



wwPDB X-ray Structure Validation Summary Report i

Feb 26, 2014 – 11:25 PM GMT

PDB ID : 2PMU
Title : Crystal structure of the DNA-binding domain of PhoP
Authors : Wang, S.
Deposited on : 2007-04-23
Resolution : 1.78 Å(reported)

This is a wwPDB validation summary 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>

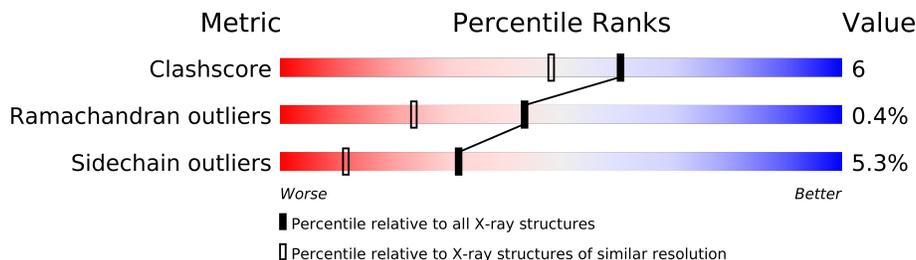
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : **FAILED**
Percentile statistics : 21963
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 1.78 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))
Clashscore	79885	6152 (1.80-1.76)
Ramachandran outliers	78287	6074 (1.80-1.76)
Sidechain outliers	78261	6073 (1.80-1.76)

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.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	110	
1	B	110	
1	C	110	
1	D	110	
1	E	110	
1	F	110	

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 5358 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 response regulator PHOP.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace	
			Total	C	N				O
1	A	98	805	520	138	147	0	1	0
1	B	103	849	546	148	155	0	1	0
1	C	92	760	491	133	136	0	1	0
1	D	96	793	514	136	143	0	1	0
1	E	103	849	546	148	155	0	1	0
1	F	93	763	492	131	140	0	1	0

There are 36 discrepancies between the modelled and reference sequences:

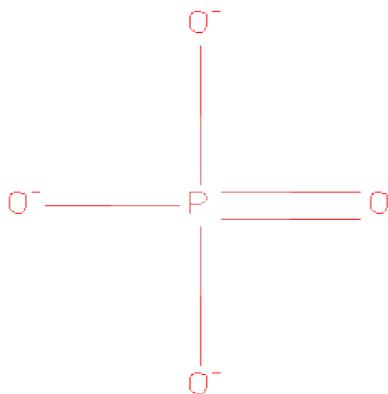
Chain	Residue	Modelled	Actual	Comment	Reference
A	140	GLY	-	EXPRESSION TAG	UNP P71814
A	141	THR	-	EXPRESSION TAG	UNP P71814
A	142	HIS	-	EXPRESSION TAG	UNP P71814
A	143	MET	-	EXPRESSION TAG	UNP P71814
A	248	LYS	-	EXPRESSION TAG	UNP P71814
A	249	LEU	-	EXPRESSION TAG	UNP P71814
B	140	GLY	-	EXPRESSION TAG	UNP P71814
B	141	THR	-	EXPRESSION TAG	UNP P71814
B	142	HIS	-	EXPRESSION TAG	UNP P71814
B	143	MET	-	EXPRESSION TAG	UNP P71814
B	248	LYS	-	EXPRESSION TAG	UNP P71814
B	249	LEU	-	EXPRESSION TAG	UNP P71814
C	140	GLY	-	EXPRESSION TAG	UNP P71814
C	141	THR	-	EXPRESSION TAG	UNP P71814
C	142	HIS	-	EXPRESSION TAG	UNP P71814
C	143	MET	-	EXPRESSION TAG	UNP P71814
C	248	LYS	-	EXPRESSION TAG	UNP P71814

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Chain	Residue	Modelled	Actual	Comment	Reference
C	249	LEU	-	EXPRESSION TAG	UNP P71814
D	140	GLY	-	EXPRESSION TAG	UNP P71814
D	141	THR	-	EXPRESSION TAG	UNP P71814
D	142	HIS	-	EXPRESSION TAG	UNP P71814
D	143	MET	-	EXPRESSION TAG	UNP P71814
D	248	LYS	-	EXPRESSION TAG	UNP P71814
D	249	LEU	-	EXPRESSION TAG	UNP P71814
E	140	GLY	-	EXPRESSION TAG	UNP P71814
E	141	THR	-	EXPRESSION TAG	UNP P71814
E	142	HIS	-	EXPRESSION TAG	UNP P71814
E	143	MET	-	EXPRESSION TAG	UNP P71814
E	248	LYS	-	EXPRESSION TAG	UNP P71814
E	249	LEU	-	EXPRESSION TAG	UNP P71814
F	140	GLY	-	EXPRESSION TAG	UNP P71814
F	141	THR	-	EXPRESSION TAG	UNP P71814
F	142	HIS	-	EXPRESSION TAG	UNP P71814
F	143	MET	-	EXPRESSION TAG	UNP P71814
F	248	LYS	-	EXPRESSION TAG	UNP P71814
F	249	LEU	-	EXPRESSION TAG	UNP P71814

