



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 10, 2017 – 10:38 PM EDT

PDB ID : 5O4W  
Title : Protein structure determination by electron diffraction using a single three-dimensional nanocrystal  
Authors : Clabbers, M.T.B.; van Genderen, E.; Wan, W.; Wiegers, E.L.; Gruene, T.; Abrahams, J.P.  
Deposited on : unknown  
Resolution : 2.11 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.

---

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20029824

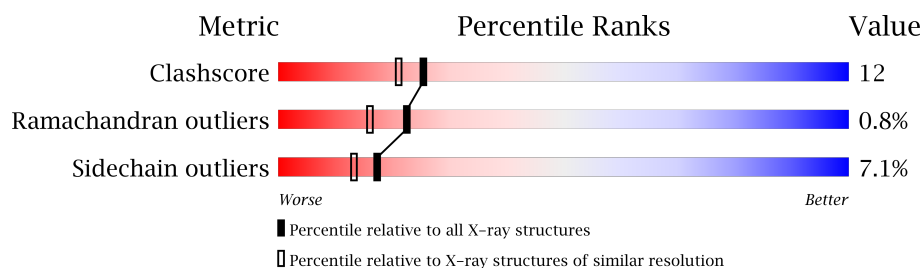
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON CRYSTALLOGRAPHY*

The reported resolution of this entry is 2.11 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))
Clashscore	112137	5557 (2.14-2.10)
Ramachandran outliers	110173	5504 (2.14-2.10)
Sidechain outliers	110143	5505 (2.14-2.10)

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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	129	
1	B	129	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2000 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 Lysozyme C.

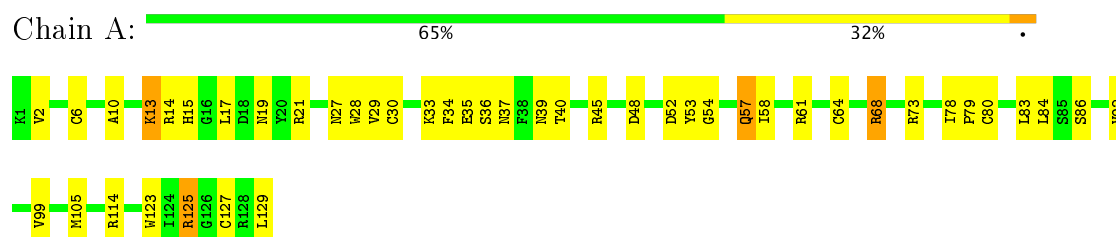
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	129	Total	C	N	O	S	0	0	0
			1000	613	193	184	10			
1	B	129	Total	C	N	O	S	0	0	0
			1000	613	193	184	10			

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

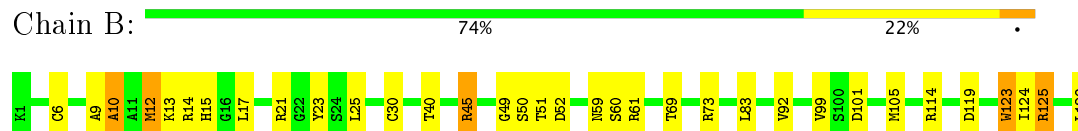
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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.

Note EDS was not executed.

- Molecule 1: Lysozyme C



- Molecule 1: Lysozyme C



GLOBAL-STATISTICS INFOmissingINFO

## 4 Model quality [i](#)

### 4.1 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	1.00	3/1020 (0.3%)	1.25	8/1379 (0.6%)
1	B	0.84	1/1020 (0.1%)	1.29	11/1379 (0.8%)
All	All	0.92	4/2040 (0.2%)	1.27	19/2758 (0.7%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	125	ARG	CZ-NH1	10.82	1.47	1.33
1	A	114	ARG	CZ-NH1	10.63	1.46	1.33
1	A	68	ARG	CZ-NH1	-10.59	1.19	1.33
1	B	123	TRP	CB-CG	-5.20	1.40	1.50

