



# wwPDB X-ray Structure Validation Summary Report i

Feb 28, 2014 – 08:15 AM GMT

PDB ID : 2HW6  
Title : Crystal structure of Mnk1 catalytic domain  
Authors : Jauch, R.; Wahl, M.C.  
Deposited on : 2006-08-01  
Resolution : 2.50 Å(reported)

This is a wwPDB validation summary report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

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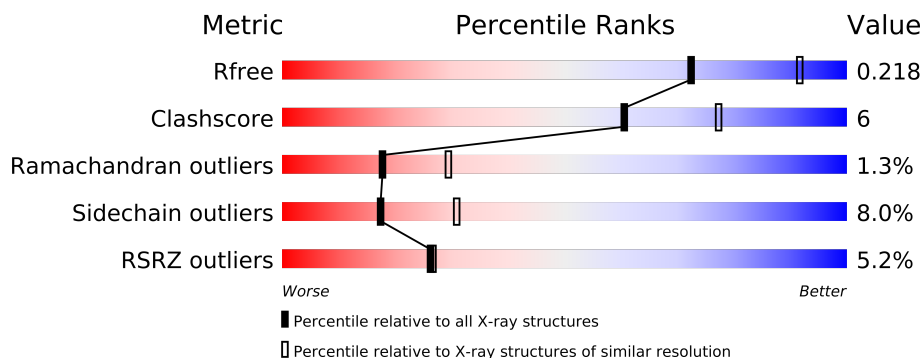
The following versions of software and data (see [references](#)) were used in the production of this report:

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 2.50 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	2784 (2.50-2.50)
Clashscore	79885	3562 (2.50-2.50)
Ramachandran outliers	78287	3480 (2.50-2.50)
Sidechain outliers	78261	3482 (2.50-2.50)
RSRZ outliers	66119	2785 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	307	
1	B	307	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
2	SO4	A	342	-	X

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3963 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 MAP kinase-interacting serine/threonine-proteinkinase 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	242	Total	C	N	O	S	0	0	0
			1941	1244	330	361	6			
1	B	233	Total	C	N	O	S	0	0	0
			1874	1203	319	345	7			

There are 86 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	35	GLY	-	CLONING ARTIFACT	UNP Q9BUB5
A	36	SER	-	CLONING ARTIFACT	UNP Q9BUB5
A	?	-	ASP	SEE REMARK 999	UNP Q9BUB5
A	?	-	LYS	SEE REMARK 999	UNP Q9BUB5
A	?	-	VAL	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
A	?	-	CYS	SEE REMARK 999	UNP Q9BUB5
A	?	-	HIS	SEE REMARK 999	UNP Q9BUB5
A	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
A	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
A	?	-	TRP	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	MET	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
A	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
A	?	-	THR	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
A	?	-	THR	SEE REMARK 999	UNP Q9BUB5

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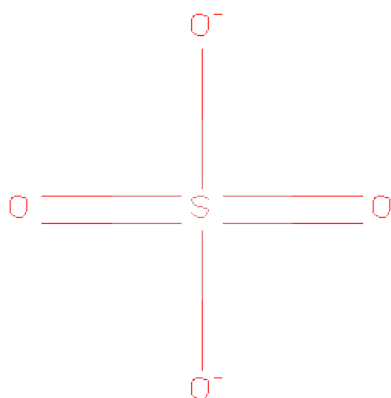
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
A	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	ASP	SEE REMARK 999	UNP Q9BUB5
A	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
A	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
A	?	-	THR	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	SER	SEE REMARK 999	UNP Q9BUB5
A	?	-	GLN	SEE REMARK 999	UNP Q9BUB5
A	?	-	VAL	SEE REMARK 999	UNP Q9BUB5
A	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
A	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
A	?	-	THR	SEE REMARK 999	UNP Q9BUB5
A	?	-	THR	SEE REMARK 999	UNP Q9BUB5
B	35	GLY	-	CLONING ARTIFACT	UNP Q9BUB5
B	36	SER	-	CLONING ARTIFACT	UNP Q9BUB5
B	?	-	ASP	SEE REMARK 999	UNP Q9BUB5
B	?	-	LYS	SEE REMARK 999	UNP Q9BUB5
B	?	-	VAL	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
B	?	-	CYS	SEE REMARK 999	UNP Q9BUB5
B	?	-	HIS	SEE REMARK 999	UNP Q9BUB5
B	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
B	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
B	?	-	TRP	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	MET	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
B	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
B	?	-	THR	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	PRO	SEE REMARK 999	UNP Q9BUB5

