



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:50 AM UTC

PDB ID : 5IBS / pdb_00005ibs
Title : Structure of E76Q, a Cancer-Associated Mutation of the Oncogenic Phosphatase SHP2
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Deposited on : 2016-02-22
Resolution : 2.32 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

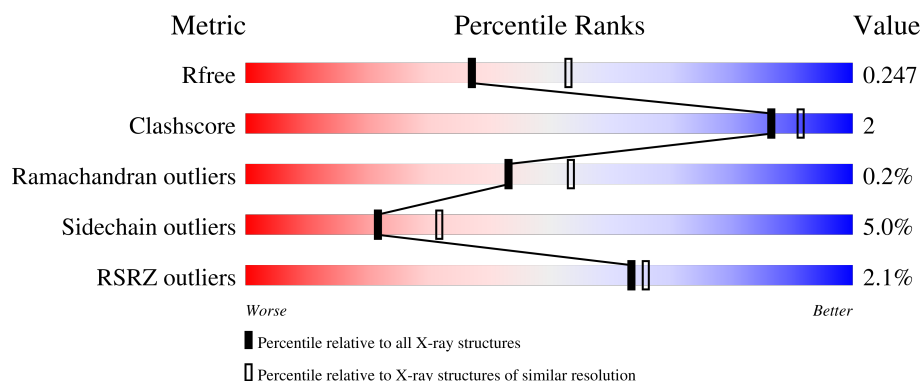
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

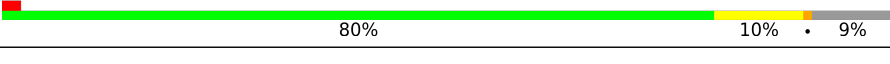
The reported resolution of this entry is 2.32 Å.

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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	526	 2% 81% 11% 8%
1	B	526	 2% 80% 10% 9%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8215 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
1	A	485	Total	C	N	O	S	0	1	0
			3937	2483	701	735	18			
1	B	479	Total	C	N	O	S	0	0	0
			3882	2451	692	721	18			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	SER	-	expression tag	UNP Q06124
A	76	GLN	GLU	engineered mutation	UNP Q06124
B	0	SER	-	expression tag	UNP Q06124
B	76	GLN	GLU	engineered mutation	UNP Q06124

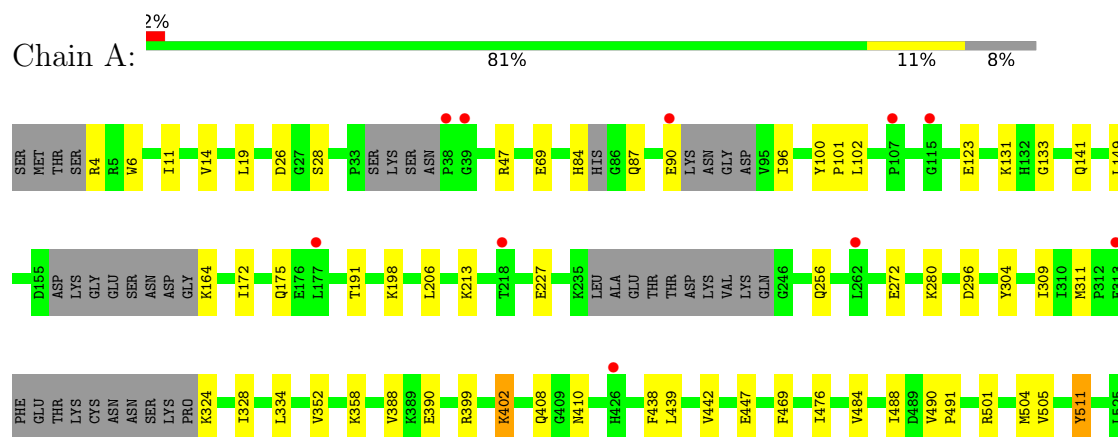
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	183	Total	O	0	0
			183	183		
2	B	213	Total	O	0	0
			213	213		

