



# Full wwPDB/EMDatabank EM Map/Model Validation Report ⓘ

Dec 18, 2018 – 09:45 PM EST

PDB ID : 6HU7  
EMDB ID: : EMD-0273  
Title : phosphorylated F97L Hepatitis B core protein capsid  
Authors : Bottcher, B.; Nassal, M.  
Deposited on : 2018-10-05  
Resolution : 2.80 Å(reported)  
Based on PDB ID : 6HU4

This is a Full wwPDB/EMDatabank EM Map/Model Validation Report  
for a publicly released PDB/EMDB 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/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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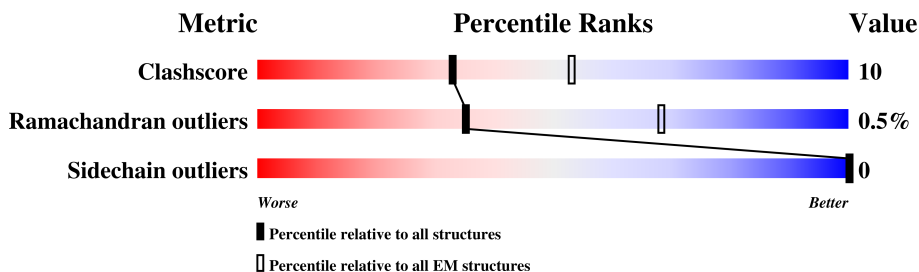
MolProbity : 4.02b-467  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20031633

# 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 2.80 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)	EM structures (#Entries)
Clashscore	136327	1886
Ramachandran outliers	132723	1663
Sidechain outliers	132532	1531

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	183	60% 20% . 20%
1	B	183	64% 19% 17%
1	C	183	64% 18% . 17%
1	D	183	64% 19% 17%
1	F	183	.. 99%
1	G	183	. 98%
1	H	183	.. 98%

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4890 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 Capsid protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	B	152	1218	787	205	220	6	0	0
1	A	147	1190	770	198	216	6	2	0
1	C	151	1218	787	205	220	6	1	0
1	D	151	1207	781	201	219	6	0	0
1	F	2	15	8	3	3	1	0	0
1	G	3	21	11	4	5	1	0	0
1	H	3	21	11	4	5	1	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	97	LEU	PHE	engineered mutation	UNP D0EYZ6
A	97	LEU	PHE	engineered mutation	UNP D0EYZ6
C	97	LEU	PHE	engineered mutation	UNP D0EYZ6
D	97	LEU	PHE	engineered mutation	UNP D0EYZ6
F	97	LEU	PHE	engineered mutation	UNP D0EYZ6
G	97	LEU	PHE	engineered mutation	UNP D0EYZ6
H	97	LEU	PHE	engineered mutation	UNP D0EYZ6





## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of particles used	31635	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	40	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	75000	Depositor
Image detector	FEI FALCON III (4k x 4k)	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	0.40	0/1228	0.51	0/1681
1	B	0.41	0/1253	0.50	0/1715
1	C	0.41	0/1253	0.49	0/1715
1	D	0.41	0/1242	0.49	0/1701
1	F	0.19	0/14	0.32	0/17
1	G	0.22	0/20	0.37	0/25
1	H	0.26	0/20	0.29	0/25
All	All	0.41	0/5030	0.50	0/6879

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	1190	0	1181	29	0
1	B	1218	0	1213	31	0
1	C	1218	0	1212	30	0
1	D	1207	0	1200	25	0
1	F	15	0	12	1	0
1	G	21	0	17	0	0
1	H	21	0	17	2	0
All	All	4890	0	4852	97	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 10.

