



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:35 PM UTC

PDB ID : 6OON / pdb_00006oon
Title : Human Argonaute4 bound to guide RNA
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Deposited on : 2019-04-23
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
Xtrriage (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

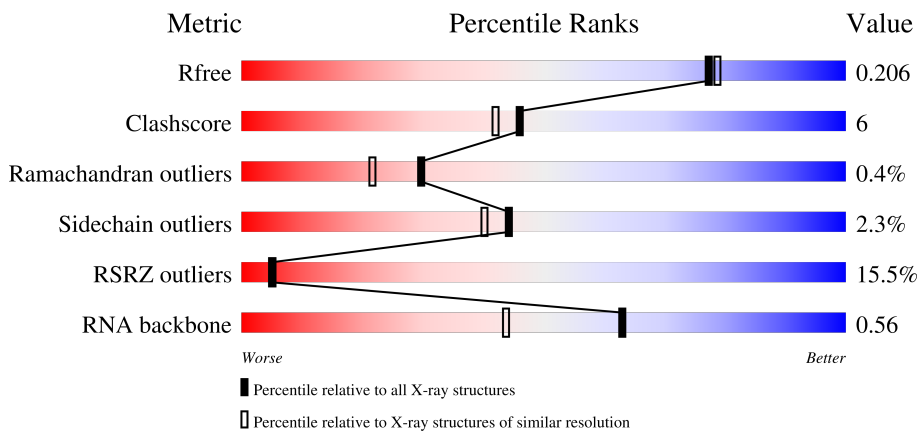
1 Overall quality at a glance

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)
RNA backbone	3983	1098 (2.30-1.50)

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	863	 14% 80% 11% 9%
2	B	12	 25% 67% 33%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7021 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 Protein argonaute-4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	785	6314	4026	1126	1118	44	8	5	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q9HCK5
A	0	SER	-	expression tag	UNP Q9HCK5

- Molecule 2 is a RNA chain called RNA (5'-R(P*AP*AP*AP*AP*AP*AP*AP*AP*AP*UP*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	B	12	243	108	49	74	12	0	0	0

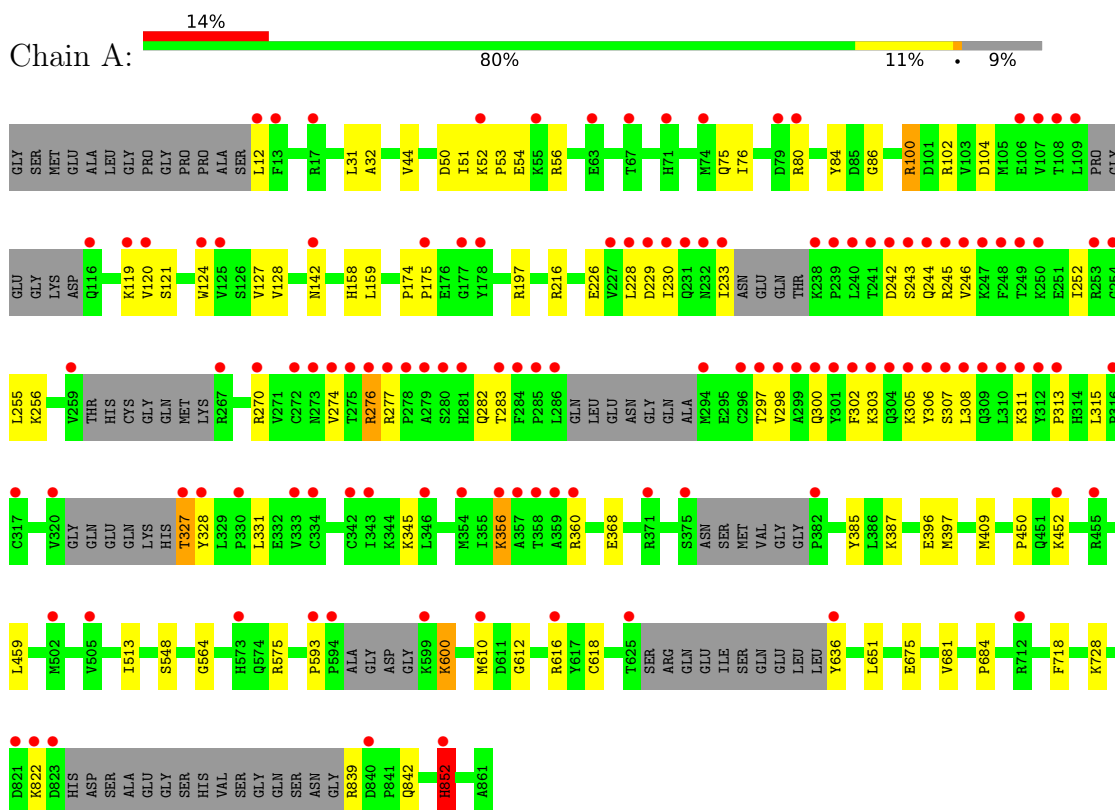
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	452	Total	O	0	0
			452	452		
3	B	12	Total	O	0	0
			12	12		

