



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 26, 2014 – 03:56 PM GMT

PDB ID : 3Q4Z
Title : Structure of unphosphorylated PAK1 kinase domain
Authors : Wang, J.; Wu, J.-W.; Wang, Z.-X.
Deposited on : 2010-12-26
Resolution : 1.89 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

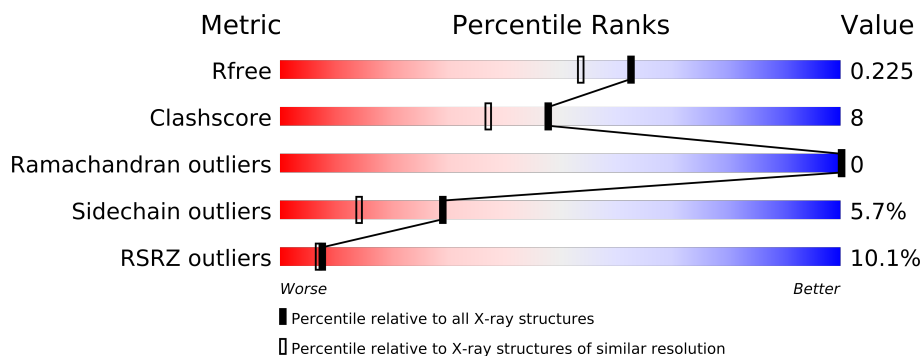
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 1.89 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}	66092	5260 (1.90-1.86)
Clashscore	79885	6268 (1.90-1.86)
Ramachandran outliers	78287	6195 (1.90-1.86)
Sidechain outliers	78261	6196 (1.90-1.86)
RSRZ outliers	66119	5262 (1.90-1.86)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	306	
1	B	306	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4670 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Serine/threonine-proteinkinase PAK 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	282	Total	C	N	O	S	0	1	0
			2218	1408	371	422	17			
1	B	279	Total	C	N	O	S	0	0	0
			2188	1389	367	417	15			

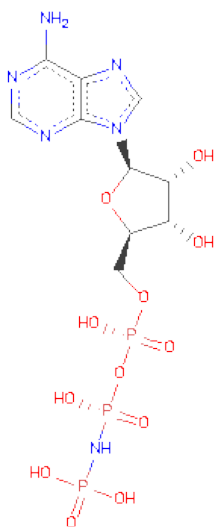
There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	259	ILE	SER	ENGINEERED MUTATION	UNP Q13153
A	299	ARG	LYS	ENGINEERED MUTATION	UNP Q13153
A	389	ASN	ASP	ENGINEERED MUTATION	UNP Q13153
A	516	ILE	LEU	ENGINEERED MUTATION	UNP Q13153
A	546	LEU	-	EXPRESSION TAG	UNP Q13153
A	547	GLU	-	EXPRESSION TAG	UNP Q13153
A	548	HIS	-	EXPRESSION TAG	UNP Q13153
A	549	HIS	-	EXPRESSION TAG	UNP Q13153
A	550	HIS	-	EXPRESSION TAG	UNP Q13153
A	551	HIS	-	EXPRESSION TAG	UNP Q13153
A	552	HIS	-	EXPRESSION TAG	UNP Q13153
A	553	HIS	-	EXPRESSION TAG	UNP Q13153
B	259	ILE	SER	ENGINEERED MUTATION	UNP Q13153
B	299	ARG	LYS	ENGINEERED MUTATION	UNP Q13153
B	389	ASN	ASP	ENGINEERED MUTATION	UNP Q13153
B	516	ILE	LEU	ENGINEERED MUTATION	UNP Q13153
B	546	LEU	-	EXPRESSION TAG	UNP Q13153
B	547	GLU	-	EXPRESSION TAG	UNP Q13153
B	548	HIS	-	EXPRESSION TAG	UNP Q13153
B	549	HIS	-	EXPRESSION TAG	UNP Q13153
B	550	HIS	-	EXPRESSION TAG	UNP Q13153
B	551	HIS	-	EXPRESSION TAG	UNP Q13153
B	552	HIS	-	EXPRESSION TAG	UNP Q13153
B	553	HIS	-	EXPRESSION TAG	UNP Q13153

