



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 01:53 AM UTC

PDB ID : 4HTT / pdb\_00004htt  
Title : Crystal Structure of Twin Arginine Translocase Receptor- TatC in DDM  
Authors : Ramasamy, S.; Suloway, C.J.M.; Clemons Jr., W.M.  
Deposited on : 2012-11-01  
Resolution : 6.80 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](mailto: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>.

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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

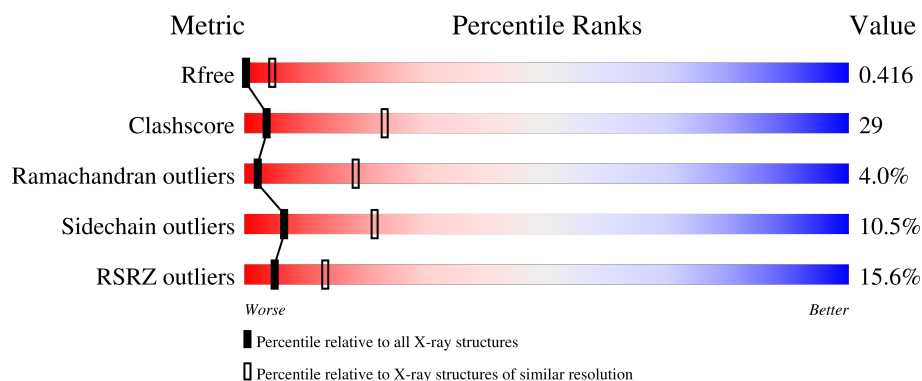
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 6.80 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))
$R_{free}$	180053	1165 (9.50-4.00)
Clashscore	190562	1006 (9.50-4.04)
Ramachandran outliers	187476	1052 (9.50-4.00)
Sidechain outliers	187428	1015 (9.50-4.00)
RSRZ outliers	180081	1158 (9.50-4.00)

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  $\geq 3$ , 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	418	<div> <div>10%</div> <div>23%</div> <div>26%</div> <div>5%</div> <div>46%</div> </div>
1	B	418	<div> <div>7%</div> <div>22%</div> <div>27%</div> <div>.</div> <div>46%</div> </div>

## 2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 3608 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 Sec-independent protein translocase protein TatC, Lysozyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	225	Total	C	N	O	S	16	0	0
			1804	1248	263	289	4			
1	B	225	Total	C	N	O	S	16	0	0
			1804	1248	263	289	4			

There are 38 discrepancies between the modelled and reference sequences:

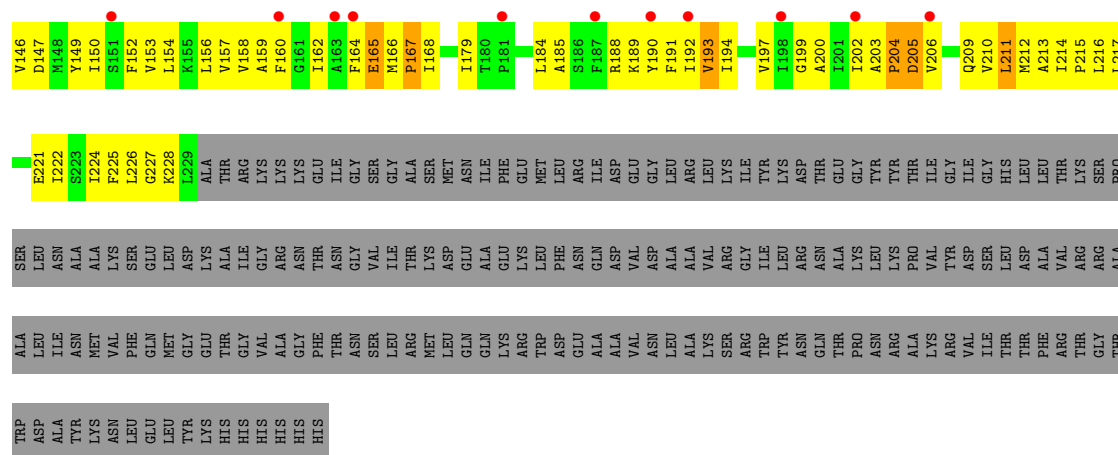
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	MET	-	expression tag	UNP O67305
A	0	GLY	-	expression tag	UNP O67305
A	236	GLU	-	expression tag	UNP P00720
A	237	ILE	-	expression tag	UNP P00720
A	238	GLY	-	expression tag	UNP P00720
A	239	SER	-	expression tag	UNP P00720
A	240	GLY	-	expression tag	UNP P00720
A	241	ALA	-	expression tag	UNP P00720
A	242	SER	-	expression tag	UNP P00720
A	296	THR	CYS	conflict	UNP P00720
A	339	ALA	CYS	conflict	UNP P00720
A	407	GLU	-	expression tag	UNP P00720
A	408	LEU	-	expression tag	UNP P00720
A	409	TYR	-	expression tag	UNP P00720
A	410	LYS	-	expression tag	UNP P00720
A	411	HIS	-	expression tag	UNP P00720
A	412	HIS	-	expression tag	UNP P00720
A	413	HIS	-	expression tag	UNP P00720
A	414	HIS	-	expression tag	UNP P00720
B	-1	MET	-	expression tag	UNP O67305
B	0	GLY	-	expression tag	UNP O67305
B	236	GLU	-	expression tag	UNP P00720
B	237	ILE	-	expression tag	UNP P00720
B	238	GLY	-	expression tag	UNP P00720
B	239	SER	-	expression tag	UNP P00720

