



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2018 – 11:56 pm GMT

PDB ID : 4M6B  
Title : Crystal structure of yeast Swr1-Z domain in complex with H2A.Z-H2B dimer  
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Deposited on : 2013-08-09  
Resolution : 1.78 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](mailto: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.

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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 : trunk30967  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk30967

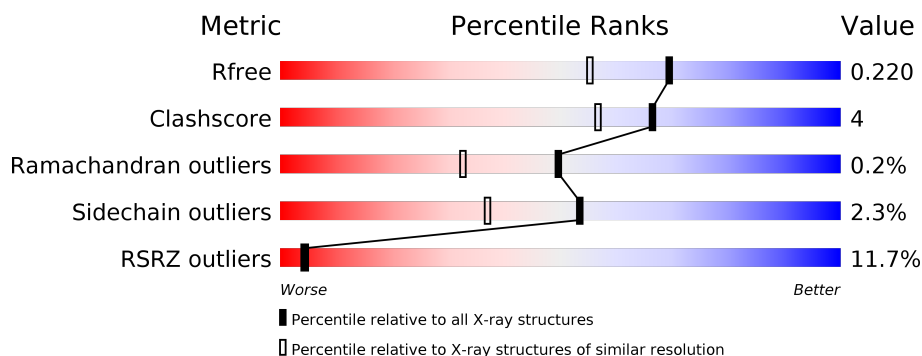
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.78 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))
$R_{free}$	111664	7886 (1.80-1.76)
Clashscore	122126	8858 (1.80-1.76)
Ramachandran outliers	120053	8764 (1.80-1.76)
Sidechain outliers	120020	8763 (1.80-1.76)
RSRZ outliers	108989	7741 (1.80-1.76)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	193	<div> <div>14%</div> <div> <div></div> <div>84%</div> <div>11%</div> <div>• •</div> </div> </div>
1	D	193	<div> <div>7%</div> <div> <div></div> <div>88%</div> <div>9%</div> <div>• •</div> </div> </div>
2	C	55	<div> <div>9%</div> <div> <div></div> <div>38%</div> <div>• •</div> <div>58%</div> </div> </div>
2	F	55	<div> <div>5%</div> <div> <div></div> <div>38%</div> <div>•</div> <div>58%</div> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3398 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 Chimera protein of Histone H2B.1 and Histone H2A.Z.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	185	Total	C	N	O	S	0	0	0
			1427	895	261	270	1			
1	D	187	Total	C	N	O	S	0	0	0
			1442	903	266	272	1			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	35	MET	-	EXPRESSION TAG	UNP P02293
D	35	MET	-	EXPRESSION TAG	UNP P02293

- Molecule 2 is a protein called Helicase SWR1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	23	Total	C	N	O	0	0	0
			171	105	24	42			
2	F	23	Total	C	N	O	0	0	0
			171	105	24	42			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	585	GLY	-	EXPRESSION TAG	UNP Q05471
C	586	SER	-	EXPRESSION TAG	UNP Q05471
C	587	HIS	-	EXPRESSION TAG	UNP Q05471
C	588	MET	-	EXPRESSION TAG	UNP Q05471
C	639	TRP	-	EXPRESSION TAG	UNP Q05471
F	585	GLY	-	EXPRESSION TAG	UNP Q05471
F	586	SER	-	EXPRESSION TAG	UNP Q05471
F	587	HIS	-	EXPRESSION TAG	UNP Q05471
F	588	MET	-	EXPRESSION TAG	UNP Q05471
F	639	TRP	-	EXPRESSION TAG	UNP Q05471

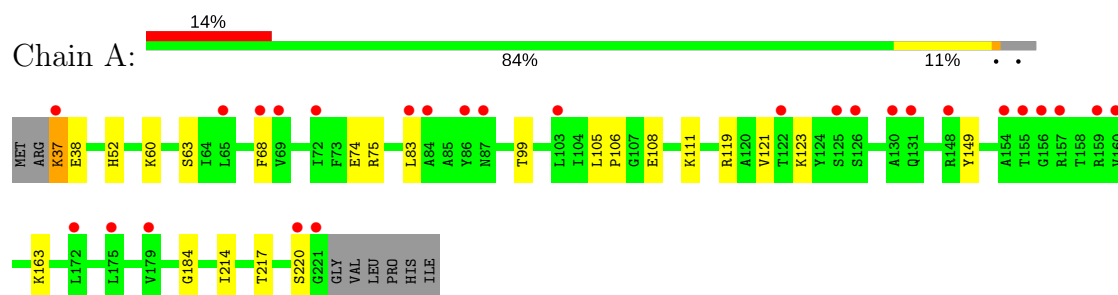
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	31	Total 31	O 31	0	0
3	C	10	Total 10	O 10	0	0
3	D	134	Total 134	O 134	0	0
3	F	12	Total 12	O 12	0	0

