



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 10, 2026 – 06:08 pm GMT

PDB ID : 9SNH / pdb\_00009snh  
Title : CTLH-CRA domain of murine Maea  
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Deposited on : 2025-09-10  
Resolution : 1.43 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.48

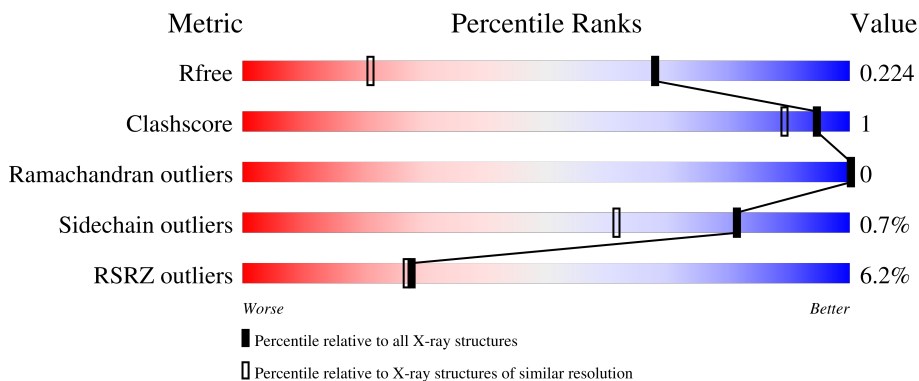
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*


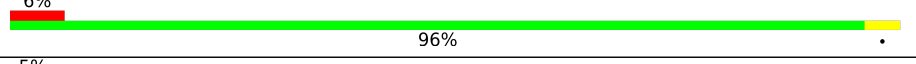
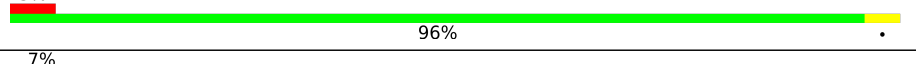
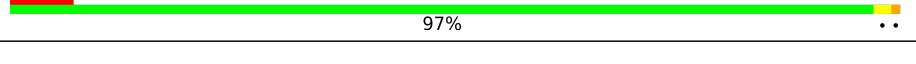
The reported resolution of this entry is 1.43 Å.

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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	164625	2809 (1.46-1.42)
Clashscore	180529	3008 (1.46-1.42)
Ramachandran outliers	177936	2971 (1.46-1.42)
Sidechain outliers	177891	2971 (1.46-1.42)
RSRZ outliers	164620	2809 (1.46-1.42)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	126	 7% 90% 7% .
1	B	126	 6% 96% .
1	C	126	 5% 96% .
1	D	126	 7% 97% ..

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8911 atoms, of which 4247 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 E3 ubiquitin-protein transferase MAEA.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	122	2084	654	1037	197	187	9	0	2	0
1	B	126	2133	669	1063	203	190	8	0	1	0
1	C	126	2153	677	1071	205	191	9	0	5	0
1	D	126	2155	678	1076	201	190	10	0	5	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	154	GLY	-	expression tag	UNP Q4VC33
A	155	PRO	-	expression tag	UNP Q4VC33
B	154	GLY	-	expression tag	UNP Q4VC33
B	155	PRO	-	expression tag	UNP Q4VC33
C	154	GLY	-	expression tag	UNP Q4VC33
C	155	PRO	-	expression tag	UNP Q4VC33
D	154	GLY	-	expression tag	UNP Q4VC33
D	155	PRO	-	expression tag	UNP Q4VC33

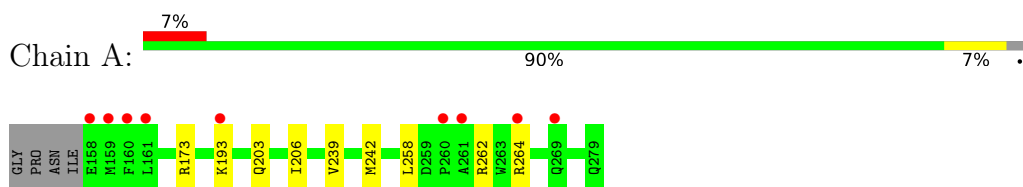
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	94	Total 94	O 94	0	0
2	B	90	Total 90	O 90	0	0
2	C	102	Total 102	O 102	0	0
2	D	100	Total 100	O 100	0	0

