



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2014 – 03:56 AM GMT

PDB ID : 2H0A  
Title : Crystal structure of probable Transcription regulator from *Thermus thermophilus*  
Authors : Kumarevel, T.S.; Shinkai, A.; Yokoyama, S.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 2006-05-14  
Resolution : 2.80 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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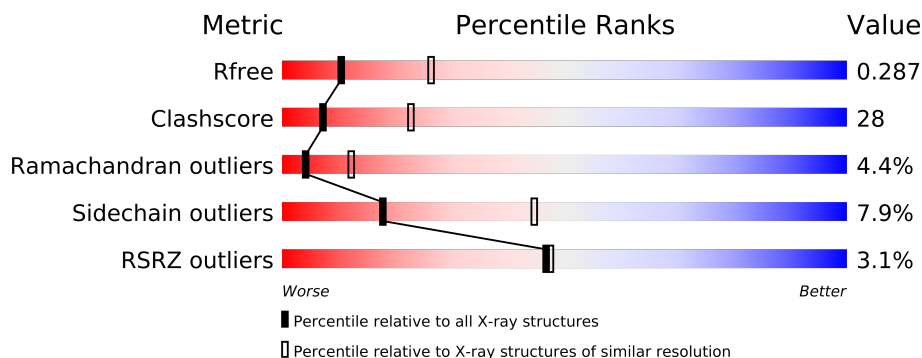
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 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 2.80 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))
$R_{free}$	66092	1799 (2.80-2.80)
Clashscore	79885	2295 (2.80-2.80)
Ramachandran outliers	78287	2252 (2.80-2.80)
Sidechain outliers	78261	2254 (2.80-2.80)
RSRZ outliers	66119	1802 (2.80-2.80)

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  $\geq 3$ , 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	276	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2176 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 Transcriptional regulator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	258	Total	C	N	O	S	24	0	0
			1991	1269	355	364	3			

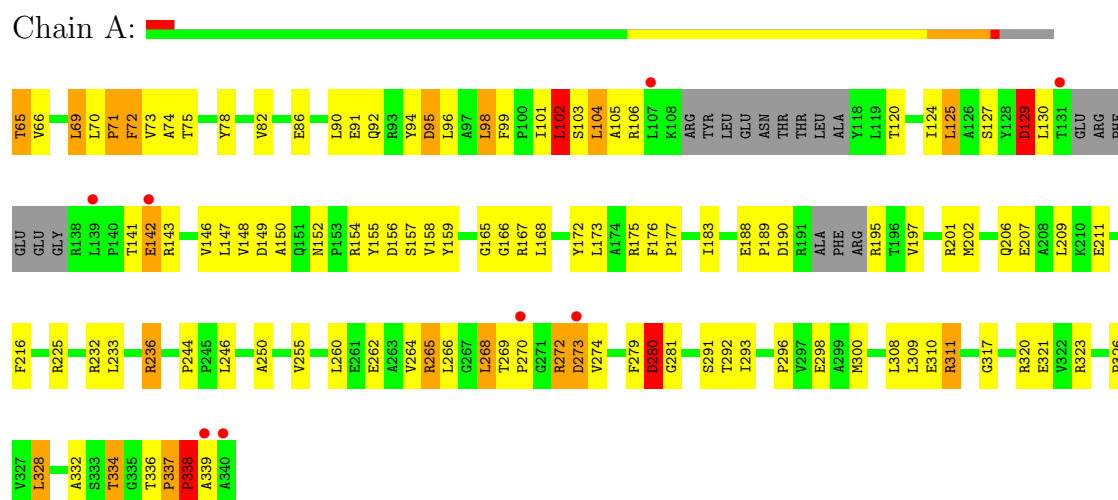
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	185	Total	O	0	0
			185	185		

### 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 ( $\text{RSRZ} > 2$ ). 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: Transcriptional regulator



