



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 09:53 AM GMT

PDB ID : 3K1B  
Title : Structure of OmpF porin  
Authors : Kefala, G.; Ahn, C.; Krupa, M.; Maslennikov, I.; Kwiatkowski, W.; Choe, S.;  
Center for Structures of Membrane Proteins (CSMP)  
Deposited on : 2009-09-26  
Resolution : 4.39 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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  
<http://wwpdb.org/validation/2016/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  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

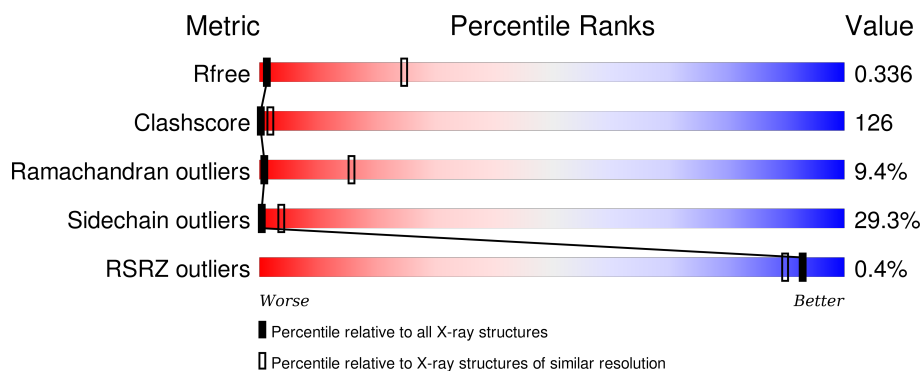
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 4.39 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))
$R_{free}$	91344	1063 (5.08-3.60)
Clashscore	102246	1171 (5.08-3.60)
Ramachandran outliers	100387	1110 (5.08-3.60)
Sidechain outliers	100360	1093 (5.08-3.60)
RSRZ outliers	91569	1067 (5.08-3.60)

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	340	<div> <div>16%</div> <div>51%</div> <div>27%</div> <div>6%</div> </div>
1	B	340	<div> <div>15%</div> <div>53%</div> <div>26%</div> <div>6%</div> </div>
1	C	340	<div> <div>19%</div> <div>54%</div> <div>22%</div> <div>5%</div> </div>
1	D	340	<div> <div>15%</div> <div>55%</div> <div>28%</div> <div>.</div> </div>

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 10508 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.

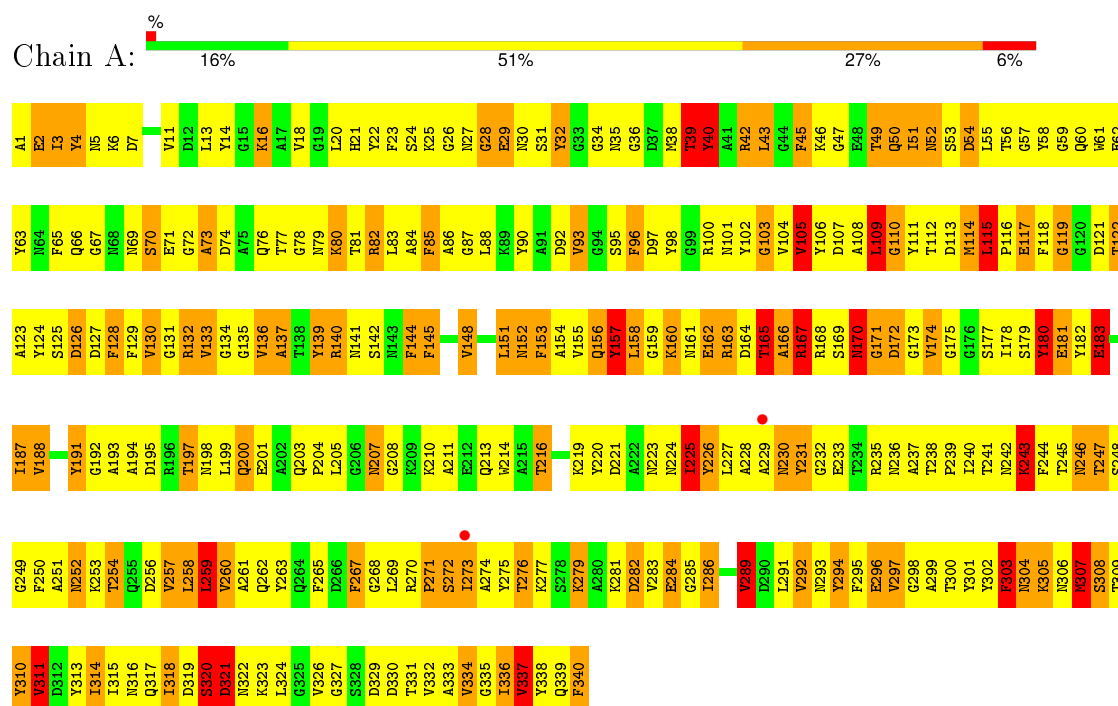
- Molecule 1 is a protein called Outer membrane protein F.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	340	Total	C	N	O	S	8	0	0
			2627	1654	438	532	3			
1	B	340	Total	C	N	O	S	0	0	0
			2627	1654	438	532	3			
1	C	340	Total	C	N	O	S	0	0	0
			2627	1654	438	532	3			
1	D	340	Total	C	N	O	S	0	0	0
			2627	1654	438	532	3			

