



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2026 – 10:48 PM UTC

PDB ID : 5HPS / pdb_00005hps
Title : System-wide modulation of HECT E3 ligases with selective ubiquitin variant probes: WWP1 and UbV P1.1
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Deposited on : 2016-01-20
Resolution : 2.05 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

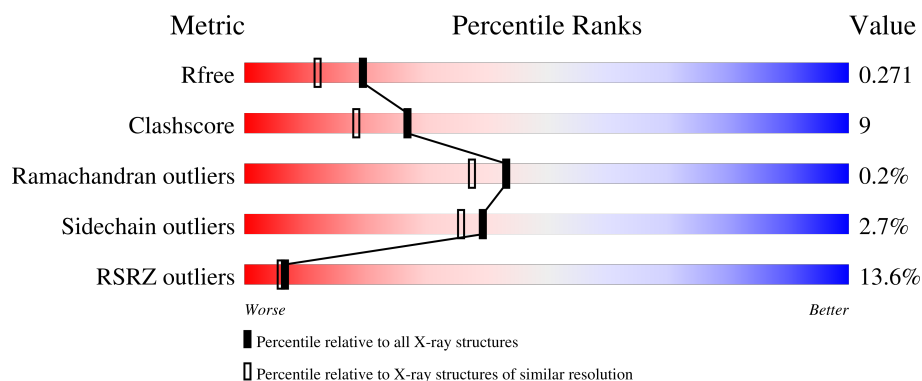
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.05 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	2260 (2.04-2.04)
Clashscore	190562	2333 (2.04-2.04)
Ramachandran outliers	187476	2318 (2.04-2.04)
Sidechain outliers	187428	2318 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

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	383	13% 74% 21% ..
2	B	83	13% 75% 13% 12%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3817 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 WWP1 HECT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	374	Total	C	N	O	S	0	0	0
			3123	2023	520	560	20			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	535	GLY	-	expression tag	UNP Q9H0M0
A	536	SER	-	expression tag	UNP Q9H0M0

- Molecule 2 is a protein called Ubiquitin variant P1.1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	73	Total	C	N	O	S	0	0	0
			600	386	101	112	1			

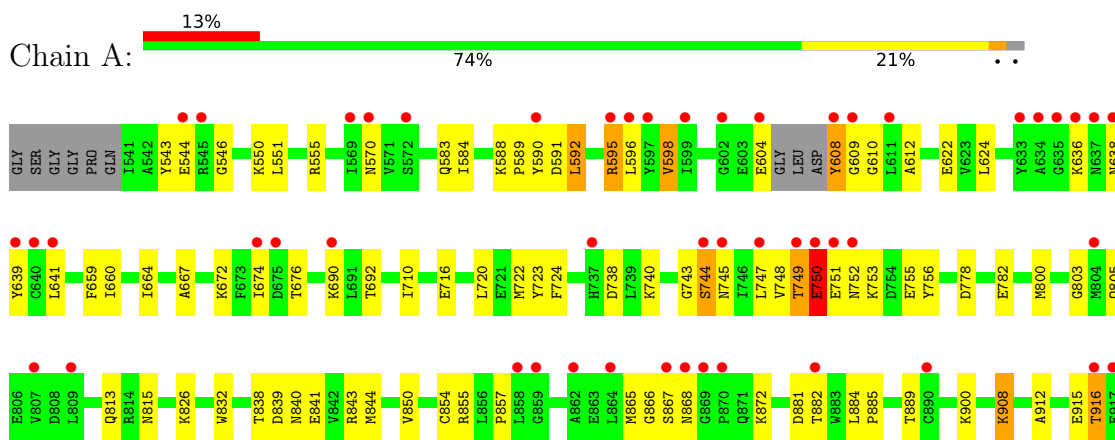
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	87	Total	O	0	0
			87	87		
3	B	7	Total	O	0	0
			7	7		

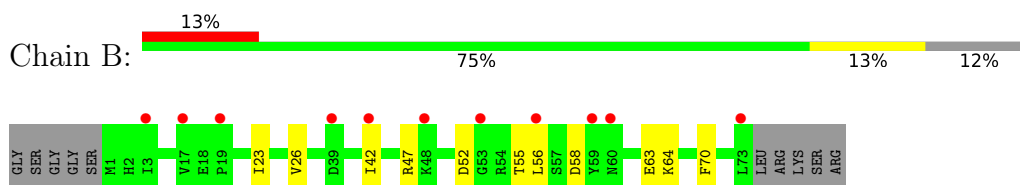
3 Residue-property plots

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: WWP1 HECT



• Molecule 2: Ubiquitin variant P1.1



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	207.91Å 44.91Å 60.20Å 90.00° 96.07° 90.00°	Depositor
Resolution (Å)	103.37 – 2.05 103.37 – 2.05	Depositor EDS
% Data completeness (in resolution range)	98.7 (103.37-2.05) 90.9 (103.37-2.05)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.85 (at 1.88Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.209 , 0.266 0.214 , 0.271	Depositor DCC
R_{free} test set	2079 reflections (4.62%)	wwPDB-VP
Wilson B-factor (Å ²)	32.5	Xtriage
Anisotropy	0.789	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 37.5	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	3817	wwPDB-VP
Average B, all atoms (Å ²)	51.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.53% 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	0.54	0/3205	0.89	6/4325 (0.1%)
2	B	0.41	0/610	0.78	0/821
All	All	0.52	0/3815	0.87	6/5146 (0.1%)