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.45Å 74.45Å 138.68Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.79 – 2.80 49.22 – 2.60	Depositor EDS
% Data completeness (in resolution range)	97.7 (19.79-2.80) 97.6 (49.22-2.60)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.13 (at 2.61Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.224 , 0.268 0.241 , 0.287	Depositor DCC
$R_{free}$ test set	483 reflections (4.85%)	DCC
Wilson B-factor (Å <sup>2</sup> )	49.4	Xtriage
Anisotropy	0.186	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 48.6	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 22870 reflections	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	2176	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.04% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

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	0.36	0/2031	0.72	4/2755 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	280	ASP	CB-CA-C	-7.86	94.68	110.40
1	A	102	LEU	N-CA-C	-5.56	95.99	111.00
1	A	166	GLY	N-CA-C	-5.36	99.70	113.10
1	A	129	ASP	N-CA-C	5.14	124.88	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	1991	0	1991	110	0
2	A	185	0	0	10	0
All	All	2176	0	1991	110	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 28.

All (110) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:141:THR:HG22	1:A:143:ARG:H	1.17	1.03
1:A:207:GLU:HG3	2:A:365:HOH:O	1.79	0.83
1:A:265:ARG:C	1:A:266:LEU:HD12	2.04	0.78
1:A:311:ARG:NH2	1:A:317:GLY:O	2.17	0.77
1:A:279:PHE:O	1:A:280:ASP:HB2	1.84	0.76
1:A:125:LEU:HB3	1:A:147:LEU:HD23	1.67	0.75
1:A:66:VAL:HG22	1:A:95:ASP:HB2	1.69	0.74
1:A:69:LEU:H	1:A:69:LEU:HD13	1.53	0.72
1:A:70:LEU:HB3	1:A:101:ILE:HD12	1.72	0.71
1:A:269:THR:H	1:A:270:PRO:HD2	1.55	0.70
1:A:262:GLU:O	1:A:266:LEU:HD13	1.93	0.68
1:A:207:GLU:O	1:A:211:GLU:HG3	1.95	0.66
1:A:141:THR:HG22	1:A:143:ARG:N	2.01	0.66
1:A:265:ARG:O	1:A:266:LEU:HD12	1.94	0.66
1:A:152:ASN:ND2	1:A:155:TYR:HD2	1.94	0.65
1:A:69:LEU:HD12	1:A:96:LEU:HD11	1.79	0.64
1:A:102:LEU:HD12	1:A:102:LEU:N	2.12	0.64
1:A:244:PRO:HB3	1:A:273:ASP:HA	1.81	0.63
1:A:264:VAL:C	1:A:266:LEU:H	2.01	0.63
1:A:148:VAL:HG23	1:A:158:VAL:HG22	1.80	0.63
1:A:268:LEU:HD12	1:A:270:PRO:HD2	1.80	0.62
1:A:225:ARG:HG3	1:A:225:ARG:HH11	1.64	0.62
1:A:269:THR:N	1:A:270:PRO:HD2	2.14	0.62
1:A:152:ASN:HD22	1:A:155:TYR:HD2	1.47	0.61
1:A:188:GLU:HB3	1:A:189:PRO:HD3	1.83	0.60
1:A:273:ASP:HB2	2:A:343:HOH:O	2.02	0.60
1:A:146:VAL:HG12	1:A:308:LEU:HD13	1.85	0.59
1:A:202:MET:O	1:A:206:GLN:HG3	2.03	0.59
1:A:279:PHE:O	1:A:280:ASP:CB	2.53	0.57
1:A:209:LEU:HD12	1:A:216:PHE:HB2	1.86	0.56
1:A:268:LEU:O	1:A:273:ASP:HB3	2.06	0.56
1:A:71:PRO:HG2	1:A:98:LEU:HD21	1.86	0.56
1:A:197:VAL:O	1:A:201:ARG:HG3	2.05	0.56
1:A:65:THR:HG23	1:A:66:VAL:H	1.71	0.56
1:A:167:ARG:HD2	2:A:368:HOH:O	2.05	0.55
1:A:264:VAL:C	1:A:266:LEU:N	2.61	0.54
1:A:69:LEU:CD1	1:A:69:LEU:H	2.21	0.53
1:A:159:TYR:HE1	1:A:321:GLU:HG3	1.72	0.53
1:A:273:ASP:CG	1:A:274:VAL:N	2.60	0.53
1:A:236:ARG:HD3	2:A:370:HOH:O	2.08	0.53
1:A:175:ARG:NH1	2:A:512:HOH:O	2.42	0.53
1:A:272:ARG:N	2:A:476:HOH:O	2.41	0.52
1:A:232:ARG:HG2	1:A:262:GLU:HB2	1.91	0.52

