



# wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 8, 2024 – 06:16 AM EDT

PDB ID : 3I38  
Title : Structure of a putative chaperone protein dnaj from klebsiella pneumoniae subsp. pneumoniae mgh 78578  
Authors : Filippova, E.V.; Minasov, G.; Shuvalova, L.; Kiryukhina, O.; Bearden, J.; Joachimiak, A.; Anderson, W.F.; Midwest Center for Structural Genomics (MCSG)  
Deposited on : 2009-06-30  
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

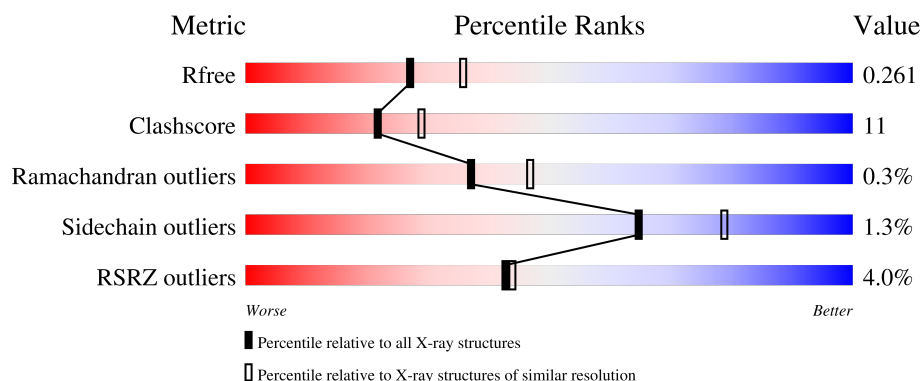
# 1 Overall quality at a glance

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	109	<div> <div>0%</div> <div>76%</div> <div>17%</div> <div>6%</div> </div>
1	B	109	<div> <div>3%</div> <div>83%</div> <div>9%</div> <div>7%</div> </div>
1	C	109	<div> <div>5%</div> <div>72%</div> <div>17%</div> <div>10%</div> </div>
1	D	109	<div> <div>2%</div> <div>87%</div> <div>7%</div> <div>6%</div> </div>

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Mol	Chain	Length	Quality of chain
1	E	109	<div><div></div><div>66%24%10%</div><div>6%</div></div>
1	F	109	<div><div></div><div>73%16%8%</div><div>6%</div></div>
1	G	109	<div><div></div><div>83%11%6%</div><div>%</div></div>
1	H	109	<div><div></div><div>67%23%9%</div><div>4%</div></div>
1	I	109	<div><div></div><div>65%23%12%</div><div>7%</div></div>
1	J	109	<div><div></div><div>66%25%7%</div><div>6%</div></div>
1	K	109	<div><div></div><div>83%13%5%</div><div>3%</div></div>
1	L	109	<div><div></div><div>75%13%10%</div><div>2%</div></div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 9501 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 Putative chaperone DnaJ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	103	Total	C	N	O	Se	0	0	0
			795	517	138	139	1			
1	B	101	Total	C	N	O	Se	0	2	0
			793	516	139	137	1			
1	C	98	Total	C	N	O	Se	0	0	0
			753	492	128	132	1			
1	D	103	Total	C	N	O	Se	0	1	0
			804	522	140	141	1			
1	E	98	Total	C	N	O	Se	0	0	0
			753	492	128	132	1			
1	F	100	Total	C	N	O	Se	0	0	0
			773	504	134	134	1			
1	G	103	Total	C	N	O	Se	0	0	0
			795	517	138	139	1			
1	H	99	Total	C	N	O	Se	0	1	0
			771	501	132	137	1			
1	I	96	Total	C	N	O	Se	0	0	0
			737	481	126	129	1			
1	J	101	Total	C	N	O	Se	0	0	0
			780	508	135	136	1			
1	K	104	Total	C	N	O	Se	0	0	0
			799	520	139	139	1			
1	L	98	Total	C	N	O	Se	0	1	0
			762	497	130	134	1			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	197	SER	-	expression tag	UNP A6TH30
A	198	ASN	-	expression tag	UNP A6TH30
A	199	ALA	-	expression tag	UNP A6TH30
B	197	SER	-	expression tag	UNP A6TH30
B	198	ASN	-	expression tag	UNP A6TH30

