



Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 06:25 am BST

PDB ID : 4DGP
Title : The wild-type Src homology 2 (SH2)-domain containing protein tyrosine phosphatase-2 (SHP2)
Authors : Yu, Z.H.; Xu, J.; Walls, C.D.; Chen, L.; Zhang, S.; Wu, L.; Wang, L.N.; Liu, S.J.; Zhang, Z.Y.
Deposited on : 2012-01-26
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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

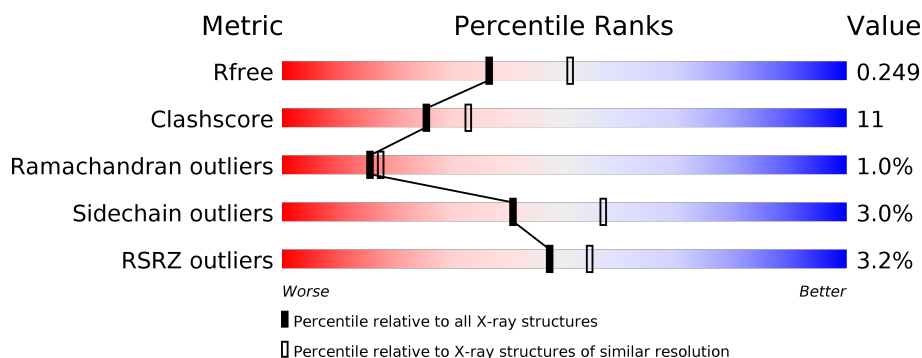
1 Overall quality at a glance

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}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (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 on 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	536	<div> <div>3%</div> <div>68%</div> <div>24%</div> <div>7%</div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4174 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 11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	499	4024	2527	718	761	18	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLN	DELETION	UNP Q06124
A	?	-	ALA	DELETION	UNP Q06124
A	?	-	LEU	DELETION	UNP Q06124
A	?	-	LEU	DELETION	UNP Q06124
A	529	LEU	-	EXPRESSION TAG	UNP Q06124
A	530	GLU	-	EXPRESSION TAG	UNP Q06124
A	531	HIS	-	EXPRESSION TAG	UNP Q06124
A	532	HIS	-	EXPRESSION TAG	UNP Q06124
A	533	HIS	-	EXPRESSION TAG	UNP Q06124
A	534	HIS	-	EXPRESSION TAG	UNP Q06124
A	535	HIS	-	EXPRESSION TAG	UNP Q06124
A	536	HIS	-	EXPRESSION TAG	UNP Q06124

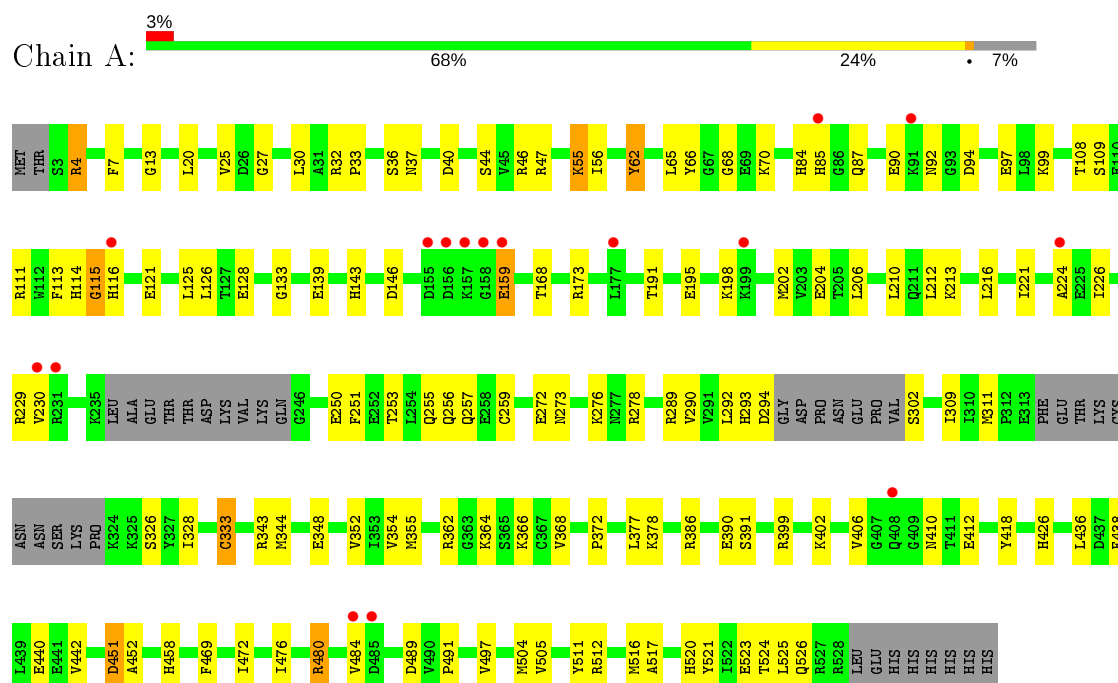
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	150	Total	O	0	0
			150	150		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Tyrosine-protein phosphatase non-receptor type 11



