



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 28, 2024 – 11:50 PM EDT

PDB ID : 2IN5  
Title : Crystal Structure of the hypothetical lipoprotein YmcC from Escherichia coli (K12), Northeast Structural Genomics target ER552.  
Authors : Zhou, W.; Forouhar, F.; Seetharaman, J.; Chen, C.X.; Cunningham, K.; Ma, L.-C.; Janjua, H.; Xiao, R.; Baran, M.C.; Acton, T.B.; Montelione, G.T.; Tong, L.; Hunt, J.F.; Northeast Structural Genomics Consortium (NESG)  
Deposited on : 2006-10-05  
Resolution : 2.30 Å(reported)

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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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

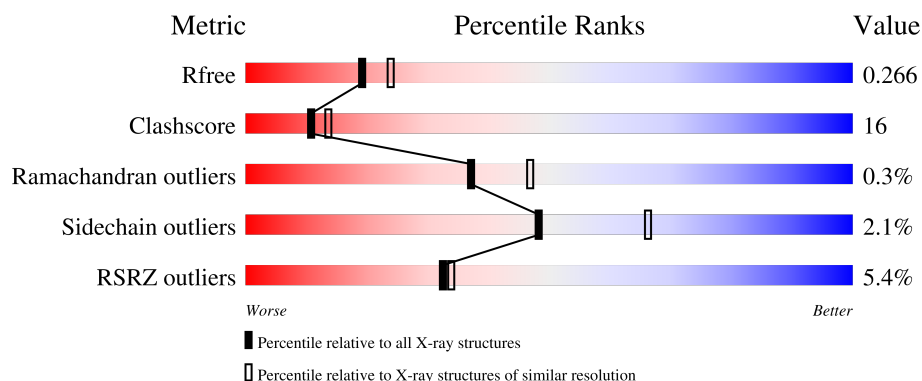
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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))
$R_{free}$	164625	5963 (2.30-2.30)
Clashscore	180529	6698 (2.30-2.30)
Ramachandran outliers	177936	6640 (2.30-2.30)
Sidechain outliers	177891	6640 (2.30-2.30)
RSRZ outliers	164620	5963 (2.30-2.30)

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	207	
1	B	207	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3285 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 Hypothetical lipoprotein ymcC.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	195	Total	C	N	O	S	Se	0	0	0
			1563	980	280	297	1	5			
1	B	188	Total	C	N	O	S	Se	0	0	0
			1510	947	271	286	1	5			

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	-	SEE REMARK 999	UNP P75884
A	8	MSE	MET	modified residue	UNP P75884
A	37	MSE	MET	modified residue	UNP P75884
A	68	MSE	MET	modified residue	UNP P75884
A	182	MSE	MET	modified residue	UNP P75884
A	192	MSE	MET	modified residue	UNP P75884
A	200	LEU	-	cloning artifact	UNP P75884
A	201	GLU	-	cloning artifact	UNP P75884
A	202	HIS	-	expression tag	UNP P75884
A	203	HIS	-	expression tag	UNP P75884
A	204	HIS	-	expression tag	UNP P75884
A	205	HIS	-	expression tag	UNP P75884
A	206	HIS	-	expression tag	UNP P75884
A	207	HIS	-	expression tag	UNP P75884
B	1	MSE	-	SEE REMARK 999	UNP P75884
B	8	MSE	MET	modified residue	UNP P75884
B	37	MSE	MET	modified residue	UNP P75884
B	68	MSE	MET	modified residue	UNP P75884
B	182	MSE	MET	modified residue	UNP P75884
B	192	MSE	MET	modified residue	UNP P75884
B	200	LEU	-	cloning artifact	UNP P75884
B	201	GLU	-	cloning artifact	UNP P75884
B	202	HIS	-	expression tag	UNP P75884
B	203	HIS	-	expression tag	UNP P75884
B	204	HIS	-	expression tag	UNP P75884

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Chain	Residue	Modelled	Actual	Comment	Reference
B	205	HIS	-	expression tag	UNP P75884
B	206	HIS	-	expression tag	UNP P75884
B	207	HIS	-	expression tag	UNP P75884

