



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 3, 2019 – 01:15 PM EDT

PDB ID : 6E4D  
Title : Atomic structure of Mycobacterium tuberculosis DppA  
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Deposited on : 2018-07-17  
Resolution : 1.25 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](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 : 2.4  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.4

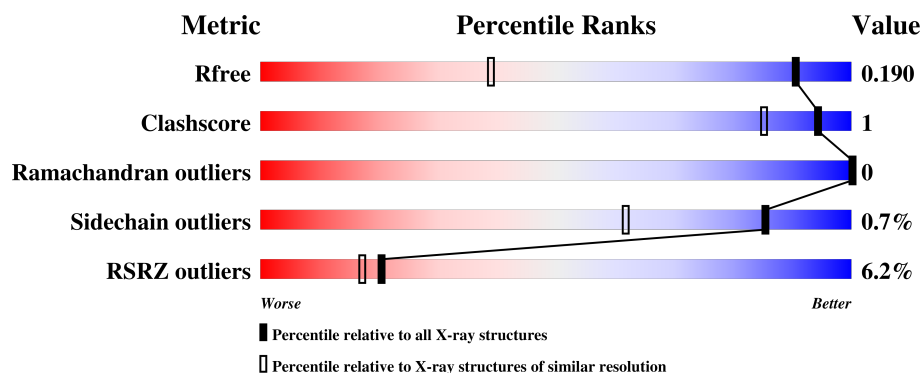
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.25 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))
$R_{free}$	111664	1924 (1.30-1.22)
Clashscore	122126	2002 (1.30-1.22)
Ramachandran outliers	120053	1934 (1.30-1.22)
Sidechain outliers	120020	1932 (1.30-1.22)
RSRZ outliers	108989	1874 (1.30-1.22)

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. 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	510	<div> <div>6%</div> <div>96%</div> <div>.</div> </div>
2	F	4	<div> <div>25%</div> <div>75%</div> <div>25%</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8316 atoms, of which 3783 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 Periplasmic dipeptide-binding lipoprotein DPPA.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	510	Total	C	H	N	O	S	0	0	0
			7671	2477	3755	689	744	6			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	179	ALA	ARG	engineered mutation	UNP A0A045KE34

- Molecule 2 is a protein called VAL-VAL-VAL-ALA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	F	4	Total	C	H	N	O	0	0	0
			54	18	28	4	4			

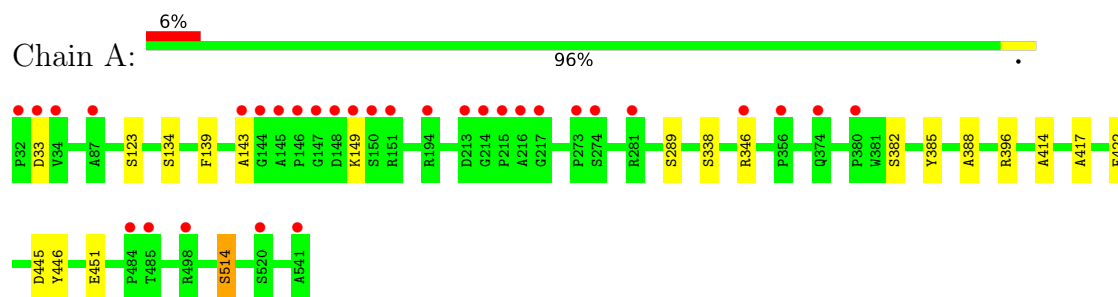
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	589	Total	O	0	0
			589	589		
3	F	2	Total	O	0	0
			2	2		

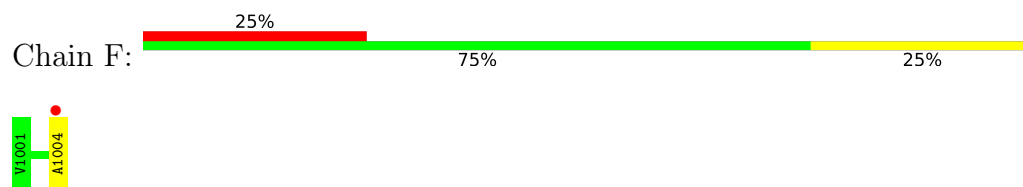
### 3 Residue-property plots [i](#)

