



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 01:39 PM UTC

PDB ID : 4XZ7 / pdb_00004xz7
Title : Crystal structure of a TGase
Authors : Yu, J.; Ge, J.; Yang, M.
Deposited on : 2015-02-04
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)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

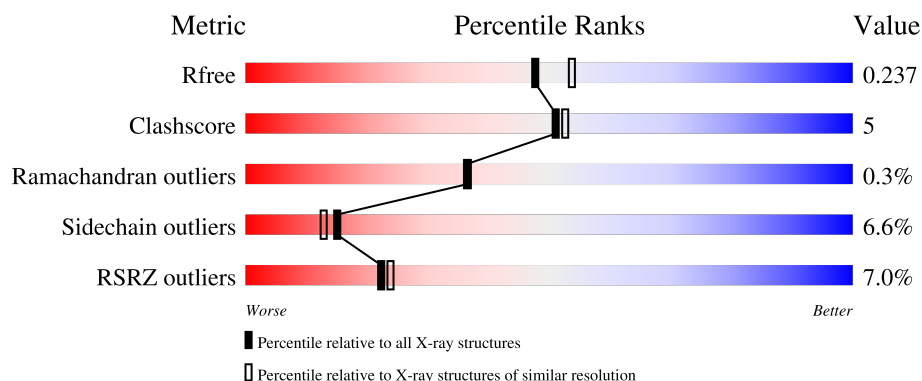
1 Overall quality at a glance

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))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (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 $\leq 5\%$. 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	399	8% 77% 15% • 5%
1	B	399	5% 84% 10% • •

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 6515 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 Putative uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	378	Total	C	N	O	S	0	0	0
			3029	1916	518	585	10			
1	B	382	Total	C	N	O	S	0	0	0
			3019	1905	524	580	10			

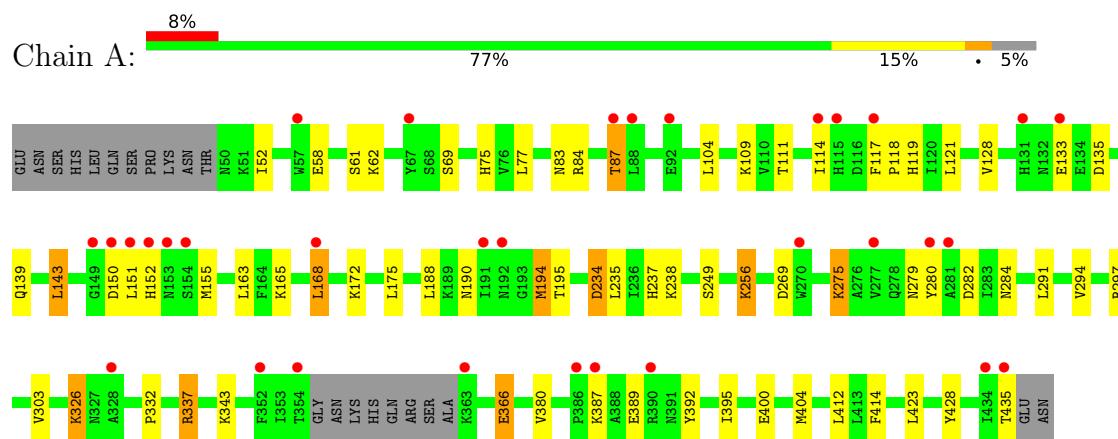
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	205	Total	O	0	0
			205	205		
2	B	262	Total	O	0	0
			262	262		

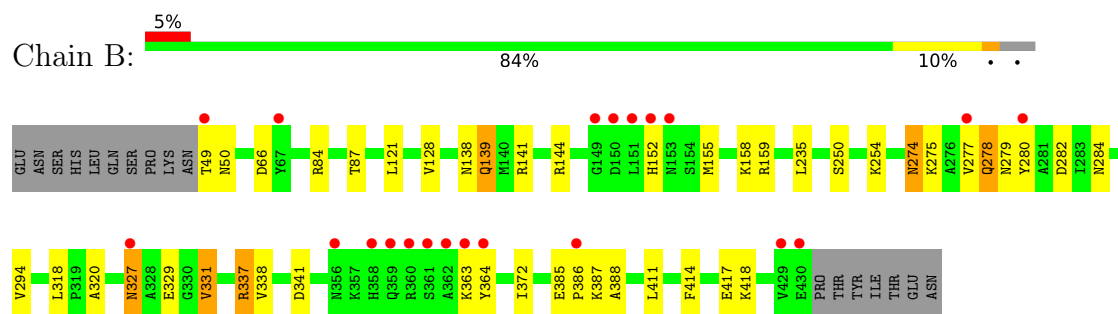
3 Residue-property plots [i](#)

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 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: Putative uncharacterized protein



• Molecule 1: Putative uncharacterized protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	89.13Å 91.94Å 102.17Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.97 – 2.10 45.97 – 2.10	Depositor EDS
% Data completeness (in resolution range)	95.8 (45.97-2.10) 95.7 (45.97-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.11 (at 2.10Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.192 , 0.236 0.197 , 0.237	Depositor DCC
R_{free} test set	2417 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	24.2	Xtriage
Anisotropy	0.163	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 49.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.015 for k,h,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6515	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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	0.50	1/3092 (0.0%)	0.78	0/4178
1	B	0.52	0/3080	0.78	0/4162
All	All	0.51	1/6172 (0.0%)	0.78	0/8340

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	303	VAL	C-O	-5.42	1.17	1.24

There are no bond angle outliers.