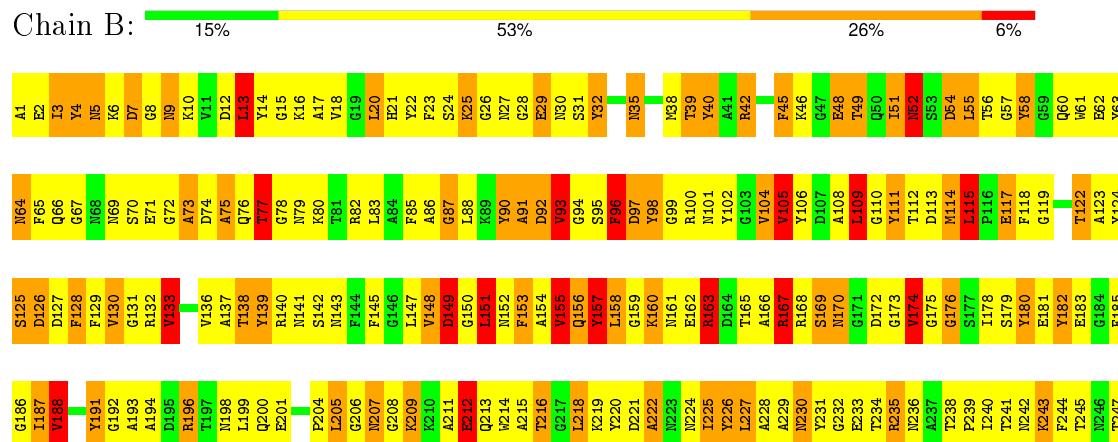
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Outer membrane protein F



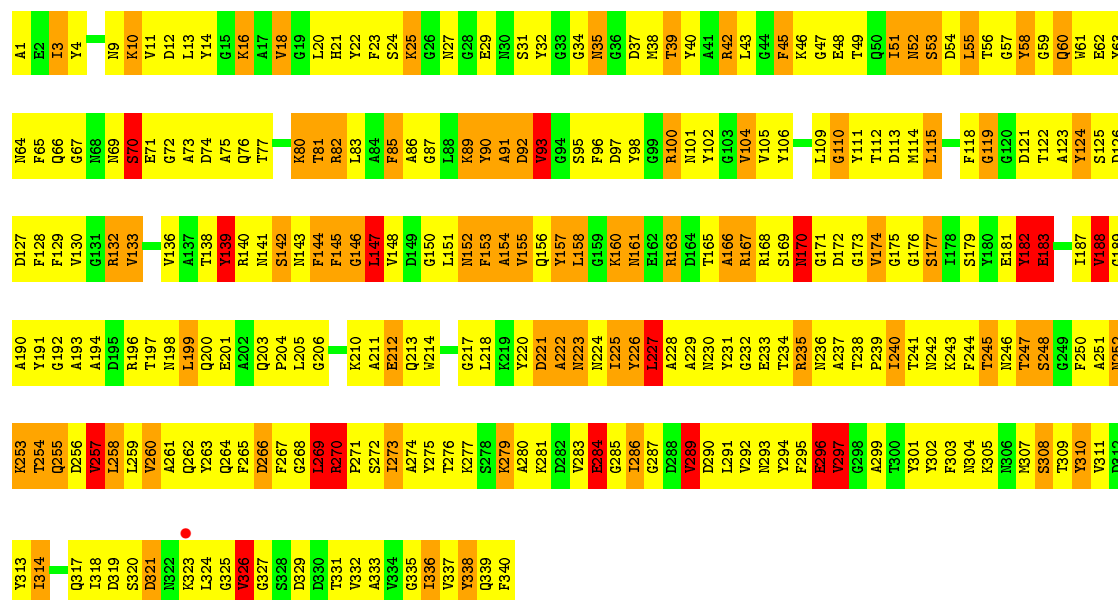
#### • Molecule 1: Outer membrane protein F





