



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 05:50 PM EDT

PDB ID : 6KET  
Title : Flavín-utilizing Monooxygenase (OX) Domain of Hybrid Polyketide/Non-Ribosomal Peptide Synthetase  
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Deposited on : 2019-07-05  
Resolution : 1.60 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
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
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)	:	2.37.1

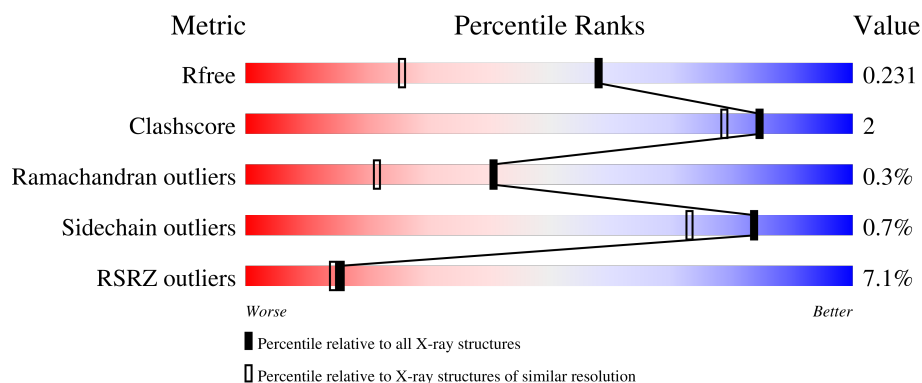
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.60 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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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	362	<div> <div>4%</div> <div>91%</div> <div>• •</div> </div>
1	B	362	<div> <div>9%</div> <div>84%</div> <div>7% 8%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5734 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 PuwE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	348	Total	C	N	O	S	0	0	0
			2720	1732	464	515	9			
1	B	332	Total	C	N	O	S	0	0	0
			2587	1650	445	484	8			

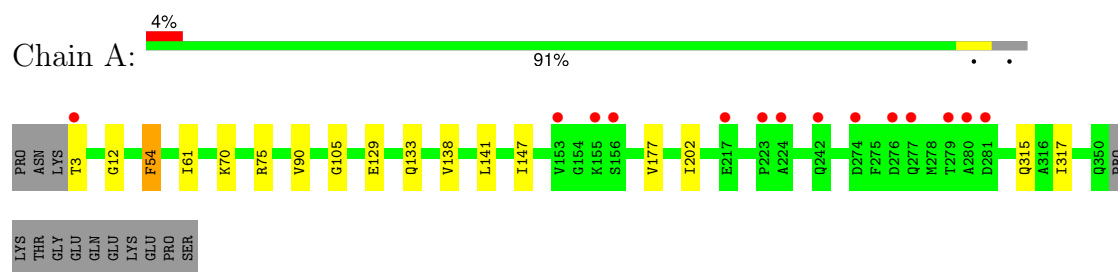
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	259	Total	O	0	0
			259	259		
2	B	168	Total	O	0	0
			168	168		

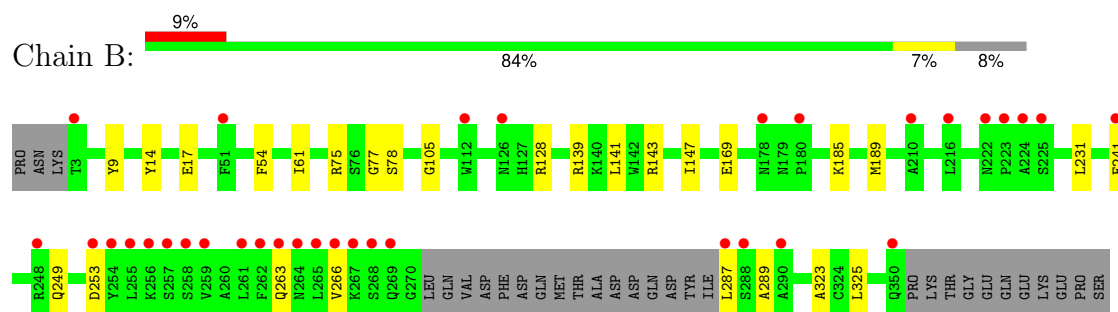
### 3 Residue-property plots [i](#)

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: PuwE



#### • Molecule 1: PuwE



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	95.61Å 103.55Å 77.22Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	23.29 – 1.60 27.99 – 1.60	Depositor EDS
% Data completeness (in resolution range)	99.6 (23.29-1.60) 99.5 (27.99-1.60)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.70 (at 1.60Å)	Xtriage
Refinement program	PHENIX 1.13-2998	Depositor
R, $R_{free}$	0.220 , 0.239 0.211 , 0.231	Depositor DCC
$R_{free}$ test set	1888 reflections (1.87%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.4	Xtriage
Anisotropy	0.391	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.40 , 51.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5734	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.43% 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	0.41	0/2784	0.56	0/3786
1	B	0.32	0/2648	0.53	0/3599
All	All	0.37	0/5432	0.54	0/7385

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	B	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	77	GLY	Peptide,Mainchain

### 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	2720	0	2648	9	0
1	B	2587	0	2533	15	0
2	A	259	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	168	0	0	1	0
All	All	5734	0	5181	24	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 2.

