



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 14, 2017 – 03:17 pm GMT

PDB ID : 1CAX  
Title : DETERMINATION OF THREE CRYSTAL STRUCTURES OF  
CANAVALIN BY MOLECULAR REPLACEMENT  
Authors : Ko, T-P.; Ng, J.D.; Day, J.; Greenwood, A.; McPherson, A.  
Deposited on : 1993-06-10  
Resolution : 2.60 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  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : recalc28949

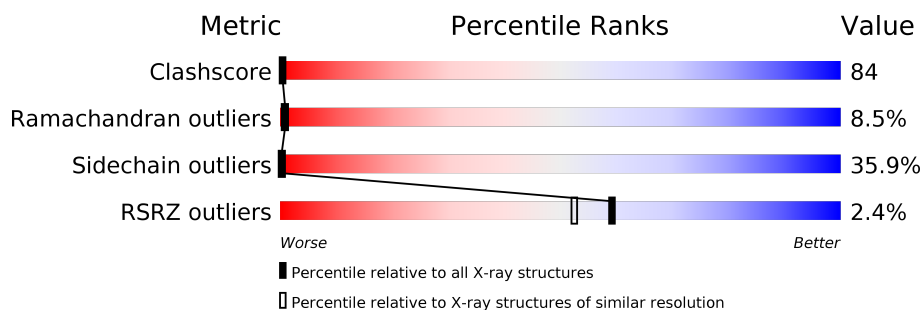
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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))
Clashscore	112137	2895 (2.60-2.60)
Ramachandran outliers	110173	2848 (2.60-2.60)
Sidechain outliers	110143	2848 (2.60-2.60)
RSRZ outliers	101464	2550 (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  $\geq 3$ , 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	181	<div> <div>12%</div> <div>47%</div> <div>30%</div> <div>10%</div> </div>
1	C	181	<div> <div>14%</div> <div>43%</div> <div>33%</div> <div>10%</div> </div>
1	E	181	<div> <div>19%</div> <div>43%</div> <div>29%</div> <div>8%</div> </div>
2	B	184	<div> <div>17%</div> <div>41%</div> <div>34%</div> <div>8%</div> </div>
2	D	184	<div> <div>17%</div> <div>42%</div> <div>32%</div> <div>9%</div> </div>
2	F	184	<div> <div>19%</div> <div>39%</div> <div>27%</div> <div>15%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8790 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 CANAVALIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	181	Total	C	N	O	S	0	0	0
			1480	946	251	281	2			
1	C	181	Total	C	N	O	S	0	0	0
			1480	946	251	281	2			
1	E	181	Total	C	N	O	S	0	0	0
			1480	946	251	281	2			

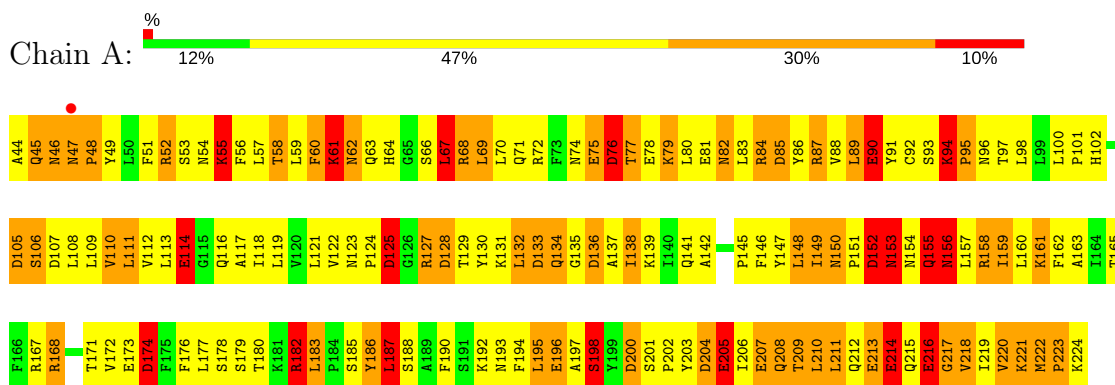
- Molecule 2 is a protein called CANAVALIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	184	Total	C	N	O	S	0	0	0
			1450	902	255	289	4			
2	D	184	Total	C	N	O	S	0	0	0
			1450	902	255	289	4			
2	F	184	Total	C	N	O	S	0	0	0
			1450	902	255	289	4			