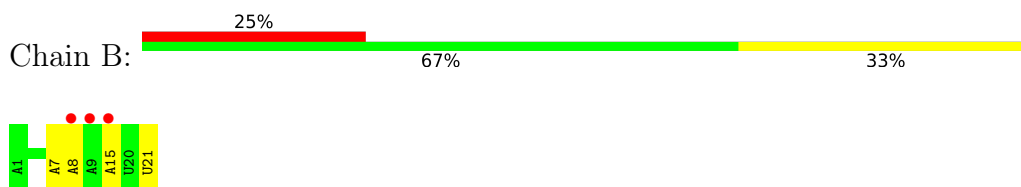
3 Residue-property plots [i](#)

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: Protein argonaute-4



- Molecule 2: RNA (5'-R(P*AP*AP*AP*AP*AP*AP*AP*AP*AP*AP*UP*U)-3')



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	213.98Å 68.01Å 83.27Å 90.00° 102.68° 90.00°	Depositor
Resolution (Å)	49.08 – 1.90 49.08 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.9 (49.08-1.90) 98.9 (49.08-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.91 (at 1.90Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.171 , 0.202 (Not available) , 0.206	Depositor DCC
R_{free} test set	4550 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	27.8	Xtrriage
Anisotropy	0.200	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 53.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7021	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.86% 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	0.48	0/6466	0.79	3/8754 (0.0%)
2	B	0.26	0/271	0.40	0/414
All	All	0.48	0/6737	0.78	3/9168 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	159	LEU	CA-C-N	-6.00	113.50	119.56
1	A	159	LEU	C-N-CA	-6.00	113.50	119.56
1	A	852	HIS	N-CA-C	5.66	119.28	112.38

