



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2014 – 03:18 AM GMT

PDB ID : 4F6L  
Title : Crystal structure of Aureusimine biosynthetic cluster reductase domain  
Authors : Mok, M.; Junop, M.  
Deposited on : 2012-05-14  
Resolution : 3.86 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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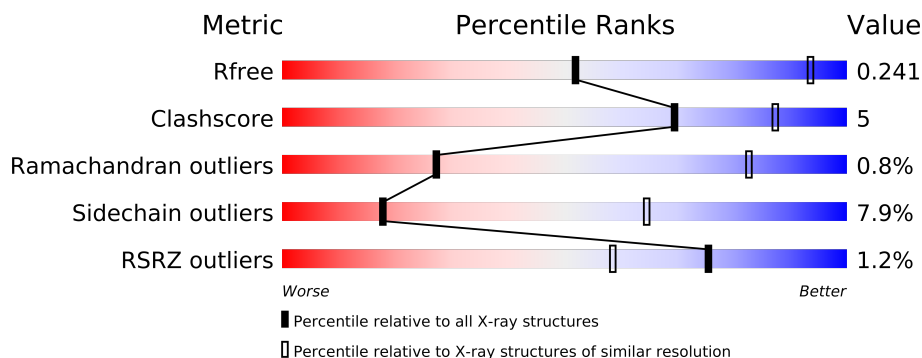
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance



The reported resolution of this entry is 3.86 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))
$R_{free}$	66092	1013 (4.30-3.42)
Clashscore	79885	1145 (4.22-3.50)
Ramachandran outliers	78287	1091 (4.22-3.50)
Sidechain outliers	78261	1081 (4.22-3.50)
RSRZ outliers	66119	1014 (4.30-3.42)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	508	
1	B	508	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 5714 atoms, of which 0 are hydrogen and 0 are deuterium.

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 AusA reductase domain protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	370	Total	C	N	O	S	0	0	0
			2842	1808	479	537	18			
1	A	378	Total	C	N	O	S	0	0	0
			2872	1828	482	546	16			

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	1895	MET	-	EXPRESSION TAG	UNP Q99X42
B	1896	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1897	SER	-	EXPRESSION TAG	UNP Q99X42
B	1898	SER	-	EXPRESSION TAG	UNP Q99X42
B	1899	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1900	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1901	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1902	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1903	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1904	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1905	SER	-	EXPRESSION TAG	UNP Q99X42
B	1906	SER	-	EXPRESSION TAG	UNP Q99X42
B	1907	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1908	LEU	-	EXPRESSION TAG	UNP Q99X42
B	1909	VAL	-	EXPRESSION TAG	UNP Q99X42
B	1910	PRO	-	EXPRESSION TAG	UNP Q99X42
B	1911	ARG	-	EXPRESSION TAG	UNP Q99X42
B	1912	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1913	SER	-	EXPRESSION TAG	UNP Q99X42
B	1914	HIS	-	EXPRESSION TAG	UNP Q99X42
B	1915	MET	-	EXPRESSION TAG	UNP Q99X42
B	1916	ALA	-	EXPRESSION TAG	UNP Q99X42
B	1917	SER	-	EXPRESSION TAG	UNP Q99X42
B	1918	MET	-	EXPRESSION TAG	UNP Q99X42
B	1919	THR	-	EXPRESSION TAG	UNP Q99X42

