



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 6, 2023 – 08:09 PM JST

PDB ID : 7YLT
Title : Structure of a bacteria protein
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Deposited on : 2022-07-26
Resolution : 2.30 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
Xtrriage (Phenix) : 1.13
EDS : 2.33
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) : 2.33

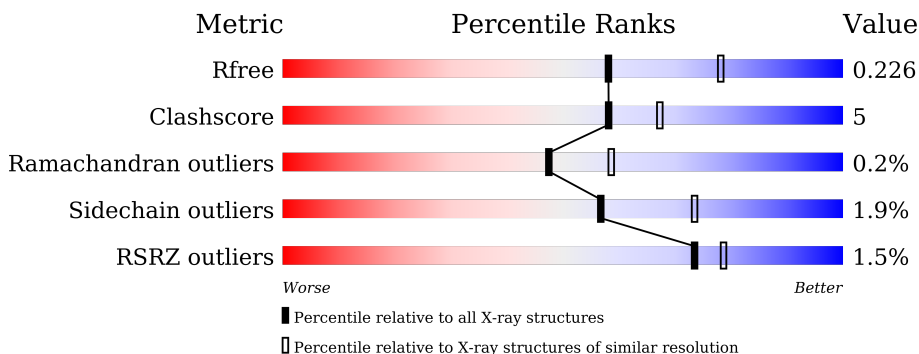
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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 $\leq 5\%$. 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	361	 2% 89% 10%
1	B	361	 2% 91% 9%
1	C	361	 2% 88% 11%
1	D	361	 2% 85% 14%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 22194 atoms, of which 10935 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 Putative ABC transporter, substrate-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	B	360	5428	1708	2741	464	508	7	0	0	0
1	D	360	5390	1701	2720	460	502	7	0	0	0
1	C	360	5444	1713	2750	465	509	7	0	0	0
1	A	361	5410	1707	2724	462	510	7	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	61	SER	ALA	conflict	UNP T1X8R6
B	388	LYS	-	expression tag	UNP T1X8R6
D	61	SER	ALA	conflict	UNP T1X8R6
D	388	LYS	-	expression tag	UNP T1X8R6
C	61	SER	ALA	conflict	UNP T1X8R6
C	388	LYS	-	expression tag	UNP T1X8R6
A	61	SER	ALA	conflict	UNP T1X8R6
A	388	LYS	-	expression tag	UNP T1X8R6

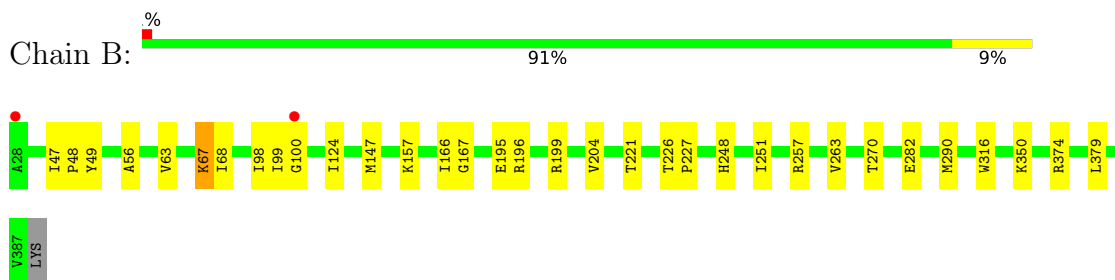
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	164	Total 164	O 164	0	0
2	D	68	Total 68	O 68	0	0
2	C	71	Total 71	O 71	0	0
2	A	219	Total 219	O 219	0	0

