



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 01:34 AM UTC

PDB ID : 3VSG / pdb\_00003vsg  
Title : Crystal structure of iron free 1,6-APD, 2-Animophenol-1,6-Dioxygenase  
Authors : Li, D.F.; Hou, Y.J.; Hu, Y.; Wang, D.C.; Liu, W.  
Deposited on : 2012-04-25  
Resolution : 2.40 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4-5-2 with Phenix2.0  
Xtrriage (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

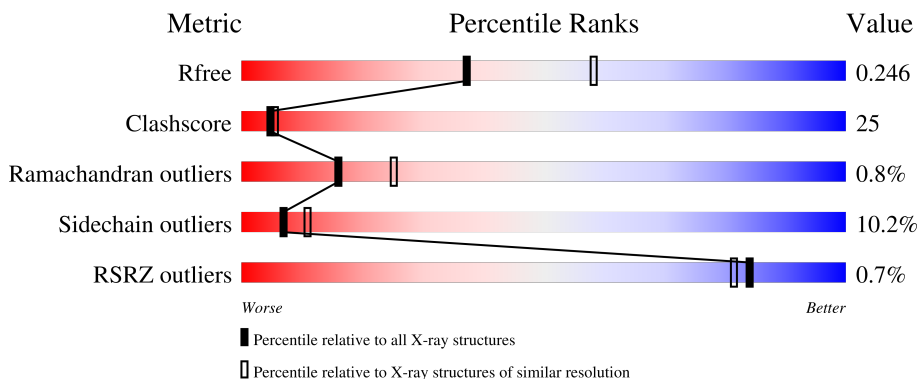
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	271	 66% 27% 6%
1	C	271	 62% 32% 5%
2	B	312	 % 52% 40% 5%
2	D	312	 % 44% 43% 9%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10215 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 2-amino-5-chlorophenol 1,6-dioxygenase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	270	Total	C	N	O	S	0	0	0
			2056	1303	358	389	6			
1	C	270	Total	C	N	O	S	0	0	0
			2056	1303	358	389	6			

- Molecule 2 is a protein called 2-amino-5-chlorophenol 1,6-dioxygenase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	304	Total	C	N	O	S	0	0	0
			2410	1541	415	439	15			
2	D	300	Total	C	N	O	S	0	0	0
			2383	1526	410	432	15			

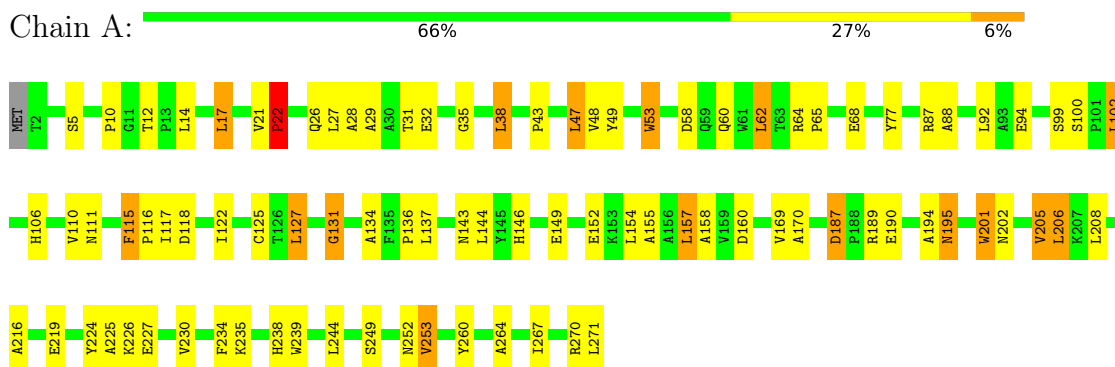
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	398	Total	O	0	0
			398	398		
3	B	293	Total	O	0	0
			293	293		
3	C	330	Total	O	0	0
			330	330		
3	D	289	Total	O	0	0
			289	289		

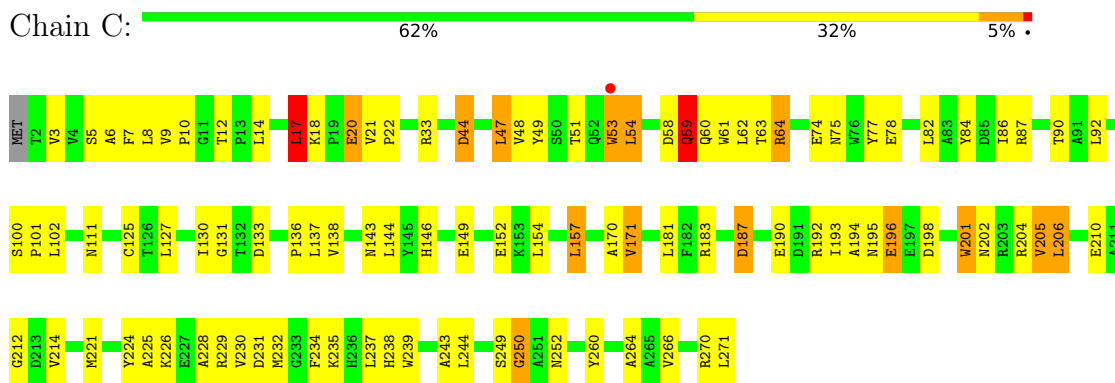
### 3 Residue-property plots [i](#)

