



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 23, 2024 – 04:19 PM EDT

PDB ID : 8VBT  
Title : Structure of the monofunctional Staphylococcus aureus PBP1 in its apo form  
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Deposited on : 2023-12-12  
Resolution : 2.00 Å(reported)

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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 : 2.36.2  
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) : 2.36.2

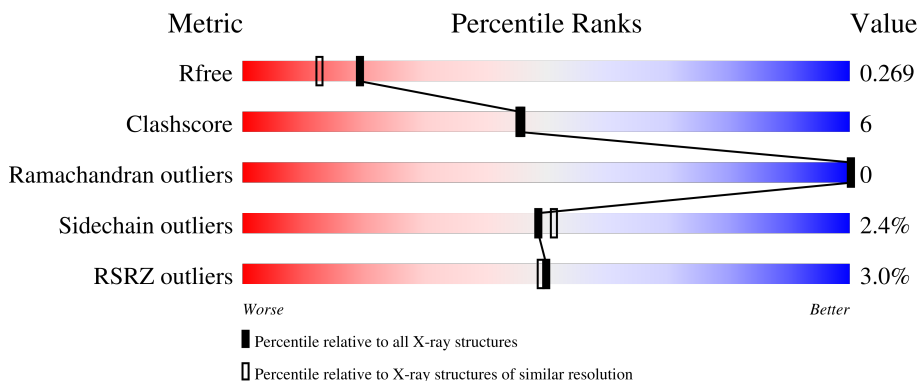
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	595	 2% (red), 73% (green), 11% (yellow), 15% (grey)
1	B	595	 4% (red), 71% (green), 14% (yellow), 15% (grey)

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 8064 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 Penicillin-binding protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	504	3832	2427	647	743	15	0	0	0
1	B	505	3846	2436	650	745	15	0	1	0

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	MET	-	initiating methionine	UNP Q2FZ94
A	15	GLY	-	expression tag	UNP Q2FZ94
A	16	SER	-	expression tag	UNP Q2FZ94
A	17	SER	-	expression tag	UNP Q2FZ94
A	18	HIS	-	expression tag	UNP Q2FZ94
A	19	HIS	-	expression tag	UNP Q2FZ94
A	20	HIS	-	expression tag	UNP Q2FZ94
A	21	HIS	-	expression tag	UNP Q2FZ94
A	22	HIS	-	expression tag	UNP Q2FZ94
A	23	HIS	-	expression tag	UNP Q2FZ94
A	24	HIS	-	expression tag	UNP Q2FZ94
A	25	HIS	-	expression tag	UNP Q2FZ94
A	26	HIS	-	expression tag	UNP Q2FZ94
A	27	HIS	-	expression tag	UNP Q2FZ94
A	28	SER	-	expression tag	UNP Q2FZ94
A	29	SER	-	expression tag	UNP Q2FZ94
A	30	GLY	-	expression tag	UNP Q2FZ94
A	31	LEU	-	expression tag	UNP Q2FZ94
A	32	VAL	-	expression tag	UNP Q2FZ94
A	33	PRO	-	expression tag	UNP Q2FZ94
A	34	ARG	-	expression tag	UNP Q2FZ94
A	35	GLY	-	expression tag	UNP Q2FZ94
A	36	SER	-	expression tag	UNP Q2FZ94
A	37	HIS	-	expression tag	UNP Q2FZ94
A	38	MET	-	expression tag	UNP Q2FZ94

