Full wwPDB X-ray Structure Validation Report ⓘ

Dec 2, 2024 – 06:07 PM EST

PDB ID	:	9D3F
Title	:	Water and chloride as allosteric inhibitors in WNK kinase osmosensing
Authors	:	Akella, R.; Goldsmith, E.J.
Deposited on	:	2024-08-09
Resolution	:	2.00 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:

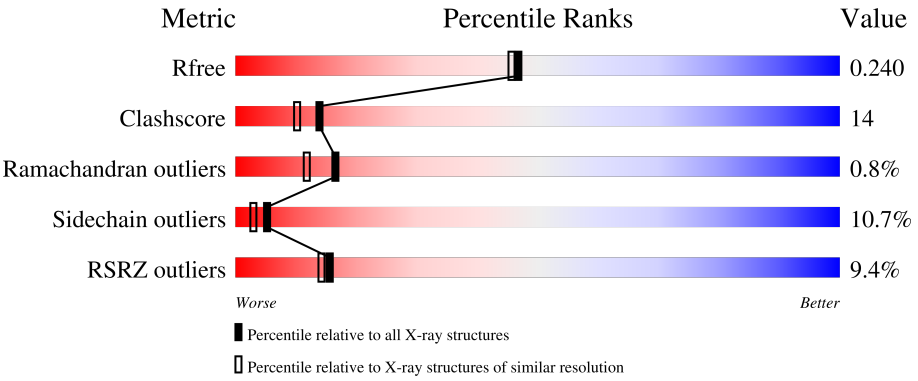
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (2.00-2.00)

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 <=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	290	9% 64% 23% • • 9%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2280 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 Serine/threonine-protein kinase WNK1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	265	Total	C	N	O	S	0	0	0
			2135	1361	364	394	16			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	254	GLU	ASP	conflict	UNP Q9JIH7

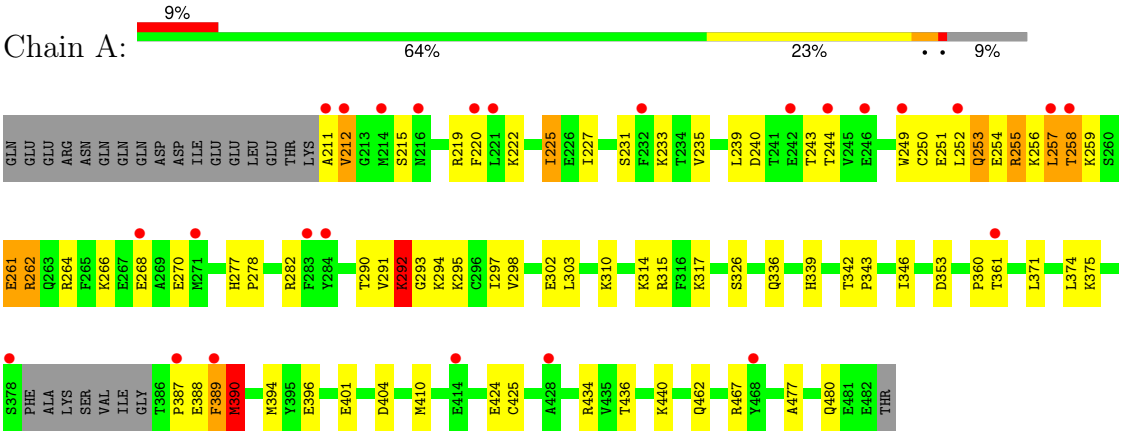
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	145	Total	O	0	0
			145	145		

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: Serine/threonine-protein kinase WNK1



