



# wwPDB X-ray Structure Validation Summary Report ⓘ

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PDB ID : 4DRF / pdb\_00004drf  
Title : Crystal Structure of Bacterial Pnkp-C/Hen1-N Heterodimer  
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Deposited on : 2012-02-17  
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)

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<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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

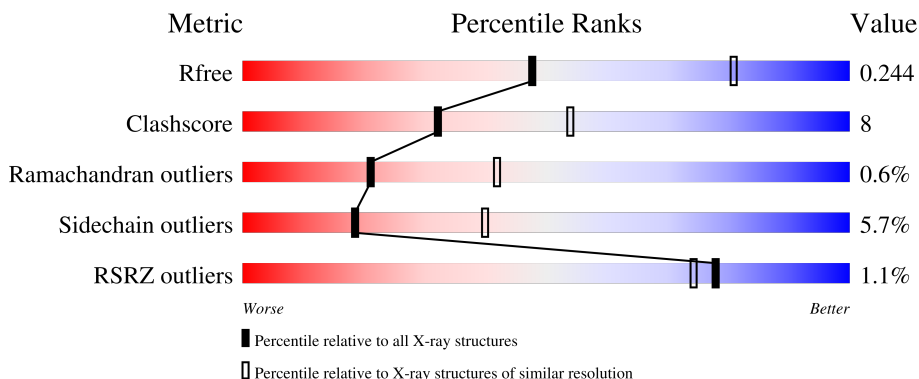
# 1 Overall quality at a glance

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))
$R_{free}$	180053	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (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 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	427	<div> <div>%</div> <div> <div></div> <div>76%</div> <div>18%</div> <div>..</div> </div> </div>
1	C	427	<div> <div>%</div> <div> <div></div> <div>77%</div> <div>17%</div> <div>..</div> </div> </div>
2	B	230	<div> <div>%</div> <div> <div></div> <div>64%</div> <div>22%</div> <div>.</div> <div>10%</div> </div> </div>
2	D	230	<div> <div>%</div> <div> <div></div> <div>63%</div> <div>22%</div> <div>..</div> <div>10%</div> </div> </div>

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10046 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 Metallophosphoesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	408	Total	C	N	O	S	0	0	0
			3276	2076	570	606	24			
1	C	408	Total	C	N	O	S	0	0	0
			3276	2076	570	606	24			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	444	MET	-	initiating methionine	UNP A3DJ38
C	444	MET	-	initiating methionine	UNP A3DJ38

- Molecule 2 is a protein called Methyltransferase type 12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	206	Total	C	N	O	S	0	0	0
			1667	1085	269	304	9			
2	D	206	Total	C	N	O	S	0	0	0
			1667	1085	269	304	9			

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			6	3	3		

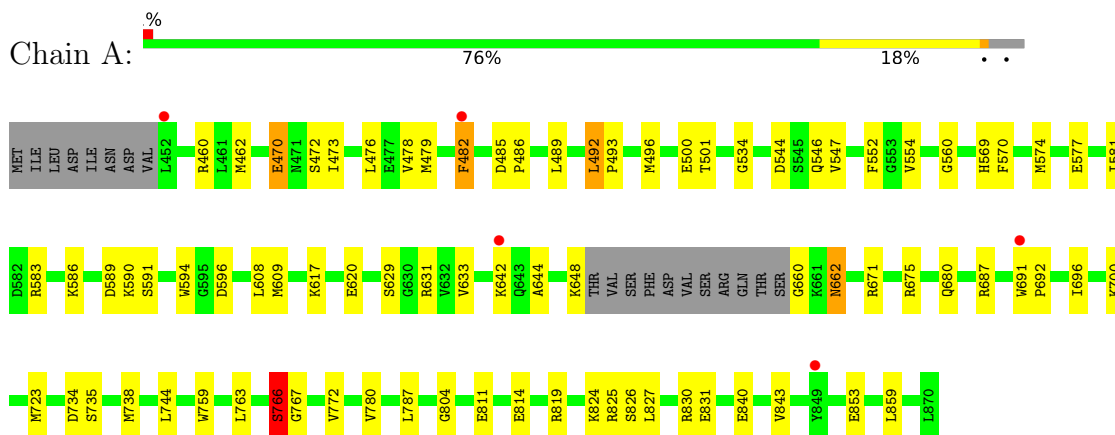
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	54	Total	O	0	0
			54	54		
4	B	28	Total	O	0	0
			28	28		
4	C	52	Total	O	0	0
			52	52		
4	D	20	Total	O	0	0
			20	20		

