



Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 11:42 am BST

PDB ID : 1LNS
Title : Crystal Structure Analysis of the X-Prolyl Dipeptidyl Aminopeptidase From Lactococcus lactis
Authors : Rigolet, P.; Mechin, I.; Delage, M.M.; Chich, J.F.
Deposited on : 2002-05-03
Resolution : 2.20 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 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

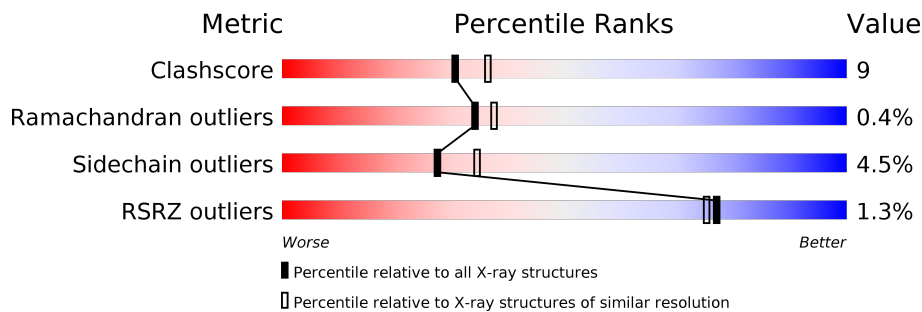
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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))
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 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	763	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6505 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 X-PROLYL DIPEPTIDYL AMINOPEPTIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	763	6200	3978	1030	1176	16	0	0	0

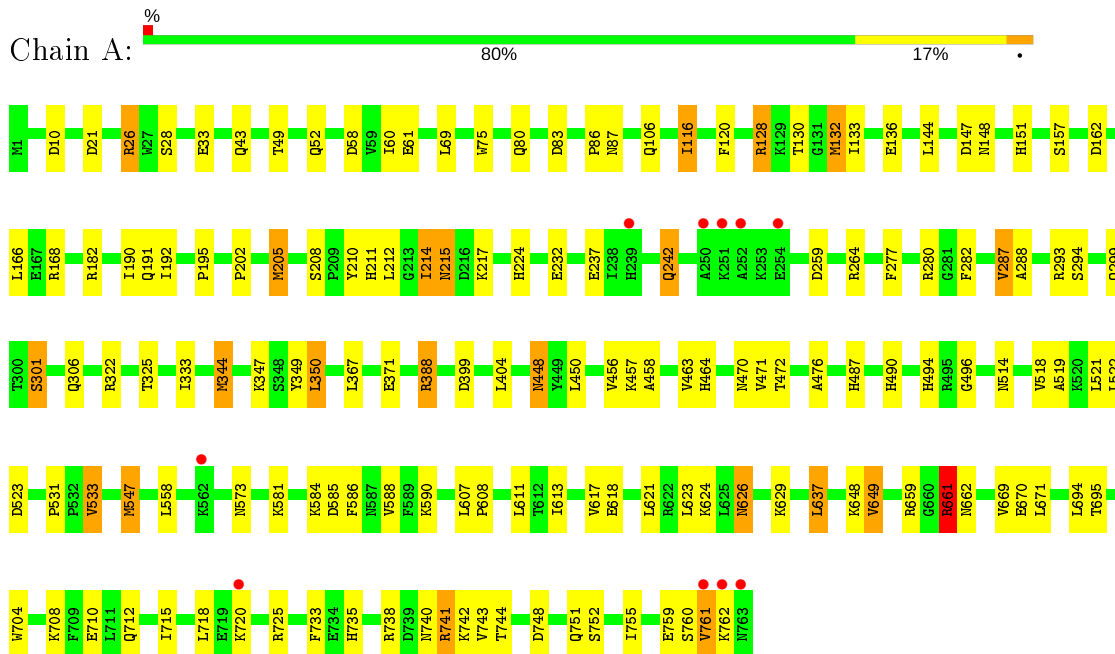
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	305	Total	O	0	0
			305	305		

