



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 07:53 PM UTC

PDB ID : 1TPE / pdb_00001tpe
Title : COMPARISON OF THE STRUCTURES AND THE CRYSTAL CONTACTS
OF TRYPANOSOMAL TRIOSEPHOSPHATE ISOMERASE IN FOUR DIF-
FERENT CRYSTAL FORMS
Authors : Noble, M.E.M.; Radha Kishan, K.V.; Zeelen, J.Ph.; Wierenga, R.K.
Deposited on : 1994-02-28
Resolution : 2.10 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

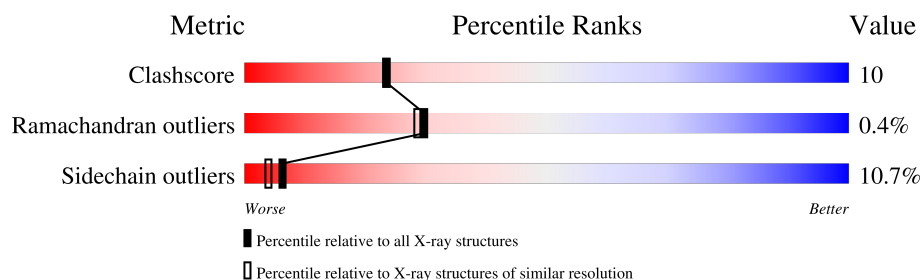
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)

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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	250	 69% 24% 6%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1989 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 TRIOSEPHOSPHATE ISOMERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	249	Total	C	N	O	S	0	0	0
			1889	1200	334	350	5			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	100	Total	O	0	0
			100	100		

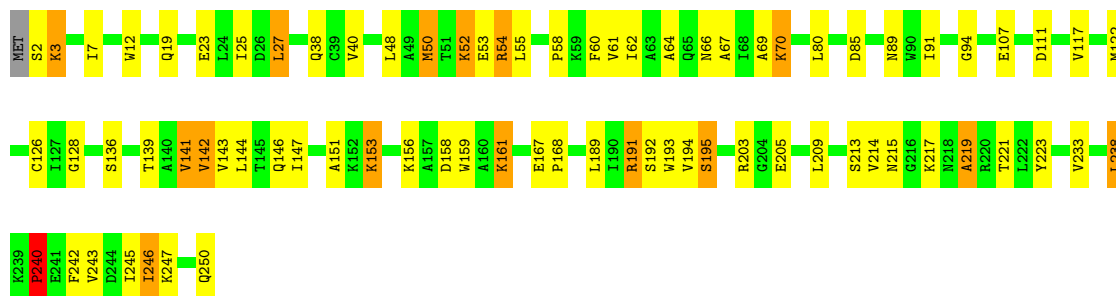
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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: TRIOSEPHOSPHATE ISOMERASE

Chain A: 



4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	95.40Å 48.20Å 67.50Å 90.00° 120.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.10	Depositor
% Data completeness (in resolution range)	(Not available) (15.00-2.10)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT, X-PLOR	Depositor
R, R_{free}	0.155 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1989	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

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	1.27	2/1923 (0.1%)	1.74	21/2606 (0.8%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	156	LYS	CE-NZ	-7.67	1.26	1.49
1	A	80	LEU	C-O	-5.65	1.19	1.24

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	168	PRO	CB-CA-C	-7.73	102.58	113.09
1	A	141	VAL	CB-CA-C	-7.62	101.94	111.70
1	A	54	ARG	CD-NE-CZ	6.39	133.35	124.40
1	A	58	PRO	N-CA-CB	5.99	109.04	103.41
1	A	122	MET	N-CA-C	-5.83	99.79	109.46
1	A	85	ASP	CA-C-O	5.56	126.44	120.55
1	A	80	LEU	CA-C-N	5.49	124.68	118.97
1	A	80	LEU	C-N-CA	5.49	124.68	118.97
1	A	89	ASN	CA-CB-CG	-5.37	107.23	112.60
1	A	240	PRO	N-CA-CB	5.31	108.79	103.48
1	A	141	VAL	O-C-N	5.30	127.68	121.96
1	A	194	VAL	N-CA-C	5.28	115.91	110.36
1	A	189	LEU	N-CA-CB	-5.27	102.35	110.20
1	A	60	PHE	CA-C-O	-5.20	115.03	120.80

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	69	ALA	N-CA-C	5.20	116.94	111.28
1	A	60	PHE	CA-CB-CG	-5.12	108.68	113.80
1	A	70	LYS	N-CA-C	5.08	116.91	109.24
1	A	246	ILE	N-CA-C	5.07	115.50	110.23
1	A	221	THR	CB-CA-C	-5.06	102.39	110.79
1	A	142	VAL	N-CA-C	5.03	115.25	110.42
1	A	219	ALA	CA-C-O	5.01	126.04	120.63

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	240	PRO	Mainchain

5.2 Too-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 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	1889	0	1925	39	0
2	A	100	0	0	1	0
All	All	1989	0	1925	39	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 10.