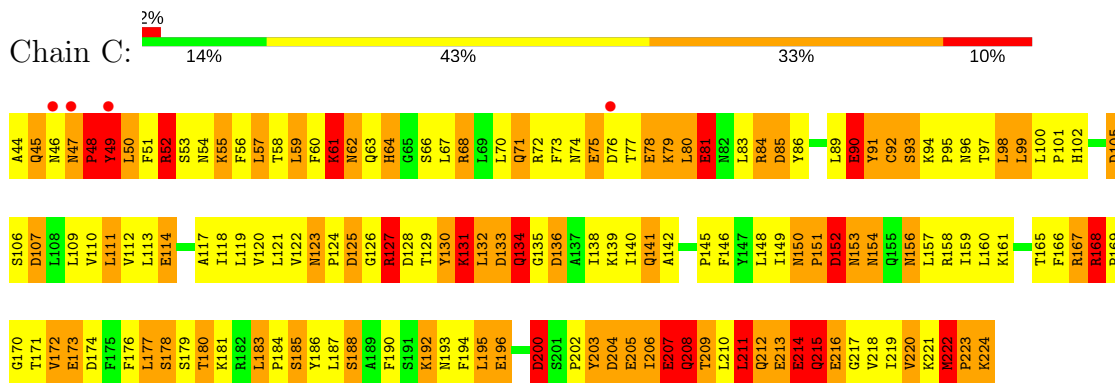
### 3 Residue-property plots

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

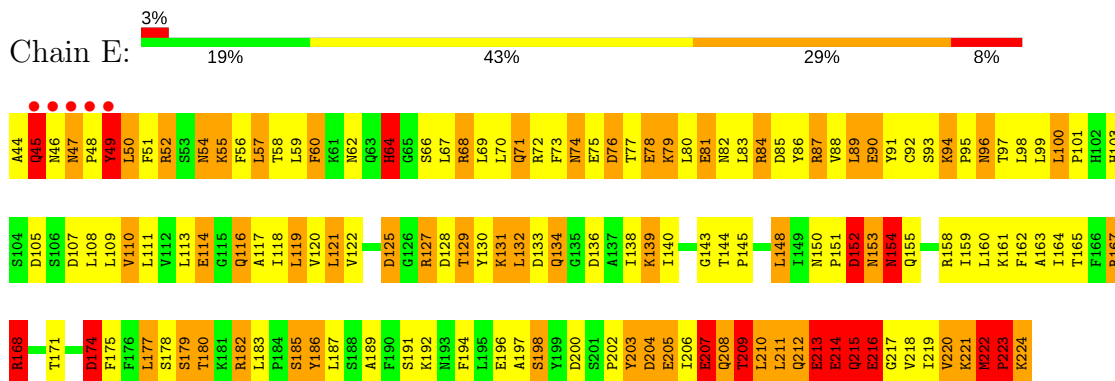
#### • Molecule 1: CANAVALIN



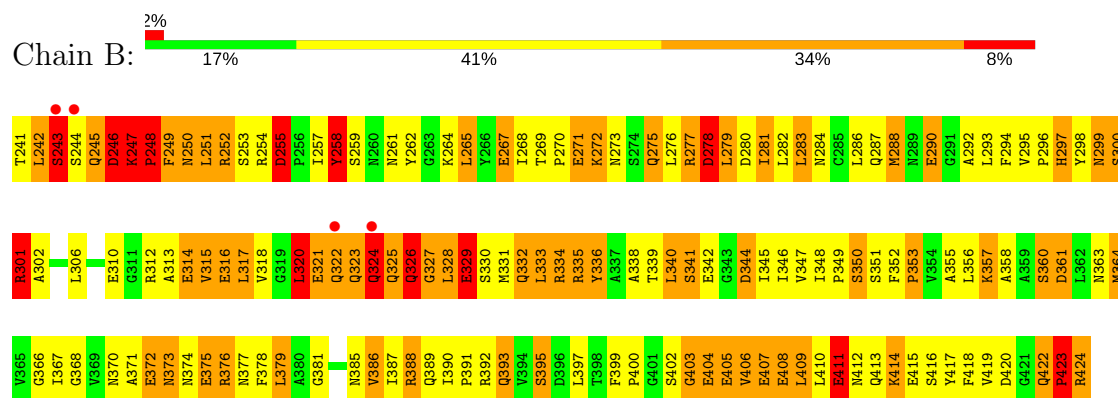
#### • Molecule 1: CANAVALIN



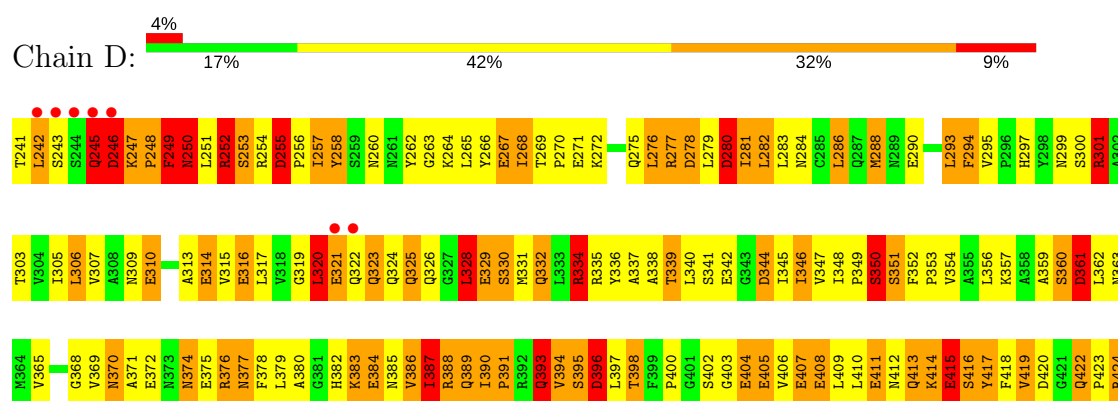
#### • Molecule 1: CANAVALIN



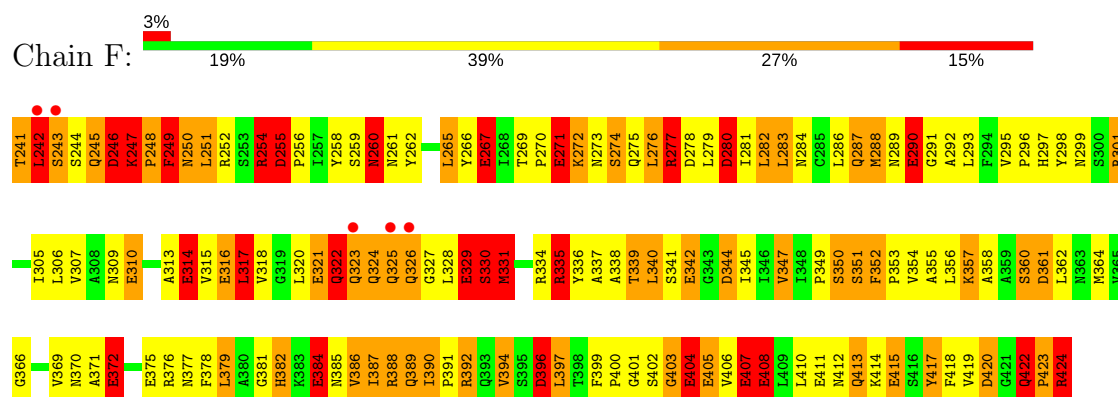
• Molecule 2: CANAVALIN



• Molecule 2: CANAVALIN



• Molecule 2: CANAVALIN



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	136.50Å 150.30Å 133.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.60 32.31 – 2.57	Depositor EDS
% Data completeness (in resolution range)	(Not available) (8.00-2.60) 66.0 (32.31-2.57)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.10 (at 2.57Å)	Xtriage
Refinement program	TNT	Depositor
R, $R_{free}$	0.175 , (Not available) 0.186 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	DCC
Wilson B-factor (Å <sup>2</sup> )	32.0	Xtriage
Anisotropy	0.290	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 132.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	8790	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.15% 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	1.30	10/1511 (0.7%)	1.70	43/2046 (2.1%)
1	C	1.35	13/1511 (0.9%)	1.65	36/2046 (1.8%)
1	E	1.30	10/1511 (0.7%)	1.72	35/2046 (1.7%)
2	B	1.40	17/1472 (1.2%)	1.70	33/1992 (1.7%)
2	D	1.37	18/1472 (1.2%)	1.63	29/1992 (1.5%)
2	F	1.41	20/1472 (1.4%)	1.71	31/1992 (1.6%)
All	All	1.36	88/8949 (1.0%)	1.68	207/12114 (1.7%)

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	3	1
1	C	2	0
1	E	4	0
2	B	0	1
2	D	3	0
2	F	5	0
All	All	17	2

