



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 27, 2022 – 07:17 pm BST

PDB ID : 7R51
Title : Structure of *P. gingivalis* DPP11 in complex with the dipeptide Arg-Asp
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Deposited on : 2022-02-09
Resolution : 1.81 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 : 2.28
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.28

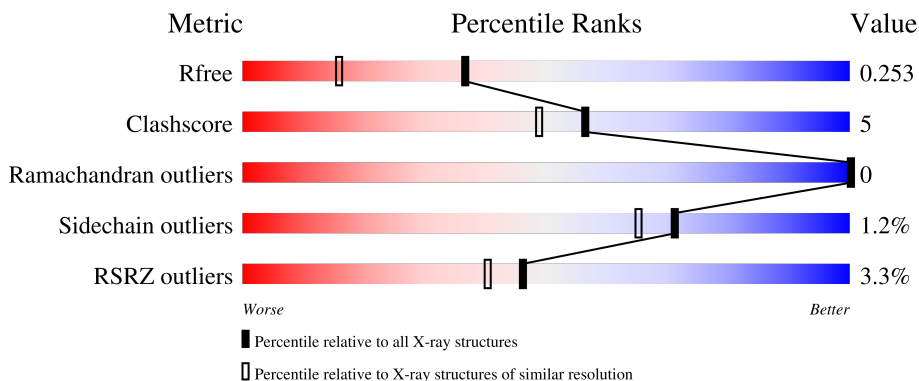
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.81 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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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	707	 4% 85% 13%
1	B	707	 3% 89% 10%
2	C	2	 50% 50%
2	D	2	 100%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 11557 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 Asp/Glu-specific dipeptidyl-peptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	695	Total	C	N	O	S	0	0	0
			5549	3521	962	1039	27			
1	B	698	Total	C	N	O	S	0	0	0
			5539	3517	950	1044	28			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	21	MET	-	initiating methionine	UNP B2RID1
A	721	ALA	-	expression tag	UNP B2RID1
A	722	HIS	-	expression tag	UNP B2RID1
A	723	HIS	-	expression tag	UNP B2RID1
A	724	HIS	-	expression tag	UNP B2RID1
A	725	HIS	-	expression tag	UNP B2RID1
A	726	HIS	-	expression tag	UNP B2RID1
A	727	HIS	-	expression tag	UNP B2RID1
B	21	MET	-	initiating methionine	UNP B2RID1
B	721	ALA	-	expression tag	UNP B2RID1
B	722	HIS	-	expression tag	UNP B2RID1
B	723	HIS	-	expression tag	UNP B2RID1
B	724	HIS	-	expression tag	UNP B2RID1
B	725	HIS	-	expression tag	UNP B2RID1
B	726	HIS	-	expression tag	UNP B2RID1
B	727	HIS	-	expression tag	UNP B2RID1

- Molecule 2 is a protein called ARG-ASP.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	2	Total	C	N	O	0	0	0
			20	10	5	5			
2	D	2	Total	C	N	O	0	0	0
			20	10	5	5			

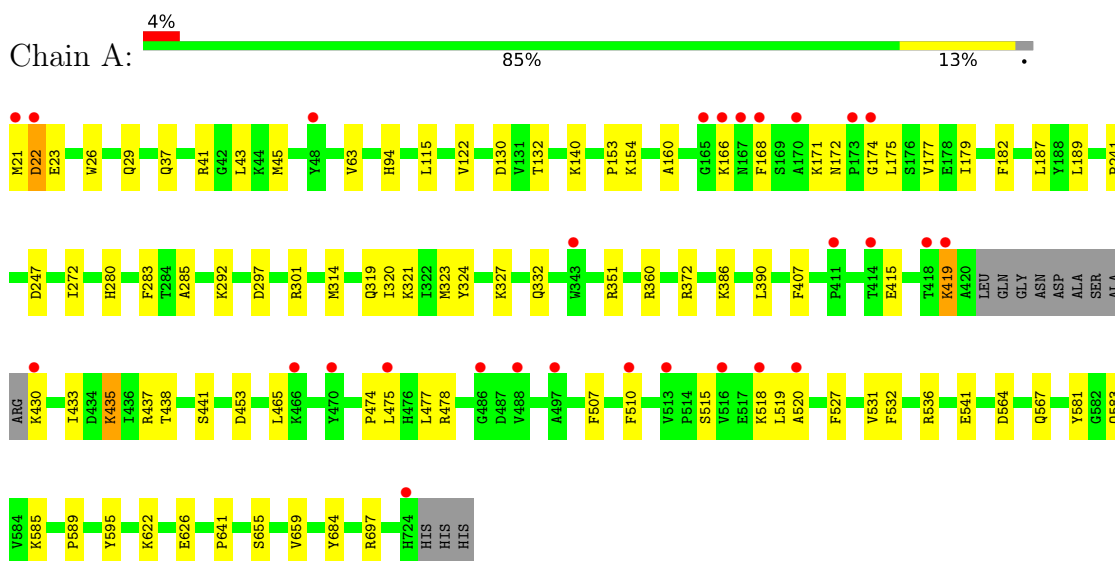
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	245	Total 245	O 245	0	0
3	B	180	Total 180	O 180	0	0
3	C	2	Total 2	O 2	0	0
3	D	2	Total 2	O 2	0	0

