1:B:140:PHE:CE2	1:B:159:GLY:HA3	2.50	0.46
1:B:84:LYS:C	1:B:86:PHE:N	2.68	0.46
1:A:242:ARG:HG2	1:A:245:ARG:NH2	2.31	0.46
1:A:268:ARG:HA	1:A:319:LYS:HZ1	1.81	0.46
1:A:321:TYR:HB3	1:A:330:TYR:HA	1.98	0.46
1:A:272:ASP:HA	1:A:275:GLU:HB2	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:79:HIS:ND1	1:B:79:HIS:N	2.61	0.46
1:A:294:GLY:HA3	1:A:317:PRO:HA	1.97	0.45
1:A:123:GLU:HG3	1:A:123:GLU:H	1.60	0.45
1:A:321:TYR:CD2	1:A:328:LYS:HE3	2.52	0.45
1:B:328:LYS:HE2	1:B:330:TYR:CZ	2.52	0.44
1:A:172:ARG:HB2	1:A:288:ASP:O	2.16	0.44
1:A:127:VAL:HG21	1:A:313:GLU:OE1	2.16	0.44
1:A:291:VAL:O	1:A:320:CYS:HA	2.18	0.43
1:A:212:ASN:O	1:A:216:VAL:HG23	2.19	0.43
1:B:246:ARG:HH21	1:B:268:ARG:HD2	1.84	0.43
1:A:276:TYR:CE2	1:A:280:LYS:CE	3.02	0.43
1:B:140:PHE:CD2	1:B:159:GLY:HA3	2.55	0.42
1:B:180:HIS:HB3	3:B:605:HOH:O	2.19	0.42
1:B:185:SER:N	1:B:186:GLU:HA	2.35	0.42
1:B:80:SER:CB	1:B:299:ASN:HD21	2.33	0.42
1:A:127:VAL:HG23	1:A:128:LEU:N	2.35	0.41
1:A:233:ASP:HB3	1:A:236:LEU:HB3	2.01	0.41
1:B:288:ASP:OD2	1:B:324:VAL:HG23	2.21	0.41
1:A:129:LYS:NZ	1:A:143:ASN:HD21	2.18	0.41
1:A:95:PHE:CE1	1:A:99:VAL:CG2	3.04	0.41
1:B:247:VAL:HA	1:B:252:LEU:HD12	2.03	0.41
1:B:83:ILE:C	1:B:85:HIS:N	2.73	0.41
1:A:149:LEU:HD23	1:A:149:LEU:HA	1.92	0.41
1:B:181:ILE:O	1:B:297:ILE:HA	2.21	0.41
1:A:226:PRO:O	1:A:228:VAL:HG23	2.21	0.41
1:B:320:CYS:HB2	1:B:331:ILE:O	2.21	0.41
1:A:239:LEU:O	1:A:243:LEU:HG	2.21	0.41
1:B:180:HIS:ND1	1:B:180:HIS:C	2.73	0.41
1:B:114:ILE:HG22	1:B:173:TYR:HD1	1.86	0.40
1:B:180:HIS:HA	1:B:296:GLN:O	2.21	0.40
1:A:95:PHE:CE1	1:A:99:VAL:HG21	2.56	0.40
1:B:103:LEU:HB3	1:B:108:PHE:HB2	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	186/297 (63%)	166 (89%)	19 (10%)	1 (0%)	31	56
1	B	218/297 (73%)	203 (93%)	10 (5%)	5 (2%)	7	13
All	All	404/594 (68%)	369 (91%)	29 (7%)	6 (2%)	11	23

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	203	ALA
1	B	203	ALA
1	B	184	ASN
1	B	85	HIS
1	B	185	SER
1	B	84	LYS

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	161/238 (68%)	151 (94%)	10 (6%)	20	40
1	B	187/238 (79%)	175 (94%)	12 (6%)	19	39
All	All	348/476 (73%)	326 (94%)	22 (6%)	20	40

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	93	ASP
1	A	106	PHE
1	A	123	GLU
1	A	133	GLU
1	A	172	ARG
1	A	178	PHE

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Mol	Chain	Res	Type
1	A	180	HIS
1	A	202	CYS
1	A	233	ASP
1	A	333	LEU
1	B	77	GLN
1	B	78	ARG
1	B	79	HIS
1	B	80	SER
1	B	84	LYS
1	B	123	GLU
1	B	126	GLN
1	B	138	SER
1	B	172	ARG
1	B	180	HIS
1	B	201	SER
1	B	233	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	296	GLN
1	B	180	HIS
1	B	299	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 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 [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

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	198/297 (66%)	0.93	27 (13%) 3 1	29, 48, 65, 76	1 (0%)
1	B	226/297 (76%)	0.76	16 (7%) 16 11	26, 37, 55, 69	0
All	All	424/594 (71%)	0.84	43 (10%) 7 4	26, 42, 62, 76	1 (0%)

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	80	SER	8.4
1	B	300	TRP	4.6
1	A	257	LEU	4.4
1	A	108	PHE	4.2
1	A	314	PHE	4.1
1	A	256	LYS	3.9
1	B	327	LEU	3.7
1	B	325	ASN	3.6
1	A	298	HIS	3.4
1	A	106	PHE	3.2
1	B	333	LEU	3.1
1	A	86	PHE	3.1
1	B	111	ASP	3.1
1	A	103	LEU	2.9
1	A	226	PRO	2.8
1	A	202	CYS	2.8
1	B	78	ARG	2.8
1	B	85	HIS	2.8
1	A	250	GLU	2.8
1	B	276	TYR	2.7
1	A	214	PHE	2.7
1	A	114	ILE	2.6
1	A	334	PRO	2.6
1	B	324	VAL	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	90	MET	2.5
1	A	232	LEU	2.5
1	A	109	THR	2.5
1	A	162	HIS	2.4
1	A	203	ALA	2.4
1	A	254	VAL	2.3
1	A	105	GLY	2.3
1	A	294	GLY	2.3
1	A	93	ASP	2.3
1	B	184	ASN	2.2
1	B	82	LEU	2.2
1	B	126	GLN	2.2
1	A	107	GLY	2.2
1	B	186	GLU	2.2
1	A	324	VAL	2.1
1	A	211	LEU	2.1
1	B	187	GLY	2.1
1	B	334	PRO	2.1
1	A	323	VAL	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 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, 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(\AA^2)	Q<0.9
2	ZN	A	500	1/1	0.98	0.14	38,38,38,38	0
2	ZN	B	500	1/1	0.98	0.17	31,31,31,31	0

6.5 Other polymers [i](#)

There are no such residues in this entry.