



# Full wwPDB X-ray Structure Validation Report ⓘ

May 26, 2020 – 11:22 pm BST

PDB ID : 5I5H  
Title : Ecoli global domain 245-586  
Authors : Dong, C.; Dong, H.  
Deposited on : 2016-02-15  
Resolution : 1.65 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 : 2.11  
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

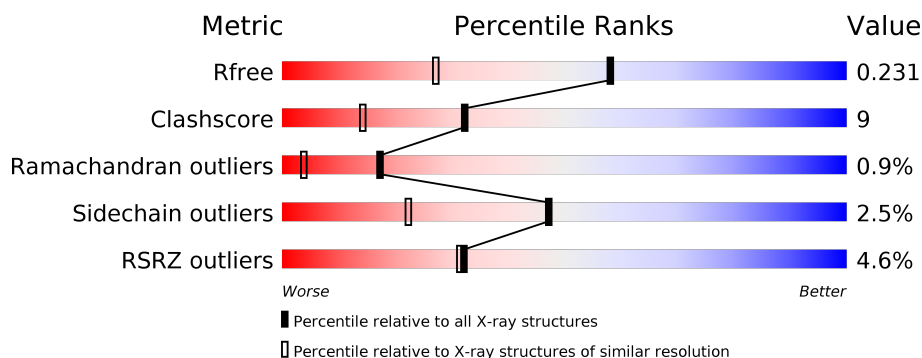
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.65 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	1827 (1.66-1.66)
Clashscore	141614	1931 (1.66-1.66)
Ramachandran outliers	138981	1891 (1.66-1.66)
Sidechain outliers	138945	1891 (1.66-1.66)
RSRZ outliers	127900	1791 (1.66-1.66)

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 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	586	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3099 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 Inner membrane protein YejM.

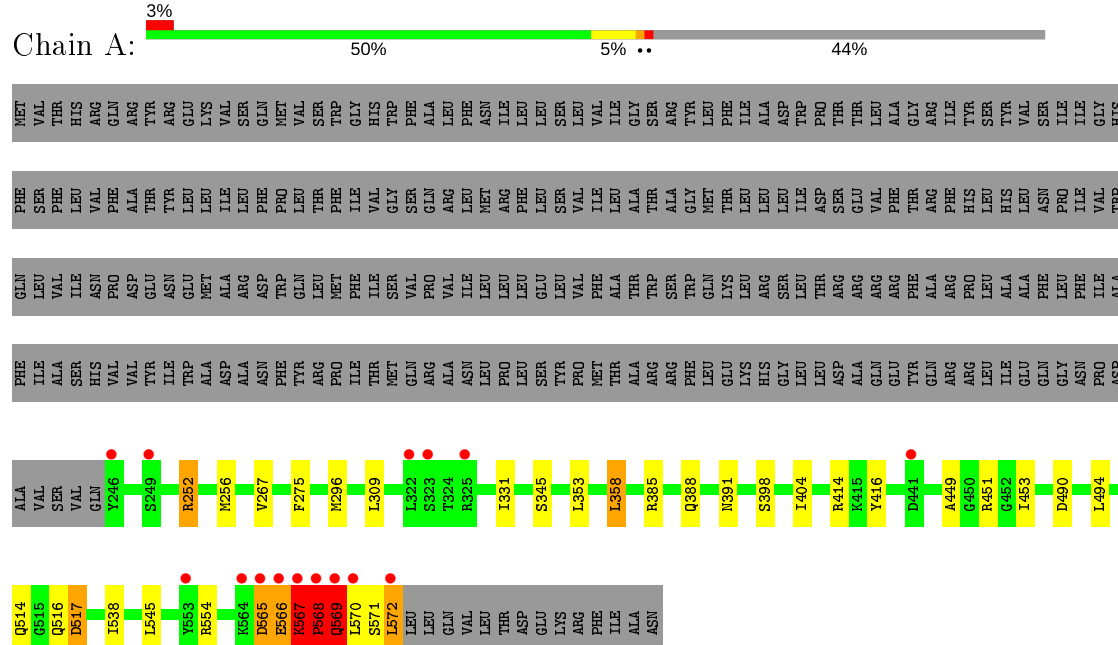
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	327	Total	C	N	O	S	0	0	0
			2604	1632	462	503	7			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	495	Total	O	0	0
			495	495		



- Molecule 1: Inner membrane protein YejM



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.86Å 56.86Å 191.81Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.70 – 1.65 47.70 – 1.65	Depositor EDS
% Data completeness (in resolution range)	99.0 (47.70-1.65) 99.0 (47.70-1.65)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.37 (at 1.65Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, $R_{free}$	0.175 , 0.237 0.174 , 0.231	Depositor DCC
$R_{free}$ test set	2208 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	20.5	Xtriage
Anisotropy	0.969	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 54.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.043 for -h,-k,l	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	3099	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.87% 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	0.70	0/2664	0.88	8/3623 (0.2%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	568	PRO	CA-N-CD	-5.88	103.28	111.50
1	A	385	ARG	NE-CZ-NH1	5.72	123.16	120.30
1	A	565	ASP	N-CA-C	5.36	125.46	111.00
1	A	569	GLN	CA-C-N	-5.35	105.44	117.20
1	A	566	GLU	C-N-CA	5.21	134.72	121.70
1	A	569	GLN	CB-CA-C	5.13	120.66	110.40
1	A	252	ARG	NE-CZ-NH1	5.05	122.83	120.30
1	A	517	ASP	CB-CG-OD1	5.03	122.83	118.30

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	2604	0	2511	45	1
2	A	495	0	0	13	3
All	All	3099	0	2511	45	4

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 9.