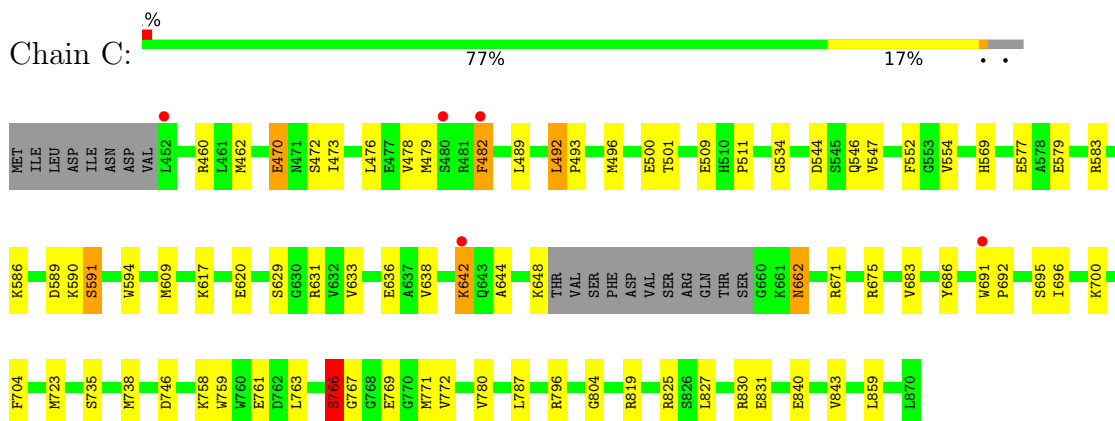
### 3 Residue-property plots

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.

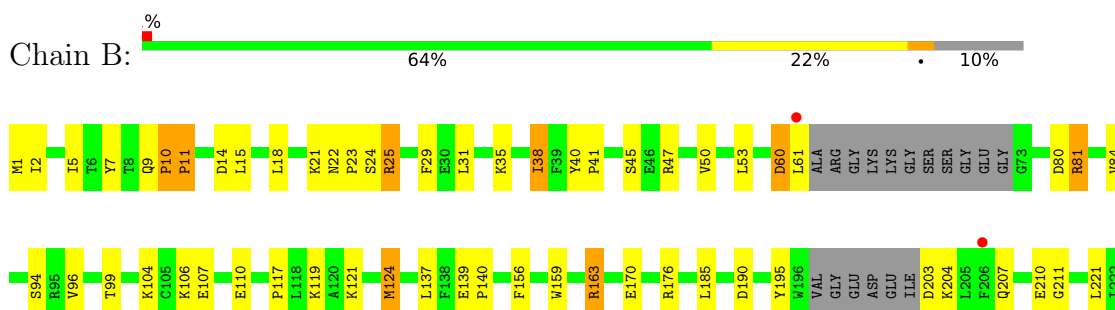
- Molecule 1: Metallophosphoesterase



- Molecule 1: Metallophosphoesterase



- Molecule 2: Methyltransferase type 12



T223  
GLY  
ARG  
TYR  
LEU  
ILE  
ARG  
LYS

• Molecule 2: Methyltransferase type 12



M1  
I2  
I5  
T6  
Y7  
T8  
Q9  
P10  
P11  
D14  
L15  
L18  
L19  
H20  
K21  
N22  
P23  
S24  
R25  
F29  
F30  
L31  
K35  
I38  
F39  
Y40  
P41  
R47  
V50  
L53  
D60  
L61  
ALA  
ARG  
GLY  
LYS  
LYS  
GLY  
SER  
SER  
GLY  
GLY  
GLY  
G73  
Y77  
R81  
R95

V96  
T99  
A100  
M101  
K104  
C105  
K106  
E107  
E110  
K119  
A120  
K121  
I122  
M123  
M124  
I133  
L137  
F138  
E139  
P140  
K144  
W159  
R163  
Y164  
L169  
E170  
R176  
N180  
L185  
D190  
Y195  
W196  
VAL  
GLY  
GLU  
ASP  
GLU  
ILE  
D203  
K204  
L205  
F206  
Q207  
L221

T222  
T223  
GLY  
ARG  
TYR  
LEU  
ILE  
ARG  
LYS

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.67Å 59.71Å 101.54Å 81.27° 87.67° 88.39°	Depositor
Resolution (Å)	42.40 – 2.60 42.40 – 2.60	Depositor EDS
% Data completeness (in resolution range)	96.2 (42.40-2.60) 96.5 (42.40-2.60)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.79 (at 2.61Å)	Xtriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	0.184 , 0.245 0.184 , 0.244	Depositor DCC
$R_{free}$ test set	2011 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	42.4	Xtriage
Anisotropy	0.334	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 48.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.026 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	10046	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.59% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL

