



# wwPDB EM Validation Summary Report i

Jul 16, 2025 – 01:04 PM JST

PDB ID : 8ZUE / pdb\_00008zue  
EMDB ID : EMD-60482  
Title : cryo-electron microscopy (cryo-EM) structure of the Hachiman defense system from Escherichia coli  
Authors : Cui, Y.Q.; Dai, Z.K.; Ouyang, Y.F.; Wang, Y.J.; Guan, Z.Y.; Zou, T.T.  
Deposited on : 2024-06-08  
Resolution : 3.10 Å(reported)

This is a wwPDB EM Validation Summary 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

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the i symbol.

The types of validation reports are described at  
<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

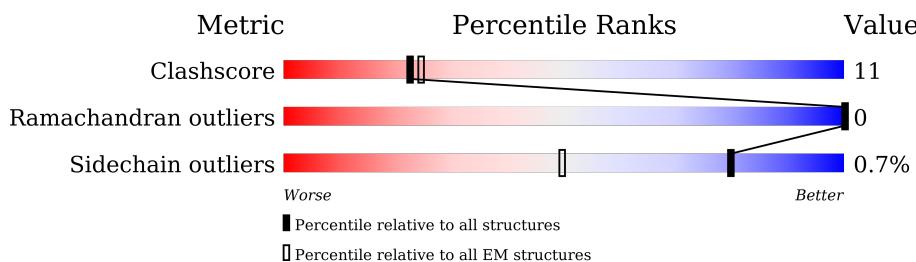
EMDB validation analysis : **FAILED**  
MolProbitY : 4-5-2 with Phenix2.0rc1  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.44

# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:  
**ELECTRON MICROSCOPY**

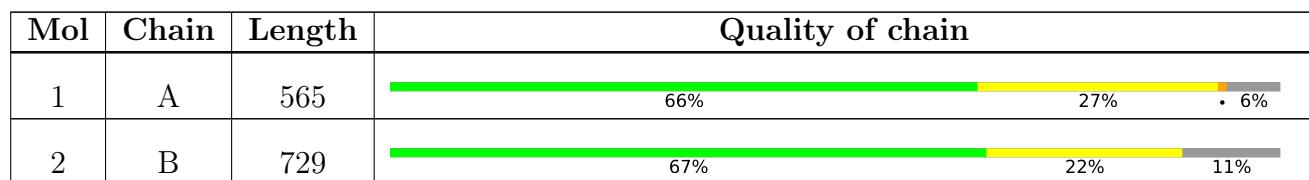
The reported resolution of this entry is 3.10 Å.

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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. 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  $\leq 5\%$



## 2 Entry composition [\(i\)](#)

There are 2 unique types of molecules in this entry. The entry contains 9536 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 Anti-bacteriophage protein A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	531	4313	2724	756	818	15	0	0

There are 27 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-26	MET	-	initiating methionine	UNP P52127
A	-25	GLY	-	expression tag	UNP P52127
A	-24	SER	-	expression tag	UNP P52127
A	-23	SER	-	expression tag	UNP P52127
A	-22	HIS	-	expression tag	UNP P52127
A	-21	HIS	-	expression tag	UNP P52127
A	-20	HIS	-	expression tag	UNP P52127
A	-19	HIS	-	expression tag	UNP P52127
A	-18	HIS	-	expression tag	UNP P52127
A	-17	HIS	-	expression tag	UNP P52127
A	-16	SER	-	expression tag	UNP P52127
A	-15	SER	-	expression tag	UNP P52127
A	-14	GLY	-	expression tag	UNP P52127
A	-13	LEU	-	expression tag	UNP P52127
A	-12	VAL	-	expression tag	UNP P52127
A	-11	PRO	-	expression tag	UNP P52127
A	-10	ARG	-	expression tag	UNP P52127
A	-9	GLY	-	expression tag	UNP P52127
A	-8	SER	-	expression tag	UNP P52127
A	-7	HIS	-	expression tag	UNP P52127
A	-6	SER	-	expression tag	UNP P52127
A	-5	ASP	-	expression tag	UNP P52127
A	-4	GLU	-	expression tag	UNP P52127
A	-3	VAL	-	expression tag	UNP P52127
A	-2	ASP	-	expression tag	UNP P52127
A	-1	ALA	-	expression tag	UNP P52127
A	0	HIS	-	expression tag	UNP P52127

