



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 07:14 AM EDT

PDB ID : 2OIV  
Title : Structural Analysis of Xanthomonas XopD Provides Insights Into Substrate Specificity of Ubiquitin-like Protein Proteases  
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Deposited on : 2007-01-11  
Resolution : 1.95 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>.

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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 : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.20.1  
EDS : 2.36.2  
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) : 2.36.2

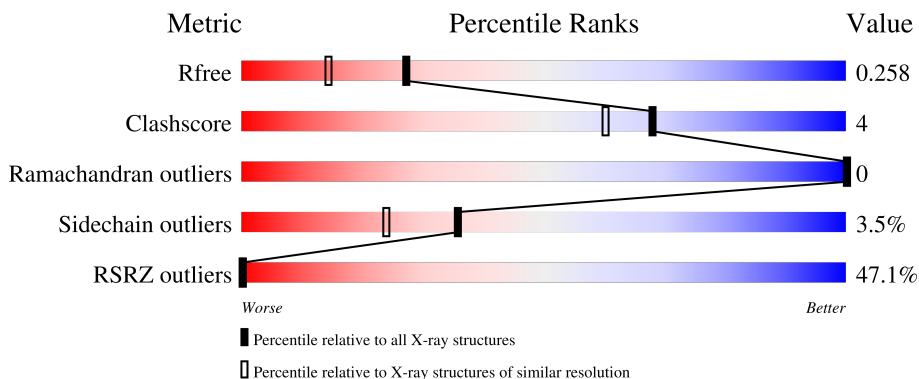
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	186	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 1438 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 Xanthomonas outer protein D.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	170	1350	844	248	253	5	0	0	0

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	P		
2	A	1	5	4	1	0	0

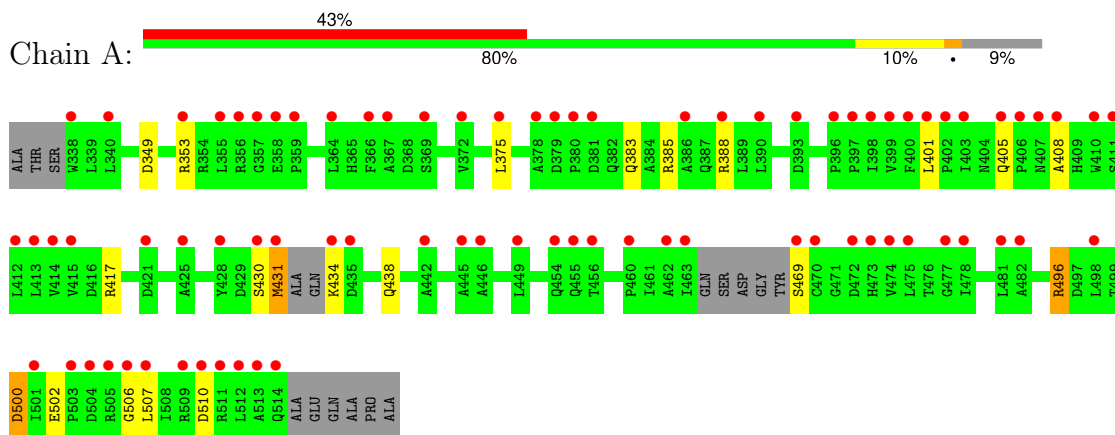
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	83	Total	O	0	0
			83	83		

### 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: Xanthomonas outer protein D



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	91.62Å 91.62Å 44.82Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	32.04 – 1.95 32.04 – 1.95	Depositor EDS
% Data completeness (in resolution range)	100.0 (32.04-1.95) 98.7 (32.04-1.95)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.47 (at 1.95Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.208 , 0.250 0.212 , 0.258	Depositor DCC
$R_{free}$ test set	718 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	36.1	Xtrriage
Anisotropy	0.412	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 70.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	1438	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.88% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	5/1379 (0.4%)	0.83	5/1874 (0.3%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	502	GLU	CG-CD	8.42	1.64	1.51
1	A	502	GLU	CB-CG	6.20	1.64	1.52
1	A	506	GLY	C-N	6.18	1.48	1.34
1	A	506	GLY	C-O	5.76	1.32	1.23
1	A	500	ASP	CB-CG	5.10	1.62	1.51

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	510	ASP	CB-CG-OD2	9.96	127.26	118.30
1	A	417	ARG	NE-CZ-NH2	-6.12	117.24	120.30
1	A	510	ASP	CB-CG-OD1	-6.03	112.87	118.30
1	A	506	GLY	O-C-N	5.67	131.77	122.70
1	A	496	ARG	NE-CZ-NH1	5.59	123.09	120.30

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	1350	0	1302	10	0
2	A	5	0	0	0	0
3	A	83	0	0	0	0
All	All	1438	0	1302	10	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 4.

