



# wwPDB X-ray Structure Validation Summary Report

Aug 22, 2023 – 10:39 PM EDT

PDB ID : 3DSN  
Title : Crystal structure of the complex of the Caf1M chaperone with the mini-fiber of two Caf1 subunits (Caf1:Caf1), carrying the Thr7Phe mutation in the Gd donor strand  
Authors : Fooks, L.J.; Yu, X.; Moslehi-Mohebi, E.; Tischenko, V.; Knight, S.D.; MacIntyre, S.; Zavialov, A.V.  
Deposited on : 2008-07-13  
Resolution : 2.20 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  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

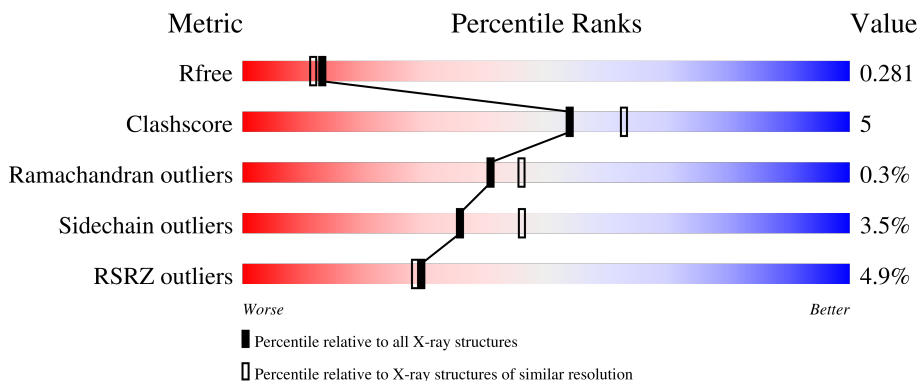
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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))
$R_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	235	 3% 74% 10% 15%
1	D	235	 6% 68% 13% 19%
2	B	149	 10% 82% 15% 2%
2	C	149	 3% 77% 11% 11%
2	E	149	 2% 87% 13% 2%

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Mol	Chain	Length	Quality of chain
2	F	149	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into four segments: a small red segment at the beginning labeled '2%', a large green segment labeled '79%', a small yellow segment labeled '7%', and a grey segment at the end labeled '13%'.</p>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7306 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 Chaperone protein caf1M.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	199	1532	986	262	280	4	0	0	0
1	D	190	1470	949	250	267	4	0	0	0

- Molecule 2 is a protein called F1 capsule antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	146	1077	672	177	226	2	0	0	0
2	C	132	981	609	163	207	2	0	0	0
2	E	149	1090	679	180	229	2	0	0	0
2	F	129	955	592	157	204	2	0	0	0

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1	ALA	-	insertion	UNP P26948
B	2	ASP	-	insertion	UNP P26948
B	3	LEU	-	insertion	UNP P26948
B	4	THR	-	insertion	UNP P26948
B	5	ALA	-	insertion	UNP P26948
B	6	SER	-	insertion	UNP P26948
B	7	PHE	-	insertion	UNP P26948
B	8	THR	-	insertion	UNP P26948
B	9	ALA	-	insertion	UNP P26948
B	10	THR	-	insertion	UNP P26948
B	11	ALA	-	insertion	UNP P26948
B	12	THR	-	insertion	UNP P26948

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1	ALA	-	insertion	UNP P26948
C	2	ASP	-	insertion	UNP P26948
C	3	LEU	-	insertion	UNP P26948
C	4	THR	-	insertion	UNP P26948
C	5	ALA	-	insertion	UNP P26948
C	6	SER	-	insertion	UNP P26948
C	7	PHE	-	insertion	UNP P26948
C	8	THR	-	insertion	UNP P26948
C	9	ALA	-	insertion	UNP P26948
C	10	THR	-	insertion	UNP P26948
C	11	ALA	-	insertion	UNP P26948
C	12	THR	-	insertion	UNP P26948
E	1	ALA	-	insertion	UNP P26948
E	2	ASP	-	insertion	UNP P26948
E	3	LEU	-	insertion	UNP P26948
E	4	THR	-	insertion	UNP P26948
E	5	ALA	-	insertion	UNP P26948
E	6	SER	-	insertion	UNP P26948
E	7	PHE	-	insertion	UNP P26948
E	8	THR	-	insertion	UNP P26948
E	9	ALA	-	insertion	UNP P26948
E	10	THR	-	insertion	UNP P26948
E	11	ALA	-	insertion	UNP P26948
E	12	THR	-	insertion	UNP P26948
F	1	ALA	-	insertion	UNP P26948
F	2	ASP	-	insertion	UNP P26948
F	3	LEU	-	insertion	UNP P26948
F	4	THR	-	insertion	UNP P26948
F	5	ALA	-	insertion	UNP P26948
F	6	SER	-	insertion	UNP P26948
F	7	PHE	-	insertion	UNP P26948
F	8	THR	-	insertion	UNP P26948
F	9	ALA	-	insertion	UNP P26948
F	10	THR	-	insertion	UNP P26948
F	11	ALA	-	insertion	UNP P26948
F	12	THR	-	insertion	UNP P26948

