



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:46 PM UTC

PDB ID : 1BHZ / pdb_00001bhz
Title : LOW TEMPERATURE MIDDLE RESOLUTION STRUCTURE OF HEN
EGG WHITE LYSOZYME FROM MASC DATA
Authors : Ramin, M.; Shepard, W.; Fourme, R.; Kahn, R.
Deposited on : 1998-06-10
Resolution : 3.90 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

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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

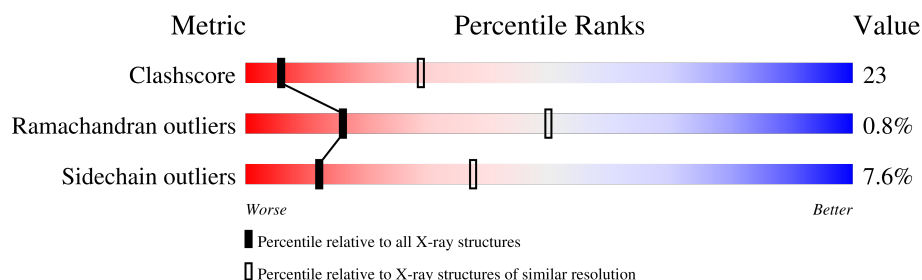
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.90 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)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	1034 (4.08-3.72)
Ramachandran outliers	187476	1251 (4.10-3.70)
Sidechain outliers	187428	1243 (4.10-3.70)

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 ≥ 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	129	37% 43% 18% .

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1001 atoms, of which 0 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 LYSOZYME.

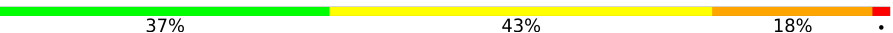
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	129	Total	C	N	O	S	0	0	0
			1001	613	193	185	10			

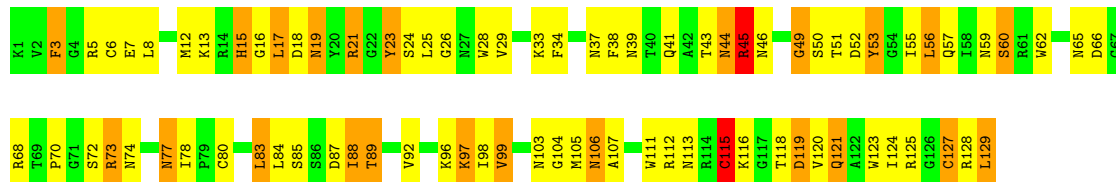
3 Residue-property plots

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.

Note EDS was not executed.

• Molecule 1: LYSOZYME

Chain A: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	78.68Å 78.68Å 37.05Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 3.90	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-3.90)	Depositor
R_{merge}	0.03	Depositor
R_{sym}	0.03	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.315 , 0.308	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1001	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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	2.69	19/1021 (1.9%)	2.65	83/1379 (6.0%)

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	3

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	49	GLY	C-N	-45.70	0.74	1.33
1	A	56	LEU	C-N	30.33	1.72	1.33
1	A	3	PHE	C-N	-28.28	0.92	1.33
1	A	107	ALA	C-N	-17.37	1.04	1.33
1	A	16	GLY	C-N	16.82	1.58	1.33
1	A	119	ASP	C-N	16.48	1.51	1.33
1	A	115	CYS	C-N	-15.94	1.11	1.33
1	A	87	ASP	C-N	14.99	1.54	1.33
1	A	88	ILE	C-N	-14.51	1.15	1.33
1	A	39	ASN	C-N	14.28	1.53	1.33
1	A	53	TYR	C-N	-12.01	1.11	1.33
1	A	84	LEU	C-N	-11.80	1.17	1.33
1	A	60	SER	C-N	8.37	1.45	1.33
1	A	23	TYR	C-N	8.27	1.45	1.33
1	A	55	ILE	CA-CB	6.04	1.61	1.54
1	A	41	GLN	C-N	-5.81	1.25	1.33
1	A	15	HIS	CD2-NE2	-5.69	1.31	1.37
1	A	29	VAL	CA-CB	5.56	1.61	1.54
1	A	15	HIS	CG-ND1	-5.02	1.32	1.38

