



## wwPDB EM Map/Model Validation Report i

Apr 10, 2016 – 01:40 PM BST

PDB ID : 2XVR  
EMDB ID: : EMD-1810  
Title : Phage T7 empty mature head shell  
Authors : Ionel, A.; Velazquez-Muriel, J.A.; Luque, D.; Cuervo, A.; Caston, J.R.;  
Valpuesta, J.M.; Martin-Benito, J.; Carrascosa, J.L.  
Deposited on : 2010-10-28  
Resolution : 10.80 Å(reported)  
Based on PDB ID : 1OHG

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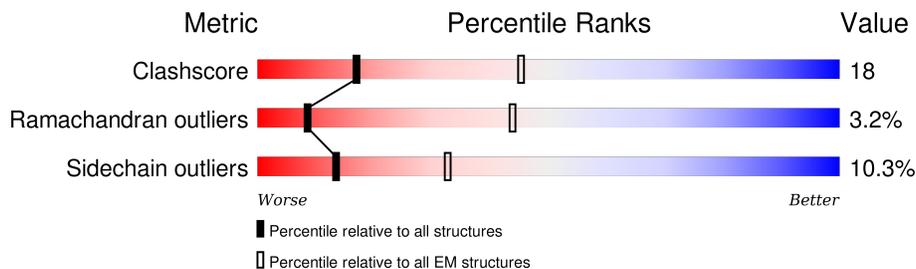
MolProbity : 4.02b-467  
Mogul : unknown  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk27241

# 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 10.80 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	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	345	
1	B	345	
1	C	345	
1	D	345	
1	E	345	
1	F	345	
1	G	345	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 12831 atoms, of which 0 are hydrogens and 0 are deuteriums.

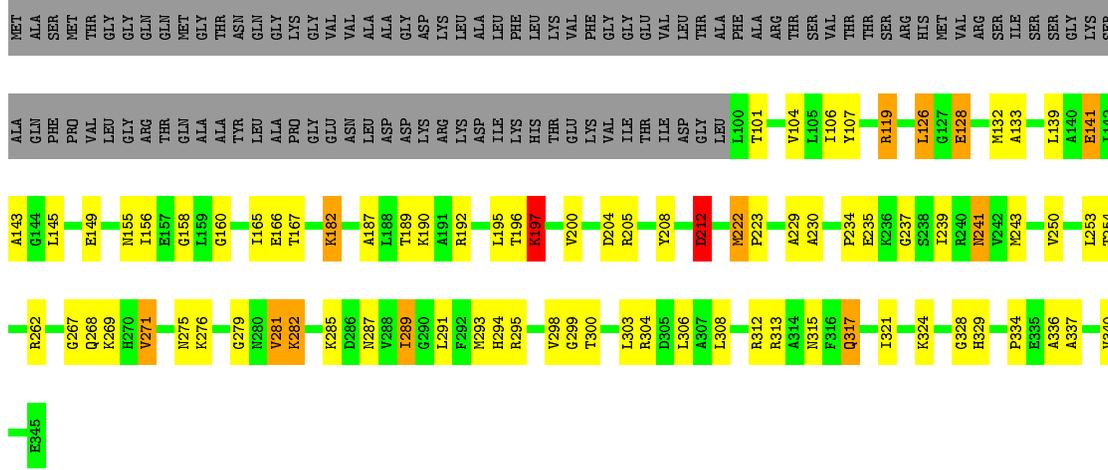
In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called MAJOR CAPSID PROTEIN 10A.

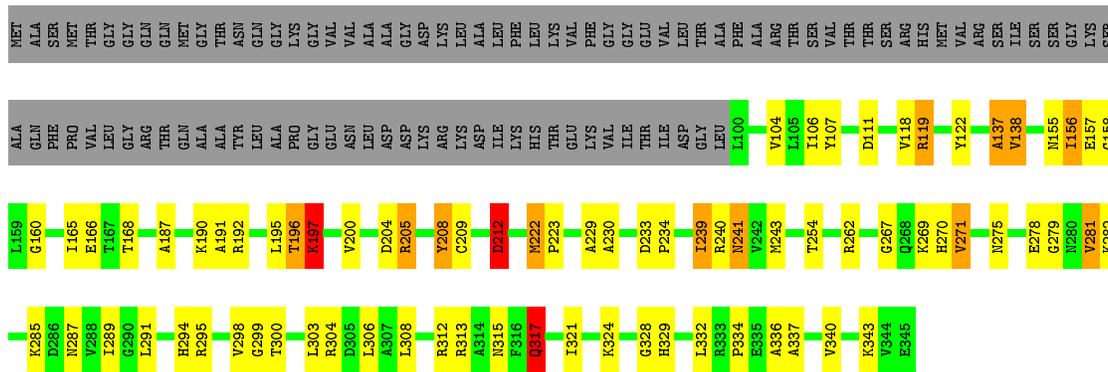
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	246	1833	1147	321	357	8	0	0
1	B	246	1833	1147	321	357	8	0	0
1	C	246	1833	1147	321	357	8	0	0
1	D	246	1833	1147	321	357	8	0	0
1	E	246	1833	1147	321	357	8	0	0
1	F	246	1833	1147	321	357	8	0	0
1	G	246	1833	1147	321	357	8	0	0