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Chain	Residue	Modelled	Actual	Comment	Reference
B	240	GLY	-	expression tag	UNP P00720
B	241	ALA	-	expression tag	UNP P00720
B	242	SER	-	expression tag	UNP P00720
B	296	THR	CYS	conflict	UNP P00720
B	339	ALA	CYS	conflict	UNP P00720
B	407	GLU	-	expression tag	UNP P00720
B	408	LEU	-	expression tag	UNP P00720
B	409	TYR	-	expression tag	UNP P00720
B	410	LYS	-	expression tag	UNP P00720
B	411	HIS	-	expression tag	UNP P00720
B	412	HIS	-	expression tag	UNP P00720
B	413	HIS	-	expression tag	UNP P00720
B	414	HIS	-	expression tag	UNP P00720





## 4 Data and refinement statistics

Property	Value	Source
Space group	I 41 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	142.01Å 142.01Å 251.75Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 6.80 30.00 – 6.80	Depositor EDS
% Data completeness (in resolution range)	95.2 (30.00-6.80) 93.5 (30.00-6.80)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	CNS, REFMAC	Depositor
R, $R_{free}$	0.344 , 0.418 0.348 , 0.416	Depositor DCC
$R_{free}$ test set	99 reflections (4.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	(Not available)	Xtriage
Anisotropy	(Not available)	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.46 , 761.0	EDS
L-test for twinning <sup>1</sup>	$\langle  L  \rangle =$ (Not available), $\langle L^2 \rangle =$ (Not available)	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.72	EDS
Total number of atoms	3608	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	474.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *(Not available)*

<sup>1</sup>Theoretical 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	0.31	0/1853	0.83	5/2522 (0.2%)
1	B	0.31	0/1853	0.83	4/2522 (0.2%)
All	All	0.31	0/3706	0.83	9/5044 (0.2%)

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	141	THR	CA-C-N	-7.01	111.08	119.84
1	B	141	THR	C-N-CA	-7.01	111.08	119.84
1	A	141	THR	CA-C-N	-6.96	111.15	119.84
1	A	141	THR	C-N-CA	-6.96	111.15	119.84
1	B	98	ARG	N-CA-C	-5.49	106.58	113.28

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	1804	0	1946	108	0
1	B	1804	0	1946	114	2
All	All	3608	0	3892	217	2

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 29.



The worst 5 of 217 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:189:LYS:HB3	1:B:206:VAL:HG22	1.48	0.96
1:A:214:ILE:HA	1:A:217:LEU:HD12	1.54	0.89
1:A:141:THR:HG23	1:A:142:PRO:HD2	1.56	0.87
1:B:141:THR:HG23	1:B:142:PRO:HD2	1.59	0.85
1:A:164:PHE:O	1:A:167:PRO:HD2	1.80	0.81

All (2) 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:B:95:HIS:NE2	1:B:95:HIS:NE2[8_775]	1.93	0.27
1:B:22:LEU:CD1	1:B:22:LEU:CD1[6_565]	2.13	0.07

## 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	223/418 (53%)	192 (86%)	22 (10%)	9 (4%)	2	18
1	B	223/418 (53%)	193 (86%)	21 (9%)	9 (4%)	2	18
All	All	446/836 (53%)	385 (86%)	43 (10%)	18 (4%)	2	18

5 of 18 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	58	THR
1	A	141	THR
1	A	211	LEU
1	B	94	SER
1	B	141	THR

### 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	195/356 (55%)	174 (89%)	21 (11%)	6	21
1	B	195/356 (55%)	175 (90%)	20 (10%)	7	23
All	All	390/712 (55%)	349 (90%)	41 (10%)	6	21

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	103	LEU
1	B	141	THR
1	B	108	ILE
1	B	137	GLN
1	B	144	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	137	GLN
1	A	209	GLN
1	B	137	GLN
1	B	209	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules 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 [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, 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	225/418 (53%)	0.86	42 (18%) <b>3</b> <b>11</b>	121, 471, 626, 717	4 (1%)
1	B	225/418 (53%)	0.91	28 (12%) <b>8</b> <b>16</b>	117, 472, 626, 717	4 (1%)
All	All	450/836 (53%)	0.88	70 (15%) <b>5</b> <b>13</b>	117, 472, 638, 717	8 (1%)

The worst 5 of 70 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	60	PRO	15.1
1	B	59	GLU	13.2
1	B	141	THR	7.6
1	B	58	THR	7.6
1	B	61	LEU	7.4

### 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.