



# Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 09:15 AM GMT

PDB ID : 3CFS  
Title : Structural basis of the interaction of RbAp46/RbAp48 with histone H4  
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Deposited on : 2008-03-04  
Resolution : 2.40 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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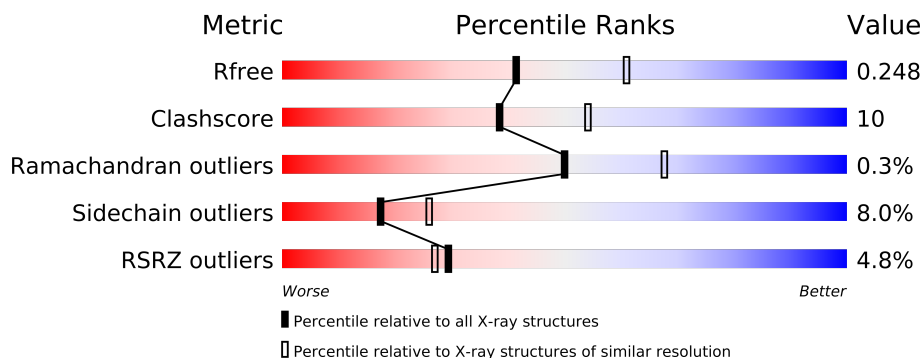
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.40 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))
$R_{free}$	66092	2207 (2.40-2.40)
Clashscore	79885	2789 (2.40-2.40)
Ramachandran outliers	78287	2736 (2.40-2.40)
Sidechain outliers	78261	2737 (2.40-2.40)
RSRZ outliers	66119	2210 (2.40-2.40)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	B	414	
2	E	15	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	ARS	B	412	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3397 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Histone-binding protein RBBP7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	383	Total	C	N	O	S	0	0	0
			3068	1940	525	593	10			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-2	HIS	-	CLONING ARTIFACT	UNP Q16576
B	-1	MSE	-	CLONING ARTIFACT	UNP Q16576
B	0	ALA	-	CLONING ARTIFACT	UNP Q16576

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	15	Total	C	N	O	0	0	0
			118	72	29	17			

- Molecule 3 is ARSENIC (three-letter code: ARS) (formula: As).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	As	0	0
			1	1		

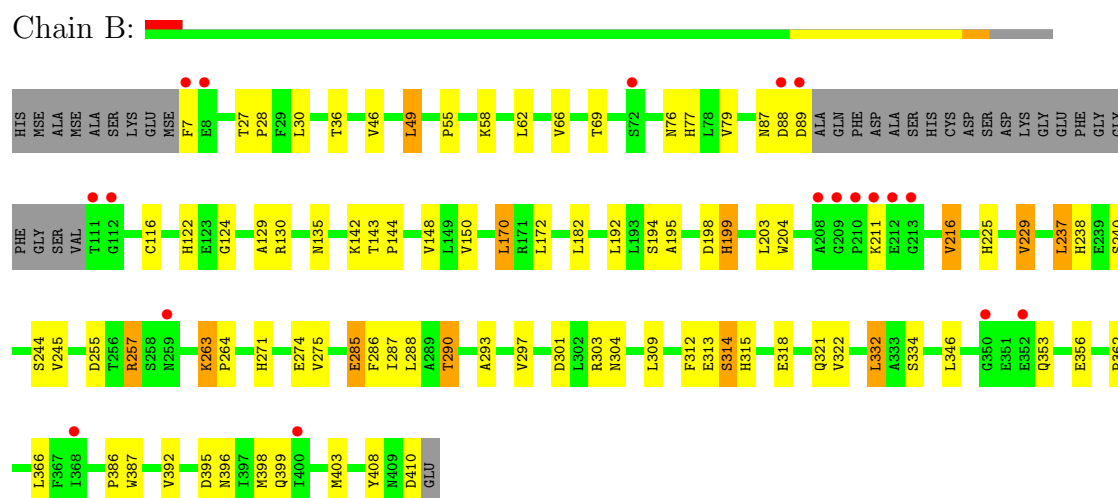
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	206	Total	O	0	0
			206	206		
4	E	4	Total	O	0	0
			4	4		

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Histone-binding protein RBBP7



- Molecule 2: Histone H4



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	44.66Å 85.72Å 117.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.53 – 2.40 19.53 – 2.40	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.53-2.40) 99.9 (19.53-2.40)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	0.13	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.38 (at 2.41Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.184 , 0.249 0.185 , 0.248	Depositor DCC
$R_{free}$ test set	935 reflections (5.38%)	DCC
Wilson B-factor (Å <sup>2</sup> )	28.7	Xtriage
Anisotropy	0.272	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 26.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 18312 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	3397	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.99% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ARS

