



Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 11:31 PM GMT

PDB ID : 4HMX
Title : Crystal structure of PhzG from Burkholderia lata 383 in complex with tetrahydrophenazine-1-carboxylic acid
Authors : Xu, N.N.; Ahuja, E.G.; Blankenfeldt, W.
Deposited on : 2012-10-18
Resolution : 1.59 Å (reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

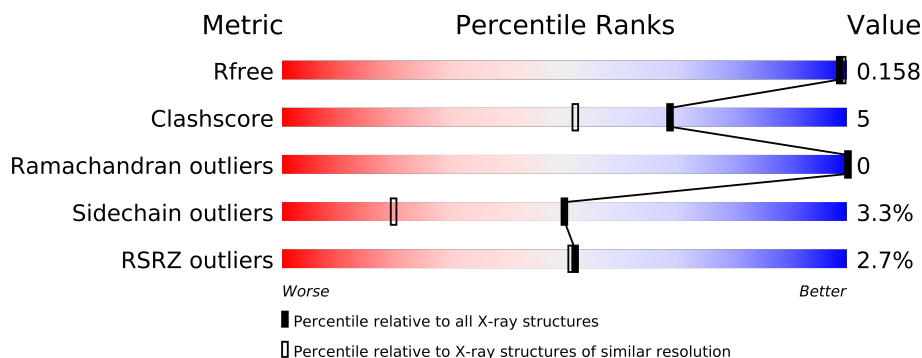
The following versions of software and data (see [references](#)) were used in the production of this report:

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 1.59 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	1872 (1.60-1.60)
Clashscore	79885	2199 (1.60-1.60)
Ramachandran outliers	78287	2126 (1.60-1.60)
Sidechain outliers	78261	2125 (1.60-1.60)
RSRZ outliers	66119	1872 (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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 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	215	
1	B	215	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	WUB	A	302	-	X

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7138 atoms, of which 3284 are hydrogens 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.

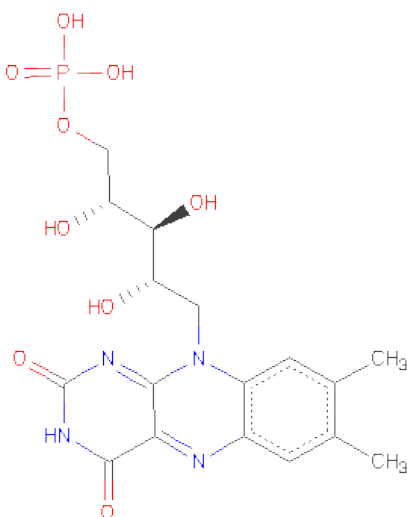
- Molecule 1 is a protein called Pyridoxamine 5'-phosphate oxidase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	202	Total	C	H	N	O	S	0	10	0
			3241	1026	1607	294	308	6			
1	B	203	Total	C	H	N	O	S	0	11	0
			3279	1038	1628	296	310	7			

There are 6 discrepancies between the modelled and reference sequences:

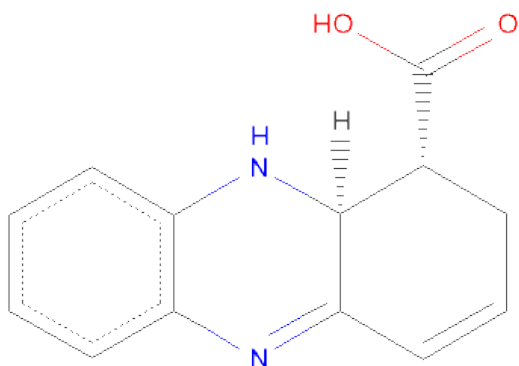
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	EXPRESSION TAG	UNP Q396C5
A	-1	SER	-	EXPRESSION TAG	UNP Q396C5
A	0	HIS	-	EXPRESSION TAG	UNP Q396C5
B	-2	GLY	-	EXPRESSION TAG	UNP Q396C5
B	-1	SER	-	EXPRESSION TAG	UNP Q396C5
B	0	HIS	-	EXPRESSION TAG	UNP Q396C5

- Molecule 2 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	P	
			50	17	19	4	9	1	
2	B	1	Total	C	H	N	O	P	
			50	17	19	4	9	1	

- Molecule 3 is (1R,10AS)-1,2,10,10A-TETRAHYDROPHENAZINE-1-CARBOXYLICACID (three-letter code: WUB) (formula: C₁₃H₁₂N₂O₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	H	N	O		
			28	13	11	2	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	261	Total	O		
			261	261	0	0
4	B	229	Total	O		
			229	229	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, α , β , γ	93.65Å 93.65Å 51.41Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.83 – 1.59 46.83 – 1.59	Depositor EDS
% Data completeness (in resolution range)	99.9 (46.83-1.59) 99.9 (46.83-1.59)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 1.59Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1069)	Depositor
R, R_{free}	0.113 , 0.158 0.113 , 0.158	Depositor DCC
R_{free} test set	3381 reflections (4.99%)	DCC
Wilson B-factor (Å ²)	20.3	Xtriage
Anisotropy	0.086	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.43 , 47.5	EDS
Estimated twinning fraction	0.021 for -h,-k,l 0.029 for h,-h-k,-l 0.022 for -k,-h,-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 67771 reflections	Xtriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	7138	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 4.29% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, WUB

