



# Full wwPDB X-ray Structure Validation Report i

Jun 29, 2014 – 11:04 PM EDT

PDB ID : 4MV5  
Title : IspH in complex with 6-chloropyridin-3-ylmethyldiphosphate  
Authors : Span, I.; Wang, K.; Song, Y.; Eisenreich, W.; Bacher, A.; Oldfield, E.; Groll, M.  
Deposited on : 2013-09-23  
Resolution : 1.90 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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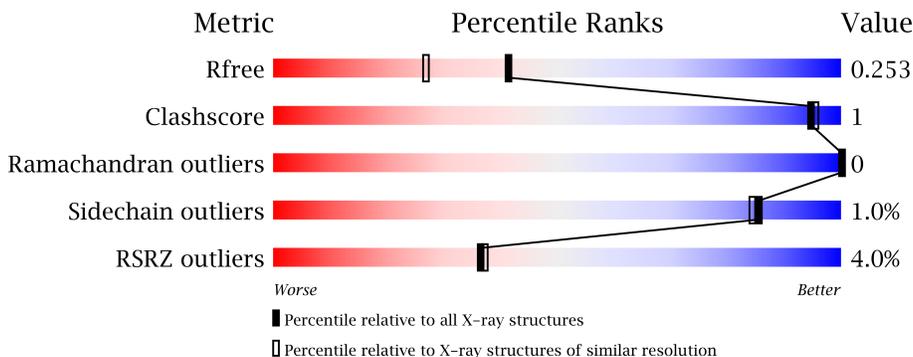
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : **FAILED**  
Xtriage (Phenix) : dev-1439  
EDS : stable23161  
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) : stable23161

# 1 Overall quality at a glance

The reported resolution of this entry is 1.90 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	3684 (1.90-1.90)
Clashscore	79885	4465 (1.90-1.90)
Ramachandran outliers	78287	4413 (1.90-1.90)
Sidechain outliers	78261	4414 (1.90-1.90)
RSRZ outliers	66119	3686 (1.90-1.90)

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	327	
1	B	327	

## 2 Entry composition i

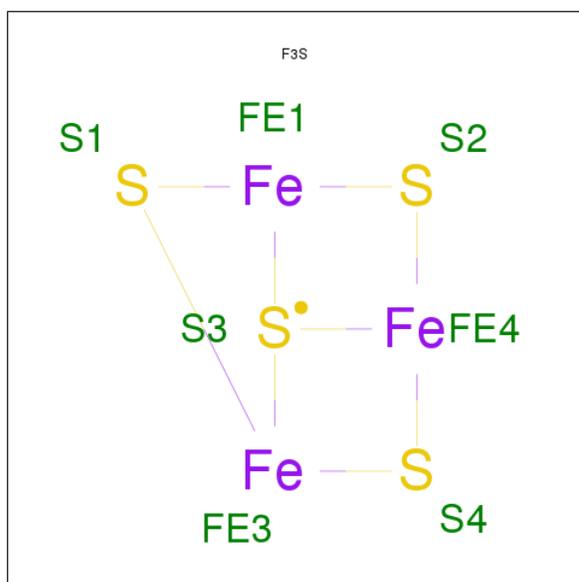
There are 4 unique types of molecules in this entry. The entry contains 5011 atoms, of which 0 are hydrogen and 0 are deuterium.

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 4-hydroxy-3-methylbut-2-enyldiphosphate reductase.

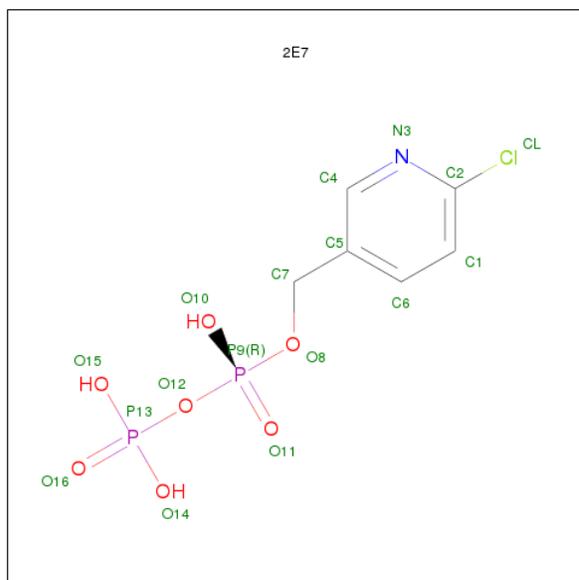
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	309	Total 2383	C 1487	N 427	O 459	S 10	0	0	0
1	B	310	Total 2390	C 1492	N 428	O 460	S 10	0	0	0

