Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 01:08 PM GMT

PDB ID	:	3T2B
Title	:	Fructose-1,6-bisphosphate aldolase/phosphatase from Thermoproteus neutrophilus, ligand free
Authors	:	Du, J.; Say, R.; Lue, W.; Fuchs, G.; Einsle, O.
Deposited on	:	2011-07-22
Resolution	:	1.52 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 ⓘ symbol.

The following versions of software and data (see references ①) were used in the production of this report:

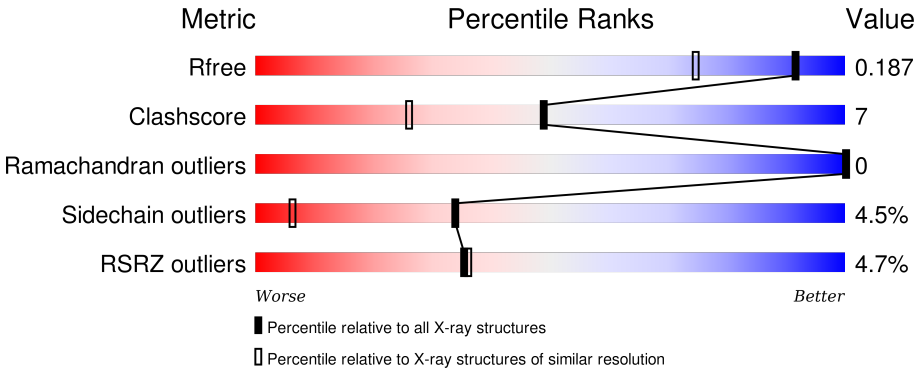
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	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 1.52 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}	91344	2658 (1.54-1.50)
Clashscore	102246	2887 (1.54-1.50)
Ramachandran outliers	100387	2818 (1.54-1.50)
Sidechain outliers	100360	2816 (1.54-1.50)
RSRZ outliers	91569	2660 (1.54-1.50)

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.

Mol	Chain	Length	Quality of chain
1	A	407	4% 73% 17% • 7%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3357 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 Fructose-1,6-bisphosphate aldolase/phosphatase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	379	Total	C	N	O	S	0	10	0
			3035	1963	515	544	13			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	400	LEU	-	EXPRESSION TAG	UNP B1YAL1
A	401	GLU	-	EXPRESSION TAG	UNP B1YAL1
A	402	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	403	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	404	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	405	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	406	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	407	HIS	-	EXPRESSION TAG	UNP B1YAL1

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Mg	0	0
			2	2		

- Molecule 3 is water.

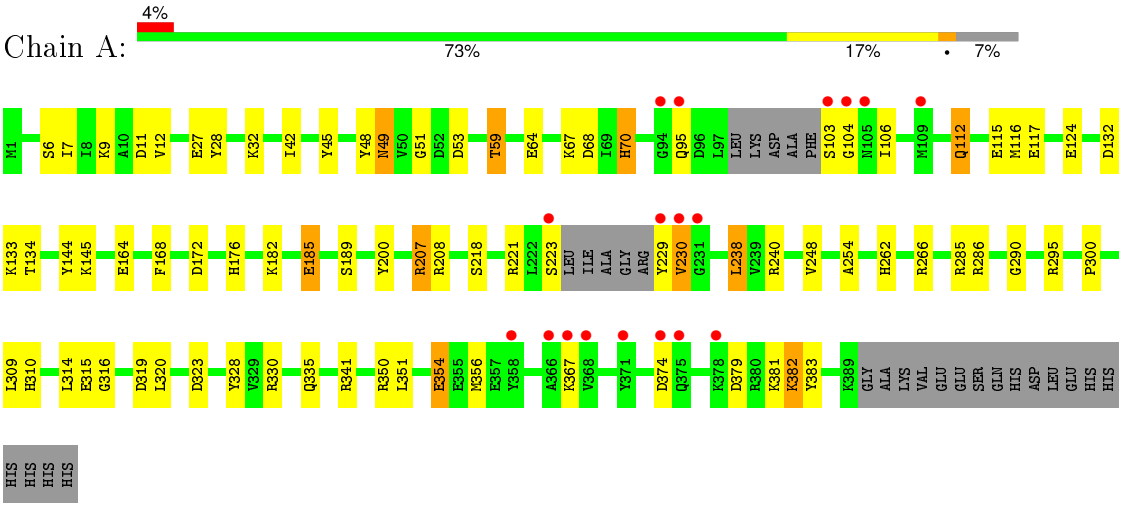
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	320	Total	O	0	0
			320	320		

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.