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: X-PROLYL DIPEPTIDYL AMINOPEPTIDASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	92.50Å 102.50Å 101.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	22.88 – 2.20 22.87 – 2.15	Depositor EDS
% Data completeness (in resolution range)	92.9 (22.88-2.20) 92.2 (22.87-2.15)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	6.34 (at 2.15Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.184 , 0.223 0.197 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	18.8	Xtrriage
Anisotropy	0.227	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 39.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.014 for -h,l,k	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6505	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.45% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² 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	0.44	0/6345	0.67	8/8594 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	659	ARG	NE-CZ-NH2	7.51	124.05	120.30
1	A	738	ARG	NE-CZ-NH2	7.45	124.02	120.30
1	A	128	ARG	NE-CZ-NH2	7.37	123.99	120.30
1	A	661	ARG	NE-CZ-NH2	7.30	123.95	120.30
1	A	388	ARG	NE-CZ-NH2	7.29	123.94	120.30
1	A	344	MET	CG-SD-CE	6.14	110.03	100.20
1	A	132	MET	CG-SD-CE	6.12	109.99	100.20
1	A	205	MET	CG-SD-CE	6.11	109.98	100.20

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	6200	0	6088	113	0
2	A	305	0	0	5	0
All	All	6505	0	6088	113	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 9.

