



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 22, 2020 – 04:11 pm BST

PDB ID : 3GAB  
Title : C-terminal domain of Bacillus subtilis MutL crystal form I  
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Deposited on : 2009-02-17  
Resolution : 2.50 Å(reported)

This is a wwPDB X-ray Structure 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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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
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

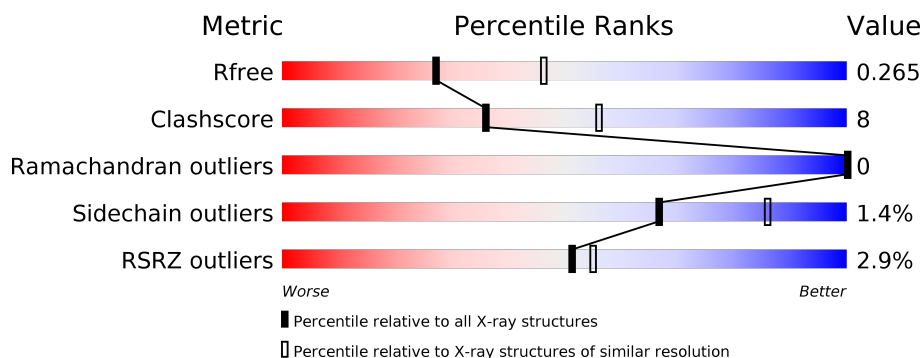
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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))
$R_{free}$	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (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 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  $\leq 5\%$ . 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	197	<div> <div>3%</div> <div> <div></div> <div>73%</div> <div>19%</div> <div>• 7%</div> </div> </div>
1	B	197	<div> <div>2%</div> <div> <div></div> <div>75%</div> <div>18%</div> <div>7%</div> </div> </div>
1	C	197	<div> <div>2%</div> <div> <div></div> <div>73%</div> <div>20%</div> <div>• 7%</div> </div> </div>
1	D	197	<div> <div>4%</div> <div> <div></div> <div>77%</div> <div>17%</div> <div>6%</div> </div> </div>

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 6122 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 DNA mismatch repair protein mutL.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	183	Total	C	N	O	S	0	0	0
			1496	952	253	281	10			
1	B	183	Total	C	N	O	S	0	0	0
			1498	953	252	283	10			
1	C	184	Total	C	N	O	S	0	1	0
			1510	961	254	284	11			
1	D	186	Total	C	N	O	S	0	0	0
			1517	966	255	286	10			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	431	GLY	-	EXPRESSION TAG	UNP P49850
A	432	ALA	-	EXPRESSION TAG	UNP P49850
A	433	MET	-	EXPRESSION TAG	UNP P49850
B	431	GLY	-	EXPRESSION TAG	UNP P49850
B	432	ALA	-	EXPRESSION TAG	UNP P49850
B	433	MET	-	EXPRESSION TAG	UNP P49850
C	431	GLY	-	EXPRESSION TAG	UNP P49850
C	432	ALA	-	EXPRESSION TAG	UNP P49850
C	433	MET	-	EXPRESSION TAG	UNP P49850
D	431	GLY	-	EXPRESSION TAG	UNP P49850
D	432	ALA	-	EXPRESSION TAG	UNP P49850
D	433	MET	-	EXPRESSION TAG	UNP P49850

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	27	Total	O	0	0
			27	27		
2	B	29	Total	O	0	0
			29	29		

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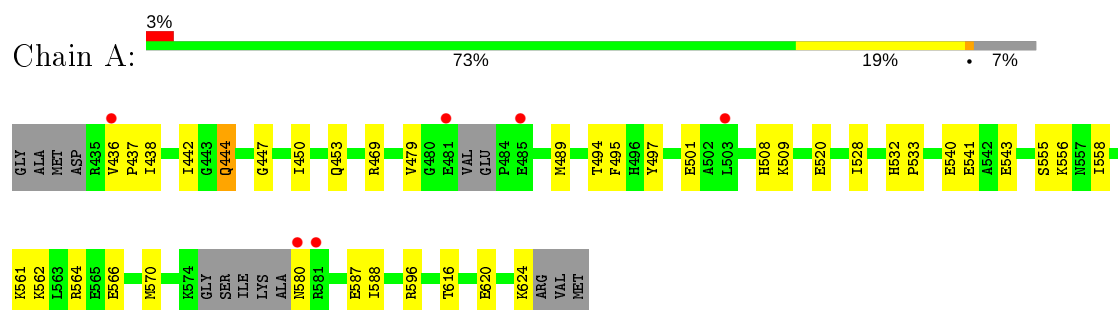
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	10	Total	O	0	0
			10	10		
2	D	35	Total	O	0	0
			35	35		

