



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 06:23 AM GMT

PDB ID : 2WY1
Title : CRYSTAL STRUCTURE OF RAT ANGIOTENSINOGEN IN P321 SPACE GROUP
Authors : Zhou, A.; Wei, Z.; Carrell, R.W.; Read, R.J.
Deposited on : 2009-11-11
Resolution : 3.15 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

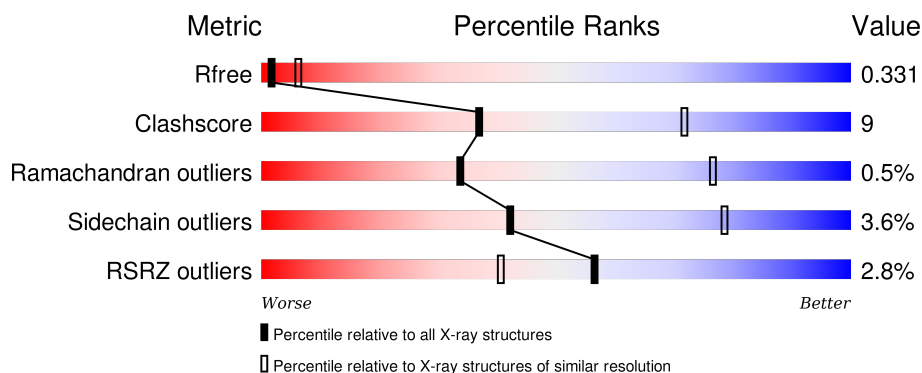
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.15 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	1112 (3.20-3.12)
Clashscore	102246	1249 (3.20-3.12)
Ramachandran outliers	100387	1222 (3.20-3.12)
Sidechain outliers	100360	1221 (3.20-3.12)
RSRZ outliers	91569	1117 (3.20-3.12)

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	453	
1	B	453	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 6454 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.

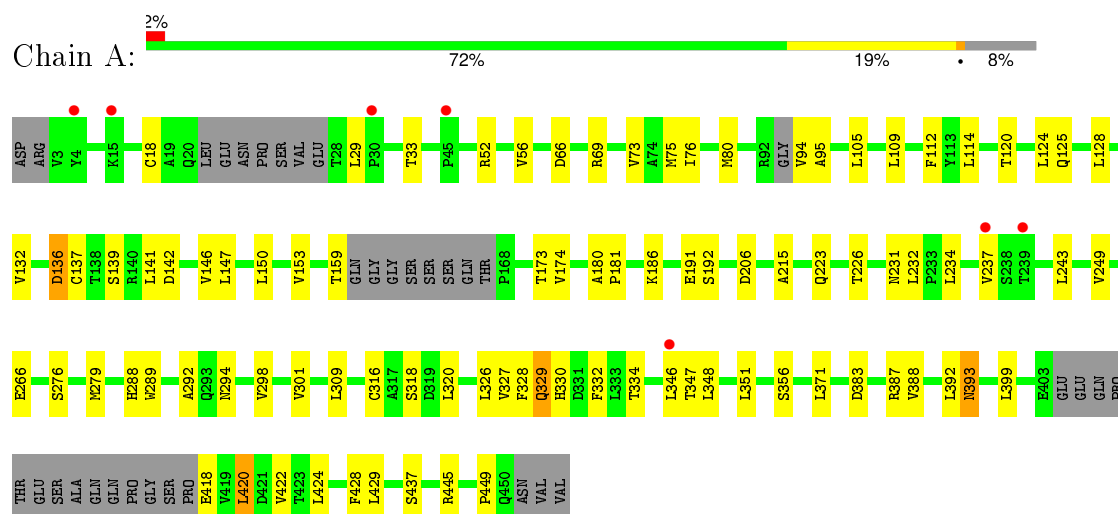
- Molecule 1 is a protein called ANGIOTENSINOGEN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	418	Total	C	N	O	S	0	1	0
			3236	2079	542	604	11			
1	B	417	Total	C	N	O	S	0	1	0
			3218	2066	540	601	11			