All (39) 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:50:MET:HG3	1:A:54:ARG:HD3	1.44	0.99
1:A:243:VAL:O	1:A:247:LYS:HG2	1.84	0.77
1:A:247:LYS:O	1:A:250:GLN:HG2	1.86	0.74
1:A:50:MET:HG3	1:A:54:ARG:CD	2.22	0.65
1:A:50:MET:O	1:A:54:ARG:HD2	1.98	0.64
1:A:27:LEU:HD11	1:A:240:PRO:HB3	1.80	0.63
1:A:50:MET:CG	1:A:54:ARG:HD3	2.26	0.62

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:191:ARG:HG2	1:A:203:ARG:HE	1.63	0.61
1:A:12:TRP:CD1	1:A:238:LEU:HD13	2.35	0.60
1:A:144:LEU:HD13	1:A:193:TRP:CD1	2.37	0.60
1:A:191:ARG:HG3	1:A:203:ARG:HG2	1.85	0.58
1:A:243:VAL:HG13	1:A:247:LYS:HE3	1.88	0.56
1:A:243:VAL:CG1	1:A:247:LYS:HE3	2.34	0.56
1:A:144:LEU:HD23	1:A:144:LEU:N	2.21	0.54
1:A:191:ARG:O	1:A:203:ARG:HG3	2.07	0.54
1:A:70:LYS:HB2	2:A:350:HOH:O	2.08	0.54
1:A:64:ALA:HB3	1:A:91:ILE:HG13	1.92	0.52
1:A:3:LYS:NZ	1:A:223:TYR:O	2.44	0.51
1:A:151:ALA:HB2	1:A:159:TRP:HZ2	1.76	0.50
1:A:195:SER:OG	1:A:203:ARG:HD2	2.12	0.49
1:A:128:GLY:HA3	1:A:167:GLU:O	2.14	0.47
1:A:111:ASP:OD1	1:A:153:LYS:HE2	2.14	0.47
1:A:142:VAL:O	1:A:146:GLN:HG3	2.14	0.46
1:A:139:THR:O	1:A:143:VAL:HG22	2.15	0.45
1:A:215:ASN:O	1:A:219:ALA:HB2	2.17	0.45
1:A:117:VAL:HG11	1:A:158:ASP:HB3	1.97	0.45
1:A:233:VAL:HG21	1:A:245:ILE:HG21	1.99	0.45
1:A:40:VAL:HG22	1:A:61:VAL:CG2	2.48	0.44
1:A:2:SER:O	1:A:3:LYS:HB2	2.16	0.44
1:A:19:GLN:O	1:A:23:GLU:HG3	2.18	0.43
1:A:7:ILE:HA	1:A:38:GLN:O	2.19	0.42
1:A:7:ILE:HB	1:A:209:LEU:HD21	2.01	0.42
1:A:242:PHE:CE2	1:A:246:ILE:HD11	2.55	0.42
1:A:70:LYS:HB3	1:A:70:LYS:HE2	1.90	0.41
1:A:27:LEU:HD23	1:A:27:LEU:O	2.20	0.41
1:A:161:LYS:HB3	1:A:161:LYS:HE2	1.21	0.41
1:A:94:GLY:O	1:A:126:CYS:HB2	2.21	0.41
1:A:48:LEU:O	1:A:52:LYS:HB2	2.22	0.40
1:A:66:ASN:CG	1:A:67:ALA:N	2.80	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	247/250 (99%)	240 (97%)	6 (2%)	1 (0%)	30 28

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3	LYS

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	197/198 (100%)	176 (89%)	21 (11%)	6 4

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	ILE
1	A	27	LEU
1	A	50	MET
1	A	52	LYS
1	A	53	GLU
1	A	55	LEU
1	A	62	ILE
1	A	107	GLU
1	A	136	SER
1	A	141	VAL
1	A	147	ILE
1	A	153	LYS
1	A	161	LYS
1	A	191	ARG
1	A	192	SER
1	A	195	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	205	GLU
1	A	213	SER
1	A	214	VAL
1	A	217	LYS
1	A	238	LEU

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

Mol	Chain	Res	Type
1	A	19	GLN
1	A	89	ASN
1	A	181	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 oligosaccharides 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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.