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	38.32Å 56.81Å 65.28Å 90.00° 95.38° 90.00°	Depositor
Resolution (Å)	42.77 – 2.00 42.77 – 2.00	Depositor EDS
% Data completeness (in resolution range)	95.8 (42.77-2.00) 95.8 (42.77-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	6.26 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.8.0419	Depositor
R, R_{free}	0.204 , 0.236 0.211 , 0.240	Depositor DCC
R_{free} test set	971 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å^2)	36.2	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 63.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	2280	wwPDB-VP
Average B, all atoms (Å^2)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.81% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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	0/2175	0.40	0/2921

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	4

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	264	ARG	Sidechain
1	A	292	LYS	Peptide
1	A	387	PRO	Peptide
1	A	467	ARG	Sidechain

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	2135	0	2157	61	0
2	A	145	0	0	3	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	2280	0	2157	61	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 14.

All (61) 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:211:ALA:O	1:A:212:VAL:HG23	1.38	1.20
1:A:425:CYS:SG	1:A:434:ARG:NH1	2.35	1.00
1:A:211:ALA:O	1:A:212:VAL:CG2	2.18	0.92
1:A:292:LYS:HB2	1:A:293:GLY:HA3	1.52	0.91
1:A:292:LYS:CB	1:A:293:GLY:HA3	2.01	0.91
1:A:389:PHE:O	1:A:390:MET:HG2	1.73	0.88
1:A:389:PHE:HD1	1:A:389:PHE:H	1.30	0.80
1:A:252:LEU:HB2	1:A:297:ILE:HG22	1.73	0.70
1:A:211:ALA:C	1:A:212:VAL:HG23	2.14	0.67
1:A:436:THR:O	1:A:462:GLN:NE2	2.25	0.67
1:A:291:VAL:O	1:A:294:LYS:N	2.29	0.66
1:A:254:GLU:O	1:A:255:ARG:HG2	1.95	0.66
1:A:292:LYS:CB	1:A:293:GLY:CA	2.70	0.66
1:A:339:HIS:HE1	1:A:404:ASP:OD2	1.81	0.63
1:A:243:THR:O	1:A:244:THR:OG1	2.17	0.63
1:A:424:GLU:HG2	1:A:434:ARG:HH12	1.67	0.59
1:A:346:ILE:HD12	1:A:401:GLU:HA	1.84	0.58
1:A:292:LYS:HB3	1:A:293:GLY:CA	2.33	0.58
1:A:292:LYS:HA	1:A:292:LYS:HE3	1.85	0.58
1:A:251:GLU:HG2	1:A:298:VAL:HG22	1.85	0.58
1:A:277:HIS:CG	1:A:278:PRO:HD2	2.40	0.56
1:A:389:PHE:C	1:A:390:MET:HG2	2.24	0.56
1:A:211:ALA:O	1:A:212:VAL:CB	2.54	0.55
1:A:258:THR:HG23	1:A:261:GLU:HB3	1.90	0.54
1:A:346:ILE:CD1	1:A:401:GLU:HG3	2.38	0.54
1:A:225:ILE:HD13	1:A:225:ILE:N	2.22	0.54
1:A:250:CYS:O	1:A:298:VAL:HA	2.08	0.53
1:A:252:LEU:HB2	1:A:297:ILE:CG2	2.38	0.53
1:A:434:ARG:NH2	2:A:502:HOH:O	2.39	0.53
1:A:389:PHE:O	1:A:390:MET:O	2.27	0.51
1:A:371:LEU:C	1:A:371:LEU:HD23	2.31	0.51
1:A:371:LEU:HD21	1:A:375:LYS:HE3	1.94	0.50
1:A:371:LEU:HD23	1:A:371:LEU:O	2.12	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:425:CYS:SG	1:A:434:ARG:CZ	2.99	0.50
1:A:220:PHE:HA	1:A:239:LEU:O	2.13	0.49
1:A:227:ILE:HD12	1:A:235:VAL:HG12	1.94	0.49
1:A:440:LYS:NZ	2:A:504:HOH:O	2.45	0.48
1:A:424:GLU:CG	1:A:434:ARG:HH12	2.26	0.48
1:A:258:THR:O	1:A:262:ARG:N	2.47	0.48
1:A:231:SER:C	1:A:233:LYS:H	2.17	0.47
1:A:292:LYS:HB3	1:A:293:GLY:HA3	1.88	0.47
1:A:258:THR:OG1	1:A:259:LYS:N	2.47	0.47
1:A:360:PRO:O	1:A:361:THR:CB	2.62	0.47
1:A:339:HIS:HD2	2:A:584:HOH:O	1.97	0.47
1:A:310:LYS:HD2	1:A:314:LYS:HE3	1.97	0.47
1:A:251:GLU:HA	1:A:297:ILE:O	2.14	0.46
1:A:227:ILE:HD13	1:A:303:LEU:HD11	1.98	0.46
1:A:477:ALA:HA	1:A:480:GLN:HG2	1.98	0.46
1:A:253:GLN:HG2	1:A:254:GLU:HG2	1.99	0.45
1:A:346:ILE:HD11	1:A:401:GLU:HG3	1.99	0.45
1:A:389:PHE:CE2	1:A:410:MET:HG3	2.52	0.44
1:A:254:GLU:OE2	1:A:294:LYS:HB3	2.18	0.44
1:A:282:ARG:HB3	1:A:302:GLU:HB2	1.99	0.43
1:A:292:LYS:HD2	1:A:292:LYS:N	2.33	0.43
1:A:240:ASP:O	1:A:244:THR:N	2.48	0.43
1:A:222:LYS:HB2	1:A:249:TRP:CD2	2.54	0.43
1:A:342:THR:HA	1:A:343:PRO:HA	1.90	0.43
1:A:353:ASP:OD1	1:A:353:ASP:C	2.57	0.42
1:A:222:LYS:HD2	1:A:249:TRP:NE1	2.34	0.42
1:A:336:GLN:HA	1:A:336:GLN:OE1	2.21	0.41
1:A:257:LEU:HD13	1:A:258:THR:HG22	2.02	0.41

