



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 02:09 AM UTC

PDB ID : 7QPX / pdb_00007qpx
Title : Complex of rice blast (*Magnaporthe oryzae*) effector protein AVR-PikC with an engineered HMA domain of Pikp-1 (Pikp-SNK-EKE) from rice (*Oryza sativa*)
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Deposited on : 2022-01-05
Resolution : 2.05 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

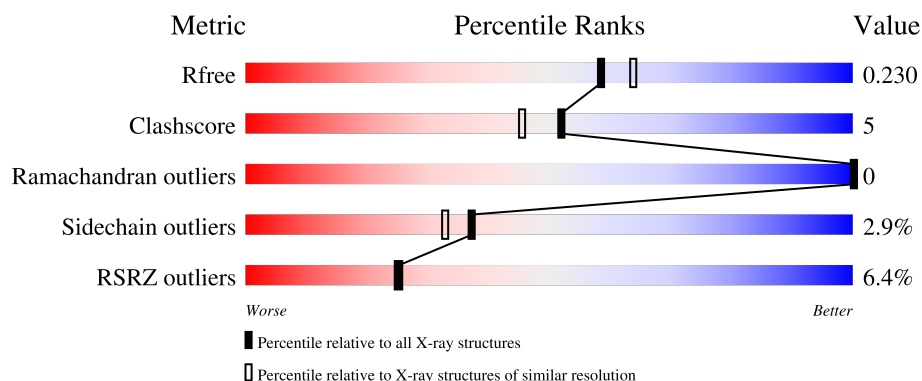
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.05 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	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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	80	6% 76% 14% 10%
1	B	80	2% 80% 10% 9%
1	D	80	11% 72% 14% 12%
1	E	80	6% 66% 21% 10%
2	C	93	6% 80% 6% 13%

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Mol	Chain	Length	Quality of chain
2	F	93	2% 83% • • 12%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3697 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 Resistance protein Pikp-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	72	Total	C	N	O	S	0	2	0
			542	344	94	101	3			
1	B	73	Total	C	N	O	S	0	1	0
			547	348	95	101	3			
1	D	70	Total	C	N	O	S	0	2	0
			531	337	91	100	3			
1	E	72	Total	C	N	O	S	0	1	0
			543	345	96	99	3			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	184	GLY	-	expression tag	UNP E9KPB5
A	185	PRO	-	expression tag	UNP E9KPB5
A	258	GLU	SER	engineered mutation	UNP E9KPB5
A	261	LYS	ASN	engineered mutation	UNP E9KPB5
A	262	GLU	LYS	engineered mutation	UNP E9KPB5
B	184	GLY	-	expression tag	UNP E9KPB5
B	185	PRO	-	expression tag	UNP E9KPB5
B	258	GLU	SER	engineered mutation	UNP E9KPB5
B	261	LYS	ASN	engineered mutation	UNP E9KPB5
B	262	GLU	LYS	engineered mutation	UNP E9KPB5
D	184	GLY	-	expression tag	UNP E9KPB5
D	185	PRO	-	expression tag	UNP E9KPB5
D	258	GLU	SER	engineered mutation	UNP E9KPB5
D	261	LYS	ASN	engineered mutation	UNP E9KPB5
D	262	GLU	LYS	engineered mutation	UNP E9KPB5
E	184	GLY	-	expression tag	UNP E9KPB5
E	185	PRO	-	expression tag	UNP E9KPB5
E	258	GLU	SER	engineered mutation	UNP E9KPB5
E	261	LYS	ASN	engineered mutation	UNP E9KPB5
E	262	GLU	LYS	engineered mutation	UNP E9KPB5

- Molecule 2 is a protein called AVR-Pik protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	81	Total	C	N	O	S	0	0	0
			663	425	113	119	6			
2	F	82	Total	C	N	O	S	0	0	0
			668	428	114	120	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	21	MET	-	initiating methionine	UNP G4MXW3
F	21	MET	-	initiating methionine	UNP G4MXW3

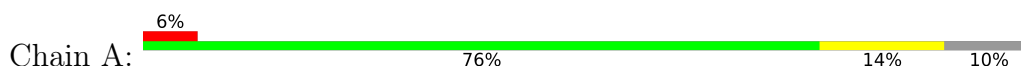
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	24	Total	O	0	0
			24	24		
3	B	39	Total	O	0	0
			39	39		
3	C	20	Total	O	0	0
			20	20		
3	D	24	Total	O	0	0
			24	24		
3	E	28	Total	O	0	0
			28	28		
3	F	68	Total	O	0	0
			68	68		

