



# wwPDB X-ray Structure Validation Summary Report i

Sep 4, 2014 – 11:19 PM EDT

PDB ID : 4BL2  
Title : Crystal structure of PBP2a clinical mutant E150K from MRSA  
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Deposited on : 2013-04-30  
Resolution : 2.72 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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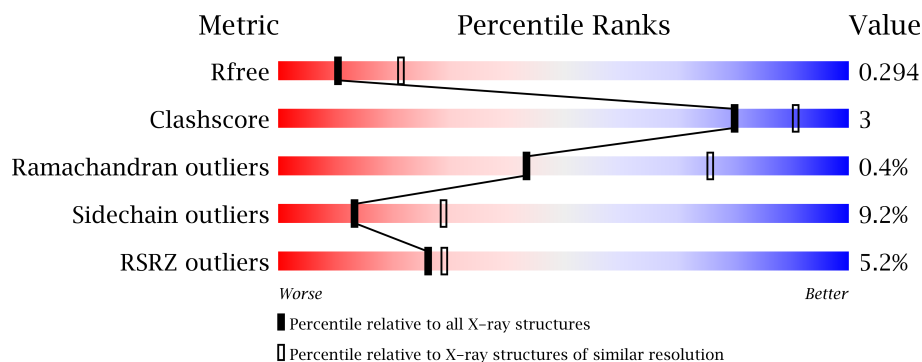
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.16 November 2013  
Xtriage (Phenix) : dev-1439  
EDS : stable23489  
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) : stable23489

# 1 Overall quality at a glance

The reported resolution of this entry is 2.72 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	1770 (2.74-2.70)
Clashscore	79885	2183 (2.74-2.70)
Ramachandran outliers	78287	2147 (2.74-2.70)
Sidechain outliers	78261	2148 (2.74-2.70)
RSRZ outliers	66119	1772 (2.74-2.70)

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	643	
1	B	643	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10453 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 PENICILLIN BINDING PROTEIN 2 PRIME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	637	Total	C	N	O	S	0	0	0
			5114	3226	865	1008	15			
1	B	637	Total	C	N	O	S	0	0	0
			5112	3224	864	1009	15			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	150	LYS	GLU	ENGINEERED MUTATION	UNP Q54113
B	150	LYS	GLU	ENGINEERED MUTATION	UNP Q54113

- Molecule 2 is CADMIUM ION (three-letter code: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	3	Total	Cd	0	0
			3	3		
2	A	4	Total	Cd	0	0
			4	4		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	Cl	0	0
			2	2		
3	A	2	Total	Cl	0	0
			2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	96	Total	O	0	0
			96	96		

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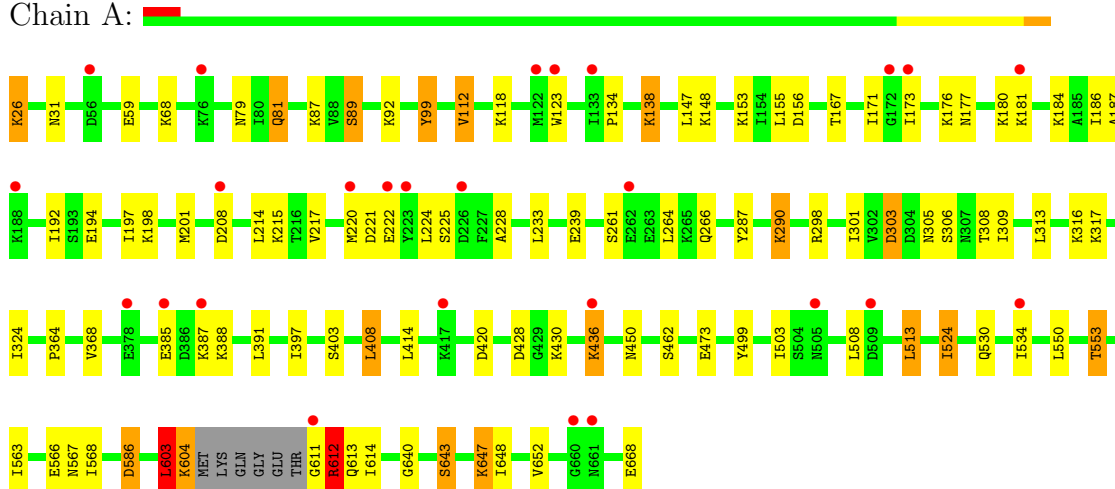
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	120	Total 120	O 120	0	0

### 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.

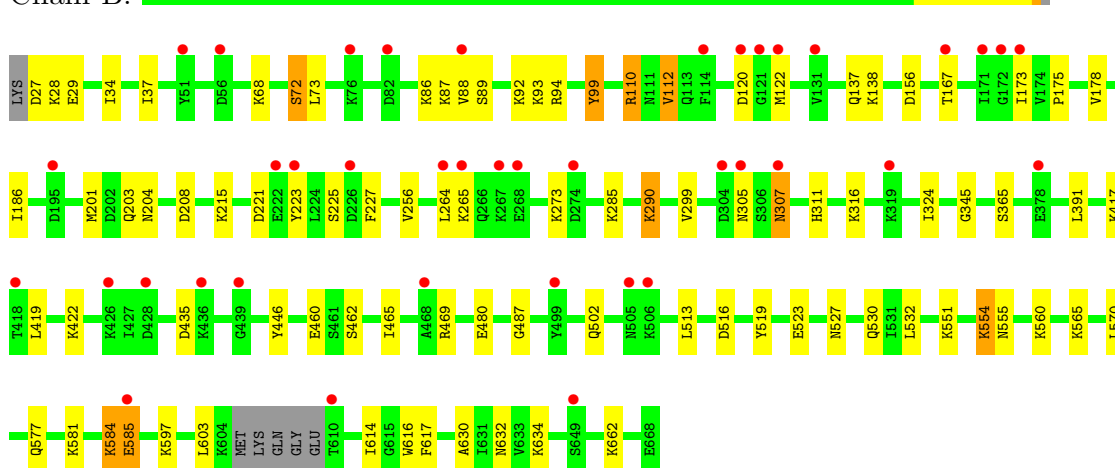
#### • Molecule 1: PENICILLIN BINDING PROTEIN 2 PRIME

