



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 2, 2026 – 03:57 AM UTC

PDB ID : 1TXD / pdb_00001txd
Title : Crystal Structure of the DH/PH domains of Leukemia-associated RhoGEF
Authors : Kristelly, R.; Gao, G.; Tesmer, J.J.
Deposited on : 2004-07-03
Resolution : 2.13 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

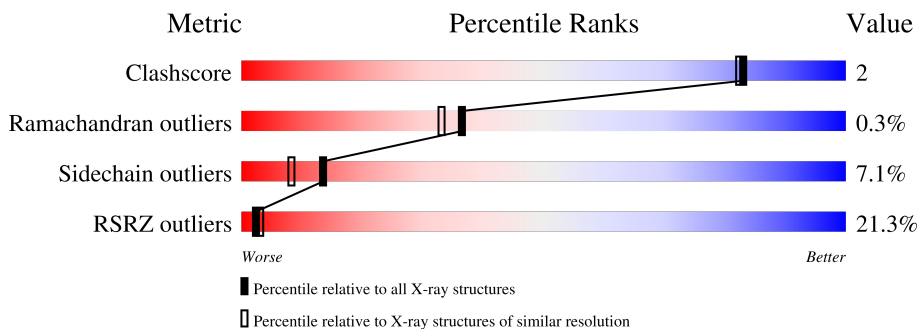
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.13 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	3812 (2.16-2.12)
Ramachandran outliers	187476	3773 (2.16-2.12)
Sidechain outliers	187428	3772 (2.16-2.12)
RSRZ outliers	180081	3691 (2.16-2.12)

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	385	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2972 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 Rho guanine nucleotide exchange factor 12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	352	2881	1822	514	533	12	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	764	GLY	THR	cloning artifact	UNP Q9NZN5
A	765	SER	ASP	cloning artifact	UNP Q9NZN5
A	973	PHE	TYR	engineered mutation	UNP Q9NZN5
A	1139	VAL	-	cloning artifact	UNP Q9NZN5
A	1140	ASP	-	cloning artifact	UNP Q9NZN5
A	1141	GLY	-	cloning artifact	UNP Q9NZN5
A	1142	GLY	-	cloning artifact	UNP Q9NZN5
A	1143	HIS	-	expression tag	UNP Q9NZN5
A	1144	HIS	-	expression tag	UNP Q9NZN5
A	1145	HIS	-	expression tag	UNP Q9NZN5
A	1146	HIS	-	expression tag	UNP Q9NZN5
A	1147	HIS	-	expression tag	UNP Q9NZN5
A	1148	HIS	-	expression tag	UNP Q9NZN5

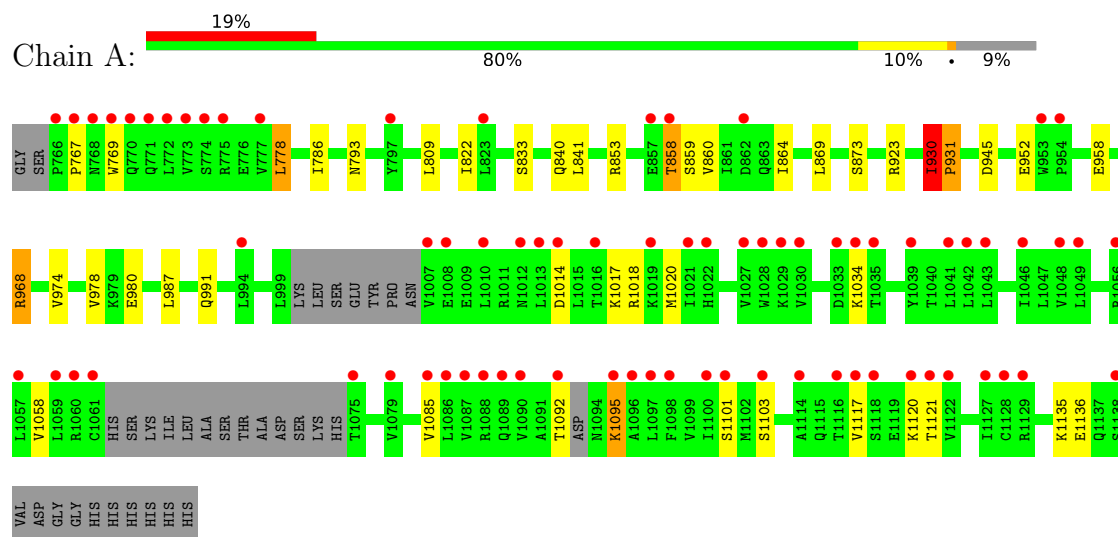
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	91	Total	O	0	0
			91	91		

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: Rho guanine nucleotide exchange factor 12



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	193.61Å 45.86Å 74.73Å 90.00° 107.49° 90.00°	Depositor
Resolution (Å)	24.85 – 2.13 24.85 – 2.13	Depositor EDS
% Data completeness (in resolution range)	97.5 (24.85-2.13) 98.2 (24.85-2.13)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.25 (at 2.06Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, R_{free}	0.235 , 0.274 0.232 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	33.5	Xtriage
Anisotropy	0.377	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 51.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	2972	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 8.66% 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	1.00	5/2922 (0.2%)	1.04	2/3937 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	974	VAL	CA-CB	-5.96	1.47	1.54
1	A	978	VAL	CA-CB	5.78	1.61	1.54
1	A	822	ILE	CA-CB	5.26	1.61	1.54
1	A	931	PRO	CG-CD	5.24	1.68	1.50
1	A	833	SER	C-O	5.09	1.30	1.24

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	930	ILE	N-CA-CB	-7.13	106.01	110.50
1	A	822	ILE	CB-CA-C	-5.29	104.91	112.22

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	2881	0	2972	14	0
2	A	91	0	0	0	0
All	All	2972	0	2972	14	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 2.