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	1
			9	7	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	D	1	Total O P 5 4 1	0	0
2	E	1	Total O P 5 4 1	0	0

- Molecule 3 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total K 1 1	0	0
3	D	1	Total K 1 1	0	0
3	E	1	Total K 1 1	0	0

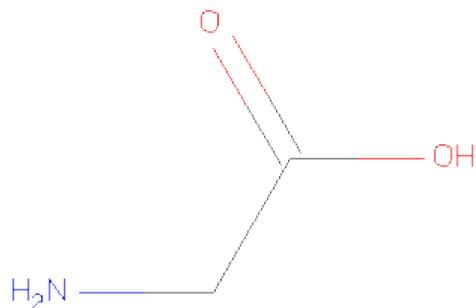
- Molecule 4 is UNKNOWN ATOM OR ION (three-letter code: UNX) (formula: X).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total X 1 1	0	0
4	A	1	Total X 1 1	0	0
4	D	1	Total X 1 1	0	0
4	E	1	Total X 1 1	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total Cl 1 1	0	0
5	D	1	Total Cl 1 1	0	0
5	E	2	Total Cl 2 2	0	0

- Molecule 6 is GLYCINE (three-letter code: GLY) (formula: C₂H₅NO₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	B	3	15	6	3	6	0	0

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	108	Total	O	0	0
			108	108		
7	B	72	Total	O	0	0
			72	72		
7	C	65	Total	O	0	0
			65	65		
7	D	107	Total	O	0	0
			107	107		
7	E	70	Total	O	0	0
			70	70		
7	F	67	Total	O	0	0
			67	67		

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.

Note EDS failed to run properly.

- Molecule 1: response regulator PHOP

Chain A: 



- Molecule 1: response regulator PHOP

Chain B: 



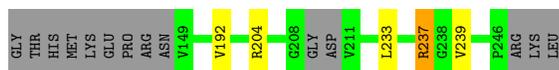
- Molecule 1: response regulator PHOP

Chain C: 



- Molecule 1: response regulator PHOP

Chain D: 



- Molecule 1: response regulator PHOP

Chain E: 



- Molecule 1: response regulator PHOP

Chain F: 



4 Data and refinement statistics (i)

EDS failed to run properly - this section will therefore be incomplete.

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	103.88Å 101.13Å 86.93Å 90.00° 126.72° 90.00°	Depositor
Resolution (Å)	20.00 – 1.78	Depositor
% Data completeness (in resolution range)	94.6 (20.00-1.78)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.12 (at 1.78Å)	Xtriage
Refinement program	REFMAC 5.2	Depositor
R, R_{free}	0.196 , 0.238	Depositor
Wilson B-factor (Å ²)	26.1	Xtriage
Anisotropy	0.170	Xtriage
Estimated twinning fraction	0.025 for -k,-h,-1/2*h+1/2*k-l 0.027 for k,h,-1/2*h-1/2*k-l 0.480 for h,-k,-h-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	0 of 65214 reflections	Xtriage
Total number of atoms	5358	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.08% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities 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: UNX, K, PO4, CL

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	0.82	0/827	0.81	0/1123
1	B	0.72	0/872	0.84	2/1183 (0.2%)
1	C	0.66	0/779	0.71	0/1057
1	D	0.81	0/814	0.78	0/1104
1	E	0.75	0/872	0.86	2/1183 (0.2%)
1	F	0.68	0/782	0.69	0/1062
All	All	0.74	0/4946	0.79	4/6712 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	E	223	ARG	NE-CZ-NH2	8.58	124.59	120.30
1	B	223	ARG	NE-CZ-NH1	8.52	124.56	120.30
1	B	223	ARG	NE-CZ-NH2	-8.22	116.19	120.30
1	E	223	ARG	NE-CZ-NH1	-7.15	116.72	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	805	0	809	12	0
1	B	849	0	854	12	0
1	C	760	0	777	13	0
1	D	793	0	801	4	0
1	E	849	0	854	10	0
1	F	763	0	773	8	0
2	A	5	0	0	0	0
2	D	14	0	0	0	0
2	E	5	0	0	0	0
3	A	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
5	B	1	0	0	1	0
5	D	1	0	0	1	0
5	E	2	0	0	1	0
6	B	15	0	6	0	0
7	A	108	0	0	0	0
7	B	72	0	0	0	0
7	C	65	0	0	4	0
7	D	107	0	0	0	0
7	E	70	0	0	0	0
7	F	67	0	0	1	0
All	All	5358	0	4874	57	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 6.