Chain A:



#### • Molecule 1: PENICILLIN BINDING PROTEIN 2 PRIME

Chain B:



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.44Å 101.64Å 186.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.89 – 2.72 19.89 – 2.72	Depositor EDS
% Data completeness (in resolution range)	99.1 (19.89-2.72) 99.1 (19.89-2.72)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.22 (at 2.71Å)	Xtriage
Refinement program	BUSTER 2.10.0	Depositor
R, $R_{free}$	0.207 , 0.287 0.210 , 0.294	Depositor DCC
$R_{free}$ test set	3004 reflections (7.72%)	DCC
Wilson B-factor (Å <sup>2</sup> )	41.1	Xtriage
Anisotropy	0.883	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 34.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 41942 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	10453	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.84% 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: CL, CD

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	0.53	1/5199 (0.0%)	0.78	6/6988 (0.1%)
1	B	0.49	0/5197	0.69	0/6987
All	All	0.51	1/10396 (0.0%)	0.74	6/13975 (0.0%)

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	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	612	ARG	C-N	-13.40	1.03	1.34

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	612	ARG	O-C-N	-20.43	90.01	122.70
1	A	612	ARG	C-N-CA	14.24	157.30	121.70
1	A	612	ARG	CA-C-N	12.94	145.66	117.20
1	A	612	ARG	N-CA-C	-9.39	85.66	111.00
1	A	603	LEU	C-N-CA	6.06	136.86	121.70

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	612	ARG	Mainchain,Peptide

## 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	5114	0	5122	44	0
1	B	5112	0	5117	29	0
2	A	4	0	0	0	0
2	B	3	0	0	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	96	0	0	1	0
4	B	120	0	0	0	0
All	All	10453	0	10239	69	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 3.

The worst 5 of 69 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:603:LEU:HA	1:A:604:LYS:HB2	1.60	0.83
1:A:138:LYS:H	1:A:138:LYS:HD2	1.52	0.74
1:A:79:ASN:HB3	1:A:81:GLN:HE22	1.53	0.73
1:B:290:LYS:HB3	1:B:324:ILE:HD11	1.75	0.67
1:A:112:VAL:HG13	1:A:134:PRO:HB3	1.78	0.66

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	633/643 (98%)	603 (95%)	28 (4%)	2 (0%)	50	81
1	B	633/643 (98%)	605 (96%)	25 (4%)	3 (0%)	38	70
All	All	1266/1286 (98%)	1208 (95%)	53 (4%)	5 (0%)	43	76

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	613	GLN
1	B	307	ASN
1	A	221	ASP
1	B	265	LYS
1	B	28	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	568/573 (99%)	514 (90%)	54 (10%)	12	27
1	B	568/573 (99%)	518 (91%)	50 (9%)	14	32
All	All	1136/1146 (99%)	1032 (91%)	104 (9%)	13	29

5 of 104 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	586	ASP
1	B	110	ARG
1	B	554	LYS
1	A	603	LEU
1	A	647	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	107	ASN
1	B	311	HIS
1	B	507	ASN
1	B	57	ASN
1	B	393	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 ⓘ

Of 11 ligands modelled in this entry, 11 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

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	637/643 (99%)	0.27	26 (4%) 35 41	22, 50, 85, 120	0
1	B	637/643 (99%)	0.31	40 (6%) 19 22	25, 49, 86, 117	0
All	All	1274/1286 (99%)	0.29	66 (5%) 26 29	22, 50, 85, 120	0

The worst 5 of 66 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	223	TYR	5.5
1	B	267	LYS	4.8
1	A	173	ILE	4.7
1	B	610	THR	4.4
1	B	222	GLU	4.1

### 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
3	CL	B	1009	1/1	0.14	-0.26	34,34,34,34	0
2	CD	B	1002	1/1	0.10	-1.07	45,45,45,45	0
2	CD	A	1003	1/1	0.12	-1.52	47,47,47,47	0
2	CD	A	1001	1/1	0.10	-1.64	46,46,46,46	0
2	CD	A	1005	1/1	0.10	-2.03	48,48,48,48	0
2	CD	A	1004	1/1	0.08	-2.37	117,117,117,117	0
2	CD	B	1007	1/1	0.09	-2.51	75,75,75,75	0
3	CL	A	1010	1/1	0.08	-2.65	43,43,43,43	0
3	CL	A	1011	1/1	0.06	-3.06	40,40,40,40	0
3	CL	B	1012	1/1	0.08	-4.10	51,51,51,51	0
2	CD	B	1006	1/1	0.04	-4.26	131,131,131,131	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.