



## wwPDB EM Map/Model Validation Report ⓘ

Apr 10, 2016 – 01:39 PM BST

PDB ID : 3C9K  
EMDB ID: : EMD-1469  
Title : Model of Histone Octamer Tubular Crystals  
Authors : Frouws, T.D.  
Deposited on : 2008-02-16  
Resolution : 20.00 Å(reported)  
Based on PDB ID : 2HIO

This is a wwPDB EM Map/Model Validation Report for a publicly released PDB/EMDB entry.  
For rigid body fitted models, validation errors reported here could stem from errors in the original structure(s) used in the fitting.  
We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/EMValidationReportHelp>

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MolProbity : 4.02b-467  
Mogul : unknown  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk27241

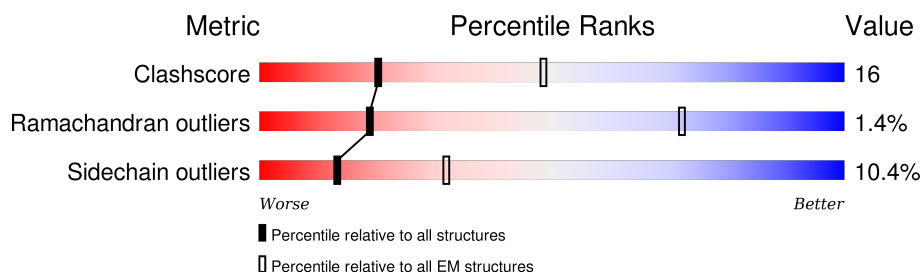
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 20.00 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)	EM structures (#Entries)
Clashscore	114402	924
Ramachandran outliers	111179	726
Sidechain outliers	111093	686

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	128	
1	E	128	
2	B	125	
2	F	125	
3	C	135	
3	G	135	
4	D	102	
4	H	102	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5700 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 H2A-IV.

Mol	Chain	Residues	Atoms				AltConf	Trace
1	A	101	Total	C	N	O	0	0
			777	490	151	136		
1	E	101	Total	C	N	O	0	0
			777	490	151	136		

- Molecule 2 is a protein called Histone H2B 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	90	Total	C	N	O	S	0	0
			700	442	124	132	2		
2	F	90	Total	C	N	O	S	0	0
			700	442	124	132	2		

- Molecule 3 is a protein called Histone H3.2.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	93	Total	C	N	O	S	0	0
			755	476	143	133	3		
3	G	93	Total	C	N	O	S	0	0
			755	476	143	133	3		

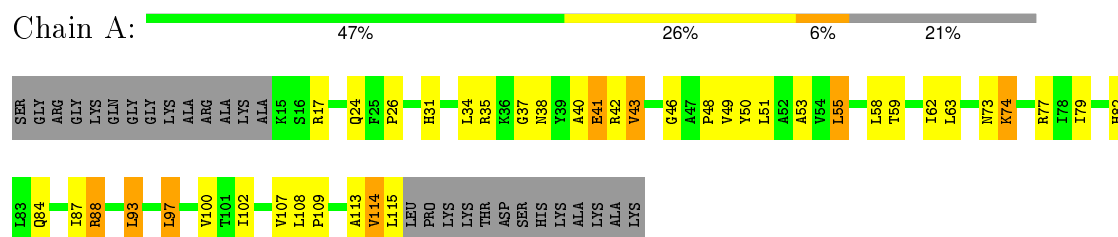
- Molecule 4 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	78	Total	C	N	O	S	0	0
			618	391	120	106	1		
4	H	78	Total	C	N	O	S	0	0
			618	391	120	106	1		

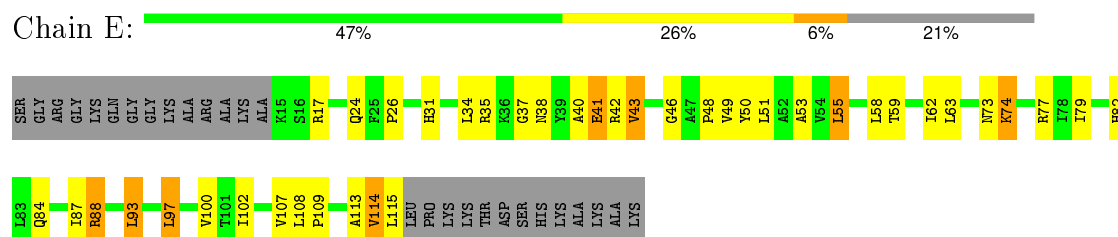
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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.

