



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 02:27 AM UTC

PDB ID : 4WOD / pdb_00004wod
Title : The duplicated taurocyamine kinase from *Schistosoma mansoni* complexed with arginine
Authors : Merceron, R.; Awama, A.; Montserret, R.; Marcillat, O.; Gouet, P.
Deposited on : 2014-10-15
Resolution : 1.90 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

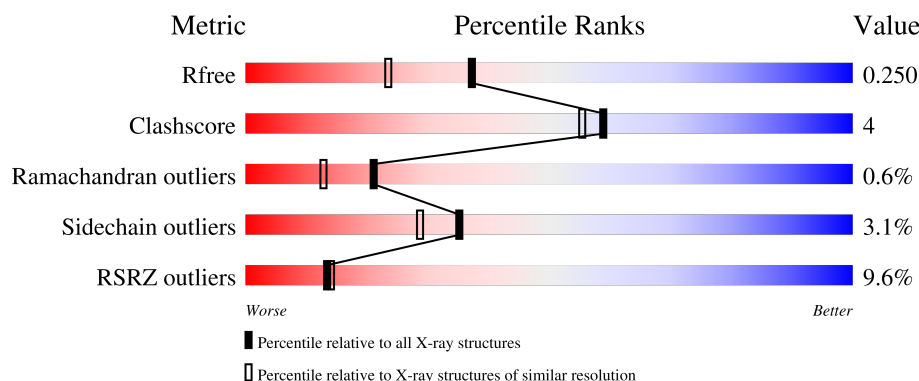
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	716	9% 86% 11% ..

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5920 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.

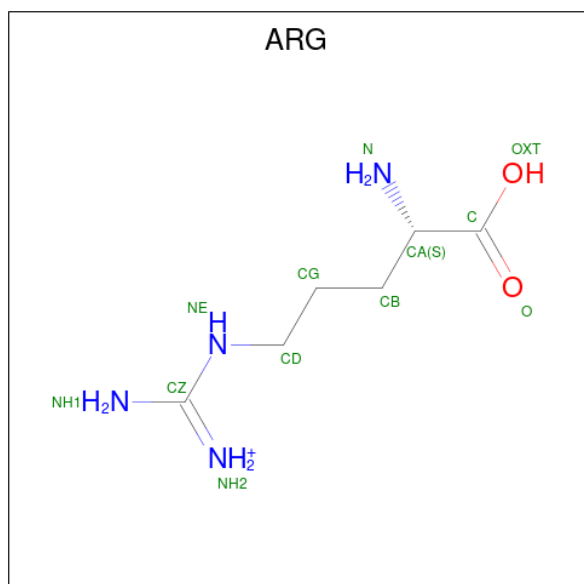
- Molecule 1 is a protein called Taurocyamine kinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	706	5568	3521	973	1045	29	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	VAL	ALA	engineered mutation	UNP P16641
A	235	GLY	ASP	engineered mutation	UNP P16641
A	237	THR	ILE	engineered mutation	UNP P16641
A	493	GLY	ASP	engineered mutation	UNP P16641

- Molecule 2 is ARGinine (CCD ID: ARG) (formula: C₆H₁₅N₄O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	12	6	4	2	0	0

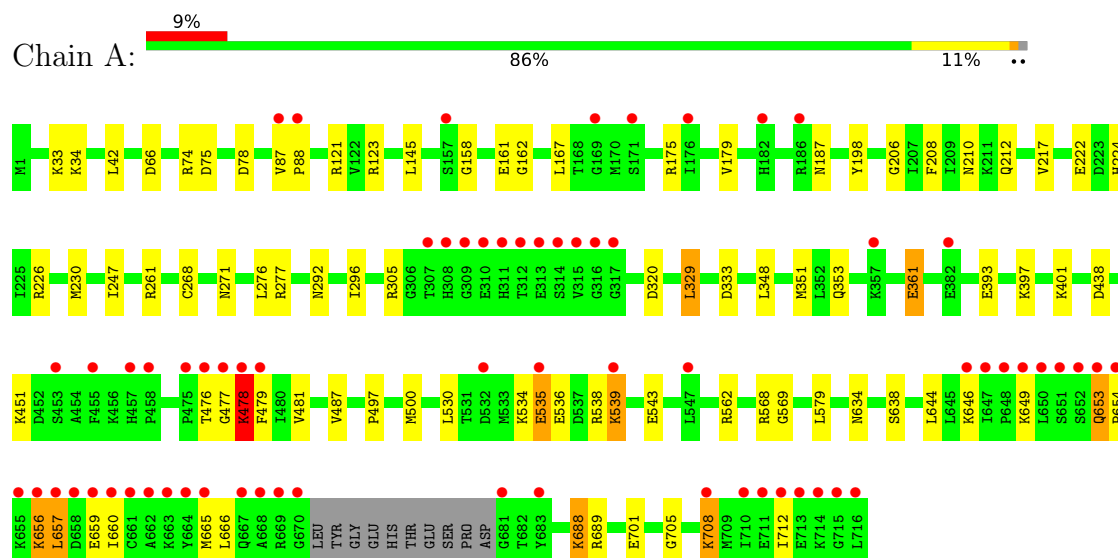
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	340	Total	O	0	0
			340	340		