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1920	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1921	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1922	GLN	-	EXPRESSION TAG	UNP Q99X42
B	1923	GLN	-	EXPRESSION TAG	UNP Q99X42
B	1924	MET	-	EXPRESSION TAG	UNP Q99X42
B	1925	GLY	-	EXPRESSION TAG	UNP Q99X42
B	1926	ARG	-	EXPRESSION TAG	UNP Q99X42
B	1927	ASP	-	EXPRESSION TAG	UNP Q99X42
B	1928	PRO	-	EXPRESSION TAG	UNP Q99X42
B	2392	ALA	-	EXPRESSION TAG	UNP Q99X42
B	2393	ALA	-	EXPRESSION TAG	UNP Q99X42
B	2394	ALA	-	EXPRESSION TAG	UNP Q99X42
B	2395	LEU	-	EXPRESSION TAG	UNP Q99X42
B	2396	GLU	-	EXPRESSION TAG	UNP Q99X42
B	2397	HIS	-	EXPRESSION TAG	UNP Q99X42
B	2398	HIS	-	EXPRESSION TAG	UNP Q99X42
B	2399	HIS	-	EXPRESSION TAG	UNP Q99X42
B	2400	HIS	-	EXPRESSION TAG	UNP Q99X42
B	2401	HIS	-	EXPRESSION TAG	UNP Q99X42
B	2402	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1895	MET	-	EXPRESSION TAG	UNP Q99X42
A	1896	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1897	SER	-	EXPRESSION TAG	UNP Q99X42
A	1898	SER	-	EXPRESSION TAG	UNP Q99X42
A	1899	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1900	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1901	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1902	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1903	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1904	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1905	SER	-	EXPRESSION TAG	UNP Q99X42
A	1906	SER	-	EXPRESSION TAG	UNP Q99X42
A	1907	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1908	LEU	-	EXPRESSION TAG	UNP Q99X42
A	1909	VAL	-	EXPRESSION TAG	UNP Q99X42
A	1910	PRO	-	EXPRESSION TAG	UNP Q99X42
A	1911	ARG	-	EXPRESSION TAG	UNP Q99X42
A	1912	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1913	SER	-	EXPRESSION TAG	UNP Q99X42
A	1914	HIS	-	EXPRESSION TAG	UNP Q99X42
A	1915	MET	-	EXPRESSION TAG	UNP Q99X42
A	1916	ALA	-	EXPRESSION TAG	UNP Q99X42

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1917	SER	-	EXPRESSION TAG	UNP Q99X42
A	1918	MET	-	EXPRESSION TAG	UNP Q99X42
A	1919	THR	-	EXPRESSION TAG	UNP Q99X42
A	1920	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1921	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1922	GLN	-	EXPRESSION TAG	UNP Q99X42
A	1923	GLN	-	EXPRESSION TAG	UNP Q99X42
A	1924	MET	-	EXPRESSION TAG	UNP Q99X42
A	1925	GLY	-	EXPRESSION TAG	UNP Q99X42
A	1926	ARG	-	EXPRESSION TAG	UNP Q99X42
A	1927	ASP	-	EXPRESSION TAG	UNP Q99X42
A	1928	PRO	-	EXPRESSION TAG	UNP Q99X42
A	2392	ALA	-	EXPRESSION TAG	UNP Q99X42
A	2393	ALA	-	EXPRESSION TAG	UNP Q99X42
A	2394	ALA	-	EXPRESSION TAG	UNP Q99X42
A	2395	LEU	-	EXPRESSION TAG	UNP Q99X42
A	2396	GLU	-	EXPRESSION TAG	UNP Q99X42
A	2397	HIS	-	EXPRESSION TAG	UNP Q99X42
A	2398	HIS	-	EXPRESSION TAG	UNP Q99X42
A	2399	HIS	-	EXPRESSION TAG	UNP Q99X42
A	2400	HIS	-	EXPRESSION TAG	UNP Q99X42
A	2401	HIS	-	EXPRESSION TAG	UNP Q99X42
A	2402	HIS	-	EXPRESSION TAG	UNP Q99X42



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	104.81Å 107.78Å 127.31Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.63 – 3.86 49.63 – 3.56	Depositor EDS
% Data completeness (in resolution range)	98.6 (49.63-3.86) 94.8 (49.63-3.56)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.69 (at 3.57Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.2_869)	Depositor
R, $R_{free}$	0.200 , 0.246 0.192 , 0.241	Depositor DCC
$R_{free}$ test set	1700 reflections (10.03%)	DCC
Wilson B-factor (Å <sup>2</sup> )	113.6	Xtriage
Anisotropy	0.169	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 98.0	EDS
Estimated twinning fraction	0.025 for k,h,-l	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 17593 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	5714	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	140.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.83% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

## 5 Model quality

### 5.1 Standard geometry

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	0.27	0/2927	0.47	0/3994
1	B	0.27	0/2895	0.46	0/3944
All	All	0.27	0/5822	0.46	0/7938

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2872	0	0	13	0
1	B	2842	0	5	14	0
All	All	5714	0	5	27	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 5.

