



# Full wwPDB X-ray Structure Validation Report ⓘ

May 21, 2020 – 11:30 am BST

PDB ID : 5Y26  
Title : Crystal structure of native Dpb4-Dpb3  
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Deposited on : 2017-07-24  
Resolution : 2.00 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  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (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

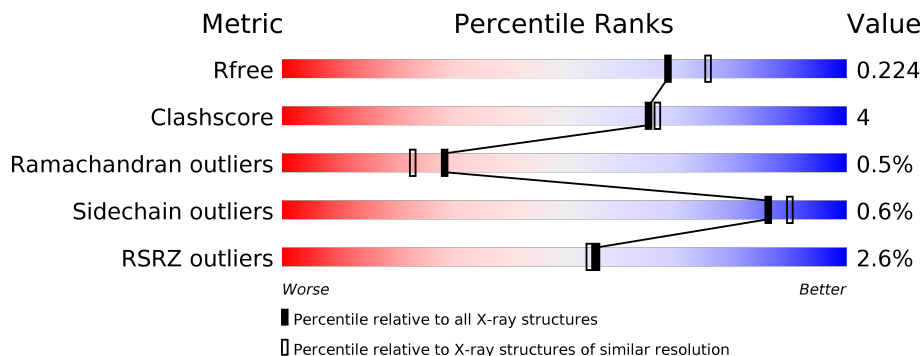
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	241	
2	B	92	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	GOL	A	301	-	-	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 1670 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 polymerase epsilon subunit D.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	97	760	486	124	147	3	0	0	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	expression tag	UNP P87174
A	1	GLY	-	expression tag	UNP P87174
A	211	ALA	-	expression tag	UNP P87174
A	212	ALA	-	expression tag	UNP P87174
A	213	ALA	-	expression tag	UNP P87174
A	214	GLU	-	expression tag	UNP P87174
A	215	ASN	-	expression tag	UNP P87174
A	216	LEU	-	expression tag	UNP P87174
A	217	TYR	-	expression tag	UNP P87174
A	218	PHE	-	expression tag	UNP P87174
A	219	GLN	-	expression tag	UNP P87174
A	220	GLY	-	expression tag	UNP P87174
A	221	LEU	-	expression tag	UNP P87174
A	222	GLU	-	expression tag	UNP P87174
A	223	ASP	-	expression tag	UNP P87174
A	224	TYR	-	expression tag	UNP P87174
A	225	LYS	-	expression tag	UNP P87174
A	226	ASP	-	expression tag	UNP P87174
A	227	ASP	-	expression tag	UNP P87174
A	228	ASP	-	expression tag	UNP P87174
A	229	ASP	-	expression tag	UNP P87174
A	230	LYS	-	expression tag	UNP P87174
A	231	HIS	-	expression tag	UNP P87174
A	232	HIS	-	expression tag	UNP P87174
A	233	HIS	-	expression tag	UNP P87174
A	234	HIS	-	expression tag	UNP P87174
A	235	HIS	-	expression tag	UNP P87174

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Chain	Residue	Modelled	Actual	Comment	Reference
A	236	HIS	-	expression tag	UNP P87174
A	237	HIS	-	expression tag	UNP P87174
A	238	HIS	-	expression tag	UNP P87174
A	239	HIS	-	expression tag	UNP P87174
A	240	HIS	-	expression tag	UNP P87174

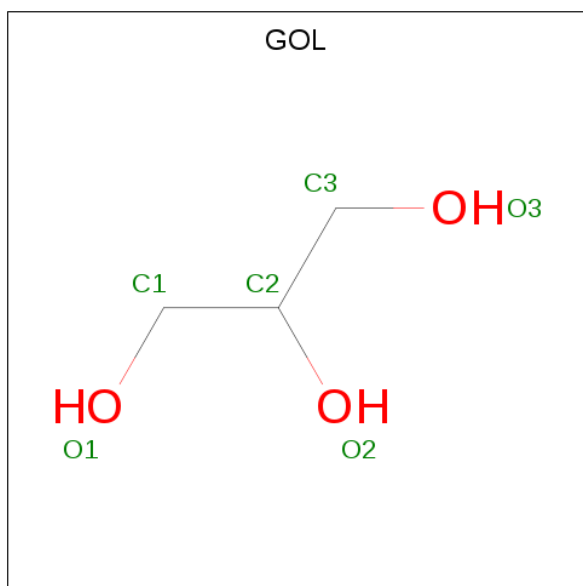
- Molecule 2 is a protein called Putative transcription factor C16C4.22.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	92	766	488	133	143	2	0	3	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	GLY	-	expression tag	UNP C6Y4D0
B	-3	PRO	-	expression tag	UNP C6Y4D0
B	-2	LEU	-	expression tag	UNP C6Y4D0
B	-1	GLY	-	expression tag	UNP C6Y4D0
B	0	SER	-	expression tag	UNP C6Y4D0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	6	3	3	0	0

