



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

Dec 29, 2018 – 10:46 AM EST

PDB ID : 6CSH  
EMDB ID: : EMD-7600  
Title : CryoEM structure of human enterovirus D68 emptied particle (pH 5.5 and 33 degrees Celsius)  
Authors : Liu, Y.; Rossmann, M.G.  
Deposited on : 2018-03-20  
Resolution : 2.90 Å(reported)

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

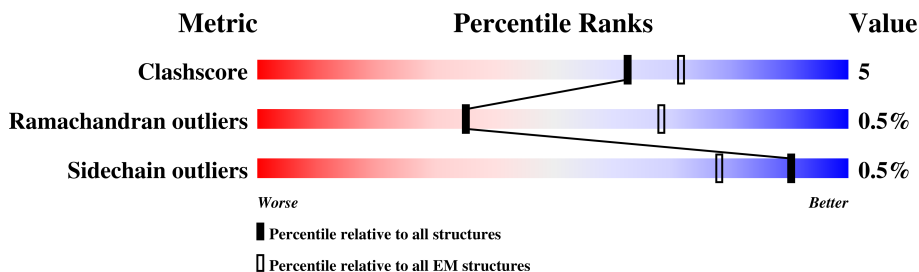
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.90 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	297	61% (Green), 7% (Yellow), 32% (Grey)
2	B	247	78% (Green), 15% (Yellow), 6% (Grey)
3	C	248	74% (Green), 13% (Yellow), 13% (Grey)

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5083 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 viral protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	202	1618	1050	275	287	6	0	0

- Molecule 2 is a protein called viral protein 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	232	1777	1128	291	340	18	0	0

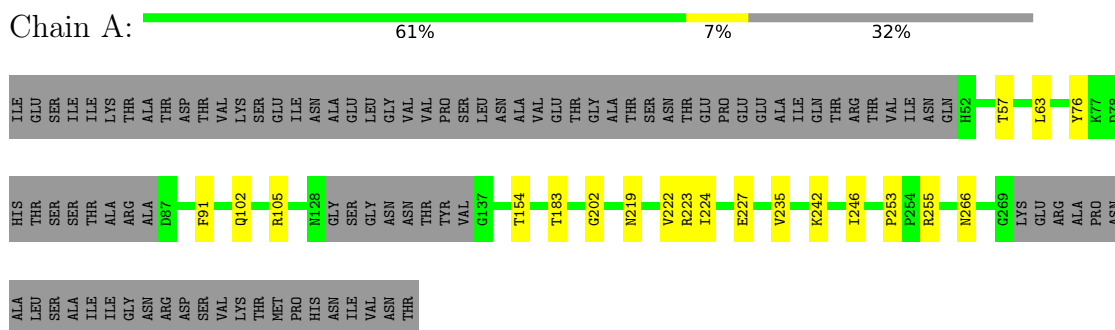
- Molecule 3 is a protein called viral protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	215	1688	1081	290	305	12	0	0

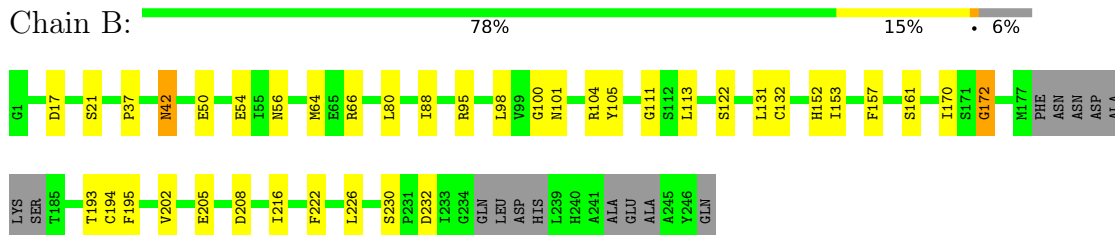
### 3 Residue-property plots [i](#)

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. 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.

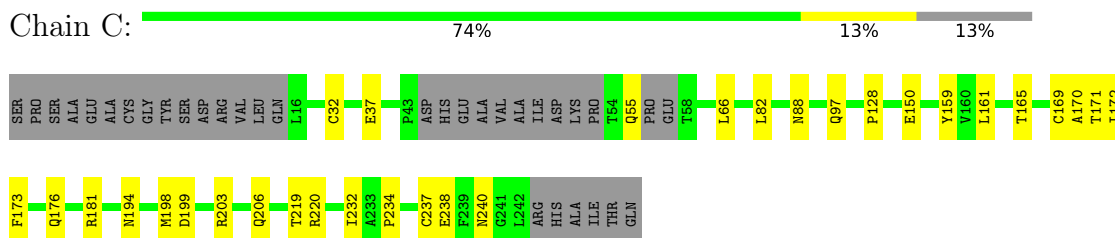
- Molecule 1: viral protein 1



- Molecule 2: viral protein 3



- Molecule 3: viral protein 2



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of particles used	19325	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; On-the-fly CTF correction during 2D alignment and 3D reconstruction	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	38	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	22500	Depositor
Image detector	GATAN K2 SUMMIT (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	0.49	0/1662	0.55	0/2255
2	B	0.49	0/1817	0.64	0/2472
3	C	0.52	0/1740	0.58	0/2380
All	All	0.50	0/5219	0.60	0/7107

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	1618	0	1609	13	0
2	B	1777	0	1739	30	0
3	C	1688	0	1621	22	0
All	All	5083	0	4969	48	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 5.

