



# Full wwPDB X-ray Structure Validation Report ⓘ

May 27, 2020 – 02:45 am BST

PDB ID : 3WXE  
Title : Crystal structure of CYLD USP domain (C596S) in complex with Met1-linked diubiquitin  
Authors : Sato, Y.; Fukai, S.  
Deposited on : 2014-07-30  
Resolution : 2.50 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

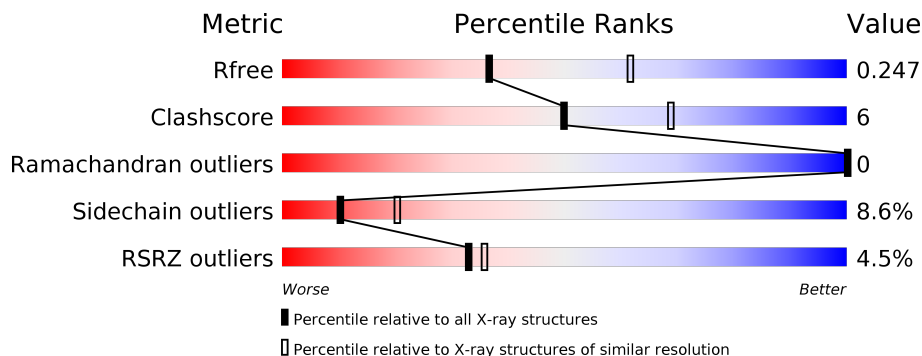
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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	312	<p>2% 81% 14% . .</p>
2	B	148	<p>9% 75% 20% 5%</p>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3664 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	301	2441	1570	399	451	21	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	575	SER	-	expression tag	UNP E7FEV5
A	576	HIS	-	expression tag	UNP E7FEV5
A	577	MET	-	expression tag	UNP E7FEV5
A	596	SER	CYS	engineered mutation	UNP E7FEV5
A	781	LEU	-	linker	UNP E7FEV5
A	782	GLU	-	linker	UNP E7FEV5
A	783	GLY	-	linker	UNP E7FEV5
A	784	GLY	-	linker	UNP E7FEV5

- Molecule 2 is a protein called Ubiquitin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	148	1176	740	203	231	2	0	0	0

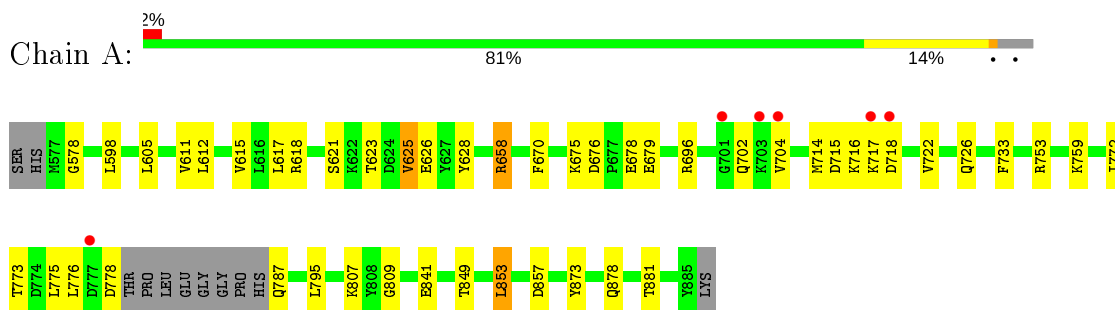
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	36	Total 36	O 36	0	0
3	B	11	Total 11	O 11	0	0