All (83) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	53	TYR	O-C-N	-19.13	100.53	123.30
1	A	16	GLY	O-C-N	17.05	142.40	122.45
1	A	16	GLY	CA-C-N	-15.60	93.85	121.14
1	A	16	GLY	C-N-CA	-15.60	93.85	121.14
1	A	45	ARG	O-C-N	-11.82	108.75	122.93
1	A	53	TYR	CA-C-N	11.70	141.52	121.39
1	A	53	TYR	C-N-CA	11.70	141.52	121.39
1	A	65	ASN	OD1-CG-ND2	-10.96	111.64	122.60
1	A	99	VAL	CB-CA-C	-9.75	97.05	112.16
1	A	59	ASN	OD1-CG-ND2	-9.62	112.98	122.60
1	A	103	ASN	CA-CB-CG	-9.50	103.10	112.60
1	A	46	ASN	OD1-CG-ND2	-9.36	113.25	122.60
1	A	19	ASN	CA-CB-CG	-9.24	103.36	112.60
1	A	119	ASP	CA-C-N	-8.62	107.41	121.54
1	A	119	ASP	C-N-CA	-8.62	107.41	121.54
1	A	124	ILE	O-C-N	-8.46	114.47	122.16
1	A	121	GLN	OE1-CD-NE2	-8.45	114.15	122.60
1	A	74	ASN	OD1-CG-ND2	-8.35	114.25	122.60
1	A	44	ASN	OD1-CG-ND2	-8.30	114.30	122.60
1	A	66	ASP	CA-CB-CG	8.17	120.77	112.60
1	A	119	ASP	O-C-N	8.13	133.21	122.56
1	A	103	ASN	N-CA-C	7.96	122.71	112.92
1	A	60	SER	CA-C-N	7.80	138.26	121.64
1	A	60	SER	C-N-CA	7.80	138.26	121.64
1	A	115	CYS	O-C-N	7.71	130.62	121.76
1	A	113	ASN	OD1-CG-ND2	-7.59	115.00	122.60
1	A	49	GLY	CA-C-N	-7.59	106.78	121.06
1	A	49	GLY	C-N-CA	-7.59	106.78	121.06
1	A	73	ARG	N-CA-C	7.45	122.37	113.28
1	A	21	ARG	CB-CG-CD	7.36	128.23	111.30
1	A	25	LEU	N-CA-C	-7.36	100.13	110.50
1	A	23	TYR	CA-C-N	-7.33	107.55	121.54
1	A	23	TYR	C-N-CA	-7.33	107.55	121.54
1	A	125	ARG	N-CA-C	7.32	123.44	111.37
1	A	39	ASN	OD1-CG-ND2	-7.25	115.34	122.60
1	A	124	ILE	CA-C-N	7.22	131.66	120.82
1	A	124	ILE	C-N-CA	7.22	131.66	120.82
1	A	106	ASN	OD1-CG-ND2	-7.14	115.46	122.60
1	A	5	ARG	NE-CZ-NH2	-7.09	112.82	119.20
1	A	21	ARG	NE-CZ-NH2	7.09	125.58	119.20
1	A	65	ASN	CB-CG-ND2	6.96	126.85	116.40
1	A	99	VAL	N-CA-CB	6.55	121.85	110.65