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:73:VAL:O	1:A:74:ALA:HB3	2.09	0.52
1:A:125:LEU:HB3	1:A:147:LEU:CD2	2.39	0.52
1:A:69:LEU:HD12	1:A:96:LEU:CD1	2.40	0.52
1:A:152:ASN:ND2	1:A:155:TYR:CD2	2.78	0.52
1:A:159:TYR:CZ	1:A:323:ARG:HB2	2.45	0.52
1:A:156:ASP:OD1	1:A:311:ARG:NH1	2.43	0.52
1:A:106:ARG:O	1:A:106:ARG:HG3	2.10	0.51
1:A:99:PHE:O	1:A:101:ILE:HG13	2.10	0.51
1:A:129:ASP:CG	1:A:130:LEU:N	2.62	0.50
1:A:272:ARG:HH11	1:A:272:ARG:HG3	1.78	0.49
1:A:148:VAL:HG23	1:A:158:VAL:CG2	2.43	0.49
1:A:272:ARG:HB2	1:A:272:ARG:CZ	2.41	0.49
1:A:209:LEU:CD1	1:A:216:PHE:HB2	2.43	0.49
1:A:124:ILE:HG13	1:A:308:LEU:HD22	1.94	0.49
1:A:268:LEU:CD1	1:A:270:PRO:HD2	2.43	0.48
1:A:165:GLY:HA2	1:A:168:LEU:HB2	1.95	0.48
1:A:268:LEU:HB2	1:A:272:ARG:CB	2.44	0.48
1:A:183:ILE:HB	1:A:250:ALA:O	2.14	0.48
1:A:72:PHE:CD1	1:A:72:PHE:C	2.87	0.47
1:A:156:ASP:CG	1:A:311:ARG:HH11	2.17	0.47
1:A:269:THR:N	1:A:270:PRO:CD	2.78	0.47
1:A:92:GLN:HG3	1:A:309:LEU:CD1	2.45	0.47
1:A:298:GLU:N	1:A:298:GLU:OE1	2.36	0.47
1:A:172:TYR:CD1	1:A:328:LEU:HD11	2.49	0.46
1:A:332:ALA:C	1:A:334:THR:H	2.18	0.46
1:A:337:PRO:HB2	1:A:338:PRO:CA	2.45	0.46
1:A:190:ASP:O	1:A:195:ARG:N	2.48	0.46
1:A:310:GLU:OE1	1:A:320:ARG:NH1	2.40	0.46
1:A:268:LEU:HD12	1:A:270:PRO:CD	2.46	0.46
1:A:332:ALA:C	1:A:334:THR:N	2.69	0.46
1:A:269:THR:O	1:A:274:VAL:O	2.34	0.46
1:A:124:ILE:CG1	1:A:308:LEU:HD22	2.46	0.46
1:A:82:VAL:O	1:A:86:GLU:HG3	2.15	0.46
1:A:120:THR:O	1:A:143:ARG:HD2	2.16	0.46
1:A:146:VAL:HG11	1:A:308:LEU:HB2	1.97	0.46
1:A:338:PRO:HG2	1:A:339:ALA:N	2.32	0.45
1:A:236:ARG:NE	2:A:510:HOH:O	2.50	0.45
1:A:246:LEU:O	1:A:274:VAL:HA	2.16	0.44
1:A:104:LEU:HD21	2:A:401:HOH:O	2.16	0.44
1:A:264:VAL:O	1:A:266:LEU:N	2.50	0.44
1:A:70:LEU:HB3	1:A:101:ILE:CD1	2.45	0.44
1:A:72:PHE:CG	1:A:73:VAL:N	2.83	0.44