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Chain	Residue	Modelled	Actual	Comment	Reference
A	118	ASP	ASN	conflict	UNP Q2FZ94
B	14	MET	-	initiating methionine	UNP Q2FZ94
B	15	GLY	-	expression tag	UNP Q2FZ94
B	16	SER	-	expression tag	UNP Q2FZ94
B	17	SER	-	expression tag	UNP Q2FZ94
B	18	HIS	-	expression tag	UNP Q2FZ94
B	19	HIS	-	expression tag	UNP Q2FZ94
B	20	HIS	-	expression tag	UNP Q2FZ94
B	21	HIS	-	expression tag	UNP Q2FZ94
B	22	HIS	-	expression tag	UNP Q2FZ94
B	23	HIS	-	expression tag	UNP Q2FZ94
B	24	HIS	-	expression tag	UNP Q2FZ94
B	25	HIS	-	expression tag	UNP Q2FZ94
B	26	HIS	-	expression tag	UNP Q2FZ94
B	27	HIS	-	expression tag	UNP Q2FZ94
B	28	SER	-	expression tag	UNP Q2FZ94
B	29	SER	-	expression tag	UNP Q2FZ94
B	30	GLY	-	expression tag	UNP Q2FZ94
B	31	LEU	-	expression tag	UNP Q2FZ94
B	32	VAL	-	expression tag	UNP Q2FZ94
B	33	PRO	-	expression tag	UNP Q2FZ94
B	34	ARG	-	expression tag	UNP Q2FZ94
B	35	GLY	-	expression tag	UNP Q2FZ94
B	36	SER	-	expression tag	UNP Q2FZ94
B	37	HIS	-	expression tag	UNP Q2FZ94
B	38	MET	-	expression tag	UNP Q2FZ94
B	118	ASP	ASN	conflict	UNP Q2FZ94

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	171	Total O 171 171	0	0
2	B	215	Total O 215 215	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	177.73Å 72.18Å 86.91Å 90.00° 103.58° 90.00°	Depositor
Resolution (Å)	86.38 – 2.00 86.38 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.6 (86.38-2.00) 99.6 (86.38-2.00)	Depositor EDS
$R_{merge}$	0.20	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.72 (at 2.00Å)	Xtrriage
Refinement program	PHENIX 1.19_4092	Depositor
R, $R_{free}$	0.235 , 0.273 0.234 , 0.269	Depositor DCC
$R_{free}$ test set	3545 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.7	Xtrriage
Anisotropy	1.114	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 44.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.41$ , $\langle L^2 \rangle = 0.24$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	8064	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.03% 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	0.41	0/3915	0.58	0/5299
1	B	0.42	0/3930	0.59	0/5320
All	All	0.42	0/7845	0.59	0/10619

There are no bond length outliers.

There are no bond angle outliers.

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	3832	0	3636	40	0
1	B	3846	0	3652	55	0
2	A	171	0	0	5	0
2	B	215	0	0	7	0
All	All	8064	0	7288	95	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 6.