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	72	SER	N-CA-C	6.48	119.38	110.24
1	A	55	ILE	N-CA-CB	-6.35	102.53	110.47
1	A	78	ILE	N-CA-CB	-6.35	102.32	111.21
1	A	77	ASN	CA-CB-CG	-6.23	106.37	112.60
1	A	127	CYS	N-CA-C	6.22	120.02	110.20
1	A	23	TYR	O-C-N	6.21	130.21	122.63
1	A	3	PHE	O-C-N	-6.11	116.05	122.96
1	A	89	THR	N-CA-C	6.08	118.41	111.11
1	A	25	LEU	O-C-N	-6.06	115.71	122.86
1	A	37	ASN	OD1-CG-ND2	-6.06	116.54	122.60
1	A	19	ASN	N-CA-C	5.93	120.09	112.86
1	A	49	GLY	O-C-N	5.91	128.79	122.65
1	A	45	ARG	CA-C-N	5.90	130.84	120.87
1	A	45	ARG	C-N-CA	5.90	130.84	120.87
1	A	60	SER	O-C-N	-5.85	103.11	122.06
1	A	3	PHE	CA-C-N	5.78	126.44	120.60
1	A	3	PHE	C-N-CA	5.78	126.44	120.60
1	A	106	ASN	CB-CG-ND2	5.78	125.06	116.40
1	A	44	ASN	CB-CG-ND2	5.66	124.89	116.40
1	A	53	TYR	N-CA-C	5.56	117.96	108.90
1	A	62	TRP	N-CA-C	5.50	120.64	113.88
1	A	34	PHE	CA-CB-CG	-5.46	108.34	113.80
1	A	26	GLY	N-CA-C	-5.39	100.41	113.18
1	A	3	PHE	CA-CB-CG	5.32	119.12	113.80
1	A	107	ALA	CA-C-N	-5.30	115.59	123.11
1	A	107	ALA	C-N-CA	-5.30	115.59	123.11
1	A	19	ASN	OD1-CG-ND2	-5.28	117.32	122.60
1	A	115	CYS	CB-CA-C	-5.26	104.07	111.65
1	A	85	SER	N-CA-C	5.26	117.08	110.24
1	A	128	ARG	CB-CA-C	-5.24	102.01	110.77
1	A	70	PRO	O-C-N	-5.21	116.73	123.03
1	A	59	ASN	N-CA-C	5.17	117.99	109.76
1	A	39	ASN	O-C-N	5.16	129.36	123.27
1	A	74	ASN	N-CA-C	5.12	118.27	111.30
1	A	74	ASN	CB-CG-ND2	5.08	124.01	116.40
1	A	98	ILE	CA-C-O	-5.05	115.82	121.17
1	A	21	ARG	CG-CD-NE	5.04	123.09	112.00
1	A	97	LYS	CB-CG-CD	-5.03	99.74	111.30
1	A	125	ARG	O-C-N	-5.02	116.33	122.11
1	A	59	ASN	CB-CG-ND2	5.02	123.93	116.40
1	A	28	TRP	CG-CD2-CE3	5.02	138.92	133.90

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	115	CYS	Mainchain
1	A	45	ARG	Mainchain
1	A	60	SER	Mainchain

5.2 Too-close contacts

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	1001	0	954	44	1
All	All	1001	0	954	44	1

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 23.

All (44) 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:49:GLY:C	1:A:50:SER:CA	1.81	1.50
1:A:56:LEU:C	1:A:57:GLN:N	1.72	1.48
1:A:49:GLY:CA	1:A:50:SER:N	1.90	1.34
1:A:49:GLY:O	1:A:50:SER:N	1.81	1.12
1:A:49:GLY:O	1:A:50:SER:CA	2.02	1.04
1:A:15:HIS:HB3	1:A:92:VAL:HG11	1.56	0.88
1:A:49:GLY:O	1:A:50:SER:HA	1.75	0.87
1:A:49:GLY:C	1:A:50:SER:N	0.74	0.84
1:A:106:ASN:HD21	1:A:116:LYS:NZ	1.84	0.74
1:A:15:HIS:CB	1:A:92:VAL:HG11	2.19	0.72
1:A:44:ASN:HD22	1:A:57:GLN:NE2	1.87	0.72
1:A:15:HIS:O	1:A:96:LYS:NZ	2.15	0.70
1:A:111:TRP:CH2	1:A:116:LYS:HG3	2.32	0.65
1:A:49:GLY:C	1:A:50:SER:C	2.64	0.65
1:A:12:MET:O	1:A:17:LEU:HB2	2.00	0.62
1:A:13:LYS:HG3	1:A:18:ASP:HB2	1.82	0.62
1:A:23:TYR:CE2	1:A:105:MET:HB2	2.35	0.61
1:A:45:ARG:HD3	1:A:51:THR:OG1	1.98	0.61