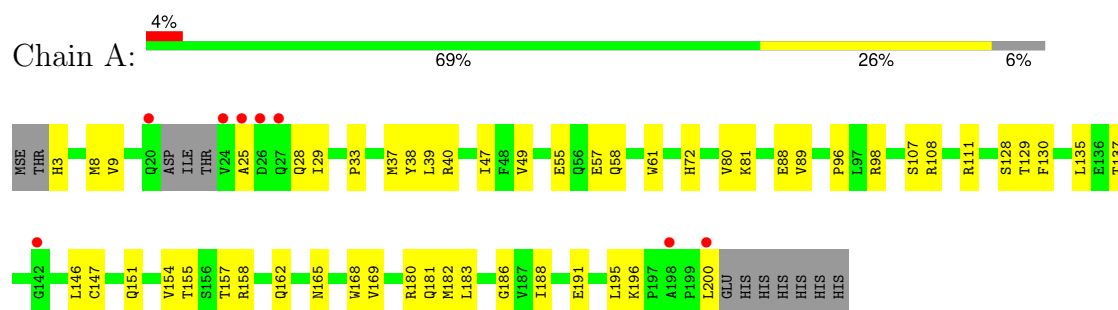
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	116	Total 116	O 116	0	0
2	B	96	Total 96	O 96	0	0

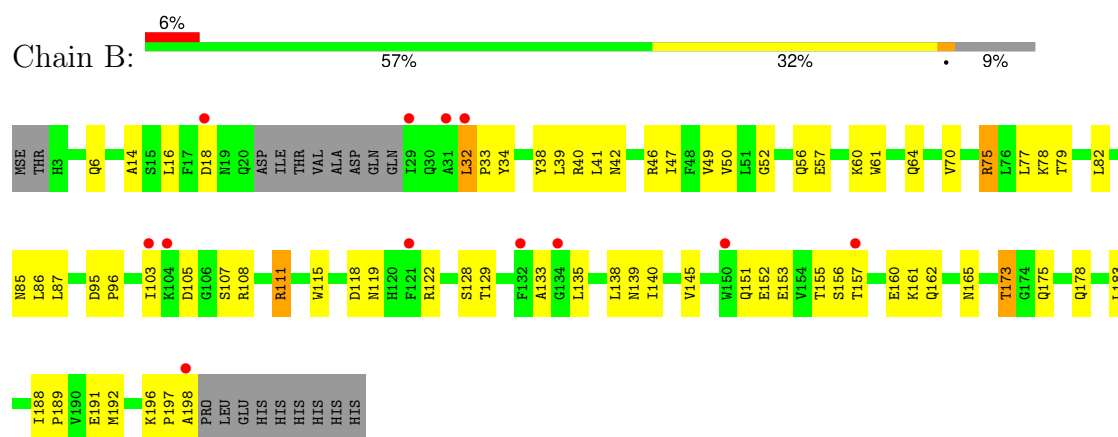
### 3 Residue-property plots [i](#)

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: Hypothetical lipoprotein ymcC



#### • Molecule 1: Hypothetical lipoprotein ymcC



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	122.79Å 75.00Å 80.20Å 90.00° 127.11° 90.00°	Depositor
Resolution (Å)	37.50 – 2.30 37.50 – 2.30	Depositor EDS
% Data completeness (in resolution range)	85.5 (37.50-2.30) 93.7 (37.50-2.30)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.02 (at 2.00Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.215 , 0.256 0.221 , 0.266	Depositor DCC
$R_{free}$ test set	2567 reflections (9.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.5	Xtriage
Anisotropy	0.792	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 49.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3285	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.34% 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

### 5.1 Standard geometry

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	0.37	0/1588	0.61	0/2146
1	B	0.37	0/1534	0.58	0/2071
All	All	0.37	0/3122	0.60	0/4217

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

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	1563	0	1533	45	0
1	B	1510	0	1481	70	0
2	A	116	0	0	3	0
2	B	96	0	0	5	0
All	All	3285	0	3014	100	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 16.

All (100) 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:108:ARG:HG2	1:B:129:THR:HG22	1.42	0.99

