



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:20 PM UTC

PDB ID : 6IJ5 / pdb_00006ij5
Title : Crystal structure of PETase P181A mutant from Ideonella sakaiensis
Authors : Joo, S.; Kim, K.J.
Deposited on : 2018-10-08
Resolution : 1.72 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

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	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

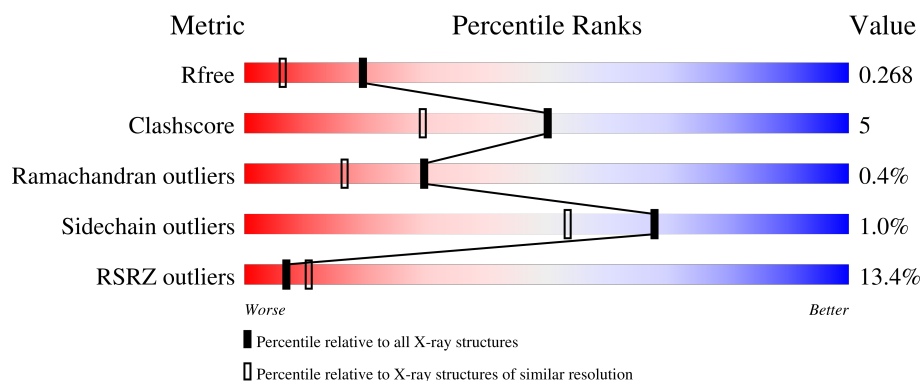
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.72 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}	180053	1039 (1.72-1.72)
Clashscore	190562	1049 (1.72-1.72)
Ramachandran outliers	187476	1041 (1.72-1.72)
Sidechain outliers	187428	1041 (1.72-1.72)
RSRZ outliers	180081	1039 (1.72-1.72)

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 ≥ 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	300	12% 70% 16% 13%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2016 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 Poly(ethylene terephthalate) hydrolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	261	Total	C	N	O	S	0	0	0
			1916	1182	344	378	12			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	13	MET	-	initiating methionine	UNP A0A0K8P6T7
A	14	GLY	-	expression tag	UNP A0A0K8P6T7
A	15	SER	-	expression tag	UNP A0A0K8P6T7
A	16	SER	-	expression tag	UNP A0A0K8P6T7
A	17	HIS	-	expression tag	UNP A0A0K8P6T7
A	18	HIS	-	expression tag	UNP A0A0K8P6T7
A	19	HIS	-	expression tag	UNP A0A0K8P6T7
A	20	HIS	-	expression tag	UNP A0A0K8P6T7
A	21	HIS	-	expression tag	UNP A0A0K8P6T7
A	22	HIS	-	expression tag	UNP A0A0K8P6T7
A	23	SER	-	expression tag	UNP A0A0K8P6T7
A	24	SER	-	expression tag	UNP A0A0K8P6T7
A	25	GLY	-	expression tag	UNP A0A0K8P6T7
A	26	LEU	-	expression tag	UNP A0A0K8P6T7
A	27	VAL	-	expression tag	UNP A0A0K8P6T7
A	28	PRO	-	expression tag	UNP A0A0K8P6T7
A	29	ARG	-	expression tag	UNP A0A0K8P6T7
A	30	GLY	-	expression tag	UNP A0A0K8P6T7
A	31	SER	-	expression tag	UNP A0A0K8P6T7
A	32	HIS	-	expression tag	UNP A0A0K8P6T7
A	33	MET	-	expression tag	UNP A0A0K8P6T7
A	181	ALA	PRO	engineered mutation	UNP A0A0K8P6T7
A	291	LEU	-	expression tag	UNP A0A0K8P6T7
A	292	GLU	-	expression tag	UNP A0A0K8P6T7
A	293	ASP	-	expression tag	UNP A0A0K8P6T7
A	294	PRO	-	expression tag	UNP A0A0K8P6T7
A	295	ALA	-	expression tag	UNP A0A0K8P6T7