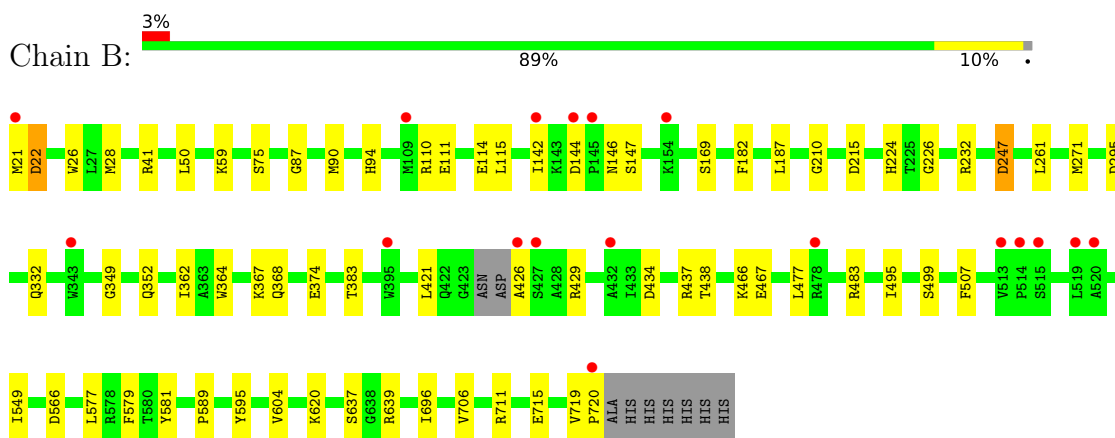
3 Residue-property plots [i](#)

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: Asp/Glu-specific dipeptidyl-peptidase



- Molecule 1: Asp/Glu-specific dipeptidyl-peptidase



- Molecule 2: ARG-ASP



- Molecule 2: ARG-ASP

Chain D:  100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	193.43Å 72.91Å 119.37Å 90.00° 91.88° 90.00°	Depositor
Resolution (Å)	119.30 – 1.81 119.30 – 1.81	Depositor EDS
% Data completeness (in resolution range)	53.2 (119.30-1.81) 53.2 (119.30-1.81)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.14 (at 1.81Å)	Xtrriage
Refinement program	PHENIX 1.14_3260	Depositor
R, R_{free}	0.206 , 0.253 0.206 , 0.253	Depositor DCC
R_{free} test set	4108 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	17.0	Xtrriage
Anisotropy	0.050	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.000 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	11557	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.37% 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	0.26	0/5675	0.45	0/7672
1	B	0.27	0/5663	0.45	0/7660
2	C	0.18	0/19	0.34	0/22
2	D	0.23	0/19	0.31	0/22
All	All	0.26	0/11376	0.45	0/15376

