Full wwPDB X-ray Structure Validation Report (i)

Aug 4, 2025 – 05:15 PM JST

PDB ID	:	9IY5 / pdb_00009iy5
Title	:	WDR5 inhibitor complex
Authors	:	Wang, F.; Zhou, C.
Deposited on	:	2024-07-30
Resolution	:	1.80 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 (i) 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 (1)) were used in the production of this report:

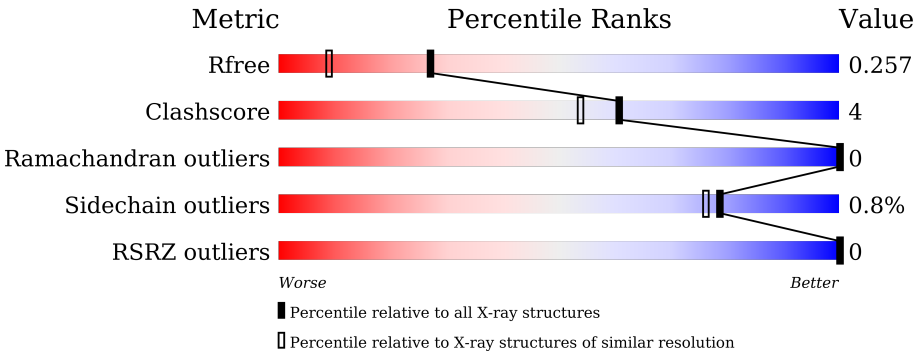
MolProbity	:	4-5-2 with Phenix2.0rc1
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.45.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7108 (1.80-1.80)
Clashscore	180529	8162 (1.80-1.80)
Ramachandran outliers	177936	8077 (1.80-1.80)
Sidechain outliers	177891	8076 (1.80-1.80)
RSRZ outliers	164620	7108 (1.80-1.80)

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 <=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	334	81% 10% 9%
1	B	334	80% 10% 10%
2	C	3	33% 67%
2	D	3	33% 67%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 5398 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 WD repeat-containing protein 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	304	Total	C	N	O	S	0	3	0
			2366	1509	394	452	11			
1	B	300	Total	C	N	O	S	0	1	0
			2327	1485	389	443	10			

- Molecule 2 is a protein called YCP-A1EAK-A1ECH.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	3	Total	C	N	O	0	0	0
			32	25	4	3			
2	D	3	Total	C	N	O	0	0	0
			32	25	4	3			

- Molecule 3 is water.

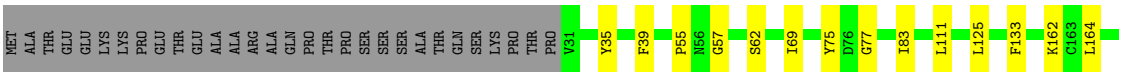
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	330	Total	O	0	0
			330	330		
3	B	308	Total	O	0	0
			308	308		
3	C	2	Total	O	0	0
			2	2		
3	D	1	Total	O	0	0
			1	1		

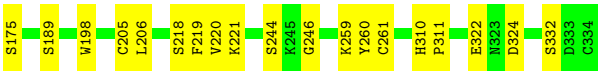
3 Residue-property plots (i)

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: WD repeat-containing protein 5

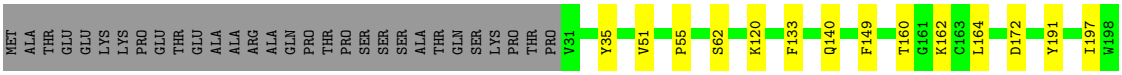
Chain A:

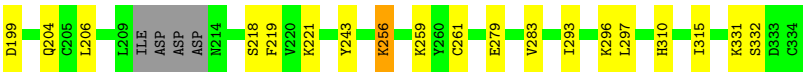




• Molecule 1: WD repeat-containing protein 5

Chain B:



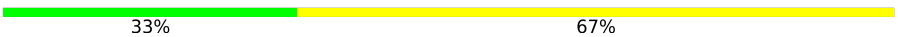


• Molecule 2: YCP-A1EAK-A1ECH

Chain C:

• Molecule 2: YCP-A1EAK-A1ECH

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	47.03Å 61.45Å 64.72Å 68.48° 88.73° 67.79°	Depositor
Resolution (Å)	37.45 – 1.80 37.45 – 1.80	Depositor EDS
% Data completeness (in resolution range)	95.4 (37.45-1.80) 95.4 (37.45-1.80)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.26 (at 1.81Å)	Xtriage
Refinement program	PHENIX (1.21rc1_4924: ???)	Depositor
R, R_{free}	0.221 , 0.255 0.224 , 0.257	Depositor DCC
R_{free} test set	2704 reflections (4.72%)	wwPDB-VP
Wilson B-factor (Å^2)	14.7	Xtriage
Anisotropy	0.776	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 33.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.118 for h,h-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	5398	wwPDB-VP
Average B, all atoms (Å^2)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.38% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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