• Molecule 1: MAJOR CAPSID PROTEIN 10A



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of images	Not provided	Depositor
Resolution determination method	Not provided	Depositor
CTF correction method	Not provided	Depositor
Microscope	OTHER	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	Not provided	Depositor
Minimum defocus (nm)	Not provided	Depositor
Maximum defocus (nm)	Not provided	Depositor
Magnification	50000	Depositor
Image detector	KODACK 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	0.32	0/1859	0.72	3/2518 (0.1%)
1	B	0.34	0/1859	0.58	2/2518 (0.1%)
1	C	0.36	1/1859 (0.1%)	0.53	1/2518 (0.0%)
1	D	0.32	0/1859	0.65	3/2518 (0.1%)
1	E	0.33	0/1859	0.69	2/2518 (0.1%)
1	F	0.35	0/1859	0.57	1/2518 (0.0%)
1	G	0.32	0/1859	0.84	3/2518 (0.1%)
All	All	0.34	1/13013 (0.0%)	0.66	15/17626 (0.1%)

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
1	A	0	1
1	B	0	1
1	C	0	1
1	D	0	1
1	E	0	1
1	F	0	1
1	G	0	2
All	All	0	8

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	317	GLN	CD-OE1	6.77	1.38	1.24

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	317	GLN	CG-CD-OE1	-28.75	64.11	121.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	317	GLN	CG-CD-OE1	-21.72	78.15	121.60
1	E	317	GLN	CG-CD-OE1	-18.80	83.99	121.60
1	D	317	GLN	CG-CD-OE1	-16.15	89.29	121.60
1	G	317	GLN	CG-CD-NE2	-13.21	85.00	116.70

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	317	GLN	Sidechain
1	B	317	GLN	Sidechain
1	C	317	GLN	Sidechain
1	D	317	GLN	Sidechain
1	E	317	GLN	Sidechain

## 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	1833	0	1832	81	0
1	B	1833	0	1832	90	0
1	C	1833	0	1832	73	0
1	D	1833	0	1832	80	0
1	E	1833	0	1832	81	0
1	F	1833	0	1832	71	0
1	G	1833	0	1832	55	0
All	All	12831	0	12824	463	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 18.

The worst 5 of 463 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:G:137:ALA:HB3	1:G:138:VAL:CB	1.84	1.06

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:137:ALA:CB	1:G:138:VAL:HB	1.91	1.01
1:A:333:ARG:HH22	1:B:141:GLU:HB3	1.23	1.00
1:C:254:THR:HG21	1:C:287:ASN:HD21	1.26	0.99
1:D:254:THR:HG21	1:D:287:ASN:HD21	1.26	0.99

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	244/345 (71%)	207 (85%)	29 (12%)	8 (3%)	5	40
1	B	244/345 (71%)	202 (83%)	35 (14%)	7 (3%)	6	43
1	C	244/345 (71%)	204 (84%)	33 (14%)	7 (3%)	6	43
1	D	244/345 (71%)	204 (84%)	31 (13%)	9 (4%)	4	38
1	E	244/345 (71%)	206 (84%)	31 (13%)	7 (3%)	6	43
1	F	244/345 (71%)	206 (84%)	31 (13%)	7 (3%)	6	43
1	G	244/345 (71%)	206 (84%)	28 (12%)	10 (4%)	3	35
All	All	1708/2415 (71%)	1435 (84%)	218 (13%)	55 (3%)	8	41

5 of 55 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	197	LYS
1	B	197	LYS
1	C	197	LYS
1	D	197	LYS
1	E	197	LYS

### 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	184/261 (70%)	163 (89%)	21 (11%)	7	33
1	B	184/261 (70%)	163 (89%)	21 (11%)	7	33
1	C	184/261 (70%)	167 (91%)	17 (9%)	11	43
1	D	184/261 (70%)	164 (89%)	20 (11%)	8	35
1	E	184/261 (70%)	164 (89%)	20 (11%)	8	35
1	F	184/261 (70%)	164 (89%)	20 (11%)	8	35
1	G	184/261 (70%)	170 (92%)	14 (8%)	16	53
All	All	1288/1827 (70%)	1155 (90%)	133 (10%)	13	37

5 of 133 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	126	LEU
1	D	298	VAL
1	G	205	ARG
1	D	128	GLU
1	D	208	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 53 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	155	ASN
1	D	329	HIS
1	G	241	ASN
1	D	198	ASN
1	D	270	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.