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:281:GLY:HA2	1:A:292:THR:HG21	1.98	0.44
1:A:92:GLN:HG3	1:A:309:LEU:HD11	1.99	0.44
1:A:90:LEU:HD23	1:A:94:TYR:O	2.17	0.43
1:A:75:THR:OG1	1:A:78:TYR:CD2	2.71	0.43
1:A:69:LEU:CD1	1:A:69:LEU:N	2.81	0.43
1:A:101:ILE:CG2	1:A:102:LEU:N	2.80	0.43
1:A:71:PRO:HG2	1:A:98:LEU:CD2	2.48	0.43
1:A:268:LEU:HB2	1:A:272:ARG:HB3	2.00	0.43
1:A:148:VAL:O	1:A:149:ASP:HB3	2.18	0.43
1:A:183:ILE:HG21	1:A:255:VAL:HG11	2.01	0.42
1:A:141:THR:HG22	1:A:142:GLU:N	2.33	0.42
1:A:91:GLU:HB3	2:A:488:HOH:O	2.19	0.42
1:A:296:PRO:O	1:A:300:MET:HG3	2.19	0.42
1:A:273:ASP:CG	1:A:274:VAL:H	2.22	0.42
1:A:225:ARG:HG3	1:A:225:ARG:NH1	2.34	0.42
1:A:336:THR:HG22	1:A:338:PRO:HA	2.02	0.42
1:A:104:LEU:HD13	1:A:105:ALA:N	2.35	0.41
1:A:159:TYR:HE1	1:A:321:GLU:CG	2.31	0.41
1:A:176:PHE:HA	1:A:177:PRO:HD3	1.86	0.41
1:A:291:SER:OG	1:A:334:THR:HB	2.20	0.41
1:A:150:ALA:O	1:A:157:SER:HB3	2.20	0.41
1:A:103:SER:HB3	2:A:518:HOH:O	2.21	0.41
1:A:293:ILE:HG22	1:A:326:PRO:HB2	2.04	0.40
1:A:146:VAL:HG13	1:A:146:VAL:O	2.22	0.40
1:A:260:LEU:HA	1:A:260:LEU:HD12	1.91	0.40

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	250/276 (91%)	222 (89%)	17 (7%)	11 (4%)	4	12

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	268	LEU
1	A	273	ASP
1	A	338	PRO
1	A	127	SER
1	A	129	ASP
1	A	272	ARG
1	A	71	PRO
1	A	72	PHE
1	A	265	ARG
1	A	280	ASP
1	A	337	PRO

### 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	202/221 (91%)	186 (92%)	16 (8%)	18 44

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	65	THR
1	A	69	LEU
1	A	95	ASP
1	A	98	LEU
1	A	102	LEU
1	A	104	LEU
1	A	125	LEU
1	A	142	GLU
1	A	154	ARG
1	A	173	LEU
1	A	233	LEU
1	A	236	ARG
1	A	311	ARG
1	A	328	LEU
1	A	334	THR
1	A	338	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	228	GLN
1	A	306	GLN
1	A	316	GLN

### 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 ⓘ

There are no ligands in this entry.

## 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<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	258/276 (93%)	-0.22	8 (3%) 47 47	29, 49, 96, 100	15 (5%)

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	273	ASP	6.3
1	A	340	ALA	3.6
1	A	339	ALA	3.5
1	A	131	THR	3.3
1	A	270	PRO	3.1
1	A	142	GLU	2.8
1	A	139	LEU	2.5
1	A	107	LEU	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 ⓘ

There are no carbohydrates in this entry.

### 6.4 Ligands ⓘ

There are no ligands in this entry.

### 6.5 Other polymers ⓘ

There are no such residues in this entry.