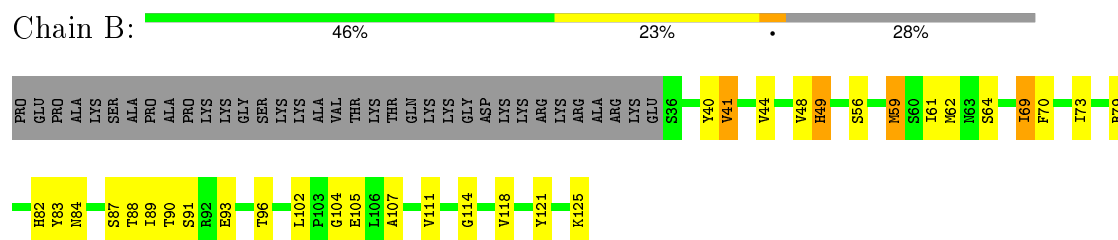
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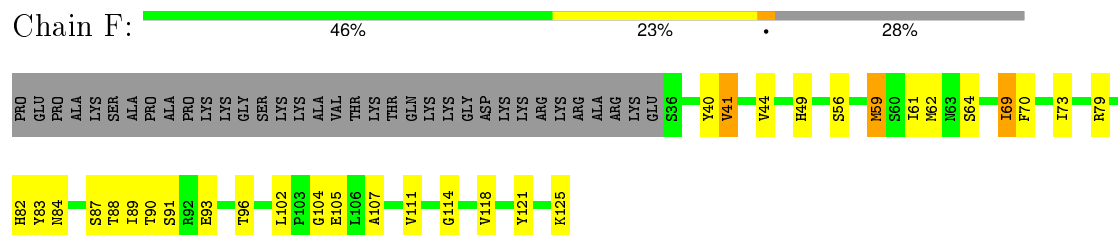
#### • Molecule 1: Histone H2A-IV