All (95) 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:359:ILE:HB	1:A:363:LEU:HD23	1.74	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:330:PHE:HA	1:B:361:MET:HE1	1.74	0.69
1:B:361:MET:CE	1:B:376:LEU:HD21	2.23	0.68
1:B:545:LYS:NZ	2:B:705:HOH:O	2.27	0.67
1:A:360:PRO:HD2	1:A:363:LEU:HD23	1.75	0.66
1:B:164:LEU:HD13	1:B:165:PRO:HD2	1.77	0.65
1:B:330:PHE:CD2	1:B:361:MET:HE2	2.32	0.64
1:B:401:MET:HG3	2:B:876:HOH:O	1.97	0.64
1:A:412:TRP:CE2	1:A:418:GLN:HG2	2.34	0.63
1:A:414:ASN:OD1	1:A:416:LEU:N	2.33	0.60
1:B:412:TRP:CD2	1:B:418:GLN:HG2	2.38	0.58
1:B:508:TYR:CE2	1:B:589:LYS:HG3	2.39	0.57
1:B:420:THR:HA	1:B:423:PHE:CE1	2.40	0.57
1:B:361:MET:HE1	1:B:376:LEU:HD21	1.85	0.56
1:A:490:ASP:OD1	1:A:494:ASN:ND2	2.31	0.55
1:A:84:LYS:HG3	1:A:143:THR:HG22	1.90	0.54
1:B:167:THR:O	1:B:186:LYS:NZ	2.35	0.54
1:A:340:HIS:HB3	1:A:349:SER:HB3	1.90	0.53
1:B:110:ALA:HA	1:B:124:ILE:HG21	1.90	0.53
1:B:85:LEU:HD12	1:B:153:ILE:HD13	1.90	0.53
1:A:412:TRP:CD2	1:A:418:GLN:HG2	2.43	0.53
1:A:363:LEU:HD11	1:A:367:TYR:CZ	2.44	0.53
1:B:378:ASP:OD1	1:B:419:LYS:NZ	2.43	0.51
1:B:414:ASN:N	2:B:722:HOH:O	2.43	0.51
1:B:477:ILE:HB	1:B:481:THR:HB	1.93	0.51
1:B:483:GLU:HG3	2:B:768:HOH:O	2.11	0.51
1:A:145:LEU:HD11	1:A:163:LEU:HD12	1.93	0.51
1:A:256:LEU:HD22	1:A:268:LEU:HD21	1.93	0.51
1:A:356:TRP:HB2	1:A:359:ILE:HD13	1.94	0.50
1:B:412:TRP:CE2	1:B:418:GLN:HG2	2.46	0.50
1:B:283:TYR:OH	1:B:304:ASP:HB2	2.11	0.49
1:A:307:GLN:OE1	2:A:701:HOH:O	2.20	0.49
1:B:325:ILE:HD13	1:B:484:LYS:HB3	1.94	0.49
1:A:283:TYR:OH	1:A:304:ASP:HB2	2.12	0.48
1:B:361:MET:HE3	1:B:376:LEU:HD21	1.93	0.48
1:B:313:GLY:HA3	1:B:517:ALA:HB2	1.95	0.48
1:A:386:LYS:HD2	1:A:412:TRP:CD1	2.49	0.48
1:A:429:VAL:HG21	1:A:434:MET:SD	2.54	0.48
1:B:324:ALA:CB	1:B:376:LEU:HD22	2.44	0.48
1:B:344:MET:HE2	1:B:416:LEU:HB2	1.95	0.47
1:A:341:ARG:HG3	1:A:374:MET:HE3	1.97	0.47
1:B:321:LEU:HB2	1:B:365:PHE:CE2	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:330:PHE:HD2	1:B:361:MET:HE2	1.78	0.47
1:B:243:THR:OG1	1:B:452:PHE:HA	2.15	0.47
1:A:184:ALA:HA	1:A:195:GLY:HA2	1.97	0.47
1:B:317:LYS:HG2	1:B:373:MET:HG3	1.96	0.47
1:B:63:PRO:HB2	1:B:209:GLY:HA3	1.97	0.46
1:B:127:ARG:HB3	1:B:136:ILE:HD13	1.97	0.46
1:B:446:ASN:HB3	1:B:472:ILE:HD12	1.97	0.46
1:A:491:LEU:O	1:A:495:SER:HB2	2.15	0.46
1:A:83:TYR:HB2	1:A:145:LEU:HD12	1.97	0.46
1:A:267:ASP:HB3	1:A:556:SER:HB3	1.96	0.46
1:A:140:ARG:HG2	1:A:141:LYS:HD3	1.98	0.46
1:A:246:SER:O	1:A:250:VAL:HG23	2.15	0.46
1:B:85:LEU:HD11	1:B:113:LEU:HD22	1.97	0.46
1:A:315:THR:HA	1:A:513:LYS:HG2	1.99	0.45
1:A:502:ASN:O	1:A:575:LYS:NZ	2.35	0.45
1:B:313:GLY:CA	1:B:517:ALA:HB2	2.46	0.45
1:B:376:LEU:HA	1:B:376:LEU:HD23	1.68	0.45
1:B:330:PHE:HA	1:B:361:MET:CE	2.44	0.45
1:B:184:ALA:HA	1:B:195:GLY:HA2	1.99	0.45
1:B:85:LEU:HA	1:B:163:LEU:HD13	1.99	0.44
1:A:177:ALA:HB3	1:A:181:ILE:HD12	1.97	0.44
1:B:448:LEU:O	1:B:450:PRO:HD3	2.17	0.44
1:A:197:LEU:HD23	1:A:198:GLY:N	2.32	0.44
1:A:532:ASN:HB2	1:A:562:ASP:HB2	2.00	0.44
1:B:497:LYS:HD2	1:B:497:LYS:N	2.32	0.44
1:A:147:TYR:CE2	1:A:151:LEU:HD11	2.52	0.44
1:A:310:TYR:O	1:A:428:THR:HA	2.17	0.44
1:B:103:VAL:HG23	1:B:103:VAL:O	2.18	0.44
1:B:413:SER:HB2	2:B:722:HOH:O	2.18	0.44
1:A:423:PHE:HE1	1:A:425:GLN:HG3	1.83	0.43
1:B:542:ALA:HA	1:B:543:PRO:C	2.38	0.43
1:B:586:ASN:ND2	2:B:720:HOH:O	2.42	0.43
1:B:113:LEU:HD21	1:B:161:ILE:HD13	2.00	0.43
1:B:331:ASP:HB3	1:B:334:LYS:HB2	2.01	0.42
1:A:572:LYS:HB2	2:A:782:HOH:O	2.20	0.42
1:A:576:PRO:HB2	2:A:837:HOH:O	2.19	0.42
1:B:543:PRO:HB3	2:B:791:HOH:O	2.18	0.42
1:A:330:PHE:CE1	1:A:361:MET:HB3	2.55	0.41
1:B:548:LYS:HA	1:B:548:LYS:HD2	1.63	0.41
1:A:471:GLN:NE2	2:A:728:HOH:O	2.47	0.41
1:B:582:LEU:HA	1:B:582:LEU:HD23	1.80	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:80:VAL:CG2	1:A:170:PHE:HB2	2.50	0.41
1:A:248:ILE:HA	1:A:251:PHE:CD2	2.56	0.41
1:B:338:SER:HG	1:B:356:TRP:H	1.62	0.41
1:B:250:VAL:O	1:B:254:GLU:HG3	2.21	0.41
1:B:66:GLY:HA3	1:B:238:ASP:O	2.20	0.41
1:B:542:ALA:HB3	1:B:582:LEU:HD11	2.03	0.40
1:B:440:ALA:HA	1:B:446:ASN:O	2.20	0.40
1:A:186:LYS:NZ	2:A:741:HOH:O	2.53	0.40
1:B:146:THR:HB	1:B:148:GLN:OE1	2.20	0.40
1:B:361:MET:HG2	1:B:372:LEU:CD1	2.51	0.40
1:A:295:LYS:HE2	1:A:295:LYS:HB3	1.67	0.40
1:A:508:TYR:CE2	1:A:589:LYS:HD3	2.56	0.40