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	0.92	3/1703 (0.2%)	0.93	5/2310 (0.2%)
1	B	0.90	1/1723 (0.1%)	0.91	2/2337 (0.1%)
All	All	0.91	4/3426 (0.1%)	0.92	7/4647 (0.2%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	153	ARG	CB-CG	-6.90	1.33	1.52
1	B	107	GLN	CB-CG	-6.84	1.34	1.52
1	A	175	TYR	CD2-CE2	6.05	1.48	1.39
1	A	183	GLU	CD-OE1	5.57	1.31	1.25

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	194	ARG	NE-CZ-NH2	-7.28	116.66	120.30
1	A	149	ARG	NE-CZ-NH2	-6.85	116.87	120.30
1	A	148	ASP	CB-CG-OD1	6.71	124.34	118.30
1	A	39	ASP	CB-CG-OD2	-6.59	112.37	118.30
1	B	194	ARG	NE-CZ-NH1	6.04	123.32	120.30
1	A	194	ARG	CG-CD-NE	5.03	122.36	111.80
1	A	176	ARG	NE-CZ-NH2	-5.01	117.80	120.30

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	1634	1607	0	17	0
1	B	1651	1628	0	14	0
2	A	31	19	0	5	0
2	B	31	19	0	5	0
3	A	17	11	0	0	0
4	A	261	0	0	1	0
4	B	229	0	0	1	0
All	All	3854	3284	0	32	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 (32) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:85:LYS:HZ2	2:B:301:FMN:HO4'	1.21	0.87
1:A:85:LYS:HZ3	2:A:301:FMN:HO4'	1.20	0.86
1:B:85:LYS:NZ	2:B:301:FMN:HO4'	1.84	0.76
1:A:78[B]:CYS:SG	1:A:125:LEU:HD13	2.26	0.75
1:A:85:LYS:NZ	2:A:301:FMN:HO4'	1.86	0.72
1:B:133:MET:HE1	1:B:172:PHE:CE2	2.28	0.69
1:A:13:VAL:HG11	1:A:189:SER:HB3	1.83	0.61
1:A:13:VAL:CG1	1:A:14:ASP:N	2.71	0.53
1:A:56:SER:OG	1:A:91[B]:GLU:CG	2.57	0.53
1:A:107:GLN:HE22	2:B:301:FMN:HO2'	1.59	0.50
1:A:56:SER:OG	1:A:91[B]:GLU:HG2	2.13	0.48
1:B:150:GLU:OE2	1:B:153:ARG:NH1	2.46	0.48
1:A:192:LEU:HD22	1:B:149:ARG:NH2	2.28	0.48
1:A:13:VAL:HG12	1:A:14:ASP:CG	2.33	0.48
1:B:16:LEU:HG	1:B:18:PRO:HD3	1.96	0.48
1:A:56:SER:OG	1:A:91[B]:GLU:OE2	2.32	0.47
1:B:89:LEU:HD22	1:B:114:ALA:HB3	1.97	0.46
1:A:85:LYS:CE	2:A:301:FMN:HO4'	2.29	0.46
2:A:301:FMN:H9	2:A:301:FMN:H1'1	1.85	0.45
1:B:183:GLU:HG2	1:B:184:PHE:N	2.31	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:141:HIS:HE1	4:A:648:HOH:O	2.01	0.43
1:B:72:ASP:HB2	4:B:618:HOH:O	2.20	0.42
2:B:301:FMN:H1'2	2:B:301:FMN:H9	1.91	0.42
1:B:149:ARG:HH11	1:B:153:ARG:NH2	2.19	0.41
1:A:63:ARG:N	1:A:63:ARG:HD2	2.35	0.41
1:A:89:LEU:HD22	1:A:114:ALA:HB3	2.01	0.41
1:B:85:LYS:CE	2:B:301:FMN:HO4'	2.33	0.41
1:B:197:ARG:O	1:B:207:THR:HA	2.20	0.41
1:A:180:HIS:ND1	1:A:181:GLU:OE1	2.54	0.41
2:A:301:FMN:HO2'	1:B:107:GLN:HE22	1.70	0.40
1:A:190:ASP:O	1:A:191:ARG:HB2	2.21	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	210/215 (98%)	207 (99%)	3 (1%)	0	100	100
1	B	212/215 (99%)	208 (98%)	4 (2%)	0	100	100
All	All	422/430 (98%)	415 (98%)	7 (2%)	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	176/182 (97%)	169 (96%)	7 (4%)	42	14