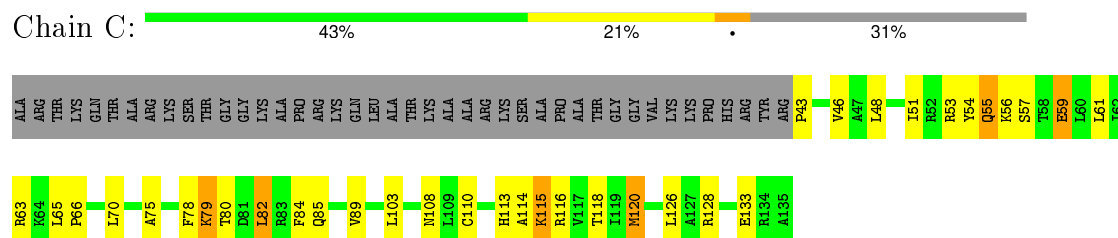
#### • Molecule 2: Histone H2B 7



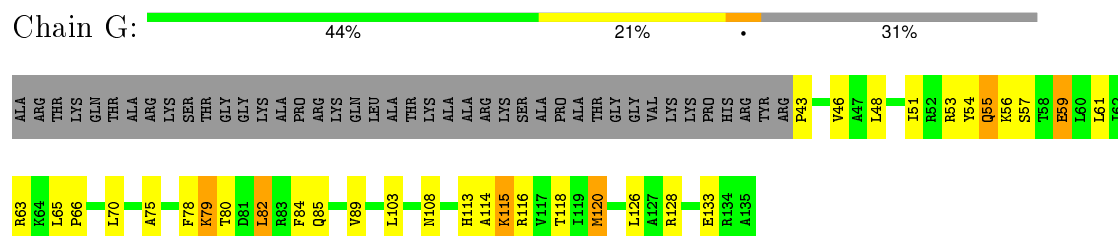
#### • Molecule 2: Histone H2B 7



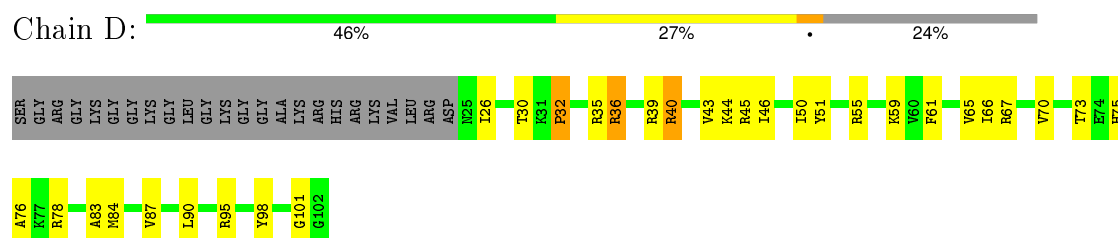
#### • Molecule 3: Histone H3.2



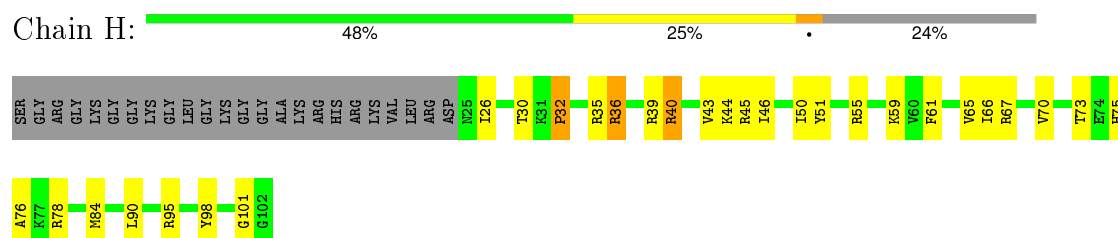
• Molecule 3: Histone H3.2



• Molecule 4: Histone H4



• Molecule 4: Histone H4



## 4 Experimental information

Property	Value	Source
Reconstruction method	HELICAL	Depositor
Imposed symmetry	POINT, Not provided	Depositor
Number of images	Not provided	Depositor
Resolution determination method	Not provided	Depositor
CTF correction method	Not provided	Depositor
Microscope	Zeiss Leo 912	Depositor
Voltage (kV)	120	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	100000	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	800	Depositor
Magnification	50000	Depositor
Image detector	Kodak SO163 Film	Depositor

## 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	$\# Z  > 2$	RMSZ	$\# Z  > 2$
1	A	0.44	0/786	0.70	0/1060
1	E	0.44	0/786	0.70	0/1060
2	B	0.46	0/711	0.69	0/957
2	F	0.46	0/711	0.69	0/957
3	C	0.48	0/764	0.68	0/1024
3	G	0.47	0/764	0.68	0/1024
4	D	0.48	0/625	0.73	1/837 (0.1%)
4	H	0.47	0/625	0.73	1/837 (0.1%)
All	All	0.46	0/5772	0.70	2/7756 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	32	PRO	CA-N-CD	-5.25	104.15	111.50
4	D	32	PRO	CA-N-CD	-5.18	104.24	111.50

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	777	0	828	35	0
1	E	777	0	828	33	0
2	B	700	0	719	35	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	700	0	719	33	0
3	C	755	0	795	27	0
3	G	755	0	795	29	0
4	D	618	0	659	27	0
4	H	618	0	659	26	0
All	All	5700	0	6002	187	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 16.

The worst 5 of 187 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)
3:C:115:LYS:CD	3:C:115:LYS:O	1.83	1.27
3:G:115:LYS:CD	3:G:115:LYS:O	1.83	1.26
3:C:115:LYS:HD2	3:C:115:LYS:O	1.38	1.15
3:G:115:LYS:HD2	3:G:115:LYS:O	1.38	1.09
3:C:115:LYS:HD3	3:C:115:LYS:O	1.62	0.97

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 PDB entries followed by that with respect to all EM entries.

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	99/128 (77%)	85 (86%)	11 (11%)	3 (3%)	5	42
1	E	99/128 (77%)	85 (86%)	11 (11%)	3 (3%)	5	42
2	B	88/125 (70%)	80 (91%)	7 (8%)	1 (1%)	17	63
2	F	88/125 (70%)	80 (91%)	7 (8%)	1 (1%)	17	63
3	C	91/135 (67%)	85 (93%)	5 (6%)	1 (1%)	17	63

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	G	91/135 (67%)	85 (93%)	5 (6%)	1 (1%)	17	63
4	D	76/102 (74%)	71 (93%)	5 (7%)	0	100	100
4	H	76/102 (74%)	71 (93%)	5 (7%)	0	100	100
All	All	708/980 (72%)	642 (91%)	56 (8%)	10 (1%)	19	58

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	114	VAL
1	E	114	VAL
2	B	104	GLY
2	F	104	GLY
1	A	74	LYS

### 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 PDB entries followed by that with respect to all EM entries.

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	79/97 (81%)	67 (85%)	12 (15%)	3	22
1	E	79/97 (81%)	67 (85%)	12 (15%)	3	22
2	B	77/106 (73%)	71 (92%)	6 (8%)	16	51
2	F	77/106 (73%)	71 (92%)	6 (8%)	16	51
3	C	80/110 (73%)	69 (86%)	11 (14%)	4	27
3	G	80/110 (73%)	69 (86%)	11 (14%)	4	27
4	D	63/78 (81%)	61 (97%)	2 (3%)	46	76
4	H	63/78 (81%)	61 (97%)	2 (3%)	46	76
All	All	598/782 (76%)	536 (90%)	62 (10%)	13	36

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	C	120	MET

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Mol	Chain	Res	Type
1	E	43	VAL
3	G	103	LEU
1	E	24	GLN
1	E	55	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	108	ASN
1	E	68	ASN
3	G	93	GLN
4	D	75	HIS
1	E	31	HIS

### 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.