All (45) 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:571:SER:CB	1:A:572:LEU:HA	1.50	1.23
1:A:571:SER:HB3	1:A:572:LEU:CA	1.74	1.17
1:A:568:PRO:HA	1:A:569:GLN:HB2	1.31	1.10
1:A:572:LEU:HD23	2:A:857:HOH:O	1.57	1.03
1:A:571:SER:CB	1:A:572:LEU:CA	2.37	0.96
1:A:451:ARG:HG3	2:A:615:HOH:O	1.79	0.82
1:A:571:SER:HB2	1:A:572:LEU:HD22	1.62	0.80
1:A:566:GLU:HA	1:A:567:LYS:HB2	1.65	0.78
1:A:570:LEU:O	1:A:570:LEU:HD12	1.83	0.78
1:A:566:GLU:OE1	1:A:566:GLU:N	2.21	0.74
1:A:571:SER:HB3	1:A:572:LEU:HA	0.78	0.74
1:A:568:PRO:HA	1:A:569:GLN:CB	2.10	0.70
1:A:570:LEU:C	1:A:570:LEU:HD12	2.14	0.68
1:A:453:ILE:HG13	2:A:615:HOH:O	1.94	0.67
1:A:566:GLU:CA	1:A:567:LYS:HB2	2.27	0.64
1:A:568:PRO:CA	1:A:569:GLN:HB2	2.19	0.58
1:A:404:ILE:CD1	1:A:416:TYR:HA	2.35	0.56
1:A:567:LYS:HA	1:A:569:GLN:HB2	1.88	0.55
1:A:453:ILE:CG1	2:A:615:HOH:O	2.54	0.54
1:A:569:GLN:HG3	2:A:842:HOH:O	2.08	0.53
1:A:252:ARG:NH1	2:A:601:HOH:O	2.41	0.53
1:A:565:ASP:C	1:A:566:GLU:OE1	2.47	0.52
1:A:538:ILE:HD12	1:A:545:LEU:HD23	1.91	0.51
1:A:570:LEU:HD12	1:A:571:SER:O	2.12	0.49
1:A:514:GLN:NE2	2:A:604:HOH:O	2.45	0.48
1:A:309:LEU:HD13	1:A:494:LEU:HD23	1.97	0.46
1:A:571:SER:HB2	1:A:572:LEU:HA	1.75	0.46
1:A:571:SER:CB	1:A:572:LEU:HD22	2.39	0.46
1:A:565:ASP:HB2	2:A:716:HOH:O	2.15	0.46
1:A:267:VAL:O	1:A:449:ALA:HA	2.16	0.45
1:A:572:LEU:CD1	1:A:572:LEU:C	2.86	0.44
1:A:414:ARG:NH2	2:A:607:HOH:O	2.49	0.44
1:A:296:MET:O	1:A:490:ASP:HA	2.18	0.44
1:A:391:ASN:HB2	2:A:987:HOH:O	2.19	0.43
1:A:353:LEU:HG	1:A:358:LEU:HD22	2.01	0.42
1:A:554:ARG:NH1	2:A:609:HOH:O	2.50	0.42
1:A:571:SER:HB2	1:A:572:LEU:CD2	2.42	0.42
1:A:345:SER:HB3	1:A:398:SER:HB3	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:569:GLN:CG	2:A:842:HOH:O	2.68	0.42
1:A:516:GLN:O	1:A:517:ASP:C	2.58	0.41
1:A:568:PRO:O	1:A:568:PRO:CD	2.68	0.41
1:A:568:PRO:CA	1:A:569:GLN:CB	2.86	0.41
1:A:570:LEU:C	1:A:570:LEU:CD1	2.85	0.40
1:A:256:MET:HG3	2:A:1071:HOH:O	2.21	0.40
1:A:570:LEU:CD1	1:A:571:SER:O	2.70	0.40

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:863:HOH:O	2:A:863:HOH:O[4_555]	1.33	0.87
2:A:795:HOH:O	2:A:983:HOH:O[4_555]	1.65	0.55
2:A:1076:HOH:O	2:A:1076:HOH:O[4_555]	2.05	0.15
1:A:567:LYS:CG	1:A:567:LYS:CG[6_555]	2.08	0.12

## 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	325/586 (56%)	310 (95%)	12 (4%)	3 (1%)	<b>17</b> <b>4</b>

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	567	LYS
1	A	568	PRO
1	A	569	GLN

### 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	283 / 514 (55%)	276 (98%)	7 (2%)	47 22

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	275	PHE
1	A	331	ILE
1	A	358	LEU
1	A	388	GLN
1	A	567	LYS
1	A	568	PRO
1	A	572	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	261	ASN
1	A	271	ASN
1	A	356	GLN
1	A	388	GLN
1	A	491	HIS

### 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	327/586 (55%)	-0.16	15 (4%) 32 31	23, 32, 66, 135	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	572	LEU	13.4
1	A	565	ASP	6.7
1	A	567	LYS	4.4
1	A	564	LYS	3.9
1	A	325	ARG	3.8
1	A	569	GLN	3.6
1	A	246	TYR	3.2
1	A	570	LEU	3.1
1	A	322	LEU	2.7
1	A	323	SER	2.7
1	A	249	SER	2.4
1	A	566	GLU	2.4
1	A	553	TYR	2.3
1	A	441	ASP	2.2
1	A	568	PRO	2.2

### 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

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.