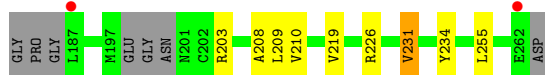
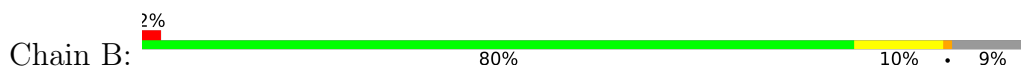
3 Residue-property plots [i](#)

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: Resistance protein Pikip-1



- Molecule 1: Resistance protein Pikip-1



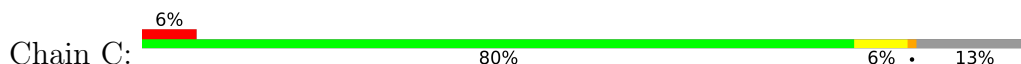
- Molecule 1: Resistance protein Pikip-1



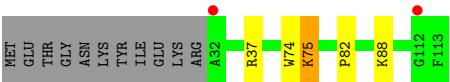
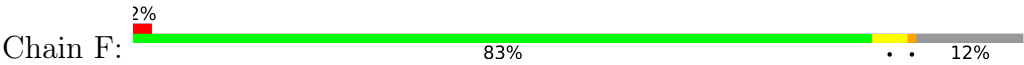
- Molecule 1: Resistance protein Pikip-1



- Molecule 2: AVR-Pik protein



- Molecule 2: AVR-Pik protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	66.35Å 83.13Å 107.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.71 – 2.05 46.71 – 2.05	Depositor EDS
% Data completeness (in resolution range)	99.6 (46.71-2.05) 99.6 (46.71-2.05)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 2.05Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.204 , 0.227 0.213 , 0.230	Depositor DCC
R_{free} test set	1898 reflections (4.86%)	wwPDB-VP
Wilson B-factor (Å ²)	38.4	Xtriage
Anisotropy	0.358	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 34.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	3697	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.85% 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	1.09	0/548	1.33	0/733
1	B	1.06	0/550	1.37	0/735
1	D	1.06	0/534	1.42	2/714 (0.3%)
1	E	1.06	0/546	1.34	1/728 (0.1%)
2	C	1.03	0/687	1.15	0/930
2	F	0.99	0/692	1.16	0/937
All	All	1.05	0/3557	1.29	3/4777 (0.1%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	258	GLU	CB-CA-C	5.54	119.34	109.65
1	E	223	GLY	CA-C-O	-5.48	117.47	122.24
1	D	223	GLY	CA-C-O	-5.31	117.99	122.29