3 Residue-property plots

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: Taurocyamine kinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	51.92Å 123.07Å 62.74Å 90.00° 108.07° 90.00°	Depositor
Resolution (Å)	45.81 – 1.90 45.81 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.0 (45.81-1.90) 99.0 (45.81-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.03 (at 1.89Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.206 , 0.251 0.205 , 0.250	Depositor DCC
R_{free} test set	2914 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	22.9	Xtriage
Anisotropy	0.119	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 37.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5920	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.59% 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

5.1 Standard geometry

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	0.52	1/5680 (0.0%)	0.81	7/7660 (0.1%)

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	A	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	230	MET	C-O	-5.68	1.16	1.23

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	656	LYS	N-CA-C	-8.06	103.01	113.17
1	A	479	PHE	N-CA-C	-7.79	104.30	113.88
1	A	87	VAL	CA-C-N	6.41	127.86	119.84
1	A	87	VAL	C-N-CA	6.41	127.86	119.84
1	A	74	ARG	N-CA-C	5.66	117.45	111.28
1	A	653	GLN	CA-C-N	5.43	126.62	119.84
1	A	653	GLN	C-N-CA	5.43	126.62	119.84

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	478	LYS	Peptide

5.2 Too-close contacts ⓘ

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	5568	0	5572	49	0
2	A	12	0	12	3	0
3	A	340	0	0	5	0
All	All	5920	0	5584	49	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 4.

All (49) 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:121:ARG:NH1	3:A:1048:HOH:O	2.22	0.73
1:A:348:LEU:HA	1:A:351:MET:HE3	1.71	0.70
1:A:530:LEU:O	1:A:538:ARG:NH2	2.25	0.70
1:A:78:ASP:OD1	1:A:261:ARG:NH1	2.26	0.68
1:A:361:GLU:H	1:A:361:GLU:CD	2.08	0.60
1:A:689:ARG:NH1	1:A:701:GLU:OE2	2.35	0.59
1:A:123:ARG:HD2	1:A:226:ARG:HD3	1.84	0.58
1:A:666:LEU:HD11	1:A:705:GLY:HA3	1.87	0.57
1:A:535:GLU:HG3	1:A:536:GLU:N	2.20	0.57
1:A:167:LEU:HD13	1:A:206:GLY:HA2	1.91	0.53
1:A:33:LYS:NZ	3:A:1224:HOH:O	2.42	0.52
1:A:277:ARG:NH2	1:A:320:ASP:OD1	2.37	0.52
1:A:397:LYS:HE2	1:A:438:ASP:OD2	2.09	0.52
1:A:654:PRO:HA	1:A:657:LEU:HB3	1.89	0.52
1:A:268:CYS:SG	2:A:801:ARG:NE	2.84	0.51
1:A:226:ARG:NE	3:A:1190:HOH:O	2.32	0.50
1:A:478:LYS:HB3	1:A:646:LYS:HE2	1.93	0.50
1:A:212:GLN:NE2	3:A:1039:HOH:O	2.42	0.49
1:A:277:ARG:HH21	1:A:305:ARG:NH1	2.10	0.49
1:A:530:LEU:HD13	1:A:569:GLY:HA2	1.95	0.49
1:A:329:LEU:HB2	1:A:333:ASP:HB2	1.93	0.49
1:A:226:ARG:HH21	1:A:226:ARG:HG3	1.79	0.48
1:A:222:GLU:OE1	2:A:801:ARG:NH1	2.46	0.48
1:A:353:GLN:HG3	3:A:1183:HOH:O	2.13	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:187:ASN:HA	1:A:198:TYR:CZ	2.50	0.46
1:A:393:GLU:CD	1:A:393:GLU:H	2.23	0.46
1:A:708:LYS:O	1:A:712:ILE:HG12	2.16	0.46
1:A:42:LEU:HD12	1:A:66:ASP:HB2	1.98	0.46
1:A:175:ARG:O	1:A:179:VAL:HG12	2.16	0.46
1:A:497:PRO:HA	1:A:500:MET:SD	2.56	0.46
1:A:688:LYS:HE3	1:A:688:LYS:HB3	1.58	0.46
1:A:33:LYS:HE3	1:A:33:LYS:HB2	1.54	0.46
1:A:268:CYS:SG	2:A:801:ARG:CD	3.05	0.45
1:A:145:LEU:HD21	1:A:224:HIS:CG	2.51	0.44
1:A:162:GLY:HA3	1:A:210:ASN:HA	1.99	0.44
1:A:123:ARG:NH2	1:A:271:ASN:OD1	2.49	0.44
1:A:665:MET:SD	1:A:689:ARG:HD2	2.58	0.44
1:A:481:VAL:HB	1:A:644:LEU:HB3	2.01	0.43
1:A:478:LYS:HB3	1:A:646:LYS:CE	2.50	0.42
1:A:500:MET:O	1:A:562:ARG:NH2	2.43	0.42
1:A:656:LYS:O	1:A:660:ILE:HG13	2.20	0.42
1:A:34:LYS:NZ	1:A:75:ASP:OD2	2.38	0.41
1:A:292:ASN:O	1:A:296:ILE:HG13	2.20	0.41
1:A:247:ILE:HD12	1:A:247:ILE:HA	1.96	0.41
1:A:539:LYS:HB2	1:A:539:LYS:HE2	1.66	0.41
1:A:487:VAL:HA	1:A:638:SER:O	2.20	0.41
1:A:530:LEU:HD22	1:A:568:ARG:HB3	2.02	0.41
1:A:208:PHE:HB3	1:A:217:VAL:HB	2.02	0.41
1:A:535:GLU:O	1:A:539:LYS:HG3	2.20	0.41

