Full wwPDB X-ray Structure Validation Report ⓘ

Jun 13, 2024 – 09:35 AM EDT

PDB ID	:	4IYC
Title	:	Structure of the T244A mutant of the PANTON-VALENTINE LEUCOCIDIN component from STAPHYLOCOCCUS AUREUS
Authors	:	Maveyraud, L.; Guerin, F.; Lavnetie, B.J.; Prevost, G.; Mourey, L.
Deposited on	:	2013-01-28
Resolution	:	2.75 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*
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.

The following versions of software and data (see references ⓘ) were used in the production of this report:

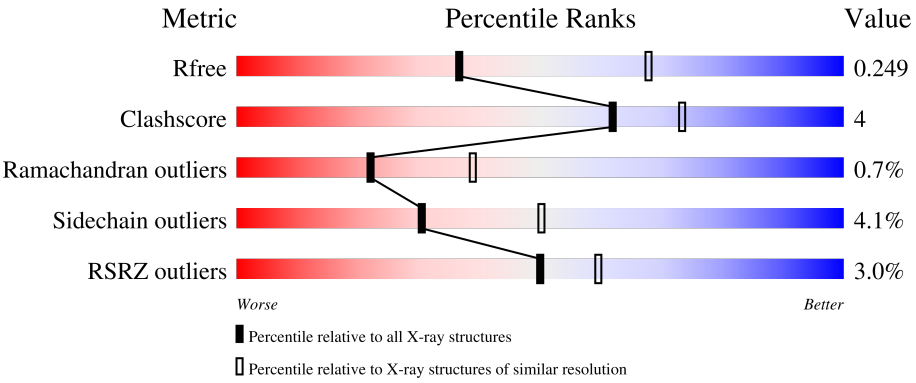
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.75 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	1235 (2.78-2.74)
Clashscore	141614	1277 (2.78-2.74)
Ramachandran outliers	138981	1257 (2.78-2.74)
Sidechain outliers	138945	1257 (2.78-2.74)
RSRZ outliers	127900	1207 (2.78-2.74)

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 >=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 <=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	292	81% 12% • 5%
1	B	292	7% 81% 14% 5%
1	C	292	3% 82% 13% • •
1	D	292	83% 12% 5%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 9119 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
1	A	277	Total	C	N	O	S	0	0	0
			2197	1384	381	428	4			
1	B	278	Total	C	N	O	S	0	0	0
			2193	1382	382	425	4			
1	C	280	Total	C	N	O	S	0	0	0
			2203	1388	382	429	4			
1	D	278	Total	C	N	O	S	0	0	0
			2207	1390	383	430	4			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	expression tag	UNP O80066
A	-6	PRO	-	expression tag	UNP O80066
A	-5	LEU	-	expression tag	UNP O80066
A	-4	GLY	-	expression tag	UNP O80066
A	-3	SER	-	expression tag	UNP O80066
A	-2	PRO	-	expression tag	UNP O80066
A	-1	GLU	-	expression tag	UNP O80066
A	0	PHE	-	expression tag	UNP O80066
A	244	ALA	THR	engineered mutation	UNP O80066
B	-7	GLY	-	expression tag	UNP O80066
B	-6	PRO	-	expression tag	UNP O80066
B	-5	LEU	-	expression tag	UNP O80066
B	-4	GLY	-	expression tag	UNP O80066
B	-3	SER	-	expression tag	UNP O80066
B	-2	PRO	-	expression tag	UNP O80066
B	-1	GLU	-	expression tag	UNP O80066
B	0	PHE	-	expression tag	UNP O80066
B	244	ALA	THR	engineered mutation	UNP O80066
C	-7	GLY	-	expression tag	UNP O80066
C	-6	PRO	-	expression tag	UNP O80066
C	-5	LEU	-	expression tag	UNP O80066

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-4	GLY	-	expression tag	UNP O80066
C	-3	SER	-	expression tag	UNP O80066
C	-2	PRO	-	expression tag	UNP O80066
C	-1	GLU	-	expression tag	UNP O80066
C	0	PHE	-	expression tag	UNP O80066
C	244	ALA	THR	engineered mutation	UNP O80066
D	-7	GLY	-	expression tag	UNP O80066
D	-6	PRO	-	expression tag	UNP O80066
D	-5	LEU	-	expression tag	UNP O80066
D	-4	GLY	-	expression tag	UNP O80066
D	-3	SER	-	expression tag	UNP O80066
D	-2	PRO	-	expression tag	UNP O80066
D	-1	GLU	-	expression tag	UNP O80066
D	0	PHE	-	expression tag	UNP O80066
D	244	ALA	THR	engineered mutation	UNP O80066

- Molecule 2 is water.