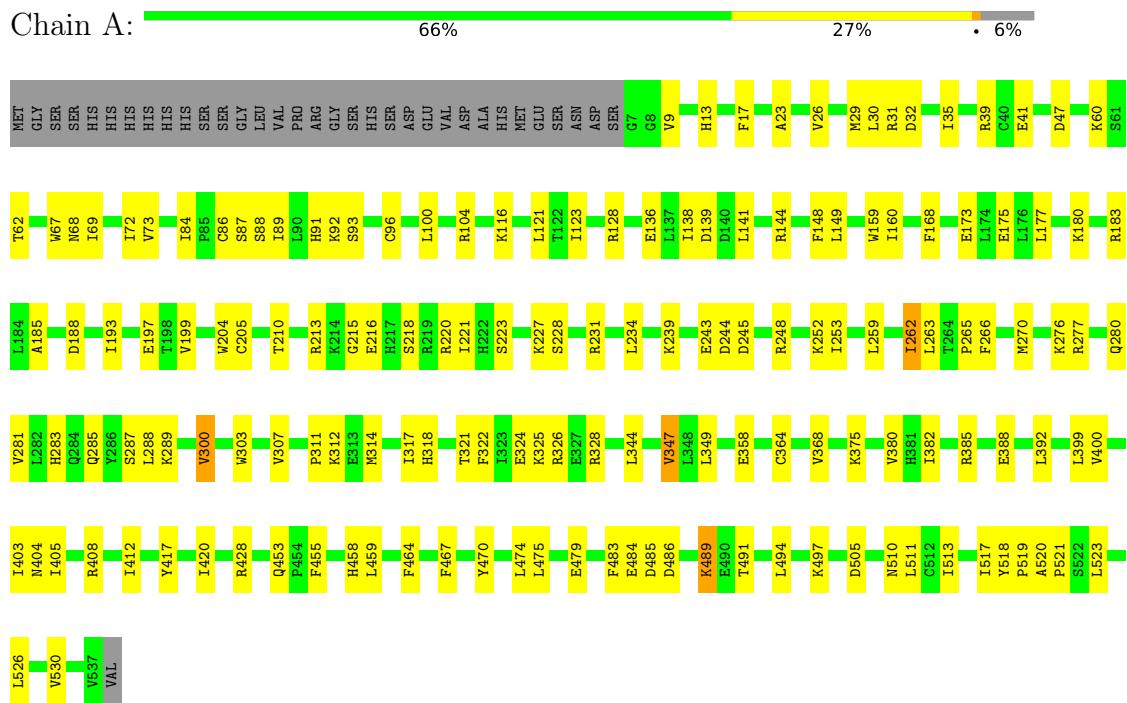
- Molecule 2 is a protein called Anti-bacteriophage protein B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	651	5223	3340	896	970	17	0	0