All (113) 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:325:THR:HA	1:A:333:ILE:HD11	1.55	0.88
1:A:52:GLN:H	1:A:80:GLN:HE22	1.22	0.84
1:A:586:PHE:HB3	1:A:733:PHE:O	1.79	0.81
1:A:210:TYR:HD2	1:A:214:ILE:HD11	1.47	0.80
1:A:299:GLN:HE21	1:A:301:SER:H	1.28	0.79
1:A:741:ARG:HG3	1:A:743:VAL:HG23	1.65	0.78
1:A:514:ASN:O	1:A:518:VAL:HG13	1.84	0.78
1:A:191:GLN:OE1	1:A:211:HIS:HE1	1.68	0.77
1:A:626:ASN:HD21	1:A:744:THR:H	1.37	0.69
1:A:585:ASP:O	1:A:588:VAL:HG22	1.93	0.69
1:A:190:ILE:HG22	1:A:287:VAL:HG13	1.78	0.65
1:A:456:VAL:O	1:A:457:LYS:HE2	1.96	0.64
1:A:448:ASN:HD21	1:A:450:LEU:HB2	1.64	0.62
1:A:464:HIS:HE1	1:A:471:VAL:O	1.82	0.62
1:A:148:ASN:ND2	1:A:162:ASP:H	1.97	0.62
1:A:388:ARG:HG2	1:A:735:HIS:HB3	1.82	0.62
1:A:148:ASN:HD21	1:A:162:ASP:H	1.46	0.61
1:A:128:ARG:HG3	1:A:132:MET:O	2.00	0.61
1:A:586:PHE:CB	1:A:733:PHE:O	2.46	0.60
1:A:618:GLU:HB2	1:A:755:ILE:HB	1.84	0.59
1:A:456:VAL:C	1:A:457:LYS:HE2	2.22	0.59
1:A:533:VAL:HG13	1:A:547:MET:HB2	1.85	0.59
1:A:626:ASN:ND2	1:A:744:THR:H	2.02	0.58
1:A:224:HIS:HE1	1:A:399:ASP:OD2	1.87	0.57
1:A:205:MET:O	1:A:344:MET:HA	2.05	0.57
1:A:210:TYR:CD2	1:A:214:ILE:HD11	2.36	0.57
1:A:626:ASN:HD22	1:A:626:ASN:N	2.03	0.56
1:A:607:LEU:HD11	1:A:718:LEU:HD13	1.88	0.56
1:A:626:ASN:H	1:A:626:ASN:ND2	2.04	0.56
1:A:748:ASP:OD2	1:A:751:GLN:HG3	2.06	0.56
1:A:494:HIS:HD2	1:A:496:GLY:H	1.55	0.55
1:A:490:HIS:HD2	1:A:531:PRO:O	1.90	0.54
1:A:168:ARG:H	1:A:264:ARG:HH21	1.54	0.54
1:A:518:VAL:O	1:A:522:LEU:HB2	2.07	0.54
1:A:618:GLU:HG2	1:A:710:GLU:HG2	1.90	0.53
1:A:136:GLU:OE1	1:A:280:ARG:NH1	2.42	0.53
1:A:214:ILE:HG13	1:A:404:LEU:HG	1.89	0.53
1:A:649:VAL:HG21	1:A:669:VAL:HG23	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:760:SER:C	1:A:762:LYS:H	2.11	0.52
1:A:621:LEU:HD23	1:A:752:SER:HB3	1.91	0.52
1:A:277:PHE:HB3	1:A:282:PHE:HB2	1.91	0.52
1:A:613:ILE:O	1:A:715:ILE:HA	2.09	0.52
1:A:325:THR:CA	1:A:333:ILE:HD11	2.34	0.51
1:A:759:GLU:HG3	1:A:761:VAL:HG22	1.91	0.51
1:A:147:ASP:OD2	1:A:151:HIS:HE1	1.93	0.51
1:A:347:LYS:HA	1:A:371:GLU:O	2.10	0.51
1:A:208:SER:HB2	1:A:350:LEU:HD22	1.93	0.50
1:A:649:VAL:HG21	1:A:669:VAL:CG2	2.42	0.50
1:A:371:GLU:HG2	1:A:463:VAL:HB	1.95	0.49
1:A:626:ASN:ND2	1:A:743:VAL:HG13	2.26	0.49
1:A:617:VAL:HG23	2:A:810:HOH:O	2.12	0.49
1:A:464:HIS:CE1	1:A:471:VAL:O	2.66	0.48
1:A:759:GLU:O	1:A:761:VAL:HG23	2.14	0.48
1:A:299:GLN:HE21	1:A:301:SER:N	2.05	0.48
1:A:626:ASN:ND2	1:A:626:ASN:N	2.61	0.48
1:A:208:SER:CB	1:A:350:LEU:HD22	2.43	0.47
1:A:626:ASN:H	1:A:626:ASN:HD22	1.61	0.47
1:A:157:SER:O	1:A:280:ARG:HG2	2.14	0.47
1:A:694:LEU:N	1:A:694:LEU:HD12	2.30	0.47
1:A:212:LEU:HD23	1:A:288:ALA:HB2	1.95	0.47
1:A:448:ASN:C	1:A:448:ASN:HD22	2.17	0.47
1:A:573:ASN:HA	1:A:740:ASN:OD1	2.15	0.47
1:A:182:ARG:HD3	2:A:809:HOH:O	2.14	0.47
1:A:210:TYR:HA	1:A:214:ILE:CD1	2.45	0.46
1:A:741:ARG:NH1	1:A:743:VAL:HG21	2.30	0.46
1:A:661:ARG:O	1:A:662:ASN:HB2	2.16	0.46
1:A:116:ILE:HD12	1:A:120:PHE:CE1	2.51	0.46
1:A:144:LEU:O	1:A:661:ARG:NH2	2.39	0.45
1:A:202:PRO:HB3	1:A:521:LEU:HB3	1.98	0.45
1:A:518:VAL:CG2	1:A:519:ALA:N	2.79	0.45
1:A:573:ASN:HD22	1:A:742:LYS:HA	1.82	0.45
1:A:208:SER:HA	1:A:350:LEU:HD22	1.98	0.45
1:A:202:PRO:HG3	1:A:522:LEU:CD2	2.47	0.45
1:A:299:GLN:HE22	1:A:306:GLN:NE2	2.14	0.45
1:A:573:ASN:ND2	1:A:742:LYS:HA	2.31	0.45
1:A:58:ASP:OD1	1:A:61:GLU:HG3	2.17	0.44
1:A:649:VAL:HG22	1:A:670:GLU:N	2.32	0.44
1:A:760:SER:O	1:A:762:LYS:N	2.50	0.44
1:A:21:ASP:OD2	1:A:26:ARG:HG2	2.18	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:624:LYS:HD2	1:A:704:TRP:CE2	2.53	0.44
1:A:494:HIS:CD2	1:A:496:GLY:H	2.36	0.43
1:A:259:ASP:OD2	1:A:259:ASP:N	2.47	0.43
1:A:558:LEU:N	1:A:558:LEU:HD12	2.33	0.43
1:A:367:LEU:HA	1:A:458:ALA:HB1	2.01	0.43
1:A:133:ILE:CG1	1:A:136:GLU:HG3	2.48	0.43
1:A:75:TRP:CZ2	1:A:106:GLN:HG2	2.54	0.43
1:A:293:ARG:O	1:A:294:SER:HB2	2.19	0.43
1:A:581:LYS:O	1:A:584:LYS:HG2	2.18	0.42
1:A:232:GLU:HB2	1:A:629:LYS:HD3	2.02	0.42
1:A:325:THR:HG22	1:A:333:ILE:HG12	2.00	0.42
1:A:49:THR:HG22	1:A:60:ILE:HD11	2.01	0.42
1:A:586:PHE:O	1:A:590:LYS:HG3	2.19	0.42
1:A:217:LYS:HG3	2:A:922:HOH:O	2.20	0.42
1:A:166:LEU:HD23	1:A:195:PRO:HA	2.01	0.42
1:A:242:GLN:HG3	1:A:242:GLN:O	2.19	0.42
1:A:33:GLU:HG3	2:A:947:HOH:O	2.18	0.42
1:A:458:ALA:O	1:A:487:HIS:HE1	2.02	0.42
1:A:472:THR:HB	1:A:712:GLN:OE1	2.20	0.42
1:A:623:LEU:HD23	1:A:623:LEU:H	1.84	0.42
1:A:637:LEU:HD23	1:A:637:LEU:N	2.35	0.42
1:A:299:GLN:NE2	1:A:301:SER:H	2.07	0.42
1:A:464:HIS:CD2	1:A:476:ALA:HB2	2.55	0.42
1:A:743:VAL:HG12	1:A:744:THR:N	2.34	0.41
1:A:759:GLU:CG	1:A:761:VAL:HG22	2.50	0.41
1:A:86:PRO:O	1:A:87:ASN:HB2	2.20	0.41
1:A:464:HIS:HD2	2:A:828:HOH:O	2.04	0.41
1:A:237:GLU:OE2	1:A:695:THR:HG22	2.21	0.41
1:A:611:LEU:O	1:A:611:LEU:HD12	2.20	0.41
1:A:350:LEU:HD23	1:A:350:LEU:N	2.36	0.41
1:A:325:THR:CG2	1:A:333:ILE:HG12	2.51	0.41
1:A:759:GLU:HG3	1:A:761:VAL:CG2	2.51	0.41
1:A:168:ARG:HA	1:A:192:ILE:O	2.22	0.40
1:A:215:ASN:HD22	1:A:215:ASN:C	2.25	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	761/763 (100%)	730 (96%)	28 (4%)	3 (0%)	34 37