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	1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	916	THR	N-CA-C	8.12	119.27	108.07
1	A	743	GLY	CA-C-N	-6.21	112.12	122.17
1	A	743	GLY	C-N-CA	-6.21	112.12	122.17
1	A	749	THR	N-CA-C	-5.96	104.78	111.28
1	A	750	GLU	N-CA-C	5.75	117.25	108.52
1	A	750	GLU	CA-CB-CG	5.54	125.19	114.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	744	SER	Peptide

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	3123	0	3049	63	0
2	B	600	0	623	7	0
3	A	87	0	0	5	0
3	B	7	0	0	0	0
All	All	3817	0	3672	68	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 9.

All (68) 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:722:MET:HB2	1:A:747:LEU:HD12	1.68	0.76
1:A:622:GLU:OE2	3:A:1001:HOH:O	2.05	0.74
1:A:722:MET:CB	1:A:747:LEU:HD12	2.20	0.72
1:A:724:PHE:HZ	1:A:752:ASN:HB2	1.60	0.66
1:A:570:ASN:O	1:A:583:GLN:NE2	2.26	0.66
2:B:63:GLU:HG3	2:B:64:LYS:HG2	1.78	0.66
1:A:544:GLU:HG3	1:A:546:GLY:H	1.61	0.65
1:A:588:LYS:HG2	1:A:591:ASP:OD2	1.97	0.65
1:A:596:LEU:HD21	1:A:598:VAL:HG13	1.81	0.63
1:A:815:ASN:OD1	1:A:872:LYS:NZ	2.35	0.59
1:A:550:LYS:NZ	3:A:1005:HOH:O	2.34	0.59
1:A:723:TYR:HD1	1:A:745:ASN:H	1.50	0.59
1:A:710:ILE:HD11	2:B:70:PHE:CE2	2.37	0.59
1:A:805:GLN:H	1:A:844:MET:HE2	1.66	0.59
1:A:639:TYR:CE2	1:A:857:PRO:HB3	2.38	0.58
1:A:778:ASP:O	1:A:782:GLU:HG3	2.05	0.56
1:A:839:ASP:OD1	1:A:841:GLU:HG2	2.05	0.56
1:A:608:TYR:C	1:A:610:GLY:HA3	2.31	0.56
1:A:609:GLY:N	1:A:610:GLY:HA3	2.19	0.56
1:A:724:PHE:CZ	1:A:752:ASN:HB2	2.41	0.56
1:A:885:PRO:HD2	1:A:912:ALA:HB2	1.90	0.54
1:A:595:ARG:HD2	1:A:596:LEU:H	1.73	0.54
1:A:598:VAL:HG21	1:A:612:ALA:HA	1.88	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:584:ILE:HD12	1:A:659:PHE:HE1	1.72	0.53
1:A:844:MET:HE3	1:A:854:CYS:HB2	1.90	0.53
1:A:690:LYS:HE3	1:A:692:THR:HG22	1.91	0.52
2:B:55:THR:HG23	2:B:58:ASP:H	1.75	0.51
1:A:884:LEU:HD23	1:A:908:LYS:HG3	1.92	0.50
1:A:638:ASN:ND2	1:A:866:GLY:O	2.44	0.50
1:A:912:ALA:O	1:A:916:THR:OG1	2.28	0.50
1:A:722:MET:HB3	1:A:747:LEU:HD12	1.94	0.49
1:A:805:GLN:H	1:A:844:MET:CE	2.25	0.48
1:A:881:ASP:OD2	1:A:900:LYS:HE2	2.14	0.48
1:A:638:ASN:ND2	1:A:866:GLY:C	2.71	0.48
1:A:546:GLY:O	1:A:550:LYS:HG3	2.13	0.47
2:B:26:VAL:HG21	2:B:56:LEU:HD21	1.94	0.47
1:A:622:GLU:CD	3:A:1001:HOH:O	2.51	0.47
1:A:803:GLY:O	1:A:855:ARG:NH1	2.48	0.46
1:A:551:LEU:HG	1:A:800:MET:HE1	1.96	0.46
1:A:667:ALA:HB3	1:A:674:ILE:HD11	1.97	0.46
1:A:750:GLU:HA	1:A:751:GLU:HA	1.25	0.45
1:A:738:ASP:HB3	1:A:740:LYS:O	2.17	0.45
1:A:638:ASN:HA	1:A:865:MET:HB2	1.98	0.44
1:A:748:VAL:O	1:A:753:LYS:HB3	2.18	0.44
1:A:638:ASN:HD21	1:A:867:SER:HA	1.82	0.44
1:A:740:LYS:HE2	1:A:755:GLU:OE2	2.17	0.44
1:A:595:ARG:HH22	1:A:672:LYS:NZ	2.16	0.43
1:A:724:PHE:CE1	1:A:747:LEU:HD23	2.52	0.43
1:A:555:ARG:HD3	3:A:1030:HOH:O	2.19	0.43
1:A:716:GLU:HG3	1:A:749:THR:HB	2.00	0.43
1:A:543:TYR:OH	1:A:915:GLU:OE2	2.19	0.43
1:A:838:THR:HG23	1:A:843:ARG:HG3	1.99	0.43
1:A:826:LYS:NZ	3:A:1008:HOH:O	2.41	0.43
1:A:660:ILE:O	1:A:664:ILE:HG12	2.19	0.42
1:A:638:ASN:HD21	1:A:866:GLY:C	2.28	0.42
1:A:866:GLY:C	1:A:868:ASN:H	2.28	0.42
1:A:589:PRO:O	1:A:592:LEU:HB2	2.20	0.41
1:A:747:LEU:HD22	1:A:756:TYR:HB2	2.01	0.41
1:A:749:THR:O	1:A:750:GLU:CB	2.67	0.41
2:B:23:ILE:HB	2:B:52:ASP:HA	2.01	0.41
1:A:624:LEU:HB3	1:A:641:LEU:CD2	2.51	0.41
1:A:850:VAL:O	1:A:889:THR:HA	2.21	0.41
2:B:47:ARG:HE	2:B:47:ARG:HB3	1.62	0.41
1:A:720:LEU:CD2	2:B:42:ILE:HD12	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:813:GLN:HA	1:A:832:TRP:CZ2	2.57	0.40
1:A:723:TYR:HD1	1:A:745:ASN:N	2.18	0.40
1:A:588:LYS:HE3	1:A:591:ASP:OD1	2.22	0.40
1:A:840:ASN:O	1:A:844:MET:HG2	2.21	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	370/383 (97%)	353 (95%)	16 (4%)	1 (0%)	36	30
2	B	71/83 (86%)	68 (96%)	3 (4%)	0	100	100
All	All	441/466 (95%)	421 (96%)	19 (4%)	1 (0%)	43	37

