



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 12, 2026 – 03:12 PM UTC

PDB ID : 4Z6Y / pdb_00004z6y
Title : Structure of the TBC1D7-TSC1 complex
Authors : Gai, Z.; Wu, G.
Deposited on : 2015-04-06
Resolution : 2.81 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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

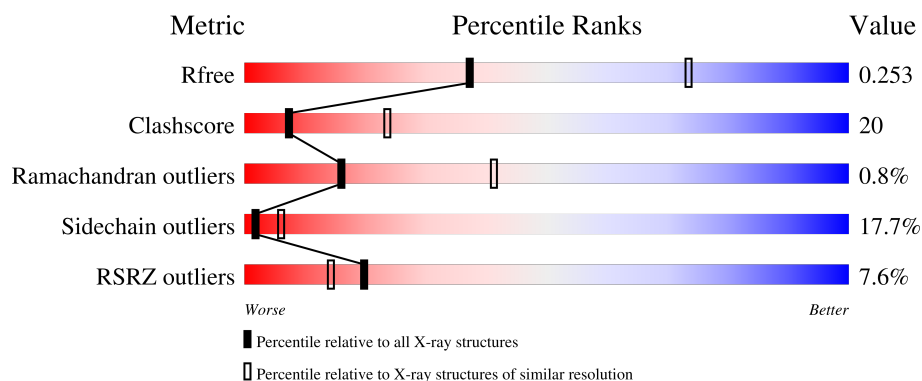
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.81 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	4591 (2.84-2.80)
Clashscore	190562	5010 (2.84-2.80)
Ramachandran outliers	187476	4916 (2.84-2.80)
Sidechain outliers	187428	4918 (2.84-2.80)
RSRZ outliers	180081	4594 (2.84-2.80)

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 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	273	
1	B	273	
1	E	273	
1	G	273	
2	C	56	

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Mol	Chain	Length	Quality of chain
2	D	56	48% 59% 30% 5% 5%
2	F	56	43% 61% 29% 7% •
2	H	56	41% 55% 21% 18% • •

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 10471 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 TBC1 domain family member 7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	272	Total	C	N	O	S	0	1	0
			2200	1424	368	393	15			
1	G	272	Total	C	N	O	S	0	1	0
			2206	1427	371	393	15			
1	E	272	Total	C	N	O	S	0	1	0
			2206	1427	371	393	15			
1	A	273	Total	C	N	O	S	0	1	0
			2212	1430	372	395	15			

- Molecule 2 is a protein called Hamartin.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	53	Total	C	N	O	0	0	0
			402	252	69	81			
2	H	55	Total	C	N	O	0	0	0
			415	259	71	85			
2	F	54	Total	C	N	O	0	0	0
			407	255	70	82			
2	D	53	Total	C	N	O	0	0	0
			402	252	69	81			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	4	Total	O	0	0
			4	4		
3	C	4	Total	O	0	0
			4	4		
3	G	6	Total	O	0	0
			6	6		
3	H	2	Total	O	0	0
			2	2		

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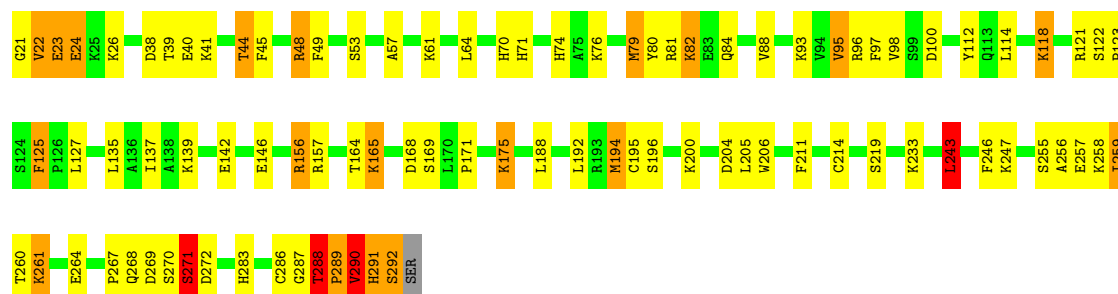
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	1	Total 1	O 1	0	0
3	F	1	Total 1	O 1	0	0
3	A	1	Total 1	O 1	0	0
3	D	2	Total 2	O 2	0	0

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.

