



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 02:56 PM GMT

PDB ID : 4B08  
Title : Yeast DNA polymerase alpha, Selenomethionine protein  
Authors : Perera, R.L.; Torella, R.; Klinge, S.; Kilkenny, M.L.; Maman, J.D.; Pellegrini, L.  
Deposited on : 2012-06-29  
Resolution : 2.67 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

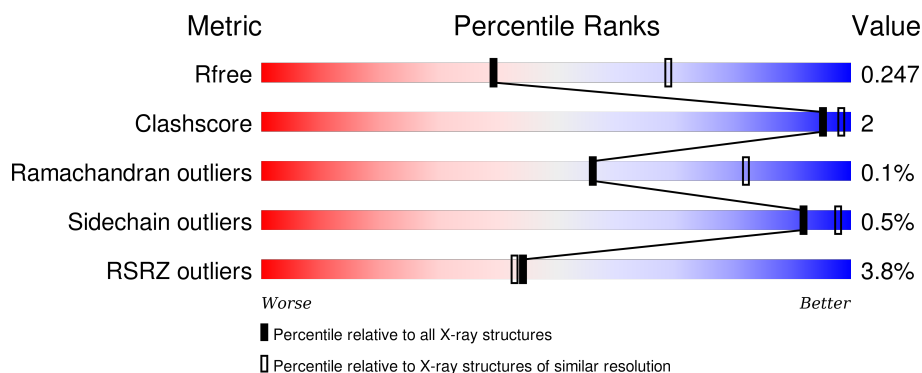
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

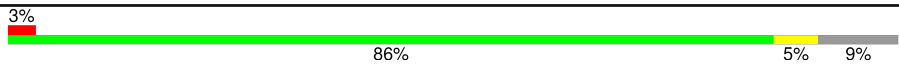
The reported resolution of this entry is 2.67 Å.

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))
$R_{free}$	91344	2780 (2.70-2.66)
Clashscore	102246	3138 (2.70-2.66)
Ramachandran outliers	100387	3089 (2.70-2.66)
Sidechain outliers	100360	3089 (2.70-2.66)
RSRZ outliers	91569	2789 (2.70-2.66)

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	910	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 13497 atoms, of which 6750 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 ALPHA CATALYTIC SUBUNIT A.

Mol	Chain	Residues	Atoms								ZeroOcc	AltConf	Trace
1	A	827	Total	C	H	N	O	S	Se		0	4	0
			13387	4203	6750	1150	1237	19	28				

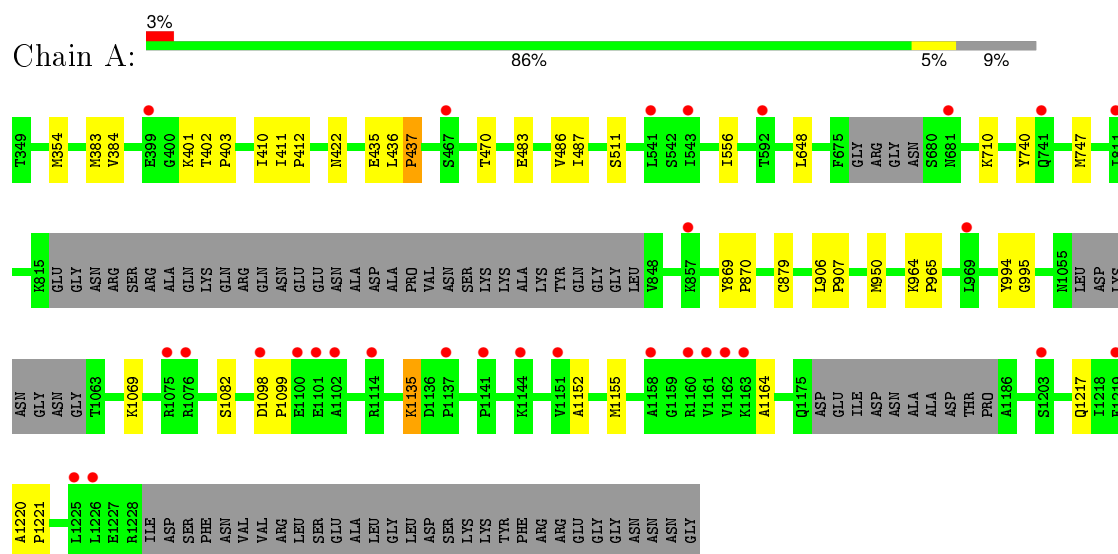
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	110	Total	O		
			110	110	0	0

