



# Full wwPDB X-ray Structure Validation Report ⓘ

May 26, 2020 – 07:21 pm BST

PDB ID : 4J0O  
Title : Structure of the Y246A Mutant of the PANTON-VALENTINE LEUCOCIDIN  
S Component from STAPHYLOCOCCUS AUREUS  
Authors : Maveyraud, L.; Laventie, B.J.; Prevost, G.; Mourey, L.  
Deposited on : 2013-01-31  
Resolution : 2.50 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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.

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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 : 2.11  
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) : 2.11

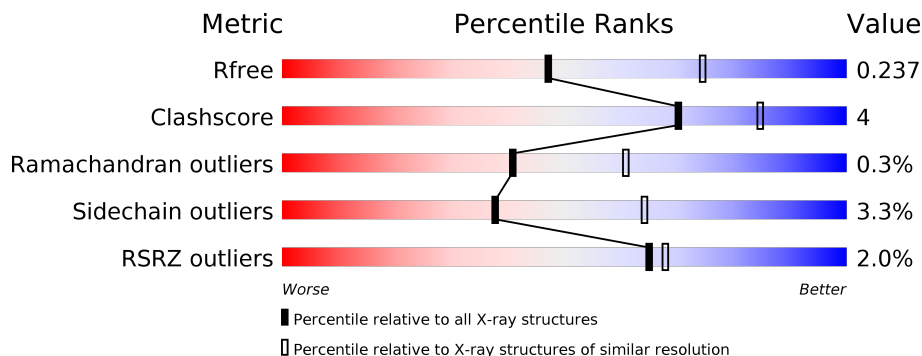
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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 on 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	291	
1	B	291	
1	C	291	
1	D	291	

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 9234 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 LukS-PV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	275	2198	1385	381	428	4	0	0	0
1	B	277	2208	1392	384	428	4	0	0	0
1	C	275	2173	1373	376	420	4	0	0	0
1	D	272	2182	1377	378	423	4	0	0	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	GLY	-	EXPRESSION TAG	UNP O80066
A	-5	PRO	-	EXPRESSION TAG	UNP O80066
A	-4	LEU	-	EXPRESSION TAG	UNP O80066
A	-3	GLY	-	EXPRESSION TAG	UNP O80066
A	-2	SER	-	EXPRESSION TAG	UNP O80066
A	-1	PRO	-	EXPRESSION TAG	UNP O80066
A	0	GLU	-	EXPRESSION TAG	UNP O80066
A	1	PHE	-	EXPRESSION TAG	UNP O80066
A	246	ALA	TYR	ENGINEERED MUTATION	UNP O80066
B	-6	GLY	-	EXPRESSION TAG	UNP O80066
B	-5	PRO	-	EXPRESSION TAG	UNP O80066
B	-4	LEU	-	EXPRESSION TAG	UNP O80066
B	-3	GLY	-	EXPRESSION TAG	UNP O80066
B	-2	SER	-	EXPRESSION TAG	UNP O80066
B	-1	PRO	-	EXPRESSION TAG	UNP O80066
B	0	GLU	-	EXPRESSION TAG	UNP O80066
B	1	PHE	-	EXPRESSION TAG	UNP O80066
B	246	ALA	TYR	ENGINEERED MUTATION	UNP O80066
C	-6	GLY	-	EXPRESSION TAG	UNP O80066
C	-5	PRO	-	EXPRESSION TAG	UNP O80066
C	-4	LEU	-	EXPRESSION TAG	UNP O80066