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Chain	Residue	Modelled	Actual	Comment	Reference
B	199	ALA	-	expression tag	UNP A6TH30
C	197	SER	-	expression tag	UNP A6TH30
C	198	ASN	-	expression tag	UNP A6TH30
C	199	ALA	-	expression tag	UNP A6TH30
D	197	SER	-	expression tag	UNP A6TH30
D	198	ASN	-	expression tag	UNP A6TH30
D	199	ALA	-	expression tag	UNP A6TH30
E	197	SER	-	expression tag	UNP A6TH30
E	198	ASN	-	expression tag	UNP A6TH30
E	199	ALA	-	expression tag	UNP A6TH30
F	197	SER	-	expression tag	UNP A6TH30
F	198	ASN	-	expression tag	UNP A6TH30
F	199	ALA	-	expression tag	UNP A6TH30
G	197	SER	-	expression tag	UNP A6TH30
G	198	ASN	-	expression tag	UNP A6TH30
G	199	ALA	-	expression tag	UNP A6TH30
H	197	SER	-	expression tag	UNP A6TH30
H	198	ASN	-	expression tag	UNP A6TH30
H	199	ALA	-	expression tag	UNP A6TH30
I	197	SER	-	expression tag	UNP A6TH30
I	198	ASN	-	expression tag	UNP A6TH30
I	199	ALA	-	expression tag	UNP A6TH30
J	197	SER	-	expression tag	UNP A6TH30
J	198	ASN	-	expression tag	UNP A6TH30
J	199	ALA	-	expression tag	UNP A6TH30
K	-2	SER	-	expression tag	UNP A6TH30
K	-1	ASN	-	expression tag	UNP A6TH30
K	0	ALA	-	expression tag	UNP A6TH30
L	197	SER	-	expression tag	UNP A6TH30
L	198	ASN	-	expression tag	UNP A6TH30
L	199	ALA	-	expression tag	UNP A6TH30

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	21	Total O 21 21	0	0
2	B	26	Total O 26 26	0	0
2	C	9	Total O 9 9	0	0
2	D	19	Total O 19 19	0	0

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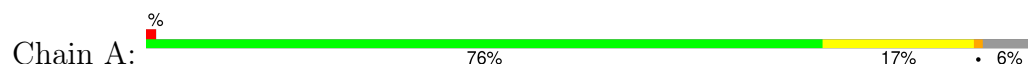
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	E	3	Total 3	O 3	0	0
2	F	12	Total 12	O 12	0	0
2	G	27	Total 27	O 27	0	0
2	H	11	Total 11	O 11	0	0
2	I	3	Total 3	O 3	0	0
2	J	8	Total 8	O 8	0	0
2	K	20	Total 20	O 20	0	0
2	L	27	Total 27	O 27	0	0

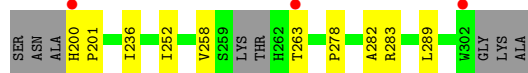
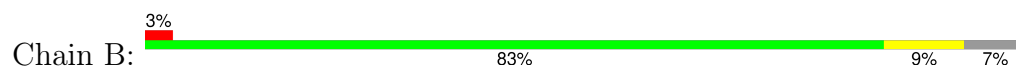
### 3 Residue-property plots [i](#)

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: Putative chaperone DnaJ



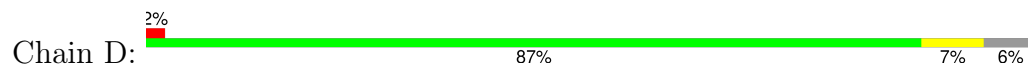
- Molecule 1: Putative chaperone DnaJ



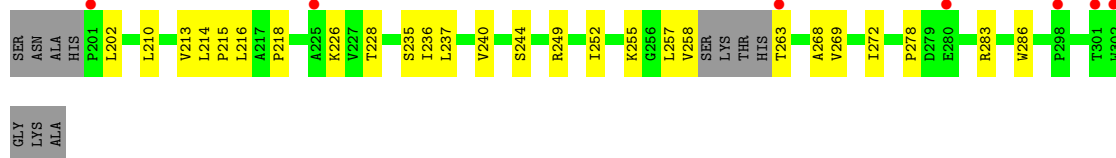
- Molecule 1: Putative chaperone DnaJ



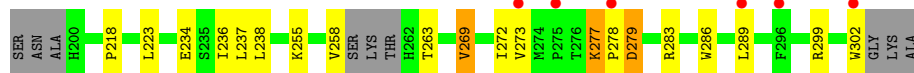
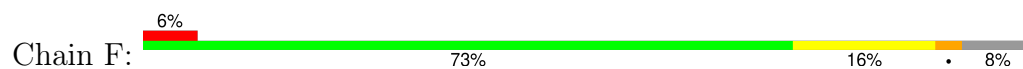
- Molecule 1: Putative chaperone DnaJ