The worst 5 of 88 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	114	GLU	CD-OE1	9.95	1.36	1.25
2	B	375	GLU	CD-OE2	9.47	1.36	1.25
2	F	321	GLU	CD-OE2	8.85	1.35	1.25
2	D	314	GLU	CD-OE2	8.54	1.35	1.25
1	E	90	GLU	CD-OE1	8.51	1.35	1.25

The worst 5 of 207 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	222	MET	C-N-CD	-20.50	75.50	120.60
1	A	94	LYS	C-N-CD	-12.62	92.83	120.60
2	F	277	ARG	NE-CZ-NH1	10.89	125.75	120.30
1	C	152	ASP	CB-CG-OD2	-9.96	109.33	118.30
2	F	249	PHE	N-CA-CB	9.91	128.44	110.60

5 of 17 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	55	LYS	CA
1	A	155	GLN	CA
1	A	196	GLU	CA
1	C	58	THR	CA
1	C	208	GLN	CA

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	198	SER	Mainchain
2	B	329	GLU	Sidechain

## 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	1480	0	1473	280	0
1	C	1480	0	1473	286	0
1	E	1480	0	1473	277	0
2	B	1450	0	1425	275	1
2	D	1450	0	1425	286	0
2	F	1450	0	1425	294	1
All	All	8790	0	8694	1463	1

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 84.

The worst 5 of 1463 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)
2:D:402:SER:HB3	2:D:405:GLU:HB2	1.23	1.20
2:F:404:GLU:HA	2:F:407:GLU:HB2	1.23	1.20
1:E:222:MET:CG	1:E:223:PRO:HD3	1.71	1.19
1:A:168:ARG:HE	2:D:322:GLN:HA	1.08	1.18
1:E:222:MET:HG3	1:E:223:PRO:CD	1.75	1.14

All (1) 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)
2:B:273:ASN:OD1	2:F:243:SER:O[3_655]	2.12	0.08

## 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	179/181 (99%)	134 (75%)	28 (16%)	17 (10%)	1	0
1	C	179/181 (99%)	134 (75%)	26 (14%)	19 (11%)	0	0
1	E	179/181 (99%)	139 (78%)	27 (15%)	13 (7%)	1	1
2	B	182/184 (99%)	137 (75%)	31 (17%)	14 (8%)	1	1
2	D	182/184 (99%)	134 (74%)	32 (18%)	16 (9%)	1	1
2	F	182/184 (99%)	140 (77%)	29 (16%)	13 (7%)	1	1
All	All	1083/1095 (99%)	818 (76%)	173 (16%)	92 (8%)	1	1

5 of 92 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	45	GLN
1	A	152	ASP
1	A	153	ASN
1	A	217	GLY

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Mol	Chain	Res	Type
1	A	222	MET

### 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	167/167 (100%)	107 (64%)	60 (36%)	0	0
1	C	167/167 (100%)	113 (68%)	54 (32%)	0	0
1	E	167/167 (100%)	113 (68%)	54 (32%)	0	0
2	B	161/161 (100%)	106 (66%)	55 (34%)	0	0
2	D	161/161 (100%)	98 (61%)	63 (39%)	0	0
2	F	161/161 (100%)	94 (58%)	67 (42%)	0	0
All	All	984/984 (100%)	631 (64%)	353 (36%)	0	0

5 of 353 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	195	LEU
2	D	306	LEU
2	F	347	VAL
1	C	212	GLN
2	D	254	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 45 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	134	GLN
2	D	261	ASN
2	F	324	GLN
1	C	150	ASN
2	D	322	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 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	181/181 (100%)	-0.91	1 (0%) 89 88	8, 20, 30, 41	0
1	C	181/181 (100%)	-0.72	4 (2%) 62 56	8, 20, 32, 39	0
1	E	181/181 (100%)	-0.70	5 (2%) 53 46	5, 18, 33, 42	0
2	B	184/184 (100%)	-0.69	4 (2%) 62 56	6, 17, 32, 40	0
2	D	184/184 (100%)	-0.79	7 (3%) 41 33	7, 20, 33, 41	0
2	F	184/184 (100%)	-0.77	5 (2%) 55 48	6, 20, 33, 42	0
All	All	1095/1095 (100%)	-0.76	26 (2%) 59 52	5, 19, 33, 42	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	48	PRO	5.3
1	C	47	ASN	4.1
2	B	243	SER	4.0
2	F	243	SER	3.8
2	D	243	SER	3.7

### 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.