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	3029	0	2908	38	0
1	B	3019	0	2881	27	0
2	A	205	0	0	9	0
2	B	262	0	0	6	0
All	All	6515	0	5789	61	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 5.

All (61) 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:297:ARG:NH1	2:A:501:HOH:O	1.95	0.98
1:B:341:ASP:OD1	2:B:501:HOH:O	1.88	0.90
1:A:83:ASN:O	2:A:502:HOH:O	2.00	0.78
1:B:250:SER:OG	2:B:502:HOH:O	2.01	0.77
1:B:84:ARG:HD2	1:B:87:THR:HG22	1.70	0.74
1:A:275:LYS:HG3	1:A:280:TYR:HB3	1.74	0.69
1:A:152:HIS:O	2:A:503:HOH:O	2.12	0.67
1:A:165:LYS:NZ	2:A:509:HOH:O	2.28	0.67
1:A:52:ILE:HD12	1:A:163:LEU:HD11	1.77	0.66
1:B:388:ALA:N	2:B:506:HOH:O	2.29	0.65
1:A:151:LEU:N	1:A:152:HIS:HA	2.15	0.62
1:A:332:PRO:O	2:A:504:HOH:O	2.16	0.61
1:A:280:TYR:CE2	1:B:275:LYS:HG3	2.37	0.60
1:A:282:ASP:OD2	1:A:284:ASN:ND2	2.35	0.57
1:A:256:LYS:HD2	1:A:366:GLU:HG3	1.86	0.56
1:B:152:HIS:HA	1:B:155:MET:HE3	1.88	0.56
1:A:389:GLU:OE2	2:A:505:HOH:O	2.17	0.55
1:B:327:ASN:HB3	1:B:329:GLU:H	1.73	0.53
1:A:117:PHE:CD1	1:A:118:PRO:HD2	2.44	0.53
1:A:111:THR:HG23	2:A:511:HOH:O	2.08	0.52
1:A:282:ASP:OD1	1:A:284:ASN:HB2	2.09	0.52
1:B:159:ARG:NH1	2:B:505:HOH:O	2.28	0.52
1:A:77:LEU:HD23	1:A:84:ARG:HG2	1.91	0.52
1:B:139:GLN:HG3	1:B:144:ARG:NH2	2.25	0.51
1:B:250:SER:O	1:B:254:LYS:HG3	2.11	0.51
1:A:75:HIS:HB3	1:A:84:ARG:HD2	1.94	0.50
1:B:49:THR:OG1	1:B:50:ASN:N	2.44	0.50
1:A:135:ASP:O	1:A:139:GLN:HG2	2.12	0.50
1:A:104:LEU:HD12	1:A:121:LEU:HB3	1.94	0.49
1:A:291:LEU:H	1:A:291:LEU:HD23	1.77	0.49
1:A:387:LYS:HG3	2:A:639:HOH:O	2.13	0.49
1:B:274:ASN:O	1:B:277:VAL:HG22	2.13	0.48
1:A:58:GLU:O	1:A:61:SER:OG	2.29	0.48
1:B:341:ASP:CG	2:B:501:HOH:O	2.50	0.47
1:A:194:MET:HG2	1:A:195:THR:N	2.30	0.46
1:B:387:LYS:HB2	2:B:506:HOH:O	2.15	0.46
1:A:234:ASP:O	1:A:238:LYS:HG2	2.17	0.45
1:A:150:ASP:N	1:A:151:LEU:HA	2.31	0.45
1:A:337:ARG:HD3	1:A:400:GLU:OE2	2.17	0.45
1:B:327:ASN:HD22	1:B:331:VAL:HG13	1.80	0.44
1:B:282:ASP:OD1	1:B:284:ASN:HB2	2.16	0.44
1:A:326:LYS:HG3	1:A:392:TYR:CE2	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:109:LYS:NZ	2:A:511:HOH:O	2.32	0.44
1:A:143:LEU:HD22	1:B:414:PHE:HB2	2.00	0.42
1:A:114:ILE:HB	1:A:119:HIS:CE1	2.54	0.42
1:A:168:LEU:HD12	1:A:168:LEU:HA	1.84	0.42
1:A:269:ASP:OD2	1:A:297:ARG:NH2	2.53	0.42
1:B:158:LYS:HA	1:B:158:LYS:HD3	1.89	0.42
1:A:175:LEU:HD22	1:B:411:LEU:O	2.19	0.42
1:B:84:ARG:HH11	1:B:87:THR:CG2	2.32	0.42
1:B:138:ASN:OD1	1:B:141:ARG:NH1	2.52	0.42
1:B:139:GLN:HE21	1:B:139:GLN:HB2	1.60	0.41
1:B:278:GLN:H	1:B:278:GLN:HG2	1.74	0.41
1:B:385:GLU:HA	1:B:386:PRO:HD3	1.94	0.41
1:B:320:ALA:HA	1:B:337:ARG:O	2.20	0.41
1:A:404:MET:O	1:A:428:TYR:HB2	2.21	0.41
1:A:282:ASP:OD1	1:B:280:TYR:OH	2.38	0.41
1:A:412:LEU:C	1:A:414:PHE:H	2.29	0.41
1:B:363:LYS:HA	1:B:364:TYR:HA	1.82	0.41
1:A:337:ARG:HD2	1:A:395:ILE:CG2	2.51	0.41
1:A:84:ARG:HE	1:A:87:THR:HG22	1.86	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	374/399 (94%)	360 (96%)	14 (4%)	0	100	100
1	B	380/399 (95%)	364 (96%)	14 (4%)	2 (0%)	24	22
All	All	754/798 (94%)	724 (96%)	28 (4%)	2 (0%)	36	36