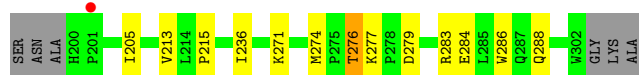
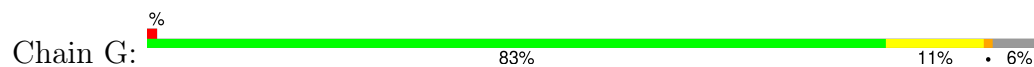
- Molecule 1: Putative chaperone DnaJ



- Molecule 1: Putative chaperone DnaJ



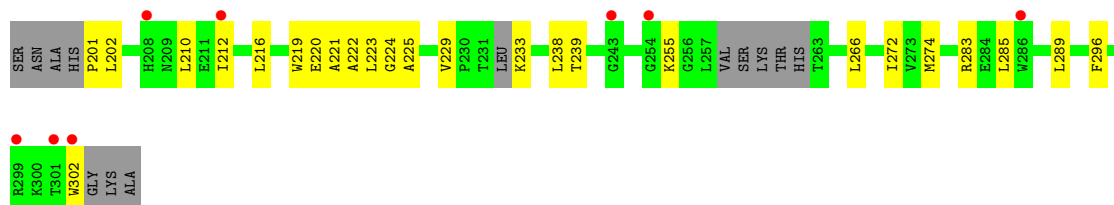
- Molecule 1: Putative chaperone DnaJ



- Molecule 1: Putative chaperone DnaJ



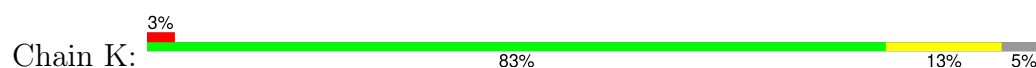
- Molecule 1: Putative chaperone DnaJ



- Molecule 1: Putative chaperone DnaJ



- Molecule 1: Putative chaperone DnaJ



- Molecule 1: Putative chaperone DnaJ



SER	ASN	ALA	HIS	P201	L202	G224	T231	L232	T236	Q248	K255	V258	SER	LYS	THR	HIS	T263	T270	K271	L272	N273	M274	P275	T276	K277	K281	Q287	Q288	L289	E293	V302	GLY	LYS	ALA
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.80Å 61.63Å 92.91Å 81.75° 78.71° 83.79°	Depositor
Resolution (Å)	90.54 – 2.30 90.39 – 2.30	Depositor EDS
% Data completeness (in resolution range)	98.1 (90.54-2.30) 98.1 (90.39-2.30)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.34 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.5.0051	Depositor
R, $R_{free}$	0.217 , 0.262 0.228 , 0.261	Depositor DCC
$R_{free}$ test set	2941 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.3	Xtriage
Anisotropy	0.163	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 47.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.014 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	9501	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 14.74% 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](#)

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	0.68	0/814	0.81	0/1107
1	B	0.70	0/817	0.84	0/1109
1	C	0.57	0/769	0.79	0/1044
1	D	0.68	0/823	0.83	0/1119
1	E	0.48	0/769	0.78	0/1044
1	F	0.54	0/791	0.80	0/1075
1	G	0.67	0/814	0.84	1/1107 (0.1%)
1	H	0.52	0/787	0.76	0/1069
1	I	0.47	0/752	0.74	0/1019
1	J	0.57	0/798	0.77	0/1085
1	K	0.61	0/818	0.83	0/1113
1	L	0.67	0/778	0.89	1/1056 (0.1%)
All	All	0.60	0/9530	0.81	2/12947 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	279	ASP	CB-CG-OD2	5.85	123.56	118.30
1	L	224	GLY	N-CA-C	-5.21	100.06	113.10

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	795	0	834	17	0
1	B	793	0	834	12	0
1	C	753	0	795	24	0
1	D	804	0	841	10	0
1	E	753	0	795	26	0
1	F	773	0	808	24	0
1	G	795	0	834	12	0
1	H	771	0	804	19	0
1	I	737	0	771	30	0
1	J	780	0	815	37	0
1	K	799	0	839	19	0
1	L	762	0	802	23	0
2	A	21	0	0	1	0
2	B	26	0	0	0	0
2	C	9	0	0	0	0
2	D	19	0	0	1	0
2	E	3	0	0	0	0
2	F	12	0	0	0	0
2	G	27	0	0	0	0
2	H	11	0	0	0	0
2	I	3	0	0	0	0
2	J	8	0	0	1	0
2	K	20	0	0	2	0
2	L	27	0	0	3	0
All	All	9501	0	9772	202	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 11.