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	54.85Å 221.10Å 40.36Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.85 – 2.30 36.85 – 2.30	Depositor EDS
% Data completeness (in resolution range)	95.6 (36.85-2.30) 95.5 (36.85-2.30)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.06 (at 2.29Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.196 , 0.255 0.192 , 0.249	Depositor DCC
R_{free} test set	1086 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	38.3	Xtriage
Anisotropy	0.511	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 46.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4174	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.20% 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

5.1 Standard geometry

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	0.44	1/4106 (0.0%)	0.58	0/5537

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	333	CYS	CB-SG	-5.53	1.72	1.81

There are no bond angle outliers.

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	4024	0	3940	84	0
2	A	150	0	0	6	0
All	All	4174	0	3940	84	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 11.

All (84) 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:294:ASP:HB2	1:A:343:ARG:HE	1.42	0.84

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:27:GLY:HA3	1:A:99:LYS:HE3	1.68	0.76
1:A:191:THR:O	1:A:195:GLU:HG2	1.86	0.75
1:A:65:LEU:HD12	1:A:68:GLY:HA3	1.68	0.74
1:A:355:MET:HG3	1:A:458:HIS:CE1	2.23	0.74
1:A:520:HIS:O	1:A:524:THR:HG23	1.91	0.70
1:A:56:ILE:HG12	1:A:65:LEU:HD23	1.76	0.67
1:A:333:CYS:O	1:A:368:VAL:HG22	1.94	0.67
1:A:115:GLY:HA2	1:A:139:GLU:HG3	1.77	0.66
1:A:328:ILE:HD11	1:A:348:GLU:HG3	1.80	0.64
1:A:272:GLU:CD	1:A:272:GLU:H	2.00	0.63
1:A:221:ILE:HG21	1:A:229:ARG:HG2	1.81	0.63
1:A:302:SER:HB3	2:A:741:HOH:O	2.03	0.59
1:A:30:LEU:C	1:A:30:LEU:HD12	2.24	0.58
1:A:402:LYS:HD2	1:A:412:GLU:CD	2.24	0.58
1:A:418:TYR:HB3	1:A:438:PHE:CE1	2.39	0.58
1:A:289:ARG:HD3	2:A:730:HOH:O	2.04	0.58
1:A:7:PHE:CZ	1:A:33:PRO:HD3	2.39	0.57
1:A:480:ARG:NH2	2:A:707:HOH:O	2.35	0.56
1:A:294:ASP:HB2	1:A:343:ARG:NE	2.18	0.56
1:A:491:PRO:HG3	1:A:511:TYR:OH	2.06	0.56
1:A:292:LEU:HD21	1:A:344:MET:HB2	1.86	0.56
1:A:372:PRO:HG3	1:A:378:LYS:HB2	1.87	0.56
1:A:364:LYS:HE3	1:A:366:LYS:NZ	2.22	0.55
1:A:512:ARG:O	1:A:516:MET:HG2	2.07	0.54
1:A:20:LEU:O	1:A:46:ARG:HD2	2.06	0.54
1:A:309:ILE:HD13	1:A:328:ILE:HG12	1.88	0.54
1:A:4:ARG:HG3	1:A:259:CYS:HB3	1.89	0.54
1:A:250:GLU:HG2	1:A:511:TYR:OH	2.07	0.54
1:A:13:GLY:HA2	1:A:32:ARG:CZ	2.39	0.53
1:A:133:GLY:HA3	1:A:213:LYS:HB2	1.89	0.53
1:A:198:LYS:HG2	1:A:212:LEU:HB2	1.90	0.53
1:A:56:ILE:HG12	1:A:65:LEU:CD2	2.40	0.52
1:A:224:ALA:HB2	1:A:484:VAL:O	2.10	0.52
1:A:273:ASN:HA	1:A:276:LYS:HD2	1.91	0.51
1:A:55:LYS:HB3	1:A:66:TYR:CD2	2.46	0.51
1:A:226:ILE:O	1:A:230:VAL:HG23	2.11	0.51
1:A:377:LEU:HD12	1:A:386:ARG:HB2	1.93	0.50
1:A:311:MET:CE	1:A:326:SER:HB3	2.42	0.50
1:A:62:TYR:CE1	1:A:70:LYS:HD2	2.47	0.49
1:A:146:ASP:OD2	1:A:173:ARG:HG2	2.12	0.49
1:A:497:VAL:HG12	1:A:504:MET:HB2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:90:GLU:OE2	1:A:92:ASN:ND2	2.47	0.47