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-3	GLY	-	EXPRESSION TAG	UNP O80066
C	-2	SER	-	EXPRESSION TAG	UNP O80066
C	-1	PRO	-	EXPRESSION TAG	UNP O80066
C	0	GLU	-	EXPRESSION TAG	UNP O80066
C	1	PHE	-	EXPRESSION TAG	UNP O80066
C	246	ALA	TYR	ENGINEERED MUTATION	UNP O80066
D	-6	GLY	-	EXPRESSION TAG	UNP O80066
D	-5	PRO	-	EXPRESSION TAG	UNP O80066
D	-4	LEU	-	EXPRESSION TAG	UNP O80066
D	-3	GLY	-	EXPRESSION TAG	UNP O80066
D	-2	SER	-	EXPRESSION TAG	UNP O80066
D	-1	PRO	-	EXPRESSION TAG	UNP O80066
D	0	GLU	-	EXPRESSION TAG	UNP O80066
D	1	PHE	-	EXPRESSION TAG	UNP O80066
D	246	ALA	TYR	ENGINEERED MUTATION	UNP O80066

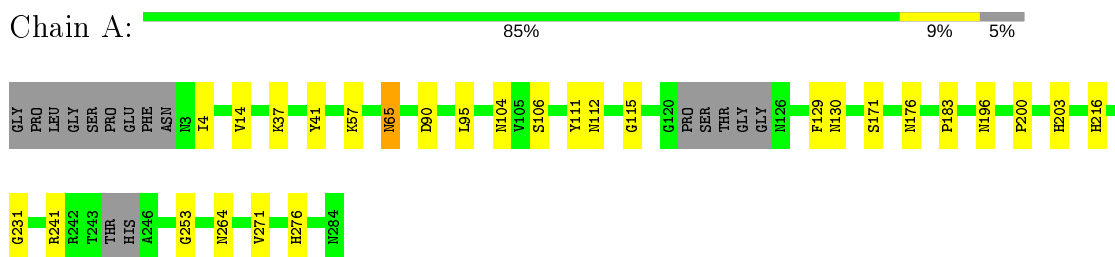
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	139	Total O 139 139	0	0
2	B	110	Total O 110 110	0	0
2	C	94	Total O 94 94	0	0
2	D	130	Total O 130 130	0	0

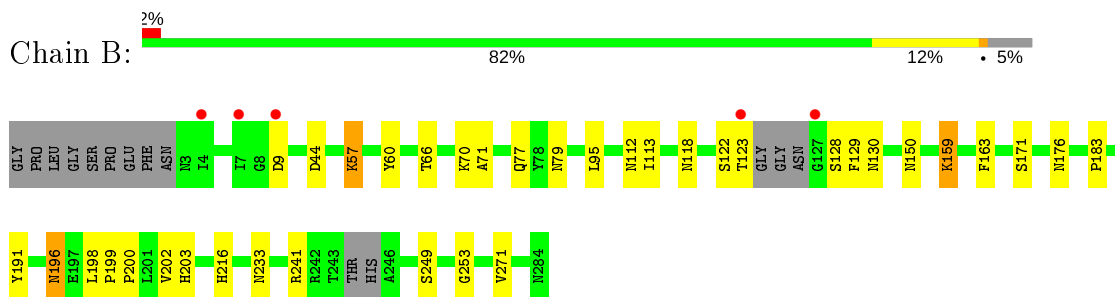
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