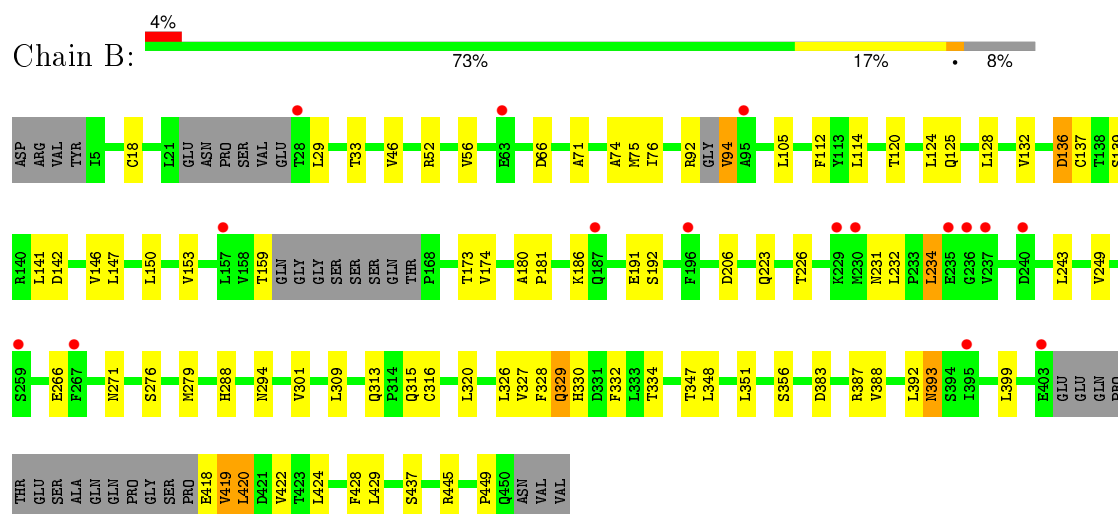
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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: ANGIOTENSINOGEN



• Molecule 1: ANGIOTENSINOGEN



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	133.10 Å 133.10 Å 97.19 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	115.47 – 3.15 19.21 – 3.15	Depositor EDS
% Data completeness (in resolution range)	98.7 (115.47-3.15) 93.7 (19.21-3.15)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 3.15 Å)	Xtriage
Refinement program	REFMAC 5.5.0099	Depositor
R, R_{free}	0.275 , 0.327 0.271 , 0.331	Depositor DCC
R_{free} test set	834 reflections (5.38%)	DCC
Wilson B-factor (Å ²)	93.5	Xtriage
Anisotropy	0.140	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 40.5	EDS
Estimated twinning fraction	0.237 for -h,-k,l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtriage
Outliers	0 of 16347 reflections	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6454	wwPDB-VP
Average B, all atoms (Å ²)	94.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.31% 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	0.39	2/3309 (0.1%)	0.50	0/4503
1	B	0.39	2/3290 (0.1%)	0.50	0/4477
All	All	0.39	4/6599 (0.1%)	0.50	0/8980

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	418	GLU	CD-OE2	7.14	1.33	1.25
1	A	418	GLU	CD-OE2	7.00	1.33	1.25
1	A	191	GLU	CD-OE2	6.92	1.33	1.25
1	B	191	GLU	CD-OE2	6.84	1.33	1.25