- Molecule 2 is FE3-S4 CLUSTER (three-letter code: F3S) (formula: Fe<sub>3</sub>S<sub>4</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	Fe	S		
2	A	1	Total 7	Fe 3	S 4	0	0
2	B	1	Total 7	Fe 3	S 4	0	0

- Molecule 3 is (6-CHLOROPYRIDIN-3-YL)METHYLTRIHYDROGEN DIPHOSPHATE (three-letter code: 2E7) (formula: C<sub>6</sub>H<sub>8</sub>ClNO<sub>7</sub>P<sub>2</sub>).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	Cl	N	O			P
3	A	1	17	6	1	1	7	2	0	0
3	B	1	17	6	1	1	7	2	0	0

- Molecule 4 is water.

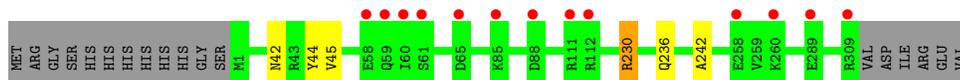
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	97	Total O 97 97	0	0
4	B	93	Total O 93 93	0	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

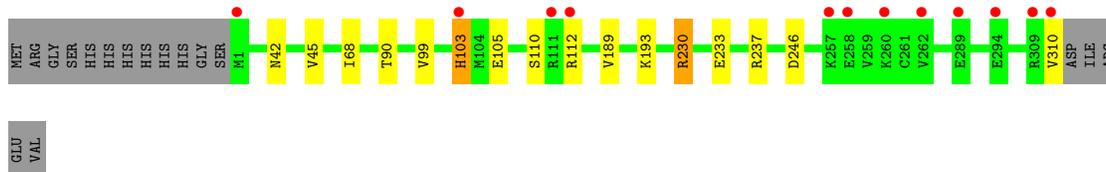
- Molecule 1: 4-hydroxy-3-methylbut-2-enyldiphosphate reductase

Chain A: 



- Molecule 1: 4-hydroxy-3-methylbut-2-enyldiphosphate reductase

Chain B: 



## 4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	70.13Å 80.90Å 111.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	14.87 – 1.90 14.87 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.7 (14.87-1.90) 99.9 (14.87-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.33 (at 1.89Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.215 , 0.249 0.224 , 0.253	Depositor DCC
$R_{free}$ test set	2535 reflections (5.26%)	DCC
Wilson B-factor (Å <sup>2</sup> )	26.1	Xtrriage
Anisotropy	0.072	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 37.5	EDS
Estimated twinning fraction	No twinning to report.	Xtrriage
L-test for twinning	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Outliers	3 of 50711 reflections (0.006%)	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5011	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 49.73 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 7.1602e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

## 5 Model quality (i)

### 5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: F3S, 2E7

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	0.46	0/2418	0.66	2/3273 (0.1%)
1	B	0.50	1/2425 (0.0%)	0.67	1/3283 (0.0%)
All	All	0.48	1/4843 (0.0%)	0.66	3/6556 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	105	GLU	C-O	8.34	1.39	1.23

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	230	ARG	NE-CZ-NH1	-7.79	116.41	120.30
1	A	230	ARG	NE-CZ-NH2	6.91	123.75	120.30
1	B	237	ARG	NE-CZ-NH2	5.63	123.11	120.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 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	2383	0	2395	3	0
1	B	2390	0	2404	10	0
2	A	7	0	0	0	0
2	B	7	0	0	0	0
3	A	17	0	0	0	0
3	B	17	0	0	1	0
4	A	97	0	0	0	0
4	B	93	0	0	4	0
All	All	5011	0	4799	13	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 1.

