



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 26, 2014 – 08:26 PM GMT

PDB ID : 2O4I  
Title : Structure of TREX1 in complex with DNA  
Authors : Brucet, M.; Macias, M.J.; Fita, I.; Celada, A.  
Deposited on : 2006-12-04  
Resolution : 3.50 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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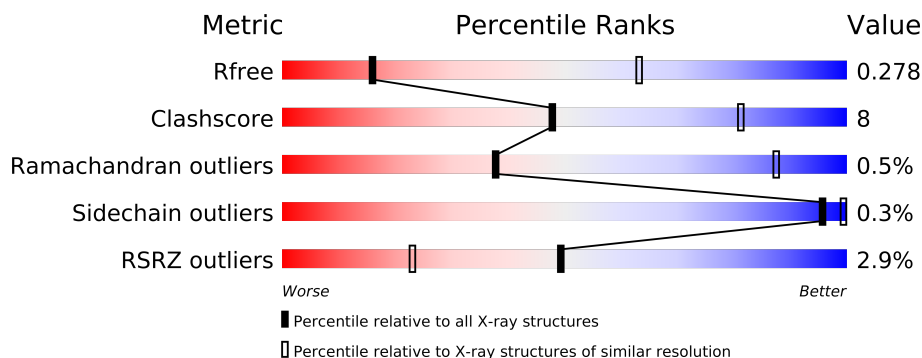
The following versions of software and data (see [references](#)) were used in the production of this report:

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 3.50 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	1243 (3.70-3.30)
Clashscore	79885	1039 (3.66-3.34)
Ramachandran outliers	78287	1000 (3.66-3.34)
Sidechain outliers	78261	1000 (3.66-3.34)
RSRZ outliers	66119	1243 (3.70-3.30)

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	C	25	
1	D	25	
2	A	247	
2	B	247	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3517 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 DNA chain called 5'-D(\*GP\*CP\*TP\*AP\*GP\*GP\*CP\*AP\*GP\*GP\*AP\*AP\*CP\*CP\*CP\*CP\*TP\*CP\*CP\*TP\*CP\*CP\*CP\*CP\*T)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	4	Total	C	N	O	P	0	0	0
			77	37	11	25	4			
1	D	4	Total	C	N	O	P	0	0	0
			77	37	11	25	4			

- Molecule 2 is a protein called Three prime repair exonuclease 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	218	Total	C	N	O	S	0	0	0
			1679	1063	293	314	9			
2	B	218	Total	C	N	O	S	0	0	0
			1684	1066	296	313	9			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	EXPRESSION TAG	UNP Q91XB0
A	0	LYS	-	EXPRESSION TAG	UNP Q91XB0
A	1	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	2	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	3	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	4	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	5	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	6	HIS	-	EXPRESSION TAG	UNP Q91XB0
A	7	PRO	-	EXPRESSION TAG	UNP Q91XB0
A	8	MET	-	EXPRESSION TAG	UNP Q91XB0
A	195	ALA	HIS	engineered	UNP Q91XB0
B	-1	MET	-	EXPRESSION TAG	UNP Q91XB0
B	0	LYS	-	EXPRESSION TAG	UNP Q91XB0
B	1	HIS	-	EXPRESSION TAG	UNP Q91XB0
B	2	HIS	-	EXPRESSION TAG	UNP Q91XB0