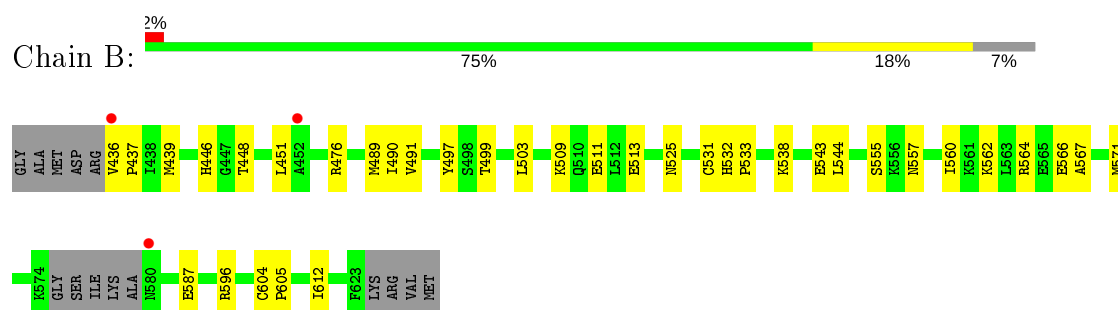
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

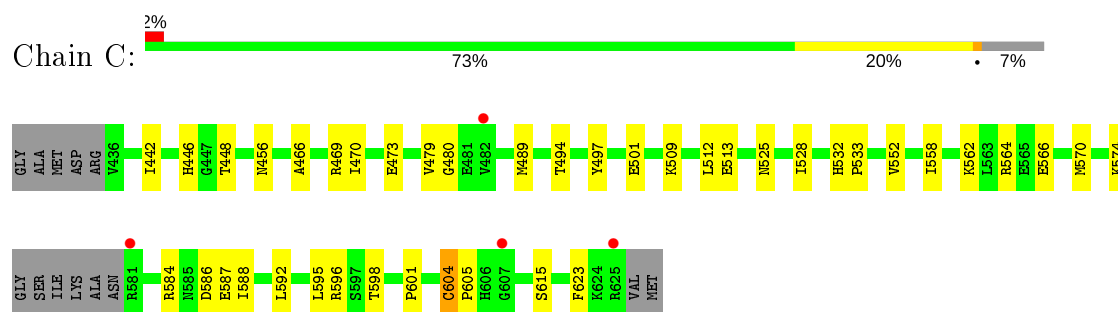
- Molecule 1: DNA mismatch repair protein mutL



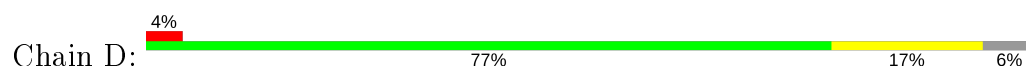
- Molecule 1: DNA mismatch repair protein mutL