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: Periplasmic dipeptide-binding lipoprotein DPPA



- Molecule 2: VAL-VAL-VAL-ALA



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	52.62Å 68.95Å 62.11Å 90.00° 106.34° 90.00°	Depositor
Resolution (Å)	14.92 – 1.25 14.92 – 1.25	Depositor EDS
% Data completeness (in resolution range)	98.2 (14.92-1.25) 98.2 (14.92-1.25)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.46 (at 1.25Å)	Xtriage
Refinement program	PHENIX 1.12_2829	Depositor
R, $R_{free}$	0.168 , 0.188 0.169 , 0.190	Depositor DCC
$R_{free}$ test set	1999 reflections (1.74%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	12.1	Xtriage
Anisotropy	0.268	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.47 , 47.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	8316	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.83% 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

### 5.1 Standard geometry

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	0/4025	0.54	0/5506
2	F	0.54	0/25	0.89	0/34
All	All	0.31	0/4050	0.55	0/5540

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	3916	3755	3755	11	0
2	F	26	28	31	1	0
3	A	589	0	0	2	0
3	F	2	0	0	0	0
All	All	4533	3783	3786	11	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 1.

All (11) 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:149:LYS:N	3:A:609:HOH:O	2.39	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:446:TYR:CZ	1:A:451:GLU:HG3	2.43	0.53
1:A:382:SER:O	3:A:601:HOH:O	2.20	0.47
1:A:338:SER:OG	1:A:346:ARG:CZ	2.64	0.46
1:A:123:SER:OG	1:A:143:ALA:O	2.32	0.46
1:A:388:ALA:HA	1:A:417:ALA:O	2.18	0.44
1:A:445:ASP:OD2	1:A:451:GLU:OE2	2.35	0.43
1:A:422:PHE:CE1	2:F:1004:ALA:HA	2.53	0.43
1:A:134:SER:HA	1:A:139:PHE:CG	2.55	0.41
1:A:385:TYR:O	1:A:414:ALA:HA	2.21	0.41
1:A:289:SER:HA	1:A:514:SER:O	2.21	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	508/510 (100%)	493 (97%)	15 (3%)	0	100	100
2	F	2/4 (50%)	2 (100%)	0	0	100	100
All	All	510/514 (99%)	495 (97%)	15 (3%)	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	407/408 (100%)	404 (99%)	3 (1%)	85	62
2	F	3/3 (100%)	3 (100%)	0	100	100
All	All	410/411 (100%)	407 (99%)	3 (1%)	85	62

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

Mol	Chain	Res	Type
1	A	33	ASP
1	A	396	ARG
1	A	514	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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](#)

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

### 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	510/510 (100%)	0.52	31 (6%) 21 18	9, 15, 29, 87	0
2	F	4/4 (100%)	0.70	1 (25%) 0 0	14, 14, 15, 25	0
All	All	514/514 (100%)	0.52	32 (6%) 20 17	9, 15, 29, 87	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	146	PRO	23.6
1	A	145	ALA	15.9
1	A	148	ASP	12.8
1	A	32	PRO	9.1
1	A	149	LYS	8.5
1	A	541	ALA	7.6
1	A	147	GLY	7.2
1	A	144	GLY	6.9
1	A	150	SER	6.8
1	A	214	GLY	5.9
1	A	215	PRO	5.5
1	A	213	ASP	5.0
1	A	356	PRO	4.8
1	A	33	ASP	4.7
1	A	273	PRO	4.2
1	A	484	PRO	3.1
1	A	281	ARG	3.1
1	A	151	ARG	3.0
1	A	34	VAL	2.9
1	A	498	ARG	2.8
1	A	380	PRO	2.8
1	A	194	ARG	2.8
1	A	274	SER	2.8
1	A	485	THR	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	87	ALA	2.5
1	A	374	GLN	2.3
1	A	520	SER	2.2
2	F	1004	ALA	2.1
1	A	346	ARG	2.1
1	A	143	ALA	2.1
1	A	216	ALA	2.1
1	A	217	GLY	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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.