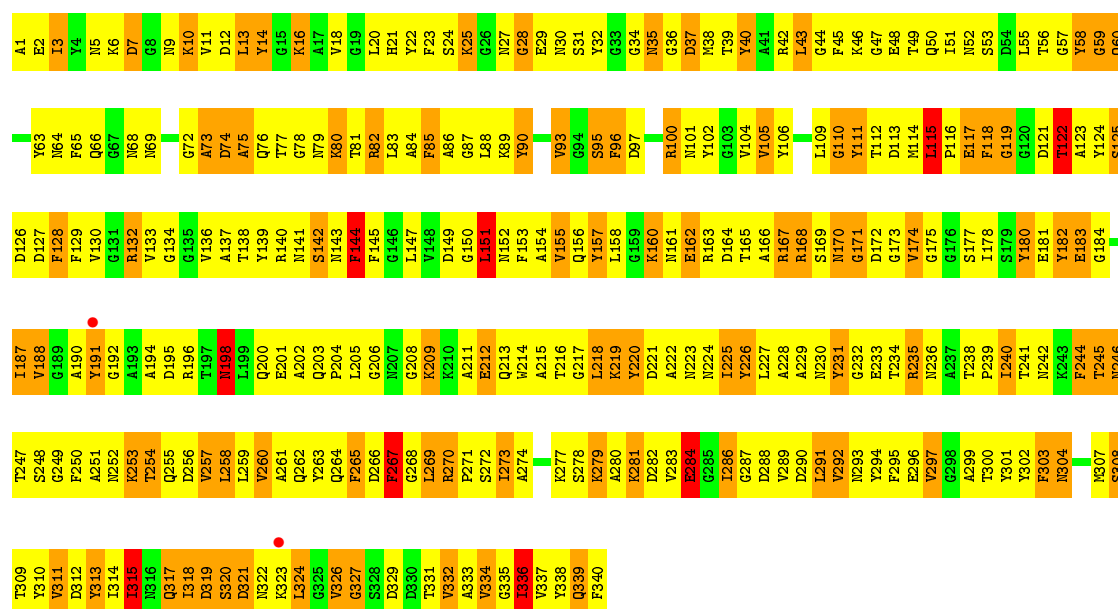
• Molecule 1: Outer membrane protein F

Chain C: 19% 54% 22% 5%



• Molecule 1: Outer membrane protein F

Chain D: 15% 55% 28% .



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	215.53Å 215.53Å 137.47Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 4.39 49.23 – 4.39	Depositor EDS
% Data completeness (in resolution range)	99.0 (50.00-4.39) 99.1 (49.23-4.39)	Depositor EDS
$R_{merge}$	0.21	Depositor
$R_{sym}$	0.21	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.90 (at 4.45Å)	Xtriage
Refinement program	REFMAC 5.5.0066	Depositor
R, $R_{free}$	0.264 , 0.329 0.273 , 0.336	Depositor DCC
$R_{free}$ test set	1211 reflections (5.42%)	DCC
Wilson B-factor (Å <sup>2</sup> )	91.5	Xtriage
Anisotropy	0.084	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.23 , 104.0	EDS
Estimated twinning fraction	0.003 for -h,-k,l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	1 of 23572 reflections (0.004%)	Xtriage
$F_o, F_c$ correlation	0.77	EDS
Total number of atoms	10508	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	126.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.22% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	1.34	11/2683 (0.4%)	1.43	24/3628 (0.7%)
1	B	1.36	13/2683 (0.5%)	1.44	33/3628 (0.9%)
1	C	1.31	13/2683 (0.5%)	1.41	24/3628 (0.7%)
1	D	1.26	9/2683 (0.3%)	1.37	21/3628 (0.6%)
All	All	1.32	46/10732 (0.4%)	1.41	102/14512 (0.7%)