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	114	ARG	NE-CZ-NH1	21.71	131.15	120.30
1	A	125	ARG	NE-CZ-NH1	17.50	129.05	120.30
1	A	114	ARG	NE-CZ-NH2	-14.48	113.06	120.30
1	A	68	ARG	NE-CZ-NH1	-12.98	113.81	120.30
1	A	125	ARG	NE-CZ-NH2	-11.94	114.33	120.30
1	A	21	ARG	NE-CZ-NH1	-11.92	114.34	120.30
1	B	125	ARG	NE-CZ-NH2	-10.60	115.00	120.30
1	B	14	ARG	NE-CZ-NH2	-10.52	115.04	120.30
1	B	119	ASP	CB-CG-OD1	-8.81	110.37	118.30
1	B	114	ARG	NE-CZ-NH2	-8.68	115.96	120.30
1	A	114	ARG	NE-CZ-NH1	8.35	124.47	120.30
1	B	101	ASP	CB-CG-OD1	8.11	125.59	118.30
1	A	45	ARG	NE-CZ-NH2	-6.38	117.11	120.30
1	B	45	ARG	NE-CZ-NH1	6.06	123.33	120.30
1	B	114	ARG	NH1-CZ-NH2	-6.05	112.74	119.40
1	B	119	ASP	CB-CG-OD2	5.85	123.56	118.30
1	A	21	ARG	NH1-CZ-NH2	5.76	125.73	119.40
1	B	61	ARG	NE-CZ-NH2	5.37	122.98	120.30

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	14	ARG	NE-CZ-NH1	5.36	122.98	120.30

There are no chirality outliers.

There are no planarity outliers.

## 4.2 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	1000	0	965	24	1
1	B	1000	0	959	22	1
All	All	2000	0	1924	46	1

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 12.

All (46) 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:ARG:NH1	1:B:51:THR:OG1	2.19	0.76
1:A:64:CYS:HG	1:A:80:CYS:HG	1.29	0.75
1:A:36:SER:HB3	1:A:57:GLN:NE2	2.09	0.68
1:A:28:TRP:CH2	1:A:99:VAL:HG11	2.30	0.66
1:A:17:LEU:HD11	1:A:92:VAL:HG13	1.78	0.64
1:A:2:VAL:HG22	1:A:39:ASN:OD1	1.97	0.64
1:B:6:CYS:O	1:B:9:ALA:O	2.16	0.64
1:B:17:LEU:HD11	1:B:92:VAL:HG13	1.80	0.62
1:A:54:GLY:O	1:A:57:GLN:NE2	2.31	0.61
1:A:6:CYS:SG	1:A:127:CYS:HB3	2.42	0.59
1:A:29:VAL:HG12	1:A:123:TRP:CZ3	2.40	0.56
1:B:23:TYR:CD1	1:B:105:MET:HG3	2.40	0.56
1:A:15:HIS:HB3	1:A:92:VAL:HG11	1.88	0.54
1:A:33:LYS:HB2	1:A:123:TRP:HH2	1.74	0.53
1:B:12:MET:HE1	1:B:17:LEU:HB3	1.92	0.52
1:A:27:ASN:HA	1:A:30:CYS:SG	2.50	0.52
1:A:28:TRP:HH2	1:A:99:VAL:HG11	1.73	0.52