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	5549	0	5404	59	0
1	B	5539	0	5369	50	0
2	C	20	0	19	1	0
2	D	20	0	19	0	0
3	A	245	0	0	6	0
3	B	180	0	0	2	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
All	All	11557	0	10811	109	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 (109) 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:B:28:MET:SD	3:B:980:HOH:O	2.30	0.88
1:B:114:GLU:OE2	1:B:232:ARG:NH1	2.15	0.79
1:A:160:ALA:HB1	1:A:177:VAL:HG12	1.70	0.73
1:A:332:GLN:NE2	3:A:803:HOH:O	2.25	0.70
1:B:620:LYS:NZ	1:B:706:VAL:O	2.23	0.69
1:B:28:MET:HE2	1:B:579:PHE:HD1	1.58	0.68
1:B:421:LEU:HA	1:B:429:ARG:HD2	1.76	0.67
1:A:390:LEU:HD13	1:A:541:GLU:HG2	1.78	0.66
1:B:21:MET:N	1:B:581:TYR:HH	1.94	0.66
1:A:437:ARG:HG3	1:A:507:PHE:HE2	1.62	0.65
1:B:362:ILE:HG12	1:B:374:GLU:HG2	1.79	0.64
1:A:626:GLU:OE2	3:A:801:HOH:O	2.15	0.64
1:A:567:GLN:NE2	3:A:807:HOH:O	2.29	0.63
1:A:21:MET:N	1:A:37:GLN:HB3	2.16	0.60
1:A:168:PHE:HA	1:A:171:LYS:HE2	1.84	0.60
1:A:22:ASP:OD1	3:A:802:HOH:O	2.15	0.60
1:B:22:ASP:HB3	1:B:26:TRP:HZ2	1.67	0.59
1:A:160:ALA:HB2	1:A:179:ILE:HG13	1.85	0.59
1:A:172:ASN:HB3	1:A:175:LEU:HD12	1.86	0.58
1:B:87:GLY:HA2	1:B:90:MET:HE2	1.85	0.58
1:B:426:ALA:N	1:B:429:ARG:HG3	2.19	0.58
1:A:21:MET:N	1:A:581:TYR:HH	2.03	0.57
1:A:292:LYS:NZ	1:A:297:ASP:OD2	2.38	0.57
1:A:415:GLU:O	1:A:419:LYS:HG2	2.05	0.57
1:B:142:ILE:HG22	1:B:144:ASP:HB3	1.87	0.56
1:B:362:ILE:HG23	1:B:374:GLU:HG2	1.87	0.55
1:A:622:LYS:NZ	3:A:805:HOH:O	2.28	0.55
1:B:21:MET:HB3	1:B:41:ARG:HH11	1.73	0.53
1:A:63:VAL:HB	1:A:122:VAL:HG13	1.91	0.53
1:A:474:PRO:HG2	1:A:477:LEU:HD12	1.89	0.52
1:A:132:THR:OG1	1:A:187:LEU:HD12	2.10	0.52
1:B:224:HIS:HB3	1:B:604:VAL:HG22	1.92	0.52
1:A:437:ARG:HG3	1:A:507:PHE:CE2	2.45	0.51
1:A:94:HIS:CE1	1:A:115:LEU:HB3	2.45	0.51
1:B:90:MET:N	1:B:90:MET:SD	2.84	0.51
1:B:383:THR:HB	1:B:549:ILE:HD11	1.92	0.50
1:B:364:TRP:O	1:B:368:GLN:HG2	2.11	0.50
1:B:620:LYS:HE3	1:B:706:VAL:HA	1.93	0.50
1:A:655:SER:OG	2:C:2:ASP:C	2.50	0.50
1:A:438:THR:O	1:A:441:SER:OG	2.19	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:144:ASP:OD2	1:B:147:SER:HB2	2.12	0.50
1:B:144:ASP:O	1:B:146:ASN:N	2.44	0.50
1:A:515:SER:HB3	1:A:518:LYS:HB3	1.94	0.49
1:A:272:ILE:HG12	1:A:659:VAL:HG22	1.93	0.49
1:A:280:HIS:HB3	1:A:283:PHE:CE1	2.49	0.48
1:A:130:ASP:HA	1:A:189:LEU:HD23	1.96	0.47
1:A:168:PHE:HA	1:A:171:LYS:CE	2.45	0.47
1:A:519:LEU:HD12	1:A:520:ALA:N	2.29	0.47
1:B:28:MET:HE1	1:B:579:PHE:N	2.28	0.47
1:A:174:GLY:HA3	1:A:241:PRO:HG2	1.96	0.47
1:A:465:LEU:HD11	1:A:477:LEU:HD22	1.96	0.47
1:A:43:LEU:HD11	1:A:45:MET:HB2	1.97	0.46
1:A:153:PRO:HD2	1:A:154:LYS:NZ	2.31	0.46
1:A:515:SER:HB3	1:A:518:LYS:CB	2.45	0.46
1:B:437:ARG:HG3	1:B:507:PHE:CE2	2.51	0.46
1:A:22:ASP:HB3	1:A:26:TRP:HZ2	1.81	0.46