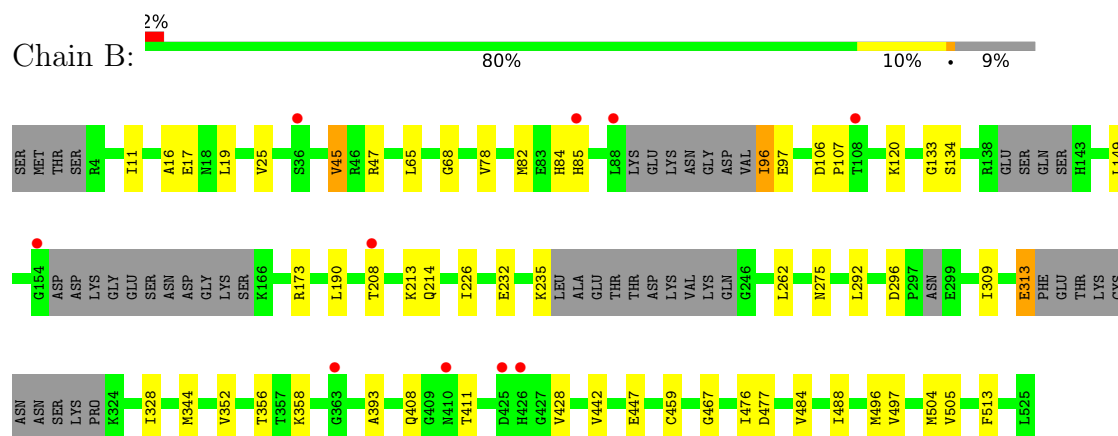
3 Residue-property plots [i](#)

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: Tyrosine-protein phosphatase non-receptor type 11



- Molecule 1: Tyrosine-protein phosphatase non-receptor type 11



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	45.46Å 214.77Å 55.38Å 90.00° 95.59° 90.00°	Depositor
Resolution (Å)	23.39 – 2.32 23.39 – 2.32	Depositor EDS
% Data completeness (in resolution range)	98.8 (23.39-2.32) 98.7 (23.39-2.32)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.28 (at 2.33Å)	Xtriage
Refinement program	BUSTER 2.11.5	Depositor
R, R_{free}	0.186 , 0.238 0.193 , 0.247	Depositor DCC
R_{free} test set	2217 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	34.0	Xtriage
Anisotropy	0.384	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 66.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8215	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.56% 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	0.79	0/4020	1.23	9/5419 (0.2%)
1	B	0.79	0/3963	1.28	7/5345 (0.1%)
All	All	0.79	0/7983	1.25	16/10764 (0.1%)

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	275	ASN	CA-CB-CG	6.22	118.83	112.60
1	A	490	VAL	N-CA-CB	5.78	114.39	110.52
1	B	84	HIS	CA-C-N	5.65	132.32	121.54
1	B	84	HIS	C-N-CA	5.65	132.32	121.54
1	A	511	TYR	CA-C-N	5.58	127.69	120.44
1	A	511	TYR	C-N-CA	5.58	127.69	120.44
1	A	438	PHE	CA-CB-CG	5.56	119.36	113.80
1	B	358	LYS	N-CA-C	-5.51	102.37	110.52
1	A	334	LEU	N-CA-C	-5.30	101.92	110.14
1	B	393	ALA	N-CA-C	-5.24	102.40	109.95
1	A	358	LYS	N-CA-C	-5.24	103.48	110.55
1	B	296	ASP	CA-CB-CG	5.21	117.81	112.60
1	A	296	ASP	CA-CB-CG	5.11	117.71	112.60
1	B	106	ASP	CA-CB-CG	5.09	117.69	112.60
1	A	304	TYR	N-CA-C	5.09	117.78	109.59
1	A	198	LYS	N-CA-C	-5.03	105.27	111.40

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	3937	0	3883	16	0
1	B	3882	0	3825	18	0
2	A	183	0	0	0	0
2	B	213	0	0	0	0
All	All	8215	0	7708	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 2.