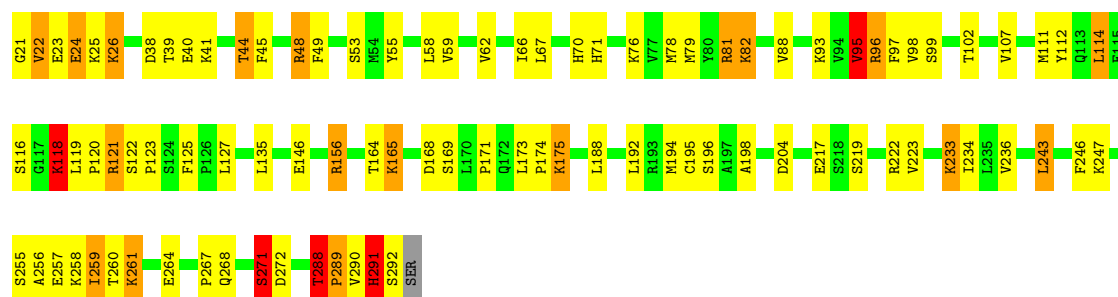
- Molecule 1: TBC1 domain family member 7

Chain B: 



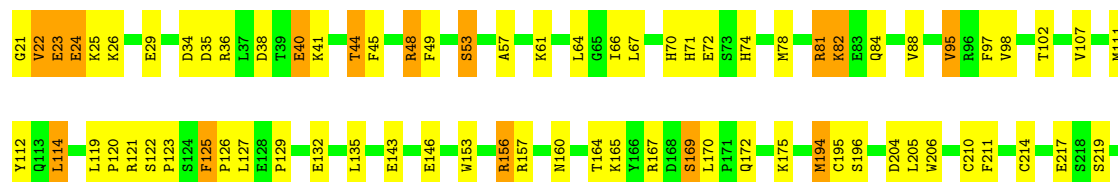
- Molecule 1: TBC1 domain family member 7

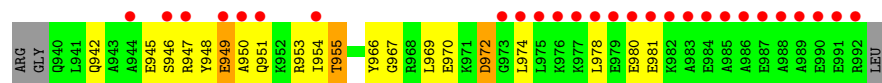
Chain G: 



- Molecule 1: TBC1 domain family member 7

Chain E: 





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	56.99Å 145.69Å 114.76Å 90.00° 89.65° 90.00°	Depositor
Resolution (Å)	50.00 – 2.81 50.00 – 2.81	Depositor EDS
% Data completeness (in resolution range)	98.0 (50.00-2.81) 97.3 (50.00-2.81)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.85 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.206 , 0.255 0.206 , 0.253	Depositor DCC
R_{free} test set	2260 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	69.9	Xtriage
Anisotropy	0.130	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 50.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.418 for h,-k,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	10471	wwPDB-VP
Average B, all atoms (Å ²)	68.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.59% 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	1.03	1/2269 (0.0%)	1.16	11/3073 (0.4%)
1	B	1.02	3/2257 (0.1%)	1.17	9/3058 (0.3%)
1	E	1.05	0/2263	1.19	15/3065 (0.5%)
1	G	1.03	2/2263 (0.1%)	1.19	11/3065 (0.4%)
2	C	0.76	0/404	1.03	0/543
2	D	0.78	0/404	1.01	0/543
2	F	0.74	0/409	1.07	0/550
2	H	0.78	0/417	1.20	3/560 (0.5%)
All	All	1.00	6/10686 (0.1%)	1.16	49/14457 (0.3%)

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	74	HIS	CG-CD2	6.00	1.42	1.35
1	B	74	HIS	ND1-CE1	5.66	1.38	1.32
1	A	283	HIS	CG-CD2	5.32	1.41	1.35
1	G	289	PRO	CA-C	5.27	1.58	1.52
1	G	288	THR	N-CA	5.24	1.51	1.46

The worst 5 of 49 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	95	VAL	N-CA-C	13.37	123.09	110.53
2	H	941	LEU	N-CA-C	-9.11	101.23	111.71
2	H	949	GLU	N-CA-C	-8.58	101.93	111.28
1	G	289	PRO	N-CA-C	8.41	123.35	111.33
1	B	289	PRO	N-CA-C	8.39	122.96	111.22

There are no chirality outliers.

There are no planarity outliers.