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	B	0.22	0/3155	0.43	0/4303
2	E	0.96	0/118	0.67	0/155
All	All	0.28	0/3273	0.44	0/4458

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
2	E	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	E	36	ARG	Sidechain

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	3068	0	2916	59	0
2	E	118	0	135	7	0
3	B	1	0	0	1	0
4	B	206	0	0	0	0
4	E	4	0	0	0	0
All	All	3397	0	3051	61	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 10.

All (61) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:271:HIS:HE1	1:B:290:THR:HG22	1.11	1.13
1:B:257:ARG:HH11	1:B:257:ARG:HG3	1.18	1.06
1:B:271:HIS:CE1	1:B:290:THR:HG22	1.94	1.03
1:B:257:ARG:NH1	1:B:257:ARG:HG3	1.82	0.90
1:B:271:HIS:HE1	1:B:290:THR:CG2	1.84	0.89
1:B:143:THR:HG22	1:B:144:PRO:HD2	1.56	0.87
1:B:271:HIS:CE1	1:B:290:THR:CG2	2.64	0.79
1:B:143:THR:CG2	1:B:144:PRO:HD2	2.14	0.76
1:B:257:ARG:HH11	1:B:257:ARG:CG	1.97	0.74
2:E:30:THR:OG1	2:E:32:PRO:HD2	1.87	0.74
1:B:410:ASP:HB3	2:E:35:ARG:NH1	2.10	0.67
1:B:69:THR:HG22	1:B:76:ASN:OD1	1.94	0.67
1:B:195:ALA:HB1	1:B:229:VAL:HG22	1.77	0.66
1:B:198:ASP:O	1:B:199:HIS:HB2	1.94	0.66
1:B:238:HIS:HD2	1:B:240:SER:H	1.43	0.64
1:B:237:LEU:HD13	1:B:285:GLU:HG2	1.80	0.63
1:B:143:THR:HG22	1:B:144:PRO:CD	2.26	0.62
1:B:122:HIS:HD2	1:B:124:GLY:O	1.82	0.62
1:B:263:LYS:HE3	1:B:264:PRO:HD2	1.82	0.62
1:B:312:PHE:HZ	1:B:346:LEU:HD22	1.67	0.60
1:B:321:GLN:HE21	1:B:322:VAL:H	1.50	0.59
1:B:315:HIS:HE1	1:B:334:SER:OG	1.87	0.56
1:B:225:HIS:HE1	1:B:244:SER:OG	1.88	0.56
1:B:142:LYS:HZ3	1:B:194:SER:HG	1.49	0.55
1:B:116:CYS:HB2	3:B:412:ARS:AS	2.67	0.54
1:B:410:ASP:HB3	2:E:35:ARG:HH12	1.71	0.54
1:B:313:GLU:O	1:B:314:SER:HB2	2.11	0.51
1:B:286:PHE:CG	1:B:303:ARG:HD2	2.47	0.50
1:B:356:GLU:OE1	2:E:36:ARG:CZ	2.60	0.49
1:B:301:ASP:OD2	1:B:303:ARG:HD3	2.13	0.48
1:B:395:ASP:O	1:B:396:ASN:HB2	2.14	0.48