- Molecule 1: Fructose-1,6-bisphosphate aldolase/phosphatase

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α, β, γ	112.53Å 112.53Å 151.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	54.79 – 1.52 54.79 – 1.52	Depositor EDS
% Data completeness (in resolution range)	99.9 (54.79-1.52) 99.9 (54.79-1.52)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$< I/\sigma(I) >$ [1]	4.88 (at 1.52Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.165 , 0.188 0.163 , 0.187	Depositor DCC
R_{free} test set	3740 reflections (5.30%)	DCC
Wilson B-factor (Å^2)	13.4	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 44.9	EDS
Estimated twinning fraction	0.024 for -1/2*h+1/2*k-1/2*l,1/2*h-1/2*k-1/2*l,-h-k 0.032 for -1/2*h-1/2*k+1/2*l,-1/2*h-1/2*k-1/2*l,h-k	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.46$, $< L^2 > = 0.29$	Xtriage
Outliers	0 of 74283 reflections	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	3357	wwPDB-VP
Average B, all atoms (Å^2)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.95% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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

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	1.51	15/3144 (0.5%)	1.39	28/4255 (0.7%)

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	218	SER	CB-OG	8.85	1.53	1.42
1	A	117	GLU	CG-CD	-6.62	1.42	1.51
1	A	185	GLU	CB-CG	-6.04	1.40	1.52
1	A	48	TYR	CE2-CZ	6.02	1.46	1.38
1	A	248	VAL	CB-CG2	5.97	1.65	1.52
1	A	207	ARG	CG-CD	-5.78	1.37	1.51
1	A	6	SER	CB-OG	5.75	1.49	1.42
1	A	145	LYS	CE-NZ	5.64	1.63	1.49
1	A	45	TYR	CG-CD1	5.64	1.46	1.39
1	A	316	GLY	N-CA	5.61	1.54	1.46
1	A	185	GLU	CD-OE1	5.46	1.31	1.25
1	A	295	ARG	CG-CD	5.34	1.65	1.51
1	A	200	TYR	CE2-CZ	5.19	1.45	1.38
1	A	254	ALA	CA-CB	5.08	1.63	1.52
1	A	28	TYR	CD1-CE1	5.02	1.46	1.39

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	240	ARG	NE-CZ-NH2	-11.42	114.59	120.30
1	A	11	ASP	CB-CG-OD1	8.39	125.85	118.30
1	A	207	ARG	NE-CZ-NH1	8.11	124.36	120.30
1	A	59	THR	O-C-N	7.44	134.60	122.70
1	A	323	ASP	CB-CG-OD2	7.25	124.82	118.30
1	A	172	ASP	CB-CG-OD2	-6.97	112.02	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	207	ARG	NE-CZ-NH2	-6.78	116.91	120.30
1	A	330	ARG	NE-CZ-NH2	-6.72	116.94	120.30
1	A	240	ARG	NE-CZ-NH1	6.60	123.60	120.30
1	A	350	ARG	NE-CZ-NH1	-6.50	117.05	120.30
1	A	144	TYR	CZ-CE2-CD2	-6.46	113.98	119.80
1	A	341	ARG	NE-CZ-NH2	-6.41	117.10	120.30
1	A	116	MET	CG-SD-CE	-6.24	90.21	100.20
1	A	42	ILE	CG1-CB-CG2	5.95	124.49	111.40
1	A	319	ASP	CB-CG-OD2	-5.84	113.04	118.30
1	A	68	ASP	CB-CG-OD1	5.82	123.54	118.30
1	A	200	TYR	CZ-CE2-CD2	-5.71	114.66	119.80
1	A	117	GLU	OE1-CD-OE2	5.71	130.15	123.30
1	A	238	LEU	CB-CG-CD1	-5.70	101.31	111.00
1	A	328	TYR	CB-CG-CD1	-5.63	117.62	121.00
1	A	320	LEU	CB-CG-CD1	-5.47	101.70	111.00
1	A	32	LYS	CD-CE-NZ	-5.46	99.14	111.70
1	A	48	TYR	CB-CG-CD2	5.43	124.26	121.00
1	A	145	LYS	CD-CE-NZ	-5.31	99.48	111.70
1	A	124	GLU	OE1-CD-OE2	-5.09	117.19	123.30
1	A	115	GLU	OE1-CD-OE2	5.09	129.41	123.30
1	A	168	PHE	CB-CG-CD2	-5.02	117.29	120.80
1	A	266	ARG	NE-CZ-NH1	-5.00	117.80	120.30

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	3035	0	3055	44	0
2	A	2	0	0	0	0
3	A	320	0	0	17	3
All	All	3357	0	3055	44	3

