



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 08:40 AM GMT

PDB ID : 3FMH
Title : P38 kinase crystal structure in complex with 6-(2,4-Difluoro-phenoxy)-8-methyl-2-((R)-1-methyl-2-tetrazol-2-yl-ethylamino)-8H-pyrido[2,3-d]pyrimidin-7-one
Authors : Kuglstatter, A.; Ghatge, M.
Deposited on : 2008-12-22
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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

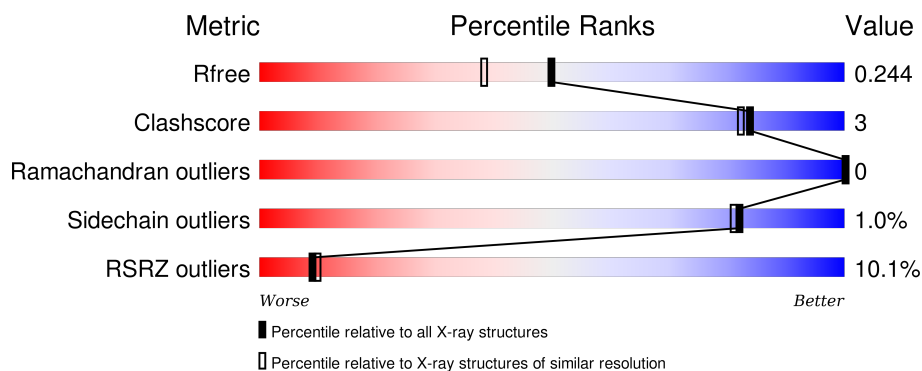
1 Overall quality at a glance

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}	91344	4755 (1.90-1.90)
Clashscore	102246	5398 (1.90-1.90)
Ramachandran outliers	100387	5338 (1.90-1.90)
Sidechain outliers	100360	5339 (1.90-1.90)
RSRZ outliers	91569	4766 (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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	372	<div> <div>9%</div> <div>87%</div> <div>6%</div> <div>7%</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3076 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.

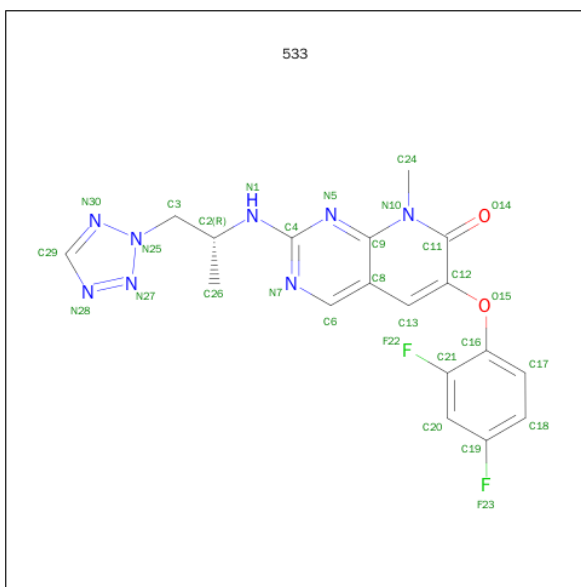
- Molecule 1 is a protein called Mitogen-activated protein kinase 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	347	Total	C	N	O	S	0	0	0
			2801	1794	476	518	13			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MET	-	EXPRESSION TAG	UNP Q16539
A	-10	ARG	-	EXPRESSION TAG	UNP Q16539
A	-9	GLY	-	EXPRESSION TAG	UNP Q16539
A	-8	SER	-	EXPRESSION TAG	UNP Q16539
A	-7	HIS	-	EXPRESSION TAG	UNP Q16539
A	-6	HIS	-	EXPRESSION TAG	UNP Q16539
A	-5	HIS	-	EXPRESSION TAG	UNP Q16539
A	-4	HIS	-	EXPRESSION TAG	UNP Q16539
A	-3	HIS	-	EXPRESSION TAG	UNP Q16539
A	-2	HIS	-	EXPRESSION TAG	UNP Q16539
A	-1	GLY	-	EXPRESSION TAG	UNP Q16539
A	0	SER	-	EXPRESSION TAG	UNP Q16539

- Molecule 2 is 6-(2,4-DIFLUOROPHENOXY)-8-METHYL-2-([(1R)-1-METHYL-2-(2H-TETRAZOL-2-YL)ETHYL]AMINO)PYRIDO[2,3-D]PYRIMIDIN-7(8H)-ONE (three-letter code: 533) (formula: C₁₈H₁₆F₂N₈O₂).

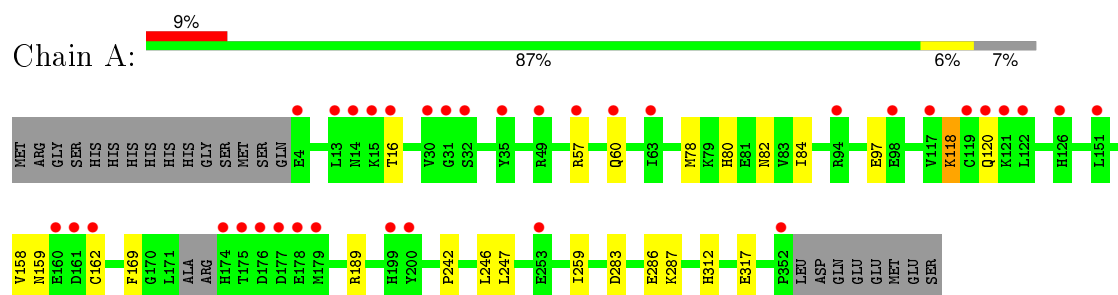


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0	0
			30	18	2	8	2		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	245	Total	O	0	0
			245	245		