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	636	LYS

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	338/344 (98%)	327 (97%)	11 (3%)	33	28

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	68/75 (91%)	68 (100%)	0	100	100
All	All	406/419 (97%)	395 (97%)	11 (3%)	39	36

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	590	TYR
1	A	592	LEU
1	A	595	ARG
1	A	598	VAL
1	A	604	GLU
1	A	608	TYR
1	A	676	THR
1	A	744	SER
1	A	750	GLU
1	A	882	THR
1	A	908	LYS

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

Mol	Chain	Res	Type
1	A	638	ASN
1	A	737	HIS

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 ⓘ

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	374/383 (97%)	0.80	50 (13%) 7 6	30, 45, 80, 118	0
2	B	73/83 (87%)	1.10	11 (15%) 5 5	36, 57, 84, 94	0
All	All	447/466 (95%)	0.85	61 (13%) 7 6	30, 47, 82, 118	0

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	639	TYR	4.9
1	A	608	TYR	4.7
2	B	53	GLY	4.6
1	A	916	THR	4.6
1	A	751	GLU	4.5
1	A	744	SER	4.2
1	A	749	THR	3.8
1	A	859	GLY	3.7
1	A	590	TYR	3.6
1	A	596	LEU	3.6
2	B	3	ILE	3.5
1	A	752	ASN	3.5
1	A	637	ASN	3.4
1	A	858	LEU	3.4
1	A	602	GLY	3.4
1	A	635	GLY	3.3
1	A	545	ARG	3.1
1	A	745	ASN	2.9
2	B	19	PRO	2.9
1	A	611	LEU	2.9
1	A	750	GLU	2.7
1	A	638	ASN	2.7
1	A	807	VAL	2.6
1	A	640	CYS	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	882	THR	2.6
1	A	599	ILE	2.6
2	B	17	VAL	2.6
1	A	595	ARG	2.6
1	A	641	LEU	2.6
1	A	569	ILE	2.5
2	B	59	TYR	2.5
2	B	73	LEU	2.5
1	A	636	LYS	2.5
2	B	39	ASP	2.5
1	A	544	GLU	2.4
1	A	674	ILE	2.4
2	B	48	LYS	2.4
1	A	597	TYR	2.4
1	A	870	PRO	2.4
1	A	570	ASN	2.4
1	A	804	MET	2.4
1	A	604	GLU	2.3
1	A	633	TYR	2.3
1	A	862	ALA	2.3
1	A	917	GLU	2.3
2	B	60	ASN	2.3
1	A	634	ALA	2.3
1	A	609	GLY	2.2
1	A	809	LEU	2.2
1	A	869	GLY	2.2
1	A	747	LEU	2.2
1	A	690	LYS	2.2
1	A	890	CYS	2.1
1	A	737	HIS	2.1
2	B	56	LEU	2.1
2	B	42	ILE	2.1
1	A	675	ASP	2.1
1	A	572	SER	2.1
1	A	868	ASN	2.0
1	A	867	SER	2.0
1	A	864	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

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.