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	53	Total O 53 53	0	0

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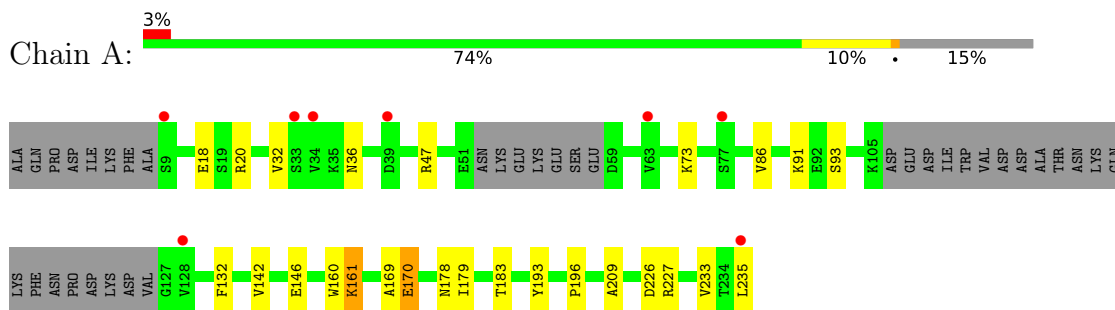
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>	<b>ZeroOcc</b>	<b>AltConf</b>
3	B	10	Total O 10 10	0	0
3	C	44	Total O 44 44	0	0
3	D	31	Total O 31 31	0	0
3	E	22	Total O 22 22	0	0
3	F	41	Total O 41 41	0	0

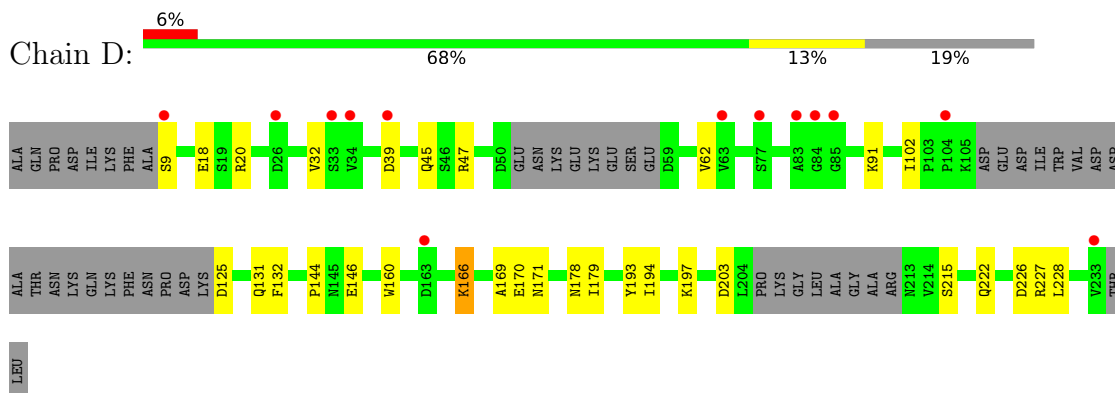
### 3 Residue-property plots [i](#)

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.