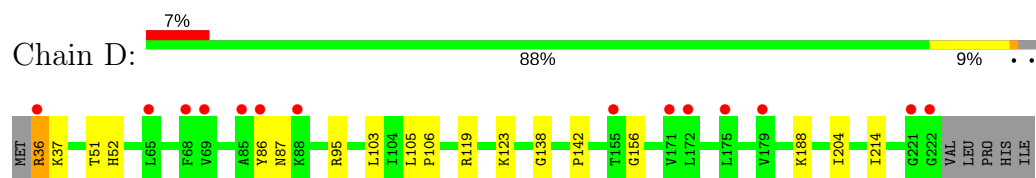
### 3 Residue-property plots [i](#)

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.

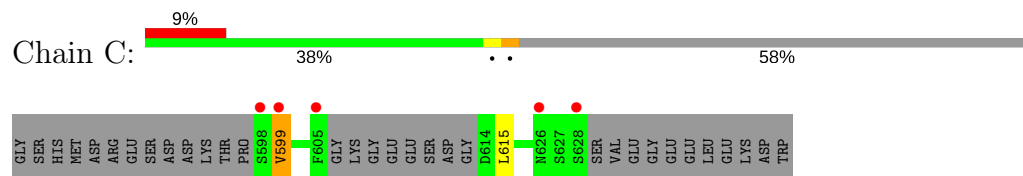
- Molecule 1: Chimera protein of Histone H2B.1 and Histone H2A.Z



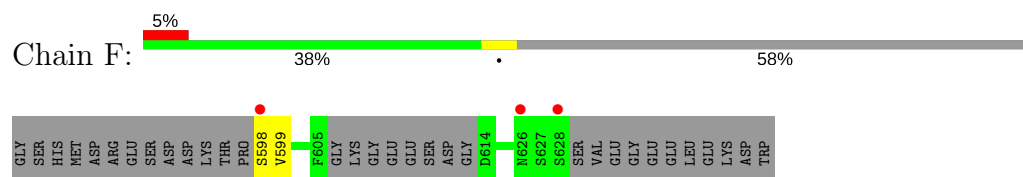
- Molecule 1: Chimera protein of Histone H2B.1 and Histone H2A.Z



- Molecule 2: Helicase SWR1



- Molecule 2: Helicase SWR1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.67Å 69.92Å 101.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.78 29.53 – 1.78	Depositor EDS
% Data completeness (in resolution range)	96.4 (50.00-1.78) 96.9 (29.53-1.78)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.32 (at 1.78Å)	Xtriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.211 , 0.220 0.211 , 0.220	Depositor DCC
$R_{free}$ test set	2224 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.2	Xtriage
Anisotropy	0.181	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 47.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3398	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.80% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.64	0/1445	0.81	0/1947
1	D	0.56	0/1460	0.80	0/1966
2	C	0.67	0/171	0.81	0/230
2	F	0.69	0/171	0.90	0/230
All	All	0.61	0/3247	0.81	0/4373