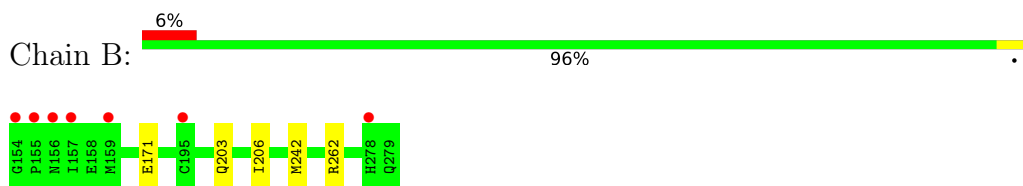
### 3 Residue-property plots [i](#)

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

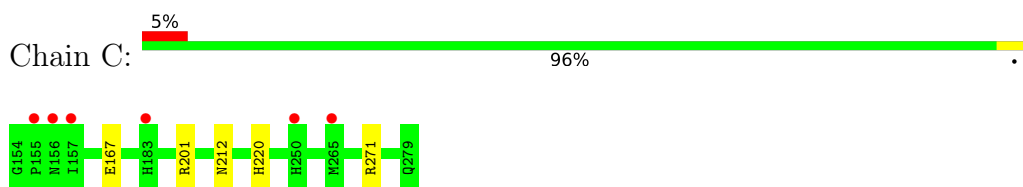
- Molecule 1: E3 ubiquitin-protein transferase MAEA



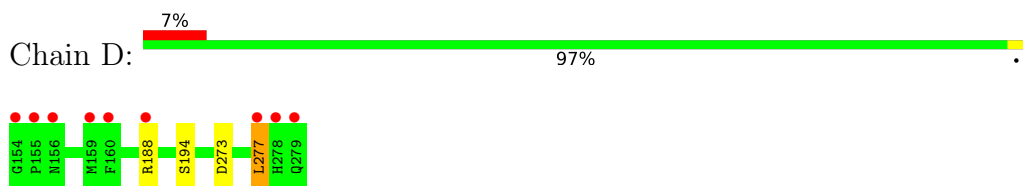
- Molecule 1: E3 ubiquitin-protein transferase MAEA



- Molecule 1: E3 ubiquitin-protein transferase MAEA



- Molecule 1: E3 ubiquitin-protein transferase MAEA



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.08Å 76.18Å 108.15Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	32.59 – 1.43 32.59 – 1.43	Depositor EDS
% Data completeness (in resolution range)	71.0 (32.59-1.43) 71.1 (32.59-1.43)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.28 (at 1.43Å)	Xtrriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, $R_{free}$	0.199 , 0.225 0.199 , 0.224	Depositor DCC
$R_{free}$ test set	3391 reflections (3.57%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.0	Xtrriage
Anisotropy	0.044	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 29.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	8911	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 39.26 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.2613e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 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	0.56	2/1068 (0.2%)	0.62	1/1431 (0.1%)
1	B	0.55	1/1092 (0.1%)	0.71	0/1464
1	C	0.30	0/1122	0.41	0/1506
1	D	0.29	0/1117	0.39	0/1499
All	All	0.44	3/4399 (0.1%)	0.55	1/5900 (0.0%)

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	2
1	B	0	1
All	All	0	3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	258	LEU	C-O	-5.66	1.16	1.24
1	A	203	GLN	C-O	-5.64	1.17	1.24
1	B	203	GLN	C-O	-5.02	1.18	1.24

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	206	ILE	CA-C-O	-5.05	115.70	120.95

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	262	ARG	Sidechain
1	A	264	ARG	Sidechain
1	B	262	ARG	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	1047	1037	1035	2	0
1	B	1070	1063	1063	2	0
1	C	1082	1071	1061	2	0
1	D	1079	1076	1082	4	0
2	A	94	0	0	0	0
2	B	90	0	0	1	0
2	C	102	0	0	0	0
2	D	100	0	0	0	0
All	All	4664	4247	4241	10	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 1.

