



# wwPDB X-ray Structure Validation Summary Report

Jun 25, 2024 – 02:08 PM EDT

PDB ID : 5XJO  
Title : Plant receptor ERL1-TMM in complex with peptide EPF1  
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Deposited on : 2017-05-03  
Resolution : 2.63 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 : 2.37.1  
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) : 2.37.1

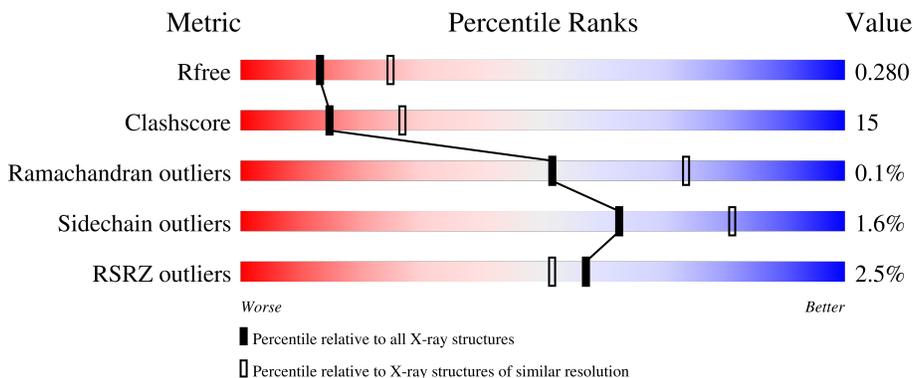
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.63 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	3797 (2.64-2.60)
Clashscore	141614	4168 (2.64-2.60)
Ramachandran outliers	138981	4093 (2.64-2.60)
Sidechain outliers	138945	4093 (2.64-2.60)
RSRZ outliers	127900	3731 (2.64-2.60)

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 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	539	 69% 27% 4% 2%
1	B	539	 70% 26% 4% 2%
2	E	52	 60% 19% 8% 19%
2	F	52	 62% 19% 4% 19%
3	C	374	 66% 32% 3% 1%

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Mol	Chain	Length	Quality of chain
3	D	374	 <p>4% 64% 33% ..</p>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 14334 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 LRR receptor-like serine/threonine-protein kinase ERL1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	523	3997	2536	680	765	16	0	0	0
1	B	523	3997	2536	680	765	16	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	546	ALA	LYS	conflict	UNP C0LGW6
B	546	ALA	LYS	conflict	UNP C0LGW6

- Molecule 2 is a protein called Protein EPIDERMAL PATTERNING FACTOR 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	F	42	306	188	54	54	10	0	0	0
2	E	42	306	188	54	54	10	0	0	0

- Molecule 3 is a protein called Protein TOO MANY MOUTHS.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	367	2864	1803	521	529	11	0	0	0
3	D	367	2864	1803	521	529	11	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	273	GLN	ILE	conflict	UNP Q9SSD1
C	312	ASN	THR	conflict	UNP Q9SSD1