1:A:41:ARG:HH21	1:A:583:GLN:HG3	1.81	0.46
1:A:166:LYS:HE3	1:A:166:LYS:HB2	1.66	0.46
1:B:637:SER:OG	1:B:639:ARG:HG3	2.16	0.46
1:B:111:GLU:HG2	1:B:232:ARG:NH1	2.31	0.45
1:B:620:LYS:CE	1:B:706:VAL:O	2.64	0.45
1:B:59:LYS:HG3	1:B:577:LEU:HD21	1.98	0.45
1:A:320:ILE:HA	1:A:323:MET:HE3	1.98	0.45
1:A:475:LEU:O	1:A:478:ARG:HG3	2.16	0.45
1:A:589:PRO:HG3	1:A:595:TYR:CE2	2.51	0.45
1:A:314:MET:HG2	1:A:321:LYS:HA	1.99	0.45
1:A:324:TYR:CD1	1:A:327:LYS:HD2	2.52	0.45
1:B:232:ARG:NH2	1:B:715:GLU:OE1	2.49	0.44
1:B:94:HIS:CE1	1:B:115:LEU:HB3	2.52	0.44
1:B:210:GLY:HA2	1:B:226:GLY:O	2.18	0.44
1:A:435:LYS:HB3	1:A:435:LYS:HE2	1.77	0.44
1:B:367:LYS:HB3	1:B:367:LYS:HE3	1.55	0.44
1:B:696:ILE:HD12	1:B:696:ILE:HA	1.86	0.44
1:B:75:SER:HB2	1:B:715:GLU:HG2	1.99	0.43
1:B:215:ASP:CG	1:B:332:GLN:HG2	2.37	0.43
1:A:182:PHE:CZ	1:A:189:LEU:HD12	2.53	0.43
1:A:154:LYS:HD3	1:A:154:LYS:H	1.83	0.43
1:B:22:ASP:HB3	1:B:26:TRP:CZ2	2.49	0.43
1:B:50:LEU:HD21	1:B:271:MET:HE1	2.00	0.43
1:A:23:GLU:HG3	1:A:684:TYR:CD1	2.54	0.43
1:A:154:LYS:HD3	1:A:154:LYS:N	2.33	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:285:ALA:HB1	1:A:351:ARG:NH1	2.33	0.43
1:A:332:GLN:HG3	3:A:821:HOH:O	2.17	0.43
1:B:477:LEU:HD23	1:B:477:LEU:HA	1.83	0.43
1:B:466:LYS:HE2	1:B:467:GLU:HG2	2.01	0.43
1:A:532:PHE:O	1:A:536:ARG:HG3	2.19	0.42
1:B:261:LEU:HB2	1:B:720:PRO:HA	2.00	0.42
1:A:430:LYS:O	1:A:433:ILE:HG22	2.20	0.42
1:A:319:GLN:O	1:A:323:MET:HG3	2.19	0.42
1:A:527:PHE:O	1:A:531:VAL:HG22	2.20	0.42
1:B:349:GLY:O	1:B:352:GLN:HG2	2.19	0.42
1:B:247:ASP:N	1:B:247:ASP:OD1	2.52	0.42
1:B:295:ASP:OD1	1:B:295:ASP:N	2.53	0.42
1:A:280:HIS:HB3	1:A:283:PHE:CD1	2.55	0.42
1:B:589:PRO:HG3	1:B:595:TYR:CE2	2.56	0.41
1:A:407:PHE:HD2	1:A:453:ASP:OD2	2.03	0.41
1:B:232:ARG:HH12	1:B:711:ARG:HH12	1.69	0.41
1:B:719:VAL:HA	1:B:720:PRO:HD3	1.83	0.41
1:B:232:ARG:HH21	1:B:715:GLU:CD	2.24	0.41
1:A:171:LYS:HE3	1:A:171:LYS:HB2	1.89	0.41
1:A:510:PHE:HZ	1:A:519:LEU:HD23	1.86	0.41
1:B:182:PHE:HB2	1:B:187:LEU:HB3	2.03	0.41
1:B:434:ASP:O	1:B:438:THR:HG23	2.21	0.41
1:B:437:ARG:HG3	1:B:507:PHE:HE2	1.85	0.41
1:A:29:GLN:CD	1:A:29:GLN:H	2.24	0.41
1:A:641:PRO:HG3	1:A:697:ARG:CZ	2.51	0.41
1:A:360:ARG:HH22	1:A:564:ASP:CG	2.25	0.40
1:B:495:ILE:O	1:B:499:SER:HB2	2.22	0.40
1:B:566:ASP:HB2	3:B:845:HOH:O	2.21	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	691/707 (98%)	676 (98%)	15 (2%)	0	100	100
1	B	694/707 (98%)	675 (97%)	19 (3%)	0	100	100
All	All	1385/1414 (98%)	1351 (98%)	34 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	578/597 (97%)	569 (98%)	9 (2%)	62	54
1	B	573/597 (96%)	568 (99%)	5 (1%)	78	75
2	C	2/2 (100%)	2 (100%)	0	100	100
2	D	2/2 (100%)	2 (100%)	0	100	100
All	All	1155/1198 (96%)	1141 (99%)	14 (1%)	71	65