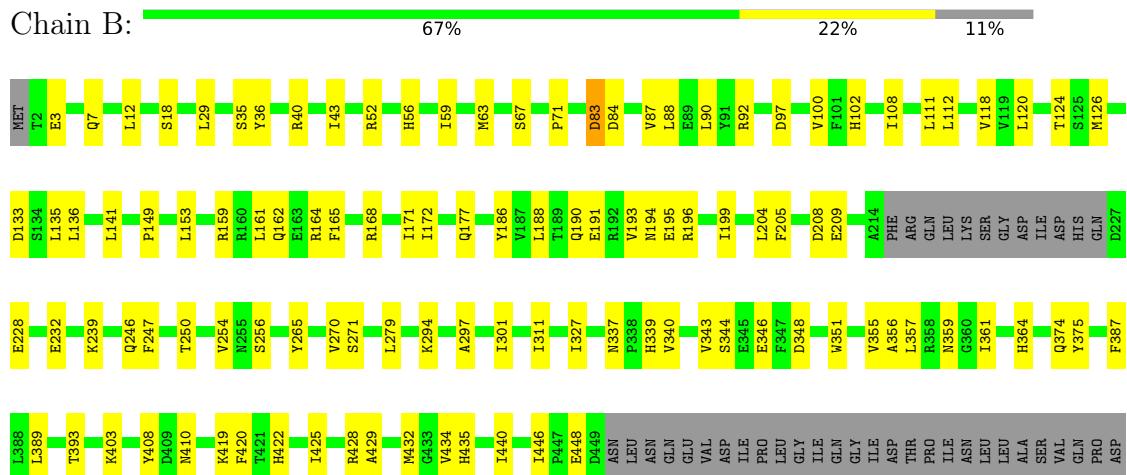
### 3 Residue-property plots [i](#)

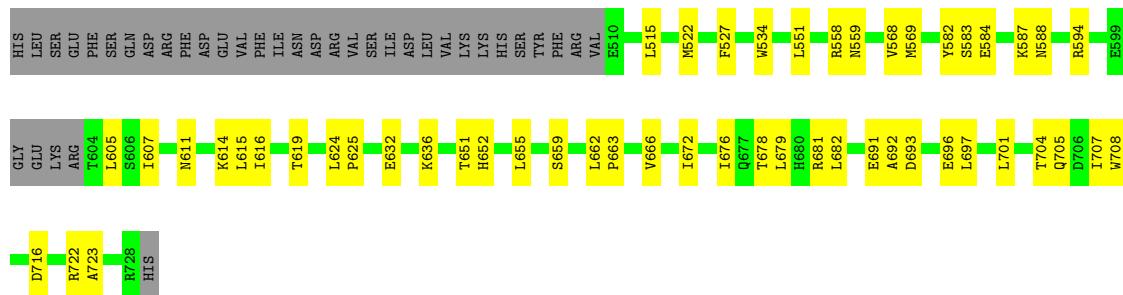
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: Anti-bacteriophage protein A



- Molecule 2: Anti-bacteriophage protein B





## 4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	440333	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	1500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k 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  > 5$	RMSZ	# $ Z  > 5$
1	A	0.14	0/4397	0.35	0/5944
2	B	0.12	0/5331	0.27	0/7214
All	All	0.13	0/9728	0.31	0/13158

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

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
1	A	262	ILE	Peptide

### 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 MolProbit. 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	4313	0	4300	112	0
2	B	5223	0	5214	105	0
All	All	9536	0	9514	211	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 11.

The worst 5 of 211 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:A:39:ARG:HB3	1:A:47:ASP:HB3	1.75	0.69
1:A:307:VAL:HG21	1:A:347:VAL:HG22	1.75	0.69
1:A:266:PHE:HD1	1:A:283:HIS:HD1	1.42	0.68
1:A:277:ARG:NH2	1:A:417:TYR:OH	2.26	0.68
2:B:582:TYR:HE2	2:B:616:ILE:HG21	1.59	0.68

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	529/565 (94%)	492 (93%)	37 (7%)	0	100 100
2	B	643/729 (88%)	612 (95%)	31 (5%)	0	100 100
All	All	1172/1294 (91%)	1104 (94%)	68 (6%)	0	100 100

There are no Ramachandran outliers to report.

### 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	484/514 (94%)	480 (99%)	4 (1%)	79	89
2	B	575/648 (89%)	572 (100%)	3 (0%)	86	92
All	All	1059/1162 (91%)	1052 (99%)	7 (1%)	80	90

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	489	LYS
2	B	83	ASP
2	B	676	ILE
2	B	124	THR
1	A	347	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	7	GLN
2	B	116	GLN
2	B	611	ASN
2	B	638	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 oligosaccharides 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.