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:30:LEU:HD21	2:E:37:LEU:HB3	1.96	0.47
1:B:182:LEU:HD22	1:B:192:LEU:HD11	1.96	0.47
1:B:403:MET:HE2	1:B:408:TYR:HB3	1.97	0.47
1:B:36:THR:HG22	1:B:399:GLN:HG2	1.97	0.46
1:B:286:PHE:HB3	1:B:303:ARG:HD2	1.97	0.46
1:B:255:ASP:OD1	1:B:257:ARG:HG3	2.16	0.46
1:B:255:ASP:OD1	1:B:257:ARG:CG	2.64	0.46
1:B:297:VAL:HB	1:B:312:PHE:HB2	1.98	0.46
1:B:293:ALA:HA	1:B:318:GLU:HG2	1.98	0.45
1:B:49:LEU:HA	1:B:49:LEU:HD12	1.88	0.45
1:B:245:VAL:HG13	1:B:275:VAL:O	2.17	0.45
1:B:312:PHE:CZ	1:B:346:LEU:HD22	2.48	0.45
1:B:55:PRO:HB2	1:B:58:LYS:HG3	2.00	0.44
1:B:275:VAL:CG1	1:B:290:THR:HG23	2.48	0.44
1:B:392:VAL:HG12	1:B:398:MET:HB3	1.99	0.43
1:B:150:VAL:HB	1:B:170:LEU:HB2	2.00	0.43
1:B:172:LEU:HB3	1:B:204:TRP:CE2	2.53	0.43
1:B:172:LEU:HD23	1:B:216:VAL:HG13	2.00	0.43
1:B:27:THR:N	1:B:28:PRO:CD	2.82	0.42
1:B:198:ASP:O	1:B:199:HIS:CB	2.63	0.42
1:B:386:PRO:O	1:B:387:TRP:HB2	2.18	0.42
1:B:87:ASN:C	1:B:89:ASP:H	2.22	0.42
1:B:322:VAL:HG22	1:B:332:LEU:HD21	2.02	0.42
1:B:362:PRO:O	2:E:39:ARG:NH2	2.54	0.41
1:B:49:LEU:HD13	1:B:66:VAL:HG23	2.02	0.41
1:B:69:THR:HB	1:B:77:HIS:H	1.85	0.41
1:B:274:GLU:HG2	1:B:293:ALA:CB	2.51	0.41
1:B:129:ALA:O	1:B:130:ARG:HD3	2.21	0.41
1:B:49:LEU:HD13	1:B:66:VAL:CG2	2.51	0.40
2:E:27:GLN:HB3	2:E:28:GLY:H	1.72	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	B	379/414 (92%)	365 (96%)	13 (3%)	1 (0%)	50	68
2	E	13/15 (87%)	13 (100%)	0	0	100	100
All	All	392/429 (91%)	378 (96%)	13 (3%)	1 (0%)	50	68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	314	SER

### 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	B	341/361 (94%)	315 (92%)	26 (8%)	19	28
2	E	11/11 (100%)	9 (82%)	2 (18%)	2	3
All	All	352/372 (95%)	324 (92%)	28 (8%)	17	26

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	7	PHE
1	B	46	VAL
1	B	49	LEU
1	B	62	LEU
1	B	79	VAL
1	B	88	ASP
1	B	135	ASN
1	B	148	VAL
1	B	170	LEU
1	B	199	HIS
1	B	203	LEU
1	B	211	LYS
1	B	216	VAL
1	B	229	VAL
1	B	237	LEU
1	B	257	ARG

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Mol	Chain	Res	Type
1	B	263	LYS
1	B	285	GLU
1	B	287	ILE
1	B	288	LEU
1	B	290	THR
1	B	304	ASN
1	B	309	LEU
1	B	332	LEU
1	B	353	GLN
1	B	366	LEU
2	E	31	LYS
2	E	37	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	26	ASN
1	B	75	GLN
1	B	87	ASN
1	B	122	HIS
1	B	135	ASN
1	B	137	HIS
1	B	175	HIS
1	B	191	HIS
1	B	225	HIS
1	B	238	HIS
1	B	249	GLN
1	B	271	HIS
1	B	304	ASN
1	B	315	HIS
1	B	321	GLN
1	B	342	ASN
1	B	384	ASN
1	B	399	GLN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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, 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	B	383/414 (92%)	-0.07	18 (4%) 30 28	5, 27, 57, 119	7 (1%)
2	E	15/15 (100%)	0.04	0 100 100	18, 38, 57, 73	0
All	All	398/429 (92%)	-0.06	18 (4%) 29 30	5, 27, 58, 119	7 (1%)

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	212	GLU	7.5
1	B	213	GLY	6.9
1	B	211	LYS	6.7
1	B	210	PRO	5.8
1	B	7	PHE	4.5
1	B	209	GLY	4.4
1	B	111	THR	4.3
1	B	88	ASP	3.9
1	B	368	ILE	3.9
1	B	89	ASP	3.8
1	B	400	ILE	3.6
1	B	72	SER	3.6
1	B	259	ASN	3.5
1	B	8	GLU	2.6
1	B	350	GLY	2.4
1	B	112	GLY	2.3
1	B	208	ALA	2.2
1	B	352	GLU	2.1

### 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 ⓘ

There are no carbohydrates in this entry.

### 6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
3	ARS	B	412	1/1	0.57	12.68	120,120,120,120	0

### 6.5 Other polymers ⓘ

There are no such residues in this entry.