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	0.60	1/3342 (0.0%)	0.94	5/4506 (0.1%)
1	C	0.60	2/3342 (0.1%)	0.95	6/4506 (0.1%)
2	B	0.60	0/1711	0.97	0/2318
2	D	0.62	0/1711	1.00	5/2318 (0.2%)
All	All	0.61	3/10106 (0.0%)	0.96	16/13648 (0.1%)

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
2	B	0	1
2	D	0	1
All	All	0	2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	662	ASN	CG-ND2	-7.01	1.18	1.33
1	C	662	ASN	CG-ND2	-6.43	1.19	1.33
1	C	662	ASN	CG-OD1	-5.26	1.13	1.23

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	492	LEU	CA-C-N	10.09	127.02	119.66
1	C	492	LEU	C-N-CA	10.09	127.02	119.66
1	A	492	LEU	CA-C-N	9.67	126.72	119.66
1	A	492	LEU	C-N-CA	9.67	126.72	119.66

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	804	GLY	CA-C-N	7.75	128.16	119.32

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	10	PRO	Peptide
2	D	10	PRO	Peptide

## 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	3276	0	3273	51	0
1	C	3276	0	3273	47	0
2	B	1667	0	1667	36	0
2	D	1667	0	1667	40	0
3	B	6	0	8	2	0
4	A	54	0	0	13	0
4	B	28	0	0	4	0
4	C	52	0	0	10	0
4	D	20	0	0	3	0
All	All	10046	0	9888	158	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 8.

The worst 5 of 158 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:C:761:GLU:OE1	4:C:921:HOH:O	1.85	0.94
2:B:117:PRO:O	4:B:424:HOH:O	1.91	0.89
1:C:692:PRO:O	4:C:913:HOH:O	1.88	0.88
1:A:500:GLU:OE1	4:A:937:HOH:O	1.92	0.85
2:B:47:ARG:NH2	4:B:420:HOH:O	2.05	0.83

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	404/427 (95%)	394 (98%)	9 (2%)	1 (0%)	43 66
1	C	404/427 (95%)	394 (98%)	8 (2%)	2 (0%)	24 46
2	B	200/230 (87%)	185 (92%)	13 (6%)	2 (1%)	12 28
2	D	200/230 (87%)	186 (93%)	12 (6%)	2 (1%)	12 28
All	All	1208/1314 (92%)	1159 (96%)	42 (4%)	7 (1%)	21 42

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	590	LYS
1	C	590	LYS
2	D	11	PRO
2	D	60	ASP
2	B	60	ASP

### 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	356/375 (95%)	342 (96%)	14 (4%)	28 55
1	C	356/375 (95%)	345 (97%)	11 (3%)	35 63
2	B	184/201 (92%)	166 (90%)	18 (10%)	7 17

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	D	184/201 (92%)	165 (90%)	19 (10%)	7	15
All	All	1080/1152 (94%)	1018 (94%)	62 (6%)	18	40

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	163	ARG
2	D	121	LYS
1	C	478	VAL
2	D	110	GLU
2	D	176	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
2	D	20	HIS
2	D	180	ASN
2	D	208	HIS
2	D	194	HIS
2	B	208	HIS

### 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](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
3	GOL	B	301	-	5,5,5	0.44	0	5,5,5	0.56	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	B	301	-	-	4/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	301	GOL	O1-C1-C2-C3
3	B	301	GOL	C1-C2-C3-O3
3	B	301	GOL	O1-C1-C2-O2
3	B	301	GOL	O2-C2-C3-O3

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	301	GOL	2	0

## 5.7 Other polymers

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

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	408/427 (95%)	-0.36	5 (1%) 76 73	21, 43, 75, 141	0
1	C	408/427 (95%)	-0.35	5 (1%) 76 73	23, 43, 75, 141	0
2	B	206/230 (89%)	-0.12	2 (0%) 79 76	25, 46, 89, 137	0
2	D	206/230 (89%)	-0.12	2 (0%) 79 76	26, 48, 89, 137	0
All	All	1228/1314 (93%)	-0.28	14 (1%) 78 74	21, 44, 79, 141	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	452	LEU	5.0
1	A	452	LEU	3.9
2	D	61	LEU	3.1
1	C	482	PHE	3.1
1	A	482	PHE	2.8

### 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 oligosaccharides in this entry.

### 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	GOL	B	301	6/6	0.83	0.12	48,62,80,81	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.