All (27) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:2029:ARG:NH2	1:A:2293:PRO:O	2.26	0.69
1:B:2189:SER:OG	1:B:2190:GLU:N	2.24	0.68

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:2360:LEU:O	1:B:2364:ASN:ND2	2.27	0.67
1:A:2367:SER:OG	1:A:2368:GLU:N	2.34	0.60
1:A:2185:ASP:OD1	1:A:2195:LYS:NZ	2.36	0.58
1:A:2171:SER:OG	1:A:2172:THR:N	2.35	0.58
1:A:2261:ASP:OD2	1:A:2317:LYS:NZ	2.40	0.54
1:B:2076:ARG:NH1	1:B:2113:ASP:O	2.40	0.54
1:A:2364:ASN:O	1:A:2364:ASN:ND2	2.41	0.54
1:A:2378:LEU:O	1:A:2382:ALA:N	2.41	0.52
1:A:2187:THR:O	1:A:2195:LYS:NZ	2.42	0.52
1:B:2303:ASN:OD1	1:B:2303:ASN:N	2.43	0.52
1:B:2033:GLY:O	1:B:2294:GLN:NE2	2.43	0.52
1:B:2242:MET:O	1:B:2242:MET:HG2	2.10	0.51
1:B:2283:GLN:NE2	1:B:2363:MET:SD	2.84	0.50
1:B:2180:ASP:O	1:B:2183:THR:OG1	2.28	0.50
1:B:2308:LYS:NZ	1:B:2312:GLU:OE2	2.45	0.50
1:B:2292:THR:OG1	1:B:2297:TYR:OH	2.29	0.50
1:B:2017:ASP:N	1:B:2017:ASP:OD1	2.47	0.48
1:A:2180:ASP:OD1	1:A:2180:ASP:N	2.48	0.47
1:A:2291:ASN:N	1:A:2291:ASN:OD1	2.48	0.46
1:B:2266:SER:OG	1:B:2324:ASP:OD1	2.34	0.46
1:B:2261:ASP:N	1:B:2261:ASP:OD1	2.49	0.45
1:B:2190:GLU:OE2	1:B:2359:THR:OG1	2.34	0.45
1:A:2294:GLN:N	1:A:2294:GLN:OE1	2.51	0.43
1:A:2362:ILE:O	1:A:2365:HIS:N	2.52	0.42
1:A:2375:ASN:OD1	1:A:2375:ASN:N	2.55	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	376/508 (74%)	342 (91%)	30 (8%)	4 (1%)	21	79
1	B	366/508 (72%)	343 (94%)	21 (6%)	2 (0%)	38	88
All	All	742/1016 (73%)	685 (92%)	51 (7%)	6 (1%)	27	82

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	2124	GLU
1	B	2119	ASP
1	A	2069	HIS
1	A	2123	PRO
1	B	2035	LEU
1	A	2053	THR

### 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	298/456 (65%)	266 (89%)	32 (11%)	10	49
1	B	300/456 (66%)	285 (95%)	15 (5%)	34	80
All	All	598/912 (66%)	551 (92%)	47 (8%)	18	64

All (47) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	2022	LEU
1	B	2023	GLN
1	B	2075	ILE
1	B	2088	MET
1	B	2105	SER
1	B	2106	ASN
1	B	2197	GLN
1	B	2255	ASN
1	B	2262	CYS
1	B	2263	ILE
1	B	2275	SER
1	B	2303	ASN
1	B	2349	GLN
1	B	2373	ILE
1	B	2374	THR
1	A	2029	ARG
1	A	2048	LEU
1	A	2055	PHE

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Mol	Chain	Res	Type
1	A	2060	LEU
1	A	2064	LEU
1	A	2117	MET
1	A	2119	ASP
1	A	2127	ASP
1	A	2145	PHE
1	A	2172	THR
1	A	2185	ASP
1	A	2200	THR
1	A	2201	SER
1	A	2206	SER
1	A	2210	SER
1	A	2218	VAL
1	A	2231	ASN
1	A	2234	SER
1	A	2255	ASN
1	A	2266	SER
1	A	2283	GLN
1	A	2287	LEU
1	A	2290	VAL
1	A	2291	ASN
1	A	2292	THR
1	A	2300	LEU
1	A	2310	LEU
1	A	2327	PHE
1	A	2331	LEU
1	A	2364	ASN
1	A	2368	GLU
1	A	2374	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

There are no ligands in this entry.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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	378/508 (74%)	0.38	7 (1%) 64 47	89, 143, 228, 250	0
1	B	370/508 (72%)	0.20	2 (0%) 88 76	77, 129, 182, 220	0
All	All	748/1016 (73%)	0.29	9 (1%) 75 58	77, 135, 216, 250	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2263	ILE	3.9
1	A	2262	CYS	3.6
1	A	2260	LEU	3.2
1	A	2319	ILE	3.1
1	B	2115	GLU	3.1
1	A	2122	LEU	3.0
1	B	2146	GLU	2.3
1	A	2126	MET	2.3
1	A	2138	HIS	2.1

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

### 6.4 Ligands ⓘ

There are no ligands in this entry.

## 6.5 Other polymers ⓘ

There are no such residues in this entry.