All (48) 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)
2:B:157:PHE:O	3:C:181:ARG:NH2	2.28	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:80:LEU:HD22	2:B:194:CYS:O	1.96	0.66
2:B:80:LEU:HD13	2:B:80:LEU:C	2.18	0.63
2:B:132:CYS:SG	2:B:193:THR:OG1	2.58	0.61
1:A:91:PHE:HB3	1:A:222:VAL:HB	1.81	0.61
2:B:161:SER:HB3	3:C:181:ARG:HE	1.66	0.59
3:C:32:CYS:HB2	3:C:176:GLN:HE21	1.68	0.57
3:C:66:LEU:HD22	3:C:150:GLU:HG2	1.86	0.57
2:B:122:SER:O	3:C:181:ARG:NH1	2.38	0.57
3:C:199:ASP:OD2	3:C:206:GLN:NE2	2.36	0.57
1:A:202:GLY:O	3:C:203:ARG:NH1	2.38	0.56
3:C:82:LEU:HD21	3:C:232:ILE:HD13	1.85	0.56
2:B:101:ASN:OD1	2:B:104:ARG:NH1	2.39	0.56
2:B:54:GLU:OE2	3:C:159:TYR:OH	2.24	0.55
1:A:102:GLN:HE22	2:B:230:SER:H	1.53	0.55
2:B:37:PRO:HB3	3:C:37:GLU:HG3	1.90	0.54
1:A:183:THR:OG1	2:B:21:SER:OG	2.24	0.54
1:A:154:THR:HG21	1:A:219:ASN:HD22	1.73	0.54
2:B:170:ILE:HG22	2:B:172:GLY:H	1.73	0.53
1:A:105:ARG:NH1	2:B:105:TYR:OH	2.42	0.53
2:B:111:GLY:HA3	2:B:222:PHE:HA	1.89	0.53
2:B:80:LEU:O	2:B:80:LEU:HD13	2.10	0.52
1:A:224:ILE:HD11	1:A:235:VAL:HG21	1.91	0.52
2:B:80:LEU:HB2	2:B:195:PHE:CE1	2.44	0.52
1:A:57:THR:OG1	2:B:42:ASN:ND2	2.43	0.51
2:B:95:ARG:NH2	2:B:232:ASP:OD1	2.43	0.51
1:A:242:LYS:NZ	2:B:17:ASP:O	2.43	0.50
1:A:253:PRO:HB3	3:C:169:CYS:HB2	1.92	0.50
2:B:208:ASP:HB3	3:C:220:ARG:HH21	1.76	0.50
1:A:76:TYR:OH	1:A:227:GLU:O	2.30	0.49
3:C:55:GLN:HG2	3:C:238:GLU:HG2	1.94	0.49
1:A:255:ARG:NH2	1:A:266:ASN:O	2.46	0.49
3:C:198:MET:SD	3:C:240:ASN:ND2	2.88	0.47
2:B:202:VAL:HG21	2:B:208:ASP:HA	1.97	0.46
3:C:88:ASN:OD1	3:C:97:GLN:NE2	2.48	0.46
2:B:205:GLU:O	3:C:219:THR:OG1	2.32	0.46
2:B:132:CYS:HA	2:B:152:HIS:HA	1.98	0.45
2:B:56:ASN:HB3	2:B:66:ARG:HA	1.99	0.44
3:C:128:PRO:HD2	3:C:173:PHE:CD1	2.53	0.43
2:B:64:MET:HG3	3:C:159:TYR:HB2	2.00	0.43
2:B:131:LEU:HB2	2:B:153:ILE:HG22	2.00	0.43
2:B:113:LEU:HD13	2:B:216:ILE:HD11	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:88:ILE:HG23	2:B:100:GLY:HA2	2.01	0.41
3:C:161:LEU:HD11	3:C:170:ALA:HB2	2.00	0.41
2:B:50:GLU:O	3:C:171:THR:OG1	2.26	0.41
1:A:63:LEU:HD12	1:A:246:ILE:HG21	2.03	0.40
2:B:98:LEU:HD11	3:C:172:ILE:HB	2.04	0.40
3:C:234:PRO:HB2	3:C:237:CYS:SG	2.61	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	196/297 (66%)	190 (97%)	6 (3%)	0	100	100
2	B	224/247 (91%)	208 (93%)	14 (6%)	2 (1%)	19	52
3	C	209/248 (84%)	191 (91%)	17 (8%)	1 (0%)	31	65
All	All	629/792 (79%)	589 (94%)	37 (6%)	3 (0%)	35	65

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	172	GLY
3	C	165	THR
2	B	226	LEU

### 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	176/256 (69%)	175 (99%)	1 (1%)	87	96
2	B	202/214 (94%)	201 (100%)	1 (0%)	90	97
3	C	182/209 (87%)	181 (100%)	1 (0%)	90	97
All	All	560/679 (82%)	557 (100%)	3 (0%)	90	97

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	223	ARG
2	B	42	ASN
3	C	194	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	102	GLN
1	A	226	ASN
2	B	42	ASN
2	B	89	GLN
3	C	176	GLN
3	C	194	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.