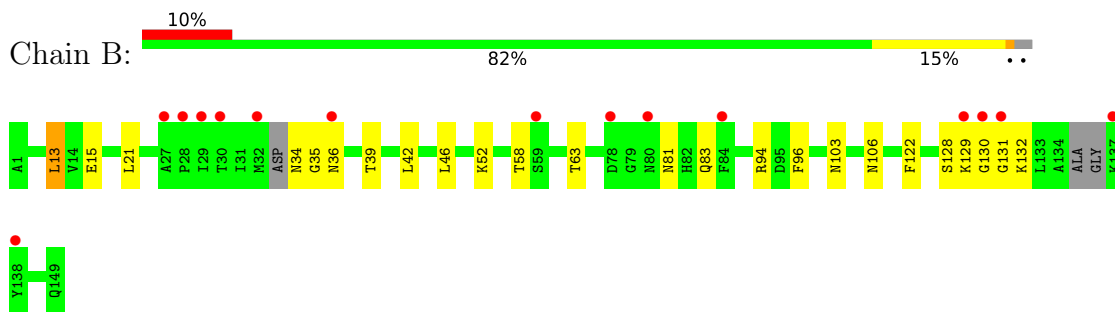
- Molecule 1: Chaperone protein caf1M



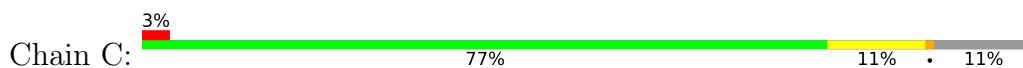
- Molecule 1: Chaperone protein caf1M

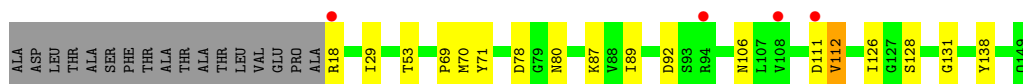


- Molecule 2: F1 capsule antigen

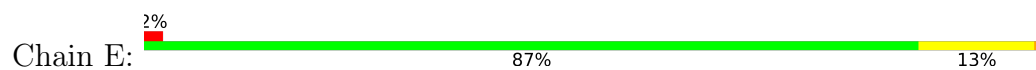


- Molecule 2: F1 capsule antigen

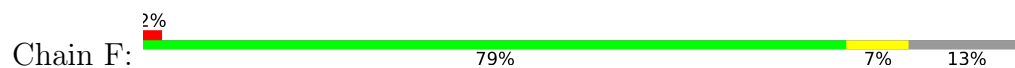




- Molecule 2: F1 capsule antigen



- Molecule 2: F1 capsule antigen





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	71.69Å 91.15Å 165.48Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.20 54.18 – 2.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (20.00-2.20) 100.0 (54.18-2.20)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.67 (at 2.20Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.234 , 0.281 0.234 , 0.281	Depositor DCC
$R_{free}$ test set	2831 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	26.0	Xtrriage
Anisotropy	0.403	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 39.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	7306	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 22.11 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.0948e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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	0.61	0/1569	0.70	0/2131
1	D	0.60	0/1504	0.68	0/2040
2	B	0.55	0/1090	0.68	1/1478 (0.1%)
2	C	0.64	0/994	0.70	0/1347
2	E	0.53	0/1105	0.66	1/1501 (0.1%)
2	F	0.65	0/967	0.69	0/1309
All	All	0.60	0/7229	0.69	2/9806 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	13	LEU	CA-CB-CG	6.18	129.51	115.30
2	E	13	LEU	CA-CB-CG	5.77	128.57	115.30

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	1532	0	1517	20	0
1	D	1470	0	1454	19	0
2	B	1077	0	1061	16	0
2	C	981	0	960	15	0
2	E	1090	0	1072	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	955	0	926	7	0
3	A	53	0	0	7	0
3	B	10	0	0	1	0
3	C	44	0	0	6	0
3	D	31	0	0	1	0
3	E	22	0	0	0	0
3	F	41	0	0	0	0
All	All	7306	0	6990	74	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 5.

The worst 5 of 74 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:86:VAL:CA	3:A:273:HOH:O	2.20	0.90
1:A:226:ASP:OD1	3:A:283:HOH:O	1.99	0.80
2:C:80:ASN:CG	3:C:185:HOH:O	2.25	0.73
1:D:222:GLN:HE21	2:F:136:GLY:HA2	1.55	0.70
2:C:80:ASN:OD1	3:C:185:HOH:O	2.10	0.69

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	193/235 (82%)	188 (97%)	4 (2%)	1 (0%)	29 31
1	D	180/235 (77%)	177 (98%)	3 (2%)	0	100 100
2	B	140/149 (94%)	133 (95%)	5 (4%)	2 (1%)	11 8
2	C	130/149 (87%)	126 (97%)	4 (3%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	E	147/149 (99%)	142 (97%)	5 (3%)	0	100	100
2	F	125/149 (84%)	122 (98%)	3 (2%)	0	100	100
All	All	915/1066 (86%)	888 (97%)	24 (3%)	3 (0%)	41	46

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	209	ALA
2	B	130	GLY
2	B	131	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	164/204 (80%)	157 (96%)	7 (4%)	29	36
1	D	159/204 (78%)	152 (96%)	7 (4%)	28	35
2	B	119/121 (98%)	117 (98%)	2 (2%)	60	74
2	C	109/121 (90%)	106 (97%)	3 (3%)	43	56
2	E	119/121 (98%)	112 (94%)	7 (6%)	19	23
2	F	106/121 (88%)	105 (99%)	1 (1%)	78	88
All	All	776/892 (87%)	749 (96%)	27 (4%)	36	46

5 of 27 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	47	ARG
1	D	170	GLU
2	E	129	LYS
1	D	166	LYS
1	D	179	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such

sidechains are listed below:

Mol	Chain	Res	Type
1	D	213	ASN
1	D	222	GLN
2	C	106	ASN
1	D	38	GLN
1	D	145	ASN

### 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 monosaccharides 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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	D	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	D	103:PRO	C	104:PRO	N	3.00

## 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	199/235 (84%)	0.23	8 (4%) 38 36	11, 23, 38, 47	5 (2%)
1	D	190/235 (80%)	0.26	13 (6%) 17 16	11, 24, 40, 87	5 (2%)
2	B	146/149 (97%)	0.50	15 (10%) 6 5	12, 28, 50, 54	1 (0%)
2	C	132/149 (88%)	-0.00	4 (3%) 50 48	9, 20, 37, 45	0
2	E	149/149 (100%)	0.10	3 (2%) 65 63	11, 28, 49, 53	1 (0%)
2	F	129/149 (86%)	-0.02	3 (2%) 60 58	9, 18, 35, 47	0
All	All	945/1066 (88%)	0.19	46 (4%) 29 28	9, 24, 45, 87	12 (1%)

The worst 5 of 46 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	33	SER	9.8
1	A	33	SER	9.4
1	D	34	VAL	8.4
1	A	34	VAL	8.1
1	A	63	VAL	4.6

### 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.