



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 12, 2024 – 02:49 PM EST

PDB ID : 3KOP  
Title : Crystal structure of Protein with a cyclophilin-like fold (YP\_831253.1) from *Arthrobacter* sp. FB24 at 1.90 Å resolution  
Authors : Joint Center for Structural Genomics (JCSG)  
Deposited on : 2009-11-13  
Resolution : 1.90 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

<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



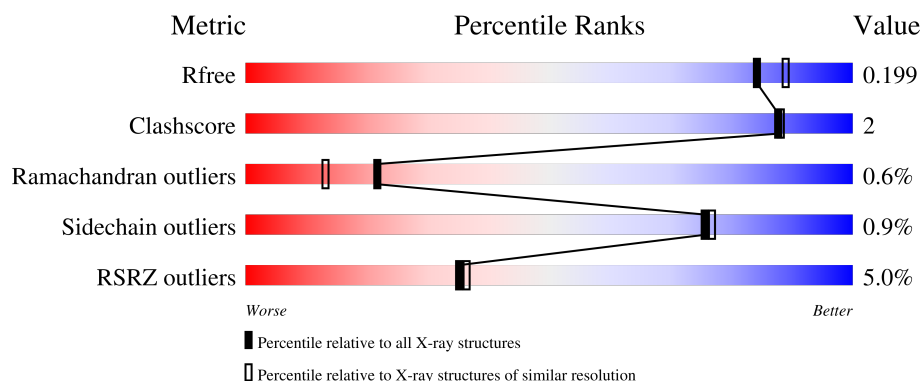
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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	7293 (1.90-1.90)
Clashscore	180529	8090 (1.90-1.90)
Ramachandran outliers	177936	8022 (1.90-1.90)
Sidechain outliers	177891	8022 (1.90-1.90)
RSRZ outliers	164620	7292 (1.90-1.90)

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	188	<div> <div>5%</div> <div> <div></div> <div>79%</div> <div>5%</div> <div>16%</div> </div> </div>
1	B	188	<div> <div>5%</div> <div> <div></div> <div>81%</div> <div>•</div> <div>17%</div> </div> </div>
1	C	188	<div> <div>4%</div> <div> <div></div> <div>81%</div> <div>7%</div> <div>12%</div> </div> </div>
1	D	188	<div> <div>3%</div> <div> <div></div> <div>79%</div> <div>5%</div> <div>16%</div> </div> </div>
1	E	188	<div> <div>5%</div> <div> <div></div> <div>85%</div> <div>•</div> <div>12%</div> </div> </div>

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Mol	Chain	Length	Quality of chain
1	F	188	<div><div></div><div>4%</div><div>83%</div><div>6%</div><div>10%</div></div>



## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8455 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	158	Total	C	N	O	S	Se	0	6	0
			1237	790	204	238	3	2			
1	B	156	Total	C	N	O	S	Se	0	4	0
			1206	769	202	230	3	2			
1	C	165	Total	C	N	O	S	Se	0	9	0
			1320	848	217	249	3	3			
1	D	158	Total	C	N	O	S	Se	0	4	0
			1228	784	203	235	3	3			
1	E	165	Total	C	N	O	S	Se	0	6	0
			1304	837	214	247	3	3			
1	F	169	Total	C	N	O	S	Se	0	6	0
			1341	855	232	248	3	3			

There are 114 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MSE	-	expression tag	UNP A0JVT3
A	-17	GLY	-	expression tag	UNP A0JVT3
A	-16	SER	-	expression tag	UNP A0JVT3
A	-15	ASP	-	expression tag	UNP A0JVT3
A	-14	LYS	-	expression tag	UNP A0JVT3
A	-13	ILE	-	expression tag	UNP A0JVT3
A	-12	HIS	-	expression tag	UNP A0JVT3
A	-11	HIS	-	expression tag	UNP A0JVT3
A	-10	HIS	-	expression tag	UNP A0JVT3
A	-9	HIS	-	expression tag	UNP A0JVT3
A	-8	HIS	-	expression tag	UNP A0JVT3
A	-7	HIS	-	expression tag	UNP A0JVT3
A	-6	GLU	-	expression tag	UNP A0JVT3
A	-5	ASN	-	expression tag	UNP A0JVT3
A	-4	LEU	-	expression tag	UNP A0JVT3
A	-3	TYR	-	expression tag	UNP A0JVT3
A	-2	PHE	-	expression tag	UNP A0JVT3