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	1427	0	1491	13	0
1	D	1442	0	1507	14	0
2	C	171	0	150	2	0
2	F	171	0	150	1	0
3	A	31	0	0	0	0
3	C	10	0	0	0	0
3	D	134	0	0	4	0
3	F	12	0	0	0	0
All	All	3398	0	3298	28	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 (28) 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:D:188:LYS:HE2	3:D:401:HOH:O	1.71	0.91
1:D:188:LYS:HG3	3:D:401:HOH:O	1.81	0.81
1:A:108:GLU:OE1	1:A:111:LYS:HD3	1.87	0.73
1:A:37:LYS:HG2	1:A:37:LYS:O	1.88	0.72
1:D:95:ARG:HG3	3:D:375:HOH:O	1.90	0.71
1:D:52:HIS:ND1	1:D:188:LYS:HE3	2.16	0.60
1:A:68:PHE:HE1	1:A:214:ILE:HD11	1.69	0.57
1:A:68:PHE:CE1	1:A:214:ILE:HD11	2.40	0.56
1:A:38:GLU:HG3	1:A:149:TYR:CZ	2.41	0.56
1:A:217:THR:O	1:A:220:SER:HB2	2.07	0.54
1:D:119:ARG:HH22	1:D:123:LYS:HD3	1.73	0.53
1:A:119:ARG:HD3	1:A:123:LYS:HE2	1.91	0.53
1:D:37:LYS:NZ	2:F:598:SER:OG	2.43	0.51
1:D:103:LEU:HG	3:D:368:HOH:O	2.10	0.51
1:D:123:LYS:HE2	1:D:138:GLY:HA3	1.92	0.50
1:D:204:ILE:HD13	1:D:214:ILE:HD13	1.93	0.49
1:D:86:TYR:HD2	1:D:87:ASN:OD1	1.96	0.48
2:C:615:LEU:HD12	2:C:615:LEU:N	2.28	0.47
1:A:108:GLU:HA	1:A:108:GLU:OE1	2.15	0.47
1:A:63:SER:OG	2:C:599:VAL:HG13	2.14	0.47
1:D:51:THR:HG22	1:D:52:HIS:CD2	2.52	0.45
1:A:105:LEU:HA	1:A:106:PRO:HD3	1.85	0.44
1:A:83:LEU:HD13	1:A:99:THR:HB	1.99	0.44
1:A:52:HIS:CD2	1:A:184:GLY:HA3	2.53	0.43
1:D:36:ARG:HD3	1:D:36:ARG:HA	1.69	0.43
1:D:119:ARG:NH2	1:D:123:LYS:HD3	2.34	0.41
1:A:121:VAL:HG13	1:A:163:LYS:HG2	2.03	0.41
1:D:105:LEU:HA	1:D:106:PRO:HD3	1.88	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	183/193 (95%)	181 (99%)	2 (1%)	0	100	100
1	D	185/193 (96%)	183 (99%)	1 (0%)	1 (0%)	31	15
2	C	19/55 (34%)	19 (100%)	0	0	100	100
2	F	19/55 (34%)	19 (100%)	0	0	100	100
All	All	406/496 (82%)	402 (99%)	3 (1%)	1 (0%)	49	32

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	156	GLY

### 5.3.2 Protein sidechains ⓘ

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	152/159 (96%)	148 (97%)	4 (3%)	49	32
1	D	153/159 (96%)	151 (99%)	2 (1%)	71	62
2	C	21/48 (44%)	20 (95%)	1 (5%)	28	11
2	F	21/48 (44%)	20 (95%)	1 (5%)	28	11
All	All	347/414 (84%)	339 (98%)	8 (2%)	53	37

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	LYS
1	A	60	LYS
1	A	74	GLU
1	A	75	ARG
2	C	599	VAL
1	D	36	ARG
1	D	142	PRO

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Mol	Chain	Res	Type
2	F	599	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 [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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	185/193 (95%)	0.90	27 (14%) 2 2	19, 35, 55, 80	0
1	D	187/193 (96%)	0.40	14 (7%) 14 14	12, 20, 37, 62	0
2	C	23/55 (41%)	1.43	5 (21%) 0 0	25, 34, 42, 43	0
2	F	23/55 (41%)	0.75	3 (13%) 3 3	25, 28, 38, 45	0
All	All	418/496 (84%)	0.70	49 (11%) 4 4	12, 27, 51, 80	0

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	598	SER	9.1
2	C	628	SER	8.0
1	A	155	THR	7.6
1	D	86	TYR	7.1
2	F	628	SER	6.8
1	D	222	GLY	6.2
2	C	599	VAL	5.8
1	A	86	TYR	5.5
1	A	157	ARG	5.2
1	D	155	THR	5.2
2	F	598	SER	4.7
1	A	37	LYS	4.6
1	D	36	ARG	4.6
1	A	83	LEU	4.4
1	A	103	LEU	4.3
1	A	220	SER	4.3
1	A	156	GLY	4.2
1	A	221	GLY	4.0
1	A	154	ALA	3.5
2	C	626	ASN	3.4
1	D	172	LEU	3.4

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Mol	Chain	Res	Type	RSRZ
1	D	175	LEU	3.1
1	A	87	ASN	3.1
1	D	68	PHE	3.0
1	A	159	ARG	3.0
1	A	172	LEU	2.8
1	D	65	LEU	2.8
1	A	69	VAL	2.7
1	A	126	SER	2.7
1	A	131	GLN	2.7
1	D	179	VAL	2.7
1	D	221	GLY	2.5
2	F	626	ASN	2.5
1	A	179	VAL	2.5
1	D	69	VAL	2.5
1	A	175	LEU	2.4
1	A	65	LEU	2.4
1	D	85	ALA	2.4
1	A	68	PHE	2.4
1	D	88	LYS	2.3
1	A	72	ILE	2.3
1	D	171	VAL	2.2
1	A	122	THR	2.2
1	A	84	ALA	2.1
1	A	125	SER	2.1
2	C	605	PHE	2.1
1	A	130	ALA	2.1
1	A	148	ARG	2.0
1	A	160	VAL	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 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.