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Chain	Residue	Modelled	Actual	Comment	Reference
B	3	HIS	-	EXPRESSION TAG	UNP Q91XB0
B	4	HIS	-	EXPRESSION TAG	UNP Q91XB0
B	5	HIS	-	EXPRESSION TAG	UNP Q91XB0
B	6	HIS	-	EXPRESSION TAG	UNP Q91XB0
B	7	PRO	-	EXPRESSION TAG	UNP Q91XB0
B	8	MET	-	EXPRESSION TAG	UNP Q91XB0
B	195	ALA	HIS	engineered	UNP Q91XB0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	80.76Å 80.76Å 171.22Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.85 – 3.50 24.85 – 3.50	Depositor EDS
% Data completeness (in resolution range)	88.0 (24.85-3.50) 88.0 (24.85-3.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.16	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.25 (at 3.46Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.243 , 0.283 0.241 , 0.278	Depositor DCC
$R_{free}$ test set	306 reflections (4.78%)	DCC
Wilson B-factor (Å <sup>2</sup> )	88.5	Xtriage
Anisotropy	0.147	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 101.3	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.43$ , $\langle L^2 \rangle = 0.25$	Xtriage
Outliers	1 of 6708 reflections (0.015%)	Xtriage
$F_o, F_c$ correlation	0.86	EDS
Total number of atoms	3517	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	113.0	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	C	0.74	0/84	1.34	0/126
1	D	0.77	0/84	1.34	0/126
2	A	0.28	0/1718	0.44	0/2342
2	B	0.28	0/1723	0.45	0/2348
All	All	0.32	0/3609	0.53	0/4942

There are no bond length outliers.

There are no bond angle outliers.

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	C	77	0	46	0	0
1	D	77	0	46	0	0
2	A	1679	0	1685	31	0
2	B	1684	0	1693	29	0
All	All	3517	0	3470	55	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 8.

All (55) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:B:112:LEU:HD11	2:B:147:LEU:HD23	1.53	0.90
2:A:107:LEU:HD12	2:B:107:LEU:HD12	1.70	0.74
2:B:112:LEU:HD11	2:B:147:LEU:CD2	2.21	0.70
2:A:112:LEU:HD11	2:A:147:LEU:HD23	1.75	0.68
2:B:112:LEU:CD1	2:B:147:LEU:HD23	2.26	0.64
2:A:37:LEU:HD11	2:A:64:VAL:HG11	1.87	0.57
2:B:14:LEU:HD12	2:B:44:LEU:CD1	2.35	0.56
2:A:37:LEU:HD13	2:A:66:LYS:HD3	1.87	0.55
2:A:34:LEU:C	2:A:34:LEU:HD12	2.27	0.55
2:A:14:LEU:HD12	2:A:44:LEU:CD1	2.37	0.54
2:B:91:GLU:O	2:B:94:VAL:HG12	2.08	0.54
2:A:196:THR:HG22	2:B:62:ARG:CZ	2.37	0.53
2:A:14:LEU:HD12	2:A:44:LEU:HD12	1.90	0.53
2:A:85:THR:HA	2:A:195:ALA:HB1	1.91	0.53
2:B:37:LEU:HD13	2:B:66:LYS:HD3	1.92	0.51
2:B:85:THR:HA	2:B:195:ALA:HB1	1.92	0.51
2:A:112:LEU:CD1	2:A:147:LEU:HD23	2.41	0.51
2:B:37:LEU:HD11	2:B:64:VAL:HG11	1.94	0.49
2:A:119:CYS:SG	2:A:150:THR:HG22	2.52	0.49
2:A:17:LEU:HD22	2:A:18:ASP:N	2.28	0.49
2:B:69:LEU:HD11	2:B:107:LEU:HD23	1.94	0.48
2:A:112:LEU:HD11	2:A:147:LEU:CD2	2.42	0.48
2:A:131:PHE:HB2	2:A:132:PRO:HD3	1.95	0.48
2:B:34:LEU:HD12	2:B:34:LEU:C	2.33	0.48
2:B:27:SER:O	2:B:75:LYS:NZ	2.45	0.48
2:B:131:PHE:HB2	2:B:132:PRO:HD3	1.94	0.48
2:B:15:ILE:HB	2:B:121:LEU:HD23	1.95	0.48
2:B:158:ALA:HB2	2:B:218:TRP:CZ3	2.49	0.48
2:A:91:GLU:O	2:A:94:VAL:HG12	2.14	0.48
2:B:17:LEU:HD23	2:B:36:LEU:HG	1.97	0.47
2:A:34:LEU:HD13	2:A:36:LEU:HD13	1.97	0.46
2:B:112:LEU:HD22	2:B:150:THR:HG21	1.96	0.46
2:A:107:LEU:HD12	2:B:107:LEU:CD1	2.45	0.46
2:A:34:LEU:HD13	2:A:36:LEU:CD1	2.45	0.46
2:B:22:THR:HG22	2:B:77:CYS:SG	2.56	0.46
2:A:22:THR:HG22	2:A:77:CYS:SG	2.56	0.45
2:A:196:THR:HG22	2:B:62:ARG:NH2	2.31	0.45
2:A:17:LEU:HD23	2:A:36:LEU:CD1	2.46	0.45
2:B:186:LEU:HD22	2:B:210:TRP:CE2	2.52	0.44
2:A:16:PHE:CE2	2:A:205:LEU:HD13	2.53	0.44
2:B:13:THR:HG21	2:B:115:GLN:HB3	2.00	0.43
2:B:122:VAL:HG22	2:B:153:VAL:CG1	2.48	0.43
2:B:34:LEU:HD13	2:B:36:LEU:CD1	2.49	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:A:17:LEU:HD22	2:A:18:ASP:H	1.84	0.42
2:A:17:LEU:HD23	2:A:36:LEU:HD12	2.01	0.42
2:A:215:LEU:O	2:A:219:VAL:HG23	2.20	0.42
2:B:84:ILE:O	2:B:195:ALA:CB	2.67	0.42
2:A:62:ARG:CZ	2:B:196:THR:HG22	2.50	0.41
2:A:14:LEU:HD11	2:A:216:LEU:HD23	2.02	0.41
2:A:134:LEU:HD21	2:A:147:LEU:HD11	2.01	0.41
2:B:125:ASN:HD21	2:B:128:ARG:HE	1.69	0.41
2:A:37:LEU:HD11	2:A:64:VAL:CG1	2.48	0.41
2:A:179:LEU:HD12	2:A:207:ILE:HD12	2.03	0.41
2:B:215:LEU:O	2:B:219:VAL:HG23	2.21	0.40
2:A:155:SER:O	2:A:159:LEU:HD23	2.21	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	
2	A	214/247 (87%)	203 (95%)	10 (5%)	1 (0%)	38	87
2	B	214/247 (87%)	201 (94%)	12 (6%)	1 (0%)	38	87
All	All	428/494 (87%)	404 (94%)	22 (5%)	2 (0%)	38	87