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:12:MET:HE2	1:B:25:LEU:HD12	1.92	0.51
1:A:58:ILE:HD12	1:A:83:LEU:HD22	1.93	0.51
1:A:36:SER:HB3	1:A:57:GLN:HE21	1.77	0.50
1:B:30:CYS:HB2	1:B:123:TRP:CD1	2.46	0.50
1:A:53:TYR:CD2	1:A:80:CYS:SG	3.05	0.50
1:B:9:ALA:O	1:B:10:ALA:HB3	2.12	0.49
1:A:78:ILE:HG22	1:A:79:PRO:O	2.13	0.48
1:A:10:ALA:HA	1:A:13:LYS:HB2	1.96	0.48
1:B:15:HIS:HB3	1:B:92:VAL:HG11	1.95	0.48
1:B:21:ARG:NH1	1:B:21:ARG:O	2.47	0.47
1:B:23:TYR:CE1	1:B:105:MET:HG3	2.50	0.46
1:B:12:MET:CE	1:B:25:LEU:HD12	2.47	0.45
1:B:9:ALA:O	1:B:10:ALA:CB	2.63	0.45
1:B:60:SER:OG	1:B:69:THR:HG21	2.16	0.45
1:A:33:LYS:HE2	1:A:34:PHE:CZ	2.52	0.45
1:A:52:ASP:OD1	1:A:57:GLN:OE1	2.34	0.45
1:B:25:LEU:HD23	1:B:124:ILE:HG21	1.99	0.44
1:A:68:ARG:O	1:A:68:ARG:CG	2.66	0.43
1:A:33:LYS:HB2	1:A:123:TRP:CH2	2.53	0.43
1:B:13:LYS:HE3	1:B:129:LEU:HB3	2.00	0.43
1:A:40:THR:HG21	1:A:86:SER:HA	2.00	0.43
1:A:30:CYS:HA	1:A:123:TRP:CE2	2.54	0.42
1:B:52:ASP:OD1	1:B:59:ASN:ND2	2.46	0.42
1:B:12:MET:SD	1:B:17:LEU:HD13	2.60	0.41
1:B:49:GLY:O	1:B:69:THR:HG22	2.19	0.41
1:B:50:SER:HA	1:B:69:THR:CG2	2.51	0.41
1:B:21:ARG:HG2	1:B:99:VAL:HG22	2.03	0.41
1:B:50:SER:HA	1:B:69:THR:HG22	2.02	0.40
1:A:35:GLU:HB3	1:A:57:GLN:HG2	2.04	0.40

All (1) 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)
1:A:13:LYS:O	1:B:125:ARG:CZ[1_554]	2.19	0.01

## 4.3 Torsion angles

### 4.3.1 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	127/129 (98%)	117 (92%)	9 (7%)	1 (1%)	22	16
1	B	127/129 (98%)	117 (92%)	9 (7%)	1 (1%)	22	16
All	All	254/258 (98%)	234 (92%)	18 (7%)	2 (1%)	22	16

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	10	ALA
1	A	48	ASP

### 4.3.2 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	105/105 (100%)	94 (90%)	11 (10%)	8	4
1	B	105/105 (100%)	101 (96%)	4 (4%)	38	37
All	All	210/210 (100%)	195 (93%)	15 (7%)	17	13

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LYS
1	A	14	ARG
1	A	19	ASN
1	A	37	ASN

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Res	Type
1	A	57	GLN
1	A	61	ARG
1	A	73	ARG
1	A	84	LEU
1	A	105	MET
1	A	125	ARG
1	A	129	LEU
1	B	12	MET
1	B	40	THR
1	B	73	ARG
1	B	83	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	19	ASN
1	A	27	ASN
1	A	37	ASN
1	A	46	ASN
1	A	57	GLN
1	A	74	ASN
1	A	103	ASN
1	B	15	HIS
1	B	27	ASN
1	B	39	ASN
1	B	46	ASN
1	B	65	ASN
1	B	74	ASN

#### 4.3.3 RNA ⓘ

There are no RNA molecules in this entry.

#### 4.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

#### 4.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 4.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 4.7 Other polymers [i](#)

There are no such residues in this entry.

## 4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 5 Fit of model and data ⓘ

### 5.1 Protein, DNA and RNA chains ⓘ

EDS was not executed - this section is therefore empty.

### 5.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section is therefore empty.

### 5.3 Carbohydrates ⓘ

EDS was not executed - this section is therefore empty.

### 5.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

### 5.5 Other polymers ⓘ

EDS was not executed - this section is therefore empty.