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:B:45:VAL:HB	1:B:96:ILE:HD11	1.80	0.61
1:A:84:HIS:HB3	1:A:87:GLN:HG3	1.83	0.60
1:A:388:VAL:HG21	1:A:402:LYS:HD3	1.86	0.58
1:B:133:GLY:HA3	1:B:213:LYS:HB2	1.85	0.57
1:A:175:GLN:HB3	1:B:25:VAL:HG11	1.87	0.56
1:B:313:GLU:HB2	1:B:496:MET:HG3	1.89	0.53
1:B:352:VAL:HG11	1:B:442:VAL:HG13	1.90	0.53
1:A:133:GLY:HA3	1:A:213:LYS:HB2	1.91	0.52
1:B:467:GLY:HA2	1:B:504:MET:HE3	1.91	0.52
1:A:501:ARG:O	1:A:504:MET:HG2	2.11	0.51
1:B:78:VAL:HG12	1:B:82:MET:HE2	1.92	0.50
1:A:309:ILE:HD13	1:A:328:ILE:HG12	1.94	0.50
1:A:390:GLU:HG2	1:A:399:ARG:HG2	1.94	0.49
1:A:69:GLU:OE1	1:A:280:LYS:HE3	2.12	0.49
1:B:65:LEU:HD12	1:B:68:GLY:HA3	1.94	0.49
1:A:90:GLU:HB3	1:A:96:ILE:HD11	1.96	0.48
1:A:28:SER:HA	1:A:100:TYR:O	2.13	0.47
1:A:491:PRO:HG3	1:A:511:TYR:OH	2.15	0.47
1:A:6:TRP:HB3	1:A:101:PRO:HB3	1.98	0.46
1:A:352:VAL:HG11	1:A:442:VAL:HG13	1.97	0.45
1:B:47:ARG:HG2	1:B:96:ILE:HD12	1.99	0.45
1:B:107:PRO:HG3	1:B:190:LEU:HD12	2.00	0.44
1:B:309:ILE:HD13	1:B:328:ILE:HG12	2.01	0.43
1:A:4:ARG:HB3	1:A:256:GLN:HE22	1.83	0.43
1:B:428:VAL:HG21	1:B:513:PHE:HB2	2.00	0.43
1:B:134:SER:HA	1:B:214:GLN:O	2.19	0.42
1:A:149:LEU:HB2	1:A:172:ILE:HD11	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:356:THR:OG1	1:B:459:CYS:HB3	2.19	0.42
1:A:439:LEU:HD21	1:A:469:PHE:HD2	1.85	0.41
1:B:292:LEU:HD21	1:B:344:MET:HB2	2.01	0.41
1:B:408:GLN:HB3	1:B:411:THR:HG23	2.02	0.41
1:B:497:VAL:HG12	1:B:504:MET:HG3	2.03	0.41
1:B:11:ILE:HD12	1:B:16:ALA:HB2	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	472/526 (90%)	462 (98%)	9 (2%)	1 (0%)	43	53
1	B	465/526 (88%)	446 (96%)	18 (4%)	1 (0%)	43	53
All	All	937/1052 (89%)	908 (97%)	27 (3%)	2 (0%)	43	53

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	505	VAL
1	B	505	VAL

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	432/468 (92%)	409 (95%)	23 (5%)	20	29
1	B	425/468 (91%)	405 (95%)	20 (5%)	23	34
All	All	857/936 (92%)	814 (95%)	43 (5%)	22	32

All (43) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	ILE
1	A	14	VAL
1	A	19	LEU
1	A	26	ASP
1	A	47	ARG
1	A	102	LEU
1	A	123	GLU
1	A	131	LYS
1	A	141	GLN
1	A	164	LYS
1	A	191	THR
1	A	206	LEU
1	A	227	GLU
1	A	272	GLU
1	A	311	MET
1	A	324	LYS
1	A	402	LYS
1	A	408	GLN
1	A	410	ASN
1	A	447	GLU
1	A	476	ILE
1	A	484	VAL
1	A	488	ILE
1	B	17	GLU
1	B	19	LEU
1	B	45	VAL
1	B	85	HIS
1	B	96	ILE
1	B	97	GLU
1	B	120	LYS
1	B	149	LEU
1	B	173	ARG
1	B	208	THR
1	B	226	ILE
1	B	232	GLU

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Mol	Chain	Res	Type
1	B	235	LYS
1	B	262	LEU
1	B	313	GLU
1	B	447	GLU
1	B	476	ILE
1	B	477	ASP
1	B	484	VAL
1	B	488	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	18	ASN
1	A	103	ASN
1	A	116	HIS
1	A	175	GLN
1	A	256	GLN
1	B	18	ASN
1	B	37	ASN
1	B	85	HIS
1	B	87	GLN
1	B	175	GLN
1	B	256	GLN
1	B	275	ASN
1	B	339	ASN
1	B	410	ASN
1	B	446	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

There are no ligands in this entry.

5.7 Other polymers

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

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	485/526 (92%)	0.20	10 (2%)	63 66	20, 44, 71, 108	1 (0%)
1	B	479/526 (91%)	0.13	10 (2%)	63 66	20, 40, 69, 88	0
All	All	964/1052 (91%)	0.17	20 (2%)	63 66	20, 42, 71, 108	1 (0%)

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	426	HIS	3.0
1	A	38	PRO	3.0
1	B	36	SER	2.8
1	B	363	GLY	2.8
1	A	177	LEU	2.7
1	A	262	LEU	2.6
1	B	154	GLY	2.5
1	B	108	THR	2.4
1	B	88	LEU	2.4
1	A	39	GLY	2.3
1	A	90	GLU	2.3
1	A	313	GLU	2.2
1	A	218	THR	2.2
1	B	85	HIS	2.2
1	B	208	THR	2.2
1	B	410	ASN	2.2
1	A	107	PRO	2.2
1	A	426	HIS	2.1
1	A	115	GLY	2.1
1	B	425	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.