- Molecule 4 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
4	A	81	Total 81	O 81	0	0
4	B	57	Total 57	O 57	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	86.52Å 86.52Å 59.80Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.26 – 2.00 43.26 – 2.00	Depositor EDS
% Data completeness (in resolution range)	96.3 (43.26-2.00) 96.3 (43.26-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.82 (at 2.00Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.181 , 0.224 0.183 , 0.224	Depositor DCC
$R_{free}$ test set	790 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.9	Xtrriage
Anisotropy	0.103	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 49.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.047 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	1670	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.63% 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](#)

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

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	0.42	0/769	0.53	0/1037
2	B	0.36	0/779	0.46	0/1044
All	All	0.39	0/1548	0.50	0/2081

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	760	0	797	7	0
2	B	766	0	797	7	0
3	A	6	0	8	1	0
4	A	81	0	0	1	0
4	B	57	0	0	0	0
All	All	1670	0	1602	13	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 4.

All (13) 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)
2:B:70:ASP:OD1	2:B:73:ARG:NH1	2.32	0.63
2:B:72:VAL:HG12	2:B:87:ILE:HD11	1.84	0.59
2:B:75:ASP:HB3	2:B:78:PHE:HD2	1.74	0.52
1:A:39:GLU:OE1	4:A:401:HOH:O	2.20	0.48
1:A:73:PRO:HG2	3:A:301:GOL:H2	1.95	0.48
2:B:11:PRO:HG2	2:B:14[B]:ARG:HG3	1.96	0.47
2:B:20:LYS:HE2	2:B:20:LYS:HB3	1.81	0.44
1:A:95:HIS:CD2	2:B:38:VAL:HG11	2.53	0.44
1:A:80:LEU:HD11	1:A:92:LEU:HD22	2.02	0.41
1:A:19:ARG:HG3	1:A:20:SER:N	2.36	0.41
1:A:38:LYS:HG2	1:A:38:LYS:H	1.51	0.41
2:B:54:LEU:HD22	2:B:71:VAL:HG23	2.02	0.41
1:A:12:LEU:HD23	1:A:12:LEU:HA	1.97	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	95/241 (39%)	93 (98%)	1 (1%)	1 (1%)	14 8
2	B	93/92 (101%)	91 (98%)	2 (2%)	0	100 100
All	All	188/333 (56%)	184 (98%)	3 (2%)	1 (0%)	29 23

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	38	LYS

### 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	86/217 (40%)	85 (99%)	1 (1%)	71	76
2	B	85/82 (104%)	85 (100%)	0	100	100
All	All	171/299 (57%)	170 (99%)	1 (1%)	86	90

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	38	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	53	GLN

### 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	$\# Z  > 2$
3	GOL	A	301	-	5,5,5	0.37	0	5,5,5	0.38	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
3	GOL	A	301	-	-	4/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	301	GOL	O1-C1-C2-C3
3	A	301	GOL	C1-C2-C3-O3
3	A	301	GOL	O1-C1-C2-O2
3	A	301	GOL	O2-C2-C3-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	301	GOL	1	0

## 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 [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	97/241 (40%)	-0.21	3 (3%) 49 48	19, 31, 69, 99	0
2	B	92/92 (100%)	-0.33	2 (2%) 62 60	17, 39, 67, 87	0
All	All	189/333 (56%)	-0.27	5 (2%) 56 54	17, 33, 69, 99	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	104	LYS	2.5
2	B	-4	GLY	2.4
2	B	57	LEU	2.3
1	A	9	THR	2.3
1	A	38	LYS	2.1

### 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. 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	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	GOL	A	301	6/6	0.80	0.50	42,62,65,65	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.