The worst 5 of 202 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:C:236:ILE:HG21	1:C:252:ILE:HD13	1.28	1.12
1:J:238:LEU:HD23	1:J:239:THR:N	1.74	1.01
1:I:201:PRO:HB2	1:I:212:ILE:HD11	1.43	0.96
1:A:231:THR:HG23	2:A:118:HOH:O	1.73	0.89
1:C:231:THR:HG22	1:C:232:LEU:H	1.37	0.89

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	101/109 (93%)	95 (94%)	6 (6%)	0	100	100
1	B	99/109 (91%)	95 (96%)	4 (4%)	0	100	100
1	C	94/109 (86%)	88 (94%)	5 (5%)	1 (1%)	12	13
1	D	102/109 (94%)	95 (93%)	7 (7%)	0	100	100
1	E	94/109 (86%)	84 (89%)	10 (11%)	0	100	100
1	F	96/109 (88%)	87 (91%)	9 (9%)	0	100	100
1	G	101/109 (93%)	94 (93%)	6 (6%)	1 (1%)	13	15
1	H	96/109 (88%)	91 (95%)	5 (5%)	0	100	100
1	I	90/109 (83%)	79 (88%)	11 (12%)	0	100	100
1	J	97/109 (89%)	88 (91%)	8 (8%)	1 (1%)	13	15
1	K	102/109 (94%)	94 (92%)	8 (8%)	0	100	100
1	L	95/109 (87%)	94 (99%)	1 (1%)	0	100	100
All	All	1167/1308 (89%)	1084 (93%)	80 (7%)	3 (0%)	37	47

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	J	301	THR
1	C	280	GLU
1	G	276	THR

### 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	85/87 (98%)	83 (98%)	2 (2%)	44	61
1	B	85/87 (98%)	85 (100%)	0	100	100
1	C	80/87 (92%)	79 (99%)	1 (1%)	65	79
1	D	86/87 (99%)	86 (100%)	0	100	100
1	E	80/87 (92%)	80 (100%)	0	100	100
1	F	82/87 (94%)	79 (96%)	3 (4%)	29	43
1	G	85/87 (98%)	85 (100%)	0	100	100
1	H	82/87 (94%)	80 (98%)	2 (2%)	44	61
1	I	77/87 (88%)	77 (100%)	0	100	100
1	J	83/87 (95%)	82 (99%)	1 (1%)	67	81
1	K	84/87 (97%)	84 (100%)	0	100	100
1	L	81/87 (93%)	77 (95%)	4 (5%)	21	31
All	All	990/1044 (95%)	977 (99%)	13 (1%)	65	79

5 of 13 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	276	THR
1	J	265	ASP
1	L	293	GLU
1	L	255	LYS
1	L	281	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 8 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	245	GLN
1	K	287	GLN
1	K	200	HIS
1	J	262	HIS
1	K	245	GLN

### 5.3.3 RNA ⓘ

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 [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, 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	102/109 (93%)	-0.05	1 (0%) 79 79	17, 27, 44, 61	0
1	B	100/109 (91%)	-0.10	3 (3%) 52 54	10, 26, 42, 60	2 (2%)
1	C	97/109 (88%)	0.46	5 (5%) 34 35	16, 28, 37, 69	0
1	D	102/109 (93%)	-0.12	2 (1%) 64 66	14, 29, 39, 69	1 (0%)
1	E	97/109 (88%)	0.69	7 (7%) 23 24	22, 32, 37, 68	0
1	F	99/109 (90%)	0.54	6 (6%) 28 30	24, 31, 38, 72	0
1	G	102/109 (93%)	-0.08	1 (0%) 79 79	19, 28, 39, 66	0
1	H	98/109 (89%)	0.30	4 (4%) 42 43	18, 30, 37, 62	1 (1%)
1	I	95/109 (87%)	0.78	8 (8%) 18 20	23, 31, 46, 79	0
1	J	100/109 (91%)	0.68	6 (6%) 29 31	23, 32, 46, 79	0
1	K	103/109 (94%)	0.04	3 (2%) 54 55	18, 28, 42, 70	0
1	L	97/109 (88%)	0.03	2 (2%) 63 64	13, 28, 37, 68	1 (1%)
All	All	1192/1308 (91%)	0.26	48 (4%) 43 44	10, 30, 42, 79	5 (0%)

The worst 5 of 48 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	302	TRP	5.3
1	I	302	TRP	4.2
1	C	302	TRP	3.9
1	B	263	THR	3.1
1	C	301	THR	3.0

### 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 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.