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	3236	0	3255	66	0
1	B	3218	0	3233	57	0
All	All	6454	0	6488	120	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 (120) 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:141:LEU:HD21	1:B:146:VAL:HG21	1.46	0.96
1:A:141:LEU:HD21	1:A:146:VAL:HG21	1.44	0.96
1:B:92:ARG:HD2	1:B:94:VAL:HG13	1.60	0.83
1:B:332:PHE:HB2	1:B:334:THR:HG23	1.60	0.83
1:A:332:PHE:HB2	1:A:334:THR:HG23	1.60	0.81
1:A:141:LEU:HD21	1:A:146:VAL:CG2	2.17	0.73
1:A:215:ALA:HB1	1:A:234:LEU:CD2	2.20	0.71
1:B:141:LEU:HD21	1:B:146:VAL:CG2	2.19	0.70
1:B:56:VAL:HG22	1:B:159:THR:CG2	2.24	0.67
1:A:56:VAL:HG22	1:A:159:THR:CG2	2.24	0.65
1:A:328:PHE:O	1:A:330:HIS:N	2.29	0.65
1:A:232:LEU:HD22	1:A:356:SER:HB2	1.81	0.63
1:B:328:PHE:O	1:B:330:HIS:N	2.29	0.62
1:B:232:LEU:HD22	1:B:356:SER:HB2	1.81	0.61
1:B:125:GLN:CD	1:B:132:VAL:HG22	2.22	0.60
1:A:234:LEU:HD13	1:A:237:VAL:HG23	1.84	0.59
1:A:173:THR:HG22	1:A:249:VAL:HG13	1.84	0.59
1:A:125:GLN:CD	1:A:132:VAL:HG22	2.24	0.58
1:A:429:LEU:HD21	1:A:445:ARG:HD2	1.85	0.58
1:B:173:THR:HG22	1:B:249:VAL:HG13	1.85	0.58
1:A:215:ALA:HB1	1:A:234:LEU:HD22	1.85	0.56
1:B:120:THR:HG22	1:B:124:LEU:HD12	1.86	0.56
1:A:76:ILE:HG23	1:A:128:LEU:O	2.06	0.56
1:B:429:LEU:HD21	1:B:445:ARG:HD2	1.88	0.56
1:B:419:VAL:CG2	1:B:419:VAL:O	2.53	0.56
1:A:232:LEU:HD13	1:A:356:SER:OG	2.06	0.55
1:A:215:ALA:HB1	1:A:234:LEU:HD21	1.87	0.55
1:B:329:GLN:O	1:B:330:HIS:CG	2.59	0.55
1:A:231:ASN:O	1:A:232:LEU:HD23	2.07	0.55
1:A:153:VAL:HG12	1:A:437:SER:HB2	1.89	0.54
1:A:292:ALA:HA	1:B:271:ASN:HD21	1.72	0.54
1:A:329:GLN:O	1:A:330:HIS:CG	2.61	0.54
1:A:56:VAL:HG22	1:A:159:THR:HG22	1.90	0.53
1:B:231:ASN:O	1:B:232:LEU:HD23	2.09	0.53
1:B:120:THR:HG22	1:B:124:LEU:CD1	2.39	0.52
1:B:234:LEU:O	1:B:234:LEU:HD22	2.09	0.52
1:B:112:PHE:CZ	1:B:388:VAL:HG11	2.45	0.52
1:B:153:VAL:HG12	1:B:437:SER:HB2	1.91	0.51
1:A:392:LEU:C	1:A:393:ASN:HD22	2.13	0.51
1:B:392:LEU:C	1:B:393:ASN:HD22	2.14	0.51
1:A:243:LEU:HD12	1:A:388:VAL:HG22	1.92	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:56:VAL:HG22	1:B:159:THR:HG22	1.93	0.49
1:A:112:PHE:CZ	1:A:388:VAL:HG11	2.47	0.49
1:A:114:LEU:HD13	1:A:192:SER:HB3	1.95	0.49
1:B:320:LEU:HD11	1:B:429:LEU:HG	1.94	0.49
1:B:136:ASP:HB2	1:B:139:SER:OG	2.12	0.49
1:B:232:LEU:HD13	1:B:356:SER:OG	2.13	0.49
1:A:180:ALA:HB1	1:A:181:PRO:CD	2.42	0.49
1:A:316:CYS:HG	1:B:316:CYS:CB	2.22	0.49
1:B:180:ALA:HB1	1:B:181:PRO:CD	2.43	0.49
1:B:294:ASN:CG	1:B:326:LEU:HD21	2.33	0.49
1:A:320:LEU:HD11	1:A:429:LEU:HG	1.94	0.48
1:A:420:LEU:HD22	1:A:420:LEU:O	2.13	0.48
1:B:243:LEU:HD12	1:B:388:VAL:HG22	1.94	0.48
1:A:232:LEU:HD22	1:A:356:SER:CB	2.43	0.48
1:A:294:ASN:CG	1:A:326:LEU:HD21	2.33	0.48
1:B:29:LEU:HD12	1:B:29:LEU:N	2.29	0.48
1:B:232:LEU:HD22	1:B:356:SER:CB	2.43	0.47
1:A:114:LEU:HD12	1:A:147:LEU:HD11	1.97	0.47