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	A	10	HIS
2	B	10	HIS

### 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	
2	A	186/211 (88%)	186 (100%)	0	100	100
2	B	186/211 (88%)	185 (100%)	1 (0%)	94	98
All	All	372/422 (88%)	371 (100%)	1 (0%)	96	99

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	10	HIS

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

Mol	Chain	Res	Type
2	A	125	ASN
2	B	125	ASN
2	B	164	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	C	4/25 (16%)	1.84	1 (25%) 1 2	113, 113, 113, 113	0
1	D	4/25 (16%)	1.36	1 (25%) 1 2	113, 113, 113, 113	0
2	A	218/247 (88%)	0.37	7 (3%) 45 21	113, 113, 113, 114	0
2	B	218/247 (88%)	0.36	4 (1%) 65 33	113, 113, 113, 114	0
All	All	444/544 (81%)	0.38	13 (2%) 49 23	113, 113, 113, 114	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	1001	DC	4.1
1	D	1001	DC	3.6
2	B	51	GLN	2.6
2	B	18	ASP	2.6
2	A	9	GLY	2.6
2	A	51	GLN	2.6
2	B	80	GLY	2.4
2	A	10	HIS	2.3
2	A	83	GLU	2.3
2	A	53	HIS	2.2
2	B	81	ALA	2.0
2	A	50	SER	2.0
2	A	234	GLY	2.0

### 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.