WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Nov 10, 2025 – 12:25 PM EST

PDB ID	:	9YLH / pdb_00009ylh
Title	:	Human p38 ALPHA MAPK:MW01-8-105SRM N,N-Dimethyl-6-phenyl-5-(4-pyridinyl)-3-pyridazinamine inhibitor complex
Authors	:	Brunzelle, J.S.; Shuvalova, L.; Roy, S.M.; Watterson, D.M.
Deposited on	:	2025-10-08
Resolution	:	2.02 Å(reported)

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

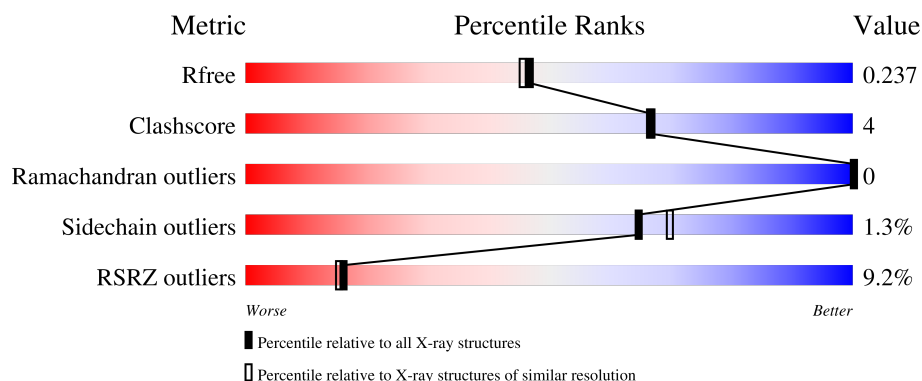|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

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 2.02 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	Percentile Ranks	Value
Rfree		0.237
Clashscore		4
Ramachandran outliers		0
Sidechain outliers		1.3%
RSRZ outliers		9.2%

Worse — *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	12358 (2.04-2.00)
Clashscore	180529	13897 (2.04-2.00)
Ramachandran outliers	177936	13770 (2.04-2.00)
Sidechain outliers	177891	13769 (2.04-2.00)
RSRZ outliers	164620	12358 (2.04-2.00)

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	360	9% / 85% 9% 6%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 2868 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.
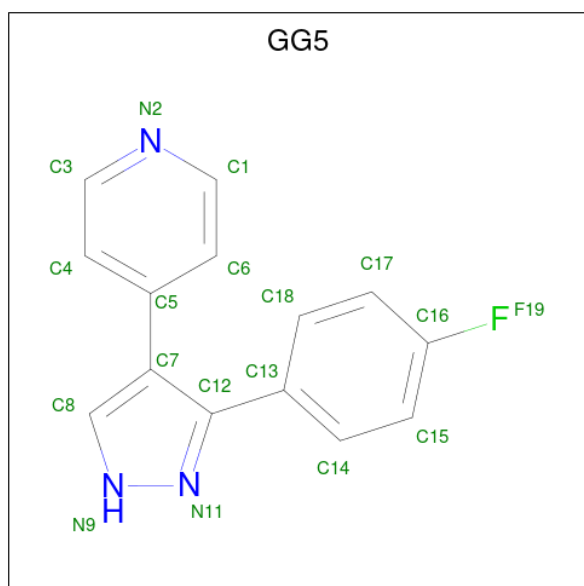
- Molecule 1 is a protein called Mitogen-activated protein kinase 14.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	339	Total 2763	C 1769	N 471	O 508	P 1	S 14	0	2	0

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 3 is 4-[3-(4-FLUOROPHENYL)-1H-PYRAZOL-4-YL]PYRIDINE (CCD ID: GG5) (formula: $C_{14}H_{10}FN_3$).