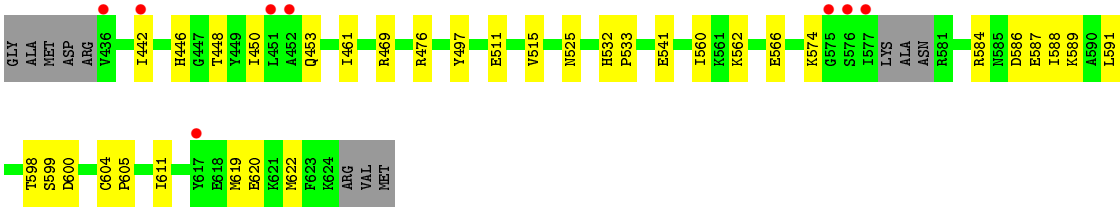


- Molecule 1: DNA mismatch repair protein mutL



- Molecule 1: DNA mismatch repair protein mutL





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	88.29 Å 94.89 Å 218.66 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.78 – 2.50 29.78 – 2.50	Depositor EDS
% Data completeness (in resolution range)	98.8 (29.78-2.50) 98.8 (29.78-2.50)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	0.03	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	7.72 (at 2.51 Å)	Xtriage
Refinement program	PHENIX (phenix.refine)	Depositor
R, $R_{free}$	0.216 , 0.267 0.210 , 0.265	Depositor DCC
$R_{free}$ test set	1631 reflections (5.13%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	49.7	Xtriage
Anisotropy	0.177	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 43.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	6122	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.65% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	0.30	1/1528 (0.1%)	0.38	0/2058
1	B	0.30	1/1531 (0.1%)	0.39	0/2066
1	C	0.30	1/1543 (0.1%)	0.38	0/2082
1	D	0.30	1/1550 (0.1%)	0.40	0/2090
All	All	0.30	4/6152 (0.1%)	0.39	0/8296

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	587	GLU	CD-OE2	7.17	1.33	1.25
1	A	587	GLU	CD-OE2	7.14	1.33	1.25
1	C	587	GLU	CD-OE2	7.08	1.33	1.25
1	D	587	GLU	CD-OE2	6.89	1.33	1.25

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	1496	0	1466	27	0
1	B	1498	0	1466	23	0
1	C	1510	0	1480	26	0
1	D	1517	0	1492	22	0
2	A	27	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	29	0	0	2	0
2	C	10	0	0	0	0
2	D	35	0	0	0	0
All	All	6122	0	5904	95	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 8.

The worst 5 of 95 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:436:VAL:HB	1:A:596:ARG:HG3	1.44	0.96
1:B:436:VAL:HB	1:B:596:ARG:HG3	1.63	0.80
1:A:444:GLN:HE22	1:A:447:GLY:H	1.30	0.76
1:C:494:THR:HG22	1:C:528:ILE:HG22	1.66	0.75
1:B:538:LYS:HE3	2:B:16:HOH:O	1.97	0.65

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	177/197 (90%)	173 (98%)	4 (2%)	0	100	100
1	B	179/197 (91%)	172 (96%)	7 (4%)	0	100	100
1	C	181/197 (92%)	178 (98%)	3 (2%)	0	100	100
1	D	182/197 (92%)	178 (98%)	4 (2%)	0	100	100
All	All	719/788 (91%)	701 (98%)	18 (2%)	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	165/176 (94%)	163 (99%)	2 (1%)	71	88
1	B	166/176 (94%)	166 (100%)	0	100	100
1	C	167/176 (95%)	163 (98%)	4 (2%)	49	74
1	D	168/176 (96%)	164 (98%)	4 (2%)	49	74
All	All	666/704 (95%)	656 (98%)	10 (2%)	67	85

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	604[A]	CYS
1	C	604[B]	CYS
1	D	515	VAL
1	C	586	ASP
1	D	476	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	446	HIS
1	B	467	GLN
1	B	532	HIS
1	A	580	ASN
1	C	500	ASN

### 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 [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	183/197 (92%)	0.11	6 (3%) 46 50	38, 58, 78, 113	0
1	B	183/197 (92%)	-0.06	3 (1%) 72 74	32, 49, 73, 104	0
1	C	184/197 (93%)	0.09	4 (2%) 62 65	37, 56, 81, 98	0
1	D	186/197 (94%)	0.06	8 (4%) 35 38	29, 46, 81, 103	0
All	All	736/788 (93%)	0.05	21 (2%) 51 55	29, 53, 79, 113	0

The worst 5 of 21 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	577	ILE	6.8
1	B	580	ASN	6.6
1	A	580	ASN	5.8
1	C	482	VAL	5.3
1	C	607	GLY	4.6

### 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.