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	261/290 (90%)	239 (92%)	20 (8%)	2 (1%)	16 12

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	212	VAL
1	A	390	MET

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	234/259 (90%)	209 (89%)	25 (11%)	5 3

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	215	SER
1	A	219	ARG
1	A	225	ILE
1	A	253	GLN
1	A	255	ARG
1	A	256	LYS
1	A	257	LEU
1	A	258	THR
1	A	261	GLU
1	A	262	ARG
1	A	266	LYS
1	A	268	GLU
1	A	270	GLU
1	A	290	THR
1	A	292	LYS
1	A	295	LYS
1	A	315	ARG
1	A	317	LYS
1	A	326	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	374	LEU
1	A	388	GLU
1	A	389	PHE
1	A	390	MET
1	A	394	MET
1	A	396	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	339	HIS
1	A	430	GLN

5.3.3 RNA

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry

There are no ligands in this entry.

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, 95^{th} 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	265/290 (91%)	0.77	25 (9%)	15	14	26, 48, 103, 130	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	389	PHE	4.5
1	A	468	TYR	3.7
1	A	244	THR	3.3
1	A	221	LEU	3.3
1	A	249	TRP	3.0
1	A	361	THR	3.0
1	A	284	TYR	2.7
1	A	378	SER	2.7
1	A	242	GLU	2.6
1	A	252	LEU	2.4
1	A	257	LEU	2.4
1	A	246	GLU	2.4
1	A	214	MET	2.4
1	A	414	GLU	2.4
1	A	212	VAL	2.4
1	A	211	ALA	2.3
1	A	268	GLU	2.3
1	A	232	PHE	2.2
1	A	258	THR	2.2
1	A	428	ALA	2.1
1	A	220	PHE	2.1
1	A	216	ASN	2.0
1	A	283	PHE	2.0
1	A	387	PRO	2.0
1	A	271	MET	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.