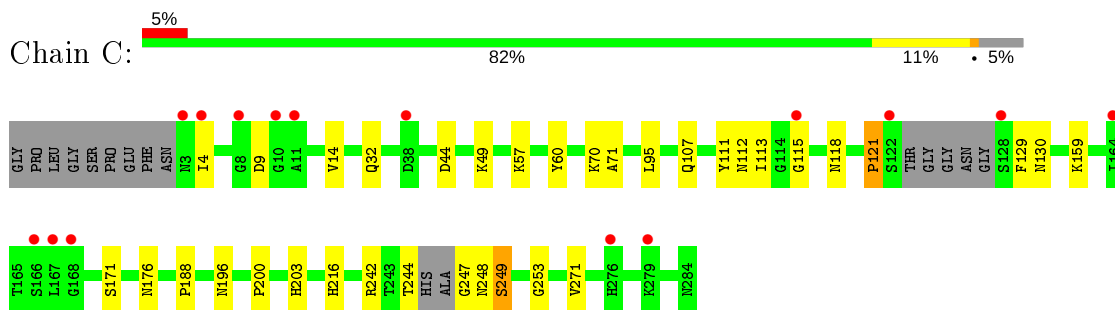
- Molecule 1: LukS-PV



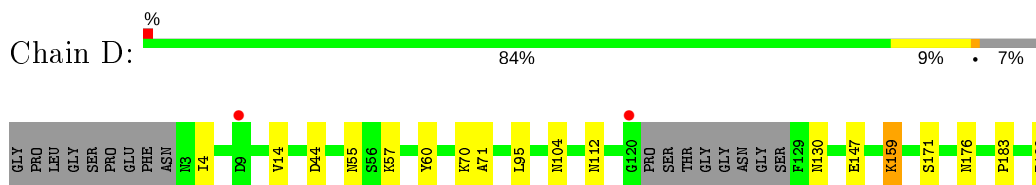
- Molecule 1: LukS-PV



- Molecule 1: LukS-PV



- Molecule 1: LukS-PV





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	94.11Å 94.11Å 306.44Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.51 – 2.50 46.51 – 2.50	Depositor EDS
% Data completeness (in resolution range)	96.1 (46.51-2.50) 96.2 (46.51-2.50)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	0.15	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.92 (at 2.51Å)	Xtrriage
Refinement program	BUSTER 2.10.0	Depositor
R, $R_{free}$	0.182 , 0.228 0.189 , 0.237	Depositor DCC
$R_{free}$ test set	2380 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.7	Xtrriage
Anisotropy	0.362	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 67.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	9234	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.00% 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	0.53	0/2252	0.74	0/3050
1	B	0.50	0/2263	0.72	0/3065
1	C	0.49	0/2228	0.72	0/3023
1	D	0.52	0/2236	0.71	0/3028
All	All	0.51	0/8979	0.72	0/12166

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	2198	0	2063	14	0
1	B	2208	0	2081	20	0
1	C	2173	0	2021	17	0
1	D	2182	0	2056	13	0
2	A	139	0	0	1	0
2	B	110	0	0	4	0
2	C	94	0	0	0	0
2	D	130	0	0	0	0
All	All	9234	0	8221	61	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 4.