- 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	45.65Å 85.91Å 126.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.66 – 1.90 29.65 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.3 (29.66-1.90) 99.3 (29.65-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.85 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.217 , 0.246 0.215 , 0.244	Depositor DCC
R_{free} test set	1993 reflections (5.28%)	DCC
Wilson B-factor (Å ²)	32.2	Xtriage
Anisotropy	0.230	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 57.4	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 39741 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3076	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.57% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 533

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	0.38	0/2866	0.50	0/3891

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 [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	2801	0	2787	17	0
2	A	30	0	16	0	0
3	A	245	0	0	2	0
All	All	3076	0	2803	17	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 3.

All (17) 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:80:HIS:HD2	1:A:82:ASN:H	1.34	0.75

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:158:VAL:CG1	1:A:162:CYS:HA	2.20	0.72
1:A:78:MET:HG3	1:A:169:PHE:CZ	2.26	0.71
1:A:80:HIS:CD2	1:A:82:ASN:H	2.10	0.69
1:A:158:VAL:HG13	1:A:162:CYS:HA	1.77	0.65
1:A:78:MET:HG3	1:A:169:PHE:CE1	2.38	0.59
1:A:158:VAL:HG12	1:A:159:ASN:O	2.09	0.52
1:A:312:HIS:HD2	1:A:317:GLU:OE2	1.93	0.52
1:A:57:ARG:HB3	1:A:60:GLN:HB2	1.92	0.50
1:A:189:ARG:HD2	3:A:1114:HOH:O	2.14	0.47
1:A:242:PRO:HB3	1:A:246:LEU:HD23	1.98	0.46
1:A:283:ASP:OD2	1:A:287:LYS:HE2	2.18	0.44
1:A:84:ILE:HG22	1:A:169:PHE:HE2	1.82	0.43
1:A:247:LEU:HD21	1:A:259:ILE:HG21	2.01	0.42
1:A:286:GLU:OE2	3:A:2015:HOH:O	2.22	0.41
1:A:247:LEU:HD21	1:A:259:ILE:CG2	2.50	0.41
1:A:118:LYS:HG3	1:A:120:GLN:HG2	2.03	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	343/372 (92%)	331 (96%)	12 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	308/330 (93%)	305 (99%)	3 (1%)	82	81

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	16	THR
1	A	97	GLU
1	A	118	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	11	GLN
1	A	14	ASN
1	A	80	HIS
1	A	126	HIS
1	A	174	HIS
1	A	228	HIS
1	A	272	ASN
1	A	312	HIS

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 carbohydrates 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	533	A	361	-	29,33,33	1.72	6 (20%)	29,47,47	2.36	9 (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
2	533	A	361	-	-	0/10/12/12	0/4/4/4

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	361	533	C13-C8	-4.76	1.31	1.42
2	A	361	533	C13-C12	-2.93	1.31	1.36
2	A	361	533	C11-N10	2.03	1.41	1.38
2	A	361	533	N27-N25	2.49	1.39	1.34
2	A	361	533	C29-N28	2.60	1.37	1.32
2	A	361	533	N28-N27	4.10	1.41	1.34

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	361	533	N7-C4-N5	-5.89	120.10	126.62
2	A	361	533	C4-N1-C2	-4.83	118.31	123.92
2	A	361	533	C18-C19-C20	-2.11	120.63	123.35
2	A	361	533	C8-C9-N5	-2.04	120.55	123.37
2	A	361	533	C6-N7-C4	2.45	120.52	115.97
2	A	361	533	C21-C20-C19	2.84	119.59	116.63
2	A	361	533	C16-O15-C12	3.34	125.86	117.75
2	A	361	533	N1-C4-N7	4.08	122.75	116.95
2	A	361	533	C4-N5-C9	4.89	120.97	115.09

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	347/372 (93%)	0.53	35 (10%) 9 10	24, 35, 51, 66	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	199	HIS	7.0
1	A	175	THR	6.0
1	A	176	ASP	5.6
1	A	174	HIS	5.0
1	A	177	ASP	5.0
1	A	178	GLU	4.6
1	A	15	LYS	4.5
1	A	352	PRO	4.4
1	A	4	GLU	4.1
1	A	98	GLU	3.8
1	A	200	TYR	3.8
1	A	119	CYS	3.8
1	A	121	LYS	3.4
1	A	179	MET	3.4
1	A	49	ARG	3.2
1	A	13	LEU	3.0
1	A	120	GLN	3.0
1	A	57	ARG	2.9
1	A	126	HIS	2.9
1	A	117	VAL	2.9
1	A	30	VAL	2.6
1	A	151	LEU	2.6
1	A	31	GLY	2.6
1	A	161	ASP	2.5
1	A	160	GLU	2.5
1	A	122	LEU	2.5
1	A	63	ILE	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	60	GLN	2.3
1	A	94	ARG	2.2
1	A	35	TYR	2.2
1	A	16	THR	2.1
1	A	253	GLU	2.1
1	A	162	CYS	2.1
1	A	32	SER	2.0
1	A	14	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 carbohydrates 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. 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	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	533	A	361	30/30	0.83	0.15	0.31	36,38,50,51	0

6.5 Other polymers [i](#)

There are no such residues in this entry.