



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 19, 2024 – 06:46 AM EDT

PDB ID : 4K40  
Title : Peptidoglycan O-acetyltransferase in action, 0 min  
Authors : Williams, A.H.; Gompert Boneca, I.  
Deposited on : 2013-04-11  
Resolution : 2.63 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.20.1  
EDS : 2.37.1  
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) : 2.37.1

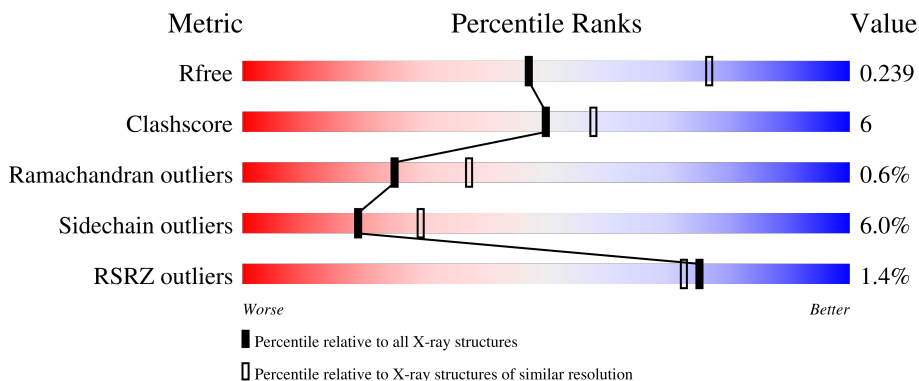
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.63 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	1426 (2.66-2.62)
Clashscore	141614	1472 (2.66-2.62)
Ramachandran outliers	138981	1446 (2.66-2.62)
Sidechain outliers	138945	1446 (2.66-2.62)
RSRZ outliers	127900	1408 (2.66-2.62)

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 of 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	379	 77% 13% 8%
1	B	379	 73% 18% 8%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5386 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 GDSL-like Lipase/Acylhydrolase family protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	349	2649	1652	481	503	13	0	0	0
1	B	349	2652	1652	484	503	13	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	19	GLY	-	expression tag	UNP A0A0A8F713
A	20	SER	-	expression tag	UNP A0A0A8F713
B	19	GLY	-	expression tag	UNP A0A0A8F713
B	20	SER	-	expression tag	UNP A0A0A8F713

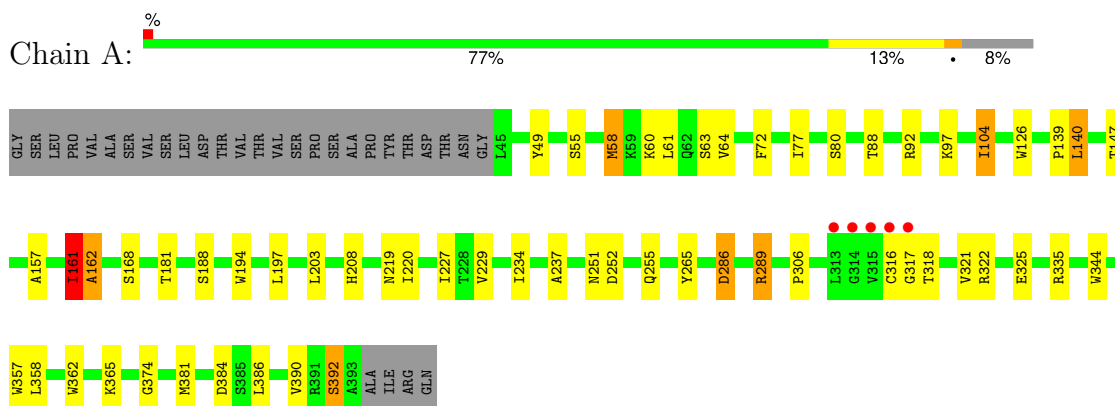
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	42	Total	O	0	0
			42	42		
2	B	43	Total	O	0	0
			43	43		

