



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 10:12 AM GMT

PDB ID : 3L8C
Title : Structure of probable D-alanine--poly(phosphoribitol) ligase subunit-1 from Streptococcus pyogenes
Authors : Ramagopal, U.A.; Toro, R.; Burley, S.K.; Almo, S.C.; New York SGX Research Center for Structural Genomics (NYSGXRC)
Deposited on : 2009-12-30
Resolution : 2.41 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

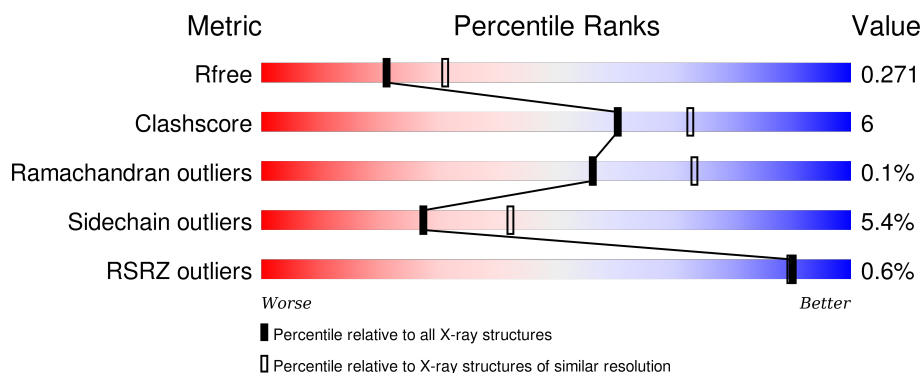
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.41 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}	91344	3386 (2.44-2.40)
Clashscore	102246	3897 (2.44-2.40)
Ramachandran outliers	100387	3837 (2.44-2.40)
Sidechain outliers	100360	3838 (2.44-2.40)
RSRZ outliers	91569	3396 (2.44-2.40)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	521	<div> <div style="width: 100%; height: 10px; position: relative;"> <div style="position: absolute; top: -10px; left: 0; width: 100%; text-align: center;">%</div> <div style="position: absolute; top: 10px; left: 0; width: 100%; text-align: center;">79%16% . .</div> </div> </div>
1	B	521	<div> <div style="width: 100%; height: 10px; position: relative;"> <div style="position: absolute; top: 10px; left: 0; width: 100%; text-align: center;">83%14% . .</div> </div> </div>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 7946 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 D-alanine--poly(phosphoribitol) ligase subunit 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	0	0
			3868	2490	616	745	17			
1	B	510	Total	C	N	O	S	0	0	0
			3973	2557	635	764	17			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	MET	-	EXPRESSION TAG	UNP Q5XBN5
A	-3	SER	-	EXPRESSION TAG	UNP Q5XBN5
A	-2	LEU	-	EXPRESSION TAG	UNP Q5XBN5
A	509	GLU	-	EXPRESSION TAG	UNP Q5XBN5
A	510	GLY	-	EXPRESSION TAG	UNP Q5XBN5
A	511	HIS	-	EXPRESSION TAG	UNP Q5XBN5
A	512	HIS	-	EXPRESSION TAG	UNP Q5XBN5
A	513	HIS	-	EXPRESSION TAG	UNP Q5XBN5
A	514	HIS	-	EXPRESSION TAG	UNP Q5XBN5
A	515	HIS	-	EXPRESSION TAG	UNP Q5XBN5
A	516	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	-4	MET	-	EXPRESSION TAG	UNP Q5XBN5
B	-3	SER	-	EXPRESSION TAG	UNP Q5XBN5
B	-2	LEU	-	EXPRESSION TAG	UNP Q5XBN5
B	509	GLU	-	EXPRESSION TAG	UNP Q5XBN5
B	510	GLY	-	EXPRESSION TAG	UNP Q5XBN5
B	511	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	512	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	513	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	514	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	515	HIS	-	EXPRESSION TAG	UNP Q5XBN5
B	516	HIS	-	EXPRESSION TAG	UNP Q5XBN5