All (97) 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:44:SER:HG	1:H:181:SER:N	1.73	0.87
1:B:150:ARG:NH1	1:C:143:LEU:O	2.13	0.80
1:A:2:ASP:OD1	1:A:3:ILE:N	2.16	0.77
1:C:7:LYS:HE2	1:D:45:PRO:HG3	1.68	0.74
1:D:62:TRP:HB2	1:D:97:LEU:HD21	1.69	0.73
1:B:60:LEU:HD13	1:A:5:PRO:HG3	1.71	0.72
1:D:24:PHE:O	1:D:98:ARG:NH1	2.28	0.66
1:B:149:VAL:HG21	1:C:118:TYR:HD1	1.62	0.64
1:C:148:VAL:HG12	1:C:149:VAL:HG23	1.81	0.63
1:B:48:CYS:HB2	1:B:52:HIS:CD2	2.34	0.63
1:A:83:ASP:OD1	1:A:84:LEU:N	2.31	0.62
1:C:60:LEU:HD13	1:D:5:PRO:HG3	1.81	0.62
1:A:62:TRP:HB2	1:A:97:LEU:HD21	1.82	0.62
1:D:79:PRO:HA	1:D:82:ARG:HG2	1.84	0.60
1:D:44:SER:OG	1:H:181:SER:N	2.37	0.57
1:C:73:GLY:HA2	1:C:82[B]:ARG:HE	1.69	0.56
1:C:73:GLY:HA2	1:C:82[A]:ARG:HE	1.69	0.56
1:C:57:GLN:HE22	1:D:100:LEU:HD21	1.70	0.56
1:B:76:LEU:HD23	1:B:78:ASP:H	1.71	0.55
1:A:79:PRO:HA	1:A:82:ARG:HG2	1.89	0.55
1:C:76:LEU:O	1:C:82[B]:ARG:NH1	2.40	0.55
1:C:76:LEU:O	1:C:82[A]:ARG:NH1	2.40	0.54
1:A:1:MET:HG3	1:A:3:ILE:HG13	1.89	0.54
1:A:9:PHE:O	1:A:112:ARG:HD2	2.08	0.54
1:A:72:VAL:HG13	1:A:76:LEU:HD22	1.89	0.54
1:A:62:TRP:HB2	1:A:97:LEU:CD2	2.38	0.54
1:C:6:TYR:CZ	1:C:16:LEU:HD22	2.44	0.53
1:B:56:ARG:NH1	1:A:8:GLU:OE1	2.42	0.53
1:A:48:CYS:HB2	1:A:52:HIS:CD2	2.44	0.53
1:A:4:ASP:OD1	1:A:13:VAL:HG23	2.10	0.52
1:A:76:LEU:O	1:A:82:ARG:NH1	2.43	0.51
1:C:72:VAL:HG12	1:C:82[B]:ARG:HG3	1.93	0.51
1:C:146:THR:HG22	1:C:150:ARG:HE	1.74	0.51
1:C:72:VAL:HG12	1:C:82[A]:ARG:HG3	1.93	0.51
1:B:65:LEU:HD21	1:B:93:MET:HE1	1.92	0.51
1:B:6:TYR:HB3	1:B:11:ALA:HB3	1.93	0.51
1:B:9:PHE:O	1:B:112:ARG:HD2	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:9:PHE:O	1:D:112:ARG:HD2	2.11	0.51
1:B:112:ARG:NH2	1:B:113:GLU:OE2	2.44	0.50
1:B:8:GLU:HG2	1:A:47:HIS:CD2	2.46	0.50
1:D:6:TYR:HB3	1:D:11:ALA:HB3	1.94	0.50
1:C:4:ASP:HB3	1:C:7:LYS:HB2	1.93	0.49
1:D:51:HIS:HB2	1:D:108:LEU:HD21	1.95	0.49
1:C:143:LEU:HD12	1:C:144:PRO:HD2	1.94	0.49
1:B:8:GLU:CG	1:A:47:HIS:HD2	2.26	0.49
1:A:142:THR:O	1:A:144:PRO:HD3	2.13	0.48
1:B:123:GLY:HA2	1:B:126:ILE:HG22	1.94	0.48
1:B:147:THR:HB	1:C:138:PRO:HA	1.95	0.48
1:A:19:LEU:HD23	1:A:122:PHE:CD2	2.49	0.48
1:B:57:GLN:HE22	1:A:100:LEU:HD21	1.78	0.48
1:C:9:PHE:O	1:C:112:ARG:HD2	2.14	0.48
1:D:48:CYS:HB2	1:D:52:HIS:CD2	2.49	0.48
1:A:123:GLY:HA2	1:A:126:ILE:HG22	1.97	0.47
1:A:25:PRO:O	1:A:98:ARG:HD2	2.15	0.47
1:A:41:ALA:HA	1:F:182:GLN:HG3	1.96	0.47
1:C:30:LEU:HD23	1:C:101:LEU:HB3	1.97	0.46
1:C:84:LEU:HB3	1:D:71:TRP:HH2	1.80	0.46
1:C:25:PRO:HB2	1:C:30:LEU:CD1	2.45	0.46
1:B:146:THR:O	1:B:147:THR:OG1	2.27	0.46
1:B:50:PRO:HG2	1:A:47:HIS:CE1	2.50	0.46
1:B:150:ARG:HA	1:C:141:SER:O	2.16	0.46
1:B:8:GLU:HG2	1:A:47:HIS:HD2	1.79	0.46
1:C:49:SER:H	1:C:52:HIS:HD2	1.64	0.46
1:A:24:PHE:CE2	1:A:99:GLN:HG2	2.51	0.46