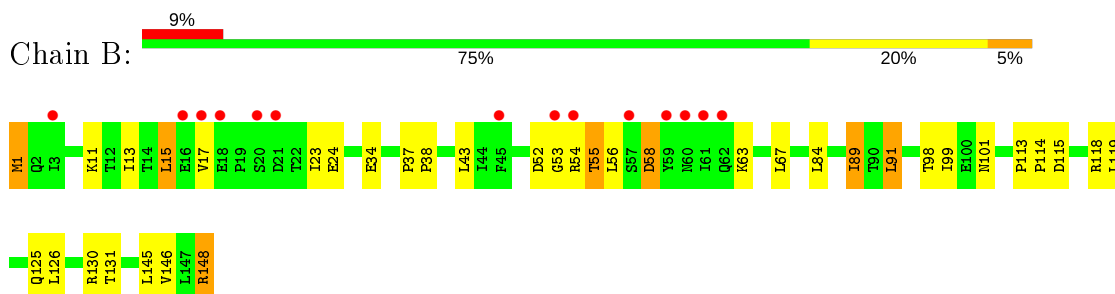
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of 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: Uncharacterized protein



- Molecule 2: Ubiquitin



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	64.68Å 49.79Å 71.00Å 90.00° 102.69° 90.00°	Depositor
Resolution (Å)	50.00 – 2.50 42.25 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.0 (50.00-2.50) 97.0 (42.25-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.03 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.8.0069	Depositor
R, $R_{free}$	0.182 , 0.247 0.185 , 0.247	Depositor DCC
$R_{free}$ test set	766 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.5	Xtrriage
Anisotropy	0.243	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 46.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3664	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.83% 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	0.88	0/2495	0.88	2/3363 (0.1%)
2	B	0.70	0/1189	0.80	0/1600
All	All	0.83	0/3684	0.86	2/4963 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	658	ARG	NE-CZ-NH2	-10.49	115.06	120.30
1	A	658	ARG	NE-CZ-NH1	8.23	124.42	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	716	LYS	Peptide

### 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	2441	0	2427	20	0
2	B	1176	0	1226	22	0
3	A	36	0	0	2	0
3	B	11	0	0	2	0
All	All	3664	0	3653	42	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 (42) 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:118:ARG:HG3	2:B:148:ARG:HE	1.52	0.73
1:A:773:THR:OG1	1:A:787:GLN:HB2	1.90	0.71
2:B:101:ASN:ND2	3:B:206:HOH:O	2.22	0.71
2:B:24:GLU:HG2	2:B:52:ASP:HB2	1.74	0.70
2:B:58:ASP:OD1	2:B:58:ASP:N	2.27	0.68
1:A:658:ARG:HD2	1:A:670:PHE:O	1.94	0.66
2:B:89:ILE:HD11	2:B:91:LEU:HD13	1.78	0.65
1:A:611:VAL:HG11	1:A:878:GLN:HB2	1.80	0.63
2:B:1:MET:N	2:B:17:VAL:O	2.31	0.63
2:B:145:LEU:O	3:B:207:HOH:O	2.17	0.61
2:B:13:ILE:HG22	2:B:15:LEU:HD13	1.82	0.60
1:A:676:ASP:OD1	1:A:873:TYR:OH	2.19	0.59
1:A:733:PHE:CD2	1:A:775:LEU:HD22	2.38	0.58
2:B:13:ILE:HD11	2:B:34:GLU:OE2	2.04	0.58
2:B:55:THR:HG23	2:B:58:ASP:OD1	2.04	0.57
2:B:99:ILE:HG12	2:B:126:LEU:HB3	1.87	0.56
1:A:753:ARG:HD3	1:A:759:LYS:HG2	1.86	0.56
2:B:52:ASP:OD1	2:B:53:GLY:N	2.41	0.53
1:A:578:GLY:HA3	3:A:924:HOH:O	2.09	0.52
2:B:118:ARG:HG3	2:B:148:ARG:NE	2.24	0.51
2:B:23:ILE:HB	2:B:52:ASP:HA	1.93	0.51
1:A:849:THR:O	1:A:853:LEU:HD22	2.11	0.49
2:B:54:ARG:NH1	2:B:58:ASP:OD2	2.45	0.49
1:A:618:ARG:NH2	1:A:628:TYR:OH	2.47	0.48
2:B:98:THR:HA	2:B:131:THR:HA	1.97	0.47
1:A:612:LEU:O	1:A:615:VAL:HB	2.15	0.47
1:A:675:LYS:HB3	1:A:675:LYS:HE2	1.75	0.46
2:B:113:PRO:HA	2:B:114:PRO:HD3	1.83	0.46
1:A:718:ASP:OD1	1:A:718:ASP:N	2.47	0.45
1:A:696:ARG:NH2	1:A:704:VAL:HG21	2.32	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:772:ILE:O	1:A:776:LEU:CD1	2.65	0.44
1:A:611:VAL:HG23	1:A:612:LEU:HG	2.00	0.44
2:B:1:MET:HG3	2:B:63:LYS:HB3	2.01	0.43
1:A:807:LYS:HE2	1:A:809:GLY:O	2.19	0.42
2:B:115:ASP:O	2:B:148:ARG:NH1	2.52	0.42
1:A:787:GLN:N	3:A:923:HOH:O	2.53	0.41
2:B:37:PRO:HA	2:B:38:PRO:HD3	1.93	0.41
1:A:776:LEU:HD12	1:A:776:LEU:N	2.35	0.41
2:B:1:MET:H2	2:B:17:VAL:H	1.69	0.41
2:B:98:THR:O	2:B:101:ASN:OD1	2.40	0.40
1:A:625:VAL:CG1	1:A:626:GLU:N	2.85	0.40
1:A:676:ASP:HB3	1:A:679:GLU:HG3	2.04	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	297/312 (95%)	280 (94%)	17 (6%)	0	100	100
2	B	146/148 (99%)	144 (99%)	2 (1%)	0	100	100
All	All	443/460 (96%)	424 (96%)	19 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	273/282 (97%)	254 (93%)	19 (7%)	15	29
2	B	134/134 (100%)	118 (88%)	16 (12%)	5	10
All	All	407/416 (98%)	372 (91%)	35 (9%)	10	20