All (13) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:42:ASN:HD22	1:B:45:VAL:H	1.41	0.65
1:A:42:ASN:HD22	1:A:45:VAL:H	1.48	0.60
1:B:103:HIS:HD2	4:B:592:HOH:O	1.97	0.47
1:B:99:VAL:HG21	3:B:402:2E7:CL	2.52	0.46
1:B:230:ARG:NH2	1:B:233:GLU:OE1	2.49	0.45
1:B:310:VAL:O	1:B:310:VAL:HG12	2.16	0.45
1:B:230:ARG:NH1	4:B:551:HOH:O	2.49	0.45
1:B:68:ILE:HD13	1:B:90:THR:HB	1.99	0.45
1:A:236:GLN:HG3	1:A:242:ALA:HB3	1.98	0.45
1:A:42:ASN:HD21	1:A:44:TYR:HB3	1.82	0.42
1:B:193:LYS:HA	4:B:579:HOH:O	2.20	0.42
1:B:103:HIS:HE1	4:B:553:HOH:O	2.02	0.41
1:B:110:SER:C	1:B:112:ARG:H	2.24	0.41

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	307/327 (94%)	304 (99%)	3 (1%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	308/327 (94%)	304 (99%)	4 (1%)	0	100	100
All	All	615/654 (94%)	608 (99%)	7 (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	257/273 (94%)	256 (100%)	1 (0%)	95	95
1	B	258/273 (94%)	254 (98%)	4 (2%)	75	70
All	All	515/546 (94%)	510 (99%)	5 (1%)	85	84

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	230	ARG
1	B	103	HIS
1	B	189	VAL
1	B	230	ARG
1	B	246	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	42	ASN
1	A	78	GLN
1	A	133	GLN
1	A	229	ASN
1	A	236	GLN
1	A	252	GLN
1	A	283	GLN
1	B	42	ASN
1	B	103	HIS
1	B	213	GLN

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Mol	Chain	Res	Type
1	B	229	ASN
1	B	277	ASN
1	B	283	GLN

### 5.3.3 RNA

There are no RNA chains in this entry.

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

Mogul failed to run properly - this section will therefore be empty.

## 5.5 Carbohydrates

Mogul failed to run properly - this section will therefore be empty.

## 5.6 Ligand geometry

Mogul failed to run properly - this section will therefore be empty.

## 5.7 Other polymers

Mogul failed to run properly - this section will therefore be empty.

## 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	309/327 (94%)	0.37	13 (4%) 35 35	18, 31, 60, 75	0
1	B	310/327 (94%)	0.31	12 (3%) 37 38	18, 32, 53, 79	0
All	All	619/654 (94%)	0.34	25 (4%) 36 37	18, 32, 58, 79	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	310	VAL	5.4
1	A	88	ASP	4.3
1	A	65	ASP	3.7
1	B	257	LYS	3.3
1	B	103	HIS	3.3
1	A	58	GLU	3.2
1	B	258	GLU	3.1
1	A	309	ARG	3.0
1	B	262	VAL	2.7
1	A	260	LYS	2.7
1	B	289	GLU	2.6
1	A	111	ARG	2.6
1	A	289	GLU	2.6
1	A	85	LYS	2.5
1	B	260	LYS	2.5
1	B	112	ARG	2.4
1	B	309	ARG	2.4
1	A	60	ILE	2.3
1	A	258	GLU	2.3
1	A	59	GLN	2.1
1	B	1	MET	2.1
1	B	111	ARG	2.1
1	A	112	ARG	2.1
1	B	294	GLU	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	61	SER	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 carbohydrates in this entry.

## 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	2E7	A	402	17/17	0.12	0.57	19,29,33,41	0
3	2E7	B	402	17/17	0.10	-0.14	21,27,33,39	0
2	F3S	B	401	7/7	0.09	-0.25	17,18,20,20	0
2	F3S	A	401	7/7	0.07	-1.19	17,18,19,20	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.