GG5

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total 18	C 14	F 1	N 3	0	0

- Molecule 4 is N,N-dimethyl-6-phenyl-5-(pyridin-4-yl)pyridazin-3-amine (CCD ID: A1CX9) (formula: $C_{17}H_{16}N_4$).
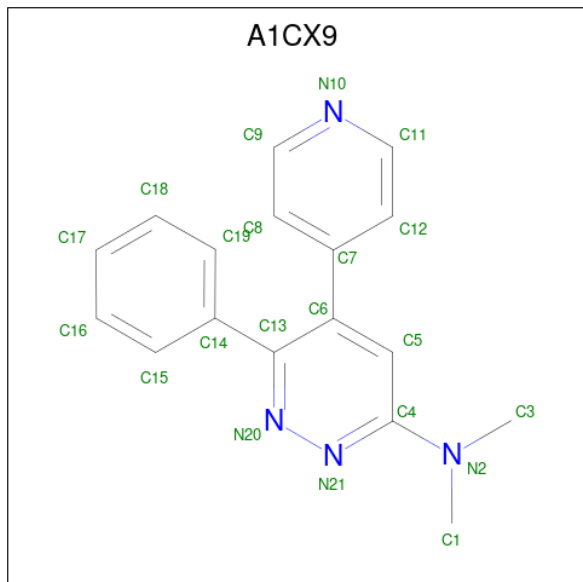
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 21	C 17	N 4	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	64	Total 65	O 65	0	1

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: Mitogen-activated protein kinase 14
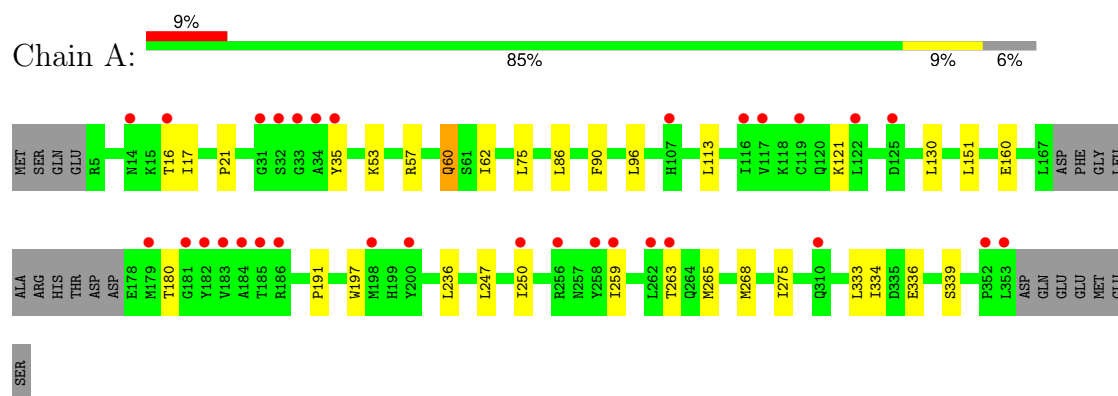
4   Data and refinement statistics   ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	65.89Å 74.85Å 77.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.96 – 2.02 38.96 – 2.02	Depositor EDS
% Data completeness (in resolution range)	92.5 (38.96-2.02) 88.2 (38.96-2.02)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.36 (at 2.01Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.212 , 0.239 0.213 , 0.237	Depositor DCC
R_{free} test set	1243 reflections (4.76%)	wwPDB-VP
Wilson B-factor (Å^2)	38.8	Xtriage
Anisotropy	0.385	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 45.6	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.016 for -h,l,k	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	2868	wwPDB-VP
Average B, all atoms (Å^2)	58.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.24% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: TPO, A1CX9, GG5, ZN, CME

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	0.32	0/2804	0.43	0/3803

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2763	0	2758	20	0
2	A	1	0	0	0	0
3	A	18	0	10	3	0
4	A	21	0	0	0	0
5	A	65	0	0	1	0
All	All	2868	0	2768	20	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 (20) 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:191:PRO:HB2	3:A:502:GG5:H15	1.83	0.60
1:A:263:THR:OG1	1:A:265:MET:HE3	2.07	0.55
1:A:75:LEU:HB3	1:A:86:LEU:HG	1.89	0.54
1:A:250:ILE:HD11	3:A:502:GG5:H18	1.90	0.53
1:A:236:LEU:HD11	1:A:259:ILE:HD11	1.90	0.53
1:A:96:LEU:HD21	1:A:339:SER:HA	1.95	0.48
1:A:160:GLU:HG3	5:A:657[A]:HOH:O	2.14	0.47
1:A:62:ILE:HG12	1:A:334:ILE:HG13	1.96	0.46
1:A:268:MET:HE2	1:A:268:MET:HB3	1.85	0.46
1:A:57:ARG:HB3	1:A:60:GLN:HB3	1.99	0.44
1:A:113:LEU:HD11	1:A:130:LEU:HD13	1.99	0.44
1:A:35:TYR:HD2	1:A:53:LYS:HD2	1.82	0.43
1:A:263:THR:OG1	1:A:265:MET:CE	2.66	0.43
1:A:333:LEU:HB2	1:A:336:GLU:HG3	1.99	0.43
1:A:21:PRO:HD3	1:A:90:PHE:CE1	2.54	0.42
1:A:160:GLU:HG3	1:A:160:GLU:H	1.68	0.42
1:A:151:LEU:HD23	1:A:151:LEU:HA	1.86	0.42
1:A:247:LEU:HD12	1:A:247:LEU:HA	1.83	0.42
1:A:121:LYS:HA	1:A:121:LYS:HD2	1.92	0.41
1:A:197:TRP:CZ3	3:A:502:GG5:H8	2.57	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	335/360 (93%)	325 (97%)	10 (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	301/318 (95%)	297 (99%)	4 (1%)	65	70