Bond lengths and bond angles in the following residue types are not validated in this section: A1EAK, YCP, A1ECH

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	0.41	1/2425 (0.0%)	0.68	2/3290 (0.1%)
1	B	0.42	0/2382	0.66	0/3229
All	All	0.41	1/4807 (0.0%)	0.67	2/6519 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	219	PHE	C-N	-6.81	1.26	1.33

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	244	SER	N-CA-C	-5.75	105.09	111.36
1	A	324	ASP	CA-CB-CG	5.04	117.64	112.60

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	2366	0	2343	21	0
1	B	2327	0	2308	19	0
2	C	32	0	10	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	32	0	10	0	0
3	A	330	0	0	8	0
3	B	308	0	0	2	0
3	C	2	0	0	0	0
3	D	1	0	0	0	0
All	All	5398	0	4671	39	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 4.

All (39) 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:283:VAL:HB	1:B:297:LEU:HB2	1.90	0.53
1:B:204:GLN:NE2	3:B:403:HOH:O	2.25	0.52
1:B:218:SER:HB2	1:B:261:CYS:HA	1.92	0.51
1:A:189:SER:HB3	1:A:220[B]:VAL:HG23	1.95	0.48
1:A:189:SER:HB3	1:A:220[B]:VAL:CG2	2.44	0.48
1:A:206:LEU:HA	3:A:492:HOH:O	2.14	0.47
1:B:172:ASP:HB3	1:B:191:TYR:HB3	1.96	0.47
1:A:218:SER:HB2	1:A:261:CYS:HA	1.96	0.47
1:A:259:LYS:HD2	1:A:260:TYR:CE2	2.49	0.47
1:A:162:LYS:HE3	1:A:164:LEU:HD23	1.96	0.47
1:B:197:ILE:HD12	1:B:243:TYR:CD1	2.51	0.45
1:B:310:HIS:HB2	1:B:315:ILE:HB	1.97	0.45
3:A:518:HOH:O	1:B:55:PRO:HB3	2.16	0.45
1:A:111:LEU:HB2	1:A:125:LEU:HB2	1.99	0.45
1:A:246:GLY:O	3:A:401:HOH:O	2.21	0.45
1:A:62:SER:O	1:A:69:ILE:HA	2.18	0.44
1:A:259:LYS:HG3	1:A:260:TYR:CD2	2.52	0.44
1:A:55:PRO:HB3	3:A:610:HOH:O	2.17	0.44
1:A:198:TRP:CZ3	1:A:205:CYS:HB2	2.52	0.43
1:A:77:GLY:HA3	3:A:625:HOH:O	2.18	0.43
1:B:35:TYR:CG	1:B:332:SER:HB2	2.52	0.43
1:B:199:ASP:HB2	1:B:206:LEU:HD11	2.01	0.42
1:B:219:PHE:CZ	1:B:221:LYS:HD2	2.54	0.42
1:B:162:LYS:HE3	1:B:164:LEU:HD21	2.01	0.42
1:B:331:LYS:HB2	3:B:619:HOH:O	2.20	0.42
1:A:39:PHE:HB3	3:A:625:HOH:O	2.18	0.42
1:B:256:LYS:HD3	1:B:279:GLU:HB2	2.01	0.42
1:B:133:PHE:CD1	1:B:149:PHE:HE1	2.37	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:69:ILE:HB	1:A:83:ILE:HB	2.02	0.41
1:A:322:GLU:HG3	3:A:522:HOH:O	2.19	0.41
1:B:51:VAL:HG12	1:B:62:SER:HB3	2.01	0.41
1:B:160:THR:OG1	1:B:162:LYS:HE2	2.20	0.41
1:A:35:TYR:CG	1:A:332:SER:HB2	2.56	0.41
1:A:57:GLY:HA3	3:A:512:HOH:O	2.20	0.41
1:A:310:HIS:CG	1:A:311:PRO:HD2	2.56	0.41
1:A:75:TYR:CZ	1:B:140:GLN:HG3	2.56	0.40
1:B:293:ILE:HG21	1:B:296:LYS:HE2	2.02	0.40
1:A:133:PHE:CD2	1:A:175:SER:HA	2.56	0.40
1:B:331:LYS:HA	1:B:331:LYS:HD2	1.93	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	305/334 (91%)	291 (95%)	14 (5%)	0	100	100
1	B	297/334 (89%)	283 (95%)	14 (5%)	0	100	100
All	All	602/668 (90%)	574 (95%)	28 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	267/291 (92%)	266 (100%)	1 (0%)	89	88
1	B	262/291 (90%)	259 (99%)	3 (1%)	70	65
All	All	529/582 (91%)	525 (99%)	4 (1%)	79	76

