



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 9LIJ / pdb_00009lij
Title : Crystal structure of oxidized form (C92-C121) of protein tyrosine phosphatase 1B (PTP1B)
Authors : Do, H.; Hwang, J.; Lee, J.H.
Deposited on : 2025-01-14
Resolution : 2.30 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
Xtrriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.47

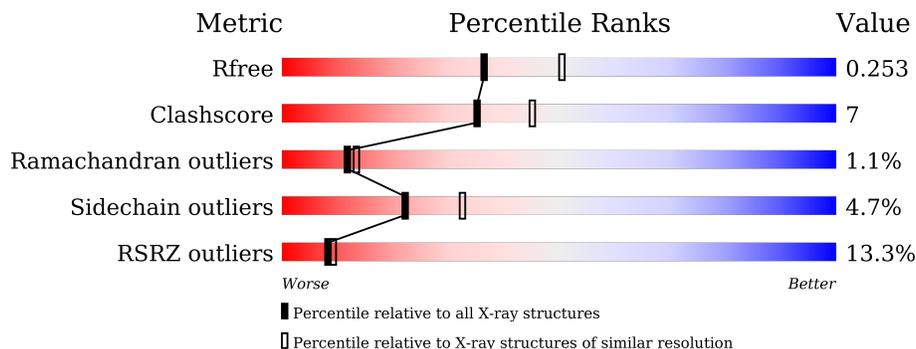
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	164625	5963 (2.30-2.30)
Clashscore	180529	6698 (2.30-2.30)
Ramachandran outliers	177936	6640 (2.30-2.30)
Sidechain outliers	177891	6640 (2.30-2.30)
RSRZ outliers	164620	5963 (2.30-2.30)

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	298	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 2332 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 Tyrosine-protein phosphatase non-receptor type 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	279	2278	1447	393	422	16	0	0	0

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	54	Total	O	0	0
			54	54		

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	56.31Å 59.83Å 88.09Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.69 – 2.30 34.69 – 2.30	Depositor EDS
% Data completeness (in resolution range)	95.2 (34.69-2.30) 95.2 (34.69-2.30)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.72 (at 2.29Å)	Xtrriage
Refinement program	REFMAC 5.8.0073, PHENIX 1.14_3260	Depositor
R, R_{free}	0.219 , 0.249 0.227 , 0.253	Depositor DCC
R_{free} test set	689 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	32.2	Xtrriage
Anisotropy	0.025	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 40.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	2332	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.89% 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	0.90	0/2329	1.42	15/3138 (0.5%)

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	3

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	120	LYS	N-CA-C	-11.79	96.72	114.64
1	A	189	ALA	CA-C-N	10.89	135.24	120.54
1	A	189	ALA	C-N-CA	10.89	135.24	120.54
1	A	190	SER	O-C-N	7.93	130.34	122.09
1	A	60	HIS	CA-C-N	-7.54	110.51	123.25
1	A	60	HIS	C-N-CA	-7.54	110.51	123.25
1	A	206	PRO	CA-C-N	6.57	129.08	120.28
1	A	206	PRO	C-N-CA	6.57	129.08	120.28
1	A	181	ASP	CA-CB-CG	5.81	118.41	112.60
1	A	147	GLU	O-C-N	-5.65	115.80	123.14
1	A	14	GLY	CA-C-N	5.54	131.48	122.67
1	A	14	GLY	C-N-CA	5.54	131.48	122.67
1	A	43	ARG	N-CA-C	-5.34	106.44	113.17
1	A	226	CYS	O-C-N	5.05	127.27	122.07
1	A	122	ALA	N-CA-C	-5.01	100.13	110.80

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	112	ARG	Sidechain
1	A	221	ARG	Sidechain
1	A	47	ARG	Sidechain

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	2278	0	2251	33	0
2	A	54	0	0	1	0
All	All	2332	0	2251	33	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 7.