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		

- Molecule 3 is PHOSPHOAMINOPHOSPHONICACID-ADENYLATE ESTER (three-letter code: ANP) (formula: C₁₀H₁₇N₆O₁₂P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	10	6	12	3		

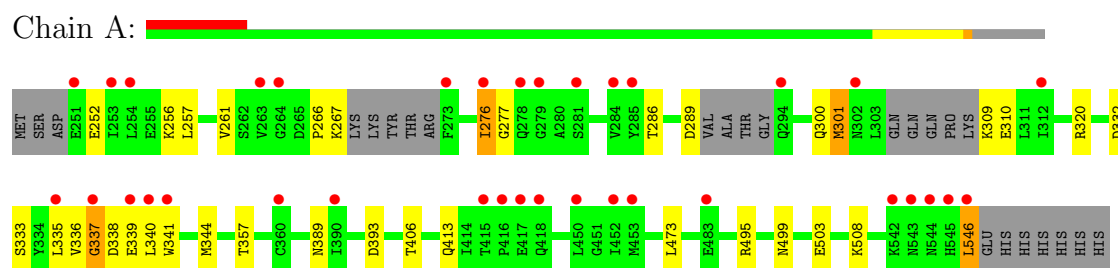
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	95	Total	O	0	0
			95	95		
4	B	137	Total	O	0	0
			137	137		

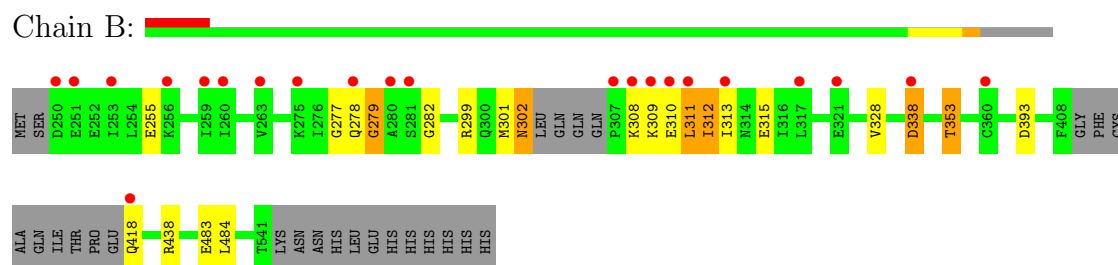
3 Residue-property plots

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: Serine/threonine-proteinkinase PAK 1



- Molecule 1: Serine/threonine-proteinkinase PAK 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	62.99Å 80.00Å 65.66Å 90.00° 107.51° 90.00°	Depositor
Resolution (Å)	31.99 – 1.89 31.99 – 1.89	Depositor EDS
% Data completeness (in resolution range)	49.6 (31.99-1.89) 97.5 (31.99-1.89)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.66 (at 1.89Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, R_{free}	0.184 , 0.231 0.180 , 0.225	Depositor DCC
R_{free} test set	2463 reflections (5.05%)	DCC
Wilson B-factor (Å ²)	36.6	Xtriage
Anisotropy	0.106	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 59.0	EDS
Estimated twinning fraction	0.018 for l,-k,h	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 48798 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4670	wwPDB-VP
Average B, all atoms (Å ²)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.23% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, ANP

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	0/2252	0.55	1/3043 (0.0%)
1	B	0.44	0/2222	0.57	1/3002 (0.0%)
All	All	0.44	0/4474	0.56	2/6045 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	337	GLY	N-CA-C	-6.66	96.44	113.10
1	B	279	GLY	N-CA-C	-6.05	97.97	113.10

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2218	0	2	18	0
1	B	2188	0	2	16	0
2	A	1	0	0	0	0
3	A	31	0	13	2	0
4	A	95	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	137	0	0	0	0
All	All	4670	0	17	35	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 8.