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:32:LEU:HD22	1:B:32:LEU:H	1.41	0.84
1:A:8:MSE:HE2	1:B:34:TYR:CZ	2.14	0.82
1:B:79:THR:HG21	1:B:82:LEU:HD12	1.63	0.81
1:A:80:VAL:HG12	1:A:81:LYS:HG2	1.63	0.81
1:A:25:ALA:HB3	1:A:28:GLN:HB2	1.63	0.80
1:A:3:HIS:HB3	1:B:173:THR:HG22	1.65	0.78
1:B:33:PRO:HG3	2:B:274:HOH:O	1.84	0.76
1:A:40:ARG:HB3	1:A:191:GLU:HB2	1.67	0.74
1:A:8:MSE:HE2	1:B:34:TYR:CE1	2.23	0.73
1:A:8:MSE:HE3	1:B:50:VAL:CB	2.20	0.72
1:A:8:MSE:HE1	1:B:16:LEU:HD11	1.72	0.71
1:A:8:MSE:HE3	1:B:50:VAL:HB	1.73	0.70
1:A:151:GLN:HG3	2:A:315:HOH:O	1.91	0.70
1:B:152:GLU:HB3	1:B:165:ASN:HB2	1.75	0.69
1:B:79:THR:HG22	1:B:85:ASN:OD1	1.94	0.68
1:B:39:LEU:HD11	1:B:41:LEU:HG	1.77	0.67
1:B:40:ARG:HH21	1:B:46:ARG:HB2	1.59	0.67
1:B:75:ARG:HD2	1:B:95:ASP:OD2	1.95	0.66
1:A:157:THR:HG21	2:A:305:HOH:O	1.94	0.66
1:A:135:LEU:HD11	1:A:146:LEU:HD22	1.79	0.64
1:B:133:ALA:HB2	1:B:151:GLN:HG2	1.80	0.63
1:B:96:PRO:O	1:B:103:ILE:HD11	1.97	0.63
1:B:32:LEU:HD22	1:B:32:LEU:N	2.12	0.62
1:B:79:THR:CG2	1:B:82:LEU:HD12	2.29	0.61
1:B:14:ALA:HA	1:B:18:ASP:HB2	1.82	0.60
1:A:8:MSE:HE1	1:B:16:LEU:CD1	2.32	0.60
1:A:147:CYS:HA	1:A:169:VAL:O	2.04	0.58
1:A:8:MSE:HE3	1:B:50:VAL:CG2	2.34	0.57
1:A:8:MSE:HE3	1:B:50:VAL:HG21	1.86	0.57
1:A:33:PRO:O	1:B:6:GLN:HG2	2.05	0.56
1:A:25:ALA:O	1:A:29:ILE:HG12	2.06	0.56
1:A:3:HIS:CG	1:B:175:GLN:HB2	2.41	0.56
1:B:32:LEU:N	1:B:32:LEU:HD13	2.21	0.56
1:A:49:VAL:HG12	1:A:61:TRP:HB3	1.87	0.55
1:A:55:GLU:O	1:A:58:GLN:HB2	2.06	0.55
1:B:107:SER:O	1:B:129:THR:HA	2.07	0.54
1:A:165:ASN:OD1	1:A:181:GLN:HA	2.07	0.54
1:B:38:TYR:HB3	1:B:46:ARG:HD2	1.90	0.54
1:A:39:LEU:HD23	1:A:47:ILE:HD11	1.90	0.53
1:B:133:ALA:HB2	1:B:151:GLN:CG	2.39	0.53
1:B:78:LYS:HE3	2:B:218:HOH:O	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:88:GLU:HG2	1:A:89:VAL:N	2.25	0.52
1:A:96:PRO:HG2	1:A:130:PHE:CZ	2.44	0.52
1:A:37:MSE:HE3	1:A:61:TRP:CD2	2.44	0.51
1:B:40:ARG:HB3	1:B:191:GLU:HB2	1.92	0.51
1:B:140:ILE:O	2:B:303:HOH:O	2.19	0.51
1:A:49:VAL:CG1	1:A:61:TRP:HB3	2.40	0.50
1:A:37:MSE:HG2	1:A:38:TYR:N	2.26	0.50
1:B:157:THR:HA	1:B:160:GLU:HA	1.93	0.50
1:A:107:SER:O	1:A:129:THR:HA	2.11	0.50
1:B:161:LYS:HB2	2:B:258:HOH:O	2.10	0.50
1:A:8:MSE:CE	1:B:50:VAL:HG21	2.42	0.50
1:B:47:ILE:HG23	1:B:64:GLN:HE21	1.76	0.50
1:A:137:THR:OG1	1:A:146:LEU:HD23	2.13	0.49
1:B:60:LYS:HG3	1:B:70:VAL:HG22	1.93	0.49
1:B:175:GLN:NE2	1:B:196:LYS:HD3	2.29	0.48
1:A:168:TRP:HH2	1:A:180:ARG:HH11	1.61	0.48
1:A:183:LEU:HB3	1:A:188:ILE:HB	1.96	0.47
1:B:14:ALA:O	1:B:18:ASP:HB2	2.14	0.47
1:B:155:THR:HG22	1:B:162:GLN:CB	2.44	0.47
1:A:195:LEU:N	1:A:195:LEU:HD22	2.30	0.47
1:A:128:SER:HB3	1:A:154:VAL:HG22	1.96	0.46
1:B:42:ASN:HA	1:B:189:PRO:HG2	1.96	0.46
1:B:197:PRO:O	1:B:198:ALA:HB2	2.16	0.46
1:B:173:THR:HG21	2:B:278:HOH:O	2.15	0.46
1:B:156:SER:OG	1:B:161:LYS:HG2	2.15	0.46
1:A:9:VAL:HG23	1:B:52:GLY:O	2.16	0.46
1:A:3:HIS:HB3	1:B:173:THR:CG2	2.40	0.46
1:B:96:PRO:HB2	1:B:103:ILE:HD12	1.97	0.45
1:B:122:ARG:HG2	1:B:122:ARG:HH11	1.82	0.45
1:B:79:THR:HB	1:B:86:LEU:H	1.81	0.45
1:B:108:ARG:CG	1:B:129:THR:HG22	2.31	0.45
1:B:175:GLN:HE22	1:B:196:LYS:HD3	1.81	0.45
1:A:182:MSE:HG3	1:A:186:GLY:HA2	1.99	0.45
1:A:57:GLU:O	1:A:72:HIS:HD2	2.01	0.44
1:A:196:LYS:HE3	2:A:282:HOH:O	2.17	0.44
1:B:77:LEU:O	1:B:78:LYS:HB2	2.18	0.44
1:B:111:ARG:N	1:B:111:ARG:HD3	2.33	0.44
1:B:49:VAL:CG1	1:B:61:TRP:HB3	2.48	0.44
1:B:138:LEU:HB2	1:B:145:VAL:HG13	1.99	0.44
1:B:39:LEU:HD22	1:B:40:ARG:N	2.34	0.43
1:B:39:LEU:C	1:B:39:LEU:HD13	2.39	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:155:THR:HG22	1:B:162:GLN:HB3	2.01	0.43
1:B:56:GLN:O	1:B:57:GLU:HB2	2.18	0.43
1:A:155:THR:HG22	1:A:162:GLN:HB3	2.01	0.42
1:A:108:ARG:HD2	1:A:129:THR:HG22	2.01	0.42
1:B:39:LEU:HD22	1:B:40:ARG:H	1.83	0.42
1:B:178:GLN:HA	1:B:192:MSE:O	2.20	0.42
1:B:135:LEU:HD13	1:B:135:LEU:HA	1.93	0.42
1:B:128:SER:HA	1:B:153:GLU:O	2.19	0.42
1:A:200:LEU:N	1:A:200:LEU:HD12	2.35	0.41
1:A:158:ARG:HH11	1:A:158:ARG:HG2	1.85	0.41
1:B:118:ASP:O	1:B:119:ASN:HB2	2.20	0.41
1:B:82:LEU:HB2	1:B:85:ASN:OD1	2.20	0.41
1:A:8:MSE:HE2	1:B:34:TYR:OH	2.19	0.41
1:B:87:LEU:HD23	1:B:115:TRP:HA	2.03	0.41
1:B:87:LEU:HD22	1:B:87:LEU:N	2.35	0.41
1:B:183:LEU:HB3	1:B:188:ILE:HB	2.04	0.40
1:B:155:THR:HG22	1:B:162:GLN: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	191/207 (92%)	186 (97%)	5 (3%)	0	100	100
1	B	184/207 (89%)	167 (91%)	16 (9%)	1 (0%)	25	32
All	All	375/414 (91%)	353 (94%)	21 (6%)	1 (0%)	37	47