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	THR	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	LEU	SEE REMARK 999	UNP Q9BUB5
B	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	ASP	SEE REMARK 999	UNP Q9BUB5
B	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
B	?	-	PRO	SEE REMARK 999	UNP Q9BUB5
B	?	-	THR	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	SER	SEE REMARK 999	UNP Q9BUB5
B	?	-	GLN	SEE REMARK 999	UNP Q9BUB5
B	?	-	VAL	SEE REMARK 999	UNP Q9BUB5
B	?	-	ALA	SEE REMARK 999	UNP Q9BUB5
B	?	-	GLY	SEE REMARK 999	UNP Q9BUB5
B	?	-	THR	SEE REMARK 999	UNP Q9BUB5
B	?	-	THR	SEE REMARK 999	UNP Q9BUB5

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	B	1	Total O S 5 4 1	0	0
2	A	1	Total O S 5 4 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	74	Total 74	O 74	0	0
3	B	64	Total 64	O 64	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	93.47Å 93.47Å 175.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.50 29.56 – 2.50	Depositor EDS
% Data completeness (in resolution range)	69.6 (30.00-2.50) 72.0 (29.56-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.81 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.207 , 0.257 0.209 , 0.218	Depositor DCC
$R_{free}$ test set	1010 reflections (5.37%)	DCC
Wilson B-factor (Å <sup>2</sup> )	34.9	Xtriage
Anisotropy	0.718	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 47.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 19805 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3963	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.34% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities 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: SO4

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	0.50	0/1982	0.60	1/2671 (0.0%)
1	B	0.46	0/1913	0.58	0/2579
All	All	0.48	0/3895	0.59	1/5250 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	194	LEU	CA-CB-CG	5.05	126.91	115.30

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	1941	0	1927	21	0
1	B	1874	0	1869	26	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	74	0	0	0	0
3	B	64	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	3963	0	3796	45	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 6.

The worst 5 of 45 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:169:ARG:HH21	1:A:169:ARG:HG2	1.14	1.07
1:B:185:SER:HB2	1:B:186:PRO:HD2	1.40	1.03
1:A:169:ARG:NH2	1:A:169:ARG:HG2	1.87	0.76
1:B:183:LYS:HG3	1:B:185:SER:HB3	1.69	0.75
1:A:57:GLU:OE1	1:B:57:GLU:HB2	1.90	0.71

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	236/307 (77%)	225 (95%)	9 (4%)	2 (1%)	27	46
1	B	227/307 (74%)	202 (89%)	21 (9%)	4 (2%)	13	20
All	All	463/614 (75%)	427 (92%)	30 (6%)	6 (1%)	18	29

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	185	SER
1	B	53	GLU
1	B	102	GLN
1	A	185	SER
1	A	291	LYS

### 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	209/263 (80%)	195 (93%)	14 (7%)	23	40
1	B	202/263 (77%)	183 (91%)	19 (9%)	13	23
All	All	411/526 (78%)	378 (92%)	33 (8%)	17	31

5 of 33 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	49	LYS
1	B	105	LYS
1	B	315	VAL
1	B	52	SER
1	B	70	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	104	ASN
1	B	143	ASN
1	B	102	GLN
1	A	100	GLN
1	B	104	ASN

### 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 ⓘ

2 ligands 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	$\# Z  > 2$
2	SO4	A	342	-	4,4,4	2.74	3 (75%)	6,6,6	0.67	0
2	SO4	B	342	-	4,4,4	0.42	0	6,6,6	0.51	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
2	SO4	A	342	-	-	0/0/0/0	0/0/0/0
2	SO4	B	342	-	-	0/0/0/0	0/0/0/0

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	342	SO4	O4-S	3.82	1.60	1.47
2	A	342	SO4	O3-S	2.94	1.57	1.47
2	A	342	SO4	O1-S	2.60	1.55	1.47

There are no bond angle outliers.

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	242/307 (78%)	-0.14	8 (3%) 44 45	27, 36, 58, 69	0
1	B	233/307 (75%)	0.36	17 (7%) 15 14	30, 53, 86, 95	0
All	All	475/614 (77%)	0.10	25 (5%) 26 26	27, 45, 82, 95	0

The worst 5 of 25 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	221	TYR	6.6
1	B	40	LEU	6.2
1	B	260	PHE	5.1
1	B	301	HIS	4.9
1	A	39	SER	4.4

### 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, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
2	SO4	A	342	5/5	0.30	11.52	85,85,86,86	0
2	SO4	B	342	5/5	0.08	-2.57	39,39,40,40	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.