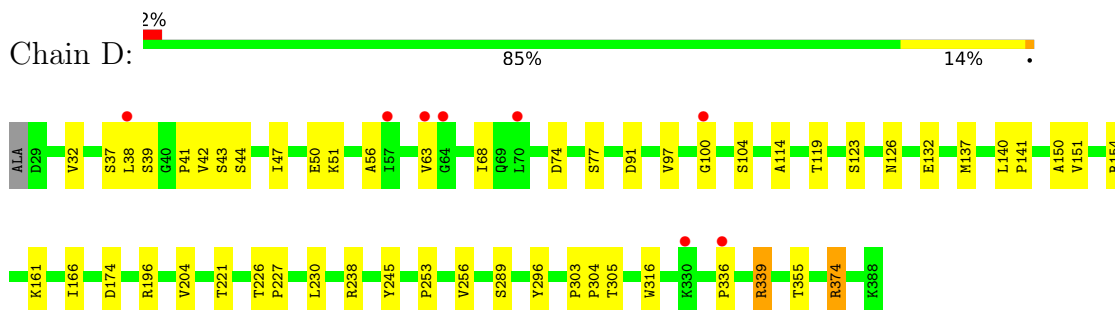
3 Residue-property plots [i](#)

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.

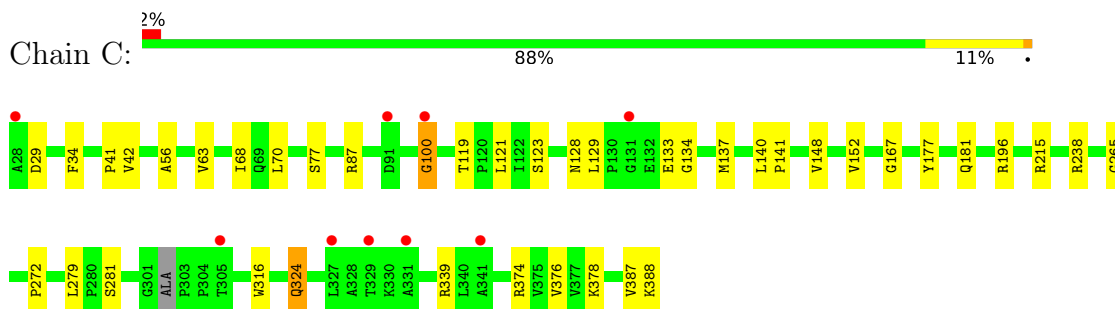
- Molecule 1: Putative ABC transporter, substrate-binding protein



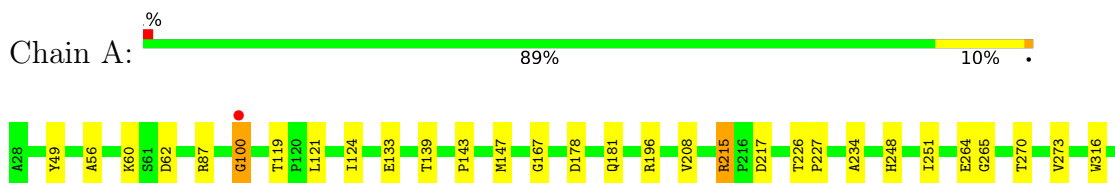
- Molecule 1: Putative ABC transporter, substrate-binding protein



- Molecule 1: Putative ABC transporter, substrate-binding protein



- Molecule 1: Putative ABC transporter, substrate-binding protein





4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	36.77Å 75.75Å 119.71Å 85.60° 89.16° 89.37°	Depositor
Resolution (Å)	48.67 – 2.30 48.67 – 2.30	Depositor EDS
% Data completeness (in resolution range)	91.0 (48.67-2.30) 91.0 (48.67-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.83 (at 2.29Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487, PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.186 , 0.228 0.185 , 0.226	Depositor DCC
R_{free} test set	2588 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	24.7	Xtrriage
Anisotropy	0.801	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 41.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.045 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	22194	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.94% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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	0.27	0/2739	0.51	0/3724
1	B	0.26	0/2740	0.52	0/3724
1	C	0.26	0/2746	0.51	0/3728
1	D	0.27	0/2723	0.52	0/3702
All	All	0.27	0/10948	0.52	0/14878

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
1	D	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	374	ARG	Sidechain

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	2686	2724	2724	24	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2687	2741	2741	20	0
1	C	2694	2750	2750	28	0
1	D	2670	2720	2720	33	0
2	A	219	0	0	3	0
2	B	164	0	0	0	0
2	C	71	0	0	2	0
2	D	68	0	0	1	0
All	All	11259	10935	10935	103	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 5.