1:B:18:PHE:HB3	1:B:126:ILE:HG21	1.98	0.45
1:B:151:ARG:HG2	1:B:152:ARG:H	1.82	0.45
1:D:42:LEU:O	1:D:56:ARG:HD3	2.17	0.44
1:B:4:ASP:HB3	1:B:7:LYS:HB2	1.98	0.44
1:B:149:VAL:HB	1:C:140:LEU:HD23	1.99	0.44
1:D:123:GLY:HA2	1:D:126:ILE:HG22	1.98	0.44
1:B:39:ARG:HG3	1:B:40:GLU:N	2.32	0.44
1:C:24:PHE:O	1:C:98:ARG:NH2	2.40	0.44
1:B:143:LEU:HD13	1:B:147:THR:HG22	2.00	0.43
1:B:60:LEU:HD11	1:A:3:ILE:HG22	2.00	0.43
1:D:9:PHE:CE2	1:D:104:HIS:HE1	2.37	0.43
1:D:144:PRO:HD2	1:D:147:THR:HG22	2.01	0.43
1:D:27:VAL:HG22	1:D:98:ARG:HB3	2.00	0.42
1:B:76:LEU:O	1:B:82:ARG:HD2	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:94:GLY:O	1:A:98:ARG:N	2.43	0.42
1:B:76:LEU:HD22	1:B:82:ARG:HG3	2.02	0.42
1:C:147:THR:HA	1:C:151:ARG:NH2	2.35	0.42
1:A:129:PRO:HA	1:A:130:PRO:HD3	1.96	0.42
1:D:44:SER:HA	1:D:45:PRO:HD3	1.86	0.42
1:A:9:PHE:CE2	1:A:104:HIS:HE1	2.38	0.42
1:B:62:TRP:HB2	1:B:97:LEU:HD22	2.01	0.41
1:D:106:SER:O	1:D:109:THR:O	2.38	0.41
1:A:28[B]:ARG:HG3	1:A:29:ASP:N	2.35	0.41
1:D:143:LEU:HB2	1:D:147:THR:HG21	2.01	0.41
1:C:4:ASP:OD1	1:C:13:VAL:HG23	2.20	0.41
1:C:122:PHE:CD1	1:C:138:PRO:HD2	2.55	0.41
1:C:30:LEU:HB3	1:C:101:LEU:HD23	2.02	0.41
1:B:78:ASP:O	1:B:82:ARG:HG3	2.21	0.41
1:D:19:LEU:HD23	1:D:122:PHE:CD2	2.56	0.40
1:B:143:LEU:CD1	1:C:138:PRO:HG3	2.52	0.40
1:D:62:TRP:HB2	1:D:97:LEU:CD2	2.45	0.40
1:D:97:LEU:HG	1:D:101:LEU:HD13	2.03	0.40
1:D:94:GLY:O	1:D:98:ARG:HG2	2.22	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 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	147/183 (80%)	142 (97%)	4 (3%)	1 (1%)	24	57
1	B	150/183 (82%)	144 (96%)	5 (3%)	1 (1%)	24	57
1	C	150/183 (82%)	144 (96%)	5 (3%)	1 (1%)	24	57
1	D	149/183 (81%)	147 (99%)	2 (1%)	0	100	100
1	G	1/183 (0%)	1 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	H	1/183 (0%)	1 (100%)	0	0	100	100
All	All	598/1098 (54%)	579 (97%)	16 (3%)	3 (0%)	35	65

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	149	VAL
1	B	148	VAL
1	A	3	ILE

### 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 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	133/166 (80%)	133 (100%)	0	100	100
1	B	136/166 (82%)	136 (100%)	0	100	100
1	C	136/166 (82%)	136 (100%)	0	100	100
1	D	135/166 (81%)	135 (100%)	0	100	100
1	F	2/166 (1%)	2 (100%)	0	100	100
1	G	3/166 (2%)	3 (100%)	0	100	100
1	H	3/166 (2%)	3 (100%)	0	100	100
All	All	548/1162 (47%)	548 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	52	HIS
1	B	57	GLN
1	B	75	ASN
1	B	90	ASN

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Mol	Chain	Res	Type
1	B	92	ASN
1	A	47	HIS
1	A	52	HIS
1	A	75	ASN
1	C	52	HIS
1	C	57	GLN
1	C	75	ASN
1	C	92	ASN
1	D	47	HIS
1	D	52	HIS
1	D	75	ASN
1	D	92	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](#)

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.