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	500/595 (84%)	486 (97%)	14 (3%)	0	100	100
1	B	502/595 (84%)	488 (97%)	14 (3%)	0	100	100
All	All	1002/1190 (84%)	974 (97%)	28 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	390/503 (78%)	381 (98%)	9 (2%)	50	53
1	B	392/503 (78%)	382 (97%)	10 (3%)	46	48
All	All	782/1006 (78%)	763 (98%)	19 (2%)	49	51

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	70	ASP
1	A	140	ARG
1	A	179	HIS
1	A	344	MET
1	A	387	SER
1	A	401	MET
1	A	425	GLN
1	A	495	SER
1	A	589	LYS
1	B	70	ASP
1	B	97	SER
1	B	127	ARG
1	B	144	ASN
1	B	145	LEU
1	B	179	HIS
1	B	326	GLN
1	B	347	ARG
1	B	425	GLN
1	B	590	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	264	GLN
1	A	561	ASN
1	B	102	HIS
1	B	563	GLN
1	B	580	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](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

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	504/595 (84%)	0.20	9 (1%) 68 66	18, 39, 68, 106	0
1	B	505/595 (84%)	0.20	21 (4%) 36 35	18, 33, 80, 117	0
All	All	1009/1190 (84%)	0.20	30 (2%) 50 49	18, 36, 76, 117	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	125	GLU	4.5
1	A	525	GLY	4.1
1	A	117	ILE	3.4
1	A	140	ARG	3.2
1	A	95	ALA	3.1
1	B	525	GLY	2.8
1	B	104	VAL	2.8
1	B	142	GLY	2.6
1	B	365	PHE	2.5
1	B	96	ASN	2.5
1	B	339	GLY	2.5
1	B	99	LYS	2.5
1	B	94	SER	2.4
1	B	124	ILE	2.3
1	B	160	GLY	2.3
1	B	590	SER	2.3
1	B	98	LYS	2.3
1	A	413	SER	2.2
1	A	367	TYR	2.2
1	B	61	GLN	2.2
1	A	96	ASN	2.2
1	B	115	THR	2.2
1	A	61	GLN	2.1
1	B	110	ALA	2.1

*Continued on next page...*

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Mol	Chain	Res	Type	RSRZ
1	B	380	VAL	2.1
1	B	106	LYS	2.1
1	A	356	TRP	2.1
1	B	117	ILE	2.1
1	B	95	ALA	2.0
1	B	118	ASP	2.0

## 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.