



wwPDB X-ray Structure Validation Summary Report

Feb 28, 2014 – 07:57 PM GMT

PDB ID : 3AXX
Title : Functional analysis of hyperthermophilic endocellulase from the Archaeon Pyrococcus horikoshii
Authors : Kim, H.-W.; Ishikawa, K.
Deposited on : 2011-04-18
Resolution : 1.90 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>

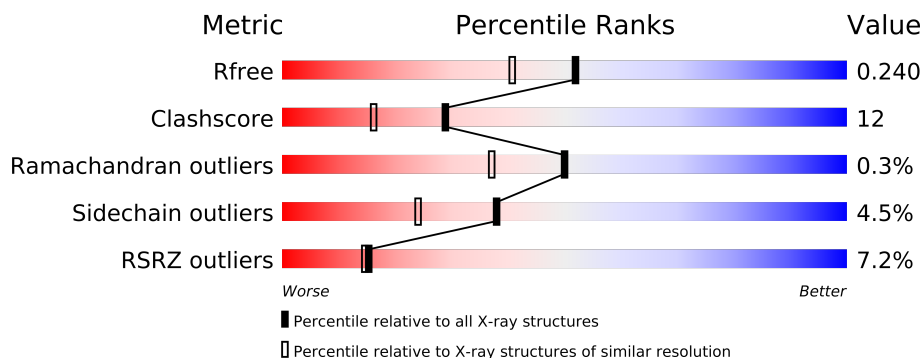
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	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 1.90 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 ≥ 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	458	
1	B	458	
1	C	458	

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	PO4	A	461	-	X

2 Entry composition i

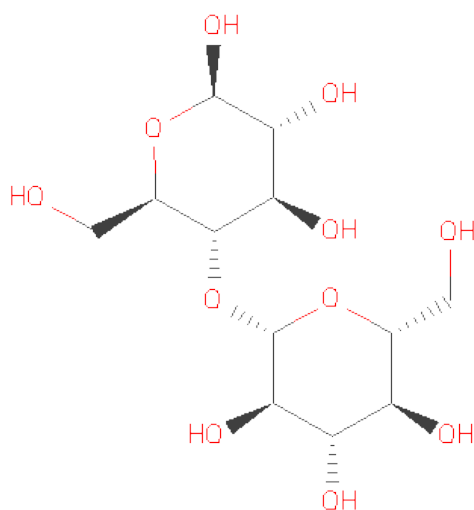
There are 4 unique types of molecules in this entry. The entry contains 9814 atoms, of which 0 are hydrogen and 0 are deuterium.

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 458aa long hypothetical endo-1,4-beta-glucanase.

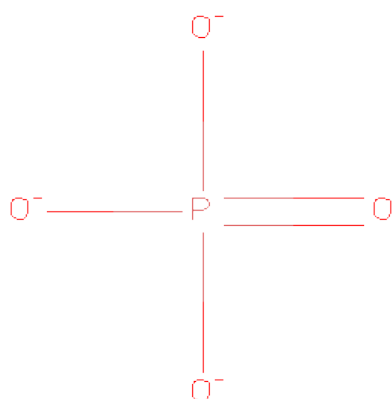
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	377	Total	C	N	O	S	0	0	0
			3071	2002	502	557	10			
1	B	379	Total	C	N	O	S	0	0	0
			3090	2015	504	561	10			
1	C	378	Total	C	N	O	S	0	0	0
			3083	2011	503	559	10			

- Molecule 2 is SUGAR (CELLOBIOSE) (three-letter code: CBI) (formula: C₁₂H₂₂O₁₁).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			23	12	11		
2	B	1	Total	C	O	0	0
			23	12	11		
2	C	1	Total	C	O	0	0
			23	12	11		

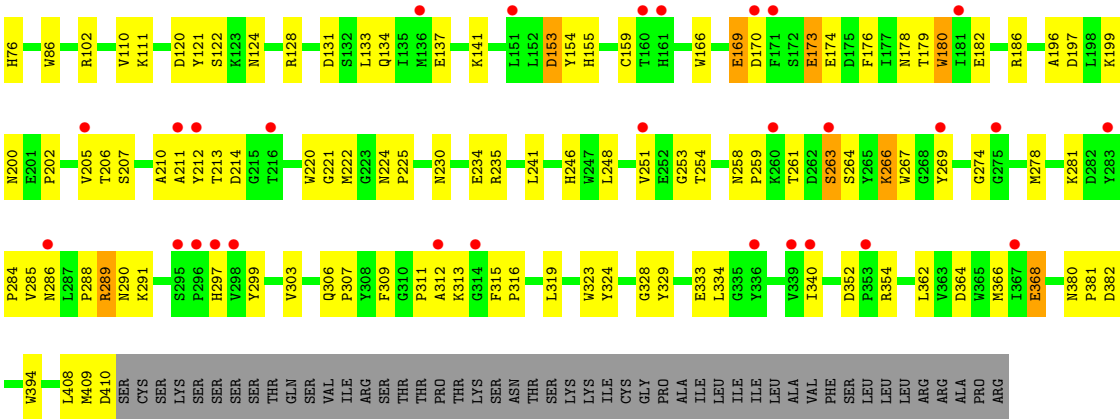
- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	192	Total	O	0	0
			192	192		
4	B	189	Total	O	0	0
			189	189		
4	C	105	Total	O	0	0
			105	105		



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	162.47Å 58.49Å 138.50Å 90.00° 109.33° 90.00°	Depositor
Resolution (Å)	50.00 – 1.90 33.42 – 1.90	Depositor EDS
% Data completeness (in resolution range)	94.6 (50.00-1.90) 94.7 (33.42-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.69 (at 1.91Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.228 , 0.241 0.226 , 0.240	Depositor DCC
R_{free} test set	4609 reflections (5.02%)	DCC
Wilson B-factor (Å ²)	26.3	Xtriage
Anisotropy	0.465	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 46.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 91847 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9814	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.62% 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: PO4, CBI