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 (44) 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:208:ARG:HD3	3:A:602:HOH:O	1.18	1.30
1:A:310:HIS:HD2	3:A:584:HOH:O	1.40	1.01
1:A:207:ARG:HD2	3:A:519:HOH:O	1.70	0.92
1:A:164:GLU:OE2	3:A:687:HOH:O	2.00	0.78
1:A:262:HIS:HD2	3:A:593:HOH:O	1.73	0.72
1:A:189:SER:OG	3:A:691:HOH:O	2.05	0.70
1:A:27[B]:GLU:OE1	1:A:285:ARG:NH2	2.25	0.69
1:A:164:GLU:OE1	3:A:686:HOH:O	2.14	0.66
1:A:354:GLU:OE1	3:A:592:HOH:O	2.14	0.64
1:A:379:ASP:HA	1:A:382:LYS:HD2	1.80	0.63
1:A:134[A]:THR:CG2	1:A:300:PRO:HB3	2.29	0.62
1:A:223:SER:OG	1:A:230:VAL:HG13	1.99	0.62
1:A:310:HIS:CD2	3:A:584:HOH:O	2.27	0.62
1:A:382:LYS:HE3	1:A:382:LYS:N	2.15	0.62
1:A:133:LYS:O	1:A:134[A]:THR:HG22	2.01	0.60
1:A:70:HIS:HD2	1:A:106:ILE:H	1.50	0.58
1:A:309[A]:LEU:HD21	1:A:314:LEU:HD23	1.86	0.58
1:A:374:ASP:HB2	3:A:607:HOH:O	2.04	0.57
1:A:64:GLU:OE1	3:A:571:HOH:O	2.18	0.54
1:A:12:VAL:HG22	3:A:556:HOH:O	2.08	0.54
1:A:112:GLN:HA	1:A:112:GLN:HE21	1.74	0.52
1:A:49:ASN:ND2	1:A:290:GLY:H	2.08	0.51
1:A:164:GLU:HG2	3:A:688:HOH:O	2.12	0.49
1:A:315:GLU:HB2	3:A:584:HOH:O	2.12	0.48
1:A:133:LYS:C	1:A:134[A]:THR:CG2	2.82	0.48
1:A:51:GLY:HA3	1:A:132:ASP:OD2	2.13	0.48
1:A:354:GLU:CD	1:A:354:GLU:H	2.17	0.47
1:A:309[A]:LEU:CD2	1:A:314:LEU:HD23	2.44	0.47
1:A:351:LEU:HB2	1:A:356[B]:MET:HG2	1.97	0.47
1:A:379:ASP:HB2	1:A:383:TYR:CE2	2.49	0.47
1:A:59:THR:HG21	1:A:309[B]:LEU:HD11	1.98	0.46
1:A:207:ARG:CD	3:A:519:HOH:O	2.45	0.45
1:A:103:SER:HA	1:A:104:GLY:HA2	1.68	0.44
1:A:335[B]:GLN:HG2	3:A:587:HOH:O	2.15	0.44
1:A:382:LYS:HE3	1:A:382:LYS:H	1.82	0.44
1:A:176:HIS:HB2	1:A:221:ARG:CZ	2.48	0.44
1:A:27[B]:GLU:OE2	1:A:285:ARG:NH1	2.53	0.42
1:A:70:HIS:CD2	1:A:106:ILE:H	2.35	0.41
1:A:382:LYS:HE3	1:A:382:LYS:HB3	1.69	0.41
1:A:7:ILE:HD12	1:A:238:LEU:HG	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:185:GLU:CD	1:A:208:ARG:HH22	2.24	0.41
1:A:49:ASN:HA	1:A:53:ASP:O	2.21	0.40
1:A:208:ARG:CD	3:A:602:HOH:O	2.08	0.40
1:A:133:LYS:C	1:A:134[A]:THR:HG23	2.42	0.40

All (3) 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	Interatomic distance (Å)	Clash overlap (Å)
3:A:574:HOH:O	3:A:574:HOH:O[8_555]	1.13	1.07
3:A:554:HOH:O	3:A:554:HOH:O[3_565]	1.98	0.22
3:A:619:HOH:O	3:A:619:HOH:O[8_555]	2.11	0.09

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	383/407 (94%)	376 (98%)	7 (2%)	0	100 100

There are no Ramachandran outliers to report.

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	318/331 (96%)	304 (96%)	14 (4%)	35 7

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LYS
1	A	49	ASN
1	A	67	LYS
1	A	70	HIS
1	A	95	GLN
1	A	112	GLN
1	A	182	LYS
1	A	229	TYR
1	A	230	VAL
1	A	286	ARG
1	A	354	GLU
1	A	367	LYS
1	A	381	LYS
1	A	382	LYS

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	49	ASN
1	A	70	HIS
1	A	112	GLN
1	A	262	HIS
1	A	310	HIS

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

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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, 95^{th} 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	379/407 (93%)	0.03	18 (4%) 35 36	5, 15, 38, 58	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	229	TYR	7.2
1	A	230	VAL	5.1
1	A	104	GLY	4.1
1	A	366	ALA	3.4
1	A	231	GLY	3.3
1	A	378	LYS	3.2
1	A	375	GLN	3.0
1	A	223	SER	3.0
1	A	109	MET	3.0
1	A	103	SER	2.9
1	A	358	TYR	2.9
1	A	105	ASN	2.8
1	A	367	LYS	2.6
1	A	94	GLY	2.6
1	A	95	GLN	2.5
1	A	368	VAL	2.2
1	A	374	ASP	2.1
1	A	371	TYR	2.1

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 (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^{th} 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	RSCC	RSR	LLDF	B-factors(Å^2)	Q<0.9
2	MG	A	409	1/1	0.99	0.05	-1.22	10,10,10,10	0
2	MG	A	408	1/1	0.98	0.05	-	12,12,12,12	0

6.5 Other polymers (i)

There are no such residues in this entry.