All (103) 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:204:VAL:HG13	1:D:230:LEU:HD22	1.50	0.91
1:D:104:SER:OG	1:D:126:ASN:O	1.96	0.81
1:D:39:SER:OG	1:D:74:ASP:OD2	1.99	0.79
1:C:215:ARG:HH11	1:C:215:ARG:HG2	1.50	0.76
1:C:339:ARG:NH1	2:C:401:HOH:O	2.23	0.66
1:A:339:ARG:NH1	2:A:405:HOH:O	2.28	0.65
1:A:208:VAL:HG21	1:A:234:ALA:HB1	1.78	0.65
1:A:178:ASP:OD1	2:A:401:HOH:O	2.14	0.64
1:C:129:LEU:HD23	1:C:134:GLY:CA	2.28	0.63
1:A:181:GLN:NE2	2:A:401:HOH:O	2.30	0.63
1:D:63:VAL:HG23	1:D:68:ILE:HD11	1.82	0.61
1:D:289:SER:HA	1:D:355:THR:HG22	1.83	0.59
1:B:99:ILE:HG22	1:B:99:ILE:O	2.04	0.57
1:A:56:ALA:HB1	1:A:316:TRP:CG	2.39	0.57
1:C:121:LEU:HD23	1:C:137:MET:HE3	1.87	0.56
1:D:336:PRO:HA	1:D:339:ARG:HE	1.68	0.56
1:C:215:ARG:HG2	1:C:215:ARG:NH1	2.17	0.56
1:C:272:PRO:HB3	1:C:279:LEU:HD11	1.87	0.55
1:A:49:TYR:CD1	1:A:124:ILE:HD12	2.41	0.55
1:C:63:VAL:HG23	1:C:68:ILE:HD11	1.87	0.55
1:B:47:ILE:HB	1:B:48:PRO:HD3	1.88	0.54
1:A:60:LYS:HD3	1:A:320:LEU:HD13	1.89	0.54
1:D:374:ARG:HH11	1:D:374:ARG:HG3	1.73	0.54
1:A:119:THR:HG23	1:A:339:ARG:HD2	1.89	0.54
1:D:56:ALA:HB1	1:D:316:TRP:CG	2.43	0.54
1:C:63:VAL:HG13	1:C:324:GLN:HG2	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:129:LEU:HD23	1:C:134:GLY:HA2	1.91	0.52
1:C:56:ALA:HB1	1:C:316:TRP:CG	2.45	0.52
1:A:56:ALA:HB1	1:A:316:TRP:CD1	2.45	0.51
1:B:99:ILE:O	1:B:99:ILE:CG2	2.57	0.51
1:D:42:VAL:HG23	1:D:77:SER:HB3	1.93	0.51
1:C:100:GLY:HA2	1:C:121:LEU:HD11	1.91	0.51
1:C:100:GLY:HA3	1:C:123:SER:HA	1.92	0.51
1:C:119:THR:HG23	1:C:339:ARG:HD2	1.93	0.50
1:B:49:TYR:CD1	1:B:124:ILE:HD12	2.47	0.49
1:A:139:THR:HG22	1:A:366:ARG:HB3	1.94	0.49
1:B:67:LYS:HD3	1:B:68:ILE:N	2.28	0.49
1:D:226:THR:N	1:D:227:PRO:HD2	2.29	0.48
1:B:56:ALA:HB1	1:B:316:TRP:CG	2.48	0.48
1:D:37:SER:O	1:D:43:SER:HA	2.13	0.48
1:D:204:VAL:CG1	1:D:230:LEU:HD22	2.33	0.48
1:D:47:ILE:O	1:D:51:LYS:HG3	2.14	0.47
1:B:282:GLU:OE1	1:B:282:GLU:N	2.44	0.47
1:C:34:PHE:HB3	1:C:70:LEU:HD11	1.96	0.47
1:A:226:THR:N	1:A:227:PRO:CD	2.78	0.47
1:C:56:ALA:HB1	1:C:316:TRP:CD1	2.50	0.46
1:A:251:ILE:CD1	1:A:270:THR:HB	2.44	0.46
1:D:32:VAL:HG23	1:D:97:VAL:CG1	2.47	0.45
1:D:41:PRO:HD2	1:D:77:SER:HB2	1.98	0.45
1:A:264:GLU:OE1	1:A:380:GLU:O	2.35	0.45
1:B:98:ILE:HG22	1:B:100:GLY:H	1.81	0.45
1:B:226:THR:N	1:B:227:PRO:CD	2.80	0.45
1:D:32:VAL:HG23	1:D:97:VAL:HG13	1.98	0.45
1:B:263:VAL:HG23	1:B:379:LEU:HD23	1.99	0.44