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	0.38	0/3182	0.69	2/4344 (0.0%)
1	B	0.40	1/3202 (0.0%)	0.71	2/4372 (0.0%)
1	C	0.36	0/3195	0.70	1/4362 (0.0%)
All	All	0.38	1/9579 (0.0%)	0.70	5/13078 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	289	ARG	CA-CB	-5.17	1.42	1.53

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	289	ARG	CB-CG-CD	-6.66	94.30	111.60
1	B	33	TYR	N-CA-C	5.86	126.82	111.00
1	A	408	LEU	CA-CB-CG	5.43	127.79	115.30
1	A	197	ASP	N-CA-C	-5.16	97.08	111.00
1	C	197	ASP	N-CA-C	-5.16	97.08	111.00

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	3071	0	2910	54	0
1	B	3090	0	2926	71	0
1	C	3083	0	2919	98	0
2	A	23	0	22	0	0
2	B	23	0	22	0	0
2	C	23	0	22	1	0
3	A	15	0	0	0	0
4	A	192	0	0	10	1
4	B	189	0	0	8	0
4	C	105	0	0	2	0
All	All	9814	0	8821	223	1

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 12.

The worst 5 of 223 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:266:LYS:HD2	1:C:266:LYS:H	1.15	1.10
1:A:212:TYR:HB3	1:A:222:MET:HE2	1.37	1.07
1:C:333:GLU:HG2	1:C:334:LEU:HD23	1.49	0.91
1:C:67:ASN:HD21	1:C:102:ARG:HH11	1.18	0.91
1:A:111:LYS:HZ2	1:A:111:LYS:HB3	1.34	0.91

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
4:A:558:HOH:O	4:A:558:HOH:O[2_555]	1.97	0.23

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	375/458 (82%)	364 (97%)	11 (3%)	0	100	100
1	B	377/458 (82%)	364 (97%)	13 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	376/458 (82%)	337 (90%)	36 (10%)	3 (1%)	27	12
All	All	1128/1374 (82%)	1065 (94%)	60 (5%)	3 (0%)	50	37

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	312	ALA
1	C	289	ARG
1	C	210	ALA

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	324/396 (82%)	314 (97%)	10 (3%)	52	41
1	B	326/396 (82%)	313 (96%)	13 (4%)	42	29
1	C	325/396 (82%)	304 (94%)	21 (6%)	24	11
All	All	975/1188 (82%)	931 (96%)	44 (4%)	38	24

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	266	LYS
1	C	34	GLN
1	C	263	SER
1	B	316	PRO
1	B	408	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	67	ASN
1	B	124	ASN
1	C	124	ASN
1	B	62	HIS

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Mol	Chain	Res	Type
1	C	161	HIS

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 ⓘ

6 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	CBI	A	459	-	24,24,24	0.42	0	35,35,35	1.10	4 (11%)
3	PO4	A	460	-	4,4,4	0.89	0	6,6,6	0.31	0
3	PO4	A	461	-	4,4,4	0.86	0	6,6,6	0.31	0
3	PO4	A	462	-	4,4,4	0.88	0	6,6,6	0.31	0
2	CBI	B	459	-	24,24,24	0.42	0	35,35,35	1.12	2 (5%)
2	CBI	C	459	-	24,24,24	0.46	0	35,35,35	1.91	13 (37%)

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	CBI	A	459	-	-	0/8/48/48	0/2/2/2
3	PO4	A	460	-	-	0/0/0/0	0/0/0/0
3	PO4	A	461	-	-	0/0/0/0	0/0/0/0
3	PO4	A	462	-	-	0/0/0/0	0/0/0/0
2	CBI	B	459	-	-	0/8/48/48	0/2/2/2
2	CBI	C	459	-	-	0/8/48/48	0/2/2/2

There are no bond length outliers.

The worst 5 of 19 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	459	CBI	O5'-C1'-C2'	-4.43	103.00	109.86
2	B	459	CBI	C1'-O5'-C5'	-3.57	107.01	113.40
2	C	459	CBI	C3'-C4'-C5'	3.33	118.33	110.85
2	C	459	CBI	C1-O4'-C4'	-3.31	109.56	117.99
2	C	459	CBI	C4-C3-C2	-3.13	105.02	110.82

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	377/458 (82%)	0.25	27 (7%) 15 14	16, 29, 49, 58	11 (2%)
1	B	379/458 (82%)	0.35	21 (5%) 24 24	16, 32, 56, 66	10 (2%)
1	C	378/458 (82%)	0.62	34 (8%) 10 9	23, 43, 62, 79	9 (2%)
All	All	1134/1374 (82%)	0.41	82 (7%) 15 14	16, 34, 58, 79	30 (2%)

The worst 5 of 82 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	33	TYR	10.1
1	B	33	TYR	7.3
1	B	32	THR	5.7
1	C	136	MET	5.6
1	B	136	MET	5.2

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(\AA^2)	Q<0.9
3	PO4	A	461	5/5	0.12	2.28	45,46,47,48	0
2	CBI	B	459	23/23	0.15	1.70	30,39,42,47	0
2	CBI	A	459	23/23	0.17	1.45	44,49,50,53	0
3	PO4	A	462	5/5	0.11	1.09	58,59,60,61	0
2	CBI	C	459	23/23	0.13	-0.48	51,53,54,57	0
3	PO4	A	460	5/5	0.07	-1.00	39,39,41,42	0

6.5 Other polymers ⓘ

There are no such residues in this entry.