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	702/716 (98%)	682 (97%)	16 (2%)	4 (1%)	21	13

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	476	THR
1	A	158	GLY
1	A	88	PRO
1	A	477	GLY

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	604/613 (98%)	585 (97%)	19 (3%)	35	29

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	161	GLU
1	A	276	LEU
1	A	329	LEU
1	A	361	GLU
1	A	401	LYS
1	A	451	LYS
1	A	478	LYS
1	A	534	LYS
1	A	535	GLU
1	A	539	LYS
1	A	543	GLU
1	A	579	LEU
1	A	634	ASN
1	A	649	LYS
1	A	653	GLN
1	A	657	LEU
1	A	659	GLU
1	A	688	LYS
1	A	708	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	20	HIS
1	A	51	ASN
1	A	56	ASN
1	A	545	HIS
1	A	595	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	ARG	A	801	-	10,11,11	1.25	1 (10%)	9,13,13	1.18	2 (22%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ARG	A	801	-	-	5/11/11/11	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	ARG	CB-CA	-2.01	1.48	1.53

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	ARG	OXT-C-O	2.65	130.10	124.08
2	A	801	ARG	CB-CG-CD	-2.01	106.27	112.07

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	801	ARG	CA-CB-CG-CD
2	A	801	ARG	OXT-C-CA-N
2	A	801	ARG	C-CA-CB-CG
2	A	801	ARG	CG-CD-NE-CZ
2	A	801	ARG	O-C-CA-N

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	801	ARG	3	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	706/716 (98%)	0.47	68 (9%) 13 14	14, 22, 52, 84	0

All (68) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	315	VAL	7.3
1	A	311	HIS	5.8
1	A	316	GLY	5.8
1	A	650	LEU	5.2
1	A	309	GLY	4.7
1	A	657	LEU	4.7
1	A	712	ILE	4.6
1	A	716	LEU	4.5
1	A	654	PRO	4.4
1	A	713	GLU	4.3
1	A	711	GLU	4.2
1	A	660	ILE	4.1
1	A	683	TYR	4.1
1	A	647	ILE	4.0
1	A	312	THR	4.0
1	A	88	PRO	3.9
1	A	659	GLU	3.9
1	A	714	LYS	3.8
1	A	314	SER	3.8
1	A	532	ASP	3.7
1	A	169	GLY	3.7
1	A	478	LYS	3.7
1	A	648	PRO	3.6
1	A	653	GLN	3.6
1	A	649	LYS	3.6
1	A	681	GLY	3.6
1	A	652	SER	3.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	715	GLY	3.5
1	A	357	LYS	3.5
1	A	313	GLU	3.4
1	A	656	LYS	3.3
1	A	308	HIS	3.3
1	A	457	HIS	3.2
1	A	662	ALA	3.2
1	A	664	TYR	3.1
1	A	476	THR	3.1
1	A	458	PRO	3.1
1	A	176	ILE	3.0
1	A	307	THR	3.0
1	A	477	GLY	3.0
1	A	651	SER	2.9
1	A	455	PHE	2.9
1	A	669	ARG	2.9
1	A	479	PHE	2.8
1	A	535	GLU	2.7
1	A	539	LYS	2.7
1	A	157	SER	2.6
1	A	453	SER	2.6
1	A	547	LEU	2.6
1	A	658	ASP	2.6
1	A	182	HIS	2.5
1	A	667	GLN	2.5
1	A	670	GLY	2.5
1	A	317	GLY	2.5
1	A	382	GLU	2.4
1	A	710	ILE	2.4
1	A	655	LYS	2.4
1	A	475	PRO	2.3
1	A	171	SER	2.3
1	A	310	GLU	2.3
1	A	87	VAL	2.3
1	A	663	LYS	2.3
1	A	661	CYS	2.2
1	A	668	ALA	2.2
1	A	708	LYS	2.2
1	A	646	LYS	2.0
1	A	665	MET	2.0
1	A	186	ARG	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	ARG	A	801	12/12	0.85	0.14	22,34,40,40	0

6.5 Other polymers [i](#)

There are no such residues in this entry.