1:B:166:ILE:HD11	1:B:204:VAL:HG21	1.98	0.44
1:B:251:ILE:CD1	1:B:270:THR:HB	2.48	0.44
1:D:123:SER:HB2	1:D:137:MET:CE	2.47	0.44
1:B:67:LYS:HD3	1:B:67:LYS:C	2.38	0.44
1:D:32:VAL:HG11	1:D:316:TRP:CH2	2.53	0.44
1:A:273:VAL:HB	1:A:355:THR:HB	1.99	0.44
1:C:41:PRO:HD2	1:C:77:SER:HB3	1.99	0.44
1:D:151:VAL:CG2	1:D:245:TYR:CD1	3.01	0.44
1:D:174:ASP:OD1	1:D:196:ARG:NH1	2.46	0.44
1:C:167:GLY:O	1:C:196:ARG:HA	2.18	0.44
1:D:150:ALA:HB2	1:D:374:ARG:HD2	1.99	0.44
1:C:42:VAL:CG1	1:C:42:VAL:O	2.66	0.44
1:C:140:LEU:HB2	1:C:141:PRO:HD3	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:166:ILE:HD11	1:B:204:VAL:CG2	2.48	0.44
1:D:114:ALA:HB1	1:D:119:THR:O	2.18	0.44
1:B:290:MET:HG3	1:A:133:GLU:CG	2.48	0.43
1:D:38:LEU:CD2	1:D:50:GLU:OE1	2.67	0.43
1:D:253:PRO:O	1:D:256:VAL:HG22	2.18	0.43
1:D:42:VAL:HG12	1:D:42:VAL:O	2.18	0.43
1:D:154:ARG:NH2	2:D:403:HOH:O	2.36	0.43
1:C:376:VAL:O	1:C:387:VAL:HG22	2.18	0.43
1:A:143:PRO:HG3	1:A:367:TYR:CD2	2.53	0.43
1:B:167:GLY:O	1:B:196:ARG:HA	2.19	0.43
1:C:265:GLY:HA2	1:C:378:LYS:HE3	1.99	0.43
1:B:166:ILE:O	1:B:221:THR:HA	2.19	0.42
1:D:204:VAL:O	1:D:204:VAL:HG23	2.19	0.42
1:A:371:GLU:H	1:A:371:GLU:CD	2.22	0.42
1:D:38:LEU:HD22	1:D:50:GLU:OE1	2.19	0.42
1:A:100:GLY:HA2	1:A:121:LEU:HD11	2.00	0.42
1:D:140:LEU:N	1:D:141:PRO:CD	2.82	0.42
1:A:60:LYS:NZ	1:A:62:ASP:O	2.47	0.42
1:A:167:GLY:O	1:A:196:ARG:HA	2.20	0.42
1:C:121:LEU:CD2	1:C:137:MET:HE3	2.49	0.41
1:D:303:PRO:O	1:D:305:THR:HG23	2.20	0.41
1:D:132:GLU:HA	1:D:132:GLU:OE1	2.19	0.41
1:C:128:ASN:ND2	2:C:411:HOH:O	2.50	0.41
1:C:265:GLY:CA	1:C:378:LYS:HE3	2.51	0.41
1:C:177:TYR:CE2	1:C:181:GLN:OE1	2.74	0.41
1:A:265:GLY:HA2	1:A:378:LYS:HE3	2.03	0.41
1:B:166:ILE:HA	1:B:195:GLU:O	2.21	0.41
1:B:147:MET:HG3	1:B:248:HIS:CE1	2.56	0.41
1:B:63:VAL:HG23	1:B:68:ILE:HD11	2.02	0.41
1:A:215:ARG:NH2	1:A:217:ASP:OD1	2.55	0.40
1:D:166:ILE:O	1:D:221:THR:HA	2.21	0.40
1:C:148:VAL:O	1:C:152:VAL:HG23	2.21	0.40
1:A:147:MET:HG3	1:A:248:HIS:CE1	2.55	0.40
1:D:296:TYR:CG	1:D:304:PRO:HG3	2.57	0.40
1:C:129:LEU:HD21	1:C:133:GLU:HG2	2.04	0.40
1:C:388:LYS:CD	1:A:329:THR:HB	2.52	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	359/361 (99%)	346 (96%)	12 (3%)	1 (0%)	41	50
1	B	358/361 (99%)	347 (97%)	11 (3%)	0	100	100
1	C	356/361 (99%)	344 (97%)	11 (3%)	1 (0%)	41	50
1	D	358/361 (99%)	340 (95%)	17 (5%)	1 (0%)	41	50
All	All	1431/1444 (99%)	1377 (96%)	51 (4%)	3 (0%)	47	58