1:A:120:THR:HG22	1:A:124:LEU:HD12	1.95	0.47
1:A:150:LEU:HD12	1:A:153:VAL:CG2	2.44	0.47
1:A:105:LEU:HD13	1:A:105:LEU:C	2.35	0.47
1:A:94:VAL:HG13	1:A:95:ALA:N	2.30	0.47
1:A:279:MET:CE	1:A:347:THR:HG22	2.45	0.47
1:B:76:ILE:HG23	1:B:128:LEU:O	2.15	0.46
1:A:266:GLU:HA	1:A:276:SER:HA	1.97	0.46
1:B:420:LEU:HD22	1:B:420:LEU:O	2.15	0.46
1:B:150:LEU:HD12	1:B:153:VAL:CG2	2.46	0.46
1:B:114:LEU:HD13	1:B:192:SER:HB3	1.97	0.46
1:B:301:VAL:HG13	1:B:309:LEU:HB3	1.97	0.46
1:B:266:GLU:HA	1:B:276:SER:HA	1.97	0.46
1:A:301:VAL:HG13	1:A:309:LEU:HB3	1.97	0.46
1:A:120:THR:HG22	1:A:124:LEU:CD1	2.46	0.46
1:B:141:LEU:HD23	1:B:142:ASP:N	2.30	0.45
1:A:141:LEU:CD2	1:A:146:VAL:HG21	2.32	0.45
1:A:424:LEU:HD12	1:A:428:PHE:CG	2.51	0.45
1:B:351:LEU:HD12	1:B:399:LEU:HD22	1.98	0.45
1:B:153:VAL:HG12	1:B:437:SER:CB	2.47	0.45
1:B:52:ARG:O	1:B:56:VAL:HG23	2.17	0.45
1:A:279:MET:HE3	1:A:347:THR:HG22	1.98	0.45
1:B:294:ASN:ND2	1:B:326:LEU:HD21	2.31	0.45
1:B:114:LEU:HD12	1:B:147:LEU:HD11	1.98	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:THR:HG21	1:A:383[B]:ASP:OD1	2.17	0.45
1:A:29:LEU:N	1:A:29:LEU:HD12	2.31	0.44
1:A:174:VAL:HG21	1:A:226:THR:HG22	1.98	0.44
1:A:125:GLN:NE2	1:A:132:VAL:HG22	2.32	0.44
1:B:125:GLN:NE2	1:B:132:VAL:HG22	2.33	0.44
1:A:153:VAL:HG12	1:A:437:SER:CB	2.48	0.44
1:B:313:GLN:NE2	1:B:424:LEU:HD13	2.33	0.44
1:B:33:THR:HG22	1:B:186:LYS:HG2	2.00	0.43
1:B:33:THR:HG21	1:B:383[B]:ASP:OD1	2.18	0.43
1:A:318:SER:OG	1:B:315:GLN:NE2	2.51	0.43
1:A:141:LEU:HD23	1:A:142:ASP:N	2.34	0.43
1:B:327:VAL:HG23	1:B:328:PHE:N	2.33	0.43
1:B:288:HIS:CE1	1:B:422:VAL:HG21	2.54	0.43
1:B:327:VAL:CG2	1:B:328:PHE:N	2.82	0.42
1:A:301:VAL:HG13	1:A:301:VAL:O	2.18	0.42
1:B:105:LEU:HD13	1:B:105:LEU:C	2.40	0.42
1:A:327:VAL:HG23	1:A:328:PHE:N	2.35	0.42
1:B:424:LEU:HD12	1:B:428:PHE:CG	2.54	0.42
1:A:234:LEU:HD13	1:A:237:VAL:CG2	2.48	0.42
1:A:52:ARG:O	1:A:56:VAL:HG23	2.19	0.42
1:B:174:VAL:HG21	1:B:226:THR:HG22	2.01	0.42
1:A:288:HIS:CE1	1:A:422:VAL:HG21	2.54	0.42
1:A:33:THR:HG22	1:A:186:LYS:HG2	2.02	0.41
1:A:136:ASP:HB2	1:A:139:SER:OG	2.19	0.41
1:B:279:MET:CE	1:B:347:THR:HG22	2.49	0.41
1:A:346:LEU:HD12	1:A:422:VAL:O	2.20	0.41
1:A:80:MET:HE2	1:A:109:LEU:CD1	2.50	0.41
1:A:351:LEU:HD12	1:A:399:LEU:HD22	2.02	0.41
1:A:289:TRP:CZ2	1:A:298:VAL:HG11	2.56	0.41
1:A:327:VAL:CG2	1:A:328:PHE:N	2.84	0.41
1:A:80:MET:HG3	1:A:105:LEU:HD11	2.02	0.41
1:B:105:LEU:O	1:B:105:LEU:HD22	2.21	0.41
1:B:92:ARG:HD2	1:B:94:VAL:CG1	2.41	0.40
1:A:124:LEU:CD2	1:A:371:LEU:HD21	2.51	0.40
1:A:69:ARG:O	1:A:73:VAL:HG12	2.20	0.40
1:A:141:LEU:CD2	1:A:146:VAL:CG2	2.96	0.40
1:A:105:LEU:O	1:A:105:LEU:HD22	2.21	0.40
1:B:71:ALA:O	1:B:74:ALA:HB3	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	409/453 (90%)	372 (91%)	35 (9%)	2 (0%)	34	76
1	B	408/453 (90%)	372 (91%)	34 (8%)	2 (0%)	34	76
All	All	817/906 (90%)	744 (91%)	69 (8%)	4 (0%)	34	76