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:LYS:HG2	1:A:123:TRP:CH2	2.35	0.60
1:A:49:GLY:C	1:A:50:SER:HA	2.05	0.57
1:A:12:MET:O	1:A:17:LEU:N	2.34	0.57
1:A:115:CYS:O	1:A:116:LYS:C	2.43	0.57
1:A:119:ASP:OD1	1:A:121:GLN:HB3	2.07	0.54
1:A:106:ASN:HD21	1:A:116:LYS:HZ1	1.56	0.53
1:A:49:GLY:N	1:A:50:SER:N	2.54	0.51
1:A:56:LEU:C	1:A:57:GLN:CA	2.74	0.51
1:A:44:ASN:HD22	1:A:57:GLN:HE22	1.59	0.50
1:A:17:LEU:HD22	1:A:92:VAL:HG13	1.94	0.50
1:A:80:CYS:O	1:A:83:LEU:HB2	2.12	0.49
1:A:118:THR:O	1:A:120:VAL:N	2.45	0.49
1:A:49:GLY:O	1:A:50:SER:C	2.55	0.49
1:A:43:THR:HA	1:A:52:ASP:O	2.15	0.47
1:A:13:LYS:HE3	1:A:18:ASP:OD2	2.15	0.46
1:A:8:LEU:CD2	1:A:38:PHE:CD1	2.98	0.46
1:A:21:ARG:NH1	1:A:104:GLY:CA	2.80	0.45
1:A:106:ASN:ND2	1:A:111:TRP:HZ3	2.15	0.44
1:A:88:ILE:O	1:A:89:THR:C	2.61	0.42
1:A:8:LEU:HD22	1:A:38:PHE:CD1	2.55	0.42
1:A:112:ARG:HA	1:A:116:LYS:HB2	2.01	0.42
1:A:111:TRP:CD1	1:A:115:CYS:HB2	2.56	0.41
1:A:45:ARG:NE	1:A:68:ARG:NH2	2.68	0.41
1:A:6:CYS:HB3	1:A:127:CYS:HB3	1.94	0.41
1:A:3:PHE:HD2	1:A:7:GLU:HG2	1.86	0.40
1:A:51:THR:HB	1:A:53:TYR:CE2	2.56	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:129:LEU:OXT	1:A:129:LEU:OXT[8_555]	2.13	0.07

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	127/129 (98%)	117 (92%)	9 (7%)	1 (1%)	16	50

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	24	SER

5.3.2 Protein sidechains ⓘ

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	105/105 (100%)	97 (92%)	8 (8%)	12	37

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	LEU
1	A	19	ASN
1	A	73	ARG
1	A	77	ASN
1	A	83	LEU
1	A	97	LYS
1	A	99	VAL
1	A	129	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	19	ASN
1	A	37	ASN
1	A	57	GLN
1	A	106	ASN
1	A	113	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	8

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	56:LEU	C	57:GLN	N	1.72
1	A	84:LEU	C	85:SER	N	1.17
1	A	88:ILE	C	89:THR	N	1.15
1	A	53:TYR	C	54:GLY	N	1.11
1	A	115:CYS	C	116:LYS	N	1.11
1	A	107:ALA	C	108:TRP	N	1.04
1	A	3:PHE	C	4:GLY	N	0.92
1	A	49:GLY	C	50:SER	N	0.74

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.