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	301	SER
1	A	608	PRO
1	A	761	VAL

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	674/674 (100%)	644 (96%)	30 (4%)	27 34

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	ASP
1	A	26	ARG
1	A	28	SER
1	A	43	GLN
1	A	69	LEU
1	A	83	ASP
1	A	116	ILE
1	A	130	THR

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Mol	Chain	Res	Type
1	A	214	ILE
1	A	215	ASN
1	A	242	GLN
1	A	287	VAL
1	A	322	ARG
1	A	349	TYR
1	A	350	LEU
1	A	448	ASN
1	A	470	ASN
1	A	523	ASP
1	A	533	VAL
1	A	547	MET
1	A	626	ASN
1	A	637	LEU
1	A	648	LYS
1	A	649	VAL
1	A	661	ARG
1	A	671	LEU
1	A	708	LYS
1	A	720	LYS
1	A	725	ARG
1	A	741	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	80	GLN
1	A	103	ASN
1	A	115	ASN
1	A	148	ASN
1	A	151	HIS
1	A	211	HIS
1	A	215	ASN
1	A	224	HIS
1	A	227	ASN
1	A	299	GLN
1	A	448	ASN
1	A	464	HIS
1	A	470	ASN
1	A	487	HIS
1	A	490	HIS
1	A	494	HIS

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Mol	Chain	Res	Type
1	A	527	ASN
1	A	542	GLN
1	A	553	ASN
1	A	555	GLN
1	A	573	ASN
1	A	626	ASN
1	A	679	GLN
1	A	691	GLN
1	A	717	HIS
1	A	735	HIS

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 [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	763/763 (100%)	-0.53	10 (1%) 77 75	5, 18, 39, 60	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	761	VAL	12.5
1	A	763	ASN	9.2
1	A	762	LYS	5.1
1	A	252	ALA	2.9
1	A	250	ALA	2.7
1	A	239	HIS	2.5
1	A	720	LYS	2.5
1	A	562	LYS	2.3
1	A	254	GLU	2.2
1	A	251	LYS	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.