### 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 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: DNA POLYMERASE ALPHA CATALYTIC SUBUNIT A



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	73.97Å 127.45Å 144.08Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	65.80 – 2.67 73.97 – 2.67	Depositor EDS
% Data completeness (in resolution range)	99.9 (65.80-2.67) 99.9 (73.97-2.67)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.12 (at 2.65Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE: DEV_1078)	Depositor
R, $R_{free}$	0.195 , 0.234 0.213 , 0.247	Depositor DCC
$R_{free}$ test set	1981 reflections (5.29%)	DCC
Wilson B-factor (Å <sup>2</sup> )	45.9	Xtriage
Anisotropy	0.730	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 43.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Outliers	0 of 39577 reflections	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	13497	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.07% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.21	0/6750	0.38	0/9079

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	6637	6750	6715	22	0
2	A	110	0	0	0	0
All	All	6747	6750	6715	22	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 2.

All (22) 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:906:LEU:HB3	1:A:907:PRO:HD3	1.87	0.55
1:A:411:ILE:HB	1:A:412:PRO:HD3	1.93	0.51
1:A:1220:ALA:HB3	1:A:1221:PRO:HD3	1.95	0.48
1:A:710:LYS:O	1:A:1069:LYS:NZ	2.46	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:410:ILE:HD12	1:A:411:ILE:N	2.29	0.48
1:A:1152:ALA:HA	1:A:1155:MSE:HE2	1.99	0.44
1:A:964:LYS:N	1:A:965:PRO:CD	2.80	0.44
1:A:869:TYR:N	1:A:870:PRO:HD2	2.32	0.43
1:A:1135:LYS:HA	1:A:1164:ALA:HB2	2.00	0.43
1:A:383:MSE:HE3	1:A:511:SER:HB3	2.01	0.42
1:A:436:LEU:HA	1:A:437:PRO:HD3	1.88	0.42
1:A:401:LYS:HG3	1:A:470:THR:HA	2.02	0.42
1:A:879:CYS:HB2	1:A:907:PRO:HD3	2.02	0.41
1:A:1082:SER:OG	1:A:1217:GLN:O	2.23	0.41
1:A:740:TYR:O	1:A:747:MSE:HE2	2.21	0.41
1:A:483:GLU:HG2	1:A:487:ILE:HD12	2.02	0.41
1:A:906:LEU:HD11	1:A:950:MSE:CE	2.50	0.41
1:A:994:TYR:CG	1:A:995:GLY:N	2.88	0.41
1:A:556:ILE:HD11	1:A:648:LEU:HA	2.02	0.41
1:A:354:MSE:SE	1:A:384:VAL:HG23	2.71	0.41
1:A:1098:ASP:HB2	1:A:1099:PRO:HD2	2.02	0.41
1:A:402:THR:HB	1:A:403:PRO:HD2	2.03	0.40

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	821/910 (90%)	794 (97%)	26 (3%)	1 (0%)	56 82

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	437	PRO

### 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	757/790 (96%)	753 (100%)	4 (0%)	92	98

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	422	ASN
1	A	435	GLU
1	A	486	VAL
1	A	1135	LYS

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 ⓘ

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	799/910 (87%)	0.55	30 (3%) 44 43	28, 52, 92, 126	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1160	ARG	4.5
1	A	1161	VAL	4.1
1	A	1158	ALA	3.7
1	A	1102	ALA	3.6
1	A	1100	GLU	3.6
1	A	1076	ARG	3.6
1	A	1101	GLU	3.6
1	A	1226	LEU	3.4
1	A	1141	PRO	3.0
1	A	857	LYS	3.0
1	A	681	ASN	2.9
1	A	541	LEU	2.7
1	A	1098	ASP	2.7
1	A	969	LEU	2.6
1	A	592	THR	2.5
1	A	467	SER	2.5
1	A	1163	LYS	2.5
1	A	741	GLN	2.4
1	A	1075	ARG	2.3
1	A	1219	PHE	2.3
1	A	1137	PRO	2.3
1	A	1144	LYS	2.2
1	A	399	GLU	2.2
1	A	543	ILE	2.1
1	A	1151	VAL	2.1
1	A	1225	LEU	2.1
1	A	1162	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	1203	SER	2.1
1	A	811	ILE	2.0
1	A	1114	ARG	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.