The worst 5 of 57 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:F:210:ASP:O	1:F:213:VAL:HG12	1.76	0.84
1:D:237:ARG:NE	1:D:237:ARG:H	1.80	0.79
1:A:150:ARG:CG	1:A:150:ARG:HH11	1.94	0.79
1:B:204:ARG:HD3	7:C:306:HOH:O	1.83	0.78
1:C:149:VAL:HG13	1:C:150:ARG:H	1.52	0.74

There are no symmetry-related clashes.

5.3 Torsion angles

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	97/110 (88%)	93 (96%)	4 (4%)	0	100	100
1	B	102/110 (93%)	93 (91%)	8 (8%)	1 (1%)	22	6
1	C	89/110 (81%)	86 (97%)	3 (3%)	0	100	100
1	D	93/110 (84%)	90 (97%)	3 (3%)	0	100	100
1	E	102/110 (93%)	95 (93%)	6 (6%)	1 (1%)	22	6
1	F	90/110 (82%)	89 (99%)	1 (1%)	0	100	100
All	All	573/660 (87%)	546 (95%)	25 (4%)	2 (0%)	43	30

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	145	GLU
1	E	145	GLU

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	89/99 (90%)	85 (96%)	4 (4%)	38	16
1	B	94/99 (95%)	91 (97%)	3 (3%)	51	29
1	C	85/99 (86%)	77 (91%)	8 (9%)	13	2
1	D	88/99 (89%)	86 (98%)	2 (2%)	63	43
1	E	94/99 (95%)	90 (96%)	4 (4%)	40	18
1	F	86/99 (87%)	79 (92%)	7 (8%)	17	4
All	All	536/594 (90%)	508 (95%)	28 (5%)	32	12

5 of 28 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	233	LEU
1	D	233	LEU
1	F	236	LEU
1	C	236	LEU
1	C	245	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	148	ASN
1	F	148	ASN

5.3.3 RNA [i](#)

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 19 ligands modelled in this entry, 4 are unknown and 7 are monoatomic - leaving 8 for Mogul analysis.

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	PO4	A	1004	-	4,4,4	0.37	0	6,6,6	0.37	0
6	GLY	B	4001	-	4,4,4	1.19	1 (25%)	4,4,4	1.67	1 (25%)
6	GLY	B	4002	-	4,4,4	1.06	1 (25%)	4,4,4	1.89	1 (25%)
6	GLY	B	4003	-	4,4,4	1.13	1 (25%)	4,4,4	1.95	1 (25%)
2	PO4	D	1001[A]	-	0,3,4	0.00	-	0,3,6	0.00	-
2	PO4	D	1001[B]	-	0,3,4	0.00	-	0,3,6	0.00	-
2	PO4	D	1002	-	4,4,4	0.37	0	6,6,6	0.32	0
2	PO4	E	1003	-	4,4,4	0.26	0	6,6,6	0.32	0

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	PO4	A	1004	-	-	0/0/0/0	0/0/0/0
6	GLY	B	4001	-	-	0/2/2/2	0/0/0/0
6	GLY	B	4002	-	-	0/2/2/2	0/0/0/0
6	GLY	B	4003	-	-	0/2/2/2	0/0/0/0
2	PO4	D	1001[A]	-	-	0/0/0/0	0/0/0/0
2	PO4	D	1001[B]	-	-	0/0/0/0	0/0/0/0
2	PO4	D	1002	-	-	0/0/0/0	0/0/0/0
2	PO4	E	1003	-	-	0/0/0/0	0/0/0/0

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	4001	GLY	OXT-C	-2.28	1.22	1.30
6	B	4003	GLY	OXT-C	-2.08	1.23	1.30
6	B	4002	GLY	OXT-C	-2.05	1.23	1.30

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	4003	GLY	OXT-C-O	-3.28	114.94	123.30
6	B	4002	GLY	OXT-C-O	-3.13	115.32	123.30
6	B	4001	GLY	OXT-C-O	-2.71	116.40	123.30

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

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

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

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

6.3 Carbohydrates

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

6.4 Ligands

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

6.5 Other polymers

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