1:A:206:LEU:HD12	1:A:206:LEU:N	2.29	0.47
1:A:168:THR:HG21	1:A:204:GLU:OE2	2.14	0.47
1:A:47:ARG:NH2	1:A:90:GLU:OE1	2.48	0.47
1:A:125:LEU:HB3	1:A:216:LEU:HD21	1.97	0.47
1:A:328:ILE:CD1	1:A:348:GLU:HG3	2.45	0.46
1:A:497:VAL:HG12	1:A:504:MET:CB	2.46	0.46
1:A:362:ARG:HD3	1:A:426:HIS:NE2	2.31	0.46
1:A:251:PHE:O	1:A:255:GLN:HG2	2.15	0.45
1:A:386:ARG:NE	2:A:617:HOH:O	2.43	0.45
1:A:113:PHE:O	1:A:114:HIS:HD2	1.98	0.45
1:A:484:VAL:HG21	1:A:526:GLN:NE2	2.31	0.45
1:A:352:VAL:HG11	1:A:442:VAL:HG13	1.99	0.45
1:A:37:ASN:O	1:A:40:ASP:HB2	2.16	0.44
1:A:390:GLU:HG2	1:A:399:ARG:HG2	1.99	0.44
1:A:489:ASP:OD1	1:A:491:PRO:HD2	2.16	0.44
1:A:311:MET:HE2	1:A:326:SER:HB3	1.99	0.44
1:A:525:LEU:HD12	1:A:525:LEU:HA	1.89	0.44
1:A:109:SER:O	1:A:253:THR:HA	2.18	0.43
1:A:436:LEU:HD11	1:A:517:ALA:O	2.18	0.42
1:A:85:HIS:CE1	1:A:97:GLU:HG2	2.53	0.42
1:A:469:PHE:HB3	2:A:737:HOH:O	2.18	0.42
1:A:90:GLU:HG2	1:A:94:ASP:HB2	2.01	0.42
1:A:523:GLU:HB3	2:A:705:HOH:O	2.18	0.42
1:A:126:LEU:HD23	1:A:216:LEU:HD13	2.01	0.42
1:A:62:TYR:CE1	1:A:70:LYS:CD	3.03	0.42
1:A:111:ARG:HD2	1:A:257:GLN:CG	2.48	0.42
1:A:451:ASP:O	1:A:452:ALA:C	2.57	0.42
1:A:84:HIS:O	1:A:87:GLN:HB2	2.20	0.41
1:A:354:VAL:HG13	1:A:438:PHE:CZ	2.55	0.41
1:A:476:ILE:HD12	1:A:521:TYR:CG	2.56	0.41
1:A:294:ASP:CB	1:A:343:ARG:HE	2.24	0.41
1:A:364:LYS:HB2	1:A:364:LYS:HE3	1.82	0.41
1:A:202:MET:HB2	1:A:210:LEU:HD12	2.03	0.41
1:A:25:VAL:O	1:A:46:ARG:HD3	2.21	0.41
1:A:278:ARG:NH1	1:A:333:CYS:O	2.54	0.41
1:A:32:ARG:NH1	1:A:44:SER:OG	2.54	0.41
1:A:472:ILE:O	1:A:476:ILE:HG12	2.21	0.41
1:A:290:VAL:HG11	1:A:344:MET:HG3	2.03	0.41
1:A:364:LYS:HE3	1:A:366:LYS:HZ1	1.86	0.41
1:A:128:GLU:HA	1:A:159:GLU:OE2	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:440:GLU:OE1	1:A:480:ARG:NH1	2.55	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	491/536 (92%)	455 (93%)	31 (6%)	5 (1%)	15 17

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	SER
1	A	116	HIS
1	A	410	ASN
1	A	505	VAL
1	A	115	GLY

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	440/478 (92%)	427 (97%)	13 (3%)	41 57

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	ARG
1	A	55	LYS
1	A	62	TYR
1	A	108	THR
1	A	121	GLU
1	A	143	HIS
1	A	159	GLU
1	A	256	GLN
1	A	293	HIS
1	A	391	SER
1	A	406	VAL
1	A	451	ASP
1	A	480	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	53	HIS
1	A	114	HIS

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 carbohydrates 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 ⓘ

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	499/536 (93%)	0.14	16 (3%) 47 54	24, 47, 75, 95	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	156	ASP	4.6
1	A	158	GLY	4.3
1	A	484	VAL	3.8
1	A	157	LYS	3.8
1	A	159	GLU	3.3
1	A	177	LEU	3.2
1	A	116	HIS	2.9
1	A	85	HIS	2.6
1	A	485	ASP	2.6
1	A	230	VAL	2.3
1	A	231	ARG	2.2
1	A	91	LYS	2.2
1	A	199	LYS	2.2
1	A	224	ALA	2.2
1	A	155	ASP	2.2
1	A	408	GLN	2.2

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 carbohydrates 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.