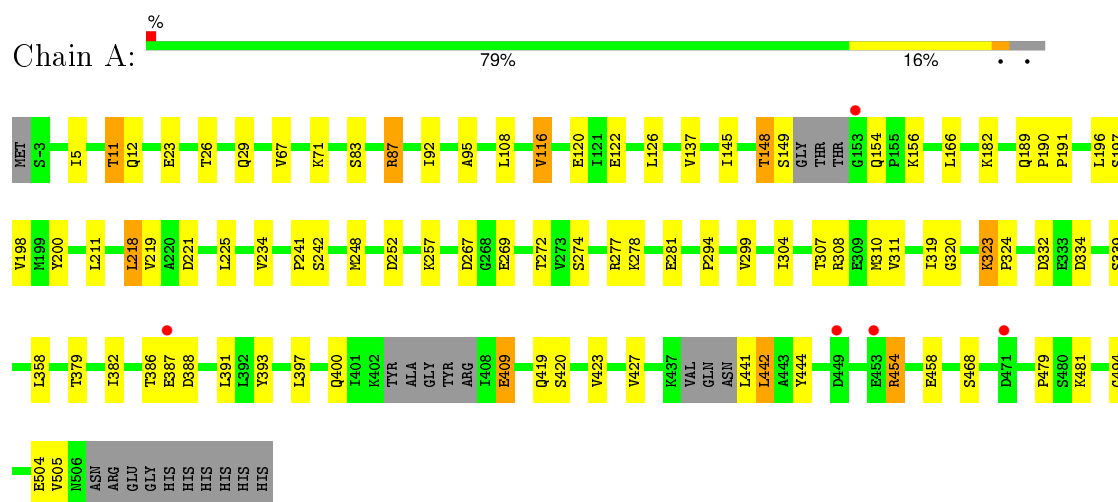
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	45	Total 45	O 45	0	0
2	B	60	Total 60	O 60	0	0

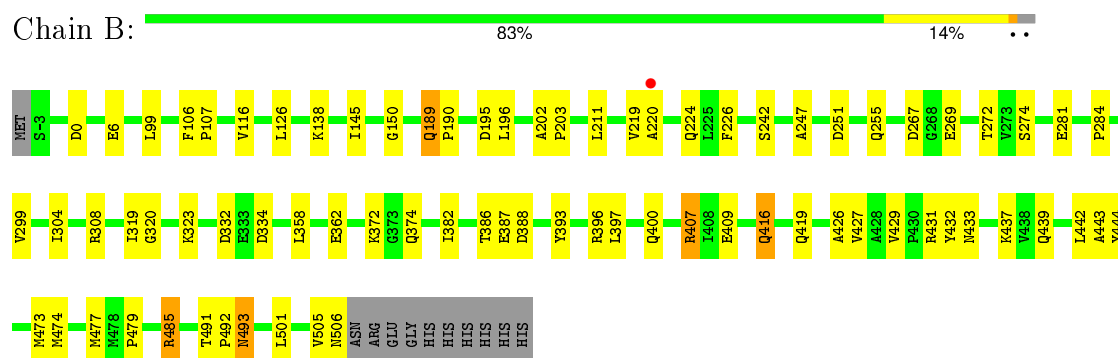
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: D-alanine--poly(phosphoribitol) ligase subunit 1



- Molecule 1: D-alanine--poly(phosphoribitol) ligase subunit 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	89.02Å 153.74Å 84.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.76 – 2.41 42.76 – 2.41	Depositor EDS
% Data completeness (in resolution range)	99.7 (42.76-2.41) 99.7 (42.76-2.41)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.22 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.5.0089	Depositor
R, R_{free}	0.217 , 0.275 0.213 , 0.271	Depositor DCC
R_{free} test set	2305 reflections (5.32%)	DCC
Wilson B-factor (Å ²)	39.6	Xtriage
Anisotropy	0.073	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 31.4	EDS
Estimated twinning fraction	0.017 for l,-k,h	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	1 of 45821 reflections (0.002%)	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7946	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.21% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.70	0/3955	0.75	1/5375 (0.0%)
1	B	0.72	0/4065	0.75	1/5527 (0.0%)
All	All	0.71	0/8020	0.75	2/10902 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	485	ARG	NE-CZ-NH1	5.13	122.86	120.30
1	A	87	ARG	NE-CZ-NH1	-5.03	117.78	120.30