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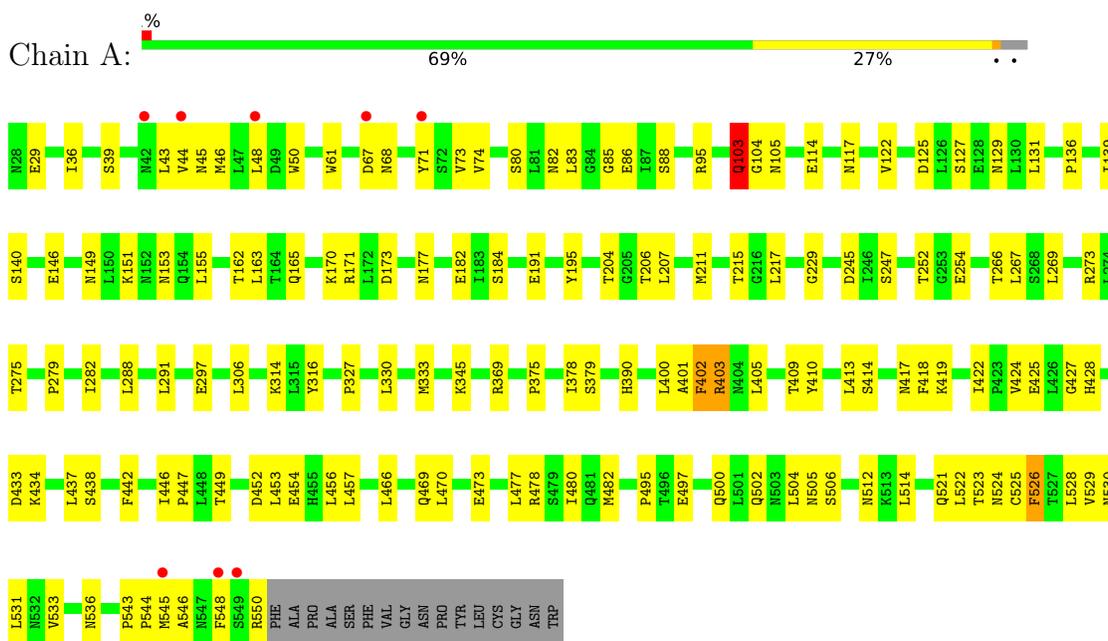
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<b>Chain</b>	<b>Residue</b>	<b>Modelled</b>	<b>Actual</b>	<b>Comment</b>	<b>Reference</b>
C	421	ALA	LEU	conflict	UNP Q9SSD1
C	422	ALA	ASP	conflict	UNP Q9SSD1
C	423	ALA	ASP	conflict	UNP Q9SSD1
D	273	GLN	ILE	conflict	UNP Q9SSD1
D	312	ASN	THR	conflict	UNP Q9SSD1
D	421	ALA	LEU	conflict	UNP Q9SSD1
D	422	ALA	ASP	conflict	UNP Q9SSD1
D	423	ALA	ASP	conflict	UNP Q9SSD1

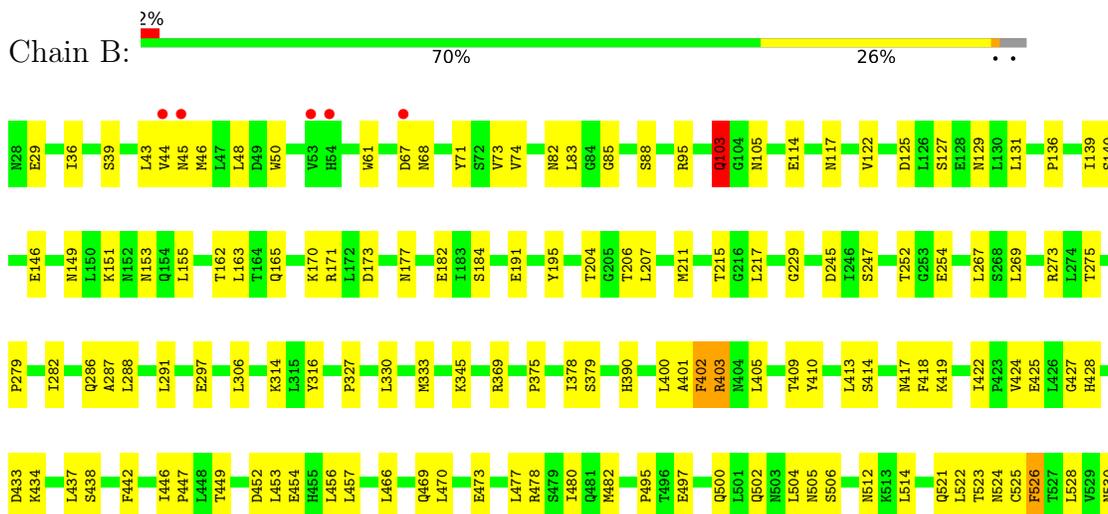
### 3 Residue-property plots

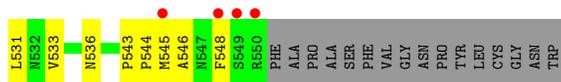
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: LRR receptor-like serine/threonine-protein kinase ERL1