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	296	ALA	-	expression tag	UNP A0A0K8P6T7
A	297	ASN	-	expression tag	UNP A0A0K8P6T7
A	298	LYS	-	expression tag	UNP A0A0K8P6T7
A	299	ALA	-	expression tag	UNP A0A0K8P6T7
A	300	ARG	-	expression tag	UNP A0A0K8P6T7
A	301	LYS	-	expression tag	UNP A0A0K8P6T7
A	302	GLU	-	expression tag	UNP A0A0K8P6T7
A	303	ALA	-	expression tag	UNP A0A0K8P6T7
A	304	ARG	-	expression tag	UNP A0A0K8P6T7
A	305	LEU	-	expression tag	UNP A0A0K8P6T7
A	306	ALA	-	expression tag	UNP A0A0K8P6T7
A	307	ALA	-	expression tag	UNP A0A0K8P6T7
A	308	ALA	-	expression tag	UNP A0A0K8P6T7
A	309	THR	-	expression tag	UNP A0A0K8P6T7
A	310	ALA	-	expression tag	UNP A0A0K8P6T7
A	311	GLU	-	expression tag	UNP A0A0K8P6T7
A	312	GLN	-	expression tag	UNP A0A0K8P6T7

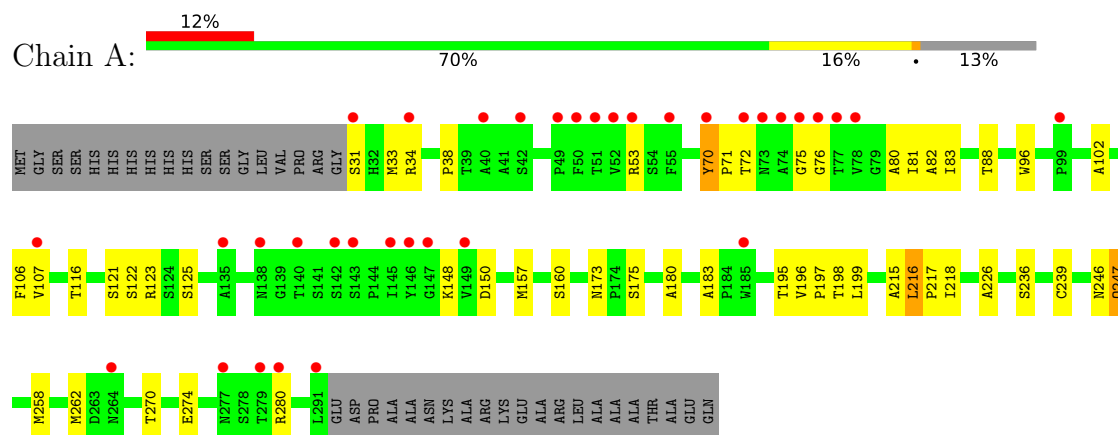
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	100	Total O 100 100	0	0

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: Poly(ethylene terephthalate) hydrolase



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	115.48Å 50.94Å 41.26Å 90.00° 92.58° 90.00°	Depositor
Resolution (Å)	24.22 – 1.72 24.22 – 1.72	Depositor EDS
% Data completeness (in resolution range)	98.5 (24.22-1.72) 98.5 (24.22-1.72)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.70 (at 1.73Å)	Xtriage
Refinement program	REFMAC 5.8.0232	Depositor
R, R_{free}	0.206 , 0.262 0.218 , 0.268	Depositor DCC
R_{free} test set	1245 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	20.2	Xtriage
Anisotropy	0.092	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 38.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.028 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	2016	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.53% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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	1.33	18/1959 (0.9%)	1.36	3/2665 (0.1%)

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	216	LEU	C-O	-7.40	1.17	1.24
1	A	173	ASN	C-O	-6.88	1.16	1.24
1	A	70	TYR	C-O	-6.76	1.17	1.24
1	A	123	ARG	C-O	-6.67	1.16	1.24
1	A	215	ALA	C-O	-6.49	1.16	1.24
1	A	199	LEU	C-O	-6.11	1.16	1.24
1	A	122	SER	C-O	-6.06	1.17	1.24
1	A	196	VAL	C-O	-6.04	1.16	1.24
1	A	81	ILE	C-O	-5.88	1.18	1.24
1	A	218	ILE	C-O	-5.74	1.17	1.24
1	A	121	SER	C-O	-5.73	1.17	1.24
1	A	83	ILE	C-O	-5.62	1.18	1.24
1	A	82	ALA	C-O	-5.52	1.17	1.24
1	A	38	PRO	C-O	-5.37	1.17	1.23
1	A	125	SER	C-O	-5.29	1.18	1.24
1	A	198	THR	C-O	-5.14	1.18	1.24
1	A	195	THR	C-O	-5.12	1.17	1.24
1	A	175	SER	C-O	-5.07	1.17	1.24