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	THR
1	A	17	ILE
1	A	60	GLN
1	A	275	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	115	ASN
1	A	199	HIS
1	A	257	ASN
1	A	260	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are 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
1	TPO	A	180	2,1	8,10,11	1.13	0	10,14,16	2.07	2 (20%)
1	CME	A	162	1	8,9,10	0.97	0	6,9,11	0.87	0

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
1	TPO	A	180	2,1	-	1/9/11/13	-
1	CME	A	162	1	-	2/5/8/10	-

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	180	TPO	P-OG1-CB	-5.72	107.80	123.33
1	A	180	TPO	CG2-CB-CA	-2.26	108.85	113.26

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	162	CME	CE-SD-SG-CB
1	A	162	CME	CZ-CE-SD-SG
1	A	180	TPO	C-CA-CB-CG2

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	GG5	A	502	-	19,20,20	1.22	1 (5%)	15,27,27	1.02	1 (6%)
4	A1CX9	A	503	-	23,23,23	0.13	0	30,31,31	0.38	0

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	GG5	A	502	-	-	1/3/8/8	0/3/3/3
4	A1CX9	A	503	-	-	0/12/12/12	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	502	GG5	C1-N2	-3.04	1.33	1.37

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	502	GG5	C15-C16-C17	3.08	122.98	118.60

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502	GG5	C4-C5-C7-C12

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	502	GG5	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 ⓘ

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	337/360 (93%)	0.62	31 (9%)	16	15	21, 55, 95, 131	4 (1%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	119	CYS	3.8
1	A	263	THR	3.5
1	A	183	VAL	3.3
1	A	258	TYR	3.3
1	A	259	ILE	3.2
1	A	117	VAL	3.2
1	A	35	TYR	3.2
1	A	250	ILE	3.2
1	A	185	THR	3.1
1	A	182	TYR	3.0
1	A	33	GLY	2.9
1	A	184	ALA	2.9
1	A	107[A]	HIS	2.9
1	A	179	MET	2.9
1	A	34	ALA	2.7
1	A	31	GLY	2.7
1	A	352	PRO	2.7
1	A	181	GLY	2.5
1	A	262	LEU	2.4
1	A	353	LEU	2.3
1	A	198	MET	2.3
1	A	116	ILE	2.3
1	A	200	TYR	2.3
1	A	186	ARG	2.3
1	A	122	LEU	2.3
1	A	256	ARG	2.2
1	A	125	ASP	2.2

Continued on next page...

Mol	Chain	Res	Type	RSRZ
1	A	14	ASN	2.1
1	A	32	SER	2.1
1	A	310	GLN	2.1
1	A	16	THR	2.1

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

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(Å^2)	Q<0.9
1	TPO	A	180	11/12	0.72	0.17	95,103,113,116	11
1	CME	A	162	10/11	0.88	0.13	40,51,98,102	0

6.3 Carbohydrates ⓘ

There are no oligosaccharides 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. 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(Å^2)	Q<0.9
3	GG5	A	502	18/18	0.74	0.19	56,69,74,75	0
4	A1CX9	A	503	21/21	0.94	0.08	33,41,49,55	0
2	ZN	A	501	1/1	0.95	0.06	45,45,45,45	1

6.5 Other polymers ⓘ

There are no such residues in this entry.