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	B	180/182 (99%)	175 (97%)	5 (3%)	56 25
All	All	356/364 (98%)	344 (97%)	12 (3%)	50 19

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	PRO
1	A	39	ASP
1	A	63	ARG
1	A	84	ARG
1	A	124	LYS
1	A	149	ARG
1	A	194	ARG
1	B	15	VAL
1	B	17	PHE
1	B	63	ARG
1	B	68[A]	SER
1	B	68[B]	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	107	GLN
1	A	113	GLN
1	A	209	GLN
1	A	211	GLN
1	B	209	GLN

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 ⓘ

3 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	FMN	A	301	-	33,33,33	1.14	3 (9%)	46,50,50	1.21	4 (8%)
3	WUB	A	302	-	19,19,19	2.09	8 (42%)	27,27,27	2.32	9 (33%)
2	FMN	B	301	-	33,33,33	1.19	4 (12%)	46,50,50	1.44	5 (10%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FMN	A	301	-	-	0/18/18/18	0/0/3/3
3	WUB	A	302	-	-	0/4/26/26	0/0/3/3
2	FMN	B	301	-	-	0/18/18/18	0/0/3/3

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302	WUB	C14-C15	4.61	1.48	1.39
2	A	301	FMN	C5A-N5	3.86	1.41	1.35
3	A	302	WUB	C15-C10	-3.21	1.36	1.41
3	A	302	WUB	C15-N16	3.11	1.45	1.39
2	B	301	FMN	C1'-C2'	2.66	1.54	1.51
3	A	302	WUB	C07-C06	2.56	1.38	1.32
2	B	301	FMN	C6-C5A	-2.55	1.38	1.41
3	A	302	WUB	C08-N09	2.49	1.37	1.32
2	B	301	FMN	C10-N1	2.34	1.39	1.35
3	A	302	WUB	O03-C02	2.24	1.29	1.22
3	A	302	WUB	C12-C11	2.23	1.44	1.39
2	A	301	FMN	C5'-C4'	2.19	1.55	1.51
2	B	301	FMN	C1'-N10	2.15	1.50	1.48
3	A	302	WUB	C10-N09	2.10	1.43	1.39

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	FMN	C9A-C5A	-2.07	1.38	1.42

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302	WUB	O01-C02-O03	5.68	136.92	124.07
3	A	302	WUB	C04-C05-C06	5.35	120.01	111.63
2	A	301	FMN	C1'-N10-C9A	4.73	123.48	118.87
3	A	302	WUB	C04-C17-N16	4.69	114.50	109.41
3	A	302	WUB	O03-C02-C04	-4.35	110.82	122.71
2	B	301	FMN	C2-N1-C10	4.35	119.36	114.98
2	B	301	FMN	C1'-N10-C9A	3.83	122.60	118.87
2	B	301	FMN	C4A-N5-C5A	3.18	120.26	116.69
3	A	302	WUB	C04-C17-C08	2.77	115.95	110.41
3	A	302	WUB	C17-C04-C02	2.67	114.01	110.50
2	A	301	FMN	C2-N1-C10	2.66	117.66	114.98
2	B	301	FMN	C5A-C9A-N10	2.56	119.32	116.80
2	A	301	FMN	C5A-C9A-N10	2.39	119.16	116.80
3	A	302	WUB	C06-C07-C08	-2.39	118.74	121.60
3	A	302	WUB	C10-N09-C08	2.34	123.46	118.52
2	B	301	FMN	C9A-N10-C10	-2.26	119.55	121.77
2	A	301	FMN	C9A-N10-C10	-2.26	119.55	121.77
3	A	302	WUB	C11-C10-N09	2.05	121.73	118.51

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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, 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	202/215 (93%)	-0.24	7 (3%) 42 40	12, 22, 43, 63	0
1	B	203/215 (94%)	-0.32	4 (1%) 62 62	12, 23, 42, 59	0
All	All	405/430 (94%)	-0.28	11 (2%) 52 51	12, 23, 43, 63	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	13	VAL	6.1
1	B	131	VAL	5.0
1	A	15	VAL	4.4
1	A	16	LEU	4.0
1	A	202	GLY	3.5
1	B	164	VAL	3.4
1	A	40	VAL	3.0
1	B	147	VAL	3.0
1	A	11	GLY	2.8
1	A	22	ASP	2.3
1	B	10	THR	2.3

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 ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(Å ²)	Q<0.9
3	WUB	A	302	17/17	0.21	3.88	39,44,51,52	0
2	FMN	A	301	31/31	0.07	0.55	10,12,18,19	0
2	FMN	B	301	31/31	0.05	-0.24	13,17,22,23	0

6.5 Other polymers ⓘ

There are no such residues in this entry.