All (10) 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:188:ARG:HE	1:D:277:LEU:CD1	2.14	0.60
1:A:193:LYS:HG2	1:A:193:LYS:O	2.11	0.49
1:B:171:GLU:OE2	2:B:301:HOH:O	2.20	0.47
1:C:201:ARG:O	1:C:220[B]:HIS:NE2	2.49	0.45
1:C:167:GLU:OE1	1:C:271:ARG:HD3	2.17	0.45
1:D:194:SER:OG	1:D:273:ASP:OD2	2.32	0.44
1:D:188:ARG:HE	1:D:277:LEU:HD13	1.84	0.43
1:A:239:VAL:O	1:A:242:MET:HG2	2.18	0.43
1:B:206:ILE:HG12	1:B:242:MET:HE1	2.01	0.42
1:D:188:ARG:HE	1:D:277:LEU:HD11	1.83	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 X-ray entries followed by that with respect to entries of similar resolution.

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	122/126 (97%)	122 (100%)	0	0	100	100
1	B	125/126 (99%)	123 (98%)	2 (2%)	0	100	100
1	C	129/126 (102%)	128 (99%)	1 (1%)	0	100	100
1	D	129/126 (102%)	128 (99%)	1 (1%)	0	100	100
All	All	505/504 (100%)	501 (99%)	4 (1%)	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 X-ray entries followed by that with respect to entries of similar resolution.

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	114/115 (99%)	113 (99%)	1 (1%)	75	51
1	B	116/115 (101%)	116 (100%)	0	100	100
1	C	119/115 (104%)	118 (99%)	1 (1%)	79	58
1	D	120/115 (104%)	119 (99%)	1 (1%)	79	58
All	All	469/460 (102%)	466 (99%)	3 (1%)	81	66

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

Mol	Chain	Res	Type
1	A	173	ARG
1	C	212	ASN
1	D	277	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	211	GLN
1	A	274	ASN
1	A	278	HIS
1	A	279	GLN
1	B	183	HIS
1	C	274	ASN
1	D	211	GLN
1	D	274	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 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.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	122/126 (96%)	0.32	9 (7%) 22 21	15, 29, 57, 94	2 (1%)
1	B	126/126 (100%)	0.41	7 (5%) 31 31	16, 33, 65, 82	1 (0%)
1	C	126/126 (100%)	0.28	6 (4%) 36 37	11, 30, 56, 69	3 (2%)
1	D	126/126 (100%)	0.24	9 (7%) 23 22	12, 30, 74, 94	5 (3%)
All	All	500/504 (99%)	0.31	31 (6%) 28 27	11, 31, 64, 94	11 (2%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	160	PHE	6.0
1	D	155	PRO	5.3
1	D	156	ASN	5.1
1	B	157	ILE	4.5
1	A	161	LEU	4.4
1	D	277	LEU	4.0
1	D	160	PHE	3.9
1	B	155	PRO	3.7
1	D	154	GLY	3.6
1	A	193	LYS	3.5
1	D	278	HIS	3.4
1	A	159	MET	3.2
1	B	154	GLY	3.2
1	C	250	HIS	3.0
1	D	279	GLN	2.9
1	A	264	ARG	2.8
1	B	159	MET	2.7
1	C	265	MET	2.7
1	C	156	ASN	2.7
1	C	155	PRO	2.6
1	D	159	MET	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	156	ASN	2.4
1	A	261	ALA	2.4
1	B	278	HIS	2.4
1	A	158	GLU	2.3
1	C	183[A]	HIS	2.2
1	D	188	ARG	2.2
1	C	157	ILE	2.2
1	A	260	PRO	2.1
1	A	269	GLN	2.1
1	B	195	CYS	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.