All (61) 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:112:ASN:HA	1:A:130:ASN:HD22	1.48	0.79
1:B:44:ASP:HB2	1:B:216:HIS:HB3	1.69	0.74
1:C:44:ASP:HB2	1:C:216:HIS:HB3	1.67	0.73
1:B:112:ASN:HA	1:B:130:ASN:HD22	1.57	0.69
1:A:106:SER:HB3	1:C:118:ASN:ND2	2.09	0.68
1:D:112:ASN:HA	1:D:130:ASN:HD22	1.61	0.65
1:C:112:ASN:HA	1:C:130:ASN:HD22	1.62	0.64
1:C:112:ASN:HD21	1:C:129:PHE:HD1	1.45	0.63
1:B:112:ASN:HD21	1:B:129:PHE:HD1	1.47	0.62
1:B:77:GLN:OE1	1:B:159:LYS:NZ	2.33	0.61
1:D:44:ASP:HB2	1:D:216:HIS:HB3	1.85	0.59
1:A:65:ASN:HD22	1:A:65:ASN:H	1.52	0.57
1:A:112:ASN:HD21	1:A:129:PHE:HD1	1.53	0.56
1:B:70:LYS:HB2	1:B:191:TYR:CD2	2.40	0.56
1:B:118:ASN:HB3	1:D:104:ASN:HB3	1.89	0.54
1:A:231:GLY:HA3	1:A:264:ASN:OD1	2.09	0.53
1:B:196:ASN:HB3	2:B:400:HOH:O	2.08	0.52
1:B:176:ASN:ND2	1:B:253:GLY:H	2.07	0.52
1:A:41:TYR:CD1	1:A:115:GLY:HA3	2.45	0.51
1:C:70:LYS:HD3	1:C:188:PRO:HA	1.91	0.51
1:B:123:THR:HA	2:B:338:HOH:O	2.12	0.50
1:B:9:ASP:HB3	2:B:353:HOH:O	2.12	0.50
1:C:176:ASN:ND2	1:C:253:GLY:H	2.10	0.49
1:A:176:ASN:ND2	1:A:253:GLY:H	2.08	0.49
1:D:147:GLU:OE2	1:D:159:LYS:NZ	2.46	0.48
1:D:176:ASN:ND2	1:D:253:GLY:H	2.11	0.48
1:C:113:ILE:H	1:C:130:ASN:ND2	2.11	0.48
1:C:107:GLN:HA	1:C:121:PRO:HA	1.96	0.47
1:B:200:PRO:HA	1:B:203:HIS:CE1	2.50	0.47
1:B:113:ILE:H	1:B:130:ASN:ND2	2.12	0.47
1:C:242:ARG:O	1:C:249:SER:HA	2.14	0.47
1:A:200:PRO:HA	1:A:203:HIS:CE1	2.50	0.47
1:A:216:HIS:HE1	2:A:311:HOH:O	1.99	0.46
1:C:200:PRO:HA	1:C:203:HIS:CE1	2.51	0.46
1:A:111:TYR:HE1	1:A:115:GLY:HA2	1.81	0.45
1:A:183:PRO:O	1:A:241:ARG:HD3	2.17	0.45
1:D:200:PRO:HA	1:D:203:HIS:CE1	2.51	0.45
1:B:183:PRO:O	1:B:241:ARG:HD3	2.17	0.45
1:D:60:TYR:HA	1:D:71:ALA:O	2.17	0.44
1:D:183:PRO:O	1:D:241:ARG:HD3	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:77:GLN:HE21	1:B:79:ASN:ND2	2.16	0.43
1:D:70:LYS:HD3	1:D:188:PRO:HA	1.99	0.43
1:A:4:ILE:HG12	1:A:14:VAL:HG22	2.00	0.43
1:D:55:ASN:O	1:D:232:ARG:NE	2.52	0.42
1:D:4:ILE:HG12	1:D:14:VAL:HG22	2.02	0.42
1:B:163:PHE:HE2	1:B:199:PRO:HG3	1.84	0.42
1:A:90:ASP:OD2	1:B:150:ASN:HB2	2.19	0.42
1:A:37:LYS:HD2	1:A:276:HIS:CE1	2.55	0.41
1:C:111:TYR:HE1	1:C:115:GLY:HA2	1.85	0.41
1:B:57:LYS:HD2	2:B:388:HOH:O	2.21	0.41
1:C:60:TYR:HA	1:C:71:ALA:O	2.21	0.41
1:B:60:TYR:HA	1:B:71:ALA:O	2.21	0.41
1:C:4:ILE:HG12	1:C:14:VAL:HG22	2.02	0.41
1:B:198:LEU:HD22	1:B:202:VAL:HG11	2.03	0.41
1:D:70:LYS:HB2	1:D:191:TYR:CD2	2.56	0.41
1:C:95:LEU:HD23	1:C:107:GLN:HB3	2.03	0.41
1:D:44:ASP:OD2	1:D:216:HIS:HD2	2.04	0.40
1:C:113:ILE:HG12	1:C:130:ASN:ND2	2.36	0.40
1:B:77:GLN:HB3	1:B:233:ASN:HB2	2.03	0.40
1:C:244:THR:O	1:C:247:GLY:HA3	2.21	0.40
1:C:32:GLN:HB2	1:C:49:LYS:HB3	2.03	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	269/291 (92%)	259 (96%)	10 (4%)	0	100	100
1	B	271/291 (93%)	260 (96%)	11 (4%)	0	100	100
1	C	269/291 (92%)	257 (96%)	9 (3%)	3 (1%)	14	26
1	D	266/291 (91%)	255 (96%)	11 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1075/1164 (92%)	1031 (96%)	41 (4%)	3 (0%)	41 61