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	279	ASN
1	B	327	ASN

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	321/348 (92%)	294 (92%)	27 (8%)	10	7
1	B	313/348 (90%)	298 (95%)	15 (5%)	23	23
All	All	634/696 (91%)	592 (93%)	42 (7%)	15	13

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	LYS
1	A	69	SER
1	A	87	THR
1	A	128	VAL
1	A	133	GLU
1	A	143	LEU
1	A	155	MET
1	A	168	LEU
1	A	172	LYS
1	A	188	LEU
1	A	190	ASN
1	A	194	MET
1	A	234	ASP
1	A	235	LEU
1	A	237	HIS
1	A	249	SER
1	A	256	LYS
1	A	275	LYS
1	A	279	ASN
1	A	294	VAL
1	A	326	LYS
1	A	337	ARG

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Mol	Chain	Res	Type
1	A	343	LYS
1	A	366	GLU
1	A	380	VAL
1	A	423	LEU
1	A	435	THR
1	B	66	ASP
1	B	121	LEU
1	B	128	VAL
1	B	139	GLN
1	B	235	LEU
1	B	274	ASN
1	B	278	GLN
1	B	294	VAL
1	B	318	LEU
1	B	331	VAL
1	B	337	ARG
1	B	338	VAL
1	B	372	ILE
1	B	417	GLU
1	B	418	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	50	ASN
1	A	56	ASN
1	A	137	HIS
1	A	138	ASN
1	A	223	ASN
1	A	237	HIS
1	B	83	ASN
1	B	101	ASN
1	B	102	ASN
1	B	216	HIS
1	B	232	ASN
1	B	368	HIS

5.3.3 RNA ⓘ

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 ⓘ

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, 95th 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	378/399 (94%)	0.46	32 (8%) 16 17	16, 38, 68, 91	0
1	B	382/399 (95%)	0.23	21 (5%) 30 32	14, 34, 62, 82	0
All	All	760/798 (95%)	0.35	53 (6%) 22 24	14, 36, 67, 91	0

All (53) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	281	ALA	4.5
1	B	49	THR	4.1
1	B	359	GLN	3.8
1	A	153	ASN	3.7
1	A	280	TYR	3.6
1	A	151	LEU	3.5
1	B	358	HIS	3.4
1	A	277	VAL	3.3
1	B	151	LEU	3.3
1	A	152	HIS	3.1
1	A	114	ILE	3.1
1	B	362	ALA	3.1
1	A	150	ASP	3.0
1	A	87	THR	3.0
1	B	363	LYS	3.0
1	A	328	ALA	3.0
1	A	131	HIS	2.9
1	A	363	LYS	2.9
1	B	150	ASP	2.9
1	A	67	TYR	2.9
1	B	360	ARG	2.8
1	B	429	VAL	2.8
1	A	149	GLY	2.7
1	A	88	LEU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	354	THR	2.6
1	B	152	HIS	2.6
1	A	154	SER	2.6
1	B	364	TYR	2.6
1	B	430	GLU	2.6
1	A	57	TRP	2.6
1	B	149	GLY	2.5
1	A	133	GLU	2.5
1	B	67	TYR	2.4
1	A	191	ILE	2.4
1	A	390	ARG	2.4
1	A	435	THR	2.4
1	B	361	SER	2.3
1	A	117	PHE	2.3
1	B	153	ASN	2.3
1	A	192	ASN	2.2
1	B	280	TYR	2.2
1	A	168	LEU	2.2
1	A	115	HIS	2.2
1	B	356	ASN	2.2
1	A	434	ILE	2.1
1	A	387	LYS	2.1
1	A	386	PRO	2.1
1	A	352	PHE	2.1
1	B	277	VAL	2.1
1	A	92	GLU	2.1
1	B	327	ASN	2.1
1	A	270	TRP	2.1
1	B	386	PRO	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 oligosaccharides in this entry.

6.4 Ligands ⓘ

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.