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	598	LEU
1	A	605	LEU
1	A	617	LEU
1	A	621	SER
1	A	623	THR
1	A	625	VAL
1	A	678	GLU
1	A	702	GLN
1	A	714	MET
1	A	715	ASP
1	A	717	LYS
1	A	722	VAL
1	A	726	GLN
1	A	778	ASP
1	A	795	LEU
1	A	841	GLU
1	A	853	LEU
1	A	857	ASP
1	A	881	THR
2	B	1	MET
2	B	11	LYS
2	B	15	LEU
2	B	43	LEU
2	B	55	THR
2	B	56	LEU
2	B	58	ASP
2	B	67	LEU
2	B	84	LEU
2	B	89	ILE
2	B	91	LEU
2	B	119	LEU
2	B	125	GLN
2	B	130	ARG
2	B	146	VAL

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Mol	Chain	Res	Type
2	B	148	ARG

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 [i](#)

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	301/312 (96%)	-0.28	6 (1%) 65 68	15, 39, 82, 110	0
2	B	148/148 (100%)	0.16	14 (9%) 8 8	27, 58, 108, 120	0
All	All	449/460 (97%)	-0.14	20 (4%) 33 36	15, 45, 96, 120	0

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	718	ASP	4.8
2	B	60	ASN	4.2
1	A	717	LYS	3.7
2	B	59	TYR	3.7
2	B	20	SER	3.3
1	A	777	ASP	2.9
2	B	53	GLY	2.8
1	A	701	GLY	2.8
2	B	16	GLU	2.6
2	B	54	ARG	2.6
2	B	17	VAL	2.5
1	A	704	VAL	2.4
1	A	703	LYS	2.4
2	B	61	ILE	2.4
2	B	62	GLN	2.2
2	B	57	SER	2.2
2	B	18	GLU	2.1
2	B	45	PHE	2.1
2	B	3	ILE	2.1
2	B	21	ASP	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.