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	542	0	596	6	0
1	B	547	0	605	7	0
1	D	531	0	580	7	0
1	E	543	0	603	12	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	663	0	617	5	0
2	F	668	0	622	3	0
3	A	24	0	0	0	0
3	B	39	0	0	0	0
3	C	20	0	0	0	0
3	D	24	0	0	1	0
3	E	28	0	0	2	0
3	F	68	0	0	1	0
All	All	3697	0	3623	36	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 (36) 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:E:190:LYS:HE3	3:E:314:HOH:O	1.72	0.89
1:D:246:ARG:HA	1:D:250:GLY:O	1.88	0.73
1:A:212:SER:HB3	1:B:208:ALA:HB2	1.81	0.60
1:B:234:TYR:CG	2:F:82:PRO:HG3	2.45	0.51
1:D:192:VAL:HG22	1:D:230[A]:GLU:HG2	1.93	0.50
1:B:209:LEU:C	1:B:209:LEU:HD23	2.36	0.50
1:E:210:VAL:HG11	1:E:231:VAL:HG22	1.95	0.48
1:D:209:LEU:C	1:D:209:LEU:HD23	2.40	0.47
1:E:209:LEU:C	1:E:209:LEU:HD23	2.40	0.46
1:E:190:LYS:CE	3:E:314:HOH:O	2.46	0.46
1:E:210:VAL:HG11	1:E:231:VAL:CG2	2.46	0.46
1:B:219[A]:VAL:HG12	1:B:231:VAL:HG13	1.98	0.45
1:D:226:ARG:NH2	3:D:304:HOH:O	2.49	0.45
1:B:203:ARG:NH1	1:B:226:ARG:O	2.50	0.45
1:D:217:ASP:OD1	1:E:226[B]:ARG:NH1	2.38	0.45
1:A:192:VAL:HG22	1:A:230[B]:GLU:HG3	1.98	0.44
1:E:242:ILE:HG13	1:E:254:LEU:HG	2.00	0.44
1:D:222:VAL:HG21	1:D:230[A]:GLU:HG3	2.00	0.44
2:F:88:LYS:HE2	3:F:234:HOH:O	2.18	0.44
2:C:35:LEU:HD11	2:C:106:LEU:HB3	1.99	0.43
1:A:246:ARG:HA	1:A:250:GLY:O	2.18	0.43
1:E:197:MET:HE2	1:E:206:ALA:HB3	2.00	0.43
1:A:233:GLY:HA3	1:A:236:ILE:HD11	2.01	0.43
1:A:194:LYS:O	1:A:252:ALA:HA	2.20	0.42
1:E:244:ALA:O	1:E:248:LYS:HG2	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:247:LYS:HB3	1:E:247:LYS:HE2	1.76	0.42
1:B:255:LEU:HD11	2:C:58:MET:HE1	2.01	0.42
2:C:42:ASN:OD1	2:C:42:ASN:C	2.62	0.42
1:E:236:ILE:O	1:E:238:PRO:HD3	2.19	0.42
2:F:74:TRP:CG	2:F:75:LYS:H	2.37	0.42
1:E:246:ARG:HA	1:E:250:GLY:O	2.20	0.41
2:C:75:LYS:N	2:C:75:LYS:HD3	2.35	0.41
1:B:210:VAL:HG11	1:B:231:VAL:HG22	2.03	0.41
1:D:203:ARG:NH2	1:D:226:ARG:O	2.54	0.40
2:C:34:ASP:CG	2:C:37:ARG:HG3	2.46	0.40
1:A:237:ASP:C	1:A:237:ASP:OD1	2.65	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	70/80 (88%)	70 (100%)	0	0	100	100
1	B	70/80 (88%)	70 (100%)	0	0	100	100
1	D	68/80 (85%)	67 (98%)	1 (2%)	0	100	100
1	E	69/80 (86%)	67 (97%)	2 (3%)	0	100	100
2	C	79/93 (85%)	77 (98%)	2 (2%)	0	100	100
2	F	80/93 (86%)	79 (99%)	1 (1%)	0	100	100
All	All	436/506 (86%)	430 (99%)	6 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	60/63 (95%)	59 (98%)	1 (2%)	53	53
1	B	60/63 (95%)	59 (98%)	1 (2%)	53	53
1	D	58/63 (92%)	56 (97%)	2 (3%)	32	27
1	E	59/63 (94%)	55 (93%)	4 (7%)	14	8
2	C	74/84 (88%)	73 (99%)	1 (1%)	59	60
2	F	74/84 (88%)	72 (97%)	2 (3%)	39	36
All	All	385/420 (92%)	374 (97%)	11 (3%)	37	33

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	200	ASN
1	B	231	VAL
2	C	75	LYS
1	D	203	ARG
1	D	224	ASP
1	E	190	LYS
1	E	205	LYS
1	E	240	LYS
1	E	242	ILE
2	F	37	ARG
2	F	75	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	259	GLN
2	C	94	ASN
2	F	62	ASN
2	F	92	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(Å²)	Q<0.9
1	A	72/80 (90%)	0.49	5 (6%)	2323	20, 45, 67, 82	2 (2%)
1	B	73/80 (91%)	0.12	2 (2%)	5658	21, 37, 56, 72	1 (1%)
1	D	70/80 (87%)	0.63	9 (12%)	77	23, 46, 73, 84	2 (2%)
1	E	72/80 (90%)	0.44	5 (6%)	2323	28, 43, 64, 73	1 (1%)
2	C	81/93 (87%)	0.69	6 (7%)	2021	34, 50, 72, 83	0
2	F	82/93 (88%)	-0.05	2 (2%)	5961	29, 37, 49, 67	0
All	All	450/506 (88%)	0.38	29 (6%)	2525	20, 43, 70, 84	6 (1%)

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	187	LEU	5.8
1	A	199	GLY	4.6
1	D	202	CYS	4.6
2	F	32	ALA	4.6
1	D	187	LEU	4.3
1	E	187	LEU	4.2
2	C	35	LEU	3.4
1	B	187	LEU	3.3
1	D	197	MET	3.3
1	D	195	VAL	3.3
1	D	251[A]	ASP	3.0
1	D	196	ALA	2.9
2	C	113	PHE	2.9
1	A	201	ASN	2.9
1	E	197	MET	2.7
1	D	203	ARG	2.6
1	A	200	ASN	2.6
1	D	260	ALA	2.5
2	C	91	ASP	2.4

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Mol	Chain	Res	Type	RSRZ
2	F	112	GLY	2.3
2	C	36	SER	2.3
2	C	73	SER	2.2
1	E	262	GLU	2.2
1	B	262	GLU	2.2
1	E	224	ASP	2.2
1	A	249	VAL	2.2
2	C	33	ILE	2.1
1	E	202	CYS	2.0
1	D	247	LYS	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.