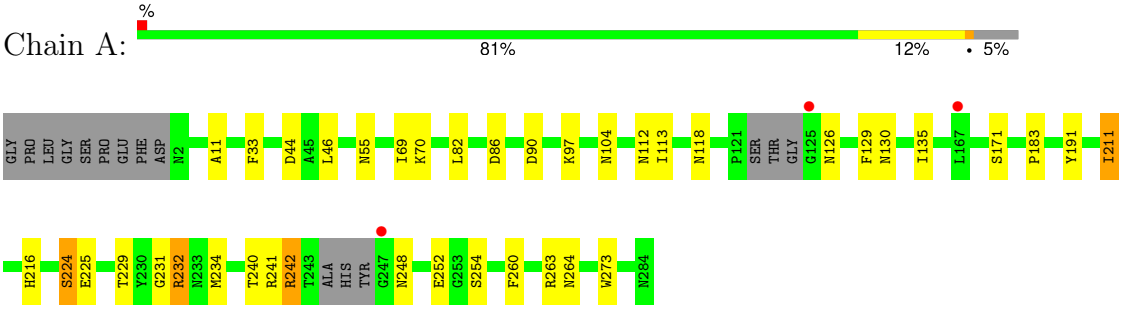
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	83	Total O 83 83	0	0
2	B	53	Total O 53 53	0	0
2	C	69	Total O 69 69	0	0
2	D	114	Total O 114 114	0	0

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.

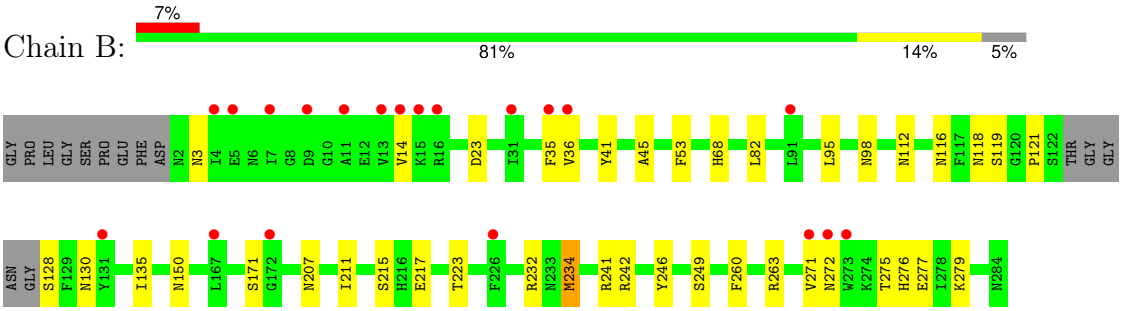
• Molecule 1: LukS-PV

Chain A:



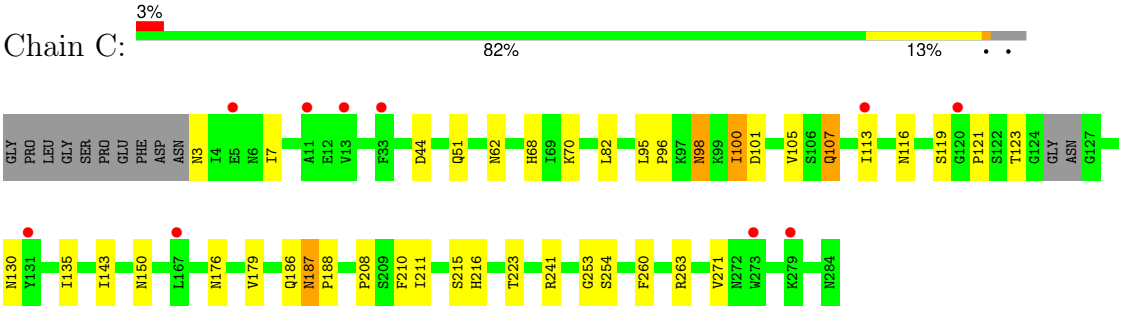
• Molecule 1: LukS-PV

Chain B:



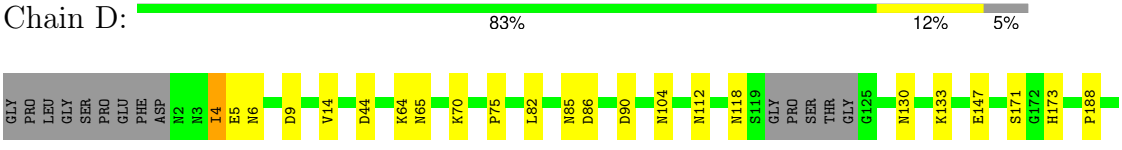
• Molecule 1: LukS-PV

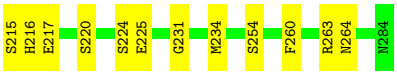
Chain C:



• Molecule 1: LukS-PV

Chain D:




S215
H216
E217
S220
S224
E225
G231
M234
S254
F260
R263
N264
N284

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	94.48Å 94.48Å 310.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.70 – 2.75 46.70 – 2.75	Depositor EDS
% Data completeness (in resolution range)	97.3 (46.70-2.75) 97.3 (46.70-2.75)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	2.49 (at 2.77Å)	Xtriage
Refinement program	BUSTER 2.10.0	Depositor
R, R_{free}	0.195 , 0.246 0.200 , 0.249	Depositor DCC
R_{free} test set	1859 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	59.6	Xtriage
Anisotropy	0.356	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 73.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9119	wwPDB-VP
Average B, all atoms (Å^2)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.02 % 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 7.6599e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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	0.49	0/2252	0.73	0/3054
1	B	0.49	1/2248 (0.0%)	0.73	0/3053
1	C	0.50	1/2259 (0.0%)	0.75	0/3069
1	D	0.53	0/2262	0.76	0/3068
All	All	0.50	2/9021 (0.0%)	0.74	0/12244

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	234	MET	SD-CE	-5.36	1.47	1.77
1	C	3	ASN	C-N	-5.06	1.22	1.34

There are no bond angle outliers.

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	2197	0	2044	22	0
1	B	2193	0	2039	18	0
1	C	2203	0	2037	22	0
1	D	2207	0	2054	17	0
2	A	83	0	0	0	0
2	B	53	0	0	0	0
2	C	69	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	114	0	0	1	0
All	All	9119	0	8174	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 4.