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.

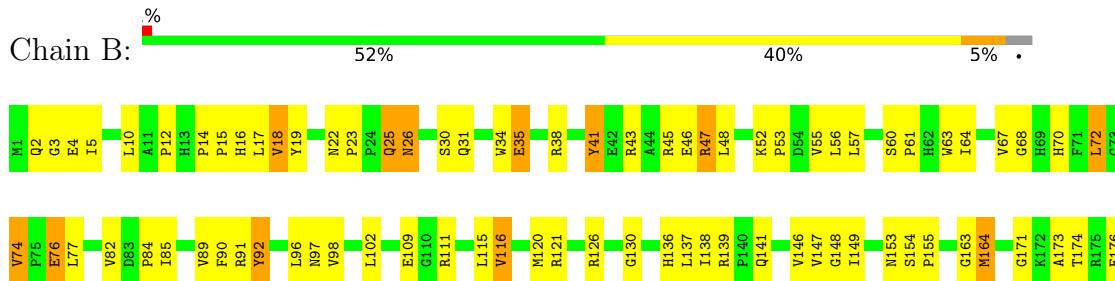
- Molecule 1: 2-amino-5-chlorophenol 1,6-dioxygenase alpha subunit

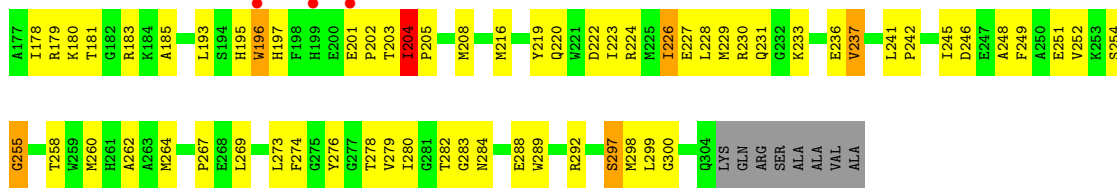


- Molecule 1: 2-amino-5-chlorophenol 1,6-dioxygenase alpha subunit

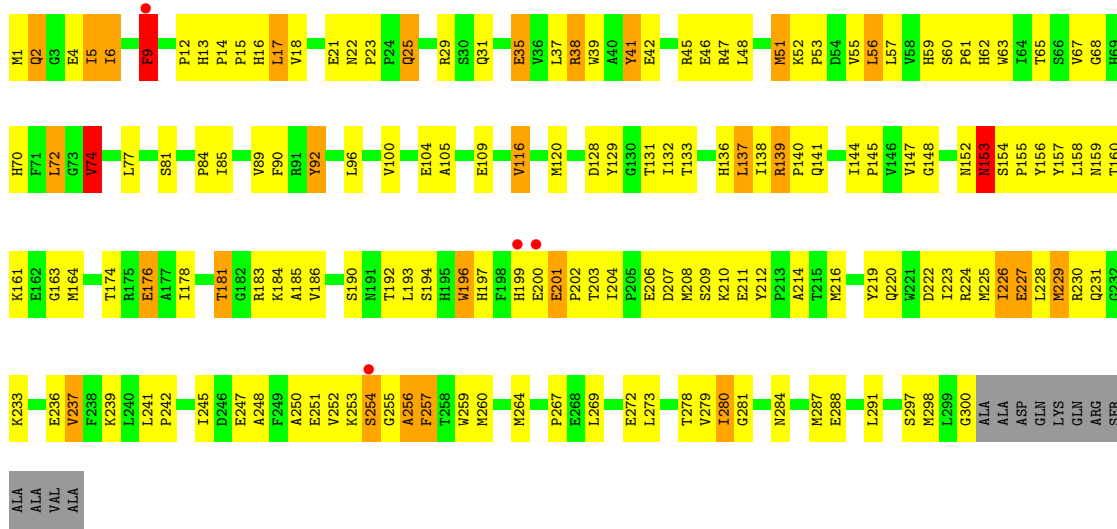
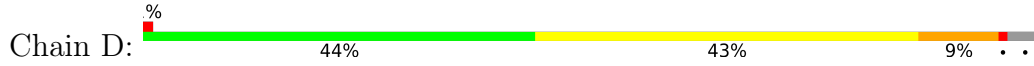