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLN	-	expression tag	UNP A0JVT3
A	0	GLY	-	expression tag	UNP A0JVT3
B	-18	MSE	-	expression tag	UNP A0JVT3
B	-17	GLY	-	expression tag	UNP A0JVT3
B	-16	SER	-	expression tag	UNP A0JVT3
B	-15	ASP	-	expression tag	UNP A0JVT3
B	-14	LYS	-	expression tag	UNP A0JVT3
B	-13	ILE	-	expression tag	UNP A0JVT3
B	-12	HIS	-	expression tag	UNP A0JVT3
B	-11	HIS	-	expression tag	UNP A0JVT3
B	-10	HIS	-	expression tag	UNP A0JVT3
B	-9	HIS	-	expression tag	UNP A0JVT3
B	-8	HIS	-	expression tag	UNP A0JVT3
B	-7	HIS	-	expression tag	UNP A0JVT3
B	-6	GLU	-	expression tag	UNP A0JVT3
B	-5	ASN	-	expression tag	UNP A0JVT3
B	-4	LEU	-	expression tag	UNP A0JVT3
B	-3	TYR	-	expression tag	UNP A0JVT3
B	-2	PHE	-	expression tag	UNP A0JVT3
B	-1	GLN	-	expression tag	UNP A0JVT3
B	0	GLY	-	expression tag	UNP A0JVT3
C	-18	MSE	-	expression tag	UNP A0JVT3
C	-17	GLY	-	expression tag	UNP A0JVT3
C	-16	SER	-	expression tag	UNP A0JVT3
C	-15	ASP	-	expression tag	UNP A0JVT3
C	-14	LYS	-	expression tag	UNP A0JVT3
C	-13	ILE	-	expression tag	UNP A0JVT3
C	-12	HIS	-	expression tag	UNP A0JVT3
C	-11	HIS	-	expression tag	UNP A0JVT3
C	-10	HIS	-	expression tag	UNP A0JVT3
C	-9	HIS	-	expression tag	UNP A0JVT3
C	-8	HIS	-	expression tag	UNP A0JVT3
C	-7	HIS	-	expression tag	UNP A0JVT3
C	-6	GLU	-	expression tag	UNP A0JVT3
C	-5	ASN	-	expression tag	UNP A0JVT3
C	-4	LEU	-	expression tag	UNP A0JVT3
C	-3	TYR	-	expression tag	UNP A0JVT3
C	-2	PHE	-	expression tag	UNP A0JVT3
C	-1	GLN	-	expression tag	UNP A0JVT3
C	0	GLY	-	expression tag	UNP A0JVT3
D	-18	MSE	-	expression tag	UNP A0JVT3
D	-17	GLY	-	expression tag	UNP A0JVT3