All (10) 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:385:ARG:HH11	1:A:388:ARG:HD2	1.49	0.76
1:A:385:ARG:NH1	1:A:388:ARG:HD2	2.10	0.66
1:A:431:MET:HG2	1:A:434:LYS:HG3	1.80	0.64
1:A:385:ARG:HH11	1:A:388:ARG:HH11	1.56	0.54
1:A:349:ASP:HB3	1:A:353:ARG:HH21	1.80	0.46
1:A:375:LEU:O	1:A:383:GLN:HG3	2.17	0.44
1:A:430:SER:O	1:A:431:MET:HB2	2.17	0.44
1:A:405:GLN:HB2	1:A:438:GLN:OE1	2.19	0.43
1:A:405:GLN:HB3	1:A:408:ALA:HB3	2.02	0.41
1:A:507:LEU:HD12	1:A:507:LEU:HA	1.92	0.41

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	164/186 (88%)	160 (98%)	4 (2%)	0	<b>100</b> <b>100</b>

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	141/151 (93%)	136 (96%)	5 (4%)	36 24

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	401	LEU
1	A	431	MET
1	A	469	SER
1	A	496	ARG
1	A	500	ASP

Sometimes 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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and



the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
2	PO4	A	100	-	4,4,4	0.96	0	6,6,6	0.52	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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	170/186 (91%)	2.46	80 (47%) <b>0</b> <b>0</b>	30, 38, 70, 76	0

All (80) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	407	ASN	12.4
1	A	338	TRP	8.5
1	A	463	ILE	8.0
1	A	513	ALA	7.7
1	A	413	LEU	7.6
1	A	414	VAL	6.8
1	A	514	GLN	6.1
1	A	406	PRO	5.9
1	A	400	PHE	5.9
1	A	431	MET	5.9
1	A	399	VAL	5.8
1	A	412	LEU	5.7
1	A	421	ASP	5.7
1	A	401	LEU	5.6
1	A	398	ILE	5.5
1	A	375	LEU	5.4
1	A	403	ILE	5.3
1	A	512	LEU	5.3
1	A	504	ASP	5.3
1	A	449	LEU	5.1
1	A	470	CYS	4.7
1	A	372	VAL	4.7
1	A	501	ILE	4.6
1	A	473	HIS	4.5
1	A	415	VAL	4.5
1	A	434	LYS	4.4
1	A	478	ILE	4.4

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	381	ASP	4.0
1	A	402	PRO	4.0
1	A	380	PRO	3.9
1	A	506	GLY	3.9
1	A	462	ALA	3.8
1	A	481	LEU	3.8
1	A	510	ASP	3.8
1	A	408	ALA	3.7
1	A	359	PRO	3.7
1	A	366	PHE	3.5
1	A	378	ALA	3.5
1	A	357	GLY	3.5
1	A	435	ASP	3.5
1	A	353	ARG	3.5
1	A	474	VAL	3.5
1	A	390	LEU	3.4
1	A	405	GLN	3.4
1	A	469	SER	3.3
1	A	411	SER	3.3
1	A	367	ALA	3.2
1	A	388	ARG	3.2
1	A	511	ARG	3.0
1	A	396	PRO	3.0
1	A	446	ALA	2.9
1	A	503	PRO	2.9
1	A	505	ARG	2.8
1	A	445	ALA	2.8
1	A	456	THR	2.8
1	A	498	LEU	2.8
1	A	428	TYR	2.8
1	A	475	LEU	2.7
1	A	442	ALA	2.6
1	A	454	GLN	2.6
1	A	509	ARG	2.6
1	A	410	TRP	2.5
1	A	425	ALA	2.5
1	A	340	LEU	2.5
1	A	379	ASP	2.4
1	A	472	ASP	2.4
1	A	369	SER	2.4
1	A	364	LEU	2.4
1	A	430	SER	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	355	LEU	2.3
1	A	477	GLY	2.2
1	A	507	LEU	2.2
1	A	393	ASP	2.1
1	A	455	GLN	2.1
1	A	358	GLU	2.0
1	A	397	PRO	2.0
1	A	460	PRO	2.0
1	A	356	ARG	2.0
1	A	386	ALA	2.0
1	A	482	ALA	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 monosaccharides in this entry.

## 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	PO4	A	100	5/5	0.81	0.32	120,120,120,120	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.