- Molecule 2: 2-amino-5-chlorophenol 1,6-dioxygenase beta subunit





● Molecule 2: 2-amino-5-chlorophenol 1,6-dioxygenase beta subunit



## 4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	269.73Å 48.26Å 108.44Å 90.00° 109.44° 90.00°	Depositor
Resolution (Å)	39.78 – 2.40 39.78 – 2.40	Depositor EDS
% Data completeness (in resolution range)	86.4 (39.78-2.40) 86.4 (39.78-2.40)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.77 (at 2.39Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.186 , 0.247 0.185 , 0.246	Depositor DCC
$R_{free}$ test set	2271 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.6	Xtrriage
Anisotropy	0.143	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 56.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	10215	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.92% 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	0.47	0/2102	1.05	12/2860 (0.4%)
1	C	0.46	0/2102	0.98	10/2860 (0.3%)
2	B	0.45	0/2478	1.02	14/3364 (0.4%)
2	D	0.48	0/2451	1.08	17/3327 (0.5%)
All	All	0.47	0/9133	1.03	53/12411 (0.4%)

There are no bond length outliers.

The worst 5 of 53 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	257	PHE	N-CA-C	-18.24	91.40	114.56
2	D	256	ALA	N-CA-C	8.11	122.84	109.06
1	A	169	VAL	N-CA-C	7.58	118.78	108.17
1	C	196	GLU	N-CA-C	-7.57	102.99	112.90
1	C	138	VAL	N-CA-C	-7.41	94.79	107.24

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	2056	0	2027	69	0
1	C	2056	0	2027	95	0
2	B	2410	0	2359	142	0
2	D	2383	0	2337	166	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	398	0	0	19	0
3	B	293	0	0	18	0
3	C	330	0	0	15	0
3	D	289	0	0	14	0
All	All	10215	0	8750	450	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 25.

The worst 5 of 450 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:D:256:ALA:HB1	2:D:259:TRP:H	1.28	0.98
1:C:51:THR:HG21	1:C:231:ASP:OD2	1.69	0.93
2:B:14:PRO:HG2	2:B:17:LEU:HG	1.51	0.92
1:C:100:SER:HA	1:C:157:LEU:HD11	1.53	0.90
2:D:139:ARG:HH11	2:D:141:GLN:HB2	1.39	0.87

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	268/271 (99%)	254 (95%)	13 (5%)	1 (0%)	30	43
1	C	268/271 (99%)	254 (95%)	12 (4%)	2 (1%)	18	28
2	B	302/312 (97%)	285 (94%)	16 (5%)	1 (0%)	36	50
2	D	298/312 (96%)	278 (93%)	15 (5%)	5 (2%)	7	10
All	All	1136/1166 (97%)	1071 (94%)	56 (5%)	9 (1%)	16	25

5 of 9 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	250	GLY
2	D	254	SER
2	B	203	THR
2	D	2	GLN
2	D	207	ASP

### 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	212/213 (100%)	188 (89%)	24 (11%)	5 8
1	C	212/213 (100%)	189 (89%)	23 (11%)	6 9
2	B	253/258 (98%)	232 (92%)	21 (8%)	10 17
2	D	251/258 (97%)	224 (89%)	27 (11%)	6 9
All	All	928/942 (98%)	833 (90%)	95 (10%)	7 11

5 of 95 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	157	LEU
2	D	18	VAL
1	C	181	LEU
1	C	226	LYS
2	D	41	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	265	GLN
2	D	197	HIS
1	C	111	ASN
2	D	265	GLN
2	D	136	HIS

### 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	270/271 (99%)	-0.60	0 <a href="#">100</a> <a href="#">100</a>	7, 18, 30, 38	0
1	C	270/271 (99%)	-0.45	1 (0%) <a href="#">88</a> <a href="#">86</a>	12, 22, 34, 40	0
2	B	304/312 (97%)	-0.27	3 (0%) <a href="#">79</a> <a href="#">76</a>	13, 25, 43, 72	0
2	D	300/312 (96%)	-0.26	4 (1%) <a href="#">75</a> <a href="#">71</a>	12, 24, 43, 72	0
All	All	1144/1166 (98%)	-0.39	8 (0%) <a href="#">84</a> <a href="#">81</a>	7, 23, 38, 72	0

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	254	SER	5.3
2	D	200	GLU	2.8
2	B	201	GLU	2.3
1	C	53	TRP	2.2
2	B	196	TRP	2.2

### 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.