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	100	GLY
1	C	100	GLY
1	D	100	GLY

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	277/281 (99%)	273 (99%)	4 (1%)	67	81
1	B	279/281 (99%)	273 (98%)	6 (2%)	52	69
1	C	280/281 (100%)	274 (98%)	6 (2%)	53	70
1	D	275/281 (98%)	270 (98%)	5 (2%)	59	75
All	All	1111/1124 (99%)	1090 (98%)	21 (2%)	57	73

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	67	LYS
1	B	157	LYS
1	B	199	ARG
1	B	257	ARG
1	B	350	LYS
1	B	374	ARG
1	D	44	SER
1	D	91	ASP
1	D	161	LYS
1	D	238	ARG
1	D	339	ARG
1	C	29	ASP
1	C	87	ARG
1	C	238	ARG
1	C	281	SER
1	C	324	GLN
1	C	374	ARG
1	A	87	ARG
1	A	215	ARG
1	A	374	ARG
1	A	380	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	181	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

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, 95th 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	361/361 (100%)	-0.27	2 (0%) 89 92	17, 25, 36, 62	0
1	B	360/361 (99%)	-0.27	2 (0%) 89 92	17, 25, 37, 61	0
1	C	360/361 (99%)	0.15	9 (2%) 57 64	24, 40, 59, 85	0
1	D	360/361 (99%)	0.14	8 (2%) 62 69	25, 40, 61, 77	0
All	All	1441/1444 (99%)	-0.06	21 (1%) 73 79	17, 32, 55, 85	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	28	ALA	5.0
1	B	100	GLY	4.4
1	C	100	GLY	4.0
1	A	100	GLY	3.3
1	A	388	LYS	3.2
1	C	131	GLY	3.1
1	D	330	LYS	3.0
1	D	63	VAL	2.9
1	B	28	ALA	2.9
1	C	91	ASP	2.8
1	C	341	ALA	2.7
1	C	329	THR	2.5
1	D	336	PRO	2.3
1	D	100	GLY	2.3
1	C	331	ALA	2.3
1	D	70	LEU	2.3
1	D	38	LEU	2.2
1	C	327	LEU	2.0
1	D	57	ILE	2.0
1	D	64	GLY	2.0
1	C	305	THR	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.