All (24) 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:139:ARG:O	1:B:143:ARG:HG3	1.97	0.64
1:A:3:THR:HA	1:A:315:GLN:HE22	1.71	0.56
1:B:263:GLN:HA	1:B:266:VAL:HG22	1.89	0.55
1:B:287:LEU:HG	1:B:289:ALA:H	1.75	0.51
1:B:14:TYR:HE2	1:B:17:GLU:HA	1.75	0.50
1:B:249:GLN:NE2	1:B:253:ASP:OD2	2.33	0.47
1:B:241:GLU:H	1:B:241:GLU:CD	2.18	0.47
1:A:61:ILE:H	1:A:61:ILE:HD12	1.79	0.47
1:A:141:LEU:HD21	1:A:147:ILE:HG12	1.97	0.47
1:B:75:ARG:HA	1:B:105:GLY:O	2.14	0.47
1:A:202:ILE:HG23	1:A:317:ILE:HD13	1.99	0.44
1:B:141:LEU:HD21	1:B:147:ILE:HG12	1.98	0.44
1:B:185:LYS:O	1:B:189:MET:HG3	2.17	0.44
1:A:3:THR:HA	1:A:315:GLN:NE2	2.32	0.43
1:A:75:ARG:HA	1:A:105:GLY:O	2.19	0.43
1:B:143:ARG:NE	1:B:169:GLU:OE2	2.48	0.43
1:B:9:TYR:CZ	1:B:231:LEU:HD12	2.53	0.43
1:B:143:ARG:NH2	2:B:405:HOH:O	2.52	0.42
1:B:231:LEU:HD21	1:B:325:LEU:HD12	2.03	0.41
1:A:129:GLU:HG3	1:A:133:GLN:NE2	2.35	0.41
1:A:90:VAL:HG22	1:A:138:VAL:HG13	2.03	0.41
1:A:12:GLY:HA2	1:A:54:PHE:CE2	2.56	0.40
1:B:9:TYR:HB2	1:B:323:ALA:HB1	2.03	0.40
1:B:61:ILE:HD12	1:B:61:ILE:H	1.86	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 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	346/362 (96%)	335 (97%)	10 (3%)	1 (0%)	41	21
1	B	328/362 (91%)	319 (97%)	8 (2%)	1 (0%)	41	21
All	All	674/724 (93%)	654 (97%)	18 (3%)	2 (0%)	41	21

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	78	SER
1	A	177	VAL

### 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	292/305 (96%)	290 (99%)	2 (1%)	84	73
1	B	277/305 (91%)	275 (99%)	2 (1%)	84	73
All	All	569/610 (93%)	565 (99%)	4 (1%)	84	73

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	54	PHE
1	A	70	LYS
1	B	54	PHE
1	B	128	ARG



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](#)

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	348/362 (96%)	0.39	14 (4%) 38 35	11, 21, 39, 47	0
1	B	332/362 (91%)	0.74	34 (10%) 6 5	12, 27, 52, 60	0
All	All	680/724 (93%)	0.56	48 (7%) 16 14	11, 24, 46, 60	0

All (48) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	287	LEU	9.0
1	B	262	PHE	8.7
1	B	259	VAL	7.3
1	B	223	PRO	6.5
1	B	266	VAL	5.9
1	A	277	GLN	4.8
1	B	224	ALA	4.8
1	B	263	GLN	4.7
1	B	258	SER	4.6
1	B	222	ASN	4.6
1	A	223	PRO	4.4
1	B	267	LYS	4.3
1	B	350	GLN	4.3
1	A	280	ALA	3.9
1	B	261	LEU	3.8
1	B	256	LYS	3.5
1	B	257	SER	3.3
1	A	281	ASP	3.3
1	B	265	LEU	3.2
1	A	224	ALA	3.2
1	B	254	TYR	3.1
1	A	156	SER	3.0
1	B	264	ASN	2.9
1	A	276	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	255	LEU	2.8
1	A	217	GLU	2.7
1	B	268	SER	2.7
1	A	155	LYS	2.6
1	B	3	THR	2.6
1	B	290	ALA	2.6
1	B	253	ASP	2.6
1	B	269	GLN	2.6
1	B	216	LEU	2.5
1	B	178	ASN	2.5
1	A	153	VAL	2.5
1	B	112	TRP	2.4
1	B	225	SER	2.4
1	B	51	PHE	2.3
1	A	274	ASP	2.2
1	B	180	PRO	2.2
1	A	279	THR	2.2
1	A	3	THR	2.1
1	B	126	ASN	2.1
1	B	288	SER	2.1
1	B	248	ARG	2.1
1	A	242	GLN	2.1
1	B	210	ALA	2.1
1	B	241	GLU	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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.