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	105	ASP

### 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	173/179 (97%)	171 (99%)	2 (1%)	67	81
1	B	167/179 (93%)	162 (97%)	5 (3%)	36	52
All	All	340/358 (95%)	333 (98%)	7 (2%)	48	66

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	ARG
1	A	111	ARG
1	B	32	LEU
1	B	75	ARG
1	B	111	ARG
1	B	139	ASN
1	B	173	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	19	ASN
1	A	30	GLN
1	A	45	GLN
1	A	56	GLN
1	A	58	GLN
1	A	72	HIS
1	A	162	GLN
1	A	164	GLN
1	A	178	GLN
1	B	45	GLN
1	B	64	GLN
1	B	139	ASN
1	B	162	GLN
1	B	175	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 [i](#)

There are no ligands in this entry.

### 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, 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	190/207 (91%)	0.27	8 (4%) 41 42	20, 36, 64, 86	0
1	B	183/207 (88%)	0.53	12 (6%) 26 27	21, 40, 64, 72	0
All	All	373/414 (90%)	0.40	20 (5%) 32 34	20, 38, 64, 86	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	29	ILE	6.1
1	B	31	ALA	4.4
1	B	198	ALA	4.3
1	B	32	LEU	3.6
1	B	134	GLY	3.4
1	A	200	LEU	3.1
1	A	24	VAL	3.1
1	A	198	ALA	3.1
1	B	157	THR	2.8
1	A	25	ALA	2.7
1	B	132	PHE	2.6
1	B	18	ASP	2.5
1	B	103	ILE	2.4
1	A	142	GLY	2.3
1	A	27	GLN	2.3
1	B	121	PHE	2.2
1	A	26	ASP	2.1
1	A	20	GLN	2.1
1	B	104	LYS	2.1
1	B	150	TRP	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 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.