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-16	SER	-	expression tag	UNP A0JVT3
D	-15	ASP	-	expression tag	UNP A0JVT3
D	-14	LYS	-	expression tag	UNP A0JVT3
D	-13	ILE	-	expression tag	UNP A0JVT3
D	-12	HIS	-	expression tag	UNP A0JVT3
D	-11	HIS	-	expression tag	UNP A0JVT3
D	-10	HIS	-	expression tag	UNP A0JVT3
D	-9	HIS	-	expression tag	UNP A0JVT3
D	-8	HIS	-	expression tag	UNP A0JVT3
D	-7	HIS	-	expression tag	UNP A0JVT3
D	-6	GLU	-	expression tag	UNP A0JVT3
D	-5	ASN	-	expression tag	UNP A0JVT3
D	-4	LEU	-	expression tag	UNP A0JVT3
D	-3	TYR	-	expression tag	UNP A0JVT3
D	-2	PHE	-	expression tag	UNP A0JVT3
D	-1	GLN	-	expression tag	UNP A0JVT3
D	0	GLY	-	expression tag	UNP A0JVT3
E	-18	MSE	-	expression tag	UNP A0JVT3
E	-17	GLY	-	expression tag	UNP A0JVT3
E	-16	SER	-	expression tag	UNP A0JVT3
E	-15	ASP	-	expression tag	UNP A0JVT3
E	-14	LYS	-	expression tag	UNP A0JVT3
E	-13	ILE	-	expression tag	UNP A0JVT3
E	-12	HIS	-	expression tag	UNP A0JVT3
E	-11	HIS	-	expression tag	UNP A0JVT3
E	-10	HIS	-	expression tag	UNP A0JVT3
E	-9	HIS	-	expression tag	UNP A0JVT3
E	-8	HIS	-	expression tag	UNP A0JVT3
E	-7	HIS	-	expression tag	UNP A0JVT3
E	-6	GLU	-	expression tag	UNP A0JVT3
E	-5	ASN	-	expression tag	UNP A0JVT3
E	-4	LEU	-	expression tag	UNP A0JVT3
E	-3	TYR	-	expression tag	UNP A0JVT3
E	-2	PHE	-	expression tag	UNP A0JVT3
E	-1	GLN	-	expression tag	UNP A0JVT3
E	0	GLY	-	expression tag	UNP A0JVT3
F	-18	MSE	-	expression tag	UNP A0JVT3
F	-17	GLY	-	expression tag	UNP A0JVT3
F	-16	SER	-	expression tag	UNP A0JVT3
F	-15	ASP	-	expression tag	UNP A0JVT3
F	-14	LYS	-	expression tag	UNP A0JVT3
F	-13	ILE	-	expression tag	UNP A0JVT3

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-12	HIS	-	expression tag	UNP A0JVT3
F	-11	HIS	-	expression tag	UNP A0JVT3
F	-10	HIS	-	expression tag	UNP A0JVT3
F	-9	HIS	-	expression tag	UNP A0JVT3
F	-8	HIS	-	expression tag	UNP A0JVT3
F	-7	HIS	-	expression tag	UNP A0JVT3
F	-6	GLU	-	expression tag	UNP A0JVT3
F	-5	ASN	-	expression tag	UNP A0JVT3
F	-4	LEU	-	expression tag	UNP A0JVT3
F	-3	TYR	-	expression tag	UNP A0JVT3
F	-2	PHE	-	expression tag	UNP A0JVT3
F	-1	GLN	-	expression tag	UNP A0JVT3
F	0	GLY	-	expression tag	UNP A0JVT3

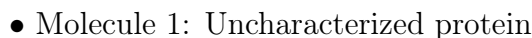
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	132	Total O 133 133	0	1
2	B	143	Total O 144 144	0	1
2	C	153	Total O 154 154	0	1
2	D	93	Total O 93 93	0	0
2	E	144	Total O 145 145	0	1
2	F	149	Total O 150 150	0	1

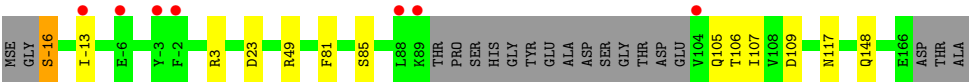
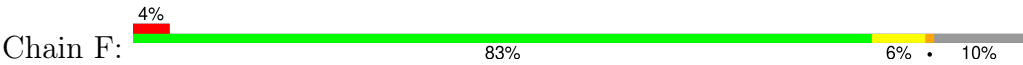




- Molecule 1: Uncharacterized protein









## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.29Å 98.10Å 84.50Å 90.00° 93.19° 90.00°	Depositor
Resolution (Å)	29.91 – 1.90 29.91 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.3 (29.91-1.90) 99.3 (29.91-1.90)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.22 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.5.0053, PHENIX	Depositor
R, $R_{free}$	0.160 , 0.196 0.167 , 0.199	Depositor DCC
$R_{free}$ test set	4416 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	18.8	Xtriage
Anisotropy	0.367	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 49.2	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	0.96	EDS
Total number of atoms	8455	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.79% 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	0.73	0/1281	0.73	1/1748 (0.1%)
1	B	0.73	0/1243	0.73	0/1697
1	C	0.72	0/1374	0.69	1/1867 (0.1%)
1	D	0.65	0/1265	0.69	0/1724
1	E	0.73	0/1349	0.74	2/1836 (0.1%)
1	F	0.72	0/1389	0.71	1/1890 (0.1%)
All	All	0.71	0/7901	0.71	5/10762 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	109	ASP	CB-CG-OD1	6.14	123.82	118.30
1	E	109	ASP	CB-CG-OD2	-6.09	112.82	118.30
1	F	23	ASP	CB-CG-OD1	5.83	123.55	118.30
1	C	23	ASP	CB-CG-OD1	5.60	123.34	118.30
1	A	77	ASP	CB-CG-OD1	5.16	122.94	118.30