All (35) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:546:LEU:CD2	1:A:546:LEU:C	2.42	0.88
1:B:308:LYS:O	1:B:309:LYS:CG	2.30	0.80
1:B:310:GLU:OE1	1:B:312:ILE:CG2	2.30	0.79
1:B:279:GLY:CA	1:B:282:GLY:O	2.30	0.79
1:B:309:LYS:O	1:B:310:GLU:CG	2.44	0.66
1:A:301:MET:O	1:A:340:LEU:N	2.29	0.65
1:A:336:VAL:C	1:A:337:GLY:O	2.33	0.63
1:A:337:GLY:O	1:A:338:ASP:C	2.34	0.63
1:A:336:VAL:O	1:A:336:VAL:CG2	2.47	0.62
1:B:310:GLU:CB	1:B:312:ILE:CG2	2.78	0.62
1:A:337:GLY:O	1:A:339:GLU:N	2.32	0.61
1:B:301:MET:O	1:B:302:ASN:CB	2.49	0.60
1:B:277:GLY:CA	1:B:278:GLN:CB	2.81	0.58
1:B:309:LYS:NZ	1:B:309:LYS:CB	2.67	0.56
1:A:276:ILE:CD1	3:A:800:ANP:O4'	2.53	0.56
1:A:337:GLY:O	1:A:338:ASP:CB	2.51	0.55
1:A:309:LYS:CG	1:A:310:GLU:N	2.71	0.54
1:B:312:ILE:CG1	1:B:313:ILE:N	2.72	0.53
1:A:276:ILE:CG2	1:A:286:THR:OG1	2.58	0.51
1:B:338:ASP:O	1:B:338:ASP:CG	2.49	0.51
1:A:276:ILE:CG1	1:A:277:GLY:N	2.76	0.49
1:A:336:VAL:O	1:A:337:GLY:O	2.30	0.49
3:A:800:ANP:O1B	3:A:800:ANP:O2G	2.31	0.48
1:B:353:THR:CG2	1:B:393:ASP:OD1	2.61	0.48
1:B:338:ASP:O	1:B:338:ASP:OD1	2.31	0.47
1:B:311:LEU:O	1:B:312:ILE:C	2.53	0.47
1:B:310:GLU:CD	1:B:312:ILE:CG2	2.84	0.45
1:A:413:GLN:NE2	4:A:242:HOH:O	2.51	0.43
1:A:495:ARG:NH1	1:A:499:ASN:OD1	2.52	0.43
1:A:503:GLU:HG2	1:A:508:LYS:CB	2.49	0.42
1:B:418:GLN:O	1:B:438:ARG:NH2	2.53	0.42
1:B:308:LYS:C	1:B:309:LYS:CG	2.88	0.42
1:A:340:LEU:C	1:A:341:TRP:CD1	2.94	0.41
1:A:332:ASP:OD2	1:A:333:SER:N	2.54	0.41

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:266:PRO:O	1:A:267:LYS:CB	2.69	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	275/306 (90%)	266 (97%)	9 (3%)	0	100	100
1	B	273/306 (89%)	264 (97%)	9 (3%)	0	100	100
All	All	548/612 (90%)	530 (97%)	18 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	246/267 (92%)	228 (93%)	18 (7%)	20	8
1	B	242/267 (91%)	231 (96%)	11 (4%)	38	22
All	All	488/534 (91%)	459 (94%)	29 (6%)	29	13

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	252	GLU
1	A	256	LYS
1	A	257	LEU

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Mol	Chain	Res	Type
1	A	261	VAL
1	A	276	ILE
1	A	289	ASP
1	A	300	GLN
1	A	301	MET
1	A	320	ARG
1	A	335	LEU
1	A	344[A]	MET
1	A	344[B]	MET
1	A	357	THR
1	A	389	ASN
1	A	393	ASP
1	A	406	THR
1	A	473	LEU
1	A	546	LEU
1	B	255	GLU
1	B	299	ARG
1	B	302	ASN
1	B	311	LEU
1	B	312	ILE
1	B	315	GLU
1	B	328	VAL
1	B	338	ASP
1	B	353	THR
1	B	483	GLU
1	B	484	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA chains in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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	$\# Z > 2$
3	ANP	A	800	2	33,33,33	4.14	12 (36%)	51,52,52	3.11	16 (31%)

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
3	ANP	A	800	2	-	0/18/38/38	0/1/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	800	ANP	PB-N3B	16.04	1.78	1.64
3	A	800	ANP	PB-O1B	9.61	1.58	1.46
3	A	800	ANP	PB-O3A	7.09	1.69	1.59
3	A	800	ANP	PG-O1G	6.86	1.54	1.46
3	A	800	ANP	PG-N3B	5.20	1.68	1.64
3	A	800	ANP	PB-O2B	4.61	1.68	1.55
3	A	800	ANP	C6-N6	3.70	1.47	1.35
3	A	800	ANP	C5'-C4'	-2.99	1.41	1.51
3	A	800	ANP	C2'-C1'	-2.90	1.49	1.53
3	A	800	ANP	O3'-C3'	-2.42	1.37	1.43
3	A	800	ANP	O2'-C2'	-2.19	1.37	1.43
3	A	800	ANP	C3'-C4'	-2.10	1.47	1.53