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	221	LYS
1	B	120	LYS
1	B	256	LYS
1	B	259	LYS

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	323	ASN
1	B	314	ASN
1	B	323	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)

6 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	YCP	D	1	2	6,8,9	1.01	0	5,9,11	0.53	0
2	A1ECH	C	3	2	15,15,15	3.33	3 (20%)	18,18,18	1.95	4 (22%)
2	A1EAK	C	2	2	8,9,10	3.20	4 (50%)	6,11,13	0.62	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	A1EAK	D	2	2	8,9,10	3.17	4 (50%)	6,11,13	0.49	0
2	A1ECH	D	3	2	15,15,15	3.30	3 (20%)	18,18,18	1.83	3 (16%)
2	YCP	C	1	2	6,8,9	0.75	0	5,9,11	0.90	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	YCP	D	1	2	-	0/1/10/12	1/1/1/1
2	A1ECH	C	3	2	-	9/12/12/12	0/1/1/1
2	A1EAK	C	2	2	-	1/3/13/15	0/1/1/1
2	A1EAK	D	2	2	-	1/3/13/15	0/1/1/1
2	A1ECH	D	3	2	-	5/12/12/12	0/1/1/1
2	YCP	C	1	2	-	0/1/10/12	0/1/1/1

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	3	A1ECH	C-N1	11.99	1.50	1.33
2	D	3	A1ECH	C-N1	11.84	1.50	1.33
2	C	2	A1EAK	C15-CB	-5.92	1.38	1.53
2	D	2	A1EAK	C12-CB	-5.90	1.38	1.53
2	C	2	A1EAK	C12-CB	5.23	1.67	1.53
2	D	2	A1EAK	C15-CB	5.16	1.67	1.53
2	C	2	A1EAK	C13-C12	-3.43	1.37	1.51
2	D	2	A1EAK	C14-C15	-3.26	1.38	1.51
2	C	3	A1ECH	C21-C22	2.41	1.58	1.51
2	D	3	A1ECH	C21-C22	2.19	1.58	1.51
2	D	3	A1ECH	C27-C22	2.11	1.43	1.38
2	C	3	A1ECH	O-C	-2.03	1.19	1.23
2	D	2	A1EAK	C13-C12	2.00	1.60	1.51
2	C	2	A1EAK	C14-C15	2.00	1.60	1.51

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	3	A1ECH	CA-C-N1	5.34	123.48	116.18
2	D	3	A1ECH	CA-C-N1	5.19	123.28	116.18
2	C	3	A1ECH	C1-N1-C	3.63	128.50	122.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	3	A1ECH	O-C-N1	-3.48	117.33	123.09
2	D	3	A1ECH	O-C-N1	-3.36	117.53	123.09
2	D	3	A1ECH	C1-N1-C	2.96	127.34	122.22
2	C	3	A1ECH	CB-CA-C	2.67	116.64	110.85

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	3	A1ECH	CA-C-N1-C1
2	C	3	A1ECH	O-C-N1-C1
2	C	3	A1ECH	N-CA-CB-C20
2	D	3	A1ECH	CA-C-N1-C1
2	D	3	A1ECH	O-C-N1-C1
2	C	3	A1ECH	C21-C20-CB-CA
2	C	3	A1ECH	C-CA-CB-C20
2	C	3	A1ECH	O-C-CA-N
2	C	3	A1ECH	N1-C-CA-N
2	D	3	A1ECH	N1-C-CA-N
2	D	3	A1ECH	O-C-CA-N
2	C	3	A1ECH	C20-C21-C22-C27
2	C	3	A1ECH	C20-C21-C22-C23
2	C	2	A1EAK	C-CA-CB-C12
2	D	2	A1EAK	C-CA-CB-C15
2	D	3	A1ECH	CB-C20-C21-C22

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	D	1	YCP	CA-CB-CD-CE-CG-N

No monomer is involved in short contacts.

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, 95^{th} 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	304/334 (91%)	-1.42	0	100	100	7, 18, 30, 56	3 (0%)
1	B	300/334 (89%)	-1.39	0	100	100	9, 20, 32, 44	1 (0%)
2	C	0/3	-	-			-	-
2	D	0/3	-	-			-	-
All	All	604/674 (89%)	-1.40	0	100	100	7, 19, 31, 56	4 (0%)

There are no RSRZ outliers to report.

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

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	YCP	C	1	8/9	0.99	0.02	14,16,17,17	0
2	YCP	D	1	8/9	0.99	0.03	12,14,18,20	0
2	A1EAK	C	2	9/10	0.99	0.03	11,16,20,23	0
2	A1EAK	D	2	9/10	0.99	0.03	13,15,19,19	0
2	A1ECH	C	3	15/15	0.99	0.03	17,22,27,28	0
2	A1ECH	D	3	15/15	0.99	0.03	13,17,21,29	0

6.3 Carbohydrates

There are no oligosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.