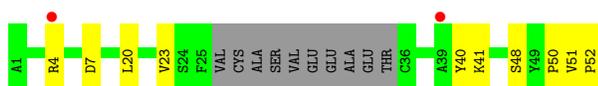


- Molecule 1: LRR receptor-like serine/threonine-protein kinase ERL1





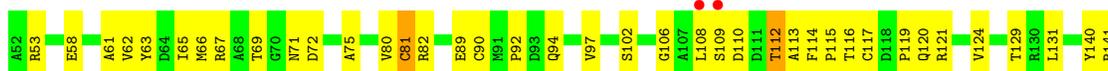
● Molecule 2: Protein EPIDERMAL PATTERNING FACTOR 1



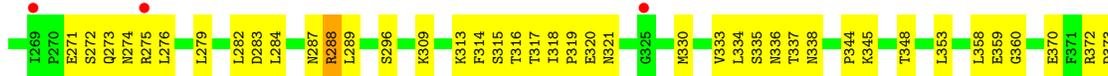
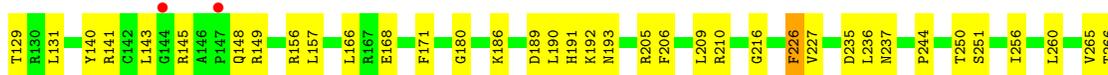
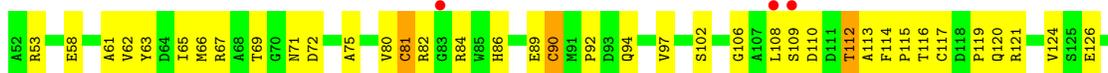
● Molecule 2: Protein EPIDERMAL PATTERNING FACTOR 1



● Molecule 3: Protein TOO MANY MOUTHS



● Molecule 3: Protein TOO MANY MOUTHS





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.11Å 66.15Å 143.49Å 97.61° 102.47° 93.68°	Depositor
Resolution (Å)	42.53 – 2.63 46.17 – 2.63	Depositor EDS
% Data completeness (in resolution range)	93.6 (42.53-2.63) 93.7 (46.17-2.63)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.69 (at 2.61Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.252 , 0.310 0.272 , 0.280	Depositor DCC
$R_{free}$ test set	3319 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	43.9	Xtrriage
Anisotropy	0.475	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 12.4	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	0.89	EDS
Total number of atoms	14334	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	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 23.01 % 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 5.0799e-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	0.52	1/4066 (0.0%)	0.67	1/5532 (0.0%)
1	B	0.53	1/4066 (0.0%)	0.67	1/5532 (0.0%)
2	E	0.63	0/313	0.85	1/421 (0.2%)
2	F	0.63	0/313	0.80	0/421
3	C	0.67	1/2920 (0.0%)	0.80	3/3965 (0.1%)
3	D	0.68	2/2920 (0.1%)	0.81	3/3965 (0.1%)
All	All	0.60	5/14598 (0.0%)	0.73	9/19836 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	81	CYS	CB-SG	-7.16	1.70	1.82
3	D	90	CYS	CB-SG	-6.75	1.70	1.82
3	D	81	CYS	CB-SG	-5.72	1.72	1.81
1	B	103	GLN	CD-OE1	-5.21	1.12	1.24
1	A	103	GLN	CD-OE1	-5.20	1.12	1.24

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	288	ARG	NE-CZ-NH1	6.67	123.64	120.30
3	C	288	ARG	NE-CZ-NH1	6.59	123.60	120.30
3	D	156	ARG	NE-CZ-NH1	5.73	123.16	120.30
3	C	156	ARG	NE-CZ-NH1	5.67	123.13	120.30
1	B	163	LEU	CA-CB-CG	5.48	127.91	115.30

There are no chirality outliers.