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	329	GLN
1	B	329	GLN
1	A	449	PRO
1	B	449	PRO

5.3.2 Protein sidechains

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	360/391 (92%)	349 (97%)	11 (3%)	47	81
1	B	357/391 (91%)	342 (96%)	15 (4%)	36	74
All	All	717/782 (92%)	691 (96%)	26 (4%)	42	78

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	CYS
1	A	66	ASP

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	75	MET
1	A	136	ASP
1	A	137	CYS
1	A	206	ASP
1	A	223	GLN
1	A	348	LEU
1	A	387	ARG
1	A	393	ASN
1	A	420	LEU
1	B	18	CYS
1	B	46	VAL
1	B	66	ASP
1	B	75	MET
1	B	94	VAL
1	B	136	ASP
1	B	137	CYS
1	B	206	ASP
1	B	223	GLN
1	B	234	LEU
1	B	348	LEU
1	B	387	ARG
1	B	393	ASN
1	B	419	VAL
1	B	420	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	123	GLN
1	A	287	GLN
1	A	315	GLN
1	A	393	ASN
1	B	123	GLN
1	B	287	GLN
1	B	315	GLN
1	B	330	HIS
1	B	393	ASN

5.3.3 RNA ⓘ

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

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	418/453 (92%)	0.22	7 (1%) 73 59	56, 91, 127, 143	8 (1%)
1	B	417/453 (92%)	0.25	16 (3%) 44 27	62, 91, 126, 141	8 (1%)
All	All	835/906 (92%)	0.24	23 (2%) 56 40	56, 91, 127, 143	16 (1%)

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	235	GLU	7.4
1	A	30	PRO	4.9
1	A	239	THR	4.5
1	B	236	GLY	3.9
1	B	395	ILE	3.2
1	B	28	THR	3.0
1	A	237	VAL	2.9
1	B	403	GLU	2.8
1	A	15	LYS	2.7
1	B	240	ASP	2.7
1	B	230	MET	2.6
1	B	259	SER	2.6
1	B	237	VAL	2.6
1	B	95	ALA	2.5
1	B	267	PHE	2.3
1	B	196	PHE	2.2
1	B	63	GLU	2.2
1	A	45	PRO	2.2
1	B	229	LYS	2.1
1	A	4	TYR	2.1
1	B	157	LEU	2.1
1	B	187	GLN	2.0
1	A	346	LEU	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 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.