All (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:D:75:PRO:HA	1:D:234:MET:HE2	1.61	0.82
1:C:113:ILE:H	1:C:130:ASN:HD22	1.28	0.80
1:C:113:ILE:H	1:C:130:ASN:ND2	1.85	0.75
1:B:260:PHE:HB3	1:B:263:ARG:HD3	1.68	0.75
1:C:135:ILE:HG23	1:C:211:ILE:HD12	1.68	0.73
1:B:95:LEU:HD21	1:B:119:SER:HB3	1.71	0.71
1:A:86:ASP:OD2	1:A:224:SER:OG	2.13	0.65
1:B:118:ASN:HB3	1:D:104:ASN:HB3	1.81	0.63
1:C:101:ASP:HB3	1:C:143:ILE:HD12	1.81	0.62
1:C:176:ASN:O	1:C:179:VAL:HG22	1.99	0.61
1:A:224:SER:HB2	1:A:273:TRP:HE1	1.65	0.61
1:D:173:HIS:HD2	2:D:393:HOH:O	1.83	0.60
1:C:95:LEU:HD21	1:C:119:SER:HB2	1.84	0.60
1:A:112:ASN:HA	1:A:130:ASN:HD22	1.68	0.58
1:D:75:PRO:CA	1:D:234:MET:HE2	2.31	0.58
1:C:100:ILE:HD12	1:C:105:VAL:HG22	1.86	0.56
1:D:4:ILE:HD13	1:D:14:VAL:HG22	1.86	0.55
1:A:135:ILE:HG23	1:A:211:ILE:HD12	1.88	0.55
1:B:135:ILE:HG23	1:B:211:ILE:HD12	1.87	0.55
1:C:96:PRO:HD2	1:C:210:PHE:CD2	2.43	0.54
1:C:260:PHE:HB3	1:C:263:ARG:HD3	1.88	0.53
1:C:113:ILE:N	1:C:130:ASN:HD22	2.04	0.53
1:B:68:HIS:HB2	1:B:241:ARG:HB3	1.90	0.53
1:A:232:ARG:HD2	1:A:234:MET:HE3	1.92	0.52
1:D:75:PRO:HA	1:D:234:MET:CE	2.38	0.50
1:A:44:ASP:HB2	1:A:216:HIS:HB3	1.93	0.50
1:D:112:ASN:HA	1:D:130:ASN:HD22	1.76	0.49
1:B:112:ASN:HA	1:B:130:ASN:HD22	1.75	0.49
1:A:70:LYS:HB2	1:A:191:TYR:CD2	2.48	0.49
1:D:85:ASN:HD21	1:D:225:GLU:HG3	1.78	0.49
1:A:231:GLY:HA3	1:A:264:ASN:OD1	2.12	0.48
1:B:275:THR:HB	1:B:277:GLU:HG3	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:44:ASP:OD2	1:D:216:HIS:HD2	1.98	0.47
1:C:7:ILE:O	1:C:113:ILE:HD11	2.15	0.47
1:D:86:ASP:OD2	1:D:224:SER:OG	2.29	0.47
1:A:69:ILE:HG12	1:A:240:THR:HG23	1.97	0.47
1:C:44:ASP:HB2	1:C:216:HIS:HB3	1.96	0.47
1:B:242:ARG:O	1:B:249:SER:HA	2.15	0.46
1:C:95:LEU:HD22	1:C:107:GLN:HE21	1.80	0.46
1:B:232:ARG:HD2	1:B:234:MET:CE	2.45	0.46
1:D:231:GLY:HA3	1:D:264:ASN:OD1	2.16	0.46
1:B:53:PHE:HD1	1:B:207:ASN:OD1	2.00	0.45
1:A:242:ARG:HD2	1:A:252:GLU:OE1	2.17	0.44
1:B:36:VAL:HB	1:B:45:ALA:HB3	1.99	0.44
1:A:232:ARG:HD2	1:A:234:MET:CE	2.48	0.44
1:B:272:ASN:HB3	1:B:275:THR:OG1	2.18	0.44
1:C:68:HIS:HB2	1:C:241:ARG:HB3	2.00	0.44
1:D:44:ASP:HB2	1:D:216:HIS:HB3	2.01	0.43
1:C:223:THR:HA	1:C:271:VAL:O	2.18	0.43
1:C:150:ASN:HB2	1:D:90:ASP:OD2	2.19	0.43
1:A:118:ASN:HD21	1:D:118:ASN:ND2	2.16	0.43
1:C:62:ASN:ND2	1:C:188:PRO:HD3	2.33	0.43
1:A:183:PRO:O	1:A:241:ARG:HD3	2.19	0.43
1:A:232:ARG:CD	1:A:234:MET:HE3	2.49	0.43
1:B:223:THR:HA	1:B:271:VAL:O	2.19	0.43
1:B:41:TYR:HE2	1:B:45:ALA:HB2	1.84	0.43
1:C:70:LYS:HD3	1:C:188:PRO:HA	2.01	0.43
1:B:232:ARG:HD2	1:B:234:MET:HE1	2.01	0.43
1:A:260:PHE:HB3	1:A:263:ARG:HD3	2.01	0.42
1:C:51:GLN:HA	1:C:208:PRO:O	2.20	0.42
1:D:260:PHE:HB3	1:D:263:ARG:HD3	2.01	0.42
1:A:55:ASN:O	1:A:232:ARG:HD3	2.20	0.41
1:A:90:ASP:OD2	1:B:150:ASN:HB2	2.20	0.41
1:B:112:ASN:HB2	1:B:116:ASN:HB2	2.02	0.41
1:C:186:GLN:O	1:C:187:ASN:HB3	2.21	0.41
1:A:126:ASN:CB	1:C:119:SER:OG	2.69	0.41
1:A:229:THR:HG23	1:A:264:ASN:HB3	2.03	0.41
1:D:70:LYS:HD3	1:D:188:PRO:HA	2.03	0.41
1:A:11:ALA:HB3	1:A:113:ILE:HD12	2.02	0.41
1:D:217:GLU:O	1:D:220:SER:OG	2.32	0.41
1:B:14:VAL:HB	1:B:35:PHE:HB2	2.03	0.41
1:A:33:PHE:HB3	1:A:46:LEU:HD11	2.03	0.40
1:A:232:ARG:HE	1:A:234:MET:HE3	1.87	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:176:ASN:ND2	1:C:253:GLY:H	2.19	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	271/292 (93%)	261 (96%)	10 (4%)	0	100	100
1	B	274/292 (94%)	259 (94%)	12 (4%)	3 (1%)	14	25
1	C	276/292 (94%)	260 (94%)	12 (4%)	4 (1%)	11	19
1	D	274/292 (94%)	262 (96%)	11 (4%)	1 (0%)	34	53
All	All	1095/1168 (94%)	1042 (95%)	45 (4%)	8 (1%)	22	39