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	6314	0	6385	73	0
2	B	243	0	121	6	0
3	A	452	0	0	4	0
3	B	12	0	0	0	0
All	All	7021	0	6506	75	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 (75) 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:452:LYS:HD2	1:A:452:LYS:H	1.38	0.87
1:A:283:THR:HG22	1:A:297:THR:HG22	1.67	0.74
1:A:450:PRO:HB2	1:A:452:LYS:HD3	1.68	0.74
1:A:32:ALA:C	1:A:397:MET:HE3	2.14	0.71
1:A:452:LYS:H	1:A:452:LYS:CD	2.03	0.71
1:A:31:LEU:HB3	1:A:397:MET:HE2	1.71	0.71
1:A:51:ILE:HG12	1:A:120:VAL:HG12	1.76	0.67
1:A:100:ARG:HG2	1:A:100:ARG:HH11	1.58	0.67
1:A:298:VAL:HG13	1:A:302:PHE:HE2	1.63	0.64
1:A:397:MET:HE1	1:A:718:PHE:HD2	1.64	0.62
1:A:216:ARG:NH2	1:A:226:GLU:OE2	2.34	0.61
1:A:245:ARG:HH12	1:A:274:VAL:HB	1.66	0.61
1:A:243:SER:HA	1:A:246:VAL:HG12	1.83	0.60
1:A:360:ARG:NH1	1:A:368:GLU:OE2	2.34	0.60
1:A:327:THR:N	2:B:21:U:HO2'	2.00	0.59
1:A:228:LEU:O	1:A:230:ILE:HG13	2.02	0.59
1:A:197:ARG:NH2	1:A:675:GLU:OE2	2.36	0.58
1:A:397:MET:HE1	1:A:718:PHE:CD2	2.38	0.58
1:A:459:LEU:HD21	1:A:513:ILE:HD11	1.84	0.58
1:A:104:ASP:CG	1:A:119:LYS:HZ3	2.11	0.57
1:A:245:ARG:NH1	1:A:274:VAL:HB	2.20	0.57
1:A:610[B]:MET:HE3	1:A:618[B]:CYS:HB3	1.88	0.55
1:A:52:LYS:HA	1:A:53:PRO:C	2.31	0.54
2:B:7:A:H2'	2:B:8:A:C8	2.43	0.53
1:A:245:ARG:HE	1:A:276:ARG:HG2	1.74	0.53
1:A:459:LEU:HD21	1:A:513:ILE:CD1	2.38	0.53
1:A:256:LYS:HE2	1:A:270:ARG:HH22	1.72	0.53
2:B:7:A:H2'	2:B:8:A:H8	1.74	0.53
1:A:100:ARG:HH11	1:A:100:ARG:CG	2.24	0.50
1:A:283:THR:HA	1:A:297:THR:HA	1.93	0.50
1:A:142:ASN:OD1	1:A:142:ASN:N	2.45	0.49
1:A:298:VAL:HG13	1:A:302:PHE:CE2	2.46	0.49
1:A:277:ARG:NH2	1:A:283:THR:H	2.11	0.48
1:A:277:ARG:NH2	1:A:283:THR:OG1	2.46	0.48
1:A:277:ARG:NE	1:A:282:GLN:HA	2.28	0.48
1:A:564:GLY:HA2	1:A:616:ARG:CZ	2.43	0.48
1:A:610[B]:MET:HE1	1:A:651:LEU:O	2.14	0.47
1:A:300:GLN:HA	1:A:303:LYS:HE2	1.97	0.46
1:A:303:LYS:HA	1:A:308:LEU:H	1.81	0.46
1:A:233:ILE:HD12	1:A:233:ILE:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:228:LEU:HD13	1:A:244:GLN:HB3	1.98	0.46
1:A:31:LEU:CB	1:A:397:MET:HE2	2.43	0.46
1:A:305:LYS:HB2	1:A:306:TYR:HD1	1.81	0.45
1:A:564:GLY:HA2	1:A:616:ARG:NH2	2.31	0.45
1:A:53:PRO:HG2	1:A:56:ARG:HE	1.82	0.45
1:A:104:ASP:CB	1:A:119:LYS:HZ3	2.29	0.45
1:A:636:TYR:N	3:A:916:HOH:O	2.49	0.45
1:A:852:HIS:ND1	1:A:852:HIS:C	2.75	0.45
1:A:452:LYS:HD2	1:A:452:LYS:N	2.20	0.44
1:A:104:ASP:OD1	1:A:119:LYS:NZ	2.49	0.44
1:A:852:HIS:ND1	1:A:852:HIS:O	2.49	0.43
1:A:681:VAL:O	1:A:684:PRO:HD2	2.18	0.43
1:A:728:LYS:HG3	3:A:925:HOH:O	2.19	0.43
1:A:75:GLN:HG2	1:A:76:ILE:HG12	2.01	0.43
1:A:84:TYR:CE2	1:A:86:GLY:HA2	2.54	0.43
1:A:256:LYS:NZ	2:B:15:A:OP2	2.48	0.43
1:A:307:SER:O	1:A:307:SER:OG	2.28	0.43
1:A:311:LYS:C	1:A:313:PRO:HD3	2.44	0.43
1:A:124:TRP:HZ2	1:A:127:VAL:HG23	1.85	0.42
1:A:174:PRO:HA	1:A:175:PRO:HD3	1.87	0.42
1:A:356:LYS:HE2	1:A:356:LYS:HB2	1.68	0.42
1:A:409:MET:HE3	1:A:409:MET:HB2	1.85	0.42
1:A:593:PRO:HG2	1:A:600:LYS:O	2.19	0.42
1:A:252:ILE:HD12	1:A:255:LEU:HD12	2.01	0.42
1:A:575:ARG:NH1	1:A:612:GLY:O	2.53	0.42
1:A:44:VAL:CG2	1:A:128:VAL:HB	2.49	0.42
1:A:245:ARG:NE	1:A:276:ARG:HG2	2.35	0.42
1:A:53:PRO:HG3	1:A:56:ARG:HH21	1.85	0.41
1:A:158:HIS:CD2	1:A:385:TYR:CZ	3.09	0.41
1:A:50:ASP:HB3	1:A:121:SER:HB2	2.03	0.40
1:A:315:LEU:HD13	1:A:331:LEU:HD12	2.03	0.40
1:A:728:LYS:NZ	3:A:925:HOH:O	2.53	0.40
1:A:616:ARG:NH1	3:A:930:HOH:O	2.54	0.40
1:A:327:THR:N	2:B:21:U:H1 [?]	2.37	0.40
1:A:328:TYR:H	2:B:21:U:H4 [?]	1.85	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	770/863 (89%)	746 (97%)	21 (3%)	3 (0%)	30 22

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	54	GLU
1	A	242	ASP
1	A	822	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.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	699/752 (93%)	683 (98%)	16 (2%)	44 40

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	LEU
1	A	80	ARG
1	A	100	ARG
1	A	102	ARG
1	A	229	ASP
1	A	276	ARG
1	A	327	THR
1	A	345	LYS

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Mol	Chain	Res	Type
1	A	356	LYS
1	A	387	LYS
1	A	396	GLU
1	A	548	SER
1	A	600	LYS
1	A	839	ARG
1	A	842	GLN
1	A	852	HIS

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	94	HIS
1	A	202	ASN
1	A	232	ASN
1	A	581	GLN
1	A	855	GLN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	B	8/12 (66%)	0	0

There are no RNA backbone outliers to report.