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	1237	0	1205	6	0
1	B	1206	0	1177	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	1320	0	1313	11	0
1	D	1228	0	1201	6	0
1	E	1304	0	1285	5	0
1	F	1341	0	1299	8	0
2	A	133	0	0	3	0
2	B	144	0	0	0	0
2	C	154	0	0	3	0
2	D	93	0	0	0	0
2	E	145	0	0	0	0
2	F	150	0	0	0	0
All	All	8455	0	7480	29	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 2.

The worst 5 of 29 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:90:THR:HG22	2:A:696:HOH:O	1.96	0.66
1:C:94:GLY:HA3	1:E:148[A]:GLN:HE22	1.64	0.62
1:C:148[A]:GLN:NE2	1:E:94:GLY:HA3	2.14	0.62
2:A:258:HOH:O	1:B:92:SER:HA	2.00	0.61
1:A:92:SER:HA	2:A:192:HOH:O	2.02	0.59

There are no symmetry-related clashes.

## 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	160/188 (85%)	158 (99%)	1 (1%)	1 (1%)	22	13
1	B	156/188 (83%)	153 (98%)	2 (1%)	1 (1%)	22	13

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	170/188 (90%)	166 (98%)	3 (2%)	1 (1%)	22	13
1	D	158/188 (84%)	155 (98%)	2 (1%)	1 (1%)	22	13
1	E	167/188 (89%)	164 (98%)	2 (1%)	1 (1%)	22	13
1	F	171/188 (91%)	170 (99%)	0	1 (1%)	22	13
All	All	982/1128 (87%)	966 (98%)	10 (1%)	6 (1%)	22	13

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	49	ARG
1	A	49	ARG
1	B	49	ARG
1	D	49	ARG
1	E	49	ARG

### 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	132/151 (87%)	131 (99%)	1 (1%)	79	80
1	B	128/151 (85%)	127 (99%)	1 (1%)	79	80
1	C	143/151 (95%)	143 (100%)	0	100	100
1	D	131/151 (87%)	130 (99%)	1 (1%)	79	80
1	E	140/151 (93%)	140 (100%)	0	100	100
1	F	142/151 (94%)	138 (97%)	4 (3%)	38	33
All	All	816/906 (90%)	809 (99%)	7 (1%)	75	77

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	-16	SER
1	F	3	ARG

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Mol	Chain	Res	Type
1	F	105	GLN
1	F	85	SER
1	D	1	MSE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 [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	155/188 (82%)	-0.30	9 (5%)	30	31	8, 15, 44, 58	6 (3%)
1	B	153/188 (81%)	-0.37	9 (5%)	29	30	8, 16, 37, 50	4 (2%)
1	C	162/188 (86%)	-0.39	7 (4%)	40	42	8, 16, 34, 45	9 (5%)
1	D	155/188 (82%)	-0.03	6 (3%)	44	45	8, 16, 37, 46	4 (2%)
1	E	162/188 (86%)	-0.32	10 (6%)	28	29	8, 16, 36, 45	6 (3%)
1	F	166/188 (88%)	-0.23	7 (4%)	41	43	8, 16, 39, 45	6 (3%)
All	All	953/1128 (84%)	-0.27	48 (5%)	35	36	8, 16, 38, 58	35 (3%)

The worst 5 of 48 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	94	GLY	7.3
1	B	91	PRO	5.9
1	B	90	THR	5.6
1	B	92	SER	5.4
1	A	95	TYR	5.1

### 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.