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	121	PRO
1	C	248	ASN
1	C	249	SER

### 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	239/258 (93%)	232 (97%)	7 (3%)	42 69
1	B	241/258 (93%)	231 (96%)	10 (4%)	30 55
1	C	233/258 (90%)	227 (97%)	6 (3%)	46 72
1	D	238/258 (92%)	230 (97%)	8 (3%)	37 63
All	All	951/1032 (92%)	920 (97%)	31 (3%)	38 64

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	LYS
1	A	65	ASN
1	A	95	LEU
1	A	104	ASN
1	A	171	SER
1	A	196	ASN
1	A	271	VAL
1	B	57	LYS
1	B	66	THR
1	B	95	LEU
1	B	122	SER
1	B	128	SER

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	B	159	LYS
1	B	171	SER
1	B	196	ASN
1	B	249	SER
1	B	271	VAL
1	C	9	ASP
1	C	57	LYS
1	C	159	LYS
1	C	171	SER
1	C	196	ASN
1	C	271	VAL
1	D	57	LYS
1	D	95	LEU
1	D	159	LYS
1	D	171	SER
1	D	196	ASN
1	D	232	ARG
1	D	249	SER
1	D	271	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (33) such sidechains are listed below:

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	30	ASN
1	A	65	ASN
1	A	79	ASN
1	A	112	ASN
1	A	118	ASN
1	A	130	ASN
1	A	176	ASN
1	A	196	ASN
1	A	216	HIS
1	A	276	HIS
1	B	79	ASN
1	B	98	ASN
1	B	112	ASN
1	B	130	ASN
1	B	148	HIS
1	B	176	ASN
1	C	79	ASN
1	C	112	ASN
1	C	118	ASN

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Mol	Chain	Res	Type
1	C	130	ASN
1	C	176	ASN
1	C	216	HIS
1	C	258	ASN
1	D	30	ASN
1	D	51	GLN
1	D	79	ASN
1	D	116	ASN
1	D	118	ASN
1	D	130	ASN
1	D	176	ASN
1	D	196	ASN
1	D	216	HIS
1	D	258	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 carbohydrates 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	275/291 (94%)	-0.32	0 <span style="border: 1px solid blue; padding: 2px;">100</span> <span style="border: 1px solid blue; padding: 2px;">100</span>	20, 35, 59, 76	0
1	B	277/291 (95%)	-0.11	5 (1%) <span style="border: 1px solid blue; padding: 2px;">68</span> <span style="border: 1px solid blue; padding: 2px;">71</span>	25, 42, 69, 83	0
1	C	275/291 (94%)	0.14	15 (5%) <span style="border: 1px solid red; padding: 2px;">25</span> <span style="border: 1px solid red; padding: 2px;">26</span>	24, 48, 78, 110	0
1	D	272/291 (93%)	-0.22	2 (0%) <span style="border: 1px solid blue; padding: 2px;">87</span> <span style="border: 1px solid blue; padding: 2px;">89</span>	22, 36, 66, 85	0
All	All	1099/1164 (94%)	-0.13	22 (2%) <span style="border: 1px solid blue; padding: 2px;">65</span> <span style="border: 1px solid blue; padding: 2px;">68</span>	20, 41, 70, 110	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	4	ILE	5.4
1	C	4	ILE	4.8
1	C	167	LEU	4.4
1	C	8	GLY	3.6
1	C	122	SER	3.2
1	B	9	ASP	3.0
1	C	279	LYS	3.0
1	D	120	GLY	2.8
1	C	38	ASP	2.8
1	C	115	GLY	2.6
1	B	7	ILE	2.5
1	C	3	ASN	2.4
1	C	168	GLY	2.4
1	C	166	SER	2.4
1	C	128	SER	2.3
1	B	127	GLY	2.3
1	B	123	THR	2.3
1	C	11	ALA	2.1
1	C	164	ILE	2.1
1	C	10	GLY	2.1
1	D	9	ASP	2.1
1	C	276	HIS	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 carbohydrates 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.