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	3
1	B	0	1
1	C	0	1
1	D	0	2
All	All	0	7

The worst 5 of 46 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	59	GLY	CA-C	9.52	1.67	1.51
1	B	157	TYR	CD1-CE1	9.44	1.53	1.39
1	A	311	VAL	CA-CB	-7.75	1.38	1.54
1	C	296	GLU	CG-CD	7.72	1.63	1.51
1	C	301	TYR	CD2-CE2	-7.41	1.28	1.39

The worst 5 of 102 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	168	ARG	NE-CZ-NH1	-12.77	113.92	120.30
1	B	269	LEU	CA-CB-CG	-11.18	89.59	115.30
1	D	182	TYR	CA-CB-CG	-9.08	96.14	113.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	324	LEU	CB-CG-CD2	-9.06	95.59	111.00
1	A	133	VAL	CB-CA-C	-8.98	94.33	111.40

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	137	ALA	Peptide
1	A	164	ASP	Peptide
1	A	321	ASP	Peptide
1	B	176	GLY	Peptide
1	C	255	GLN	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	2627	0	2442	772	0
1	B	2627	0	2443	693	5
1	C	2627	0	2444	650	2
1	D	2627	0	2444	608	1
All	All	10508	0	9773	2562	6

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 126.

The worst 5 of 2562 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:258:LEU:CD1	1:A:276:THR:HG23	1.28	1.58
1:A:313:TYR:CD1	1:A:332:VAL:CG2	1.86	1.58
1:A:114:MET:HE1	1:A:226:TYR:CE1	1.39	1.55
1:A:191:TYR:HD2	1:A:192:GLY:N	1.06	1.53
1:A:313:TYR:HD1	1:A:332:VAL:CG2	1.19	1.52

The worst 5 of 6 symmetry-related close contacts are listed below. The label for Atom-2 includes



the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:6:LYS:CB	1:B:6:LYS:NZ[5_555]	1.70	0.50
1:B:6:LYS:C	1:B:6:LYS:NZ[5_555]	1.91	0.29
1:B:6:LYS:CA	1:B:6:LYS:NZ[5_555]	1.96	0.24
1:C:287:GLY:CA	1:D:321:ASP:OD1[2_565]	1.97	0.23
1:B:287:GLY:CA	1:C:321:ASP:OD1[3_455]	2.07	0.13

## 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	338/340 (99%)	255 (75%)	47 (14%)	36 (11%)	0	11
1	B	338/340 (99%)	270 (80%)	41 (12%)	27 (8%)	1	19
1	C	338/340 (99%)	255 (75%)	53 (16%)	30 (9%)	1	17
1	D	338/340 (99%)	256 (76%)	48 (14%)	34 (10%)	1	13
All	All	1352/1360 (99%)	1036 (77%)	189 (14%)	127 (9%)	1	16

5 of 127 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	29	GLU
1	A	52	ASN
1	A	73	ALA
1	A	115	LEU
1	A	119	GLY

### 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	263/263 (100%)	174 (66%)	89 (34%)	0	2
1	B	263/263 (100%)	184 (70%)	79 (30%)	0	3
1	C	263/263 (100%)	192 (73%)	71 (27%)	0	5
1	D	263/263 (100%)	194 (74%)	69 (26%)	0	6
All	All	1052/1052 (100%)	744 (71%)	308 (29%)	0	4

5 of 308 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	209	LYS
1	C	29	GLU
1	D	246	ASN
1	B	226	TYR
1	B	289	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	60	GLN
1	B	316	ASN
1	D	101	ASN
1	B	69	ASN
1	C	35	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates 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	339/340 (99%)	-0.26	2 (0%) 90 86	71, 125, 137, 149	0
1	B	340/340 (100%)	-0.36	1 (0%) 94 92	99, 122, 134, 139	0
1	C	340/340 (100%)	-0.37	1 (0%) 94 92	101, 124, 138, 146	0
1	D	340/340 (100%)	-0.21	2 (0%) 90 86	118, 135, 147, 157	0
All	All	1359/1360 (99%)	-0.30	6 (0%) 93 90	71, 126, 142, 157	0

The worst 5 of 6 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	273	ILE	2.6
1	C	323	LYS	2.5
1	A	229	ALA	2.3
1	B	323	LYS	2.3
1	D	323	LYS	2.3

### 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.