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	3868	0	3808	47	0
1	B	3973	0	3935	40	0
2	A	45	0	0	0	0
2	B	60	0	0	2	0
All	All	7946	0	7743	87	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 (87) 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:382:ILE:HD11	1:A:397:LEU:HD12	1.43	0.98
1:B:432:TYR:H	1:B:506:ASN:HD21	1.16	0.92
1:A:332:ASP:HB3	1:A:334:ASP:OD2	1.77	0.83
1:B:323:LYS:HE2	2:B:519:HOH:O	1.85	0.76
1:A:386:THR:HG22	1:A:388:ASP:H	1.51	0.76
1:A:382:ILE:HD11	1:A:397:LEU:CD1	2.15	0.75
1:A:441:LEU:HD23	1:A:479:PRO:HA	1.69	0.75
1:B:432:TYR:H	1:B:506:ASN:ND2	1.84	0.75
1:B:387:GLU:HG2	2:B:547:HOH:O	1.89	0.72
1:B:407:ARG:HG3	1:B:407:ARG:HH11	1.59	0.68
1:B:145:ILE:HD13	1:B:358:LEU:HD22	1.77	0.67
1:B:224:GLN:OE1	1:B:224:GLN:HA	1.96	0.65
1:B:416:GLN:HG2	1:B:473:MET:HG2	1.83	0.59
1:B:242:SER:HB2	1:B:269:GLU:OE1	2.01	0.59
1:B:304:ILE:HB	1:B:320:GLY:HA2	1.85	0.58
1:A:386:THR:HG22	1:A:387:GLU:N	2.20	0.56
1:B:332:ASP:OD1	1:B:334:ASP:N	2.38	0.55
1:A:319:ILE:HD13	1:A:393:TYR:HB2	1.88	0.55
1:B:427:VAL:HG11	1:B:501:LEU:HD13	1.88	0.55
1:A:382:ILE:CD1	1:A:397:LEU:HD12	2.29	0.55
1:B:189:GLN:HB3	1:B:190:PRO:HD3	1.89	0.55
1:A:196:LEU:HD13	1:A:267:ASP:HB3	1.87	0.54
1:A:400:GLN:HA	1:A:409:GLU:HA	1.90	0.54
1:A:87:ARG:NH1	1:A:148:THR:O	2.40	0.54
1:B:491:THR:OG1	1:B:493:ASN:ND2	2.41	0.54
1:A:442:LEU:N	1:A:442:LEU:HD23	2.22	0.54
1:A:441:LEU:HD23	1:A:479:PRO:CA	2.38	0.53
1:A:145:ILE:HD13	1:A:358:LEU:HD22	1.90	0.52
1:A:444:TYR:OH	1:A:504:GLU:HB3	2.10	0.51
1:A:92:ILE:O	1:A:95:ALA:O	2.29	0.51
1:A:319:ILE:HG13	1:A:391:LEU:HB3	1.93	0.51
1:B:407:ARG:HG3	1:B:407:ARG:NH1	2.24	0.51
1:A:294:PRO:HG3	1:A:379:THR:HG22	1.93	0.51
1:A:218:LEU:HD23	1:A:225:LEU:HA	1.93	0.51
1:B:196:LEU:HD13	1:B:267:ASP:HB3	1.93	0.50
1:A:148:THR:HG22	1:A:156:LYS:H	1.77	0.50
1:B:226:PHE:CE1	1:B:247:ALA:HB2	2.47	0.50
1:A:198:VAL:HB	1:A:299:VAL:HG21	1.96	0.48
1:A:272:THR:HG22	1:A:274:SER:N	2.27	0.48
1:A:122:GLU:O	1:A:126:LEU:HD13	2.13	0.48
1:B:427:VAL:HG13	1:B:444:TYR:HB2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:150:GLY:HA2	1:B:492:PRO:HB2	1.95	0.48
1:B:443:ALA:HB2	1:B:479:PRO:HG2	1.94	0.48
1:A:148:THR:HG23	1:A:149:SER:N	2.28	0.48
1:A:420:SER:HB3	1:A:423:VAL:HG23	1.96	0.48
1:B:382:ILE:HD11	1:B:397:LEU:HD13	1.96	0.47
1:B:433:ASN:ND2	1:B:439:GLN:OE1	2.47	0.47
1:A:272:THR:HG22	1:A:274:SER:H	1.80	0.47
1:B:272:THR:HG22	1:B:274:SER:H	1.80	0.46
1:B:202:ALA:N	1:B:203:PRO:HD2	2.30	0.46
1:A:190:PRO:HA	1:A:191:PRO:HD3	1.75	0.46
1:B:400:GLN:HB2	1:B:409:GLU:OE1	2.16	0.46
1:B:99:LEU:HD11	1:B:116:VAL:HG23	1.97	0.46
1:A:444:TYR:OH	1:A:505:VAL:HG13	2.15	0.46
1:A:307:THR:OG1	1:A:310:MET:HG3	2.16	0.46
1:A:442:LEU:N	1:A:442:LEU:CD2	2.79	0.46
1:A:200:TYR:HD1	1:A:211:LEU:HD22	1.82	0.45
1:A:248:MET:HG2	1:A:278:LYS:HD3	1.98	0.45
1:A:277:ARG:HB2	1:A:311:VAL:HG11	1.99	0.45
1:B:386:THR:CG2	1:B:387:GLU:N	2.79	0.44
1:B:386:THR:HG22	1:B:388:ASP:H	1.82	0.44
1:A:323:LYS:HA	1:A:324:PRO:HD3	1.88	0.44
1:B:219:VAL:O	1:B:220:ALA:HB3	2.18	0.44
1:A:116:VAL:HG22	1:A:120:GLU:HG2	1.99	0.44
1:B:255:GLN:OE1	1:B:284:PRO:HD2	2.17	0.43
1:B:386:THR:HG22	1:B:387:GLU:N	2.33	0.43
1:A:26:THR:H	1:A:29:GLN:HE21	1.66	0.43
1:A:454:ARG:HG3	1:A:454:ARG:O	2.17	0.43
1:A:242:SER:HB2	1:A:494:GLY:O	2.19	0.43
1:A:11:THR:HG22	1:A:12:GLN:HG2	2.00	0.42
1:B:195:ASP:OD1	1:B:299:VAL:HA	2.18	0.42
1:A:241:PRO:HD2	1:A:269:GLU:HB3	1.99	0.42
1:A:252:ASP:HA	1:A:257:LYS:HG3	2.01	0.42
1:B:431:ARG:HE	1:B:442:LEU:HD11	1.84	0.42
1:B:189:GLN:HE21	1:B:189:GLN:HB3	1.72	0.42
1:B:211:LEU:HA	1:B:211:LEU:HD23	1.81	0.42
1:B:427:VAL:CG1	1:B:444:TYR:HB2	2.50	0.42
1:A:200:TYR:CD1	1:A:211:LEU:HD22	2.55	0.41
1:B:0:ASP:OD2	1:B:138:LYS:NZ	2.43	0.41
1:A:304:ILE:HB	1:A:320:GLY:HA2	2.01	0.41
1:B:319:ILE:HD13	1:B:393:TYR:HB2	2.02	0.41
1:A:67:VAL:O	1:A:71:LYS:HG3	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:386:THR:CG2	1:A:387:GLU:N	2.84	0.41
1:B:426:ALA:HA	1:B:444:TYR:O	2.20	0.41
1:B:106:PHE:HA	1:B:107:PRO:HD3	1.99	0.40
1:A:189:GLN:N	1:A:190:PRO:CD	2.84	0.40
1:A:197:SER:HA	1:A:200:TYR:CE2	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	491/521 (94%)	463 (94%)	28 (6%)	0	100	100
1	B	508/521 (98%)	489 (96%)	18 (4%)	1 (0%)	52	69
All	All	999/1042 (96%)	952 (95%)	46 (5%)	1 (0%)	56	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	372	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.

