Full wwPDB X-ray Structure Validation Report (i)

Jan 31, 2016 – 10:29 PM GMT

PDB ID	:	1TUX
Title	:	HIGH RESOLUTION CRYSTAL STRUCTURE OF A THERMOSTABLE XYLANASE FROM THERMOASCUS AURANTIACUS
Authors	:	Natesh, R.; Bhanumoorthy, P.; Vithayathil, P.J.; Sekar, K.; Ramakumar, S.; Viswamitra, M.A.
Deposited on	:	1998-10-29
Resolution	:	1.80 Å(reported)

This is a Full wwPDB X-ray Structure 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/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

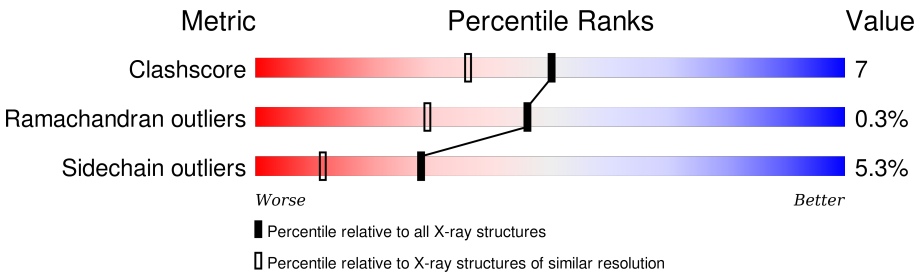
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)

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. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	301	86% 11% •

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2562 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 XYLANASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	301	2296	1446	399	446	5	0	0	0

There are 21 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	ASP	LYS	CONFLICT	UNP P23360
A	96	VAL	SER	CONFLICT	UNP P23360
A	115	ILE	LEU	CONFLICT	UNP P23360
A	120	ILE	LYS	CONFLICT	UNP P23360
A	145	ASN	LEU	CONFLICT	UNP P23360
A	158	ARG	GLN	CONFLICT	UNP P23360
A	181	LYS	TYR	CONFLICT	UNP P23360
A	185	SER	GLN	CONFLICT	UNP P23360
A	189	LYS	ASN	CONFLICT	UNP P23360
A	193	LYS	GLN	CONFLICT	UNP P23360
A	218	ILE	VAL	CONFLICT	UNP P23360
A	219	ASP	LEU	CONFLICT	UNP P23360
A	220	ALA	GLN	CONFLICT	UNP P23360
A	224	ASN	LEU	CONFLICT	UNP P23360
A	240	ILE	VAL	CONFLICT	UNP P23360
A	244	THR	SER	CONFLICT	UNP P23360
A	250	ASP	ASN	CONFLICT	UNP P23360
A	257	ASP	ASN	CONFLICT	UNP P23360
A	259	ASP	GLN	CONFLICT	UNP P23360
A	262	ILE	VAL	CONFLICT	UNP P23360
A	300	LEU	ASP	CONFLICT	UNP P23360

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	266	266	266	0	0

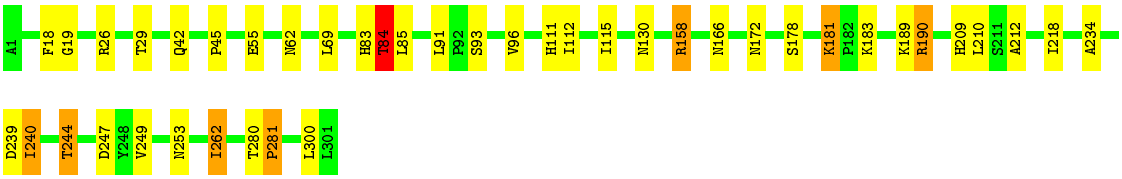
3 Residue-property plots (i)

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 was not executed.