There are no RNA pucker outliers to report.

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](#)

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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	15:A	O3'	20:U	P	17.02

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	784/863 (90%)	0.50	120 (15%) 5 5	13, 38, 98, 142	4 (0%)
2	B	12/12 (100%)	1.01	3 (25%) 2 1	33, 48, 125, 133	0
All	All	796/875 (90%)	0.50	123 (15%) 5 5	13, 38, 98, 142	4 (0%)

All (123) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	306	TYR	11.5
1	A	233	ILE	8.5
1	A	636	TYR	8.0
1	A	302	PHE	7.2
1	A	12	LEU	6.9
1	A	382	PRO	6.2
1	A	327	THR	6.2
1	A	359	ALA	5.2
1	A	594	PRO	5.1
1	A	259	VAL	5.1
1	A	297	THR	4.9
1	A	274	VAL	4.8
1	A	852	HIS	4.6
1	A	281	HIS	4.5
1	A	294	MET	4.5
1	A	296	CYS	4.5
1	A	358	THR	4.5
1	A	238	LYS	4.4
1	A	298	VAL	4.3
1	A	625	THR	4.0
1	A	109	LEU	4.0
1	A	286	LEU	3.9
1	A	823	ASP	3.9
1	A	240	LEU	3.8

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Mol	Chain	Res	Type	RSRZ
1	A	246	VAL	3.8
1	A	142	ASN	3.8
1	A	308	LEU	3.6
1	A	284	PHE	3.6
1	A	74	MET	3.6
1	A	55	LYS	3.5
1	A	821	ASP	3.5
1	A	247	LYS	3.5
1	A	822	LYS	3.5
1	A	228	LEU	3.4
1	A	301	TYR	3.4
1	A	124	TRP	3.3
2	B	9	A	3.3
1	A	241	THR	3.3
1	A	278	PRO	3.3
1	A	285	PRO	3.3
1	A	328	TYR	3.2
1	A	333	VAL	3.2
1	A	71	HIS	3.2
1	A	245	ARG	3.2
1	A	272	CYS	3.2
1	A	279	ALA	3.1
1	A	283	THR	3.1
1	A	357	ALA	3.1
1	A	280	SER	3.1
1	A	254	GLY	3.0
1	A	231	GLN	3.0
1	A	313	PRO	3.0
1	A	304	GLN	2.9
1	A	67	THR	2.9
1	A	610[A]	MET	2.9
2	B	15	A	2.9
1	A	242	ASP	2.9
1	A	63	GLU	2.9
1	A	300	GLN	2.9
1	A	239	PRO	2.8
1	A	303	LYS	2.8
1	A	13	PHE	2.8
1	A	248	PHE	2.8
1	A	354	MET	2.8
1	A	79	ASP	2.7
1	A	277	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	356	LYS	2.7
1	A	177	GLY	2.7
1	A	360	ARG	2.7
1	A	52	LYS	2.7
1	A	175	PRO	2.7
1	A	299	ALA	2.6
1	A	80	ARG	2.6
1	A	107	VAL	2.6
1	A	375	SER	2.6
1	A	106	GLU	2.6
1	A	320	VAL	2.6
1	A	275	THR	2.5
1	A	244	GLN	2.5
1	A	229	ASP	2.5
1	A	250	LYS	2.5
1	A	309	GLN	2.5
1	A	120	VAL	2.5
1	A	311	LYS	2.5
1	A	267	ARG	2.4
1	A	616	ARG	2.4
1	A	712	ARG	2.4
1	A	307	SER	2.4
1	A	108	THR	2.4
1	A	119	LYS	2.4
1	A	116	GLN	2.4
1	A	371	ARG	2.4
1	A	342	CYS	2.4
1	A	840	ASP	2.4
1	A	273	ASN	2.4
1	A	125	VAL	2.4
1	A	227	VAL	2.4
1	A	310	LEU	2.3
1	A	455	ARG	2.3
1	A	230	ILE	2.3
1	A	249	THR	2.3
1	A	312	TYR	2.3
1	A	505	VAL	2.3
1	A	346	LEU	2.3
1	A	334	CYS	2.3
1	A	573	HIS	2.2
1	A	316	PRO	2.2
1	A	305	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	276	ARG	2.2
2	B	8	A	2.2
1	A	253	ARG	2.2
1	A	593	PRO	2.2
1	A	17	ARG	2.2
1	A	599	LYS	2.2
1	A	330	PRO	2.1
1	A	502	MET	2.1
1	A	270	ARG	2.1
1	A	317	CYS	2.1
1	A	243	SER	2.0
1	A	452	LYS	2.0
1	A	178	TYR	2.0
1	A	343	ILE	2.0
1	A	232	ASN	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.