There are no planarity outliers.

## 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	3997	0	4048	114	4
1	B	3997	0	4048	112	4
2	E	306	0	294	12	0
2	F	306	0	296	11	0
3	C	2864	0	2904	98	4
3	D	2864	0	2904	106	4
All	All	14334	0	14494	440	8

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 15.

The worst 5 of 440 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)
3:C:53:ARG:NH2	3:C:82:ARG:HH12	1.18	1.36
3:D:53:ARG:NH2	3:D:82:ARG:HH12	1.18	1.34
3:C:53:ARG:HH21	3:C:82:ARG:NH1	1.26	1.29
3:D:53:ARG:HH21	3:D:82:ARG:NH1	1.26	1.29
3:D:81:CYS:SG	3:D:90:CYS:SG	1.26	1.13

The worst 5 of 8 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)
3:D:375:LYS:NZ	1:B:454:GLU:OE1[1_655]	1.90	0.30
1:A:478:ARG:NH2	3:C:373:ASP:OD2[1_565]	1.94	0.26
3:D:373:ASP:OD2	1:B:478:ARG:NH2[1_655]	1.94	0.26
1:A:454:GLU:OE1	3:C:375:LYS:NZ[1_565]	1.98	0.22
3:D:375:LYS:NZ	1:B:454:GLU:CD[1_655]	2.11	0.09

## 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	521/539 (97%)	464 (89%)	56 (11%)	1 (0%)	47	69
1	B	521/539 (97%)	464 (89%)	56 (11%)	1 (0%)	47	69
2	E	38/52 (73%)	35 (92%)	3 (8%)	0	100	100
2	F	38/52 (73%)	36 (95%)	2 (5%)	0	100	100
3	C	365/374 (98%)	331 (91%)	34 (9%)	0	100	100
3	D	365/374 (98%)	331 (91%)	34 (9%)	0	100	100
All	All	1848/1930 (96%)	1661 (90%)	185 (10%)	2 (0%)	51	74

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	401	ALA
1	B	401	ALA

### 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	459/471 (98%)	450 (98%)	9 (2%)	55	77
1	B	459/471 (98%)	450 (98%)	9 (2%)	55	77
2	E	37/45 (82%)	37 (100%)	0	100	100
2	F	37/45 (82%)	37 (100%)	0	100	100
3	C	324/328 (99%)	320 (99%)	4 (1%)	71	86

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
3	D	324/328 (99%)	320 (99%)	4 (1%)	71 86
All	All	1640/1688 (97%)	1614 (98%)	26 (2%)	62 81

5 of 26 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	D	226	PHE
1	B	68	ASN
1	B	409	THR
3	D	376	HIS
1	B	71	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 20 such sidechains are listed below:

Mol	Chain	Res	Type
3	D	351	ASN
1	B	286	GLN
1	B	536	ASN
1	B	481	GLN
3	C	148	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 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](#)

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	523/539 (97%)	-0.04	8 (1%) 73 70	27, 38, 62, 84	0
1	B	523/539 (97%)	0.10	9 (1%) 70 66	27, 38, 62, 84	0
2	E	42/52 (80%)	0.51	4 (9%) 8 5	35, 50, 57, 59	0
2	F	42/52 (80%)	0.32	2 (4%) 30 24	38, 51, 58, 64	0
3	C	367/374 (98%)	0.13	10 (2%) 54 49	25, 40, 60, 77	0
3	D	367/374 (98%)	0.21	14 (3%) 40 34	25, 40, 60, 77	0
All	All	1864/1930 (96%)	0.10	47 (2%) 57 51	25, 39, 61, 84	0

The worst 5 of 47 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	549	SER	9.1
3	C	144	GLY	6.7
3	C	145	ARG	5.7
3	C	415	VAL	4.6
3	C	108	LEU	4.4

### 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.