- Molecule 1: XYLANASE

Chain A:



4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	41.69Å 68.10Å 51.44Å 90.00° 113.59° 90.00°	Depositor
Resolution (Å)	10.00 – 1.80	Depositor
% Data completeness (in resolution range)	92.0 (10.00-1.80)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.160 , 0.211	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2562	wwPDB-VP
Average B, all atoms (Å^2)	13.0	wwPDB-VP

5 Model quality (i)

5.1 Standard geometry (i)

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	0.61	0/2345	0.78	4/3203 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	84	THR	N-CA-C	8.12	132.94	111.00
1	A	83	HIS	C-N-CA	6.83	138.77	121.70
1	A	83	HIS	CA-C-N	-6.21	103.55	117.20
1	A	83	HIS	O-C-N	5.11	130.88	122.70

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2296	0	2250	32	0
2	A	266	0	0	6	0
All	All	2562	0	2250	32	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (32) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:158:ARG:HH11	1:A:158:ARG:HG3	1.42	0.84
1:A:244:THR:HG22	2:A:473:HOH:O	1.82	0.79
1:A:253:ASN:OD1	1:A:300:LEU:HD21	1.88	0.74
1:A:190:ARG:HH11	1:A:190:ARG:HG3	1.58	0.69
1:A:158:ARG:HH11	1:A:158:ARG:CG	2.07	0.67
1:A:111:HIS:HE1	2:A:419:HOH:O	1.78	0.65
1:A:166:ASN:HB2	2:A:577:HOH:O	1.97	0.63
1:A:178:SER:HB3	1:A:181:LYS:HE3	1.80	0.63
1:A:111:HIS:O	1:A:115:ILE:HG12	2.01	0.61
1:A:91:LEU:HD23	1:A:96:VAL:HG12	1.84	0.59
1:A:93:SER:HA	1:A:96:VAL:HG22	1.85	0.57
1:A:96:VAL:HG11	2:A:432:HOH:O	2.04	0.57
1:A:45:PRO:HB3	1:A:69:LEU:HD22	1.85	0.56
1:A:209:HIS:HD2	1:A:239:ASP:OD1	1.89	0.55
1:A:212:ALA:HA	1:A:240:ILE:HD11	1.90	0.54
1:A:19:GLY:HA3	1:A:42:GLN:NE2	2.23	0.54
1:A:158:ARG:NH1	1:A:158:ARG:CG	2.67	0.53
1:A:262:ILE:H	1:A:262:ILE:HD13	1.77	0.50
1:A:130:ASN:HD22	1:A:172:ASN:HB3	1.76	0.50
1:A:300:LEU:HG	1:A:300:LEU:O	2.13	0.49
1:A:85:LEU:HD13	1:A:112:ILE:HG23	1.96	0.48
1:A:183:LYS:HB2	2:A:543:HOH:O	2.16	0.46
1:A:19:GLY:HA3	1:A:42:GLN:HE21	1.81	0.45
1:A:189:LYS:HA	1:A:189:LYS:HE2	1.97	0.45
1:A:280:THR:N	1:A:281:PRO:HD3	2.31	0.45
1:A:190:ARG:NH1	1:A:190:ARG:HG3	2.28	0.45
1:A:244:THR:HG23	1:A:247:ASP:OD2	2.16	0.45
1:A:55:GLU:OE1	1:A:111:HIS:HD2	2.00	0.44
1:A:178:SER:HB2	2:A:463:HOH:O	2.18	0.43
1:A:210:LEU:HB2	1:A:240:ILE:HB	2.02	0.40
1:A:249:VAL:HG13	1:A:300:LEU:HD22	2.04	0.40
1:A:234:ALA:HB2	1:A:262:ILE:CD1	2.51	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

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	299/301 (99%)	292 (98%)	6 (2%)	1 (0%)	46 29

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	84	THR

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	243/243 (100%)	230 (95%)	13 (5%)	28 11

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	PHE
1	A	26	ARG
1	A	29	THR
1	A	62	ASN
1	A	84	THR
1	A	158	ARG
1	A	181	LYS
1	A	190	ARG
1	A	218	ILE
1	A	240	ILE
1	A	244	THR
1	A	262	ILE
1	A	281	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	42	GLN
1	A	62	ASN
1	A	75	GLN
1	A	111	HIS
1	A	130	ASN
1	A	172	ASN
1	A	209	HIS
1	A	287	ASN
1	A	289	ASN
1	A	299	GLN

5.3.3 RNA (i)

There are no RNA molecules 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)

There are no ligands in this entry.

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates (i)

EDS was not executed - this section will therefore be empty.

6.4 Ligands (i)

EDS was not executed - this section will therefore be empty.

6.5 Other polymers (i)

EDS was not executed - this section will therefore be empty.