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	75	GLY	N-CA-C	-7.27	95.96	113.18
1	A	33	MET	N-CA-C	5.48	117.64	109.25
1	A	76	GLY	CA-C-O	5.01	127.88	122.47

There are no chirality outliers.

There are no planarity outliers.

5.2 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	1916	0	1848	20	0
2	A	100	0	0	0	0
All	All	2016	0	1848	20	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 5.

All (20) 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:216:LEU:HB3	1:A:217:PRO:HD3	1.80	0.61
1:A:80:ALA:HA	1:A:107:VAL:O	2.05	0.56
1:A:197:PRO:HA	1:A:226:ALA:O	2.09	0.52
1:A:72:THR:HA	1:A:148:LYS:HE3	1.91	0.52
1:A:96:TRP:CZ3	1:A:247:GLN:HG2	2.45	0.51
1:A:157:MET:HA	1:A:180:ALA:O	2.15	0.47
1:A:246:ASN:OD1	1:A:280:ARG:HD2	2.14	0.47
1:A:160:SER:HA	1:A:183:ALA:O	2.14	0.47
1:A:34:ARG:HG3	1:A:34:ARG:NH2	2.30	0.46
1:A:270:THR:O	1:A:274:GLU:HB3	2.16	0.46
1:A:236:SER:O	1:A:239:CYS:HB3	2.16	0.46
1:A:34:ARG:HG3	1:A:34:ARG:HH21	1.81	0.45
1:A:96:TRP:CZ3	1:A:247:GLN:CG	3.00	0.45
1:A:72:THR:HA	1:A:148:LYS:CE	2.49	0.43
1:A:53:ARG:O	1:A:70:TYR:CD1	2.72	0.43
1:A:88:THR:HA	1:A:116:THR:HB	2.00	0.43
1:A:157:MET:HG2	1:A:180:ALA:HB3	2.02	0.41
1:A:150:ASP:C	1:A:150:ASP:OD1	2.62	0.41
1:A:258:MET:O	1:A:262:MET:HB2	2.21	0.41
1:A:102:ALA:HA	1:A:106:PHE:O	2.21	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	259/300 (86%)	250 (96%)	8 (3%)	1 (0%)	30	16

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	71	PRO

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	207/235 (88%)	205 (99%)	2 (1%)	68	53

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	SER
1	A	247	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	32	HIS
1	A	91	GLN
1	A	264	ASN

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 oligosaccharides 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, 95th 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 ²)	Q<0.9
1	A	261/300 (87%)	0.75	35 (13%) 7 10	11, 26, 46, 69	0

All (35) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	76	GLY	5.7
1	A	146	TYR	5.5
1	A	147	GLY	5.0
1	A	75	GLY	4.6
1	A	74	ALA	4.4
1	A	72	THR	4.4
1	A	53	ARG	4.1
1	A	73	ASN	4.1
1	A	51	THR	4.0
1	A	145	ILE	3.6
1	A	279	THR	3.3
1	A	149	VAL	3.1
1	A	34	ARG	3.0
1	A	31	SER	3.0
1	A	55	PHE	3.0
1	A	135	ALA	2.8
1	A	77	THR	2.8
1	A	52	VAL	2.8
1	A	185	TRP	2.7
1	A	142	SER	2.6
1	A	50	PHE	2.6
1	A	291	LEU	2.5
1	A	264	ASN	2.5
1	A	138	ASN	2.5
1	A	42	SER	2.4
1	A	277	ASN	2.3
1	A	107	VAL	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	99	PRO	2.2
1	A	78	VAL	2.2
1	A	280	ARG	2.2
1	A	143	SER	2.1
1	A	140	THR	2.1
1	A	49	PRO	2.1
1	A	70	TYR	2.1
1	A	40	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 oligosaccharides 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.