All (33) 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:219:ILE:HD12	1:A:259:GLY:HA3	1.64	0.79
1:A:148:ASP:OD1	1:A:150:LYS:HE3	1.91	0.70
1:A:118:SER:O	1:A:119:LEU:HB2	1.95	0.66
1:A:89:PRO:HA	1:A:121:CYS:HB3	1.79	0.63
1:A:11:ASP:HB3	1:A:16:TRP:HE1	1.64	0.63
1:A:119:LEU:HB3	1:A:121:CYS:H	1.67	0.60
1:A:89:PRO:HA	1:A:121:CYS:CB	2.32	0.60
1:A:219:ILE:HG22	1:A:260:LEU:HD23	1.84	0.59
1:A:83:LEU:HD22	1:A:222:SER:HB3	1.84	0.59
1:A:72:ILE:HD13	1:A:256:PHE:HB2	1.85	0.57
1:A:121:CYS:HA	1:A:124:TYR:HA	1.89	0.55
1:A:70:SER:HB2	1:A:257:ARG:HD2	1.89	0.54
1:A:83:LEU:HD23	1:A:213:VAL:HB	1.91	0.53
1:A:20:TYR:CE2	1:A:24:ARG:HD2	2.45	0.51
1:A:102:GLN:O	1:A:209:GLY:HA3	2.12	0.50
1:A:49:VAL:HG21	1:A:217:ALA:HB1	1.93	0.50
1:A:126:PRO:HG3	1:A:133:MET:HG3	1.94	0.50
1:A:83:LEU:CD2	1:A:213:VAL:HB	2.42	0.49
1:A:219:ILE:HG21	1:A:258:MET:O	2.12	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:83:LEU:CD2	1:A:222:SER:HB3	2.43	0.48
1:A:121:CYS:O	1:A:123:GLN:N	2.49	0.46
1:A:79:ARG:CZ	1:A:233:LEU:HD11	2.46	0.45
1:A:83:LEU:HD23	1:A:83:LEU:HA	1.75	0.44
1:A:121:CYS:HB3	1:A:122:ALA:H	1.62	0.44
1:A:148:ASP:OD1	1:A:150:LYS:CE	2.65	0.43
1:A:59:LEU:HB2	1:A:65:ASP:HA	2.02	0.42
1:A:204:LEU:CD2	1:A:211:VAL:HG11	2.49	0.42
1:A:113:VAL:O	1:A:114:MET:C	2.63	0.42
1:A:73:LYS:HB2	1:A:73:LYS:HE3	1.91	0.41
1:A:92:CYS:SG	1:A:120:LYS:O	2.78	0.41
1:A:30:PHE:HB3	2:A:329:HOH:O	2.21	0.41
1:A:6:GLU:O	1:A:10:ILE:HG13	2.21	0.40
1:A:141:LYS:HB2	1:A:163:LEU:HD21	2.04	0.40

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	275/298 (92%)	262 (95%)	10 (4%)	3 (1%)	12 13

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	119	LEU
1	A	122	ALA
1	A	261	ILE

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	253/271 (93%)	241 (95%)	12 (5%)	22 32

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	ASP
1	A	50	SER
1	A	92	CYS
1	A	112	ARG
1	A	114	MET
1	A	118	SER
1	A	119	LEU
1	A	121	CYS
1	A	123	GLN
1	A	139	ASN
1	A	164	THR
1	A	166	GLN

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	78	GLN
1	A	127	GLN
1	A	139	ASN
1	A	262	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

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	279/298 (93%)	0.71	37 (13%) 8 9	20, 38, 72, 96	0

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	182	PHE	6.0
1	A	121	CYS	5.8
1	A	119	LEU	5.6
1	A	118	SER	5.4
1	A	48	ASP	4.6
1	A	114	MET	4.4
1	A	181	ASP	3.9
1	A	113	VAL	3.8
1	A	122	ALA	3.6
1	A	60	HIS	3.6
1	A	280	PHE	3.4
1	A	164	THR	3.1
1	A	123	GLN	3.0
1	A	137	ASP	2.8
1	A	165	THR	2.8
1	A	282	MET	2.7
1	A	8	GLU	2.7
1	A	138	THR	2.6
1	A	218	GLY	2.6
1	A	239	LYS	2.5
1	A	10	ILE	2.4
1	A	120	LYS	2.3
1	A	63	ASP	2.3
1	A	14	GLY	2.3
1	A	283	GLY	2.3
1	A	90	ASN	2.2
1	A	162	ASN	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	92	CYS	2.2
1	A	6	GLU	2.2
1	A	136	GLU	2.1
1	A	281	ILE	2.1
1	A	3	MET	2.1
1	A	219	ILE	2.1
1	A	216	SER	2.1
1	A	217	ALA	2.0
1	A	22	ASP	2.0
1	A	240	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.