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	800	ANP	PB-N3B-PG	-11.63	110.50	130.07
3	A	800	ANP	N3-C2-N1	-8.23	121.83	128.71

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	800	ANP	O1B-PB-N3B	-7.84	99.98	111.83
3	A	800	ANP	O2B-PB-O1B	-6.84	94.10	109.89
3	A	800	ANP	N3-C4-N9	5.09	134.62	125.43
3	A	800	ANP	O2B-PB-N3B	4.78	119.58	106.61
3	A	800	ANP	O3A-PB-N3B	3.90	117.42	106.59
3	A	800	ANP	C3'-C2'-C1'	3.77	106.81	100.91
3	A	800	ANP	C8-N9-C4	3.66	109.69	106.90
3	A	800	ANP	PA-O3A-PB	-3.50	119.86	131.81
3	A	800	ANP	C4-C5-N7	-3.16	106.82	109.52
3	A	800	ANP	C5-C4-N3	-3.09	118.97	125.70
3	A	800	ANP	O2B-PB-O3A	2.79	118.39	105.14
3	A	800	ANP	O5'-C5'-C4'	2.78	119.16	108.94
3	A	800	ANP	N7-C8-N9	-2.28	107.92	114.36
3	A	800	ANP	C2-N3-C4	2.27	120.49	114.01

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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 ⓘ

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	282/306 (92%)	0.60	35 (12%) 5 4	27, 50, 152, 268	0
1	B	279/306 (91%)	0.23	22 (7%) 13 12	27, 46, 143, 297	0
All	All	561/612 (91%)	0.41	57 (10%) 7 7	27, 48, 147, 297	0

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	253	ILE	8.9
1	B	280	ALA	8.6
1	A	253	ILE	7.4
1	A	276	ILE	7.1
1	A	337	GLY	5.9
1	A	416	PRO	5.7
1	B	278	GLN	5.7
1	B	259	ILE	5.4
1	A	254	LEU	5.1
1	B	338	ASP	4.9
1	A	273	PHE	4.7
1	A	279	GLY	4.6
1	B	260	ILE	4.5
1	B	309	LYS	4.5
1	B	251	GLU	4.5
1	A	264	GLY	4.5
1	B	313	ILE	4.3
1	B	250	ASP	4.2
1	A	281	SER	4.1
1	A	545	HIS	4.1
1	A	335	LEU	3.9
1	B	263	VAL	3.8
1	B	281	SER	3.8
1	A	390	ILE	3.5

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Mol	Chain	Res	Type	RSRZ
1	A	339	GLU	3.5
1	A	294	GLN	3.4
1	A	284	VAL	3.4
1	A	278	GLN	3.4
1	B	418	GLN	3.3
1	A	251	GLU	3.3
1	B	308	LYS	3.2
1	B	307	PRO	3.0
1	A	285	TYR	3.0
1	A	417	GLU	2.9
1	A	302	ASN	2.9
1	B	310	GLU	2.7
1	A	546	LEU	2.7
1	A	450	LEU	2.6
1	A	263	VAL	2.6
1	A	542	LYS	2.5
1	B	360	CYS	2.5
1	B	256	LYS	2.5
1	A	543	ASN	2.5
1	A	418	GLN	2.5
1	B	311	LEU	2.5
1	A	360	CYS	2.5
1	A	452	ILE	2.5
1	A	544	ASN	2.5
1	A	415	THR	2.4
1	A	312	ILE	2.3
1	B	317	LEU	2.3
1	B	321	GLU	2.1
1	A	340	LEU	2.1
1	A	341	TRP	2.1
1	A	453	MET	2.1
1	B	275	LYS	2.1
1	A	483	GLU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	MG	A	1	1/1	0.13	0.12	69,69,69,69	0
3	ANP	A	800	31/31	0.12	-0.51	49,83,110,116	0

6.5 Other polymers

There are no such residues in this entry.