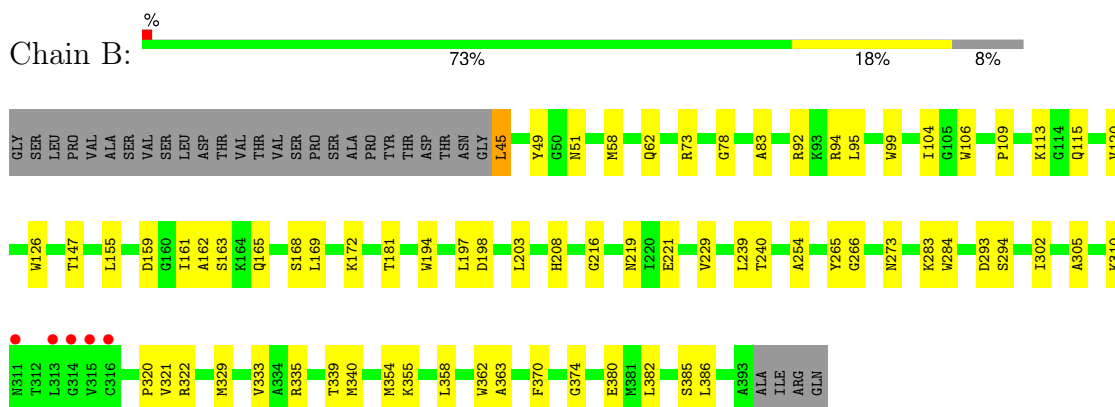
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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: GDSL-like Lipase/Acylhydrolase family protein



- Molecule 1: GDSL-like Lipase/Acylhydrolase family protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	71.87Å 79.49Å 124.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.00 – 2.63 49.00 – 2.63	Depositor EDS
% Data completeness (in resolution range)	98.3 (49.00-2.63) 98.3 (49.00-2.63)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.90 (at 2.65Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, $R_{free}$	0.165 , 0.238 0.171 , 0.239	Depositor DCC
$R_{free}$ test set	1094 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	42.4	Xtrriage
Anisotropy	0.112	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 24.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	5386	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	12.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.81% 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	0.40	0/2702	0.59	1/3665 (0.0%)
1	B	0.40	0/2705	0.61	0/3668
All	All	0.40	0/5407	0.60	1/7333 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	140	LEU	CA-CB-CG	5.10	127.03	115.30

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	2649	0	2595	28	0
1	B	2652	0	2597	33	0
2	A	42	0	0	1	0
2	B	43	0	0	4	0
All	All	5386	0	5192	61	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 6.

All (61) 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:B:45:LEU:N	2:B:442:HOH:O	2.09	0.83
1:B:92:ARG:NH1	1:B:229:VAL:O	2.15	0.80
1:A:104:ILE:HD11	1:A:220:ILE:HD12	1.67	0.77
1:A:72:PHE:HB3	1:A:227:ILE:HD13	1.78	0.65
1:A:157:ALA:HB2	1:A:203:LEU:HD23	1.79	0.64
1:B:165:GLN:NE2	2:B:443:HOH:O	2.29	0.64
1:A:58:MET:HE1	1:A:390:VAL:HG22	1.80	0.63
1:A:161:ILE:HG12	1:A:162:ALA:H	1.63	0.63
1:B:310:LYS:HD2	1:B:320:PRO:HA	1.81	0.63
1:A:322:ARG:NE	1:A:325:GLU:OE2	2.31	0.63
1:B:94:ARG:NH1	1:B:380:GLU:OE2	2.34	0.59
1:B:339:THR:HG22	1:B:340:MET:O	2.05	0.57
1:B:254:ALA:HB2	1:B:294:SER:HB2	1.86	0.57
1:B:162:ALA:HB3	1:B:203:LEU:HB2	1.85	0.56
1:B:168:SER:HB2	1:B:219:ASN:HB3	1.89	0.53
1:A:357:TRP:CE3	1:A:362:TRP:HB3	2.44	0.53
1:A:286:ASP:OD2	1:A:289:ARG:NH2	2.42	0.52
1:A:92:ARG:NH1	1:A:229:VAL:O	2.41	0.52
1:B:73:ARG:NE	1:B:221:GLU:OE2	2.27	0.51
1:A:392:SER:O	1:A:392:SER:OG	2.22	0.51
1:B:362:TRP:O	1:B:374:GLY:HA3	2.12	0.49
1:B:168:SER:OG	1:B:198:ASP:OD1	2.26	0.49
1:B:266:GLY:HA3	1:B:305:ALA:HB2	1.95	0.48
1:B:181:THR:OG1	1:B:208:HIS:HB2	2.13	0.48
1:A:126:TRP:CE2	1:A:147:THR:HG22	2.49	0.48
1:B:239:LEU:HD23	1:B:284:TRP:CD2	2.49	0.47
1:B:363:ALA:HA	1:B:370:PHE:HA	1.97	0.47
1:B:78:GLY:HA2	1:B:265:TYR:CZ	2.50	0.47
1:B:95:LEU:HD22	1:B:99:TRP:CZ3	2.51	0.46
1:A:306:PRO:HB3	1:A:344:TRP:CG	2.52	0.45
1:A:325:GLU:HG3	2:A:401:HOH:O	2.16	0.45
1:A:157:ALA:HB3	1:A:161:ILE:HD12	1.99	0.45
1:A:251:ASN:O	1:A:255:GLN:HG3	2.16	0.45
1:B:58:MET:O	1:B:62:GLN:HG2	2.17	0.45
1:A:362:TRP:O	1:A:374:GLY:HA3	2.17	0.45
1:B:106:TRP:CZ3	1:B:219:ASN:HB2	2.52	0.45
1:A:49:TYR:CB	1:A:335:ARG:HA	2.47	0.44
1:A:234:ILE:HB	1:A:237:ALA:HB2	1.98	0.44
1:A:381:MET:O	1:A:384:ASP:HB2	2.17	0.44
1:A:140:LEU:HB2	1:A:252:ASP:HB2	2.00	0.44
1:B:109:PRO:HG3	1:B:216:GLY:O	2.18	0.44
1:A:181:THR:OG1	1:A:208:HIS:HB2	2.18	0.44