All (14) 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:769:TRP:CD1	1:A:793:ASN:ND2	2.61	0.68
1:A:769:TRP:CD1	1:A:793:ASN:HD21	2.21	0.59
1:A:930:ILE:N	1:A:931:PRO:CD	2.67	0.57
1:A:841:LEU:C	1:A:841:LEU:HD23	2.30	0.56
1:A:987:LEU:HD21	1:A:1020:MET:HE3	1.88	0.55
1:A:1095:LYS:HG2	1:A:1117:VAL:HG22	1.91	0.53
1:A:869:LEU:O	1:A:873:SER:OG	2.24	0.53
1:A:945:ASP:OD2	1:A:968:ARG:NH2	2.44	0.50
1:A:1085:VAL:O	1:A:1135:LYS:NZ	2.45	0.48
1:A:793:ASN:OD1	1:A:853:ARG:NH2	2.46	0.48
1:A:991:GLN:NE2	1:A:1014:ASP:HA	2.30	0.47
1:A:858:THR:C	1:A:860:VAL:H	2.25	0.44
1:A:809:LEU:HD23	1:A:809:LEU:HA	1.81	0.43
1:A:769:TRP:CZ3	1:A:778:LEU:HD11	2.55	0.42

There are no symmetry-related clashes.

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	344/385 (89%)	331 (96%)	12 (4%)	1 (0%)	36	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	767	PRO

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	326/354 (92%)	303 (93%)	23 (7%)	13 8

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	778	LEU
1	A	786	ILE
1	A	840	GLN
1	A	858	THR
1	A	859	SER
1	A	864	ILE
1	A	923	ARG
1	A	930	ILE
1	A	952	GLU
1	A	958	GLU
1	A	968	ARG
1	A	980	GLU
1	A	1017	LYS
1	A	1018	ARG
1	A	1034	LYS
1	A	1058	VAL
1	A	1092	THR
1	A	1095	LYS
1	A	1101	SER
1	A	1103	SER
1	A	1120	LYS
1	A	1121	THR
1	A	1136	GLU

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	969	GLN
1	A	972	ASN

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Mol	Chain	Res	Type
1	A	1031	ASN

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 ⓘ

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	352/385 (91%)	1.19	75 (21%) 2 3	10, 31, 69, 83	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1007	VAL	8.2
1	A	766	PRO	7.4
1	A	769	TRP	6.8
1	A	953	TRP	6.8
1	A	768	ASN	5.3
1	A	1117	VAL	5.2
1	A	1095	LYS	4.8
1	A	772	LEU	4.7
1	A	767	PRO	4.7
1	A	1030	VAL	4.6
1	A	773	VAL	4.4
1	A	771	GLN	4.3
1	A	1087	VAL	4.2
1	A	1034	LYS	4.1
1	A	1086	LEU	3.7
1	A	1061	CYS	3.6
1	A	797	TYR	3.6
1	A	770	GLN	3.6
1	A	1138	SER	3.6
1	A	774	SER	3.5
1	A	1090	VAL	3.5
1	A	1120	LYS	3.4
1	A	1060	ARG	3.3
1	A	1114	ALA	3.3
1	A	1041	LEU	3.2
1	A	1101	SER	3.2
1	A	858	THR	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	954	PRO	3.2
1	A	1092	THR	3.0
1	A	775	ARG	3.0
1	A	1043	LEU	2.9
1	A	1128	CYS	2.9
1	A	1121	THR	2.8
1	A	1046	ILE	2.8
1	A	1013	LEU	2.7
1	A	1021	ILE	2.7
1	A	1016	THR	2.7
1	A	1035	THR	2.7
1	A	1042	LEU	2.7
1	A	1027	VAL	2.7
1	A	1100	ILE	2.6
1	A	1127	ILE	2.6
1	A	1059	LEU	2.6
1	A	1056	ARG	2.6
1	A	1010	LEU	2.6
1	A	1019	LYS	2.6
1	A	1033	ASP	2.5
1	A	1097	LEU	2.5
1	A	1098	PHE	2.5
1	A	1085	VAL	2.4
1	A	857	GLU	2.4
1	A	1103	SER	2.4
1	A	1022	HIS	2.4
1	A	1116	THR	2.4
1	A	862	ASP	2.4
1	A	1122	VAL	2.4
1	A	1048	VAL	2.3
1	A	1028	TRP	2.3
1	A	1029	LYS	2.3
1	A	1012	ASN	2.3
1	A	994	LEU	2.2
1	A	1049	LEU	2.2
1	A	777	VAL	2.2
1	A	1096	ALA	2.1
1	A	1088	ARG	2.1
1	A	1008	GLU	2.1
1	A	1118	SER	2.1
1	A	1039	TYR	2.1
1	A	1075	THR	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	1079	VAL	2.1
1	A	1089	GLN	2.1
1	A	1129	ARG	2.0
1	A	823	LEU	2.0
1	A	1057	LEU	2.0
1	A	1014	ASP	2.0

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.