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	22	ASP
1	A	140	LYS
1	A	247	ASP
1	A	301	ARG
1	A	372	ARG
1	A	386	LYS
1	A	419	LYS
1	A	435	LYS
1	A	585	LYS
1	B	22	ASP
1	B	110	ARG
1	B	169	SER
1	B	247	ASP
1	B	483	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	332	GLN
1	A	724	HIS
1	B	583	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	695/707 (98%)	0.42	28 (4%) 38 32	8, 19, 40, 60	0
1	B	698/707 (98%)	0.40	18 (2%) 56 51	9, 22, 44, 64	0
2	C	2/2 (100%)	-0.14	0 100 100	14, 14, 14, 15	0
2	D	2/2 (100%)	0.21	0 100 100	17, 17, 17, 19	0
All	All	1397/1418 (98%)	0.41	46 (3%) 46 40	8, 20, 42, 64	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	145	PRO	10.3
1	B	343	TRP	5.0
1	B	426	ALA	4.3
1	B	21	MET	3.9
1	A	343	TRP	3.7
1	A	510	PHE	3.6
1	A	168	PHE	3.6
1	A	518	LYS	3.6
1	A	475	LEU	3.5
1	A	724	HIS	3.3
1	A	486	GLY	3.3
1	A	166	LYS	3.2
1	B	144	ASP	3.2
1	B	427	SER	3.1
1	B	519	LEU	3.1
1	B	142	ILE	3.1
1	B	513	VAL	3.0
1	A	488	VAL	2.9
1	A	497	ALA	2.8
1	B	154	LYS	2.8
1	B	514	PRO	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	174	GLY	2.7
1	A	170	ALA	2.6
1	B	520	ALA	2.6
1	A	411	PRO	2.6
1	A	21	MET	2.5
1	A	418	THR	2.5
1	A	470	TYR	2.5
1	A	430	LYS	2.4
1	A	516	VAL	2.4
1	A	419	LYS	2.3
1	A	173	PRO	2.3
1	A	48	TYR	2.2
1	B	432	ALA	2.2
1	B	515	SER	2.1
1	A	520	ALA	2.1
1	B	478	ARG	2.1
1	B	109	MET	2.1
1	A	414	THR	2.1
1	A	513	VAL	2.1
1	A	22	ASP	2.1
1	A	167	ASN	2.0
1	A	165	GLY	2.0
1	B	720	PRO	2.0
1	B	395	TRP	2.0
1	A	466	LYS	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.