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	418/447 (94%)	391 (94%)	27 (6%)	21	32
1	B	431/447 (96%)	412 (96%)	19 (4%)	35	52
All	All	849/894 (95%)	803 (95%)	46 (5%)	27	42

All (46) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	ILE
1	A	11	THR
1	A	23	GLU
1	A	83	SER
1	A	108	LEU
1	A	116	VAL
1	A	137	VAL
1	A	148	THR
1	A	154	GLN
1	A	166	LEU
1	A	182	LYS
1	A	218	LEU
1	A	219	VAL
1	A	221	ASP
1	A	234	VAL
1	A	281	GLU
1	A	308	ARG
1	A	323	LYS
1	A	339	SER
1	A	409	GLU
1	A	419	GLN
1	A	427	VAL
1	A	442	LEU
1	A	454	ARG
1	A	458	GLU
1	A	468	SER
1	A	481	LYS
1	B	6	GLU
1	B	126	LEU
1	B	189	GLN
1	B	251	ASP
1	B	281	GLU

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Mol	Chain	Res	Type
1	B	308	ARG
1	B	362	GLU
1	B	374	GLN
1	B	396	ARG
1	B	407	ARG
1	B	416	GLN
1	B	419	GLN
1	B	429	VAL
1	B	437	LYS
1	B	474	MET
1	B	477	MET
1	B	485	ARG
1	B	493	ASN
1	B	505	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	29	GLN
1	A	374	GLN
1	A	493	ASN
1	A	503	ASN
1	B	12	GLN
1	B	135	HIS
1	B	183	GLN
1	B	189	GLN
1	B	419	GLN
1	B	493	ASN
1	B	503	ASN
1	B	506	ASN

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 [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 [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, 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	499/521 (95%)	-0.20	5 (1%) 84 83	19, 37, 59, 77	0
1	B	510/521 (97%)	-0.29	1 (0%) 95 95	19, 36, 55, 66	0
All	All	1009/1042 (96%)	-0.25	6 (0%) 90 90	19, 37, 57, 77	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	153	GLY	3.1
1	A	449	ASP	3.0
1	B	220	ALA	2.5
1	A	387	GLU	2.4
1	A	471	ASP	2.3
1	A	453	GLU	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 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.