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:321:VAL:HG12	1:B:322:ARG:HD2	1.99	0.44
1:A:168:SER:HB2	1:A:219:ASN:HB3	2.00	0.43
1:B:273:ASN:HA	1:B:322:ARG:HG2	2.01	0.43
1:B:168:SER:HA	1:B:197:LEU:O	2.18	0.43
1:B:172:LYS:HD3	1:B:194:TRP:CD1	2.53	0.43
1:A:60:LYS:O	1:A:64:VAL:HG23	2.17	0.43
1:B:83:ALA:HB1	1:B:115:GLN:HG2	2.01	0.43
1:B:302:ILE:HG13	1:B:339:THR:HG21	2.00	0.43
1:A:161:ILE:HG12	1:A:162:ALA:N	2.32	0.42
1:A:55:SER:OG	1:A:58:MET:HB2	2.20	0.42
1:B:240:THR:HG23	2:B:416:HOH:O	2.20	0.42
1:A:317:GLY:HA3	1:A:318:THR:HA	1.94	0.42
1:B:49:TYR:CG	1:B:335:ARG:HA	2.55	0.41
1:A:139:PRO:HG3	1:A:194:TRP:CH2	2.55	0.41
1:B:113:LYS:HD3	2:B:415:HOH:O	2.20	0.41
1:B:284:TRP:HB3	1:B:333:VAL:HG11	2.02	0.41
1:B:386:LEU:HA	1:B:386:LEU:HD23	1.82	0.41
1:A:77:ILE:HG22	1:A:265:TYR:OH	2.21	0.41
1:B:126:TRP:CD2	1:B:147:THR:HG22	2.56	0.40

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	347/379 (92%)	332 (96%)	12 (4%)	3 (1%)	17	26
1	B	347/379 (92%)	332 (96%)	14 (4%)	1 (0%)	41	56
All	All	694/758 (92%)	664 (96%)	26 (4%)	4 (1%)	25	37

All (4) Ramachandran outliers are listed below:



Mol	Chain	Res	Type
1	A	316	CYS
1	A	162	ALA
1	A	161	ILE
1	B	161	ILE

### 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	273/299 (91%)	256 (94%)	17 (6%)	18	28
1	B	273/299 (91%)	257 (94%)	16 (6%)	19	30
All	All	546/598 (91%)	513 (94%)	33 (6%)	19	29

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	58	MET
1	A	61	LEU
1	A	63	SER
1	A	80	SER
1	A	88	THR
1	A	97	LYS
1	A	104	ILE
1	A	161	ILE
1	A	188	SER
1	A	197	LEU
1	A	286	ASP
1	A	289	ARG
1	A	321	VAL
1	A	358	LEU
1	A	365	LYS
1	A	386	LEU
1	A	392	SER
1	B	45	LEU
1	B	51	ASN
1	B	104	ILE

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	B	120	VAL
1	B	155	LEU
1	B	159	ASP
1	B	163	SER
1	B	169	LEU
1	B	283	LYS
1	B	293	ASP
1	B	329	MET
1	B	354	MET
1	B	355	LYS
1	B	358	LEU
1	B	382	LEU
1	B	385	SER

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

Mol	Chain	Res	Type
1	B	165	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 monosaccharides 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 [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	349/379 (92%)	-0.44	5 (1%) 75 73	2, 9, 34, 75	0
1	B	349/379 (92%)	-0.48	5 (1%) 75 73	1, 9, 31, 89	0
All	All	698/758 (92%)	-0.46	10 (1%) 75 73	1, 9, 33, 89	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	316	CYS	6.2
1	A	315	VAL	4.3
1	A	314	GLY	3.7
1	B	315	VAL	3.7
1	A	316	CYS	3.7
1	A	317	GLY	3.6
1	B	314	GLY	3.2
1	B	313	LEU	3.1
1	A	313	LEU	2.3
1	B	311	ASN	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 monosaccharides 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.