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	121	PRO
1	C	98	ASN
1	C	123	THR
1	B	246	TYR
1	C	121	PRO
1	B	276	HIS
1	C	187	ASN
1	D	64	LYS

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	237/259 (92%)	225 (95%)	12 (5%)	24	41
1	B	235/259 (91%)	226 (96%)	9 (4%)	33	53
1	C	235/259 (91%)	228 (97%)	7 (3%)	41	61
1	D	237/259 (92%)	226 (95%)	11 (5%)	27	46
All	All	944/1036 (91%)	905 (96%)	39 (4%)	30	50

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	82	LEU
1	A	97	LYS
1	A	104	ASN
1	A	129	PHE
1	A	171	SER
1	A	211	ILE
1	A	224	SER
1	A	225	GLU
1	A	232	ARG
1	A	242	ARG
1	A	248	ASN
1	A	254	SER
1	B	3	ASN
1	B	23	ASP
1	B	82	LEU
1	B	98	ASN
1	B	128	SER
1	B	171	SER
1	B	215	SER
1	B	217	GLU
1	B	279	LYS
1	C	82	LEU
1	C	98	ASN
1	C	100	ILE
1	C	107	GLN
1	C	116	ASN
1	C	215	SER
1	C	254	SER
1	D	4	ILE
1	D	5	GLU

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Mol	Chain	Res	Type
1	D	6	ASN
1	D	9	ASP
1	D	65	ASN
1	D	82	LEU
1	D	133	LYS
1	D	147	GLU
1	D	171	SER
1	D	215	SER
1	D	254	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	79	ASN
1	A	104	ASN
1	A	130	ASN
1	A	176	ASN
1	A	216	HIS
1	A	238	HIS
1	B	79	ASN
1	B	130	ASN
1	B	155	GLN
1	B	176	ASN
1	B	238	HIS
1	C	62	ASN
1	C	79	ASN
1	C	107	GLN
1	C	116	ASN
1	C	118	ASN
1	C	130	ASN
1	C	176	ASN
1	C	196	ASN
1	C	238	HIS
1	D	79	ASN
1	D	118	ASN
1	D	130	ASN
1	D	176	ASN
1	D	216	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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

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^{th} 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^2)	Q<0.9
1	A	277/292 (94%)	-0.10	3 (1%) 80 86	39, 58, 90, 105	0
1	B	278/292 (95%)	0.26	20 (7%) 15 18	39, 71, 106, 124	0
1	C	280/292 (95%)	0.17	10 (3%) 42 51	43, 66, 99, 123	0
1	D	278/292 (95%)	-0.11	0 100 100	42, 57, 88, 126	0
All	All	1113/1168 (95%)	0.05	33 (2%) 50 59	39, 63, 99, 126	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	4	ILE	6.1
1	B	7	ILE	5.1
1	C	167	LEU	4.3
1	B	11	ALA	3.9
1	B	35	PHE	3.5
1	B	15	LYS	3.4
1	B	36	VAL	3.4
1	B	13	VAL	3.2
1	C	11	ALA	2.9
1	B	31	ILE	2.9
1	B	273	TRP	2.9
1	B	14	VAL	2.7
1	C	33	PHE	2.6
1	C	13	VAL	2.5
1	B	172	GLY	2.5
1	B	91	LEU	2.5
1	A	247	GLY	2.4
1	A	167	LEU	2.4
1	B	271	VAL	2.4
1	C	5	GLU	2.4
1	B	226	PHE	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	279	LYS	2.3
1	B	272	ASN	2.3
1	B	5	GLU	2.2
1	C	273	TRP	2.2
1	C	113	ILE	2.2
1	B	16	ARG	2.2
1	A	125	GLY	2.2
1	B	167	LEU	2.1
1	C	131	TYR	2.1
1	B	9	ASP	2.1
1	B	131	TYR	2.1
1	C	120	GLY	2.1

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.