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	2212	0	2253	103	1
1	B	2200	0	2237	61	1
1	E	2206	0	2248	74	2
1	G	2206	0	2248	102	2
2	C	402	0	382	15	0
2	D	402	0	383	18	0
2	F	407	0	385	20	0
2	H	415	0	392	48	0
3	A	1	0	0	1	0
3	B	4	0	0	0	0
3	C	4	0	0	0	0
3	D	2	0	0	0	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
3	G	6	0	0	0	0
3	H	2	0	0	0	0
All	All	10471	0	10528	429	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 20.

The worst 5 of 429 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:121:ARG:HD2	1:A:125:PHE:CE2	1.20	1.73
1:A:121:ARG:CD	1:A:125:PHE:CE2	1.89	1.54
1:G:22:VAL:C	1:G:24:GLU:HB2	1.34	1.50
1:A:21:GLY:C	1:A:24:GLU:HG2	1.43	1.41
1:A:121:ARG:HD2	1:A:125:PHE:CD2	1.57	1.36

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)
1:G:24:GLU:OE1	1:E:290:VAL:N[1_655]	1.80	0.40
1:G:23:GLU:O	1:E:288:THR:O[1_655]	1.88	0.32
1:B:290:VAL:CG2	1:A:40:GLU:OE2[1_655]	2.18	0.02

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	272/273 (100%)	253 (93%)	18 (7%)	1 (0%)	30	58
1	B	271/273 (99%)	254 (94%)	16 (6%)	1 (0%)	30	58
1	E	271/273 (99%)	254 (94%)	17 (6%)	0	100	100
1	G	271/273 (99%)	255 (94%)	16 (6%)	0	100	100
2	C	51/56 (91%)	43 (84%)	6 (12%)	2 (4%)	2	8
2	D	51/56 (91%)	39 (76%)	11 (22%)	1 (2%)	6	19
2	F	52/56 (93%)	48 (92%)	3 (6%)	1 (2%)	6	20
2	H	53/56 (95%)	47 (89%)	2 (4%)	4 (8%)	1	1
All	All	1292/1316 (98%)	1193 (92%)	89 (7%)	10 (1%)	16	41

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	981	GLU
2	H	991	GLU
2	F	982	LYS
2	D	980	GLU
1	B	23	GLU

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	249/249 (100%)	207 (83%)	42 (17%)	2	7
1	B	247/249 (99%)	207 (84%)	40 (16%)	2	8
1	E	248/249 (100%)	207 (84%)	41 (16%)	2	7
1	G	248/249 (100%)	208 (84%)	40 (16%)	2	8
2	C	36/45 (80%)	26 (72%)	10 (28%)	0	1
2	D	36/45 (80%)	29 (81%)	7 (19%)	1	4
2	F	36/45 (80%)	27 (75%)	9 (25%)	0	2
2	H	37/45 (82%)	23 (62%)	14 (38%)	0	0
All	All	1137/1176 (97%)	934 (82%)	203 (18%)	2	6

5 of 203 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	95	VAL
1	E	291	HIS
2	D	972	ASP
1	E	125	PHE
1	E	194	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	172	GLN
2	D	942	GLN
1	E	84	GLN
1	E	161	GLN
1	E	172	GLN

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	273/273 (100%)	-1.15	0 100 100	38, 58, 109, 198	1 (0%)
1	B	272/273 (99%)	-1.20	0 100 100	39, 60, 99, 165	1 (0%)
1	E	272/273 (99%)	-1.12	0 100 100	39, 58, 105, 185	1 (0%)
1	G	272/273 (99%)	-1.14	0 100 100	40, 60, 103, 170	1 (0%)
2	C	53/56 (94%)	4.71	25 (47%) 0 0	4, 58, 150, 155	21 (39%)
2	D	53/56 (94%)	4.18	27 (50%) 0 0	3, 62, 99, 117	25 (47%)
2	F	54/56 (96%)	3.51	24 (44%) 0 0	5, 66, 119, 149	21 (38%)
2	H	55/56 (98%)	3.93	23 (41%) 0 0	4, 69, 195, 213	22 (40%)
All	All	1304/1316 (99%)	-0.29	99 (7%) 20 14	3, 59, 117, 213	93 (7%)

The worst 5 of 99 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	974	LEU	20.0
2	C	987	GLU	16.6
2	D	987	GLU	16.4
2	D	974	LEU	15.1
2	F	988	ALA	14.4

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.